Hydration care for older adults, including those living with dementia: mixed methods design combining systematic review, ethnography and online forum analysis

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Abstract

Background

Low-intake dehydration (serum/plasma osmolality>300mOsm/kg), following insufficient drinking, is associated with adverse health outcomes in older people. There is mixed evidence relating to numbers affected and which groups may be at higher risk. Care home staff supporting older adults living with dementia to drink frequently report challenges in doing so. This thesis aimed to establish the prevalence of low-intake dehydration in older adults, identify groups at greater risk, examine caregivers' discourses, actions and interactions for how people living with dementia drink in care homes, and explore interactive negotiations between care home staff and residents when supporting residents to drink.

Methods

This mixed-methods thesis used a convergent parallel design encompassing three studies. The systematic review assessed low-intake dehydration prevalence in non-hospitalised older adults. An ethnographic case study observing staff and residents, explored ways in which care home residents living with dementia were supported to drink. Thematic discourse analysis of caregivers' online forum posts assessed the importance allotted to drinking in caring for long-term care residents living with dementia.

Findings

Meta-analysis of 44 studies found that 24% of non-hospitalised adults were dehydrated (95%CI:0.07,0.46), including 34% of long-term care residents and 19% of community-dwellers. Subgroup analyses did not suggest that people with cognitive impairment were at more risk than those with no cognitive impairment. The ethnography found that staff discourse and actions de-prioritised drinking activities compared to other care needs. Forum users also de-prioritised drinking in their discourses compared to food and eating.

Discussion

These empirical studies demonstrate that whilst low-intake dehydration is highly prevalent in community and long-term care settings, providing hydration care to those living with dementia in care homes is often de-prioritised compared to other care needs.

These findings indicate the value of care settings reviewing how they prioritise making drinks available and accessible to promote residents' health and wellbeing.

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Acronyms

AOIR – Association of Internet Researchers

ARC EoE – Applied Research Collaborations East of England

BSG – British Society of Gerontology

BPS – British Psychological Society

BUN – Blood Urea Nitrogen

CAG – Confidential Advisory Group

CQC – Care Quality Commission

DCM – Dementia Care Mapping

D-DRINC Study A– 'Drinking for people living with Dementia IN Care homes' study – ethnography

D-DRINC Study A– 'Drinking for people living with Dementia IN Care homes' study – online forum analysis

EFSA – European Food Safety Authority

ENRICH – Enabling research in care homes

ESPEN – European Society for Clinical Nutrition and Metabolism

FMH – Faculty of Medicine and Health

GP – General Practitioner

GRADE – Grades of Recommendation, Assessment, Development and Evaluation

HRA – Health Research Authority

IOMR – Institute of Internet Mediated Research

IRAS – Integrated Research Application System

JBI – Joanna Briggs Institute

MMSE – Mini Mental State Examination

NHANES – National Health and Nutrition Examination Survey

NHS – National Health Service

NIHR – National Institute of Health and Care Research

PERSyst - Prevalence Estimates Reviews – Systematic Reviewing Methodology Group

PPI – Public partner involvement

REC – Research Ethics Committee

SRQR - Standards for reporting qualitative research

UEA – University of East Anglia

UK – United Kingdom

US – United States of America

WMA- World Medical Association

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Dedications

I dedicate this thesis to my wonderful Grandma who was diagnosed with dementia as I wrote this thesis.

Acknowledgements

People say that ‘life happens’ throughout the lifespan of a PhD. ‘Life’ certainly did happen for me. I have so many people to thank and acknowledge for their unwavering support, care and belief in me, for whom I could not have completed this PhD without.

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My children were my biggest motivation for me completing this PhD. Theo and Maia, you inspire me every day. You both make me a better person and you drive me to want to make the world a better place. I hope that this PhD inspires you both one day to also achieve your dreams against all odds and to use your experiences to want to make the world a better place.

Terms used in this thesis

This thesis primarily focusses on the topic of low-intake dehydration, when drinks intake is insufficient(2). This thesis uses the European Society for Clinical Nutrition and Metabolism's (ESPEN) definition of low-intake dehydration: "Low-intake dehydration is a shortage of pure water leading to loss of both intracellular and extracellular fluid and to raised osmolality in both compartments (intracellular and extracellular)"(2). Unless stated otherwise, the term 'dehydration' in this thesis relates to low-intake dehydration.

This thesis examines the hydration care of older people and those living with dementia in care homes. At the time of writing this thesis, dementia is the term used medically in the UK to describe diseases and injuries to the brain which affect memory, cognition and everyday functional ability(3). The term 'dementia' is not accepted by all people living with dementia and their families and some people prefer the term 'memory problems' whilst people from other European countries prefer the term Alzheimer's dementia to categorise all dementias. The term 'dementia' is used throughout this thesis as it is currently used across the UK's health and social care system.

I use the term 'long-term care residents' and 'residents' throughout this thesis. Some people, particularly family members, do not like the term 'resident' to describe people living in long-term care as they perceive it to dehumanise the individual. I use the term 'resident' for two reasons. The first is for consistency in describing the group of people my thesis includes. The second is that aside from D-DRINC Study A, I did not know the individuals included within the participant sample and so could not provide any relevant characteristics of these participants other than where they live.

Terms such as 'hydration', 'drinks' and 'drinking' throughout this thesis refer to non-alcoholic drinking.

People may perceive the acceptability of terms differently and this may also change over time. I do not intend to cause any offence from the terms I use in this thesis and only intend to convey the upmost respect to the communities this research intends to be useful for.

1. Thesis introduction

1.1 Aim and outline of chapter

This chapter introduces the research problem, research questions and rationale for this thesis and provides an overview of the thesis structure.

This mixed-methods PhD sought to answer the following questions: *How many older people are dehydrated and how do older people living with dementia drink in care homes?*

1.2 The research problem this thesis seeks to address

Older people are at risk of low-intake dehydration due to physiological changes in ageing leading to fluid loss, along with changes to mobility, cognitive and functional ability which may make shopping for drinks, making drinks and consuming drinks, more difficult(2, 4-6). Low-intake dehydration is caused by insufficient fluid intake(2) and mostly leads to intracellular fluid loss, resulting in raised serum or plasma osmolality(2, 7). It is associated with numerous heath conditions(4, 8-16), increased risk of hospitalisation(12, 17), mortality(12, 18-20) and is reported to be a significant economic burden on health and social care systems(21, 22). Previous economic analyses have estimated that it costs between $446 million and $1.4 billion to treat and support dehydrated, hospitalised older adults(21, 22). Economic analyses are outdated and have previously used non-robust measures of low-intake dehydration and different definitions of dehydration to estimate the prevalence of low-intake dehydration and so analyses are inaccurate, but it does indicate the extent and significance of the problem of dehydration amongst older people. It is commonly reported in research publications(6, 12, 14, 17, 23) and anecdotally in media reports(24-28) that older people are dehydrated, particularly those living in long-term care settings(2, 29) but it is not known whether older long-term care residents are at higher risk of dehydration than those living in the community. It is also often reported that people living with dementia find drinking difficult and/or are more likely to be dehydrated(30-33), however the evidence to support the association between dehydration, cognitive impairment and dementia is inconsistent(14, 34-38). Research is therefore needed to estimate the prevalence of dehydration amongst older adults and establish which groups of older people are most at-risk of dehydration, to enable hydration interventions to be designed and implemented appropriately and sustainably. An accurate prevalence of low-intake dehydration amongst older adults using robust measures could underpin more precise analyses of the economic impact of dehydration. The inconsistent evidence for the association between cognitive impairment, dementia and dehydration amongst older people requires further exploration. It is necessary to generate more nuanced knowledge which may explain why some studies report that people living with dementia are more dehydrated(34, 37), whilst other studies do not report this association(16, 39). An in-depth exploration of how people living with dementia consume drinks could benefit the designs of hydration interventions for people living with dementia, potentially leading to more impactful and effective interventions to improve drinking and reduce the risk of dehydration amongst older people.

1.2.1 How many older people are dehydrated?

There are some individual studies which report the prevalence of low-intake dehydration amongst long-term care residents(14, 34, 35) and some larger population-based cohort studies which report the prevalence for community-dwelling older adults(23, 36, 40). A recently published systematic review reported that between 0.8-38.5% of long-term care residents were dehydrated. However, the systematic review included studies which assessed dehydration using various non-robust measures and the authors did not conduct subgroup analyses to explore the heterogeneity(29). The systematic review excluded community-based studies which does not allow researchers to compare prevalence across settings(29). Authors of the systematic review included some datasets twice which is likely to bias the findings(29). No meta-analyses have been conducted to estimate a prevalence of low-intake dehydration globally amongst the older population. Although there are reports that older long-term care residents may be at higher risk of dehydration(24, 26, 27), there is currently no robust evidence which compares prevalences of community-dwelling older adults and long-term care residents in subgroup analyses to support this claim. A rigorous systematic review and meta-analysis is needed to synthesise all studies globally using robust measures to assess dehydration, to estimate the prevalence of low-intake dehydration amongst older adults. Meta-analytic subgrouping is required to explore heterogeneity and examine any differences between groups of older adults, to identify groups that may be at higher risk of dehydration. These findings could inform evidence-based hydration interventions targeted to groups of people most at-risk of dehydration. These findings would enable researchers to explore why these groups may be at-risk of dehydration so that hydration interventions could be designed most effectively and sustainably.

1.2.2 How do older people living with dementia drink in care homes?

More than three quarters of long-term care residents are considered to have dementia(41) and people living with middle to late stage dementia are more likely to live in long-term care settings compared to those in earlier stages of the disease(42). It is necessary to consider where someone lives (the setting) when considering hydration care, because it determines who is involved in their care, how and what drinks are provided and how someone may, or may not, be supported to live their life. There is inconsistent evidence from observational studies which suggests that older people living with dementia and/or cognitive impairment may be more at-risk of low-intake dehydration(14, 34-36, 38). This inconsistency may be because cross-sectional studies cannot investigate participant characteristics in more depth to explore individual differences in hydration practices and because many studies have excluded people living with moderate to severe dementia(40, 43-47), or those who may lack capacity to provide informed consent for research purposes(48-50), from the hydration literature. There are many reports that people living with dementia find drinking difficult, however there has been little research conducted to explore this phenomenon to establish what kinds of difficulties these may be(31, 32, 51).

Despite many multicomponent hydration interventions implementing evidence-based strategies to increase fluid intake amongst long-term care residents(52, 53), no hydration intervention has been sustainable and effective long-term in increasing fluid intake and some research has reported that care home residents living with dementia remain dehydrated(52, 54, 55). Some qualitative studies have examined hydration care in long-term care settings using observational methods(56-61). Observational studies have reported the influence of care home routines and resident characteristics on how residents drink fluids, as well as the role of drinking vessels(56-61). Previous qualitative research examining hydration care of care home residents has involved formal care staff, informal family caregivers, housekeeping, kitchen staff and speech and language therapists(61-63). Whilst some studies involved older care home residents as participants(64-67), only four of these studies included residents living with dementia within the research(56, 58, 59, 61). To generate knowledge which may explain why there is inconsistent evidence for the association between low-intake dehydration and dementia, it is necessary to adopt a nuanced approach to examining the relationship, which actively involves care home residents living with dementia. Knowledge of how people living with dementia access and consume drinks in care homes would help to identify any influences on drinking which could be used to support the design of tailored hydration interventions specifically for the people who may benefit from them. Support to improve how people living with dementia in care homes drink may lead to improved health outcomes, quality of life and reduced risk of hospitalisation and mortality.

1.3 Care Quality Commission (CQC) Regulations

The CQC is the independent regulator of health and social care in England and sets standards by which care providers must adhere to(68) in providing safe and effective care to the people using registered health and social care services, such as hospitals, care homes and domiciliary services, although they have no regulatory role for people being cared for by their families. Many people living with dementia access CQC registered settings for acute care, home care, respite care or long-term care(41). The CQC regulates how health and social care providers should deliver hydration care and meet the hydration needs of service users within regulation 9 and 14 of the CQC's regulated activities regulations(69). The CQC's regulation 14 relates to how care providers should meet the nutritional and hydration needs of people using their services(70). Regulation 14 states that registered services must do the following to meet the hydration needs of service users: a suitably trained person assesses hydration needs, hydration needs regularly reviewed and responded to, hydration intake recorded and monitored to prevent dehydration, water available and accessible to people at all times, whilst other drinks should be provided 'periodically', people should be encouraged and supported to drink independently but receive appropriate support if needed, and appropriate equipment or tools should be provided for someone to drink independently(70).

CQC Regulation 9 states that care providers must provide person-centred care to service users, where care is specifically tailored to individual needs and preferences(71).The guidance states that providers must make "every reasonable effort" to meet individual's preferences and in cases when a care provider cannot meet the needs or preferences of individuals, this should then be explained to individuals, whom should be supported to take part in the decision making processes regarding their care(71). Preferences should be updated accordingly and anyone providing care should have updated knowledge of the preferences of people they care for. Regulation 9 states that care providers must consider the wellbeing and quality of life of service users when assessing individual needs. When considering hydration care, care providers should therefore consider residents' hydration needs on an individual basis. If care providers are inspected and found not to comply with any of the 14 fundamental standards, the CQC can make recommendations for improvement and re-inspect the service(72). The CQC may take enforcement action against the providers, which could result in prosecution and closure of settings, if the provider does not demonstrate improvements(69).

1.4 Thesis overview

Chapters One, Two, Three, Five and Eight are written in third person whilst Chapters Six, Seven and Nine are written in first person to reflect the researcher's role in actively constructing the research.

Chapter One

This chapter outlines the research problem, research question and purpose of the thesis. The chapter provided an overview of the structure of the thesis and contributions of each chapter to the thesis.

Chapter Two

The chapter introduces the concept of dehydration, the physiological processes attributed to dehydration and defines low-intake dehydration which is the focus of this thesis. The chapter appraises measures used to assess low-intake dehydration, discusses why older people are more at-risk of dehydration and the negative consequences associated with dehydration for older people. The chapter discusses dementia and why drinking may be problematic for this group of people. The chapter proceeds to discuss long-term care settings, how drinks are provided in these settings and how older people living with dementia may experience mealtimes and drinking in care homes.

Chapter Three

The chapter presents the aims and objectives of the thesis and identifies the research gap the thesis seeks to address.

Chapter Four

The chapter describes and justifies the mixed-methods approach to this thesis and presents the methods used to answer the thesis' research questions. The chapter discusses ethical challenges and decision making and describes the researcher's positionality and how it related to this thesis.

Chapter Five

The chapter describes the systematic review and meta-analysis which aimed to estimate the prevalence of low-intake dehydration in older people. The chapter describes the review methodology, findings and implications of these, along with the methodological challenges of completing the review.

Chapter Six

The chapter describes the care home ethnographic case study which aimed to explore and examine how people living with dementia consume drinks in care homes. The chapter describes the rationale for the study, how it involved public partners in designing the study, the findings and interpretation of findings. The chapter concludes by discussing how the findings may be useful for hydration care practice.

Chapter Seven

The chapter describes the online public discussion forum analysis study which aimed to examine the public discourse within written posts of how people living with dementia consume fluids in care homes. The chapter reports on the rationale for the study, the findings and discusses the potential implications of the findings for policy and practice relating to the hydration of older people.

Chapter Eight

The discussion chapter summarises the key findings from the three studies and describes the method for integrating findings from each study. The chapter then appraises the fit of the integrated findings and describes each integrated finding in turn. The chapter evaluates how well this thesis addressed the research questions and the strengths and limitations of the thesis overall. The chapter concludes with implications for policy, practice and future research arising from this research.

Chapter Nine

This chapter outlines all dissemination activities arising from this PhD project and the potential impact of each of the activities on public awareness of dehydration, hydration care practices, future research and policymaking.

1.5 Conclusion

This chapter identified the research problem this thesis will address and the research questions. This chapter also provided an overview of each thesis chapter and how each of the three studies will address the thesis aims, to generate rich knowledge pertaining to how many older people are dehydrated and how older care home residents living with dementia consume drinks. The next chapter details the aims and objectives of this thesis.

2. Literature review

2.1 Aim and introduction to chapter

This chapter outlines the physiology of dehydration, assessment of low-intake dehydration, negative health outcomes associated with low-intake dehydration and characteristics of older people which may increase their risk of low-intake dehydration. The chapter discusses dementia, the association between dementia and low-intake dehydration and how dementia might influence an older person’s ability to drink. The chapter concludes with an overview of existing studies which have examined hydration care for older people, and those living with dementia, in long-term care settings.

2.2 What is dehydration?

2.2.1 Definitions of dehydration

Dehydration is when the body experiences a loss of total body water(2, 7, 73). Dehydration is the opposite of euhydration when the body is optimally hydrated. Dehydration caused by insufficient drinking is known as ‘low-intake dehydration’(2) and leads to a loss of both intracellular and extracellular fluids, though mostly intracellular loss, resulting in raised serum or plasma osmolality(2, 7). Salt-loss dehydration refers to dehydration caused by a loss of water and salts via sweat, bleeding, vomiting and diarrhoea(2, 7, 74), predominantly losing extracellular fluids(73). A variety of terms are interchangeably used in the literature to describe both types of dehydration, without distinction made as to the causes, effects and management of each type of dehydration(2, 7, 75)(Table 2.1). This thesis only discusses low-intake dehydration hereafter.

TABLE 2.1: DEFINITIONS OF DEHYDRATION

Low-intake dehydration	Salt-loss dehydration
Intracellular dehydration	Extracellular dehydration
Water-loss dehydration	hypotonic dehydration
hypertonic dehydration	Volume depletion
Hyperosmotic dehydration	Hypovolaemia
Hypohydration	Isotonic dehydration
	Hyponatremia

2.2.2 The physiology of water balance

It is estimated that the human adult body is comprised of 60% water, though this varies depending on body mass and age(8, 76). Total body water ranges from approximately 75% in infants to 55% for older adults(8, 77). Water is the most abundant compound in the human body and is fundamental to maintaining life(8, 78). Water is involved with numerous bodily functions inside cells and between cells. These include thermoregulation, removal of waste products and toxins, circulation, homeostasis, nutrient transportation, providing moisture and lubrication to skin and joints and facilitating metabolic activities(7, 73, 77, 79). Mitochondria within cells generate the compound adenosine triphosphate (ATP) required to fuel cellular respiration and metabolism(80). Approximately 65% of the body's total water is stored in intracellular compartments, whilst 35% is stored within extracellular fluid compartments, plasma and interstitial spaces(81, 82). Total body water fluctuates throughout the course of a day. Humans lose water via urine, faeces, perspiration and respiration(7, 73, 74, 82). The body water equilibrium is rebalanced when humans consume water from fluids (drinks) and diet(81). This process is part of cellular homeostasis. Figure 2.1 shows the regulatory mechanisms used to maintain water balance in humans.

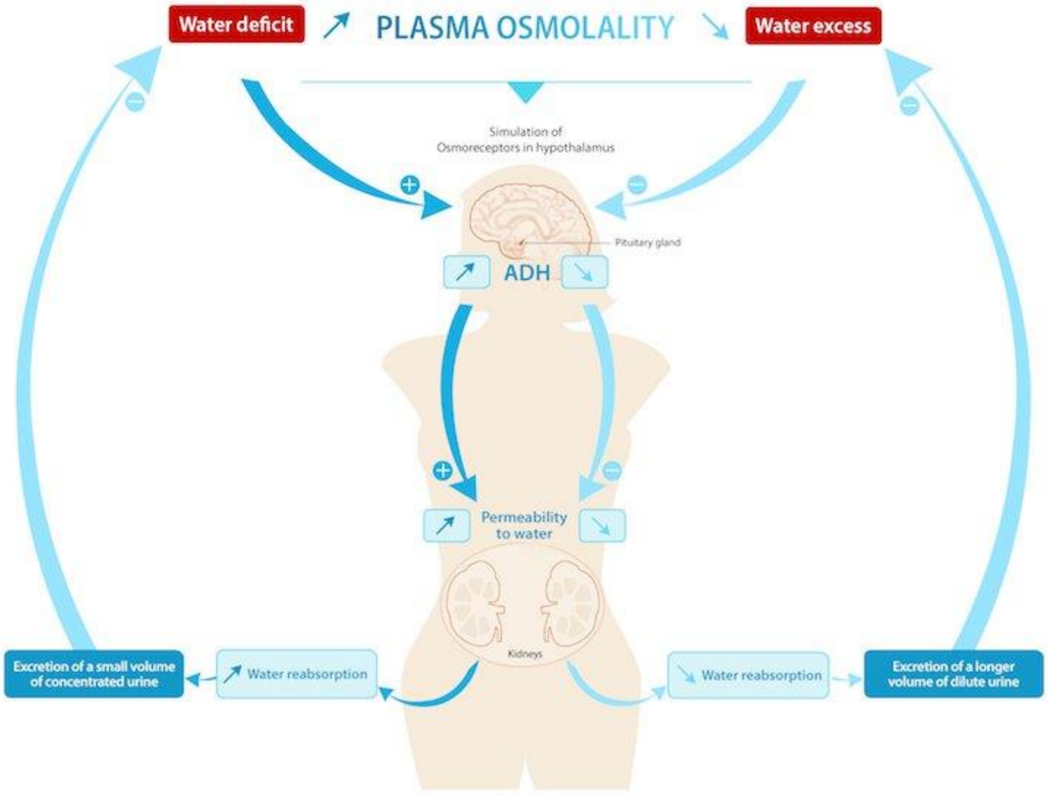


FIGURE 2.1: WATER BALANCE IN THE HUMAN BODY (GUYTON & HALL, 2006(83))

Low-intake dehydration

When drinks intake is insufficient to replace bodily fluids excreted, the intracellular and extracellular fluids become more concentrated, raising plasma and serum osmolality(2, 7, 76). The body's water balance is predominantly regulated by the antidiuretic hormone (ADH), also known as arginine vasopressin (AVP), which is produced in the hypothalamus(73). When the body is low on water, plasma ADH levels rise, water moves from inside cells and into extracellular space causing cells to shrink(8, 84). Once ADH has been triggered, osmoreceptors in the brain trigger the hypothalamus to restrict renal function, stimulating the thirst response and promoting incorporation of water channels to facilitate water reabsorption(8, 76, 84), prompting drinking. Although the threshold for stimulating ADH release can vary between individuals, one review reported that the mean osmotic threshold was between 286-298mOsm/kg(73).

Salt-loss (volume depletion) dehydration

Blood loss, sweat, diarrhoea and vomiting constitute a loss of extracellular fluid and electrolytes which may cause serum or plasma osmolality to decrease lower than normal range or remain at normal range(2, 76, 84). The sodium-potassium pumps within cell membranes cause sodium to remain in the extracellular compartment thus helping to retain some extracellular fluids(84). Because the extracellular water loss limits the body's effective circulating volume, the body responds by stimulating the sympathetic nervous system, suppressing atrial receptors, stimulating antidiuretic hormone (ADH) and activating receptors in the renal afferent arterioles, which is reflected in reduced blood pressure(76, 84). These bodily processes lead to renal conservation of salts and water, stimulating the thirst response to encourage drinking, which restore the body's fluid equilibrium(84). ESPEN recommend that older adults should be administered isotonic fluids to replenish water and salts loss from salt-loss dehydration(2). ESPEN recommend that where older adults lose excessive amounts of blood, they should be assessed for salt-loss dehydration by having their postural pulse change assessed, from lying to standing, to measure blood pressure(2). Diagnosing salt-loss dehydration, following vomiting and diarrhoea, is more difficult to be identified from individual signs or symptoms, and so ESPEN recommend that it can be identified when older adults present with at least four of the following seven symptoms: "confusion, non-fluent speech, extremity weakness, dry mucous membranes, dry tongue, furrowed tongue, sunken eyes"(2).

2.2.3 Fluid intake recommendations

There are different fluid intake recommendations around the world. The UK follows the European Food Safety Authority (EFSA) guidance which recommends that female adults should consume ≥1.6L fluids per day (as drinks) and male adults should consume ≥2.0L per day(85). This guidance applies to all adults aged 14 years and older, including older adults. The fluid intake guidance shown in Table 2.2 relates to the volume of fluids that should be orally consumed from beverages. EFSA recommended that adults consume 20% extra fluids from food intake(5, 85) which provides total water intake. EFSA is based on data from population studies across 13 European countries(86). ESPEN guidance uses EFSA guidance and makes recommendations specifically for older adults. Various methods are used to develop fluid intake recommendations, such as water balance studies, water turnover studies and cohort data(86) and consider individuals' activity level, temperature and bodily fluid losses(87). Because of these daily fluctuations in water balance, some fluid intake recommendations are calculated using body mass which more accurately reflect individual-level fluid requirements than more general population-based fluid requirements(88).

TABLE 2.2: ORAL FLUID INTAKE GUIDANCE

Guidance	**Daily drinks intake recommendations for older adults**
NHS (UK)(89)	6-8mugs for adults of both sexes
The European Society for Metabolism and Nutrition (ESPEN)(5)	Men: ≥2.0L
	Women: ≥1.6L
The European Food Safety Authority (EFSA)(85)	Men: ≥2.0L
	Women: ≥1.6L
Institute of Medicine (USA)(90)	Men: 3.0L
	Women: 2.2L
Chinese Nutrition Society(91)	Men: 1.7L/d
	Women: 1.5L/d

2.2.4 Low-intake dehydration assessment

How low-intake dehydration is assessed

Dehydration is assessed in older adults using a variety of tests for both clinical and research purposes(92). These include directly-measured serum or plasma osmolality, calculated serum or plasma osmolarity, oral fluid intake, saliva osmolality, urinary and blood markers, bioelectrical impedance analysis, clinical signs and symptoms and ultrasonography(92). Whilst assessment of oral fluid intake cannot indicate low-intake dehydration, prolonged insufficient oral fluid intake is likely to lead to low-intake dehydration(2).

Directly-measured serum or plasma osmolality

ESPEN recommended that directly-measured serum or plasma osmolality should be used to diagnose low-intake dehydration in older adults, with a reference standard of >300mOsm/kg(2) and 295-300mOsm/kg indicating impending dehydration(2). Despite ESPEN implementing this guidance, many researchers still do not use the recommended reference standards to assess low-intake dehydration in older people(4, 93).The concentration of solutes in the plasma or serum increases when someone has low-intake dehydration(74). Osmolality is assessed from a blood sample using a freezing point depression osmometer in a laboratory(2, 74). Whilst the terms serum or plasma osmolality are used interchangeably(94), Cheuvront *et al.* (2013) state that the threshold for plasma osmolality is +/- 5mmol/kg of serum osmolality and thus recommends the inclusion of impending dehydration (295-300mmol/kg) in recognising variance in basal set points in individuals(74). Impending dehydration reflects the state of “long-term chronic fluid deficiency” in which intervention may reverse the effects of dehydration(94). Although serum or plasma osmolality are recommended for accuracy, it is an invasive procedure, requiring a venous blood sample and specialist laboratory equipment and personnel trained in venepuncture and testing, which is time-consuming and expensive(95). It is recognised that a simpler and less invasive indicator of dehydration is needed to accurately assess low-intake dehydration in older adults more frequently across settings, because common signs and symptoms of low-intake dehydration are not effective in older adults(2, 74, 94, 96, 97).

Calculated serum or plasma osmolarity

ESPEN recommend that the Khajuria and Krahn osmolarity equation(72) accurately predicts directly measured serum or plasma osmolality in older adults(2, 95). Calculated serum or plasma osmolarity is a more feasible and cost-effective measure for assessing low-intake dehydration compared to directly-measured serum or plasma osmolality(95), because the components obtained from routine blood tests are used to predict directly-measured serum or plasma osmolality values(95). There are many osmolarity equations reported in the literature used to predict osmolality(95). A diagnostic accuracy study assessed 39 equations against the reference standard of directly-measured serum or plasma osmolality (>300mOsm/kg) in older adults (>65 years)(95). After an initial selection of the most accurate equations, by removing equations which had a statistically significant difference between the results of the osmolarity equation and the reference standard, or where there was a mean difference of -1 to +1mOsm, five osmolarity equations remained in the study(95). Of the five equations, the osmolarity equation which consistently showed most predictive accuracy for older people with and without diabetes, with good or poor renal function (eGFR<60), with normal, impending or current dehydration, men and women, low-alcohol and high-alcohol intake, was the Khajuria and Krahn calculated osmolarity equation(72, 95). The equation: ($osmolarity=1.86\times(Na^{+}+K^{+})+1.15\times glucose+urea+14$) demonstrated 85% sensitivity and 59% specificity against the reference standard, when authors used data from five large cohort studies across community, long-term care and hospital settings(95). It is clear that whilst the Khajuria and Krahn equation has good predictive accuracy for directly-measured serum or plasma osmolality, other equations are not as accurate and should not be used because they may lead to dehydrated older people being misdiagnosed as being euhydrated(95).

Oral fluid intake charts

Low intake dehydration is the result of consistent reduced fluid intake(2) and thus fluid intake or fluid balance charts are routinely completed in health and care settings, as an easy and accessible method of monitoring fluid intake(98, 99). Fluid intake charts are often used in research with various methods used, such as electronic questionnaires, food-frequency questionnaires, 24-hour recalls, estimated food diaries and the Mini Nutritional Assessment(100, 101). These assessments are often associated with a high risk of bias due to variation in how fluid intake is reported, the difference in definitions of fluids, how fluids are measured, and inaccurate recording of drinks consumption(98). The Fluid Intake Study in the Elderly (FISE) study found that 24-hour self-reported fluid intake amongst older long-term care residents were more accurate than 24-hour care home staff fluid charts, when compared with researcher observation of fluid intake(98). Care staff’s charts omitted some drinks and did not adjust for drinks that were given but not finished(98). There was a strong expert consensus at ESPEN that informal carers should periodically ask healthcare providers to assess the individual’s serum or plasma osmolality to assess low-intake dehydration, because fluid intake assessment is an inaccurate and unreliable assessment tool(2).

A Cochrane systematic review of 67 clinical signs and symptoms used to assess current or impending low-intake dehydration in older people, using either directly-measured serum or plasma osmolality (≥295mOsm/kg), calculated osmolarity or weight change over 1 week, as reference standards of low-intake dehydration(94), also established that oral fluid intake charts were not diagnostically accurate at assessing low-intake dehydration(94). The diagnostic inaccuracy of fluid intake charts therefore raises questions as to why they are still used in practice. The Care Quality Commission (CQC) regulation 14 in the UK states that hydration intake should be monitored and recorded to prevent dehydration(70), but if the fluid intake records are inaccurate and not reliable, then the regulations cannot protect the people the CQC regulations aim to protect. However, fluid intake charts can be used to indicate patterns of drinking and drinks preferences, which may be useful to care providers to support residents with drinking and delivering optimal hydration care.

Saliva osmolality

Saliva osmolality shows potential as a non-invasive point-of-care tool for assessing low-intake dehydration in older adults(102). A diagnostic accuracy study including older adults admitted to hospital for emergency or acute medical care found that whilst simple saliva indices were not accurate at detecting low-intake dehydration in this population(103), saliva osmolality could detect low-intake dehydration in the sample of hospitalised older adults, with a 70% sensitivity and 68% specificity(103). The study found that saliva osmolality demonstrated a moderate degree of diagnostic accuracy, detecting water-loss dehydration in 69% of older adults admitted to hospital (OR: 5.0, 95 CI:1.7-15.1)(103). A more recent community-based study reported similar salivary osmolality values(48) to those of Fortes *et al.'s* hospital study(103). However, the community-based study had a small participant sample (n=53)(48). There is currently only limited evidence supporting the use of salivary osmolality in older people across hospital and community settings, but not long-term care settings. It should be noted that point-of-care devices such as those used to assess saliva osmolality are still under-developed and not readily accessible outside of research settings(102, 103).

Urinary markers

Urinary tests (colour, volume, specific gravity, urinary osmolality) are frequently used by health and social care professionals to assess low-intake dehydration in older people, as they are inexpensive, non-invasive and easy to administer and process(92). Urinary tests may be useful to indicate fluid intake levels in the younger population(104). Urine colour is reported to change in response to daily fluid intake in young, healthy adults(104) and urine volume, osmolality, specific gravity and colour was able to identify fluid intake habits of 'high drinkers' and 'low drinkers' of young, healthy, community-living adults(105). However, in the same study, the plasma osmolality was not different between 'high drinkers' and 'low drinkers'(105). It is therefore important to be cautious about the utility of urinary markers in diagnosing low-intake dehydration in older adults(106, 107). Urinary tests are not accurate in diagnosing low-intake dehydration in older people, due to declining renal function with age(106, 107). A diagnostic accuracy study reported that urine colour, urine specific gravity, urine osmolality, urine volume and urinary measures such as pH, glucose and protein, had low diagnostic accuracy in diagnosing low-intake dehydration, the reference standard of serum osmolality >300mOsm/kg, for a sample of 162 long-term care residents and a sample of 221 community-dwelling older adults(106). These findings were also reported in a hospital-based diagnostic accuracy study for older people(103). The Cochrane systematic review reported no diagnostic accuracy for urinary measures to assess low-intake dehydration in older people(94). ESPEN therefore do not recommend the use of urine colour, or urine specific gravity to assess low-intake dehydration in older adults, due to their lack of diagnostic accuracy(2).

Creatinine-based blood markers

Creatinine-based markers are accessible measures routinely used to assess dehydration in older people for clinical and research purposes. Both Urea-Creatinine ratio (U:Cr ≥80mmol/L) and blood urea nitrogen-creatinine ratio (BUN:Cr>20mg/dL) are creatinine-based markers used to assess the ratio of creatinine to other molecules in the blood(79). When someone experiences dehydration, urea concentrations in the renal medulla increases disproportionately to the rise of creatinine(79). This process assumes effective renal function, which declines with age and so accuracy decreases with increasing age. Creatinine-based measures are not specific to low-intake dehydration(106) and the urea-creatinine ratio also increases for other health issues, such as sepsis and starvation(79). The Cochrane systematic review did not find any diagnostic accuracy for either creatinine-based measure to assess low-intake dehydration in older people(94).

Bio-impedance analysis

Bioimpedance analysis (BIA) is a one-time, non-invasive method of predicting total body water, intracellular and extracellular water volumes, by assessing the resistance of the electrical current flow through the water and electrolytes in the body(108). The Cochrane systematic review reported that whilst bioimpedance analysis of total body water, extracellular and intracellular water volumes as percentages of body weight, were not useful in accurately assessing dehydration against the reference standard test, yet BIA with resistance set at 50kHz did demonstrate some diagnostic utility at assessing dehydration in older adults in two of the four studies examining BIA studies(94). BIA demonstrated appropriate sensitivity and specificity in two studies(109, 110) but did not meet the specificity and sensitivity threshold set by authors of the review (sensitivity ≥ 0.60 and specificity ≥ 0.75) in the remaining two studies(111, 112). Despite two of the four studies from the Cochrane review showing promising results for specificity and sensitivity, they had wide confidence intervals and heterogeneity, reflecting the small sample sizes(94). It should be noted that in the two studies where the BIA method was more diagnostically accurate, the reference standard was calculated serum osmolarity, whereas the other two studies used directly-measured serum or plasma osmolality(94). There is variability in the diagnostic accuracy and usefulness of the BIA method in older adults and studies have only demonstrated some use in small participant samples(94, 113). ESPEN consequently do not recommend bioimpedance analysis to assess dehydration in older people(2, 5). There is potential for the BIA method to be developed into wearable technology, providing real-time data on an individual's hydration status however a study which tested the effectiveness of this technology excluded adults older than 60 years from participating(108). This wearable technology would need to be regularly and accurately calibrated with height, weight and age updated frequently(108). There is more research needed to develop the BIA method, as well as useful and accurate technologies using the BIA method for older people.

Clinical signs and symptoms of low-intake dehydration

The usual clinical signs and symptoms of dehydration widely used in clinical practice, such as skin turgor, thirst sensation, dry mucous membranes, sunken eyes or capillary refill, are not diagnostically accurate for use with older adults(79, 96, 106). A diagnostic accuracy study, in which 188 long-term care residents underwent double-blind assessment of 49 signs and symptoms typically associated with dehydration, found that none of the signs or symptoms were diagnostically accurate when compared to the reference standard of serum osmolality >300mOsm/kg(92). ESPEN recommend against using signs and symptoms to assess dehydration and instead recommend that the reference standard of serum osmolality >300mOsm/kg is used(2, 5).

Ultrasonography

There is mixed evidence for the diagnostic accuracy of assessing dehydration from the diameter of the inferior vena cava and its collapsibility index, assessed using ultrasound(94). One hospital study which used Bun:Cr >20 as the reference standard to indicate low-intake dehydration, found no associations with the inferior vena cava diameter in older adults(114). Another hospital study found that, older patients who had been clinically assessed as dehydrated, had differences in the diameter and compressibility of the inferior vena cava, compared to patients who had been clinically assessed as euhydrated(115). There was no significant association reported between inferior vena cava collapsibility index and serum osmolality for nursing home residents in Japan(34). Although ultrasonography is non-invasive, it is still not accessible in all care settings and the evidence does not provide robust assessments against the reference standard of serum or plasma osmolality >300mOsm/kg in hospitalised or non-hospitalised older populations(94).

2.3 Older people and the risk of low-intake dehydration

2.3.1 Prevalence of low-intake dehydration in older people

Low-intake dehydration is reported to be prevalent in older people across community, long-term care and hospital settings(2, 14, 18, 29, 35, 75, 112, 116). Prevalence of dehydration varies widely across studies due to dehydration being defined in different ways, assessed using various measures, using different cut-off points and across several settings and contexts(2, 5, 8, 18, 29). Whilst the difference in prevalence are reported across long-term care, community and hospital settings, this thesis only focusses on non-hospital settings. Many studies have reported prevalence figures for low-intake dehydration in long-term care settings(14, 20, 21, 29, 35, 38, 117-120) but there are fewer reports in community-dwelling older adults(48, 112, 121-125). It is unclear whether this is because dehydration is more prevalent in long-term care settings than the community because subgrouping analyses have not been conducted in a systematic review comparing care settings. No meta-analyses have yet been published aiming to establish the prevalence of low-intake dehydration in older people and examining any differences in prevalence across settings(29) and so it remains unclear whether dehydration is more prevalent in one setting compared to another.

Paulis *et al*. (2018) conducted a systematic review of 19 long-term care studies and reported low-intake dehydration prevalence of between 0.8-38.5%(29). The authors of the systematic review did not conduct a meta-analysis, stating the presence of high heterogeneity caused by combining several different measures of dehydration in the analysis(29). Only four of the included studies assessed dehydration using the reference standard of directly-measured serum osmolality(29). The authors did not investigate this heterogeneity by using subgroup analyses including each dehydration measure(29). Many of the included dehydration measures do not have diagnostic accuracy for assessing dehydration in older people and so an accurate systematic review using robust assessments of dehydration is required(29, 92). A systematic review and meta-analysis should explore any differences in prevalence between care settings, so that interventions to improve hydration can be implemented into those specific settings. Accurate economic analyses would be facilitated by more accurate estimations of prevalence, using robust assessment of low-intake dehydration. To prevent the significant economic impacts of low-intake dehydration, interventions are needed to appropriately target high-risk groups of dehydration, by establishing the prevalence of low-intake dehydration among older adults using robust measures(18, 21, 22, 116).

2.3.2 Characteristics which might predispose older people to low-intake dehydration

Awareness and attitudes of drinking and dehydration amongst older adults

Older adults are not generally aware of how much fluid they should consume from drinks/beverages(125). Awareness of oral fluid intake guidance is imperative in ensuring that older adults consume enough fluids to stay adequately hydrated. One qualitative study found that whilst older adults were aware that hydration was important for their health(60), they were less aware that some foods are a source of hydration. A survey was completed by a sample of 170 community-dwelling older adults in the US which aimed to gauge their understanding of dehydration as a health risk(124). The survey revealed that only 56% of the sample drank more than six glasses of fluid each day and respondents were unaware of the risks of insufficient hydration(124). If older people are unaware of the risks associated with dehydration, along with not knowing how much they should drink, they may be less likely to prioritise drinking. Bhanu *et al.,* (2019) explored the views of community-dwelling older adults by interviews and a focus group and reported that older participants relied on thirst as an indicator of dehydration, particularly in times of heat, which might increase their risk of dehydration(125). Evidence shows that thirst is an inaccurate indicator of dehydration in older adults(92). These findings involving community-dwelling older adults may not be generalisable to long-term care settings in which individuals are likely to require more support with activities of daily living and will experience different influences on their drinking activities. More research is needed to explore the views of long-term care residents as these individuals may have less influence over what drinks they consume, how much they consume and when they consume them.

Physiological and biological mechanisms in older adults

Older adults are physiologically prone to fluid loss(5, 7, 75, 76, 126). During ageing, the body's fluid reserve is smaller due to reduced muscle mass, causing reduced total water body(5, 7, 75, 76, 126). Older adults are thus more vulnerable to fluid loss at times of heat exposure(7). Older adults are likely to take diuretic and laxative medication, which leads to increased fluid loss(4, 8, 75). Renal function also declines with older age(4, 7). Glomerular filtration rate tends to decrease after age 40(8) and maximum urinary concentrating ability halves by age 80(107) which results in increased urine output and predisposes older adults to increased risk of low-intake dehydration(4, 7, 75, 127). Older adults may also be predisposed to reduced fluid intake due to having a diminished thirst sensation(4, 7, 75, 127). Robust evidence indicates that older people's taste acuity diminishes with age(128-131) due to factors such as physiological changes, reduction in taste buds on the tongue, as well as effects of medication on taste perception(130, 131).

Physical abilities of older adults

Older adults might experience reduced physical ability, reduced mobility and reduced strength as they age, which might impair their ability to shop for, reach for, open containers, make drinks and lift drinks(48, 56, 125). Hospital-based studies have reported how older patients were unable to reach for and lift their water jugs(132-134). One qualitative care home study found that residents preferred drinking vessels which were lighter and had larger handles, and when these preferred drinking vessels were implemented into practice, residents consumed more fluids at drinking opportunities(135). Older adults who lose physical strength or mobility as they age, might depend on others to help meet their hydration needs. Functional impairment and dependency on others are associated with dehydration risk(5, 56, 120, 136).

Frailty is associated with increased risk of dehydration(38, 39), which is commonly associated with those aged over 80 years(125, 137). Frailty is a state of health in which people experience decline in bodily reserves and functions, such as sarcopenia, unintended weight loss, low energy, multiple long-term health problems and reduced gait speed, resulting in risk of adverse physical and mental outcomes(138). There is some evidence to suggest an association between cognitive impairment and frailty(139) which may also be associated with low-intake dehydration(38). However, the relationship is complex. Frail, older adults living with dementia might find it difficult lifting drinking vessels, opening fluid containers, coordinating the drinking process and have limited mobility and strength(48, 56, 125, 132, 134, 135). In one hospital study, where cognitive impairment was assessed using the Rowland Universal Dementia Assessment Scale (RUDAS(140)) and low-intake dehydration was assessed using both clinical assessments and calculated serum osmolarity, there was no difference in dehydration status depending on individuals' cognitive status(38). However, within the 'cognitively intact' group, frail older people were significantly more likely to be dehydrated on admission to hospital, though the sample was small (n=5)(38). In another hospital study where dehydration was assessed using calculated serum osmolarity, there was no difference in frailty score or dementia diagnoses between dehydrated and non-dehydrated groups(39) suggesting limited interaction between frailty, dementia and dehydration. There is little evidence to support a linear relationship between low-intake dehydration and frailty; it is far more complex(141).

Dysphagia in older adults

Swallowing difficulties create problems for successful drinking and thus increases risk of low-intake dehydration(4, 5, 142, 143). Dysphagia often occurs as dementia progresses, which is related to more problematic drinking, if left undetected and unmanaged(31, 51, 144). Guidance has previously recommended that fluids are thickened for people experiencing dysphagia(143) but a systematic review provided evidence-based recommendations advising caution with this practice because people do not always find the taste and texture pleasant(143, 145, 146). The International Dysphagia Diet Standardisation Initiative (IDDSI) provide global guidance on food textures and drink thickness for people diagnosed with dysphagia(147), to ensure a consistent approach to nutritional care. A Cochrane systematic review reported that whilst people living with dementia and dysphagia tolerated 'honey-thick' viscosity liquids well immediately, there was a higher incidence of pneumonia for this group compared to people living with dementia receiving 'nectar-thick' liquids and thin liquids(148). The use of thickened fluids should be closely monitored and managed because it may prevent someone from consuming more fluids, instead of promoting fluid intake and may contribute to worse health outcomes overall(148). ESPEN guidance recommends that fluid-rich foods should be consumed if someone is dysphagic and enteral fluids given if optimal fluids cannot be tolerated orally(5, 143).

Cognitive abilities of older adults

Many studies support a broad association between hydration and cognitive performance and functioning(18, 36). Existing evidence is mostly based on data from younger adults(149) which is likely to differ from older adults, due to physiological changes in ageing(150). It is necessary to be critical about exactly which domains of cognitive function studies assess, when investigating the association with cognitive impairment and low-intake dehydration. Cognitive functioning relates to eight domains: sensation, perception, motor skills and construction, attention and concentration, memory, executive functioning, processing speed, language and verbal skills(151). The process of drinking is likely to involve each of the cognitive domains at different timepoints, such as requesting a drink, making a drink, reaching and feeling for a drink, having awareness of a drink in the vicinity, consuming a drink, remembering the drink is available and being able to carry out each of these stages in an appropriate order. Using data from the NHANES 2011-2014 dataset, it was reported that hydration status, as assessed by calculated serum osmolarity using the Khajuria and Krahn equation(72), and water intake were moderately associated with attention and processing speed in older females(152). No statistically significant associations were reported between dehydration or low water intake and cognitive test scores in men(152). A German longitudinal, observational study found that dehydration, as assessed by calculated serum osmolarity using the Khajuria and Krahn equation(153), significantly predicted poorer performance on the Digit symbol substitution test (DSST) for healthy community-dwelling adults over the age of 60 when compared to those euhydrated ($p<0.001$)(154). The DSST is a pencil and paper task requiring motor speed, attention and visuo-perceptual functions to complete the task(155). Completion of the DSST is associated with activation of the frontal lobes in electroencephalography, supporting the notion the task assesses executive functioning(156). To understand the relationship between low-intake dehydration and cognitive function more comprehensively, research needs to investigate the relationship with individual cognitive domains, instead of combined tasks or reporting global cognitive function.

When the relationship between dehydration and individual cognitive domains are explored, clearer insights are gained into which cognitive domains may be influenced by hydration. A retrospective analysis of 1957 participants with a mean age of 65 years from the PREDIMED-Plus cohort study reported a significant association between higher calculated serum osmolarity and cognitive decline, as indicated by the global cognitive function score(36). The composite global cognitive function score combined scores from a battery of eight neuropsychological tests to assess different cognitive domains at baseline and 2-year follow up(36). However, when cognitive tests were considered independently, only attention and short-term memory were associated with >2.2-4.4L of total water intake a day at 2-year follow up(36). No significant relationship was found between any individual cognitive domain and calculated serum osmolarity at 2-year follow up(36). Whilst there seems to be a relationship between adequate fluid intake, attention and short-term memory, the association between low-intake dehydration and other cognitive domains is less clear(36). A retrospective analysis of older adults attending an outpatient clinic (mean age: 80 years) reported that those diagnosed with dementia were more commonly dehydrated than those not with a diagnosis of dementia (58% vs 53%, p=0.044), as assessed using DSM-V(16), though the population were generally at high risk of dehydration. The study reported that whilst subtypes of dementia were not statistically significantly associated with dehydration, as assessed using the Khajuria and Krahn equation for calculated osmolarity, dehydration was more common for people diagnosed with vascular dementia (OR 1.83, 95% CI: 0.98-3.42, p=0.055)(16). Knowledge into which cognitive domains and subtypes of dementia may be implicated in increasing risk of low-intake dehydration are crucial for designing effective hydration-based interventions to prevent cognitive decline and dehydration.

Few studies have conducted a full assessment of each cognitive domain for dehydrated older people using the reference standard of low-intake dehydration and instead investigate domains such as attention or concentration(36, 152). A recent systematic review reported on six studies which reported cognitive outcomes and dehydration in older adults, of which three were non-hospital settings(18). The UK DRIE study reported a significant association between higher directly-measured serum osmolality and higher MMSE score for a sample of 188 long-term care residents with a mean age of 85.7 years(14). The authors reported that residents unable to complete the MMSE task of drawing two intersecting pentagons were 74% more likely to be dehydrated(14). McCrow *et al*. (2016) reported that there was no difference in dehydration status, as assessed by calculated serum osmolarity, between cognitively well and cognitively impaired groups of 44 hospitalised older patients (mean age: 81 years)(38). Ackland *et al.* (2008) investigated the relationship between dehydration and cognition of 52 hospitalised adults (mean age: 62.2years)(157). The authors reported that hydration status, as assessed by bioimpedance analysis, did not affect any of the comprehensive neuropsychological tasks assessing attention, executive function and memory/verbal learning(157). However, this participant sample was younger than previously discussed samples and the study investigated the effect of dehydration after three days and not longer-term effects of dehydration(157). Seymour (1980) investigated dehydration in 71 older hospitalised people (mean age: 81.2years) and reported that there was a statistically significant relationship between dehydration, assessed using blood osmolality, and mental function, assessed using a brief mental status questionnaire (p=0.01)(158). Cognition was not assessed using standardised tools to assess cognition and included people in 'confused' states which could include delirium(158). Suhr *et al.,* (2004) investigated how 14 healthy community dwelling older adults, who had fasted overnight (Mean age: 63.9 years) performed on a series of cognitive tasks compared to those who hydrated as normal (mean age 62.5 years)(159). The authors reported a significant association between hydration status, as assessed using bioimpedance analysis and performance on psychomotor processing speed (p=0.01) and attention/memory skills (p=0.03)(159). The participant samples were very small however and dehydration was not assessed using robust measures(159). Suhr *et al.* (2010) reported a statistically significant association between hydration status, as assessed by bioimpedance analysis and working and declarative memory using Auditory Verbal Learning test and Auditory Consonant Trigrams for 21 post-menopausal women with a mean age of 60.3years(160). There are differences in participant ages and sample sizes of the studies described here, as well as how dehydration and cognition was assessed(160). Only Hooper *et al.* (2016) assessed low-intake dehydration using the reference standard making it difficult to draw comparisons between studies(94).

Greater clarity is needed when reporting cognitive function in the literature, including details of which assessment tools and cognitive tasks are employed. The literature thus far, indicates that dehydration is more closely associated with some cognitive domains more than others(36, 152, 153). It would be useful for future research to examine associations between intake dehydration and independent cognitive domains. The MMSE is the most commonly used screening tool in research and clinical practice to assess mental status and briefly assesses five areas of cognitive function: orientation, registration, attention and calculation, recall and language(161). The MMSE was not intended to be a diagnostic tool of dementia or mild cognitive impairment(162) as only three of the 30 points assesses memory function(163). Executive functions are underrepresented on the MMSE and so it is insensitive to frontal lobe dysfunction(163). A cross-sectional study, conducted by a team of neuropsychologists, compared MMSE assessment to a comprehensive neuropsychological assessment of 338 healthy controls and 360 patients(164). Patients with mild cognitive impairment and dementia reported more memory complaints compared to healthy controls and healthy controls generally scored higher on all domains compared to patients with mild cognitive impairment or dementia(164). However, the authors concluded that whilst some domains reflect educational ability, the remaining domains pinpoint cognitive decline and the MMSE registration domain was not associated with cognitive decline nor educational ability(164). It therefore may be more useful to assess dehydration against MMSE domains, instead of an overall score which is less specific(36, 44, 153). The relationship between dehydration and cognitive function is unclear. Whilst there is some limited evidence to suggest that increased fluid intake improves attention and short-term memory for some groups of older people(36), there are few studies which assess cognitive function using comprehensive neuropsychological tests and/or report any associations with cognitive domains independently(36, 44, 153), to draw conclusions about any associations with hydration status, using directly-measured serum osmolality.

Communication abilities of older adults

Older people may experience difficulties with their hearing, vision and/or speech, which may make it more difficult for them to communicate with others(53, 165-167). If someone is dependent on others to provide them with drinks, whether in their own home or in a care home, they must be able to effectively communicate their hydration needs and preferences to ensure optimal hydration(52, 55, 114). If someone is unable to request a caregiver, inform the caregiver that they would prefer their drink made a different way, to inform their caregiver that they may be unable to reach or consume their drink, or any other communication relating to their drinking, then they may not consume adequate fluids and become dehydrated(52, 55, 114). Staff or residents who speak a different language to the person they are either caring for, or receiving care from, or in an unfamiliar dialect, may also face additional challenges engaging in mutual communication(56). Long-term care residents who are dependent on care staff to provide them with drinks, due to mobility issues, communication difficulties, or cognitive impairment, therefore are also reliant on care providers' routines to be effective, to provide them with adequate amounts of fluids(52, 55, 114).

Social opportunities for drinking in older age

Drinking is usually considered an enjoyable activity(60, 125, 168, 169) in which people may choose to pair food items with drinks, such as tea and cake. People often centre social plans around drinking, such as going to the pub or a café. As people get older, they may find it more difficult leaving the house to attend social events, or find that fewer people visit them at home, which might lead to social isolation and loneliness(170). Care staff report that some residents living with dementia mirror their behaviour in dining situations, which might lead them to drink(171). Social isolation, common amongst older adults(172), increases the risk of low-intake dehydration because social opportunities provide opportunities for drinking(4, 168).

Concerns about incontinence in older age for older adults

Continence and toilet issues are often reported as potential contributors to older resident's fluid intake and dehydration risk(48, 60, 117, 125, 173, 174). However, researchers observing residents' eating and drinking in care homes have reported this association less clearly. One carer in a care home study reported that some residents are too “scared” to ring their bell if they need the toilet because they know staff are busy(65), but it is unclear how this affected residents' drinking. Another qualitative care home study reported that staff asked residents to wait when residents requested to use the toilet(61). A study reported that residents restricted fluids to prevent needing to use the toilet(58) as the care home scheduled no opportunities for staff to take residents to the toilet and staff sometimes staff forgot about these residents' requests(58). Some older research participants reported that they “see no reason to” drink more and some restricted their fluid intake to prevent urinary incontinence(48, 125). It is unclear how toilet restriction impacted residents' drinking because these observational studies did not record fluid intake.

2.4 Negative outcomes of low-intake dehydration for older people

2.4.1 Economic burden of low-intake dehydration

Low-intake dehydration is associated with multiple long-term health problems, increased risk of hospitalisation and mortality(4, 8-16, 18-20). Dehydration is an economic burden on society due to the costs incurred from associated health conditions, increased length of hospital stay and increased risk of hospital readmission for those dehydrated(18). Although dated, figures from a US study in 1991 estimated that it cost an estimated $446 million to treat older, dehydrated Medicare patients, in which low-intake dehydration was classified using an ICD code(22). The ICD-10 code for dehydration includes both salt-loss and low-intake dehydration and so these economic analyses may lack accuracy for low-intake dehydration specifically(22). ICD codes are the World Health Organization's international classification of diseases and are often used by primary, secondary and tertiary care providers to record healthcare issues and diagnoses for patients(175). Economic analyses using data from the 1999 Healthcare Cost and Utilisation Project, estimated that avoidable hospitalisations of dehydrated older adults, classified using the ICD code for volume depletion, could have saved the economy an estimated $1.4 billion, after considering hospital stay, medications, therapies and diagnostics(21). Whilst it could be argued that this figure might represent older adults with salt-loss dehydration as well as low-intake dehydration, the authors state that their $1.4 billion is likely to be an under-estimation as they only included patients with a primary diagnosis of dehydration, instead of anyone with a secondary diagnosis of dehydration and also excluded patients who died from dehydration(21). A review of 15 studies reporting both direct and indirect costs associated with low-intake and salt-loss dehydration in hospitalised older adults found that dehydration is directly associated with higher healthcare expenditure, although a meta-analysis was not feasible due to heterogeneity from methodological differences across studies such as setting, outcomes, types of patients and how dehydration is classified(116). Whilst low-intake dehydration is costly to society, it is largely preventable, and costs can be reduced. It is necessary to have more current figures based on accurate prevalences of low-intake dehydration using robust measures.

2.4.2 Co-morbidities associated with low-intake dehydration

Hydration is critical to sustaining life and thus insufficient hydration leads to negative health outcomes(8). Low-intake dehydration is frequently associated with poorer quality of life, urinary tract infections(176), pneumonia mortality, infections, frailty, pressure ulcers, pain, renal failure(9), falls and fractures(10), cardiovascular disease, bradyarrhythmia, constipation, heat stress, headaches and confusion in older people(4, 11-13, 15, 16, 22). It is important to note that causation cannot be inferred from these associations because most evidence is reported from cross-sectional or cohort studies. There is a lack of direct evidence linking dehydration and co-morbidities, but this is discussed in more detail in the section below which examines metabolic health, gastrointestinal health, skin health and delirium.

Metabolic health

Evidence suggests that mild to moderate hypohydration impairs cardiovascular function(177), however most research has so far involved healthy and younger males and so does not represent female or older populations(178). A cross-sectional study involving adults aged younger than 60 years (mean age: 46.8 years) showed that increased plain water intake (>6 cups) was associated with reduced hypertension risk, compared to those consuming ≤1 cup a day(179). However, the same study reported that younger participants (mean age: 45.9 years) drank more cups of plain water on average compared to older participants (mean age: 48.6 years)(179). It is possible that people who drink more plain water, instead of other beverages, are more health-conscious which may decrease their risk of hypertension, due to consuming fewer sugar-sweetened beverages and/or moderating other lifestyle factors associated with adverse cardiovascular events, though hydration is still likely to play a mediating role in hypertension risk(179). A random effects meta-analysis of seven cohort studies reported that higher consumption of total water was associated with a lower risk of dying from cardiovascular disease (86%, 95% CI: 0.78-0.95, I2=0% and p=0.002) and a 3% lower risk of death for each additional cup of water intake per day (p<0.001)(180). However, only three of the studies included older adults in their samples (up to age 70) and no subgroup analyses were conducted by age(180). There is therefore limited evidence to support a direct association between water intake, cardiovascular disease and hypertension risk in the older adult population but those consuming more plain water may consume fewer unhealthy beverages, which may indirectly reduce their risk of cardiovascular events. Further research is needed to explore any association in older adults.

There may be an association between low-intake dehydration and stroke in the older adult population(181). A cross-sectional study reported that older patients presenting to hospital with stroke or transient ischaemic attacks had higher plasma osmolality levels compared to the controls in the general population, using the NHANES dataset, suggesting that dehydration may contribute to cerebral ischaemia(181). The authors suggested that high plasma osmolality was likely present in older people prior to their cerebral ischaemic event, instead of the higher plasma osmolality being caused by the stroke(181). Further research is needed to explore the association between dehydration and ischaemic events in older people.

Higher plasma osmolality is associated with diabetes mellitus in hospitalised and non-hospitalised older adults(14, 16, 35, 181). The association of diabetes with dehydration in older long-term care residents was reported in two cross-sectional studies(14, 35). The UK DRIE study reported a statistically significant association between higher directly-measured serum osmolality for 188 older long-term care residents and lower eGFR, indicating worse renal function, lower MMSE, indicating poorer cognitive performance, diabetic medication use and not taking potassium-sparing diuretics(14). Long-term care residents taking any diabetic medication were almost seven times more likely to be dehydrated (OR 6.77, 95% CI: 2.18-21.04), p=0.001)(14). Another long-term care study reported that BUN, MMSE score assessment of cognitive impairment and diabetes most significantly accounted for variation in directly-measured serum osmolality of 132 long-term care residents ($R^2 = 0.46$, $P<0.001$)(35). In the final multivariate analysis model, diabetic residents were more likely to be dehydrated, but this was not statistically significant (1.761, p=0.157)(35). A recently published retrospective study reported that from a sample of 1377 older adults attending an outpatient appointment, those diagnosed with diabetes were more likely to be dehydrated, assessed using the Khajuria and Krahn equation of calculated osmolarity(p=0.001)(16). Low-intake dehydration and diabetes seem to be related in the older adult population, which might be expected given that glucose is raised in diabetes and is also one of the factors used to calculate osmolarity and osmolality(72).

Gastrointestinal function

Adequate hydration is important for optimal digestion(182). Several longitudinal, cohort studies report associations between lower daily fluid intake, constipation and slower colonic transit(182, 183). A three-month trial involving toilet assistance, exercise and offer of food and fluid snacks every two hours a day for 112 nursing home residents found that bowel movements and fluid intake significantly improved post-intervention (p<0.05)(184). Constipation is also associated with consumption of some medications, occurrence of certain diseases, physical activity, low energy intake and higher percentage of protein in diet and thus the relationship between dehydration and constipation is likely to be mediated by other factors in older people(183).

Skin health

Sufficient hydration is crucial to tissue viability, preserving and repairing skin integrity in older people(185, 186). Sufficient fluids are required to support the blood flowing to wounded tissues and thus dehydration slows this wound healing(185). Research is limited in this area, but it is accepted that adequate fluid intake leads to improved skin hydration(8).

Kidney function

Older kidneys have reduced urinary concentrating ability(8) leading to increased fluid loss, pre-disposing to dehydration. It is thus difficult to generalise findings from studies with younger cohorts to older populations. Research shows that increased water intake reduces vasopressin secretion, which in turn improves renal function for people with and at-risk of chronic kidney disease(9). Fluid overload for people with end-stage renal disease and those receiving dialysis could be detrimental and would not improve renal function(9). A large cross-sectional study using data from NHANES 2009-2012 dataset reported a significant positive association between better hydration status, as assessed by calculated osmolarity, urinary markers and nephrolithiasis risk, in their sample of 8195 adult participants(187). Older people who consumed more fluids and better hydrated, were less likely to have self-reported previously having kidney stones and authors concluded that 2.5L of daily water intake was needed to prevent kidney stones forming(187). Two long-term care studies reported a statistically significant association between higher directly-measured serum osmolality and worse renal function, as indicated by BUN and lower eGFR(14, 35). A community-based study recently reported a statistically significant association between dehydration and chronic kidney disease ($p<0.001$) for a cohort of older outpatients with a mean age of 80 years(16). There seems to be a clear association between low-intake dehydration, fluid intake and renal function, with increased water intake seeming to improve function for people pre-end stage renal disease(14, 35). This is potentially because people with advanced renal disease may be encouraged to restrict their fluid intake, which might consequently predispose them to low-intake dehydration.

Delirium

Delirium is a condition in which someone experiences an acute change in attention, awareness and cognition, which cannot be explained by other neurocognitive disorders(188).There are many risk factors for delirium including malnutrition, neurocognitive deficits, advanced age, social isolation and numerous triggering agents such as acute infections, surgical intervention, psychoactive drugs and disturbances of electrolyte and water balance(188, 189). Delirium is associated with an increased risk of hospital admission, development of, or worsening of dementia or death(190, 191). A recent meta-analysis of 24 studies reported a significant association between delirium and long-term cognitive decline in older surgical and non-surgical older people (mean age: 75.4years), with an estimated effect size of 0.45 (95%CI: 0.34-0.57, $p<0.001$)(192). The I^2 value was high at 0.81 which the authors explored using univariate meta-regression(192). The authors found that age, number of covariates in analysis, baseline matching/adjustment and duration of follow-up accounted for 70% of the heterogeneity(192). Dehydration is likely to be a predictor of delirium, but it is a complex picture(188, 193). ESPEN recognise that dehydration is a common precipitating factor to delirium and recommend multi-component non-pharmacological interventions involving nutrition and hydration to prevent delirium in hospitalised older adults(2). Delirium management guidelines recommend checking nutrition and hydration of older people(190). A Cochrane systematic review of three non-pharmacological trials aimed at preventing delirium in long-term care residents(194), included one 4-week hydration-based cluster-randomised controlled trial involving 98 residents(190, 191). The systematic review authors concluded that it was unclear whether increased fluid intake improved delirium incidence because the trial was of very low quality and participants had a variety of co-morbid conditions at baseline(190, 191). Further trials are required to investigate the effects of longer-term increased fluid intake for older people on delirium outcomes.

2.4.3 Hospitalisation

It is unclear whether dehydrated patients stay in hospital longer, as research evidence assessing low-intake dehydration using robust measures is limited(18). Mukand *et al*. (2003) reported that dehydrated patients stayed five days longer in US hospitals than euhydrated older patients when dehydration was assessed using BUN:Creatinine ratio to indicate prerenal azotaemia and orthostasis(195). However, it is likely that this assessment is not reflecting low-intake dehydration and instead reflects renal dysfunction and blood loss post-surgery(195). El-Sharkawy *et al.,* (2015) found no significant association in length of hospital stay for dehydrated older adults when dehydration was assessed using directly-measured serum osmolality, although mortality rates were higher in the dehydrated group(12). Both studies had small sample sizes with n=39 and n=187, respectively, potentially limiting the generalisability of these findings(12). However, a large hospital cohort study (n=42,533) reported that where dehydration was assessed using the Khajuria and Krahn equation to calculate serum osmolarity, older patients had a median stay of eight days in hospital, compared to euhydrated patients who spent a median of three days in hospital ($p<0.001$)(20) suggesting that dehydrated older patients do have longer hospital stays.

2.4.4 Mortality

The risk of mortality is significantly higher for dehydrated older adults than those euhydrated(12, 18, 20, 22, 196). One British hospital cohort study found that older adults who were dehydrated on admission to hospital, as assessed by directly-measured serum osmolality, were six times more likely to die in hospital after 30 days(HR=6.04, 95% CI 1.64-22.25, $p=0.007$) compared to euhydrated older adults, irrespective of age, gender, illness severity, risk of malnutrition or comorbidities(12). A larger UK hospital-based cohort study (n=42,553) replicated these findings and reported that dehydrated older patients admitted to hospital had a 17% 30-day mortality rate and 44% one-year mortality rate whilst euhydrated older patients admitted to hospital had a 7% and 25% mortality rate respectively, when dehydration was assessed using the Khajuria and Krahn equation to calculate osmolarity(20). Edmonds *et al*. (2021) conducted a random-effects meta-analysis of 30-day mortality rates from four hospital studies(12, 196-198) and estimated that dehydrated older adults were found to be twice as likely to die after 30 days in hospital (RR = 2.54, 95% CI 1.23, 5.25, p=0.011), than those adequately hydrated(18). The meta-analysis reported low heterogeneity (I^2=37.7%), but combined different measures of dehydration including serum osmolarity, BUN:Creatinine ratio and fluid retention index, none of which were the reference standard of low-intake dehydration(2). Diagnostically accurate measures are needed to assess low-intake dehydration, as renal dysfunction in ageing can skew findings from non-robust measures(96).

2.5 Dementia in older age

Dementia is a syndrome caused by brain illness, disease or injury, leading to functional and cognitive decline and affecting an individual’s cognitive function, emotional control, behaviour and ability to carry out activities of daily living(3). There are over 100 types of dementia of which Alzheimer’s disease, vascular dementia, dementia with Lewy bodies and Fronto-temporal dementia are the most common types(199). Dementia is different to mild cognitive impairment in which modest impairment in one or more cognitive domains is identified which does not interfere with everyday activities, though they may require additional time and effort to complete(200). Dementia is typically diagnosed when mild cognitive impairment progresses to significantly impact functional or social abilities(200). It is estimated that 982,000 older people live with dementia in the UK, projected to increase to 1.4 million people by 2040(42). Dementia is prevalent in 7% of the older adult population(42). Whilst dementia can affect people of any age, the strongest currently known risk factor is older age(3, 201). Recently published economic analyses estimated that dementia currently costs £42 billion in the UK, attributed to cost of unpaid care, social care, healthcare, diagnosis and treatment, reduced quality of life and economic losses(42). This cost is predicted to increase to £90 billion by 2040, with £40 billion expected to be spent on social care(42). The cost of care increases as dementia progresses, with the care of someone with severe dementia (as assessed by MMSE score) costing almost double what the care of someone with mild dementia costs(42). Interventions are crucial for delaying the onset of more severe dementia symptoms where costs are likely to be higher(42), but also for the individual’s quality of life and reducing caregiver burden. Addressing modifiable risk factors to dementia is one way of achieving this. The Lancet Commission reviewed the evidence and identified fourteen modifiable risk factors for developing dementia throughout the life-course: less education, hypertension, hearing impairment, smoking, obesity, depression, physical inactivity, diabetes, low social contact, excessive alcohol consumption, high cholesterol, vision loss, traumatic brain injury and air pollution(201, 202). Many of the modifiable risk factors identified in the Lancet report relate to characteristics of the older adult population, particularly those living in long-term care settings(14, 203). Some of the dementia risk factors identified in the Lancet report may also impact someone's ability to access drinks. People with hearing impairments may find it difficult communicating their drinks request and/or preferences(165, 166). People with limited social contact may have fewer opportunities to have drinks made or share drinks with someone(4, 168). People with physical inactivity may have mobility issues which may make it more difficult to shop for, prepare and/or reach drinks(48, 109, 117). There is also an association with diabetes(14, 35), hypertension(179) and low-intake dehydration in older adults. There are therefore numerous modifiable risk factors for dementia which are also implicated in poor drinking and/or low-intake dehydration. Robust research is needed to investigate the role of drinking and hydration in older people living with dementia.

2.5.1 Reasons why drinking may be more problematic for people living with dementia

Older people living with dementia may forget to drink due to having memory problems(65, 204) and a reduced thirst sensation in older age(45, 127, 205) which would usually prompt someone to drink. Older adults living with cognitive impairment or dementia might have difficulty communicating their hydration needs, might forget that they need a drink, not recognise drinks, might be unable complete all steps in a logical order involved in successful drinking, or forget how to access drinks(4, 7, 75). Older adults living with dementia might therefore require assistance from family or professional caregivers to meet their hydration care needs(206). Long-term care residents living with dementia might not be aware of drinks in their vicinity or recognise what a drink or drinking vessel is(67, 207, 208). This issue may be more pronounced when someone living with dementia moves into a care home where they may not recognise drinking vessels used there(209).

The prevalence of low-intake dehydration for people living with dementia is unclear because a number of studies have previously excluded people with dementia(40, 43-47) or people unable to provide informed consent due to lacking mental capacity(48-50). It is commonly reported that older people living with dementia find drinking problematic, which might predispose to dehydration(31). People living with dementia may find it difficult making drinks, sourcing appropriate equipment and tools to make drinks, knowing where or how to access drinks, recognising drinks and remembering to drink, due to cognitive impairment(31). Someone with cognitive impairment might benefit from assistance, prompting or encouragement to drink(51).

Someone with dementia might have communication or speech difficulties(210), making it difficult for them to request drinks or communicate their drinks preferences to caregivers supporting them. Drinks preferences may be affected by taste changes in older age, along with dementia progression(31, 51, 131). Olfactory dysfunction is related to some neurologic disorders, such as Alzheimer’s disease and cognitive impairment(211) in older people, which might affect how they experience food and drink tastes(131). One experimental study reported that 29 people living with Alzheimer’s disease were less able to perceive taste compared to fourteen older control participants and 43 older participants living with mild cognitive impairment(211) when presented with gustatory tests. The same study reported that both groups of participants with Alzheimer’s disease and mild cognitive impairment were less able to detect umami flavours compared to control participants, perhaps suggesting that there might be some taste acuity changes associated with neurological changes(211). Umami is one of the five recognised basic tastes and is linked to increased appetite, increased palatability, and interest in food(212). If people living with Alzheimer’s disease and cognitive impairment are less able to perceive umami tastes, they might have reduced appetites, as well as taste changes relating to food and drink. There are reports of people living with dementia preferring different tastes in food and drink, such as sharper or sweeter flavours, which would also support this notion(51, 213). Older people living with dementia may drink less, or not at all, if they are not provided with drinks that they perceive to taste pleasant, which could lead to dehydration.

People living with moderate to later stages of dementia are more likely to reside in long-term care settings, due to requiring more support with their activities of daily living and potentially having more long-term health conditions(42, 214) and thus will be more dependent on others to meet their hydration needs. The dining environment, ambience and presentation of food and drink may also impact whether someone living with dementia consumes food and drink or not(52). Researchers conducted two sister systematic reviews to establish the effectiveness of direct and indirect interventions on supporting food and fluid intake in people living with dementia across settings(52, 55). Direct interventions included oral supplements, food/drink modification, management of swallowing problems, eating assistance, social support to improve food and fluid intake(55) and indirect interventions included environmental, behavioural, educational, exercise and multicomponent interventions to improve or maintain food and fluid intake(52). Most of the included studies across both reviews included small participant samples and most were assessed as being at high risk of bias(52, 55). The authors concluded that none of the 56 indirect interventions and 43 direct interventions which aimed to improve food and fluid intake were effective in supporting people living with dementia to drink or increase fluid intake(52, 55). These systematic reviews identify numerous influences on food and fluid intake for people living with dementia and yet no intervention was sustainable long-term(52, 55). However, the authors reported a high risk of bias in most included studies, due to factors such as inadequate random sequence generation in interventional studies, no adequate allocation concealment, no blinding of participants, and high risk of attrition in most studies(215). Included studies assessed dehydration and fluid intake using different measures and only two studies used the reference standard of directly-measured serum osmolality(215). Future hydration interventions should use robust assessments of dehydration so that outcome measures can be examined accurately(96). It remains unclear how many people living with dementia are dehydrated and whether people living with dementia are more at-risk than those not living with dementia. It is therefore crucial to generate knowledge of the prevalence of low-intake dehydration for older people living with dementia and to understand how people living with dementia consume drinks, to gain insights into the influences on drinking.

Stage of dementia and drinking

As dementia progresses, drinking ability may change(31, 51). In the early stages of dementia, olfactory and taste changes occur, along with attentional problems, impaired decision making and executive functional deficits, which may impact someone's drink and food preferences, and how they shop for, prepare and select food and drink to consume(30). In the moderate stages of dementia, coordination skills, recognition and perception of objects may be impaired, along with 'behavioural problems' and dysphagia(30), which will impact how someone engages with food and drink, likely requiring input from others to support eating and drinking. ESPEN report that in severe dementia, people may refuse to eat(30), but they do not comment on refusal of drinks. ESPEN note that whilst older people living with dementia may experience these dementia-related nutritional problems, they may also be affected by age-related issues affecting their nutritional care such as multiple long-term health problems(30). There is undoubtedly individual variation in someone living with dementia's ability to drink, given dementia stage, potentially the aetiology of dementia and any other health issues which may influence their ability to drink(105). It should not be assumed that a diagnosis of dementia impairs someone's entire ability to consume a drink, and instead, personalised nutritional interventions with the support of adequately trained staff, may improve how someone consumes a drink(31, 216). If people living with dementia rely on others to meet their hydration needs and the caregivers believe that poor drinking is to be expected with a diagnosis of dementia, then caregivers may not ensure that someone drinks enough and instead perceives the person to ‘refuse a drink’. It is therefore crucial that knowledge is generated relating to how people living with dementia consume drinks.

ESPEN Guidance for people living with dementia

ESPEN develop guidance and make evidence-based recommendations about the hydration and nutrition care of older people and those living with dementia(5, 31). Guidance needs to be evidence-based and informed by research which involves the people it seeks to generate guidance for. As mentioned in Chapter One, only four qualitative studies included people living with dementia as participants when examining hydration care in care homes(56, 58, 59, 61). The 2015 ESPEN guidance heavily focused on the nutrition of food and eating abilities for people living with dementia with less regard for nutrition relating to drinking(30). “Drink” is mentioned six times, “hydration” is mentioned nine times in the ESPEN guidance publication, compared to 205 mentions of “nutrition” and only one of the 20 evidence-based recommendations relating to hydration(30), which perhaps reflects the limited attention given to hydration and drinking for people living with dementia in the literature. In 2024, ESPEN published updated guidance entitled ‘ESPEN guideline on nutrition and hydration in dementia’(31), indicating the importance of hydration for the nutritional care of people living with dementia also. In contrast to the 2015 guidance, the 2024 guidance mentions “drink” 103 times, “hydration” 93 times and 29/40 of the clinical recommendations relate to hydration care in some way(31), reflecting an increased focus on drinking for people living with dementia. The guidance suggests that nutritional care for people living with dementia requires a comprehensive multicomponent, multiprofessional and individualised approach(31) to optimise food and fluid intake, recognising heterogeneity in the ability and support needs of older people living with dementia to consume drinks.

2.6 Care setting and low-intake dehydration

2.6.1 Why consider care settings?

Care settings must be considered when discussing hydration care because these settings provide the context for how someone lives their life, who is involved in the individual's care and how the individual may, or may not, be supported to live their life. Each type of care setting offers different services to meet people's health and social care needs. In the UK, older people may live at home, in assisted-living housing where extra support may be available to the residents such as a warden service, or in residential or nursing homes(217). People living at home or in an assisted living provision may also receive domiciliary care or 'home care' where carers deliver routine care visits to the home or provide live-in care. The term 'care home' is often used in the UK to encompass both nursing and residential care homes(217) and thus the term 'care home' is used throughout this thesis to refer to both settings unless stated otherwise. There are three main types of residential care: care homes, nursing homes and care homes with dementia care. Some residential care settings are dual-registered and offer all types of residential care, nursing care and dementia care(217). Residential care homes offer people support with their personal care and everyday functioning(217). Nursing homes offer personal care and support with residents' everyday needs but additionally provides nursing support and expertise(217). Care homes which provide dementia care often have dementia care-trained staff(217). People usually move into long-term care settings when they are older, frailer and live with more multiple long-term health conditions which are likely to affect their ability to carry out activities of daily living(42, 218), including those which are basic to sustaining life, such as eating and drinking. People may move into care homes after hospitalisation(219), when it might be considered best for the individual to receive additional support from a care home instead of returning home, or it may be decided that they can no longer safely remain at home, due to increased need, or due to caregiver burden(220). Whilst older people may also temporarily reside in hospitals or hospices, this thesis will only focus on settings where older people may reside for longer periods in more permanent arrangements, such as long-term care settings and community settings.

2.6.2 Long-term care settings

Older people living with dementia will require additional support with activities of daily living at some stage in the disease progression, often leading to them receiving formal care in middle to later stages of the disease due to progressive cognitive and functional decline(217). The latest Census data released in 2021 reported that 278,946 people aged over 65 years, were registered as living in residential care or nursing homes in England and Wales, constituting 2.5% of the population aged 65 years and older in England and Wales(221). This report showed that over 70% of older, long-term care residents were living with disabilities which greatly limited their day to day activities(221). Older nursing home residents were seen as more limited by their disabilities(79%) than older residential care home residents(65%)(221) and more likely to rely on care staff to meet their daily needs. Comprehensive economic modelling based on 2015 data projected that by 2040 in England, 170,000 older people living with dementia will be receiving no care, 348,000 people will be receiving unpaid care only, 37,000 will be receiving formal homecare, 131,000 people will be receiving both formal homecare and unpaid care, and 667,000 people will be care home residents(222). Long-term care settings make up the largest group of where people living with middle to later stage dementia reside(222). It is therefore necessary to understand the differences between long-term care and community-dwelling populations and issues relating to drinking, service provision and therefore support available, so that evidence-based hydration care interventions can be implemented into settings most appropriately, ensuring quality of life and prevent worsening health.

It is largely uncontested that older, frailer people living with dementia reside in long-term care settings, whilst people living with earlier stages of dementia may remain living independently or semi-independently in the community, supported by unpaid caregivers or homecare(42). A meta-analysis of 15 studies, mainly from the United States of America, reported factors which led to people living with dementia moving into long-term care settings, including greater cognitive impairment, more impairments of activities of daily living and higher mobility impairments, when compared to those who did not move into long-term care settings(218). Another meta-analysis which included 23 studies from 12 different countries, found people living with dementia were more likely to be discharged from hospital into long-term care settings if they were older, female, had dementia or cognitive impairment and had more functional dependencies(223). People living with dementia have an increased number of functional dependencies and are more likely to live in long-term care settings(218, 223), but it is not clear whether care setting impacts dehydration prevalence for older people, and those living with dementia, or whether it is the dementia or setting itself.

Dehydration prevalence is more often reported in studies of long-term care settings(14, 29, 34, 35) mostly using non-robust measures of low-intake dehydration, but no research has compared the prevalence of dehydration across both community and long-term care settings using robust measures. The prevalence of low-intake dehydration in community-dwelling older adults remains largely unknown, though some large cohort studies have reported on calculated serum osmolarity(36, 40) and oral fluid intake(36, 40, 224).

Although it is assumed that the profile and characteristics of community-dwelling older adults is different to those living in long-term care settings, it is not known how this may affect their risk of low-intake dehydration. It is therefore useful to understand whether care setting influences dehydration prevalence, or whether dehydration prevalence is influenced by other factors, such as age, multiple long-term health conditions, or cognitive impairment. A systematic review using robust measures, and meta-analytic subgroup analyses to examine the difference of dehydration prevalence between older people living in the community versus long-term care settings is needed.

2.6.3 Community settings

Older adults living with dementia in the community are likely to be younger, in earlier stages of dementia, more functionally independent and may be receiving support from unpaid carers or formal care at home(42, 217). In a recent report commissioned by the Alzheimer's Society, which used NHS and Cognitive Function and Ageing Study cohort data from 2015, it is estimated that 74% of people living in the earlier stages of dementia live in the community compared to only 34% of people living with later stages of dementia(42, 222). Community-dwelling older adults living with dementia may not drink sufficient fluids if they forget to drink, restrict fluid intake to prevent incontinence, unable to shop for drinks, unable to prepare drinks, or cannot find equipment or tools used to make drinks, increasing their risk of being hospitalised or moving into a care home for additional support(225). One study reported that mobility and psychological factors, such as restricting fluids to prevent incontinence and forgetting to drink, were barriers to community-dwelling adults being adequately hydrated(48). The study used saliva osmolality to assess low-intake dehydration, which is not the most robust assessment of dehydration in older people(2, 103). The study employed convenience sampling to recruit participants from a day centre which may have limited the profile of older adults in the study(48). Nonetheless the study provides useful insights into potential risk factors for low-intake dehydration in the community-dwelling population(48).

Compared to long-term care, there is limited hydration literature for people living with dementia in the community. According to estimations using 2015 cohort data, 13% of people live at home with dementia and received homecare, whilst 28% of people live at home with dementia received both homecare and unpaid care(42). To my knowledge and from searching the peer-reviewed literature, no research has examined the hydration status of people living with dementia and receiving homecare. However, community-based research has potentially included people living with dementia receiving homecare in their participant samples but have not reported this information. Depending on the mobility, cognitive ability, communicative ability and health status of community-dwelling individuals receiving homecare only, there is a risk that these individuals may only receive drinks at limited opportunities during the day when a care worker arrives to deliver care, and so this group of people living with dementia are potentially at-risk of low-intake dehydration. Without research focussed on this group of people, this can only be speculated. Much hydration research has so far focussed on long-term care or hospital settings(18), but with the pressures on social care provision, as well as the soaring cost of social care, it is important that hydration research spans across all care settings. Dehydration needs to be detected early, to prevent worsening health of older adults living with dementia due to insufficient hydration(14, 22, 59), which may increase their risk of hospitalisation or moving into a long-term care settings(119, 225, 226). It is crucial to understand which settings low-intake dehydration is more prevalent, so that evidence-based interventions and practice can be implemented to prevent low-intake dehydration.

2.7 Hydration care in care homes

Mentes (2006) wrote an insightful paper almost 20 years ago after conducting a six-month study in two American nursing homes, involving staff interviews, six mealtime assessments for fluid intake, records of dehydration episodes, quantitative assessments of residents' ability, cognitive status and hydration status, assessed using BUN/creatinine ratio, urine specify gravity, urine colour and bioimpedance measurements(227). It is noteworthy that these dehydration measures are no longer found to be accurate in older people(96). Mentes proposed four types of hydration problems in the long-term care residents who participated in their study: those that "can drink" who are either "independent" or "forgets", those that "can't drink" who are either "dysphagic" or "physically dependent", those that "won't drink" who are either "sippers" or "fear incontinence" and those at "end of life"(227). The residents in Mentes' (2006) study had a mean Cognitive Performance Scale(228) score of three which indicated moderate cognitive impairment and 86% of the included residents had more than three functional impairments affecting their daily life(227). Mentes (2006) acknowledged that whilst each group was designed to be stand-alone, there may be some overlap in characteristics between groups(227). Whilst Mentes' typology is useful(227), it does not capture the 'reaching ability' of residents, which has been identified in other studies(57, 58, 61), crucial for residents being able to access and consume any available drink in their vicinity.

Aside from individual-level factors, there are numerous organisational-level factors reported to be associated with dehydration in long term care settings, such as staffing, routines, staff training, size of the care facility, leadership, ownership of facilities and care home environment(43, 56, 229, 230). The UK DRIE study found that care homes with a lower dehydration risk were more likely to be in rural locations, have a qualified nurse present and have ensuite bathroom facilities(229). Care homes offering specialist dementia care were associated with an increased risk of dehydration(229), though causation is unclear. Long-term care settings in the UK vary in how they are managed, staffed, and operationalised. The UK DRIE study investigated the role of care home ownership in dehydration prevalence, but there was a lack of evidence to draw conclusions(229). An association has previously been found between the presence of nursing staff and a lower risk of dehydration, due to nurses perhaps having more training and awareness of dehydration(56, 231, 232), though the underlying reason remains unknown. However, other research contradicts this association(233). A recently published retrospective, longitudinal study reported that a higher skill mix, relating to more care provided by registered nurses was associated with fewer adverse outcomes, such as hospitalisation, falls, pressure ulcers and urinary tract infections(232). Although the study did not specifically report on dehydration, each of those adverse outcomes can be associated with low-intake dehydration and so may be relevant to our understanding of dehydration prevention also(232). Findings relating to associations between adverse outcomes and skill mix differed between care providers and so no strong conclusions could be drawn from the study(232). Further research is required to explore these associations, providing a more nuanced understanding of potential influences on care.

2.7.1 Care-home based interventions to address low-intake dehydration

Cook *et al.* (2019)(53) provided an overview of the literature on hydration interventions for older people living in long-term care settings. Cook *et al.,* (2019)(53) reported that dementia and frailty were significant predictors of dehydration in older residents of long-term care settings. These findings illustrate how the characteristics of long-term care residents might place them at more risk of low-intake dehydration and might also make them more dependent on staff to provide them with drinks, to prevent dehydration. There is consensus within the literature that fluid intake levels are generally too low for long-term care residents(53) but no drinking intervention has so far sustainably improved hydration amongst residents. Knowledge is needed on how long-term care residents, including those living with dementia, access drinks, so that effective and sustainable drinking interventions can be designed and developed to increase fluid intake in older residents.

Multicomponent interventions including staff awareness, drinking assistance, toilet assistance and a variety of drinks available may be effective at increasing fluid intake amongst older adults living in long-term care(5, 55). Interventions aimed at improving fluid intake have mostly focussed on increasing the availability and opportunities to consume drinks, improving the pleasure and social experience of drinking, staff and resident education of hydration, assistance and equipment to support drinking, and improving the drinking experience and environment(215, 234). A systematic review including 19 intervention and four observational studies, aiming to improve fluid intake or reduce dehydration risk in long-term care settings did not report any consistently successful and sustainable interventions(215). A more recent systematic review of interventions to improve hydration in older adults included 13 care home studies and one mixed care home-hospital study(234). The more recent systematic review only reports two further studies within their included studies(58, 59) of which both studies actually relate to the same larger quality improvement project carried out by researchers at the University of West London. Authors of the more recent systematic review also highlighted that few studies assessed dehydration using robust measures(234) which limits the reliability and validity of study findings. It is concerning that hydration interventions are not being designed to incorporate objective and robust measures of dehydration despite ESPEN recommendations, because it prevents knowledge of effective evidence-based hydration care from progressing.

A quality improvement study conducted across two English city care homes (West London), noted above, was reported to have been considered a service evaluation not requiring Health Research Authority (HRA) approval, but did receive approval at the institutional research ethics committee(58, 59, 135, 235). The quality improvement project was designed because previous research identified that care staff did not prioritise residents' drinking(59). Strategies to improve drinking used in the quality improvement project were informed by preliminary care home observations conducted as part of doctoral research(58). The quality improvement project reported that increasing drinking opportunities and supporting individual preference of drinks was associated with an increase of the amount and range of fluids consumed by residents, though this change was not sustained long-term(59). However fluid intake measurement was not assessed robustly and instead six residents were randomly selected to have their drinking observed by a researcher between 6am-9pm once a month and volumes estimated(235). A multi-component approach to increase fluid intake and prevent low-intake dehydration in older people living in care homes is required, using robust measures of low-intake dehydration to assess its effectiveness. The design of appropriate interventions involving underserved communities such as care home residents, should involve and engage the residents themselves to promote recruitment and retention, and sustainability of outcomes(236). There has been little research including the views of older adults with regards to improving hydration care in care homes or understanding the influences on how older care home residents consume drinks(60, 125, 234). Studies which have sought the views of older adults on hydration care in care homes have either excluded those living with severe dementia or those lacking the mental capacity to consent to the research(60, 98, 237). It is therefore crucial that future research involves older adults affected by dehydration, particularly those identified as being at-risk of dehydration, to design appropriate interventions aimed at preventing dehydration.

Many long-term care residents living with dementia are excluded from participating in research if they lack the mental capacity to provide their own informed consent, or do not have a personal consultee to give assent on their behalf, or if the person’s dementia is assessed to be ‘too severe’(238, 239). Those residents are consequently not represented in the evidence used to underpin interventions and guidance to improve drinking. A recently published feasibility trial of a multicomponent intervention to improve the fluid intake of care home residents living with dementia found that fluid intake did not increase after three months across 11 English care homes(203). The intervention group (n=50) were reported to have a mean fluid intake of 1291ml a day post-intervention which remained below EFSA’s recommend daily fluid intake for adults(203).The intervention involved a whole system approach to hydration care including hydration policies implemented, hydration learning resources provided to staff, changes to drinking equipment, changes to drinking environments and drinking-related social activities, along with the offer of ongoing implementation workshops for staff to attend(203).The authors noted a limitation of the research being the unreliability of using fluid balance sheets to measure oral fluid intake, because staff often recorded the volume of fluids offered to residents, instead of what was consumed(203). It remains critical that hydration researchers use objective and diagnostically accurate to assess low-intake dehydration, so that intervention effectiveness can be reliably and empirically compared. If older care home residents living with dementia face a unique set of challenges accessing and consuming drinks, then interventions may need to be developed differently to those targeted at the general older adult population. Without a nuanced and comprehensive knowledge of how people living with dementia consume and access drinks, interventions aimed at increasing fluid intake and improving drinking for this group of people will never be effective or sustainable.

2.7.2 Care home routines and practices which might support drinking.

Traditionally, care homes provide drinks and food to residents at routine times and have certain practices, such as staff circulating the tea trolley to residents, to provide residents with drinks. Some staff may provide additional drinks alongside care home activities, such as afternoon tea or for special occasions(58, 65, 203). Some care homes have cafés or bars where residents can 'order' additional drinks(58). In the UK, the CQC's regulation 14 legislates that care providers must ensure that residents have enough to eat and drink and receive appropriate support from care staff in order to eat and drink(70). Residential care or nursing home managers are likely to be the people who impose the routines onto the homes, which staff follow, to deliver care to residents. These routines are likely to be different to the usual routines of when the older people lived in their own homes, with the residents having to adjust to 'residential care or nursing home life', some with inflexible routines, which may reduce the individual's opportunities for drinking. It is reported in the literature that long-term care residents do not always receive adequate support with eating and drinking(64).

There is consensus in the literature that long-term care residents do not drink enough(6, 53, 203, 208). How care providers provide drinks to residents differs across long-term care settings. Residents in some settings have access to drink making facilities, such as kitchenettes, to make drinks for themselves, however this is not standard practice across all care homes(57, 58, 65, 240, 241). Most care and nursing homes have routines whereby meals, comprised of drinks and food, are served at set times throughout the day and evening and care staff either serve residents food and drink from the tea trolley periodically through the day or additional drinks are served at points through the day(57, 58, 65, 240, 241). Resident opportunities to drink might be reduced in homes where staff only provide drinks during routine times(57, 242). Some long-term care staff eat and drink alongside residents during these times, whilst others do not. To ensure that there is water available at all times to residents, care and nursing home staff may place jugs of water in residents' rooms and communal areas(57, 58, 65). There is a relatively new approach to care, adopted by some care homes, called the Butterfly model which rejects the more traditional approach to care provision(243). The Butterfly model was originally developed to support people to live well with dementia in care homes by creating a more flexible and home-like environment for residents(243). The author is unaware of any trials which assess the effectiveness of the Butterfly model compared to standard care, however a pilot project briefly reported improvements in fewer falls, reduced antipsychotic usage and higher staff satisfaction(244). The article does not report how any outcome data was measured and so it is difficult to ascertain any further details(240) and further research into the Butterfly model is required. The Butterfly model does not endorse using a tea trolley and instead enables residents to have access to a kitchenette at all times(243). Residents who are dependent on care staff to provide them with drinks, due to mobility issues, communication difficulties, or cognitive impairment are therefore reliant on care providers’ routines and observations to be effective to provide them with adequate amounts of fluids. It is clear that whilst care home routines and practices intend to facilitate residents to eat and drink, these routines and practices may not meet residents’ hydration needs(203). In care homes using the Butterfly model, staff must still be attentive and responsive to resident’s individual needs, be aware of the importance of adequate hydration for residents, ensure that residents can access their drinks and have drinks available to them, to meet all residents’ hydration needs, which can all be achieved if staff deliver person-centred care(245) recognising residents as individuals. Whilst the Butterfly model may be useful for responding to residents’ individual needs and preferences(240), regular drinks routines embedded into daily life may additionally ensure that all residents are offered regular drinks. Strong leadership is needed to ensure that routines and processes and embedded within care homes(59).

2.7.3 Who is involved in drinking activities in a care home?

Ensuring that residents drink well takes a whole home approach, involving all staff roles as well as the resident themselves, family caregivers and visitors, allied health professionals and care home staff. Care assistants and nursing staff, otherwise known as ‘social care staff’ have traditionally been responsible in UK long-term care settings for providing residents with drinks(235). Healthcare assistants in some settings and care staff, often referred to as ‘carers’, enact routines which involve giving drinks to residents, encouraging residents to consume their drinks and sometimes providing physical support to residents to consume their drinks(57, 65, 230, 241). Carers might be allocated residents on their shift(57, 58) by a more senior member of the care team, for whom they are responsible for ensuring that resident drinks, refill residents’ drinks, sit down and assist residents to drinks, or they might have an overall responsibility for all residents’ fluid intake(57, 58). Much research to date has involved researchers interviewing care staff about their role in providing residents with drinks and their awareness of fluid requirements for residents(207). However, when researchers have conducted observations attending to residents drinking in care homes, researchers identified that other staff may also be involved in providing residents drinks, such as kitchen staff, housekeeping staff and activity staff(58, 65). Visitors play a role in ensuring that residents drink by supporting residents to drink, providing them with drinks, telling care home staff about the resident’s drinks preferences and/or advocating for them by requesting drinks on their behalf or checking their fluid charts(58, 207, 230). A number of reports have reported issues with using fluid balance charts. Care staff have been found to overestimate fluid balance charts(60, 98). In one small study(n=22) where researchers accurately observed and recorded residents drinking, care staff overestimated the quantity of fluids consumed by residents by a mean of 702g/day ($p=0.076$)(98). Staff are likely to record drinks intake retrospectively when they finish completing care tasks(241). Some care staff may not be aware of how much residents should drink, to sustain optimal hydration levels, as some care staff have reported their care/nursing homes have drinking targets for residents to drink as little as 500ml a day(208). It is crucial that care staff are aware of how much residents should be drinking so they can support residents to meet their daily fluid intake(70). It is noteworthy how many practices and social actors are involved in how older people living in care homes drink fluids(58, 65, 203). These practices range from staff providing residents with drinks, supporting the residents to drink, and monitoring residents' drinking(58, 65, 203). All of these entail interactional activities which may or may not fit well together.To better understand how people living in long-term care settings drink, research needs to encompass the features of interactions involved in and shaping drinking within these settings.

2.7.4 How people living with dementia access drinks from staff in a care home

There is limited research relating to how people living with dementia drink in care homes. If drinking interventions are to be designed effectively for residents living with dementia, it is necessary to understand how they may access drinks in these settings. Long-term care residents living with dementia might not be aware of drinks in their vicinity or recognise what a drink or drinking vessel is or realise that it belongs to them(67, 207, 208). If a resident with memory problems forgets to drink, or is not aware of the drink, they will drink fewer fluids, unless someone else is responsible for supporting or prompting them to drink(246). Many long-term care residents living with dementia reside in care homes because they rely on care staff to support them with activities of daily living(226), such as providing them with drinks. Care staff are responsible for making and providing residents with their preferred drinks and supporting them to consume the drinks, whether by physically supporting them, or verbally prompting(56, 65, 207). If care staff do not make drinks to residents' preferred taste, residents may not consume those drinks, leading to reduced fluid intake. In the Fluid Intake Study in our Elders (FISE), researchers observed that residents were not routinely provided with their preferred drinks within the care homes(99). Further research has since confirmed this finding that older care home residents are not always provided with their preferred drinks(58, 59, 61, 235). Due to resident’s dependency on care staff to enable drinking for most residents living with dementia, whether that be in making drinks, or physically assisting to drink drinks, it is crucial that residents are able to communicate their wants and needs to care staff.

Most people agree that residents unable to verbally communicate should be supported by care staff to make decisions and staff should receive appropriate training to attend to residents’ communication styles and nonverbal cues(247). This aligns with CQC’s regulation 9 which states that residents should be involved in decisions around their care to the “maximum extent possible”, whereby staff should support residents to understand the information in an accessible way to meet their needs(71). One study reported that staff were required to communicate calmly with residents to encourage them to drink fluids(60). Previous observational studies have reported how communication prevented long-term care residents receiving quality or acceptable care(241, 248). One seven month ethnography using a social constructionist paradigm to observe and examine the care of people living with dementia in an assisted living facility in America, reported three key themes: conflict between providing quality care and financial profit, difference between person-centred caregivers and non-person-centred caregiver and how caregivers provided care and responded to residents’ health and care needs(248). Whilst staff in the care home were reported to frequently offer residents drinks and ‘push fluids’, it was also reported that staff often lacked knowledge about how to care for residents living with dementia(248). The study reported difficulties in communication between residents living with dementia and migrant workers, whose first language may not be the same as the residents they are providing care for(248). The migrant workers were reported to have little English-speaking ability but learned how to undertake their roles and learned to communicate in English from other staff and the residents(248). These workers were required to communicate to administrative staff when the health of residents living with dementia changed(248). Care staff should be able to communicate effectively with residents to meet their needs but must also be able to communicate with other staff about a resident’s health needs(248). The same study reported how care workers used ‘dehumanising behaviour’ and infantilising language to speak to, and about, residents living with dementia(248), which prevented staff being able to meet the care needs of residents, as the staff dismissed the residents’ emotional, physical and mental care needs. Having said that, even when staff and residents are able to verbally communicate effectively, this still may not result in homes producing and delivering quality or acceptable care. To respond to residents’ drinks preferences and hydration needs, staff also need to be able to understand what residents are communicating to them, which may require knowing the resident well.

Carers have a difficult job of carefully balancing the preferences and choices of residents whilst also ensuring they provide care which optimises the individual's wellbeing. The carer-resident drinking interaction is a complex relationship involving mutual communication and respect, to ensure that the resident is heard and feels valued, which is related to a resident's quality of life(207) as well as their potential to consume adequate fluids. A study which involved 43.5 hours of observations of 22 residents living with dementia over eight days aimed to explore the hydration care experiences of residents on a single care home unit in London, England(57). The researcher reported observing a healthcare assistant offer a resident a coffee instead of an apple juice, which the resident had initially requested, because the staff member thought it would keep the resident awake at night(57). The carer still provided the resident with a drink, but one that they did not request(57), which was perhaps thought to be in the resident's best interest. Another study involving focus groups with care staff, revealed how staff deceived residents into thinking they were drinking a beef stock drink with one cube, but had in fact halved the cube due to the salt content(171). These examples draw attention to how even when residents and staff are able to communicate with each other that residents may still not gain access to the drinks of their choice.

It is commonly reported that residents living with dementia 'refuse' or 'resist' food and drink(249, 250). Care home residents living with more advanced dementia may not understand what care staff intend to do to them and in response may refuse their care(250). Refusals of care were most prevalent when care staff communicated negatively or used 'Elderspeak' to interact with residents living with dementia(250). Elderspeak is considered inappropriate language which replicates 'babytalk' and is often patronising or belittling towards older people(251). Residents may display 'behaviours' which are interpreted by caregivers as residents refusing care such as turning away, pushing them, verbally refusing, clenching jaw shut and/or being physically aggressive(252). Higher incidence of refusal of care is associated with increased dependence on others to assist with activities of daily living(253) which might more commonly occur as the disease progresses. One qualitative study involving 94 Dutch nursing home residents, reported that nurses stopped attempting to assist residents to eat during mealtimes if they believed that the resident was no longer hungry(254). Nursing staff did not consider that residents might refuse to eat if they did not understand staff's intentions or if residents did not understand how, or why they needed to eat(254). This again reflects the importance of staff understanding residents' wishes and preferences, as well as finding a way of effectively communicating with residents to ensure they can meet residents' care needs. It is unclear whether care home residents living with dementia actively 'refuse' to consume drinks. The action of residents stopping the consumption of a drink may be incorrectly interpreted by caregivers as a 'refusal' when in fact the resident might still want to drink but might want the drink prepared in a different way, for example(254). A systematic review of 18 studies relating to how carer-resident interactions affected the oral intake of someone living with dementia during mealtimes, predominately reported findings relating to food and eating during mealtimes, rather than drinking(207). The authors reported that social interaction, individualised care, empowering the resident to be independent and how staff respond to food refusal, all played a role in how a person living with dementia experienced mealtimes(207). An interview study of five care assistants from two English care homes aiming to explore carers' perceptions of residents' nutritional needs, mostly reported findings based on residents' food intake, rather than drinks intake(255). The authors reported that carers were unable to provide quality mealtime care despite reporting that they wanted to, due to staff shortages, a focus on enacting routines and a focus on meeting residents' physical needs instead of their psychosocial needs(255). Understanding mealtime experiences may help us to understand more about drinks experiences. The studies explored in this section show how communication and dependency on others may influence a resident's ability to access drinks in care homes.

2.7.5 Qualitative studies which examined mealtime experiences of older adults in UK care homes

Communication, dependency on others, resident characteristics, care home routines and processes and staffing may all influence how care home residents drink in care homes, but it remains unclear whether care home residents are at a higher risk of dehydration from not drinking enough compared to those living in the community, or how people living with dementia drink in care homes over a 24-hour period. Research studies have identified how drinks are prioritised less than food during mealtimes in care homes(53, 65, 207) and how residents might lack control over aspects of their mealtimes, such as seating, timings and what food and drink items they consume. Several researchers have conducted structured and unstructured observations within care homes to examine mealtime experiences(61, 64, 65, 67). Holmes (2018) conducted 15 structured mealtimes observations during the main meal of the day, in addition to a series of semi-structured interviews with residents and care home staff, to critically explore factors which affected the mealtime experience for older care home residents, along with influences on drinks provision during mealtimes(65). Holmes (2018) developed an observation framework to use when observing care home residents eating their main meal in the dining room(65), paying attention to how care staff served food, the dining room environment, social interaction during the mealtime, presence of a person-centred approach and the sensory appeal of residents food(65). The researcher observed the dining space approximately fifteen minutes prior to mealtimes begun and through to the end of the main mealtime(65). In relation to the role of drinks within the mealtime experience, Holmes (2018) concluded that residents should receive a choice of their preferred drink and all staff should have knowledge of each resident's drinks preferences to provide a positive mealtime experience(65). However, the authors concluded that whilst drinking was an opportunity for residents to interact with staff, other residents and visitors, carers often "overlooked" drinks as part of the mealtime experience(65). This study provides insights into the role of drinks as being a lower priority at mealtimes in care homes, however it does not give insights into how care home residents undertake the activity of drinking at other times, which is crucial in understanding why care home residents may be more at risk of dehydration.

Watkins (2018) interviewed and observed 11 care home residents to explore the residents' experiences of mealtimes within the care home and what factors influenced residents' enjoyment of meals(64). Watkins (2018) conducted observations to provide context for the interviews during mealtimes(64). The study concluded that social interaction with other residents was important for residents to enjoy mealtimes, however care staff were often responsible for placing residents at tables, which restricted who could socialise together(64). Watkins (2018) reported how food was important at special occasions for residents and quoted one resident saying they had drunk an alcoholic drink for Wimbledon alongside strawberries and scones(64), which was one of the few mentions of drink. It does however highlight the enjoyment of food and drink together. This study intended to focus on identifying factors which contribute to an effective mealtime experience and enjoyment of meals and so the study had a stronger focus on food than drinks(64). The study therefore provided limited insight into how older care home residents enact drinking, potentially showing lower priority for drinks during mealtimes.

Collins (2020) used a constructivist approach to observe mealtimes for eight people living with dementia and dysphagia and commented how they did not conduct an ethnography as they did not attend to the whole care home and instead just observed mealtime opportunities using Dementia Care Mapping (DCM)(61). Dementia Care Mappers use coding frames to record different types of resident's behaviour such as 'eating and drinking', coded together under the category 'food', the resident's mood and care interactions from staff which can either be positive or negative(61, 256). Dementia Care Mappers record these codes for every five minutes of observation, as well as recording detailed qualitative notes(61, 256). Collins (2020) adapted the DCM framework(256) by separating the code ‘food’ into eating and drinking, recognising that they are separate activities(61). Unless Dementia Care Mappers recognise that eating and drinking are separate activities and respond by separating these into two separate codes like Collins (2020) has, researchers will not have access to drinking-specific data from DCM. Collins (2020) reported that care home residents living with dementia and dysphagia became ‘passive recipients of care relating to eating and drinking’ with care home staff, whilst family visitors respectfully interacted with their loved one with dementia and actively involved them, when assisting them to eat and drink(61). Collins (2020) reported that care staff infantilised residents with dementia in how they spoke about them and in how the care staff served residents with dementia drinks in plastic beakers(61). Care staff were reported to use a task-focused approach to give residents food and drink and hurriedly gave residents with dementia drinks, without interacting with them(61). Collins (2020) reported that meal and snack time routines were inflexible with residents not receiving items outside of these set times unless they verbally requested these(61). Meals and snacks were served at set times within all the care homes observed during this study. If residents requested food or drink outside of the set times, care staff sometimes provided them with food and drink(61). If residents did not verbalise requests for food and drink outside set times, or were unable to, staff did not offer these to residents(61). Residents with dementia and dysphagia, particularly those on modified diets, lacked choice over what drinks and food they consumed(61). Collins (2020) concluded that residents living with dementia and dysphagia become resigned to not being able to control what food and drink they consume and family members resign themselves to thinking that care staff are supporting their loved ones the best they can, despite acknowledging many improvements that could be made to their care(61). This study highlighted numerous influences on drinking and how a ‘one size fits all’ does not apply to how residents drink fluids in care homes(61). This study is important for our knowledge on how people living with dementia and dysphagia eat and drink in care homes which there has previously been limited knowledge of.

Davies *et al*., (2022) conducted a rapid ethnography of 11 residents’ experiences of person-centred care during mealtime experiences, including residents living with dementia, within one care home in the UK(67). The researcher observed that staff did not always implement residents’ choice of food or drink as menu-planning did not involve residents and hot drinks were not available at lunchtimes(67). Residents were reported to not be aware of the jugs of water available in communal areas and cups were unavailable(67). Davies *et al.,* (2022) reported that routines were inflexible, with nursing staff being occupied undertaking medication rounds which led to some residents unhappily waiting for their food, or waiting for staff to assist them with their meal, because fewer staff were then available to assist with mealtimes(67). This has also been reported by other researchers observing mealtimes in care homes(58, 59). In a different study, Holmes (2018) reported that they did not always observe staff provide residents with drinks alongside food during mealtimes(65). These are examples of how mealtimes in long-term care settings are not always structured to provide residents with adequate fluids or adequate support to consume those fluids(67). Although mealtimes are routine events in care homes to ensure that residents receive food and drink, research has identified how there are occasions when residents often do not receive adequate drinks and food from care staff enacting these routines(67). An ethnographic study using non-participant observations of care home objects, practices, routines and staff and residents' actions, interactions and language, relating to drinking-related activities, is needed to attend to the nuanced influences on how a resident living with dementia consume drinks, during mealtimes but also during times which may not be classified as being drinking opportunities or occasions.

2.7.6 Qualitative studies involving observations of older people drinking in care homes

Researchers have previously undertaken structured and unstructured observations within care homes to specifically examine older care home residents drinking practices(67). Researchers at the University of West London conducted a quality improvement study, which involved observations of hydration care practices in care homes to develop the I-hydrate training intervention for care home staff(57-59, 235, 257). In one qualitative study comprising the I-hydrate project, researchers observed 22 residents with dementia, and any care staff involved in hydration care for eight days between 6am to 10.45pm(57). Researchers supplemented field notes from observations with conversations with resident's relatives and care staff(57). Researchers reported that routines were inflexible within the care home which led to staff not always giving residents additional drinks outside of these set times(57). Staff were not observed to drink socially with residents and although water jugs were available in residents rooms, residents were not observed by researchers to serve themselves drinks(57). Residents were not observed by researchers to receive a choice of drinks or drinking vessels(57). Researchers reported that when care staff persisted to encourage residents to drink, this led to the resident sipping from their drink(57). In another of the observational studies, researchers observed eight frail older residents, some with mild to moderate cognitive impairment, in two care homes between 6am to 9pm over five days(58, 59). Researchers observed each resident drink, estimated the fluid volume consumed and compared it against care staff records of residents' daily fluid intake(58, 59). Researchers recorded that care staff served residents with a mean fluid intake of 1512ml, of which residents were estimated to consume an average 68% of the fluids they were served(58, 59). Researchers recorded that residents who required more assistance and remained in their bedrooms were served less fluids but consumed a higher proportion of fluids served(58, 59). Residents who needed assistance to drink, received a higher proportion of their fluid intake through fluid-rich food instead of drinks(58, 59). Within the same study, researchers observed that residents received most of their drinks from staff during mealtimes instead of between meals(58, 59). Residents who sat in communal areas received more drinks than those in their bedrooms(58, 59). Wilson *et al*., (2020) and Bak (2018) reported that resident food consumption was prioritised over fluid consumption and if residents requested drinks between meals, care staff asked them to wait until next meal/drinks time(58, 59). Wilson *et al*., (2020) and Bak (2018) also reported that not all residents' fluid intake was recorded on charts, but when staff did record these drinks, it mostly reflected what staff had provided in a cup rather than what residents had consumed(58, 59), confirming the FISE study findings(98). These studies identify the importance of staff being responsive to residents' needs and how whilst some care home routines are designed to facilitate drinking, such as the tea trolley, these routines can also prevent drinks being served to residents.

Godfrey (2012) used an interpretive approach to conduct some observations of care home hydration care practices, along with a staff focus group and semi-structured interviews with residents, to make sense of residents' experiences, as well as the experiences of care staff and nurses involved in hydration care in the care home(60). Residents were excluded from participating in the study if they could not provide informed consent or were too ill to participate(60). The researchers conducted three two-hour observation periods, involving a lunchtime, bingo/afternoon tea and a 'keep fit and sherry'/lunchtime period, as well as interviews with four residents and ten care home staff(60). The researchers identified numerous ways in which residents' drinking was not supported, for example, fluid intake charts were only completed for some residents and care home residents commented on the inflexibility of routines in receiving their first drink of a morning(60). The researchers reported that although water was refilled in jugs in communal areas, individual residents' drinks were not refilled before staff cleared cups away and care staff did not socialise with residents over drinks(60). Care staff shared strategies within interviews about how they encouraged residents to drink and expressed how important good hydration is for residents, whilst also acknowledging that there was not always enough time or staff to assist residents to drink(60). Residents reported sometimes not drinking to prevent needing to use the toilet or requiring staff to assist them to drink(60). The researchers clearly illustrated the lower importance of hydration within the busy system of a care home when they reported a quote from a healthcare assistant who stated that their focus was on ‘feeding residents, then “pad round” and then “fluids afterwards” (P.1206)(60). This study provides insights into tensions between staff and residents and how routines and practices can sometimes enable and prevent drinking. It is noteworthy that the residents included within this study were cognitively able and well enough to participate and only care delivery staff were involved(60). The short observation periods did not allow researchers to observe the care home processes and resident-staff interactions across the whole care, nor did the study examine language used by social actors which may have led to residents drinking, or not(60). There are therefore gaps to be explored further, such as the need to observe for longer periods including both routine drinking and non-drinking times, to include people living with dementia including those who may lack mental capacity to provide their own informed consent and including all staff roles within the care home.

Kayser-Jones *et al.,* (1999) conducted a large anthropological study exploring why some care home residents did not drink well across two large nursing homes between 1993-1995(56, 258, 259). Kayser-Jones *et al.,* (1999) reported on some factors which may have contributed to dehydration within this group of nursing home residents of which half the participant sample had a diagnosis of dementia(56). Although this research is now over 20 years old, the learning from this research is still pertinent today. Kayser-Jones *et al.,* (1999) reported that 39 of the 40 residents drank less than 1500ml of fluid a day, many residents went for long periods without consuming drinks and drinks were not always served to residents alongside food during mealtimes(56). Kayser-Jones *et al.,* (1999) concluded from their observations that residents who consumed least fluids had undiagnosed dysphagia, were more severely functionally and cognitively impaired and had unmanaged pain(56). Residents’ fluid intake increased if family caregivers visited and assisted residents at mealtimes(56), suggesting a benefit of sociable mealtimes. Institutional factors such as staff unawareness of residents’ cultural preferences, staff’s negative attitudes and beliefs, inaccessible drinks, inadequate training of staff, poorly positioned residents during eating and drinking, residents not receiving adequate support to drink and non-native speaking residents were most at risk of dehydration from not drinking enough(56). This seminal study highlights how dependent some residents living in long-term care settings are on care staff to meet their hydration needs, as well as how interactional the influences on drinking are within this complex setting(56). Although this study reveals such important insights into important influences on drinking, the researchers only observed residents drink during mealtimes(56), which is not reflective of the 24/7 care that residents receive within long-term care settings.

2.7.7 A social constructionist approach is needed to examine how people living with dementia consume drinks

Bak (2018) observed residents living with dementia as part of a larger quality improvement project of two long-term care units and aimed to understand the barriers to drinking and ‘challenge’ the preconceived, and mostly accepted, idea that people living with dementia refuse drinks(58). Bak’s (2018) mixed-methods study was guided by a pragmatic approach, as the observations fed into the design of various interventions to increase fluid intake and thus they only attended to residents’ fluid intake, fluid provision and hydration care and equipment(58). The author noted that their approach to the observations may have limited the findings generated and suggested that future research attend to resident characteristics and institutional barriers of hydration for a more comprehensive picture of drinking practices and interactions in care homes(58).

Greene *et al.* (2021) used a qualitative, observational approach to conduct 43.5 hours of observations of residents living with dementia, in which they attended to the care environment, interactions and care processed to describe the residents’ experience of hydration(57). Greene *et al*. (2021) provide limited information about their methodological approach but advised that the observations were conducted to feed into a larger improvement study(57). The observations are described as being less structured than those in Bak’s (2018) study(58), where the researchers identified broader influences on residents’ drinking, such as communication, missed opportunities for drinking and division of care, instead of only focussing on more practical aspects of hydration care and provision, such as drinking equipment and assistance(57). Both studies received ethical approval from the research ethics review board at University of West London after reportedly being classified as service evaluations not requiring NHS ethical review(57). Whilst Bak’s (2018) study(58) focussed on fluid intake, hydration care and provision in a care home and Greene *et al.,* (2021)’s study (57) focussed on residents’ experiences of hydration, neither study sought to focus on the specific processes which led to residents living with dementia drinking or not. Moreover, researchers did not spend prolonged periods observing in the care homes which could have led to the researchers identifying more patterns in how hydration care is delivered and how residents accessed drinks in the home.

2.8 Summary

Low-intake dehydration is the term used to describe dehydration when people do not drink enough to replace fluid lost from intracellular and extracellular spaces(5). Older females should drink at least 1.6L and older men should drink at least 2L of fluids a day to prevent low-intake dehydration(5). Low-intake dehydration appears to be common in older adults but there are currently no accurate prevalence rates using robust measures to support this14, 20, 21). Low-intake dehydration is most accurately assessed using serum or plasma osmolality (>300mOsm/kg)(5) though it is often assessed using diagnostically inaccurate signs and symptoms(96). The Khajuria and Krahn equation of calculated osmolarity is recommended by ESPEN to predict directly-measured serum osmolality(5). Low-intake dehydration is costly to health and social care services and is associated with increased risk of hospitalisation, mortality, and multiple health conditions(14, 20, 21). Many characteristics associated with ageing may predispose older people to low-intake dehydration, such as unawareness of drinking guideline recommendations, physiological changes, physical abilities, dysphagia, cognitive abilities, communication abilities, social opportunities and fear of incontinence(4, 8-16, 18-20). Whilst the profiles of older people living in long-term care settings and those living in the community differ, it is still unknown whether the risks and prevalence of low-intake dehydration are different between these groups. The support provided within these settings may also differ. It is often difficult to draw comparisons between studies in hydration research because many studies do not use robust measures of dehydration, limiting generalisability of findings.

The prevalence of dementia is predicted to increase and the risk of developing dementia increases with older age(42). It is commonly reported that people living with dementia find drinking problematic(32, 249). This may be due to taste changes(31, 51, 131), confusion, forgetting to drink, requiring more support with activities of daily living(4, 7, 75), such as drinking and communication difficulties(241, 248). As dementia progresses, older people living with dementia might move to live in long-term care settings to receive extra support for activities such as drinking, though some people remain receiving care at home(217). There is a lack of knowledge relating to how older people consume drinks in care homes. Many people with dementia have previously been excluded from taking part in drinking-related research in care homes(238, 239). This lack of knowledge may limit the development of effective evidence-based interventions to increase fluid intake. There is minimal research relating to how people living with dementia drink in care homes, which should be addressed, if drinking interventions are to be designed appropriately and effectively for this group of residents.

This thesis aims to answer the following research questions: *How many older people are dehydrated and how do older people living with dementia drink in care homes?*

2.9 Conclusion

To design hydration interventions to prevent dehydration in older people, there is a need to establish how many older people are dehydrated, in which settings people may be most at risk and which groups of people are most at risk of low-intake dehydration. Chapter Five of this thesis therefore describes a systematic review which aimed to establish the prevalence of low-intake dehydration using robust measures to investigate any difference in prevalence between care settings and health conditions. To design effective and sustainable interventions able to improve drinking and prevent dehydration in older people living with dementia in care homes, there is a need to examine drinking in these settings for these groups of people. Chapter Six of this thesis thus describes a single case ethnographic study which aims to examine how people living with dementia in care homes drink fluids and what interactive negotiations occur between staff and residents, which lead to residents drinking. Chapter Seven describes an online forum analysis to explore and examine the public discourse of how people living with dementia drink fluids in long-term care settings, which may indicate how drinking is framed by caregivers of care home residents living with dementia.

3. Aims and objectives of this thesis

3.1 Aim and introduction to chapter

This chapter outlines the aims and objectives and provides the rationale for this thesis.

3.2 Aims of this thesis

This thesis sought to determine the prevalence of low-intake dehydration amongst older adults and aimed to examine how older people living with dementia drink in care homes.

3.3 Rationale for this thesis

Low-intake dehydration in older people is associated with multiple health conditions(4, 8-16), increased risk of hospitalisation(12, 17) and risk of mortality(12, 18-20) and is costly to wider society(21, 22). It is commonly reported that older people residing in different care settings are dehydrated from not drinking enough(6, 12, 14, 17, 23) but a meta-analysis has never been conducted to estimate the prevalence of low-intake hydration amongst older people globally. Meta-analytic subgrouping analyses can identify groups of people most at-risk of low-intake dehydration(29). Prevalences are useful for raising awareness of health problems and often underpin public health campaigns(260). To design hydration interventions to prevent dehydration in older people, there is a need to establish how many older people are dehydrated, in which settings people may be most at risk and which groups of people are most at risk of low-intake dehydration. A reliable dehydration prevalence amongst older people is required, using robust and accurate measures of low-intake dehydration, to inform public awareness and policy related to improving health and hydration in older people. An accurate dehydration prevalence for specific subgroups of older adults would also enable evidence-based interventions designed to increase fluid intake targeted to groups of older people most at risk of low-intake dehydration.

There are inconsistent reports that people living with dementia may be more at risk of low-intake dehydration(14, 34-36, 38) and some reports suggest that people living with dementia refuse drinks(249, 250). Long-term care settings are home for most people living with middle to later stage dementia(222). Evidence-based multicomponent interventions aimed to increased fluid intake for residents living with dementia have not been sustainably effective in care homes(52, 55). Much qualitative hydration research underpinning interventions have excluded residents living with dementia(40, 43-47) or those without the mental capacity to provide informed consent to participate in research(48-50). Instead, hydration research has mostly involved care home residents without cognitive impairment, formal caregivers, informal caregivers and health professionals(61-63). It is concerning that evidence-based hydration interventions designed to increase fluid intake amongst care home residents is designed using an evidence base which specifically excludes a large proportion of the care home population who live with moderate to severe dementia(222). In the small number of qualitative hydration studies involving care home residents living with dementia, researchers have tended to observe routines when drinks or mealtimes are anticipated, mostly focusing on how drinks are provided(56, 58, 59, 61). Less attention has been given to how people living with dementia engage with drinks and enact drinking within the wider context of a care home. This has left a gap in the literature which requires exploration of how residents living with dementia consume drinks in care homes, which may appropriately inform evidence-based hydration interventions and equip caregivers with knowledge to support people living with dementia to drink.

3.4 Thesis objectives

Objective 1: To establish the prevalence of low-intake dehydration amongst older adults globally, using robust and accurate measures of dehydration.

Objective 2: To investigate any differences in low-intake dehydration prevalence amongst older adults by age, sex, care settings, cognitive impairment, renal impairment, diabetes and dependency on others.

Objective 3: To examine care home routines, practices and staff and residents' actions and interactions to explore how care home residents living with dementia consume drinks.

Objective 4: To explore how informal caregivers of people living with dementia frame drinking in care homes.

4. Methodology and methods

4.1 Aim and introduction to chapter

This chapter justifies the mixed methods approach using three individual studies to robustly answer the research question, providing insights from different study designs and data collection methods. The chapter also discusses ethical challenges encountered, ethical decision making and the researcher's positionality and how that relates to the thesis.

4.2 How this thesis addressed the research questions?

This mixed-methods thesis triangulated quantitative findings from a systematic review and meta-analysis with qualitative findings from a care home ethnography and an online forum analysis to comprehensively answer the research questions: *How many older people are dehydrated* and *how do older people living with dementia drink in care homes?*

1. Systematic review and meta-analysis to establish the prevalence of low-intake dehydration amongst older people.
2. Care home ethnography examining how older people living with dementia drink in care homes (*D-DRINC study A*)
3. Online discussion forum analysis of how older people living with dementia drink in care homes (*D-DRINC study B*)

4.3 Mixed-methods approach to this thesis

A mixed-methods study design was required to most appropriately answer this thesis' research questions thoroughly and effectively because triangulation of qualitative and quantitative findings can produce more comprehensive understanding of a phenomenon(261). Mixed-method study designs are often implemented in health and social care research to answer complex research questions in a richer way than answering research questions from one theoretical perspective or using one data collection method(261, 262). It is widely acknowledged that mixed method study designs can be used to address and minimise the limitations and biases from individual studies(261). This thesis adopted a convergent parallel design (Figure 4.1)(263) whereby three studies were conducted and analysed individually and then the findings from the two qualitative studies were triangulated before integrating the quantitative and qualitative findings to generate a meta-inference(261, 263). The systematic review study sought to address the thesis' first aim to establish the prevalence of low-intake dehydration amongst older people, whilst the ethnographic study (D-DRINC study A) and forum analysis (D-DRINC study B) sought to address the thesis' second aim to examine how older people living with dementia drink in care homes, which together made up the 'Drinking for people living with Dementia IN Care homes' study (D-DRINC study).

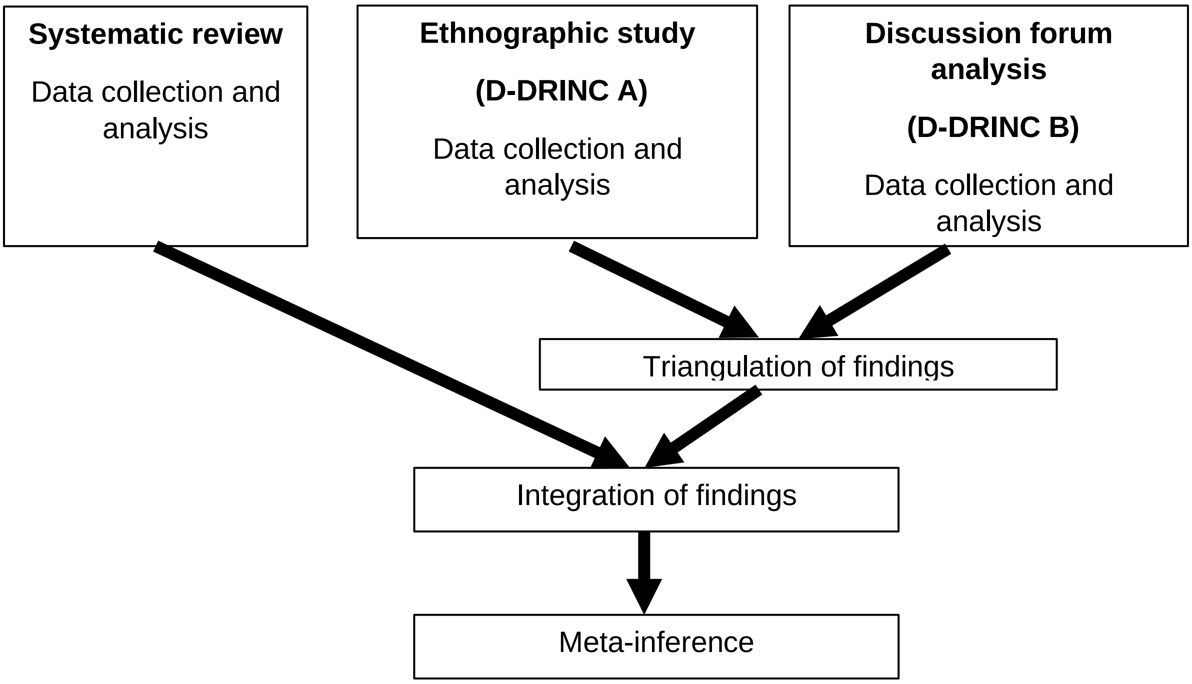


FIGURE 4.1: CONVERGENT PARALLEL DESIGN OF THE THESIS

4.4 Systematic review methods

The systematic review and meta-analysis aimed to establish the prevalence of low-intake dehydration amongst older people. This section (4.4) is written in the Third person.

4.4.1 Protocol development

The protocol for the systematic review and meta-analysis was developed between December 2020-March 2021 and registered on PROSPERO(264) 6th March 2021, to ensure transparency of the review process and reduce bias.

4.4.2 Lead reviewer training

The lead reviewer (EP) had completed substantial training in systematic reviewing prior to conducting this systematic review and meta-analysis and had been involved with conducting three scoping reviews as part of a large review team for the World Health Organisation.

4.4.3 Recruiting a review team

The review team of eight people recruited from the UEA and University of Hertfordshire represented a range of experience and knowledge. The team were trained in title and abstract screening using Covidence systematic review management software(265) and each reviewer piloted an initial sample of 200 studies to screen. This process ensured consistency across reviewers and ensured the inclusion criteria were effective and suitable. After screening, the team were trained to use the data extraction and risk of bias assessment tool on Covidence and each reviewer piloted these processes on five full texts. This ensured consistency amongst reviewers in these stages of the review reducing any potential bias. The data extraction and risk of bias assessment tools were revised as a result of this testing phase, including revisions of wording, and an additional question about delirium. The team regularly met online to discuss the review progress and discuss any issues and discrepancies.

4.4.4 Systematic review guidance

The systematic review protocol was developed using the Cochrane Handbook for systematic reviewing(266) to ensure robust methodology. However, Cochrane does not offer guidance for prevalence reviews and so JBI guidance for prevalence reviews(267) was also employed. The systematic review and meta-analysis was reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines(268).

4.4.5 Inclusion criteria

Any quantitative study reporting dehydration using directly measured serum/plasma osmolality, calculated serum/plasma osmolarity, 24-hour oral fluid intake or saliva osmolality, for adults aged ≥65 years, living in community or long-term care settings was included (Table 4.1). Studies needed to report either a dehydration prevalence using an eligible measure, or a mean (*where measure of variance and participant sample size were also available*) of any of the outcome measures below:

TABLE 4.1: SYSTEMATIC REVIEW INCLUSION CRITERIA

	Inclusion Criteria
Population	Adults aged ≥65 years, mean age of ≥65, or at least 80% of participants aged ≥65
Setting	Community setting (including independently living) and long-term care settings, in any part of the world.
Hydration measures *(in order of robustness)*	• Directly-measured serum or plasma osmolality, *or* • calculated serum or plasma osmolarity (any equation), *or* • saliva osmolality, *or* • fluid intake (where it was a current fluid intake, not estimated, and there was a definition of how it had been assessed/measured, with volumetric data)
Study Type	Case studies, cross sectional studies, cohort studies, case-control studies, randomised controlled trials, controlled clinical trials, before-after studies, including at least five participants and not restricted by publication status, language or date of publication

Studies reporting dehydration using BUN Creatinine ratio were excluded in July 2021 because it does not accurately distinguish between renal function(92) and dehydration in older adults. In August 2021, the systematic review was split into two, to create a sister review of hospital studies, and so hospital studies were excluded from the current review(269) because the current review was too large for the time and resources allocated to the PhD project. To ensure that only the most robust studies reporting on oral fluid intake were included, only studies which reported 24-hour oral fluid intake where methods were reported about the drinks being measured and where volumetric data of the 24-hour oral fluid intake was reported, were included. All revisions to the inclusion criteria were reported on Prospero throughout the review to ensure transparency. Exclusion criteria can be found in Table 4.2 below.

TABLE 4.2: SYSTEMATIC REVIEW EXCLUSION CRITERIA

	Exclusion criteria	**Notes**
Studies which include the following:	Where fluid intake or osmolality values have been pre-specified as part of the inclusion/exclusion criteria for the study.	
	Fluid intake, where measures were not standardised or defined.	Where no volumetric data was provided or no description was provided of how fluid intake was assessed/measured, or

		if fluid intake record relied on a dietary recall (e.g. 7 day).
	'Dehydration' undefined	Where authors did not provide a definition of dehydration or dehydration did not relate to fluid intake or other outcome measures.
	Hospital Setting	
	BUN Creatinine ratio	
	End of life care/End of life pathway	Where it was been stated that fluids were restricted, or fluid intake was reduced due to being end of life.
	Pre/post-operative fluids	Unless it stated that baseline data was obtained prior to any controlled operative hydration.
	Pre-operative fasting	12 hours pre/post operation, unless it stated that baseline data was obtained prior to any fasting.
	Dialysis	Unless it provided baseline data before dialysis began for the first time, e.g. end stage renal disease studies.
	IV Fluids	Only include PEG, NG tube and Hypodermoclysis
	Saline hydration	
	Salt-loss dehydration	

4.4.6 Searches

A complex and comprehensive search strategy was developed following the Peer Review of Electronic Search Strategies (PRESS) 2015(270) guidelines, based on the following format: *[aged] and [prevalence or incidence] and [dehydration or fluid] and [human]*. As per the PRESS checklist(270), an expert in conducting searches (LH) peer-reviewed the search strategy to ensure its comprehensiveness. The Cochrane advanced search technique to filter for "humans" within Medline (Ovid) and Embase (Ovid)(266) was included along with operators, truncation, free text and indexing terms. Five relevant online databases for peer-reviewed and grey literature were searched: Medline (Ovid), Cochrane CENTRAL, Embase (Ovid), CINAHL Complete/Ultimate, Proquest Dissertations Theses A&I/Global from inception until 20th April 2023. Nutrition and Food Sciences was searched from inception until 18th March 2021, but this search was not updated on 20th

April 2023, as the UEA library no longer had access to this database. Likewise, when the searches were renewed on 20th April 2023, the UEA no longer had access to CINAHL Complete and had instead subscribed to the more comprehensive CINAHL Ultimate. Searches of all databases were initially searched from inception until 18th March 2021, but during the peer-review process of publishing this review(54), searches were updated to 20th April 2023. Searches were not restricted by language or publication status.

4.4.7 Systematic review management

Covidence systematic reviewing software(265) was used for all stages of the systematic review. All citations were exported into Endnote X9 citation and referencing management software(271) and then exported as XML files into Covidence.

4.4.8 Title and abstract screening

The ‘study inclusion form’ was used by all reviewers to assess eligibility of studies (Appendix 4a). The lead reviewer initially assessed all titles and abstracts for potential inclusion within the review. If titles and abstracts did not contain enough information, but looked potentially eligible, then the study was included for full text review. Each member of the team was allocated a proportion of title and abstracts to independently screen, to reduce bias, by blindly duplicating this process. Any discrepancies between reviewers were discussed and then arbitrated by a third reviewer where necessary. Papers authored by any of the reviewers were assessed by other review team members.

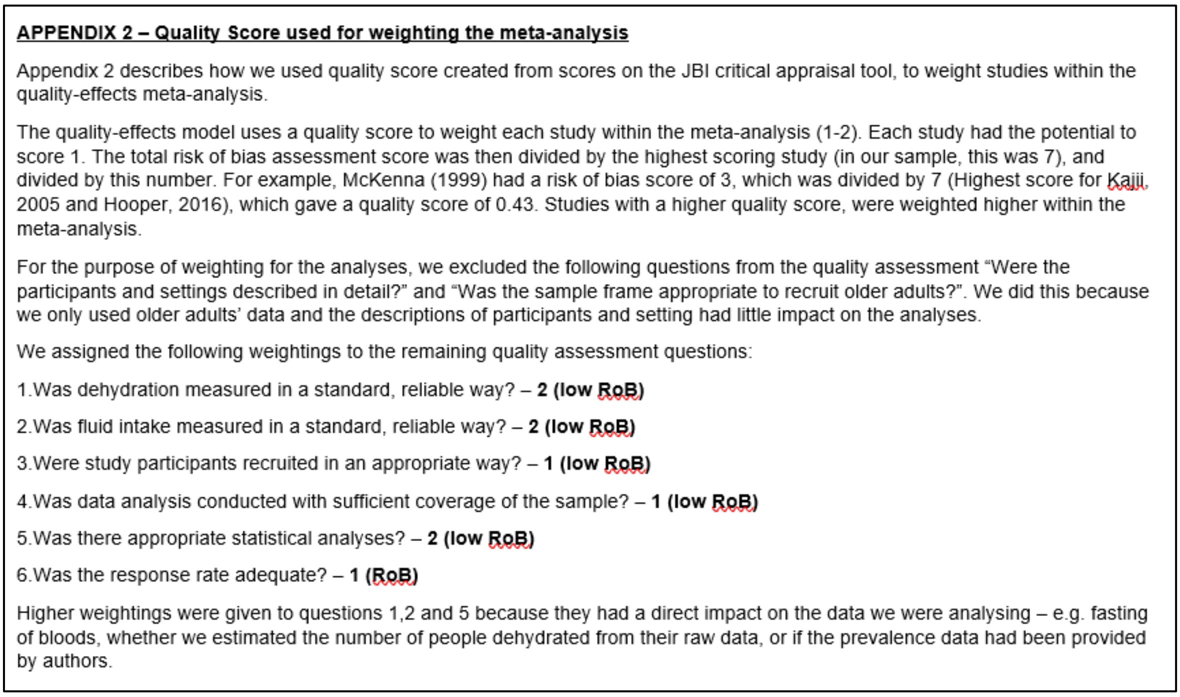
4.4.9 Full text screening

Full texts were sourced using EndNote(271), journal websites and via the UEA’s interlibrary lending request system by the review team and uploaded into Covidence(265). The lead reviewer independently assessed all full texts in Covidence which was blindly duplicated by the review team. Any discrepancies between reviewers were discussed and then arbitrated by a third reviewer where necessary. Reference lists of dehydration-related reviews were citation-searched and reference lists of papers by key authors in the field were hand-searched.

4.4.10 Risk of bias assessment and data extraction

The data extraction template was edited within Covidence to capture data relevant to the review’s outcomes. Questions from the JBI critical appraisal tool for prevalence studies(272) were adapted. The “unclear” category, question 3 ‘Was the sample size adequate’ and question 6 ‘Were valid methods used for the identification of the condition?’

were removed because the inclusion criteria determined that studies could only be included if they reported ≥5 participants and appropriate robust outcome measures of dehydration/oral fluid intake. Questions 1-4, relating to reliability of how fluid intake/dehydration was measured, how appropriately participants were recruited and how well participants and setting were described, were used to assess studies' risk of bias. Studies were assessed to be at low risk of bias if they scored at least 2 out of 3 on questions 1-4 (Figure 4.2).



APPENDIX 2 – Quality Score used for weighting the meta-analysis

Appendix 2 describes how we used quality score created from scores on the JBI critical appraisal tool, to weight studies within the quality-effects meta-analysis.

The quality-effects model uses a quality score to weight each study within the meta-analysis (1-2). Each study had the potential to score 1. The total risk of bias assessment score was then divided by the highest scoring study (in our sample, this was 7), and divided by this number. For example, McKenna (1999) had a risk of bias score of 3, which was divided by 7 (Highest score for Kajii, 2005 and Hooper, 2016), which gave a quality score of 0.43. Studies with a higher quality score, were weighted higher within the meta-analysis.

For the purpose of weighting for the analyses, we excluded the following questions from the quality assessment "Were the participants and settings described in detail?" and "Was the sample frame appropriate to recruit older adults?". We did this because we only used older adults' data and the descriptions of participants and setting had little impact on the analyses.

We assigned the following weightings to the remaining quality assessment questions:

1.Was dehydration measured in a standard, reliable way? – **2 (low RoB)**

2.Was fluid intake measured in a standard, reliable way? – **2 (low RoB)**

3.Were study participants recruited in an appropriate way? – **1 (low RoB)**

4.Was data analysis conducted with sufficient coverage of the sample? – **1 (low RoB)**

5.Was there appropriate statistical analyses? – **2 (low RoB)**

6.Was the response rate adequate? – **1 (RoB)**

Higher weightings were given to questions 1,2 and 5 because they had a direct impact on the data we were analysing – e.g. fasting of bloods, whether we estimated the number of people dehydrated from their raw data, or if the prevalence data had been provided by authors.

FIGURE 4.2: HOW QUALITY SCORE WAS CALCULATED FROM RISK OF BIAS ASSESSMENT SCORING

The existing data extraction template in Covidence was adapted to extract bibliographic details, study details, participant details and outcome measure data. Multiple records reported on the same study were merged in Covidence, e.g. conference abstracts, publications or reports(265). Data extraction and risk of bias assessment were conducted blindly in duplicate. Study authors and websites were contacted for further information needed to complete data extraction. Studies which did not report outcome measures relevant to this review were excluded. For data extraction of reports requiring translation, members of the review team, proficient in some foreign languages, translated reports written in Dutch, German, French and Spanish. For the two reports written in Korean and Japanese, for which reviewers did not have language proficiency skills, the Microsoft Word translation tool and Google Translate were used to translate the reports and confirm each tool's translations of the reports.

4.4.11 Analysis

As per the protocol(264), random-effects meta-analysis to establish the prevalence of low-intake dehydration amongst the included studies was planned. However, the Cochrane handbook(266) does not provide guidance to conduct meta-analysis of prevalence data. The JBI manual provides limited guidance for analysing prevalence data, including that proportional data from included studies should be analysed using either fixed-effects or random-effects meta-analysis(267). After investigating analysis of prevalence data further and discovering that random-effects models may not be appropriate for prevalence meta-analyses(273, 274) because they are prone to high heterogeneity and a random-effects meta-analysis creates an unweighted average as it over disperses the data relative to the model when there is high heterogeneity(273, 274), a quality-effects meta-analysis was decided upon instead.

The meta-analysis was conducted using Meta-XL version 5.3 to establish the prevalence of low-intake dehydration as recommended by one of the developers of Meta-XL, Suhail Doi(274, 275). The quality-effects model was weighted by the quality score calculated from the risk of bias assessment (Table 4.3) using the double arcsine transformation which the developers argued was capable of handling the heterogeneity better, generated from meta-analysing prevalence data. Heterogeneity was assessed using the I^2 statistic and the meta-analyses presented using forest plots and tables. Planned sensitivity and subgroup analyses were reported using forest plots and tables. As per the protocol(264), for the studies that reported more than one measure of hydration status, data was only included from the highest quality measure within the meta-analysis e.g. the most robust measures was directly-measured serum or plasma osmolality, then calculated serum or plasma osmolarity and then 24-hour oral fluid intake. Whilst the lead reviewer (EP) conducted all analyses independently, they met with LH regularly to discuss the analyses with, ensuring accuracy.

TABLE 4.3: AN EXAMPLE OF HOW THE QUALITY SCORE IS CALCULATED

Study ID	**1&2**	**3**	**6**	**7**	**8**	**RoB Score**	**Quality Score**
McKenna1999	2	0	1	0	0	**3**	0.43
O'Neill1997	2	0	0	0	1	**3**	0.43
O'Neill1989	1	0	1	2	1	**5**	0.71
Morgan2003	2	0	0	2	0	**4**	0.57
Nagae2020	2	0	1	2	0	**5**	0.71
Mack1994	2	0	0	0	0	**2**	0.29

Kajii2005	2	1	1	2	1	**7**	1.00
Bossingham2005	2	0	1	2	0	**5**	0.71
Johnson2018	2	1	1	2	0	**6**	0.86
O'NEILL1990	2	0	0	2	0	**4**	0.57
Albert1989	2	0	0	0	0	**2**	0.29
Simmons2001	2	1	0	2	1	**6**	0.86
Hooper2016	2	1	1	2	1	**7**	1.00
Marra2016	2	1	0	2	1	**6**	0.86
Wu2011	1	0	0	2	0	**3**	0.43
Zappe1996	2	0	0	0	0	**2**	0.29
Phillips1993	2	0	0	0	0	**2**	0.29
Phillips1984	2	0	0	0	0	**2**	0.29
NUAGE&Hooper2015	2	0	0	2	0	**4**	0.57

Multiple outcome measures were included within the systematic review (24-hour oral fluid intake, calculated serum or plasma osmolarity, directly-measured serum or plasma osmolality and salivary osmolality) but no studies reporting salivary osmolality reported data eligible for this meta-analysis. Studies were eligible to be included within the meta-analysis if the proportion of older people who were dehydrated was reported against the set cut-off of >300mOsm/kg for osmolality, >300mmOl/L for osmolarity or <1.5L[1] for oral fluid intake. Studies were also eligible if authors reported raw data or where authors reported mean oral fluid intake, osmolality or osmolarity data and a measure of variance, from which the standard deviation could be calculated and proportion of people dehydrated from the participant sample estimated, based on a normal distribution, using the following formula: =1-NORM.DIST(300,MEAN OSM/FI,SD,TRUE) within Microsoft Excel.

Subgroup analyses

Meta-XL version 5.3 did not have functionality to formally assess heterogeneity between subgroups and so distinct differences between subgroups were assumed when the means were different by more than 0.2.

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[1] The NHS recommends 1.5l-2.0L (6-8cups) of oral fluid intake, which varies to other global guidelines, so the 1.5L was used as a minimum for the oral fluid intake cut-off

Subgroup analyses were planned to investigate any methodological heterogeneity resulting from the different measures of dehydration, age, sex, care settings, cognitive impairment, renal impairment, diabetes, dependency on others.

Many of the individual studies did not report individual participant data for having cognitive impairment, renal impairment, diabetes and functional ability, and so studies were grouped by the proportion of participants from their sample assessed as having each condition/ability, as shown in Table 4.4 below.

TABLE 4.4: SYSTEMATIC REVIEW SUBGROUP DEFINITIONS

Cognitive Impairment	Cognitively able *(0% of sample had cognitive impairment)*	Low cognitive impairment (>0-29% *of sample had cognitive impairment)*	Medium cognitive impairment *(30-59% of sample had cognitive impairment)*	High cognitive impairment *(60-100% of sample had cognitive impairment)*
Renal impairment	Low renal impairment *(<20% of sample had renal impairment)*	High renal impairment *(≥20% of sample had renal impairment)*		
Diabetes	Low diabetes *(0% of sample had diabetes)*	High diabetes *(>0% of sample had diabetes)*		
Functional dependency	Fully independent *(0% of sample had functional dependence on others for ADLs)*	Mixed dependency (Sample included a range of participants with a range of functional abilities)		

Sensitivity analyses

Sensitivity analyses based on risk of bias score, along with sensitivity analyses of the most robust measures of low-intake dehydration were planned: directly-measured serum or plasma osmolality and calculated serum or plasma osmolarity using the Khajuria and Krahn equation(72).

Meta-regression analyses

Meta-regression were planned to investigate any statistically significant differences between the percentage of participants with cognitive impairment/dementia, on the prevalence of dehydration, if enough studies were available for the regression to run (≥10 studies per predictor variable).

Grades of Recommendations, Assessment, Development and Evaluation (GRADE)

The certainty of evidence of the systematic review using the GRADE approach(276) was planned to assess the overall evidence. Whilst the JBI manual does not provide any recommendations on assessing the certainty of evidence(267), the Cochrane handbook advises GRADE assessment of the overall evidence as best practice when systematic reviewing(277).

4.5 Drinking for people living with Dementia IN Care homes (D-DRINC study A) methods

This care home ethnography examined how older people living with dementia drink in care homes (*D-DRINC study A*). This section (4.5) is written in the First person.

This methods section describes how I designed this study and provides an overview of the care home, routines and activities that happen within it. This section describes the steps I took recruiting social actors within this study and enacting informed consent processes, how I conducted observations and recorded fieldnotes and how I analysed and interpreted the data to produce findings.

To design this ethnographic study, I considered public partner involvement (PPI) insights, the philosophical approach and the ethical issues which I anticipated and encountered during this research. I considered which setting my ethnographic study would be based, who to involve in the study, how I could involve them and how to collect data from the setting, to generate findings.

4.5.1 Public partner involvement (PPI)

I planned to involve contributions from PPI members and set these alongside my extensive readings of literature on hydration care in long-term care settings, including residents living with dementia. I planned PPI activities to seek wider views on which groups of participants were important for data collection, what methods would be useful for data collection, what activities were pertinent to residents' drinking, how I should recruit participants into the study and the design of the recruitment documents(278-280). Involving PPI contributors in designing this study was important to ensure the research would be useful to people living with dementia and their caregivers, as well as ensuring the methodology would be appropriate to gain appropriate data and participants to involve(278-280), to answer the study's research questions.

Online PPI Workshop 1

To assist in designing my study, I organised and hosted a one-hour online PPI workshop in March 2021, organised as an open discussion involving all attendees. This workshop was conducted during times when Covid-19 lockdown measures were in place in the UK, I organised the workshop online instead of in-person. I sought and gained funding from the NIHR's ARC East of England, to offer each attendee recognition for their time and insights with a £10 voucher. I advertised the workshop via the Alzheimer's Society Research Network and received a positive response from numerous people wishing to attend the workshop, all of whom had experience providing informal care to someone living with dementia. I had capacity for six people to attend this workshop due to funding constraints. The workshop aimed to gain insights from attendees relating to how I could engage care home residents living with dementia in research, in which ways could I find out how people living with dementia might not drink so well and which groups of people may support residents living with dementia to consume drinks.

Workshop attendees shared their experiences of supporting drinking with care home residents living with dementia. Some shared strategies which resulted in the resident drinking, whereas others shared challenging experiences where the resident found it more difficult to drink. Examples of this included contributors mentioning occasions when they identified the resident feeling thirsty and acted to rectify the thirst by reaching for a drink. Evidence shows that the thirst sensation is less sensitive in older age(205) and is not an accurate indicator of dehydration in older people(92). This exemplifies the importance of considering PPI contributions alongside my own knowledge and the wider literature(280). The PPI contributors advised that I should consider how residents drink more when socially drinking with someone else, that residents depend on care staff to support their drinking, how staff record and monitor fluid intake, as well as what drinks and what drinking vessels are offered to residents within the care home. One PPI contributor raised the importance of a researcher spending long enough in a care home to observe how a resident's health might deteriorate as a consequence of insufficient drinking. Many of the attendees' experiences of supporting a care home resident living with dementia to consume drinks resonated with recent literature in the field. Many of the workshop attendees commented on the importance of this research topic, which may be expected to a degree, given they had volunteered their time to contribute to this PPI workshop. PPI contributors suggested that I could collect data for this study by observing people living with dementia and interview them face-to-face. All attendees were clear that virtual engagement with care home residents living with dementia would not be as productive as seeing them in-person. Some workshop attendees argued for the usefulness of my observing drinking interactions of people living with dementia within the care home and also of having conversations with people who live in, work in, or visit the care home, who might be involved in hydration care, as crucial for gaining insight into what might influence drinking. All workshop attendees gave importance to my adopting a 'whole care home approach' in the design of this study, involving all social actors working, living and visiting within the care home. Most attendees spoke about dehydration being a 'systemic problem' involving the overall management of a care home, the care home environment and culture, visitors, caregivers, staff, residents and health professionals. The workshop attendees detailed many factors which they saw might affect drinking. These included the size of the home, colour of tableware and glassware, importance of routine, resident mobility, the impact of Covid-19 and lockdowns, making drinks accessible, making drinking fun, individual preferences of drinks and care plans to be shared with all staff. These insights highlighted to me how complex the emergence of the phenomenon of drinking within care homes might be. They helped to confirm to me that an ethnographic study was most appropriate in understanding drinking in a care home. Ethnography would enable me to explore the multitude of interplaying factors of drinking, and roles and interactions of social actors, which the literature and PPI contributors discussed.

Online PPI Workshop 2

To assist in designing the recruitment strategies and study materials, I hosted another one-hour online PPI workshop in March 2022. I again sought funding from the NIHR's ARC East of England to offer five attendees £30 vouchers for their time and contributions. I advertised the workshop on several platforms including X[2], LinkedIn, Alzheimer's Society Research Network and Norfolk's DEEP group (Dementia Engagement and Empowerment Group): Creake Encounters. Whilst I sought to involve people living with dementia, as well

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[2] X was formerly Twitter

as those who had experience supporting people living with dementia when advertising the workshop, only informal or formal caregivers with experience supporting residents living with dementia in a care home setting attended and participated in the workshop. The workshop aimed to gain insights relating to the design of the recruitment materials, the informed consent documents and the participant information sheets, as well as informed consent processes within the care home.

The interactive online workshop provided a discussion, in which I shared my computer screen using an interactive Miro whiteboard(281) and noted down attendees' contributions on 'sticky notes' as they spoke (Figure 4.3 below). Two of the five PPI contributors were unable to attend on the day of the workshop and so contributed via email instead. Attendees brought a range of caregiving experiences of supporting people living with dementia in care homes. During the workshop, public partners offered many insights into how to recruit different participants, how to advertise the D-DRINC study and in what format, the format and content of informed consent and participant information sheets. This ethnographic study sought to address the limitations of other studies, previously described in Chapter Two, which excluded people living with dementia from their research. I decided to employ inclusive data collection methods to facilitate their involvement. To successfully recruit people living with dementia into the study, PPI contributors made me aware that I might need to consider ways of communicating with residents with aphasia and ways in which I might consent residents into the study, if they might lack mental capacity to provide their own informed consent. The PPI contributors emphasised that to do this, I should make the study recruitment documents as simple as possible, using pictures and user-friendly language to facilitate care home resident's involvement in the study. The PPI contributors advised that to facilitate the involvement of family caregivers and staff involved with care home residents, I should consider using electronic forms and ensure that the care home manager allows staff time to read the information sheets to take part. PPI contributors advised that I should not use family visit times to consent participants into the study, as this time was precious to visitors. These insights proved useful options in how I designed the recruitment strategies and study documents for this study(280). There were also potentially useful and appropriate examples of peer-reviewed study materials from the 'Assent Project' for people with communication difficulties or those that may lack mental capacity(282) and research projects involving people with intellectual disabilities which guided me in developing recruitment materials for this study(283).

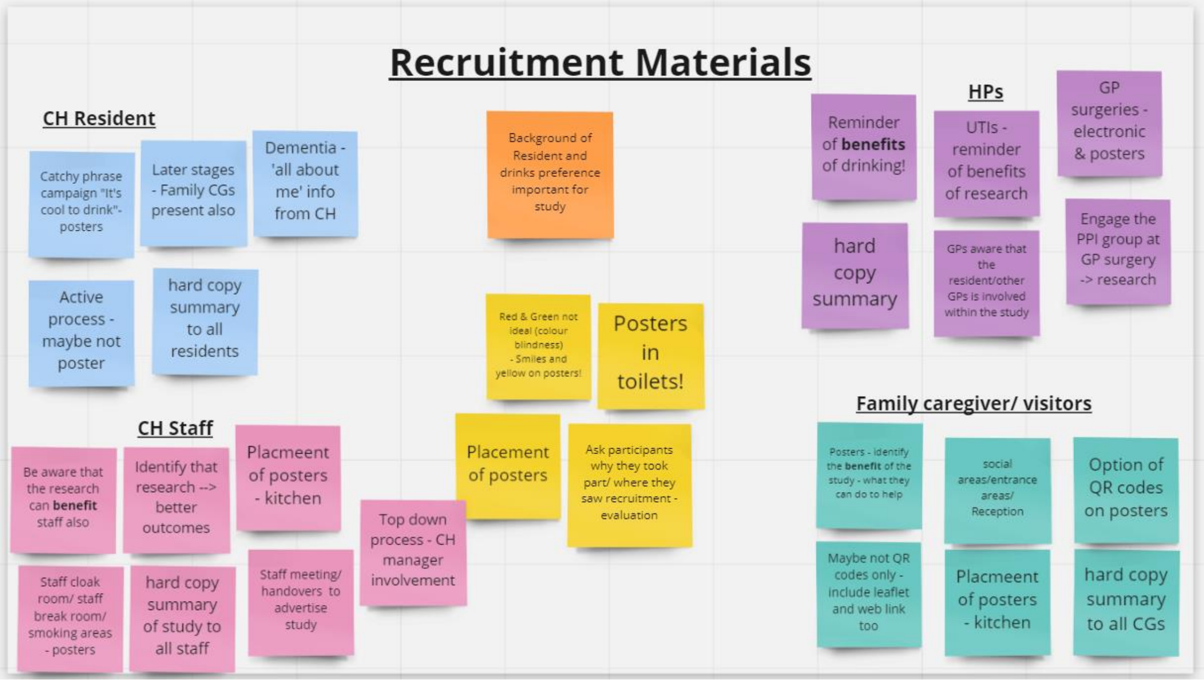


FIGURE 4.3: ONE OF THE FOUR MIRO BOARDS FROM THE PPI WORKSHOP IN MARCH 2022

When ending the workshop, I informed the group that I would develop the documents and materials drawing on their input, alongside existing templates and materials for other ethics-approved studies and my own knowledge. I advised the group that once I had designed the study materials, I would seek their further comments on the developed materials. I informed PPI contributors that I would be unable to implement all their input, given legislative and ethical requirements e.g. sufficiently informative information sheets. Contributions from PPI members which I implemented, included the poster content and design (bright colours, a picture of an older person smiling, and catchy title) and providing an easy-read version of the information sheet and consent form for residents. The workshop contributors agreed on enabling participant choice between providing information sheets in both hard-copy and digital versions and conveyed the importance of having both options.

4.5.2 An exploratory single-case study design

An exploratory case study design is appropriate when there is little knowledge about a naturally-occurring phenomenon and seeks to answer in-depth “how” or “why” questions, without the researcher seeking to control events and when the focus of the research is in the ongoing present, rather than on historical events(284). There is currently limited evidence which explores how older people living with dementia drink in care homes and even less on reasons for conflicting evidence on why people living with dementia are dehydrated in some care home studies and not others. The case study method is an “all-encompassing method" which involves the researcher using multiple sources of data to explore a phenomenon and can be used with any epistemological approach(284).

Case studies can include multiple cases, but much ethnographic research is focused on a single case(284). Here I decided to explore a single-case study to comprehensively examine drinking and drinks provision over a 24-hour period within the context of a single residential care home. I chose a single-case study for pragmatic reasons due to a care home manager advising me that I would be unable to research in multiple homes due to potential cross-transmission of Covid-19 between care homes, which was based on the official government guidance on care home visiting at the time(285). A single case study design enabled me to spend extensive time in a single residential care home, conducting in-depth data collection of how older people living with dementia drink. Yin (2014) advises that a case study researcher should employ an appropriate theoretical paradigm to guide the design to address the multiplicity of influences of interest within the context being explored(284). I used a social constructionist approach(286) to direct the ontology of my enquiry, data collection methods, data sources and analysis, to gain a nuanced, cultural and contextualised insight of everyday life from within the unique setting of a residential care home. This approach enabled me to thoroughly examine in a holistic way how the routines, practices, actions and interactions of people working, visiting and living within this system, led or did not lead older care home residents living with dementia to drink.

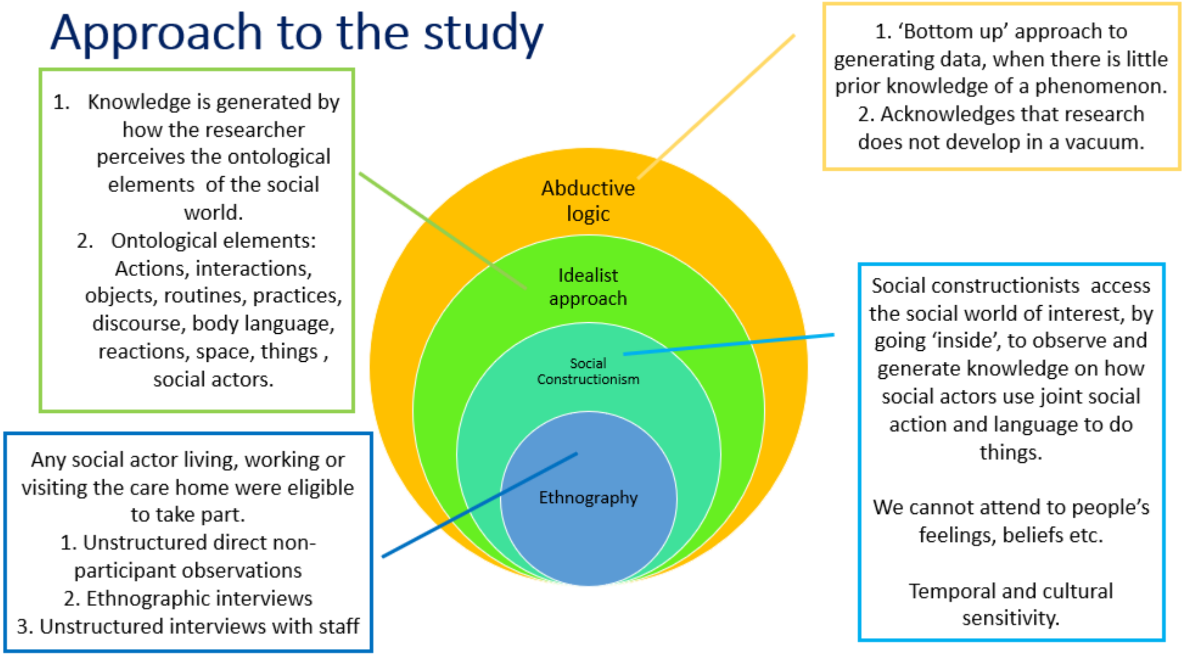
I followed Yin's (2014) guidance to conduct a robust single exploratory case study to produce reliable, valid and useful findings(284). Yin (2014) describes four criteria which can be used to assess the quality of case study research, however only three of these are relevant to exploratory case study designs(284): construct validity, external validity and reliability. He argues that a case study researcher can demonstrate construct validity by using multiple sources of evidence and have the draft case study report reviewed by key informants(284). I planned to triangulate the data generated from ethnographic interviews and non-participant observations, involving different groups of participants to strengthen the construct validity of this case study. To report the case study findings, Yin (2014) suggests that single case study researchers demonstrate external validity by using theory to guide data(284). To demonstrate reliability, Yin (2014) proposes that case study researchers develop a study protocol, develop a case study database and demonstrate a chain of evidence(284). Some critics of Yin (2014) argue that his case study approach is too structured and inflexible to potential changes to data collection and data analytic approaches compared to other case study methodologists, where a priori conceptual frameworks are not required prior to data collection(287, 288). Yin's (2014) case study approach enables the researcher to use a wide range of data collection methods, including records, participant observations, interviews and physical artefacts, all of which facilitate the researcher's thorough exploration and examination of a phenomenon, enabling the researcher to link the data generated from the study directly back to the original research question(287). Yin's (2014) approach therefore provides a robust and empirical framework to guide and structure data collection and analysis of a study, when there are a multitude of interplaying factors within a complex setting(284).

4.5.3 Logic of enquiry

A logic of enquiry frames a research problem and outlines which research questions can be answered(289). There are four types of logic: deductive, abductive, inductive and retroductive, which can each be used to answer different types of "what" or "why" research questions(289). There is little known about how older residents living with dementia enact the activity of drinking within a care home, as described previously. An abductive logic was appropriate for this study because it enables the researcher to approach the research with a 'bottom-up' logic(289) (Figure 4.4 below). Abductive logic assumes that the researcher begins with having little knowledge of a phenomenon and uses data collection methods to explore the phenomenon further, producing culturally-informed knowledge of the previously less-known phenomenon(289). There are two stages in abductive logic: the researcher's use of thick description to describe their encounters and the researcher's 'sense-making' process of the data they collected(289).

The first stage of abductive logic is for the researcher to use 'thick descriptions' to describe what they encounter in terms of the everyday activities of social actors within the world they are examining(290). Everyday activity of social worlds is essentially 'mundane' and 'taken-for-granted'(291). The 'social world' relates to a context which is made up of different ontological elements, which can be examined by researchers(291). Insights can be gained into social worlds by accessing the discourse of people ('social actors') who exist, act and interact within social worlds(289) and social actors use discourse to describe their actions or action of others(289). Researchers can therefore learn about this social world by attending to the everyday activities, actions and routines of everyday life and attending to how the social actors use discourse to report and enact activity within the social world and to ascribe meaning to their environment, experiences and practices within the social world(289).

The second stage of abductive logic is for the researcher to make sense of this developing knowledge by categorising the data and generating meanings in everyday activities and discourse relating to older residents drinking(289). Abductive logic assumes that data collection and knowledge generation emerge simultaneously and iteratively, as how the researcher generates data is shaped by their developing analytical thinking(291). This logic therefore considers that the researcher is influenced by their own experiences and existing literature, when generating knowledge, rather than the researcher generating theory in a vacuum(291). My research sought to do more than 'record actions' but use this to generate culturally-and interactionally-informed knowledge of how older residents living with dementia drink within the unique setting of a care home. Abductive logic therefore lends itself well to the study design.



1. Knowledge is generated by how the researcher perceives the ontological elements of the social world.
2. Ontological elements: Actions, interactions, objects, routines, practices, discourse, body language, reactions, space, things , social actors.

1. 'Bottom up' approach to generating data, when there is little prior knowledge of a phenomenon.
2. Acknowledges that research does not develop in a vacuum.

Social constructionists access the social world of interest, by going 'inside', to observe and generate knowledge on how social actors use joint social action and language to do things.

We cannot attend to people's feelings, beliefs etc.

Temporal and cultural sensitivity.

Any social actor living, working or visiting the care home were eligible to take part.
1. Unstructured direct non-participant observations
2. Ethnographic interviews
3. Unstructured interviews with staff

FIGURE 4.4: APPROACH TO UNDERTAKING THIS RESEARCH

4.5.4 Ontology and Epistemology

Ontology

An ontological position makes clear what elements of the world will be attended to as ontologically relevant within qualitative research(291). Idealism is an ontological theory which posits that objects in a social world can only exist in the form that social actors in that world perceive them(289). Idealism proposes that all knowledge is constructed by how ontological elements and actors of the social world are perceived(289). This fitted with my adopting an idealist approach defining how older people living with dementia drink fluids in care homes (Figure 4.4). I attended to the following ontological elements guided by abductive logic to answer my research questions: people/social actors, objects, environment, discourses, actions, reactions, interactions, body language, social relations, social and cultural practices, routines, time, space and things(291). These offered me elements which I could perceive and use to generate knowledge. Taking an idealist position therefore enabled me to examine interactional influences of actions and discourse which shaped how older people living with dementia to drink fluids within the social reality of a care home.

Epistemology

An epistemological approach describes how knowledge of the ontological elements can be obtained(289). There are said to be six types of approach here: empiricism, rationalism, falsificationism, neo-realism, constructionism and conventionalism(289). An idealist approach supports a constructionist epistemological approach which enabled me, as the researcher, to generate knowledge by observing how social actors use language within the care home to generate their own reality(289). Social constructionism asserts that researchers can only access the social world by being inside the social world and attending to its social actors' language, seen to be "performative and constructive"(286). This asserts that access cannot be gained into social actors' inner self, such as their experiences, wants or feelings and therefore their language and actions should be attended to, in order to generate knowledge(286). A social constructionist approach is useful for this study because it attends not only to peoples' language, but also to actions and interactions over time and seen in context(286). This is relevant because it enables residents living with dementia who may have communication difficulties to take part and so social constructionism was a useful and appropriate way to examine how residents living with dementia drank in a care home. This could take account of how each home has its distinctive nature, culture, processes, routines and practices, as well as their own distinct workforce and residents, all of which will influence how a resident living with dementia may or may not drink fluids. A social constructionist approach can make visible how knowledge is constructed and sustained within a care home(292) by attending to the discourse and social action of social actors living and working in the home. Constructionists take a critical stance towards 'taken-for-granted' knowledge, allowing the researchers to essentially 'step back' and critically attend to the mundane everyday activities, exploring how social actors make sense of their worlds(292). It was important for me to observe the everyday activities of life within the study's residential care home so that I could attend to how knowledge around hydration and drinking was jointly produced, sustained and changed by participant social actors throughout my sequence of observations(286). This offered a way to build a nuanced and contextualised understanding of how older residents living with dementia come to drink, or not, in care homes.

Several methodological issues arise from taking a social constructionist approach. Specifically, challenging the existence of one objective truth, the power dynamic between the researcher and ‘the researched’ and reliability and validity in this research(286, 289). If there is no one objective truth to be found, social constructionists will therefore generate data based on their own subjective interpretations of what they perceived to exist from the social world(286, 289). This makes the practice of reflexivity crucial to social constructionism, to be conscious of any participants’ own expressed thoughts, but also to actively monitor “the ongoing flow of social life” in the setting(286, 289). Reflexivity is the “continual internal dialogue and critical self-evaluation of researcher’s positionality”(216) whereby a researcher considers and evaluates how their activity, personal characteristics, worldview, lived experiences might shape data generated, and consider how the language they use to describe the data and interpret findings(216) may shape the data generated. Giddens (1984) argues that because humans, including researchers, are “purposive agents” continuously responding to and considering their surroundings, they may be able to discursively explain their actions if questioned and if able to articulate(293). I applied reflexivity to my research in two ways. I wrote reflections of how I felt, my thoughts and impressions during the data collection period within my field notes, often relating to the care home environment but also things I had observed which I found upsetting, anxiety-provoking, joyful or surprising, which I triangulated into my analysis. My second reflexivity practice was to write in my field notes what I attended to and why I was attending to it, and documenting what might have taken my attention away, why this was, and reasons for my stopping observations. I analysed the dataset using reflexive thematic analysis(294). These reflexivity practices provided means to make visible some influences on my interpretations of the social world and also how my subjectivity and reflexivity contributed to my analysis(286, 289).

Another methodological issue arising from social constructionism, as with many research approaches, is that of power dynamics of ‘the researcher vs the researched’(286). Some researchers use member-checking, where participants ‘check’ what the researcher has recorded about them to democratise the power dynamic between researcher and participant(295). It has been argued that this is not feasible in social constructionist research(286) since social constructionists are seen to actively choose what ontological elements they attend to at each point in their observation periods and record what they perceive to exist within that temporal context. The researcher therefore holds the power of what they attend to and record(286). It is not theoretically feasible for anyone else to represent or re-construct what the researcher observed. I decided that it would not therefore be meaningful or appropriate to involve participants in the research by using member-checking practices. I argue that using a social constructionist approach in this study(75) could be seen as illuminating power issues relating to the older residents living with dementia, making more visible their more explicit power or disempowerment relating to drinking communications and actions, particularly for those who may not be able to verbally communicate their needs or wants relating to drinking, or general care within their everyday lives.

The final issue with social constructionism I have already discussed, is that commonly-assumed quantitatively-relevant terms of reliability and validity may be less relevant to quality in this approach(286). My research cannot be replicated by another researcher for many reasons. It is therefore more appropriate to consider how useful the findings generated from this study, drawing upon social constructionism will be(181). I have therefore instead reported the findings to apply guidance(284) for assessing the quality of case study findings for this research to fit a constructionist approach(286), such as by following the pre-planned research protocol, reporting the evidence chain, making visible how I interactively generated the findings and triangulating findings from two data collection methods: ethnographic interviews and observations. These measures contributed to my robust and theoretically informed approach to this research.

4.5.5. Ethnography

An ethnography was relevant as a way of observing social actors within their natural social setting(289) and to conduct unstructured observations of everyday activities within the care home, which may have contributed to how residents living with dementia drink. The social constructionist exploratory single case study design(284, 286) helped focus observations on how social action and language constructed and sustained activities relating to drinking within the care home. I conducted unstructured non-participant observations and ethnographic interviews with all consenting social actors within the care home to generate contextualised, nuanced and experience-based knowledge of how older people living with dementia drink. The social constructionist approach, within an exploratory single case study design and guided by an idealist perspective, made it appropriate for me to conduct an ethnography to observe how social action and language constructed and sustained knowledge relating to drinking within the care home(284, 286).

I adopted the position of ‘mediator of languages’(289) to conduct the ethnography where I acknowledged that my own assumptions relating to care homes and drinking, as well as my own experiences and emotions affected my observations and details within my fieldnotes. This aligned well with a social constructionist approach whereby the ethnographer reconstructs their own construction of what they perceive in the social world(286).

4.5.6 Recruiting a Care Home to host the ethnographic study

I initially emailed four care homes via the Carehome.co.uk website search and contact function in 2021, to inform them of the proposed study and asking if they would be interested to host it. I had phone calls with several care homes to discuss the study further. One care home, which provided nursing care to older people in a rural area in the East of England, invited me to have a face-to-face meeting with the home manager in July 2021. The manager agreed to host the study on the condition that I would not visit other homes to prevent the potential risk of Covid-19 cross-transmission. After reflecting upon this, given that the Covid-19 situation was still precarious for care homes, I decided to implement a single case study. Unfortunately, despite me emailing the manager on numerous occasions, I did not receive any further communication from them.

In June 2022, I began looking for a host care home again. I contacted the communications manager of a local newsletter delivered electronically bi-weekly to all care homes in two counties, which is an organisation that advertises training, information and notices to care managers across the region. I emailed them an advert to share in their E-bulletin, which gave a brief description of the D-DRINC study and explained that I was seeking advice on how best to recruit care home managers and participants to participate in the study, via Microsoft Form I had devised. One care home manager completed the Form suggesting some recruitment strategies and emailed me their expression of interest hosting the study. I emailed the manager further information about the D-DRINC study and arranged a face-to-face meeting with them in July 2022. After the meeting, the residential care home manager confirmed that they would like to host the study and so I submitted my ethics application including the care home and care home manager’s details to the NHS Research Ethics Committee (REC).

<u>Participant recruitment</u>

Residents with a formal diagnosis of dementia documented in their care records and aged at least 65 years, any staff that worked in the care home, any visiting health professional to the care home and any informal caregiver or visitor to the care home were eligible to take part in this study.

Recruitment of participants into this study was complex. Interruptions to my time in the home, due to Covid-19 and diarrhoea and sickness outbreaks, made it difficult for me to establish myself within the home at the outset. I also sensed that staff were unsure of my purpose in the home and potentially saw me as a an ‘inspector’ watching staff, instead of being a researcher in the home to learn about drinking.

INFORMING ALL SOCIAL ACTORS OF THE STUDY

As per my protocol, I regularly met with the care home manager to discuss recruitment and sought their permission to put up the study posters with a QR code and website linking to all study documents and electronic consent forms around the care home, on noticeboards identified by the manager as being appropriate. I asked the care home manager to share the ‘short study summary’ document (Appendix 4b), which included my contact details, to all family members on their mailing list, informing them of the study and my presence within the care home, which the care home manager confirmed they had actioned. I left study information sheets at the staff entrance to the care home and on staff tables, with the manager’s permission. I sought to provide people visiting, working and living within the care home with many opportunities to be informed about the study and ask questions about the study. I presented the study at staff, resident and family meetings hosted in the care home, which were also hosted on Zoom for people unable to attend in-person, to inform them of the study taking place in the care home, informing them of participant opportunities and opportunity to ask questions about the study.

Family members/visitors

Only one of the five residents recruited into the study had regular visitors, but they declined participation in the study. I was therefore unable to recruit any family members or visitors into this study.

Health professionals

District nurses visited residents who required monitoring for particular health conditions, but they did not visit the residents who were participating in this ethnographic study. On two occasions, I had the opportunity to briefly outline the purpose of the study and give an information sheet to different visiting district nurses from two different sites, but I did not see these nurses again.

The local GP practice was reported by the care home manager to be their first port of call if any resident appeared unwell or if they required referral to any other service/therapy for residents. I was therefore keen to recruit a GP into the study. When GPs visited the care home, they appeared time-pressured and had a list of residents to see. I had the opportunity to discuss the study with a visiting GP on one occasion and they commented how they would like to take part and so I gave them an information sheet to consider. As part of the REC conditions, I was required to give prospective participants at least 48 hours to consider the information and unfortunately after calling the GP surgery on two occasions, I did not receive a response from any GP at the practice.

HANGING-OUT PERIOD

I planned a three week ‘hanging-out period in the care home to familiarise myself with the home and social actors within it. I used this period to learn about the spaces and routines within the home and discussed the study with all social actors within the home. In practice, this period was shortened to eight days (28 hours and 35 minutes) of observations due to three non-continuous weeks of infectious outbreaks in the care home at the beginning of my study which set limits on my timeframes. Other ethnographers have reported the use of a hanging-out or familiarisation period for speaking to staff and residents about the study(296) and to prevent a potential ‘culture shock’ of entering the field(297). The hanging-out period was useful for me to introduce myself to all social actors within the home, discuss recruitment and become familiar with the care home environment, practices, and routines. I displayed posters around the home advertising the study and I wore a yellow name badge stating *“Hello, my name is Ellice, Researcher”.* During this time, I wore a disposable face mask as part of Covid-19 transmission mitigations and so I waved to residents and pointed to my name badge to communicate more effectively with residents, of whom some may have had hearing impairments. I handed ‘short study summary’ A4 sheets to residents (Appendix 4b) so that they could also learn why I was in the home.

GENERATING FIELDNOTES

Brief notes detailing my observations would be recorded in a notepad whilst I observed activities in the care home, recording the observations temporally(298). On returning home from the care home, I planned to expand my brief fieldnotes into detailed fieldnotes writing ‘thick descriptions’ about my observations(290). Geertz describes “thick descriptions” as the “intellectual effort” which underpins and defines ethnography(290). ‘Thick descriptions’ of what the ethnographer observes allows the reader to be informed of the context in which the act happened(290). Further details of how fieldnotes were generated can be found in Chapter Six (section 6.5.4).

DATA ANALYSIS

The process of analysis is commonly understood to begin with how and what a researcher, including ethnographers, select as being important and relevant within their observations(299). The ethnographer is instrumental in shaping the nature of data they generate as when they begin to narrow their focus in relation to what they perceive to be relevant and important in answering the research question(286). I therefore devised vignettes to illustrate how I constructed the findings from life in the care home(300). I devised one vignette per month of the study, illustrating developments in recruitment and constructing finding of how people living with dementia drunk in the care home. I employed inductive reflexive thematic analysis to analyse the data generated from this study because it assumes the researcher has practiced reflexivity throughout data generation and is appropriate for use with the social constructionist paradigm(294, 301, 302). This type of analysis takes a bottom-up and data-driven logic which leads to the generation of themes and categories and is theoretically flexible, which aligns with an 'abductive' approach to research and thus appropriate for analysing this dataset(294, 301, 302). In inductive reflective thematic analysis, the researcher deeply engages with the dataset to explore, analyse and interpret the dataset to iteratively generate categories/themes(294). Braun and Clarke (2021) suggest that the process of inductive reflexive thematic analysis follows six steps: familiarisation; coding; generate initial themes; review and develop themes; refine, define and name themes; write up findings(294).

4.6 Online forum analysis methods

This online forum analysis examined how older people living with dementia drink in care homes (*D-DRINC study B*). This section (4.6) is written in the first person.

4.6.1 Theoretical positioning

I used a social constructionist approach(292) to examine the written contributions to the Dementia Talking Point (DTP) forum to make sense of how users frame drinking within their online posts. A social constructionist approach can make visible how knowledge is constructed and re-constructed between online users of the forum(292). The ontological focus of this study was the textual content of the online posts on the forum(286). Social constructionism asserts that knowledge is socially constructed and our view of the world is a product of ongoing social negotiations relating to the meaning of objects, events and actions(292). To understand how others construct their sense of reality, the means in which people negotiate their view of the world must be examined(292). In this study, I examined the mechanism of written text to explore the public discourse on how carers of people living with dementia drink in care homes.

4.6.2 'Dementia Talking Point' online forum used for data collection

I chose to only use the 'Dementia Talking Point' forum(303) to select online posts from for this study because it is, to my knowledge, the largest UK online public discussion forum dedicated to supporting people affected by dementia. It was therefore likely that online users would write about drinking or hydration care of care home residents living with dementia, to some degree within their written contributions to the forum. As of August 2024, 93,968 members were registered to use the forum. This figure likely reflects the number of people who have ever registered to use the site. The forum hosts a live 'user' count on its site reporting how many members – those registered to use the site – and non-members are using the forum at any point in time. As I write this (17/08/24 11:00), 16 forum members are online and 305 non-members are on the site. The forum consists of over 142,000 threads containing over two million messages posted by users since 2003. Although anyone can access the 'Dementia Talking Point' forum online(303) and the posts are publicly available to read, users must register with the forum to post messages. People post asynchronously to initiate or contribute to threads and respond to messages by other users. Each post is time and date-stamped and the user's self-generated member name is displayed at the top of each online post. The forum is organised and maintained by a team of 13 volunteer moderators and hosts who contribute posts to the 'discussions' on the site, as well as a team of six staff members responsible for moderation, technical support and initiating threads(303).

In the 'Talking Point's 2022 user satisfaction survey'(304), the Alzheimer's Society UK reported that of the 506 Dementia Talking Point forum users who completed the survey 86% of users on their site were White British, the majority were female (77%) and either cared for someone living with dementia (51%) or had a relative living with dementia (45%)(304). There was a wide age range reported amongst survey respondents, with the youngest members being aged 25 years and the oldest members exceeding 84 years of age(304). Although the figure of 506 respondents is a very small proportion of the overall registered membership of the forum, it might be that the more engaged members of the forum would be more likely to complete a survey about their user experience of the site. However, this is speculative, because survey respondents were not linked with online user profiles and there was no survey question about the user's level of engagement with the site.

4.6.3 Sampling of forum content

As I adopted the 'passive/unobtrusive' approach to this forum research(305), forum membership was not needed for me to access the written contributions on the forum. I searched the whole forum for relevant posts relating to drinking in long-term care settings, due to the forum's specific relevance to dementia and the large corpus of data available. I did not restrict the inclusion of posts by date, because any post which met the inclusion criteria was relevant to answering the research question. The forum search function limits searches to ten pages of results and so the results of the searches would always be manageable. I included all eligible posts within the dataset for thematic analysis.

Some researchers sample posts by searching search terms within forum posts, or sample posts by message characteristics, user characteristics, temporally, randomly, or only select particular discussion board topics or threads(1). These decisions are usually made due to pragmatism, to prevent an unmanageable analysis of excessively large number of posts retrieved from forum sites, which may be analysed using content analysis or machine learning(306-308). In this study, I conducted a thematic discourse analysis which comprised two stages(294, 302). I firstly thematically analysed all posts retrieved from the search and then purposively selected a small sample of written contributions to analyse using discourse analysis to examine how forum users position drinking within their written discourse. Discourse analysts tend to analyse a small sample of posts, to closely attend to the way that discourse is used to frame a phenomenon within forum posts(309).

4.6.4 Search of forum content

To retrieve posts including data about drinking in care home residents living with dementia, I purposively searched the terms 'drink', 'hydrate', 'juice', 'tea', 'coffee', 'milk', 'beer', 'dehydration' and 'water' using the Dementia Talking Point forum(303) search function from 17th October 2022 to 2nd January 2023. I searched "hydrat" to encompass a broader search, but this retrieved no results. Each time I searched a term e.g. "drink", up to ten pages of results was displayed. Any posts which exclusively related to alcoholic drinking were not selected for sampling. The website limited searches to ten pages of results for each search term. All search terms resulted in ten pages except for 'hydrate' when just four pages displayed, indicating the term was used less often (Table 4.5).

I read through each post retrieved from the search of each drinking term. I selected any post which referred to non-alcoholic drinking and the post or thread referred to a person living in a care, residential or nursing home. I assumed that posts related to people living with dementia because they were being posted on the ‘Dementia Talking Point’ forum(303). Table 4.5 shows how many pages of results were retrieved from searching each search term and dates that searches were conducted. Although demographic information was not available for the users, it appeared from the content of posts, that most people posted from the UK and occasionally from the US. All posts included within the analysis were in English and I only viewed English postings during my engagement with the site.

TABLE 4.5: SEARCH RESULTS FOR EACH SEARCH TERM

Search Term	Search Dates	number of posts displayed
Drink	17/10/22-09/11/22	98 posts (10 pages)
Hydrate	09/11/22-16/11/22	46 posts (4 pages)
Juice	16/11/22-18/11/22	95 posts (10 pages)
Tea	18/11/22-21/11/22	93 posts (10 pages)
Coffee	21/11/22-22/11/22	97 posts (10 pages)
Milk	23/11/22-24/11/22	98 posts (10 pages)
Beer	24/11/22-12/12/22	95 posts (10 pages)
Dehydration	14/12/22-01/01/23	96 posts (10 pages)
Water	01/01/23-02/01/23	99 posts (10 pages)

I read through 817 posts retrieved from searching the forum for drinking-related terms. From these 817 posts, I selected 282 posts which referred to a care home resident drinking, or not, in a long-term care setting, to include within the analysis. I excluded any posts which only related to alcohol drinking. The posts that I selected contained at least one of the relevant search terms dated from June 2006 to November 2022. Due to time constraints and practical reasons, I did not search any more drinking-related terms, as I already had sufficient data with temporal variation of content from the posts that I had reviewed. For the thematic analysis, I selected all posts containing relevant drinking-related terms and references to someone living in long-term care settings(294, 302). For the discourse analysis(310), I purposively selected a small, diverse sample of written posts which related to themes generated from the thematic analysis.

I copied and pasted each of the selected posts into a Microsoft Word(311) document and anonymised any identifiable information from the posts. I highlighted any extract of the written text which related to drinking. I imported the Microsoft Word document(311) into NVivo 1.7.1(312) in preparation for analysis.

4.6.5 Analysis of forum content

I approached analysis of the forum posts, which made up the dataset, combining inductive reflexive thematic analysis(301) with focused discourse analysis(310).

Inductive reflexive thematic analysis

I initially conducted an inductive reflexive thematic analysis(301) to analyse the dataset. This approach acknowledges that a researcher brings their own subjective skills and experiences to how they engage with the data and undertake analysis(302). I conducted this analysis after completing D-DRINC Study A, which shaped how I approached this analysis, in terms of how I noted experiencing drinking within the care home and what I identified as my key learning from the care home (Chapter 6 – D-DRINC study A). I used inductive reflexive thematic analysis to categorise the data using a bottom-up approach from site-user comments posted on the forum, to generate themes which framed how people living with dementia drink in long-term care settings, whilst also acknowledging the process of how I reflected on the data and theme generation(301). Inductive reflexive thematic analysis was appropriate for use, together with the social constructionist approach applied within this study, because it enabled not only inductively categorising data, but also to use my own ongoing experiences and positioning to interpret the data by showing how I played an active role in data analysis(302). Braun and Clarke (2021) argue that a ‘quality’ analysis does not require a research team, but rather it is constructed by the researcher iteratively engaging with the data and reflecting on their positioning and their approach to the analysis(302) which aligns with a constructionist approach.

I firstly familiarised myself with the dataset by reading through the dataset in NVivo(312). Forum posts included information relating to anything the user wished to post onto the forum and thus sometimes only a sentence or a few words from the textual dataset related to drinking. I read through the dataset again, this time making notes about any initial thoughts or notions which might be influencing or relating to drinking; either those which were commonly recurring or seemed pertinent to drinking or drinks provision. Whilst reading through, I began inductively coding parts of the text which related to drinking, remaining close to the words used in the original text, as I did not want to apply my own meaning to the text. Examples of these codes were “checks fluid chart”, “admitted to hospital for IV fluids” or “speaks up for resident”.

As I re-read the text, I began to generate themes and categorise recurring codes. Examples of these early themes were “spirituality of drinking”, “resident communication ability” and “trial and error of hydration approaches”. I continued this process, constantly referring back to my research question to assess relevance of the codes and themes relating to drinking. I read through my dataset again, iteratively generating higher-level themes and categorising the initial themes. I used a constant comparative method to assess how well new data fitted into the higher-level themes, generating new themes if necessary or reassessing and refining the theme altogether. I referred back to my original reflections, to assess how they related to these themes and to check whether these had helped frame the data as sitting within the themes. After reviewing the dataset for a final time, to assess how well the themes reflected the data I had analysed, I eventually identified six higher-level themes encompassing 16 lower-level themes. No examples of analysis are provided in the appendices for this study because any excerpts of data could potentially identify online users.

Discourse analysis

I conducted a discourse analysis of a subset of written posts from the online forum to examine how drinking is framed within discourse on the site. Once I generated themes using inductive reflexive thematic analysis(301), I conducted discourse analysis of one theme: ‘*Prioritisation of food, over drink’.* The D-DRINC Study A data analysis also generated this theme which I had not expected to find but helped to identify participants’ practices and reasons for not drinking or for encouraging drinking. This suggested a need to examine how this theme may have been reproduced in other discourses used by people involved with caring for older people and what such discourses are used to do. Discourse analysis enables researchers to see how people use discourse to do something(310). Public discussion forums are a form of digitally-mediated text in which users have a “dialogic character” to respond in a conversational style to other users’ posts, and responses are adapted to the previous post(313). In discourse analysis, beside the focus on the structure and meaning of the text, there is focus on how forum users can use text to perform linked social actions(313). I specifically attended to the words users used to describe drinks and drinking-related actions in the written text and how these drinking words were positioned in the context of the wider text, specifically focusing on how they positioned drinking in relation to food and eating. As this was not a Conversation Analysis, I did not attend to or specifically reproduce grammatical or punctuational details as part of this process of analysis(310).

Conducting the discourse analysis

I purposively sampled several posts which related to the theme '*Prioritisation of food, over drink'* that I generated from the thematic analysis. Discourse analysis is suited to interrogating small sections of text, rather than large amounts of text and would enable me to generate meaning from the textual data.

I copied and pasted the subset of forum posts into a Word document(311). I examined each post individually, only attending to the sentences which referred to a drinking activity/action. I firstly attended to any instances of written text which related to drinking. I listed the words used to describe any drinking related actions within the Word document(311). This allowed me to pay close attention to how drinking is framed in relation to other phenomena and the context of its discussion within the written text. I then described in detail what discourse forum users employ to write about drinking, paying close attention to the words used, the actions relating to the drinking activity and how food and eating might be framed differently to drinking. I shared my initial analysis with my supervisor who has expertise in discourse analysis (FP) to ensure I had attended to the data as acutely as possible. Once I had analysed the text in this way, I wrote an analytical commentary summarising what I learned from the discourse of each post.

4.7 Methods used to triangulate and integrate the findings

In a convergent design, findings from the quantitative and qualitative datasets are brought together and compared, to generate a more comprehensive perspective of the research problem(314). Findings from the qualitative D-DRINC study datasets(263) were firstly merged. Different data collection methods were used within D-DRINC study A and B to answer the same research question. The methodological triangulation of the findings generated from two qualitative sets enables the researcher to generate a deeper and richer understanding of the research topic(261). The themes from each dataset were tabulated. Convergence of themes generated from the qualitative datasets were examined and any divergence of themes were explored further to generate explanation for such divergence within the context of each qualitative study(314).

Once findings from both qualitative datasets were merged, the merged qualitative findings were then integrated with the systematic review and meta-analysis findings. Findings were integrated through visual means, also known as integrating through joint displays(263), to demonstrate how the qualitative findings potentially fit with the quantitative findings. Whilst findings can be integrated narratively or via data transformation, the visual display method was most appropriate for this study, because it shows how new insights have been generated from this research beyond the findings of each individual study(314). Once findings were integrated through joint displays using Canva(315), an ‘assessment of fit’ was conducted, or an interpretation of how well the mixed methods research addressed the research questions(314). The final stage of interpreting mixed-methods research using convergent designs, is the meta-inference(314). A meta-inference provides an overall conclusion of what the mixed methods research has found and how far it goes to answer the research questions.

4.8 Ethical issues and challenges encountered in this thesis

4.8.1 Systematic review and meta-analysis ethical issues

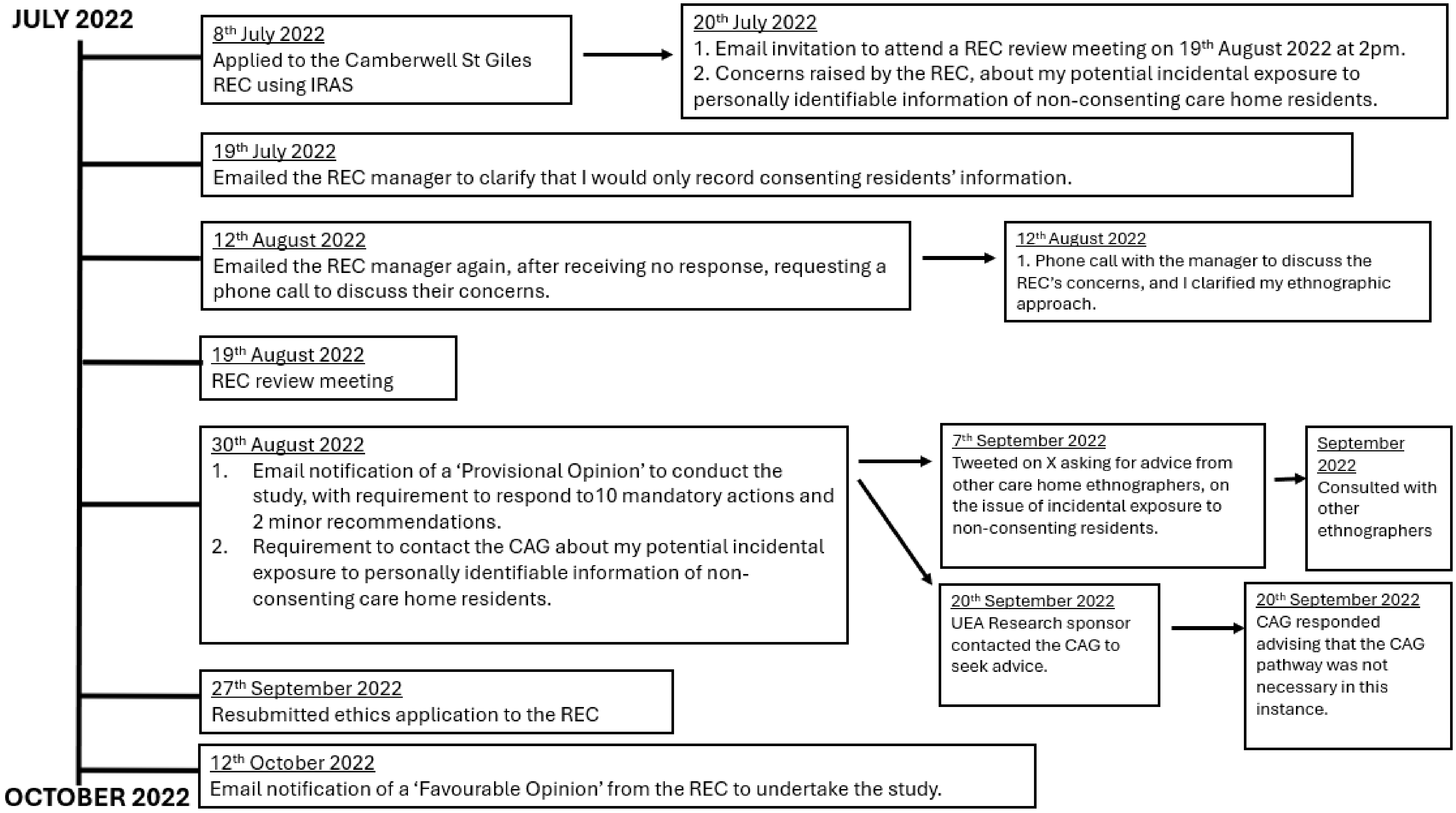
Ethical approval was not required for the systematic review and meta-analysis, due to systematic reviews collating anonymised data from individual studies already in the public domain, where consent processes and ethical approvals had already been sought, and ethical research processes followed.

4.8.2 Ethnographic case study ethical issues

I adhered to the Helsinki Ethics principles when conducting this study(316), ensuring I minimised any harm to participants, ensured the privacy and confidentiality of participants, ensured that participants were fully informed of study processes before they consented to participation and I developed and adhered to the study protocol which was reviewed and approved by a flagged NHS REC. Ethical guidelines serve a useful and important framework for considering how to conduct ethical research practices and rightly protect participants from harm, but there is question as to the appropriateness of some rigid and positivist ethical frameworks for ethnographic research involving people living with dementia in care homes(317). I encountered many situations during the ethnography which I had not anticipated and instead found I had to make ‘in-the-moment’ ethical decisions. Backhouse and Daly (2021) discussed some of the contentions and contradictions between the ethical principles required by ethics committees compared to the realities of care home fieldwork(318). In this next section, I outline the steps to my seeking ethical approval for this study.

<u>The process of seeking ethical approval from the Research Ethics Committee</u>

I applied to a ‘flagged’ NHS REC for qualitative research and research involving adult participants who may lack mental capacity to provide informed consent, using the Integrated Research Application System (IRAS) (Ref**:**22/LO/0551) on 8th July 2022 to seek ethical approval for D-DRINC study A (Figure 4.5) and D-DRINC study B.



8th July 2022
Applied to the Camberwell St Giles REC using IRAS

20th July 2022
1. Email invitation to attend a REC review meeting on 19th August 2022 at 2pm.
2. Concerns raised by the REC, about my potential incidental exposure to personally identifiable information of non-consenting care home residents.

19th July 2022
Emailed the REC manager to clarify that I would only record consenting residents' information.

12th August 2022
Emailed the REC manager again, after receiving no response, requesting a phone call to discuss their concerns.

12th August 2022
1. Phone call with the manager to discuss the REC's concerns, and I clarified my ethnographic approach.

19th August 2022
REC review meeting

30th August 2022
1. Email notification of a 'Provisional Opinion' to conduct the study, with requirement to respond to10 mandatory actions and 2 minor recommendations.
2. Requirement to contact the CAG about my potential incidental exposure to personally identifiable information of non-consenting care home residents.

7th September 2022
Tweeted on X asking for advice from other care home ethnographers, on the issue of incidental exposure to non-consenting residents.

September 2022
Consulted with other ethnographers

20th September 2022
UEA Research sponsor contacted the CAG to seek advice.

20th September 2022
CAG responded advising that the CAG pathway was not necessary in this instance.

27th September 2022
Resubmitted ethics application to the REC

12th October 2022
Email notification of a 'Favourable Opinion' from the REC to undertake the study.

FIGURE 4.5: FLOWCHART SHOWING THE STEPS INVOLVED IN SEEKING ETHICAL APPROVAL TO CONDUCT THE D-DRINC STUDY.

After submission, the REC raised concerns that the ethnographic study would require approval from the Confidentiality Advisory Group (CAG) due to my potential incidental exposure to personally identifiable information of non-consenting residents. To my knowledge, other ethnographers had not required CAG approval to conduct ethnographies in care homes and it was unlikely that I would have any access to any resident identifiable information apart from first names. Figure 4.5 depicts my interactions with the REC where I attempted to reassure them of how the observations would not include non-consenting people, nor would any data be collected pertaining to those residents. I explained that the proposed approach to conducting observations is central to being an ethnographic researcher and that I would already be privy to information from non-consenting people during my ‘hanging out period’ when I would not collect data. I was keen to avoid seeking CAG approval as I knew it was not necessary or appropriate to this study design. It is well documented that the formal processes of a REC review are not always well aligned with the flexibility required of an ethnography(319).

The REC meeting involved members asking many questions, including clarifying details of proposed processes, personal data handling or reasons for my not specifying participant numbers for qualitative research. Most discussion centred on issues of conducting ethnography in a care home and applying the Mental Capacity Act (2005)(320). The REC asked me to clarify how I would not collect data from non-consenting people. In addition to previously proposed mitigations, I suggested that I could places posters around the care home with the care home manager’s agreement, to inform all social actors of my observations each day. The REC granted me a ‘provisional opinion’ to conduct the research, requiring me to respond to 10 mandatory actions and two minor recommendations (Appendix 4c for REC communication), one of which related to me seeking CAG approval. By way of mitigating the potential incidental exposure to non-consenting people, the REC suggested that I could reserve certain areas of the care home specifically for consenting people, whilst other areas of the care home would be reserved for residents and staff not involved in the study. Observing everyday life unfold in natural settings is pertinent to ethnography and so the proposed approach from the REC would likely cause disruption to the care home routines and not represent a usual situation in which to conduct ethnographic work aiming to describe how systems work. I consequently contacted a number of other ethnographers to seek their insights for responding to the REC (Figure 4.5). As a result of these discussions with ethnographers, I decided that I would wear a yellow name badge to identify that I was a researcher and notify and seek permission from any person in the room that I enter to remain observing in the room. I had already proposed all other mitigations which other ethnographers had recommended within my study protocol. The full response to the REC is in Appendix 4d. After resubmitting to the REC, I received a favourable opinion to begin the research on 12th October 2022.

I formally met with the care home manager on 19th October to initiate the study. The manager agreed to remind all staff not to discuss non-participant residents’ information in my presence, by way of minimising my potential incidental exposure to non-participants’ personal information. The manager would inform all residents, staff and residents’ families of the study by sharing the ‘short study summary’ (Appendix 4b) flyer with them. I attended family and residents’ meetings to discuss the study and answer any questions. The care home group’s regional manager attended both meetings. I met with the regional manager to answer any questions they had about the study and the site agreement was later completed by UEA and the regional manager on 22nd November 2022, enabling me to begin data collection.

Confidentiality

As per my protocol, I did not record any information relating to non-participants within my fieldnotes. My fieldnotes were anonymised and I used pseudonyms to refer to participants. My fieldnotes were securely stored within a locked filing cabinet in a researcher office at UEA and electronically on the secure UEA OneDrive.

Anonymity

I anonymised participant names and referred to the ethnographic context as “the care home”, rather than reporting the home’s name to ensure anonymity and confidentiality of the home and all social actors. I did not report any other information which could potentially identify the care home such as names of routines or practices which may be unique to that specific care home. I chose not to describe the location or grounds of the care home so as to avoid potentially identifying it. These processes protect the anonymity of participants within the care home and the reputation of the care home involved in research, as reported by other care homes ethnographers(241, 321).

Process of seeking informed consent

I assumed all potential participants to have mental capacity(322) to provide their own informed consent for purposes of participating in this study. I discussed the study to all potential participants when I handed them information sheets, allowing a minimum of 48 hours between giving potential participants information sheets (Appendix 4e and 4f) and consenting them into the study, which the REC requested. The timeframe was longer than 48 hours in reality due to the shifts of individual staff who had expressed interest in participating and my observation periods sometimes conflicting, which meant that it was sometimes several days before I saw the same staff member again.

Staff

I initially employed convenience sampling to recruit any participants into the study. As more staff members consented to take part in the study via convenience sampling, I began to purposively sample staff to seek maximum variation across different job roles, gender, ethnicity, age and day/night staff. I collected this data using a short ‘participant demographic’ form after gaining initial informed consent (Appendix 4g). All staff completed the paper consent forms, instead of the digital forms, and handed the forms to me in-person.

Residents

During my time in the home, I spoke to and identified some residents who regularly attended communal areas and potentially had dementia. I gave each potentially eligible resident an information sheet and spoke to them about the study on more than one occasion. In applying the Mental Capacity Act (2005)(322), I assessed each of these residents as either not retaining the study information or not understanding what the study would involve, despite me explaining it in different ways using both information sheets (Appendix 4e and 4f) and thus I assessed each resident who participated in this study as not having mental capacity to provide informed consent. Initially I stated in my protocol that I would record residents’ mental capacity using a ‘capacity assessment form’ but during the REC review of the study, the REC advised against this practice and advocated for process consent instead. I discussed any potential resident participant with the care home manager, who advised me whether or not they thought the residents were eligible to participate in the study based on diagnosis or availability of personal consultees. I therefore involved personal consultees to recruit residents into the study. The care home manager liaised with relatives on my behalf and shared information sheets (Appendix 4h) with interested family members. If the personal consultees agreed to their relative’s participation and after having the opportunity to ask any questions, they returned the completed personal consultee declaration forms (Appendix 4i) into the pre-stamped envelopes, addressed to me at the care home’s address. Copies of these forms remained on residents’ files.

I applied process consent throughout the study by checking that any social actor in the home was content with my presence in the communal spaces when I was conducting observations. I reiterated to participants their right to withdraw from taking part in observations and the study and paid attention to body language of participants to gauge whether they were comfortable with my presence and their continued participation.

4.8.3 Ethical issues arising in the online forum analysis

In this section I discuss how I considered and addressed the ethical issues pertaining to sourcing and analysing forum data in D-DRINC study B.

Private vs public space

The 'Dementia Talking Point' forum(303) is an online forum which anyone can publicly view. Users must register on the site to become a member and contribute posts to the site. When an individual registers with the 'Dementia Talking Point' forum(303), they are required to agree to the terms and conditions of the site, one of which states the following: "*Alzheimer's Society may grant permission for your data to be used for academic research purposes. This data is anonymised before analysis takes place.*" Terms and Rules | Dementia Support Forum (alzheimers.org.uk). I consequently took the view that the data on the 'Dementia Talking Point' forum was publicly available and that users had been provided with the opportunity to be informed about the use of their data(303).

Informed consent

I decided to not attempt obtaining informed consent from any user that I used data from, because I had no intention of interacting with forum users, the forum data was publicly available, and the terms and conditions of the site allowed research activity. I sought permission from the 'Dementia Talking Point' forum(303) to use the site for research purposes (Appendix 4j) reiterating that I would anonymise all posts and would not publish any literal quotes from the site. This decision concurred with the BPS' ethical guidance for conducting online forum research(323) and decisions made by other Dementia Talking Point forum researchers(324).

Ethical and site approval

Along with seeking approval from the ‘Dementia Talking Point’ research team to use their site for research purposes(303), I received a favourable ethical opinion from an NHS REC to conduct this research (Ref:22/LO/0551).

Theoretical framework

I applied a social constructionist approach(292) to this study to examine how online users construct their written contributions to the forum, relating to how people living with dementia drink fluids in long-term care settings.

Anonymity

In line with BPS guidance(323) and to respect the privacy and anonymity of online users and prevent ‘digital trespassing’(325), I decided not to report any literal quotes from the online forum to prevent traceability. The ‘Dementia Talking Point’ forum(303) states in its terms and conditions that researchers must anonymise any forum data. I did not report quotes verbatim from the site and instead generated general themes and paraphrased quotes to prevent traceability of posts. I changed keywords of quotes with words sharing the same semantics to retain the relevant meaning. I changed all references of someone living in a care home to “resident” and changed pronouns to “they/them” to further protect anonymity of users. In some instances, I removed or added in extra filler words to the quote. I searched parts of each new ‘paraphrased’ quote, as well as the full quote, within the forum to check it never retrieved the original post. I continued revising paraphrased quotes until original posts could no longer be traced, but the meaning and key semantics of the quote were retained.

Safeguarding protocol

I wrote into my study protocol that I would report any concerning posts to the ‘Dementia Talking Point’ Forum moderation team(303). During the study, I read three concerning posts. One of these posts described how an informal caregiver had assaulted someone living with dementia, but on this occasion, the forum moderator had already intervened and replied to this forum user and so I did not report this. I reported two concerning posts which I had read on the site to the forum moderation team, one of which described a caregiver expressing their desire to end the person living with dementia’s life and another post described a caregiver assaulting the person living with dementia they cared for. It struck me how ‘open’ online users felt they could be with an anonymous identity online but also that they sought support from online users instead of more formal services, such as social services or third-sector organisations. It highlighted to me the complexities of people's caring situations, as well as how vulnerable some people living with dementia might be within those caring situations.

Role of researcher using the forum

Although I perceived the 'Dementia Talking Point' forum as a 'public' site(303), because the data was publicly available to non-members, I made the decision to use the 'passive/unobtrusive' approach(305) whereby I remained a passive observer of the site and did not interact with the online community in any way.

4.9 What practical challenges did I face and how did I resolve them?

The systematic review size and eligible dehydration measures

The first challenge I encountered was deciding which dehydration measures should be included within the systematic review. I did not previously know about low-intake dehydration amongst older people and so I researched which measures were used to assess dehydration in older people from the literature when developing the review protocol. This led to my inclusion of BUN:Creatinine as a dehydration measure. The systematic review initially included studies from any care setting. However, after the initial title and abstract screening stage of the review, it was apparent that the review was too large for the time I had to complete the review within my PhD. I therefore made a pragmatic decision, after discussions with my supervisors, to exclude BUN:Creatinine studies as this is a diagnostically inaccurate dehydration measure for older adults(96) and also excluded hospital studies to create a separate hospital prevalence systematic review instead.

Inability to be detached from ethnographic observations

I found the ethnography emotionally challenging to conduct and was unable to remain 'detached' from observations. I had intended to adopt a 'detached observer' position(289) to conduct the ethnography because I wanted to influence the social world and data generation as little as possible. I specifically intended to remain separate from drinking-related activities, such as during tea trolley times, or when residents were drinking, while observing and writing notes using a notepad and pen. As I became familiar with the setting and my responses to my fieldwork, I soon learned that it would not be feasible for me to be a ‘detached observer’ within this ethnography for several reasons(289). I was unable to remain emotionally detached from what I observed. I felt upset, emotional, annoyed, stressed, anxious and often helpless while conducting the observations. I had not anticipated that observing drinking-related activities could affect me so much. I had not expected that I would often be the only non-resident sitting in the communal areas for extended periods of time. Unless it was a mealtime, staff often swiftly entered and left rooms. This led to many residents asking me to help them or get them a drink during my time observing. It also led to me to intervening in resident care on several occasions. These incidents could relate to where a resident had accidentally spilled their full beaker over their clothes and appeared upset by it and so I walked over to reassure them, but also to check that they were not hurt by a hot drink. Another incident related to when a resident had slid out of their wheelchair, and I paused observations to seek staff to assist with getting the resident sat back into their chair. On another occasion, a resident who was dependent on walking aids, tried walking independently as they could not reach their walking aids, and it looked as though they were likely to fall and so I paused observations to seek staff to assist with the resident to prevent them from falling. I could also see that over time I had become a ‘drinking prompt’ for some staff. Of course, I cannot infer intention from social actors, but it seemed to me that when some staff entered a room and saw me in the room, they sometimes checked drinks of residents or expressed the importance of drinking to residents. Unless I intended to deceive the participants about what I was researching, this was unavoidable and therefore highlights how I could not be a ‘detached observer’ in this ethnography(289).

4.10 The researcher’s positionality

4.10.1 Care experience

I have worked in the field of dementia care research for over ten years and also have experience of working in social care. I worked in the NHS as a Research Fellow on studies and clinical trials for people living with Huntington’s disease and during my undergraduate psychology degree, I worked on a zero-hour contract as a care worker in a residential care home for older people and a residential care facility for people with complex learning disabilities. I received minimal training from the care home, but I recall the training prioritising manual handling. At the care facility for people living with learning disabilities, I received more training into manual handling, British Sign Language, behaviour and safeguarding. I received no hydration or nutrition training from either workplace, and I did not know the importance of good hydration, despite being required to prepare family-style meals and drinks to residents as part of my daily duties and completing food and fluid logs.

4.10.2 Insider/outsider status for the ethnographic case study (D-DRINC Study A)

I, perhaps naively, expected to have some ‘insider’ status when I conducted the study in the care home. An insider is a researcher who has some shared experiences or characteristics with the study population(326). I had previously visited care homes on many occasions to conduct assessments with people living with advanced Huntington’s disease. In my personal life I had visited loved ones living in care homes. I care about people, and I care about people receiving good health and social care. In all of my previous roles I had been able to ‘play my part’ to improve the care for someone, whether I referred them to the psychiatrist for a medication review or directly provided quality and compassionate care to them. I am sociable and friendly and thought that I would find it easy to get along with the care home staff, expecting them to respond positively to me being in the home. However, this was not always the case during this study.

I was most definitely treated as an ‘outsider’ for the duration of the study. Researchers tend to agree now that this duality of definition insider/outsider is too simplistic(326). Despite my having had care work experience, it was made clear that staff always perceived me as an outsider coming in from elsewhere. Other researchers have shared their experiences of researching with a population of whom they share experiences or characteristics(318, 319, 326, 327) and how this limited the access they anticipated to have to the social world they were exploring and the relationships they expected to build with the social actors, potentially shaping the data they were able to generate. During the study, I frequently reflected on my outsider status in the home. Staff made comments to me throughout my time in the home emphasising my non-permanence, such as *‘I thought you’d be done by now’*, or *‘oh, you’ve come back’*. The care home manager invited me to access the home via the visitors’ entrance instead of the staff entrance, further enforcing my ‘outsider’ status. I did not attend staff handovers and my limited access to some spaces in the home, as I described earlier, led me to only be able to generate data as an outsider. Reporting on my reflexivity and making my positioning transparent is crucial for understanding the context of the findings I generated in this thesis.

4.11 Conclusion

This chapter presented and justified the mixed methods approach to the thesis. The methods of the systematic review, ethnographic case study and online forum analysis studies were described and discussed in turn. The ethical challenges were presented and ethical decision making described and justified. Practical challenges encountered as part of this thesis and the researcher’s positionality were lastly discussed. The next chapter provides the rationale for the systematic review and presents the findings and discussion.

5. Systematic review and meta-analysis

5.1 Aim and outline of chapter

This chapter presents a systematic review and meta-analysis which estimated the prevalence of low-intake dehydration amongst non-hospitalised older people globally. The chapter presents the existing literature and rationale for conducting the systematic review, the results and an interpretation and discussion of the findings. The chapter also presents a discussion of the methodological challenges faced whilst conducting the systematic review and meta-analysis and makes recommendations for guidance to be developed specifically for conducting prevalence systematic reviews. Methods are reported in section 4.4.

The systematic review and meta-analysis, tables and figures presented in this chapter were published in Clinical Nutrition in July 2023(54)(Appendix 5a).

5.2 Background

5.2.1 Why is prevalence data useful?

Prevalence is the proportion of a population affected by a health problem(260). This data can inform our understanding of a health condition as well as what types of people may be affected by this condition or health problem(260). Prevalence data can therefore inform interventions to improve the health condition within a population, inform policy, underpin health economic analyses which estimate the cost of the health condition to wider society and inform evidence-based practice(260). Many cross-sectional, cohort and experimental studies have reported the proportion of older people dehydrated within their participant samples(2, 29). Whilst it may be useful to know how many people are affected by a condition within a single study's participant sample, there are many varying factors which may impact the prevalence across a population, such as participant characteristics, participants' health, settings where participants are recruited from and how the condition is assessed(2, 96). The prevalence of a health condition is likely to vary between participant samples across studies(328). To assess the prevalence of low-intake dehydration in a subgroup of a population, or across a wider population such as older people, it is necessary to combine prevalences from all individual studies and calculate an overall prevalence(273) which can then more reliably inform policy, evidence-based practice and interventions.

5.2.2 Why conduct a systematic review and meta-analysis for this study?

Systematic reviews intend to robustly summarise high quality and relevant studies reporting the prevalence of a health condition(266), such as low-intake dehydration, affecting different participant samples of the same population. A systematic review aims to identify and minimise the impact of different types of bias which might present in a single study, for example sampling bias, publication bias and/or reporting bias(266). A meta-analysis quantitatively synthesises the prevalences of individual studies and usually only includes those at lower risk of bias, to estimate the prevalence of dehydration in the wider population(266) to provide more robust data. To date, a global prevalence of low-intake dehydration amongst older people using robust measures, has not been reported in the literature. Robust measures of dehydration are required to accurately assess dehydration in older people because common signs and symptoms of dehydration do not accurately assess dehydration in older adults(96, 106). If dehydration is not accurately assessed in older people, an accurate prevalence of dehydration cannot be calculated for this population. Data from studies using robust measures of dehydration require synthesis using systematic review methodology to estimate the prevalence of low-intake dehydration, to identify how many older people are dehydrated globally.

5.2.3 Measures used to assess low-intake dehydration in older people

As discussed previously in Chapter Two, dehydration is assessed using various methods for research purposes and in clinical practice in older people(96). Despite research evidence indicating lack of diagnostic utility, researchers, health and social care professionals continue to assess older peoples' hydration status by skin turgor, urine colour, and/or check for sunken eyes, as well as other clinical signs and symptoms of dehydration(4, 96). This practice continues because research findings often take years to be accepted and incorporated into clinical practice(4, 106). Across both health and social care settings, staff record the oral fluid intake of older people, which can be used to gauge whether someone is meeting their recommended daily fluid intake or not(2). However, well-known issues with fluid intake charts include staff recording the charts inaccurately or incompletely(2, 98). Persistent inadequate oral fluid intake leads to low-intake dehydration(5). Despite researchers and health and social care staff using various measures to assess dehydration, only directly-measured serum or plasma osmolality can accurately assess low-intake dehydration in older people(2). There is expert consensus and strong research evidence that the Khajuria and Krahn equation of calculated serum or plasma osmolarity accurately predicts directly-measured serum or plasma osmolality and is recommended as an acceptable measure of dehydration in older people(2, 95). It is therefore important that dehydration is assessed using accurate measures, to ensure that reliable prevalences of dehydration can be calculated.

5.2.4 Eligible dehydration measures for the review

Directly-measured serum or plasma osmolality was included within this review as the reference standard for assessing dehydration in older people(2) and the recommended cut-off indicating dehydration (>300mOsm/kg) was used within this review. A limitation of including studies using serum or plasma osmolality is that it is an expensive, resource-intensive and invasive measure and thus is unlikely to be routinely conducted across all health and social care settings globally(95), limiting which types of studies may be included, from which settings.

Calculated serum or plasma osmolarity was included within this review as a predictor of directly measured serum or plasma osmolality(95). Calculated serum or plasma osmolarity is a more cost-effective measure for assessing low-intake dehydration, compared to directly-measured serum or plasma osmolality, because it uses components from routine blood tests, which can be processed by any laboratory(95). Whilst a number of equations are used to calculate serum or plasma osmolarity, the Khajuria and Krahn osmolarity equation is reported to predict directly measured serum/plasma osmolality most accurately, in older people(95).

Saliva osmolality was included as a measure within this review as some research studies have reported that it shows promising utility and moderate accuracy in assessing dehydration in older people(48, 103). Salivary measures are less invasive and more accessible than blood measures, but are not frequently used in clinical practice as the technology is underdeveloped and factors such as recent food and fluid intake and medication usage may impair its diagnostic accuracy(103).

Though not a useful measure of dehydration, oral fluid intake was included as a measure within this systematic review because many health and social care settings record oral fluid intake as part of everyday routines(58, 98) and this review aimed to collect data from various settings and different countries(89). EFSA recommends that women consume 1.6L and men consume 2L of fluids a day(85), whilst the NHS recommend that adults consume between 1.5-2L or 6-8 cups of fluids a day(89). The lower limit of 1.5L was used as the cut-off within this systematic review to capture both guidelines. Within the systematic review, subgroup analyses were planned to investigate any differences between the prevalence of insufficient oral fluid intake and prevalence of low-intake dehydration using a robust measure.

Creatinine-based measures are routinely used to assess dehydration in the older adult population in clinical practice(96) and thus BUN:Creatinine ratio was initially included as a measure within the review. This measure assesses the ratio of blood urea nitrogen to creatinine and usually has a cut-off of >20 to assess dehydration(329). However, creatinine-based measures do not accurately assess dehydration in older adults, particularly those with impaired renal function, which is common in this population(14) and so subgroup analyses were planned to investigate any heterogeneity between measures.

The systematic review included the following measures of dehydration in order of robustness: directly-measured serum or plasma osmolality was the most robust measure, then calculated serum or plasma osmolarity, then saliva osmolality, then 24-hour oral fluid intake and then BUN: Creatinine ratio was the least robust measure.

5.2.5 Personal characteristics which may affect prevalence of dehydration

As discussed in Chapter Two, there are several long-term health conditions reported to be associated with low-intake dehydration, such as diabetes, renal impairment and cognitive impairment(14, 35). Therefore, it was necessary for this systematic review to investigate any differences in dehydration prevalence among older adults diagnosed with renal impairment, cognitive impairment and/or diabetes in sub-group analyses.

Whilst it is known that older adults are more likely to be dehydrated than younger adults due to physiological changes with ageing(4), it is not known if the risk of dehydration increases with age within the older adult population. Studies have previously reported that age did not predict dehydration in their samples of care home residents(14, 35) but it is not known whether dehydration prevalence varies by age in the wider older adult population.

Dehydration prevalence is associated with being dependent on others to have everyday needs met, such as personal care(5, 56, 120, 136). People who require support with everyday needs may require extra support and assistance with their hydration needs. If someone is unable to receive support with their hydration needs, they will be less likely to consume adequate fluids, increasing their risk of dehydration. A systematic review should investigate differences in dehydration prevalence between older people with different functional abilities.

There is no strong evidence that dehydration prevalence is affected by sex or gender when dehydration is assessed using directly measured serum osmolality(12, 14, 35). The benefit of a systematic review is that once evidence has been synthesised, any sex differences in dehydration prevalence may be investigated using subgroup analyses.

5.2.6 Dehydration prevalence across settings

Some older adults may remain in their own homes and receive care from a relative or via homecare whilst other older adults may move into long-term care settings to receive 24-hour care and/or supervision(217). Some older adults may be admitted to hospital for planned medical intervention or emergency treatment. Studies reported in the literature suggest that dehydration is prevalent across all settings(12, 14, 29, 112, 118, 330). A systematic review of 19 studies in care home settings, using various measures to assess dehydration, reported that dehydration prevalence ranged from 0.8-38.5%(29) but they did not conduct a meta-analysis due to heterogeneity. Although it is known that dehydration is prevalent in older people across all settings, a robust systematic review is needed to synthesise all relevant studies and conduct subgroup analyses to identify if there are any differences in the prevalence of dehydration between care settings.

5.3 Rationale for this systematic review

A systematic review and meta-analysis is required to use robust and accurate measures of dehydration to establish the prevalence of low-intake dehydration in older adults. A reliable dehydration prevalence would inform public awareness and policy related to improving health and hydration in older people. Accurate prevalence for specific subgroups of older adults would enable evidence-based interventions and practice targeted to the groups of older people most at risk of dehydration.

5.4 Methods

A systematic review and meta-analysis was conducted, following JBI guidance for prevalence reviews(267) and the Cochrane Handbook for systematic reviews(266). Detailed methods are reported in Chapter Four (Section 4.4.1).

5.5 Results

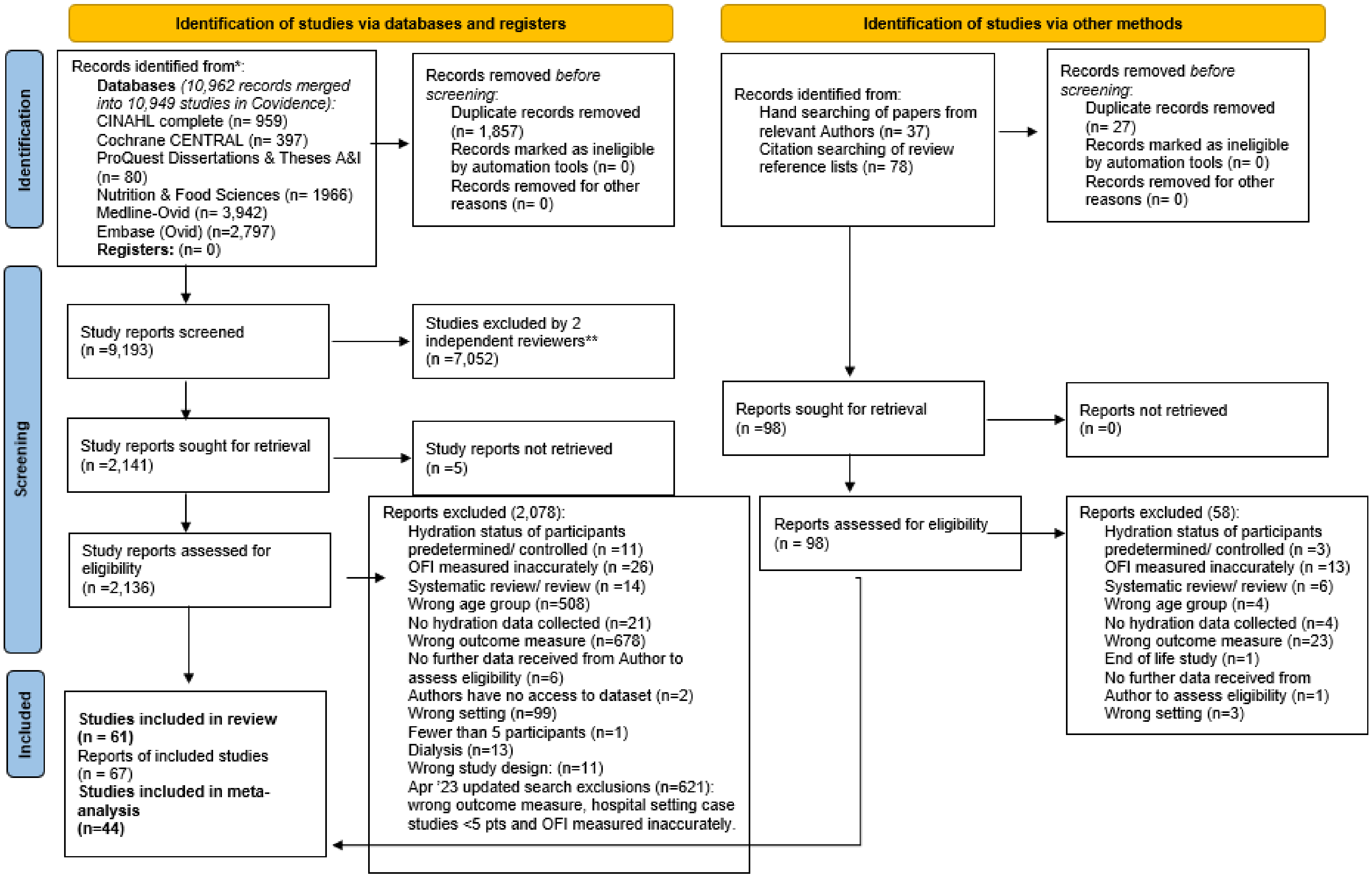
5.5.1 Searches

Searches resulted in 10,962 citations, with an additional 78 citations from reviewing review reference lists and 37 citations from hand searching papers by key authors. Automatic de-duplication in Covidence(265) removed 1,857 citations and 9,193 title and abstracts were screened, which led to 2,141 citations being assessed as potentially eligible for inclusion. Full texts of five citations were unable to be sourced and so 2,136 full texts were screened for inclusion within the review.

Throughout the screening process, large cohort studies which could potentially have records of eligible data for this review were recorded within an Excel spreadsheet. The original datasets were sought from study websites and authors of 105 cohort studies. Of these 105 cohort studies, only four collected eligible data for this review, but no response was received from authors of The Spanish ANIBES study. Raw data was received from the Irish National Adult Nutrition Survey(224), the American NHANES data(112) and the European NUAGE data(95).

Sixty-seven reports were assessed as being eligible for inclusion within the review, which merged into 61 studies (Figure 5.1 for PRISMA flow chart below).

FIGURE 5.1:PRISMA FLOW DIAGRAM



5.5.2 Characteristics of included studies within the systematic review

The characteristics of all 61 included studies are detailed in Appendix 5b. In summary, 25 of the included studies reported directly-measured serum or plasma osmolality (2,955 participants; 60.3% females (14, 23, 34, 35, 40, 43-46, 50, 94, 173, 331-348), and 21 of these studies were eligible to be included within the meta-analysis. Six of the included studies reported calculated serum or plasma osmolarity (3,891 participants) of which all six were included within the meta-analysis. Twenty-five of the included studies reported oral fluid intake (15,232 participants), of which 17 were eligible for meta-analysis) and one study reported salivary osmolality (53 participants) but was not included in the meta-analysis. Of the 61 included studies, 30 were assessed as being at low risk of bias. Of the 29 included studies reporting directly-measured serum or plasma osmolality, 15 were assessed as being at low risk of bias, and 14 as high risk of bias (Appendix 5c). From here onwards, the characteristics of included studies are only reported for directly-measured serum or plasma osmolality as that was the most robust measure of the meta-analysis from which the prevalence findings are reported.

The 29 included studies reporting directly-measured serum or plasma osmolality (Table 5.1) were from a total of 12 countries: Australia, Italy, France, Japan, Netherlands, Poland, Republic of Ireland, Sweden, Taiwan, Thailand, United Kingdom, United States of America. Twenty of the studies(23, 40, 43-46, 94, 331-335, 337-339, 342-346, 348) reported serum or plasma osmolality data for community-dwelling older people (mean age range: 67-82 years) and nine studies(14, 34, 35, 173, 336, 340, 341, 347) reported data of older people living in long-term care settings (mean age range: 75-88 years). The prevalence of cognitive impairment was reported in eight studies(14, 34, 35, 45, 331, 341, 347) but this was not reported in 18 studies(23, 50, 173, 332, 334-340, 342-346, 348). The prevalence of renal impairment was reported in eleven of these studies(14, 34, 40, 44-46, 337, 342) but not reported in 12 studies(44, 50, 331, 333, 334, 337-339, 341, 342, 346, 349). The prevalence of diabetes was reported in eight studies(14, 23, 34, 35, 40, 45, 335, 340) but not reported in 18 studies(44, 173, 331-334, 336-338, 341-348). Nine studies of the 25 studies reporting serum or plasma osmolality specifically excluded participants who had cognitive impairment, and/or renal impairment, and/or diabetes from participating in their studies(23, 43, 44, 46, 50, 332, 339, 347, 348).

Participants were reported to have a range of functional dependency abilities in six of the studies, and thus were labelled as having ‘mixed functional dependency’ for the purpose of this review(14, 23, 34, 35, 50, 347) as participants could not be separated by dependency level. In fourteen of the studies all participants were described to be functionally independent(43-46, 332, 334, 337, 338, 342-346, 348). However, the functional dependency of participants was either unclear or not reported in seven of the studies. Although some authors reported functional dependency using assessment scales such as the Barthel Index or the Dependency in Activities of Daily Living from the Minimum Dataset (MDS-ADL), most authors did not report the method of assessing functional dependency in their participants.

TABLE 5.1: BRIEF CHARACTERISTICS OF INCLUDED STUDIES REPORTING DIRECTLY-MEASURED SERUM OR PLASMA OSMOLALITY

Author	**Setting**	**Country**	**Sample size**	**Study Design**	**Mean Age**	**Health Conditions**	**Mean Osmolality**
*Albert et al. (1989) **(331)**	Community	United States	18	Non-randomised experimental study	Control gp: 65 (SD 2) years Experimental gp: 68 (SD 3) years.	Cognitive impairment 50%	Experimental gp: 313 mOsmol/kg (SEM 4) Control gp: 300 mOsmol/kg (SEM 3)
Bossingham et al. (2005)* **(332)**	Community	United States	21	3-arm crossover non-randomised intervention study	Men: 72 years (SD 4) Women: 75 years (SD 4)	None	Men: 291 mOsm/kg (SD 12) Women: 291 mOsm/kg (SD 4)
Crowe et al. (1987) **(43)**	Community	United Kingdom	6	Cross-sectional	72 years	None	285 mOsm/kg
Engelheart et al. (2021) **(333)**	Community	Sweden	56	Cohort study	Home health care sample (n=69): 82 years	Cognitive impairment	299 mOsmol/kg
Farrell et al. (2008) **(334)**	Community	Australia	12	Non-randomised experimental study	68 years (SD 3)	NR	283.5 mOsm/kg
Fraser et al. (1989) **(44)**	Community	United Kingdom	27	Cross-sectional	NR (Age range: 70-83)	Cognitive impairment 0%	289 U/L

TABLE 5.1: BRIEF CHARACTERISTICS OF INCLUDED STUDIES REPORTING DIRECTLY-MEASURED SERUM OR PLASMA OSMOLALITY

Author	**Setting**	**Country**	**Sample size**	**Study Design**	**Mean Age**	**Health Conditions**	**Mean Osmolality**
Kakeshita et al. (2022) **(335)**	Community	Japan	211	Cohort study	NR (Median age of CKD group (n=121): 71 years, Non-CKD group (n=90): 65 years)	Renal impairment 57.3% Diabetes 23.2%	NR
*NUAGE **(40)** and Hooper et al. (2015) **(95)**	Community	United Kingdom, Italy, Netherlands, France, Poland	1088	Cross-sectional	71 years (SD 4)	Cognitive impairment 1% Renal impairment 16% Diabetes 4%	303 mOsm/kg (SD 12.1)
*Hooper et al. (2016) **(14)**	LTC	United Kingdom	188	Cohort study	86 years (SD 8)	Cognitive impairment 54% Renal impairment 42% Diabetes 19%	293.4 mOsm/kg (SD 8.1)
*Johnson et al. (2018) **(336)**	LTC	Sweden	55	Cohort study	84 years	Renal impairment 22%	307.5 mOsmol/kg (SD 8.9)
*Kajii et al. (2005) **(337)**	Community	Japan	71	NR	77 years (SD 7)	NR	287.1 (SD 5. 3) mOsm/L

TABLE 5.1: BRIEF CHARACTERISTICS OF INCLUDED STUDIES REPORTING DIRECTLY-MEASURED SERUM OR PLASMA OSMOLALITY

Author	**Setting**	**Country**	**Sample size**	**Study Design**	**Mean Age**	**Health Conditions**	**Mean Osmolality**
*Mack et al. (1994) **(338)**	Community	United States	8	Non-randomised experimental study	69 years (SE 2)	NR	287 (SD 1) mOsmol/kg/H_20
*Marra et al. (2016) **(35)**	LTC	United States	132	Cross-sectional study	83 years (SD 11)	Cognitive impairment 76% Renal impairment 22% Diabetes 29%	298.9 mOsm/kg (SD 8.8)
*McKenna et al. (1999) **(45)**	Community	Republic of Ireland	24	Non-randomised experimental study	HONK gp: 71 years Diabetes gp: 71 years Control gp: 70 years	Diabetes 67%	HONK gp: 293.5 (SD 2.8) mmol/kg Diabetes gp: 286.8 mmol/kg (SD 2.0) Control gp: 287.3 mmol/kg (SD 2.5)
*Morgan et al. (2003) **(339)**	Community	United States	35	Cross-Sectional study	77 years (SD 8)	NR	286.56 mOsm/kg (SD 6.87)

TABLE 5.1: BRIEF CHARACTERISTICS OF INCLUDED STUDIES REPORTING DIRECTLY-MEASURED SERUM OR PLASMA OSMOLALITY

Author	**Setting**	**Country**	**Sample size**	**Study Design**	**Mean Age**	**Health Conditions**	**Mean Osmolality**
*Nagae et al. (2020) **(34)**	LTC	Japan	89	Prospective, observational study	88 years (SD 6)	Cognitive impairment 56% Renal impairment Diabetes 11%	288.5 (SD 6.1) mOsm/kg
*O'Neill et al. (1989) **(341)**	LTC	United Kingdom	39	Cross-Sectional study	83 years	Cognitive impairment	302 mOsm/kg (SD or SE 8)
*O'Neill et al. (1990) **(340)**	LTC	United Kingdom	58	Cohort study	81 years (SD 7)	Renal impairment 2% Diabetes Mellitus 2%	304 mOsmol/kg (SD 8)
*O'Neill et al. (1997) **(50)**	LTC	United Kingdom	12	Cross-sectional study	Gp A: 83 years Gp B: 80 years	NR	Gp A: 294.2 mOsmol/kg Gp B: 293.8 mOsmol/kg
*Phillips et al. (1984) **(46)**	Community	United Kingdom	7	Non-randomised experimental study	71 years	NR	288.4 mOsmol/KgH_20 (SE 1.3)
Phillips et al. (1991) **(342)**	Community	Australia	7	Non-randomised experimental study	70 years	NR	Pre-isotonic infusion gp: 283 mOsm/kg Pre-hypertonic infusion gp: 279 mOsm/kg

TABLE 5.1: BRIEF CHARACTERISTICS OF INCLUDED STUDIES REPORTING DIRECTLY-MEASURED SERUM OR PLASMA OSMOLALITY

Author	**Setting**	**Country**	**Sample size**	**Study Design**	**Mean Age**	**Health Conditions**	**Mean Osmolality**
*Phillips et al. (1993) **(343)**	Community	Australia	10	Non-randomised experimental study	NR (Range: 64-76 years)	NR	290.4 mOsmol/kg$H_2$0 (SE 3.1)
*Simmons et al. (2001) **(173)**	LTC	United States	28	Non-randomised experimental study	Intervention gp: 89 years (SD 7) Control gp: 86 years (SD 6)	Renal impairment	Intervention gp: 303.6 (SD 9.1) Control gp: 303.4 (SD 8.5)
*Sri-On et al. (2023) **(23)**	Community	Thailand	704	Cohort study	NR (Median age: 72 years).	Renal impairment 0% Diabetes 25.1%	NR
*Stachenfeld et al. (1996) **(344)**	Community	United States	6	Non-randomised experimental study	72 years (SE 2)	Renal impairment 0%	286mOsm/kg (SE 1.5)
Stachenfeld, et al. (1997) **(345)**	Community	United States	6	Cross-sectional study	70 years (SD 2)	NR	Time Control gp: 293 mOsmol-kg-1 $H_2$0 Head out water Immersion gp: 294 mOsmol-kg-1 $H_2$0

TABLE 5.1: BRIEF CHARACTERISTICS OF INCLUDED STUDIES REPORTING DIRECTLY-MEASURED SERUM OR PLASMA OSMOLALITY

Author	**Setting**	**Country**	**Sample size**	**Study Design**	**Mean Age**	**Health Conditions**	**Mean Osmolality**
Takamata et al. (1999) **(346)**	Community	Japan	9	Non-randomised experimental study	70 years (SE 3)	NR	294 mOsm/kg H_20
*Wu et al. (2011) **(347)**	LTC	Taiwan	111	Cross-sectional study	75 years	Cognitive impairment 18%	287.85 mmol/kg (SD 10.51)
*Zappe (1996) **(348)**	Community	United States	6	Non-randomised experimental study	67 years (SD 1)	NR	292 mOsmol/kgH_20 (SE 2)

Table 5.1 Glossary: LTC: long term care, Gp: group, SD: standard deviation, SEM: standard error of mean, SE: standard error, NR: not reported, U/L: units per litre, HONK: Hyperglycaemic hyperosmolar non-ketotic coma, CKD: Chronic kidney disease

*INCLUDED IN META-ANALYSIS.

5.5.3 Quality-Effects Meta-Analysis

From the 61 studies, seventeen studies were not eligible for meta-analysis due to having no relevant data (PRISMA flow diagram in Figure 5.1). These studies are detailed within the 'characteristics of included studies table' (Appendix 5b) and were narratively synthesised using Synthesis Without Meta-Analysis in Systematic-Reviews (SWiM)(350) guidance and treated as missing data in the meta-analysis. Raw data was used where this was provided from the three large cohort studies (NU-AGE(40, 95),NHANES 2017-March 2020(351) and National Irish Survey(224)) to calculate prevalence of those dehydrated from each sample and within relevant subgroup analyses.

Prevalence of dehydration

A quality-effects weighted meta-analysis was initially conducted with all 44 studies eligible for meta-analysis and sub-grouped by hydration measure. For studies which reported more than one measure of dehydration, only the most robust measure was entered into the meta-analysis (See Table 4.1). The quality-effects meta-analysis reported that when dehydration was assessed using directly-measured serum or plasma osmolality, the prevalence was 0.26, 95% CI 0.107-0.46, I^2=97%, using 24-hour oral fluid intake was 0.77, 95% CI 0.56-0.95, I^2=97% and using calculated osmolarity was 0.26, 95% CI 0.00-1.00, I^2=100% (Figure 5.2). As described earlier, Meta-XL does not report the statistical significance of differences between subgroups and so significant differences in mean prevalences were assessed as being when there were differences between subgroups by more than 0.2. There were significant differences in dehydration prevalence of studies providing data on serum or plasma osmolality and oral fluid intake. Sensitivity analyses were then conducted to decide whether directly-measured serum or plasma osmolality and calculated serum or plasma osmolarity studies should be combined in further analyses.

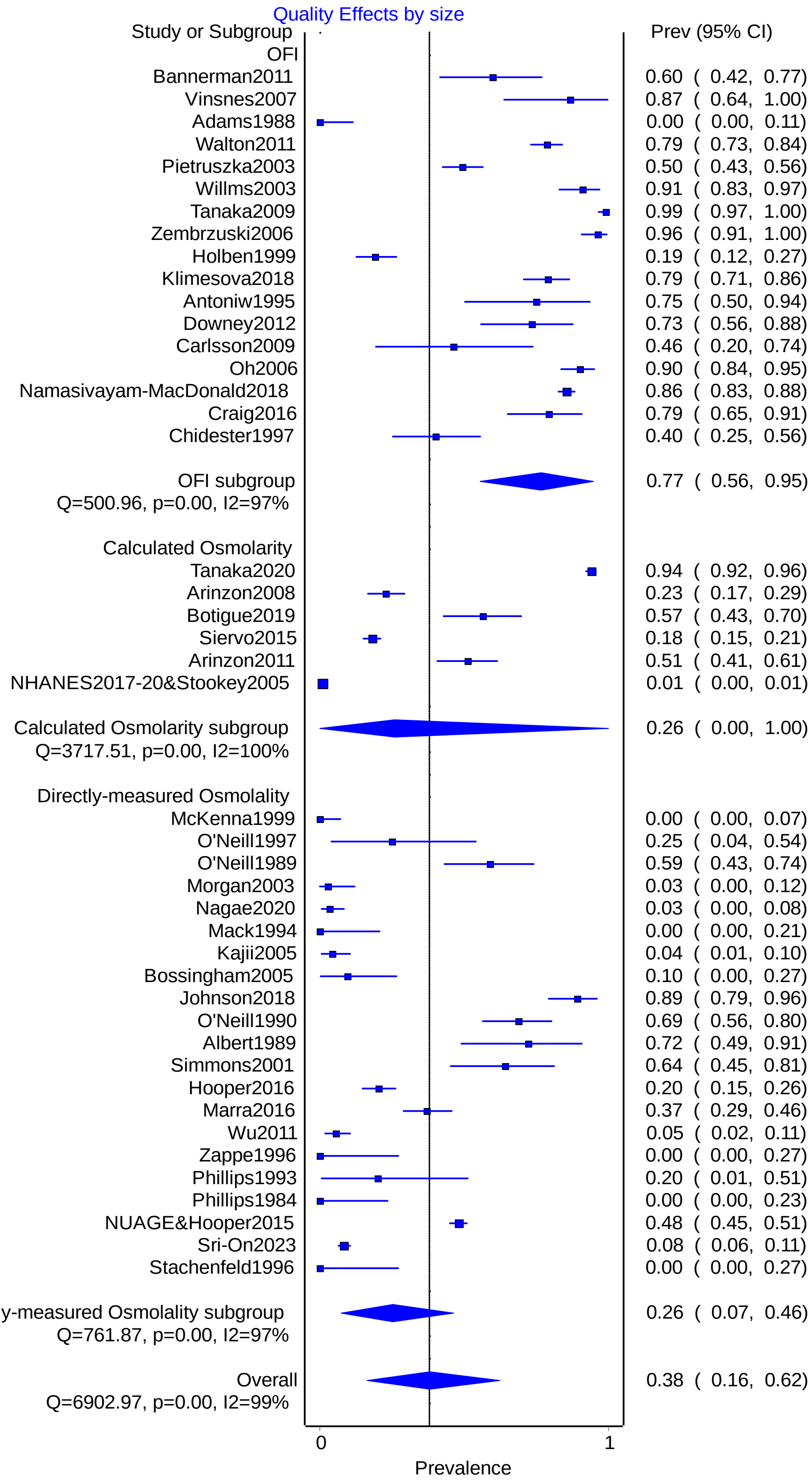


FIGURE 5.2:FOREST PLOT OF STUDIES REPORTING SERUM OR PLASMA OSMOLALITY, ORAL FLUID INTAKE AND CALCULATED SERUM OR PLASMA OSMOLARITY (N=44)

Prevalence of dehydration using directly-measured osmolality

The prevalence of low-intake dehydration assessed using 21 studies reporting directly-measured serum/plasma osmolality was 24% (95% CI 0.07-0.46, I^2=97). Proportions of dehydrated older adults between individual studies was highly heterogeneous and ranged from zero to 0.89 (Figure 5.3 below).

Data could not be included from eight community-based studies within the meta-analysis, which assessed dehydration using serum or plasma osmolality(43, 44, 333-335, 342, 345, 346) because they either did not report the number of participants dehydrated within their study or did not provide relevant data to estimate the number of people dehydrated. It is useful to note that participant samples in the eight studies were relatively small, with the largest study having 211 participants(335). The funnel plot for the quality-effects meta-analysis was asymmetrical (Figure 5.4) which may be explained by publication bias or by the number of small studies with high heterogeneity across studies(352). Subgroup analyses were conducted to investigate whether setting, personal characteristics or health conditions could explain the high heterogeneity of the meta-analysis (I^2=99%).

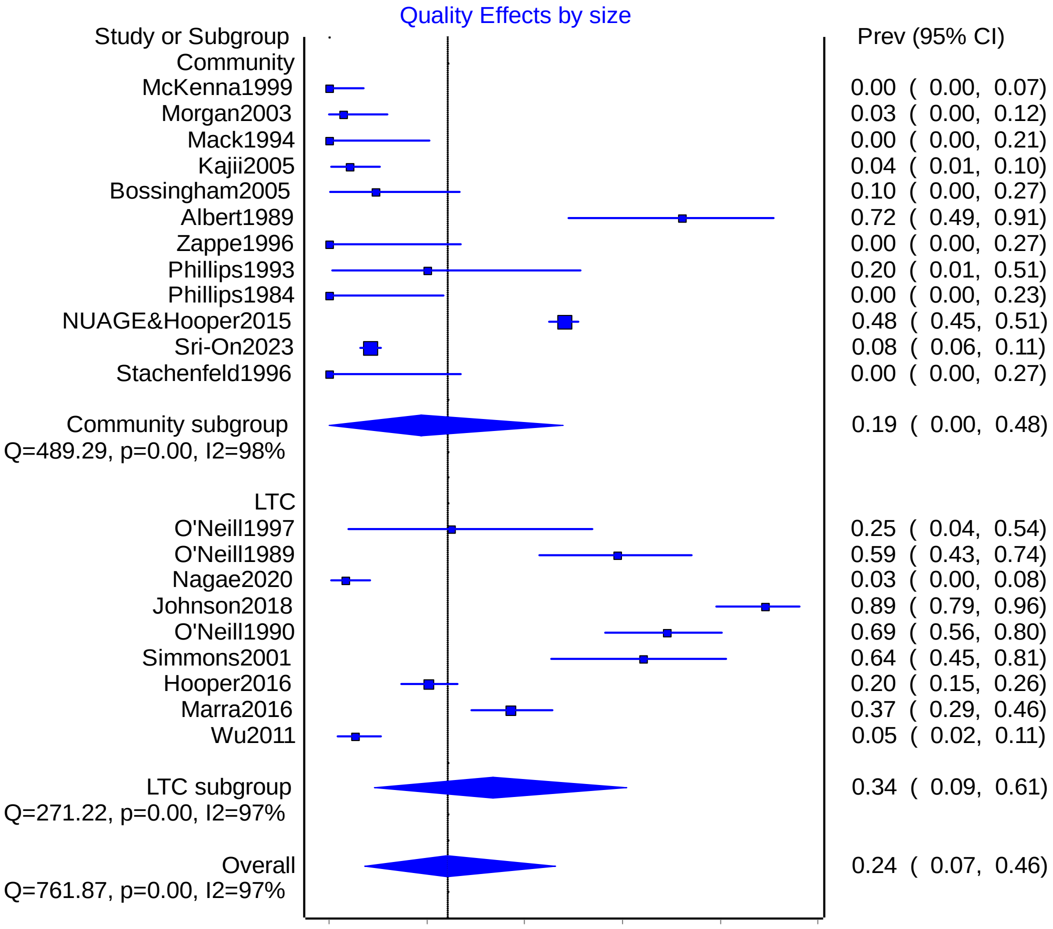


FIGURE 5.3: FOREST PLOT OF STUDIES REPORTING SERUM OR PLASMA OSMOLALITY (N=21)

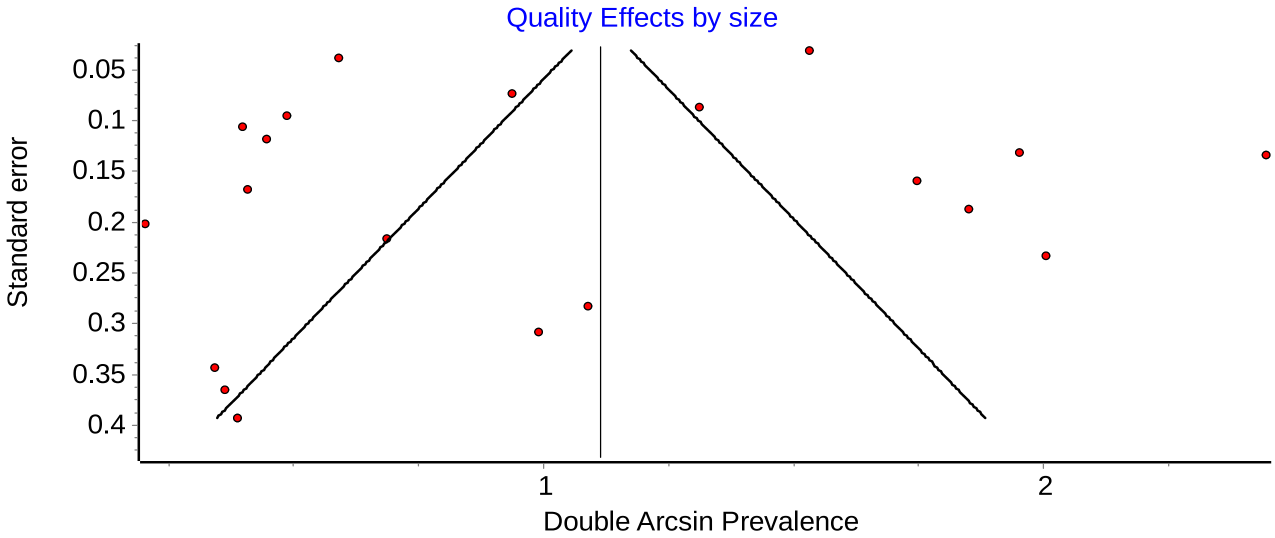


FIGURE 5.4:FUNNEL PLOT OF DIRECTLY-MEASURED SERUM/PLASMA OSMOLALITY STUDIES

Sensitivity analyses

The quality-effects model uses the quality score to weight the meta-analysis and so the sensitivity analysis using studies at low risk of bias was not necessary.

The pre-planned sensitivity analysis including all osmolality studies and any additional calculated osmolarity studies using the Khajuria and Krahn equation(72) was conducted. Only one study was added to the meta-analysis(353) and the prevalence did not alter greatly (23%, 95% CI 0.10-0.41, I^2=97) and thus it was decided to keep the osmolality group (n=21) pure without adding data from other outcome measures.

Subgroup analyses

Care setting

Care setting was subgrouped to investigate any differences in prevalence of low-intake dehydration. Whilst 19% of community-dwellers were dehydrated, as assessed by serum or plasma osmolality (95% CI:0.00,0.48, I^2=98%), 34% of older adults living in long-term care settings were dehydrated (95% CI:0.09,0.61, I^2=97%) (Figure 5.3).

Age

The 65-74 year old mean age group had a prevalence of 29% (95% CI:0.00,0.66), whilst 38% of the 75-84 year mean age group were dehydrated (95%CI: 0.17, 0.60) and 17% of the 85 year and older mean age group (96% CI:0.00, 0.51) (Table 5.2).

Cognitive impairment

Within the ‘cognitively able’ group, 31% were reported to be dehydrated (95% CI: 0.06, 0.60), whilst 50% of the ‘low cognitive impairment’ group were dehydrated (95% CI:0.00,1.00), 17% of the ‘medium cognitive impairment’ group were dehydrated (95% CI:0.00, 1.00) and 16% of the ‘high cognitive impairment’ group were dehydrated (95% CI: 0.00, 0.78) (Table 5.2).

Renal impairment

Of the ‘low renal impairment’ group, 23% were dehydrated (95%CI:0.03, 0.47), whilst 42% of the ‘high renal impairment’ group were dehydrated (95%CI:0.23,0.61) (Table 5.2)

Diabetes

Of the ‘low diabetes’ group, 24% were dehydrated (95%CI:0.03,0.49), whilst 25% of the ‘high diabetes’ group were dehydrated (95%CI:0.03,0.53) (Table 5.2).

Number of health conditions

The group in which participants had fewer health conditions (diabetes, renal impairment or diabetes), 15% of this group were dehydrated (95%CI:0.00,0.43), compared to 37% prevalence of dehydration in the group where more than two health conditions were reported in participant samples (95%CI:0.14, 0.62) (Table 5.2).

Functional dependency

Only 5% of the ‘fully independent group’ were dehydrated (95%CI:0.02,0.09), compared to 13% of the ‘mixed dependency’ group (95%CI:0.02,0.27) (Table 5.2).

Sex

Twenty-six percent of men were dehydrated (95%CI:0.00,0.59), whilst 24% of women (95%CI:0.01,0.53) (Table 5.2).

TABLE 5.2: SUBGROUP ANALYSIS FINDINGS

	Subgroups	Prevalence % (95% CI)	Heterogeneity (I^2)	# Studies (participants)
Mean Age Group	65-74 years	29 (0.00, 0.66)	95%	10 (1,070)
	75-84 years	38 (0.17, 0.60)	96%	10 (745)
	85+ years	17 (0.00, 0.51)	96%	3 (234)
Cognitive Impairment	Cognitively able	31 (0.06, 0.60)	94%	13 (1,418)
	Low cognitive impairment	50 (0.00, 1.00)	99%	2 (166)
	Medium cognitive impairment	17 (0.00, 1.00)	98%	2 (117)
	High cognitive impairment	16 (0.00, 0.78)	98%	4 (249)
Renal Impairment	Low renal impairment	23 (0.03, 0.47)	97%	18 (2,205)
	High renal impairment	42 (0.23, 0.61)	93%	3 (376)
Diabetes	Low diabetes	24 (0.03, 0.49)	95%	15 (1496)
	High diabetes	25 (0.03, 0.53)	99%	5 1,082)
# of Health Conditions	<2 conditions	15 (0.00, 0.43)	94%	16 (1,155)
	≥2 conditions	37 (0.14, 0.62)	98%	5 (1,555)
Functional Dependency	Fully independent	5 (0.02, 0.09)	0%	8 (153)
	Mixed dependency	13 (0.02, 0.27)	94%	6 (1,236)
Sex	Male	26 (0.00, 0.59)	97%	7 (793)
	Female	24 (0.01, 0.53)	99%	4 (1,257)

Meta-regression analyses

Insufficient data was available to conduct the pre-planned meta-regression analyses to further explore the heterogeneity within this review.

GRADE

The overall body of evidence from this systematic review was assessed as being low quality. The evidence was downgraded for inconsistency and imprecision due to the wide confidence intervals and high heterogeneity (Table 5.3).

TABLE 5.3: GRADE ASSESSMENT OF EVIDENCE

No of Studies	**Certainty Assessment**						**Prevalence**			**Certainty**
	Study design[3]	Risk of bias[4]	Inconsistency[5]	Indirectness[6]	Imprecision[7]	Other considerations	Proportion	95% CI	Range	
29 (2,955 participants)	_	_	↓	_	↓	N/A	0.24	0.07, 0.46	0-0.89	Low

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[3] Study design was not downgraded, because observational studies are seen to be appropriate for inclusion in prevalence and prognosis systematic reviews.

[4] Risk of bias was not downgraded, because sensitivity analyses using risk of bias assessment showed little variation to the prevalence.

[5] Inconsistency was downgraded once because there was large heterogeneity, as demonstrated by the high I^2, and also downgraded for imprecision, which is related.

[6] Indirectness was not downgraded, because the population was specific, and serum or plasma osmolality is a robust measure of low-intake dehydration.

[7] Imprecision was downgraded due to the wide confidence intervals, showing large variance in prevalence rates.

5.6 Discussion

5.6.1 How many older people are dehydrated?

This is the first robust systematic review that synthesises and reports on studies using the most accurate measures of dehydration in the non-hospitalised older adult population. A meta-analysis was conducted of 21 studies reporting directly-measured serum or plasma osmolality (>300mOsmk/kg, reference standard measure in older people(2)) including studies from both long-term and community settings across 12 upper-middle and high-income countries. The meta-analysis reports almost one quarter of older adults are at high risk of low-intake dehydration (24%, 95% CI:0.07,0.46). There was no significant difference between prevalence of low-intake dehydration in long-term care settings (34%, 95%CI:0.09,0.61, range: 5-89%) or community settings (19%, 95% CI:0.00,0.48, range:0-72%). There was vast heterogeneity of dehydration prevalence across individual studies, irrespective of setting.

A systematic review of dehydration prevalence in long-term care settings previously reported that 0.8-38.5% of older people living in nursing homes were dehydrated(29). These findings are a much lower estimation of prevalence, compared to our findings of 34% dehydration prevalence of older adults living in long-term care, with a range between 3-89%. The authors did not conduct meta-analysis, nor investigate the heterogeneity, but suggested that the wide range of prevalence rates within their systematic review might be explained by the variance in how dehydration was measured, as they included many non-robust measures of dehydration(29). However, findings from the present systematic review suggests that heterogeneity exists even when assessment of dehydration is limited to the most robust measure of dehydration in older adults, using the recommended cut-off >300mOsm/kg(2).

5.6.2 Explaining the high heterogeneity in these studies

Subgroup analyses were conducted to investigate the high variance of the prevalence of low-intake dehydration amongst older adults within this systematic review. Whilst there were no significant differences in dehydration prevalence between care settings, there was a notable 15% difference. Likewise, there were no significant difference in dehydration prevalence between the two subgroups for renal impairment but there was a notable 19% difference between groups. There was a significant difference in dehydration prevalence in the subgroup which had two or more health conditions, compared to those with fewer than two (37% vs 15%). However, no significant differences were found in dehydration prevalence between subgroups for cognitive impairment, diabetes, age, sex or functional dependency and these subgroup analyses did not explain the heterogeneity found in the meta-analysis. Although some of the subgroups only included a small number of studies, it is more likely that the heterogeneity is due to individual differences found within the older adult population, such as opportunities for drinking, availability and accessibility of drinks provision, support to consume drinks, encouragement and prompting by others to consume drink, and cultural factors such as drinking routines, drinking quantities, and continence concerns, which should all be investigated at individual study level. Individual differences were discussed by Mentes (2006) in their pivotal study of hydration care in care homes(227). Mentes (2006) describes how the hydration habits of nursing-home residents vary, depending on their typology: those who “can drink”, “can’t drink” and “won’t drink”(227). Mentes (2006) described how individual barriers to drinking, such as fear of incontinence, dysphagia, having access to appropriate drinking vessels, effective communication between staff and residents, knowledge of the recommended fluid intake guidelines, opportunities for social drinking and requiring verbal prompts to drink, will contribute to whether someone becomes dehydrated(227). These individual barriers to drinking may explain some of the heterogeneity found within this systematic review.

An older person’s hydration risk may also be linked to a complex interaction of cognitive and physical frailty and support. Frailty is likely to composite factors such as age, functional status, renal, diabetic and cognitive function and number of pre-existing conditions(137). Whilst someone may receive support for their frailty and cognitive impairment, this does not necessarily mean that they will also receive adequate support to consume drinks or be provided with drinks which are accessible to them. However, if an older adult receives quality and attentive support to drink, regardless of their frailty, age, or multiple long-term health conditions, they may be less likely to be dehydrated. This systematic review highlights how dehydration is not a prerequisite for older people with multiple long-term health conditions, cognitive impairment, limited functional ability, or in older age. These complex relationships are difficult to see in subgroup analyses, but they may help to explain some of the patterns of dehydration risk with age and cognitive status (Table 5.2). These relationships should be explored at an individual study level, as there was insufficient data to conduct meta-regression, within this systematic review. Moreover, an ethnographic study could explore some of the influences on hydration care of older people, which may explain some of the heterogeneity reported in this review. Another potential cause of heterogeneity was that the timing of blood draw varied across studies, with eight studies reporting blood collections between early morning to afternoon blood collections. However, 19 studies did not report timing of blood draw. Older people are more dehydrated in the morning which may be more exaggerated if participants fasted prior to blood draw and limited their drinks intake overnight, as a result overnight.

5.6.3 Which older adults are at most risk of low-intake dehydration?

The subgroup analyses reported that dehydration was more prevalent in older people with more pre-existing conditions of cognitive impairment, diabetes and renal impairment. However, there was only a slight suggestion of higher dehydration prevalence in older adults with renal impairment compared to those with no renal impairment and did not report any relationship with diabetes. Our findings contradict previous literature which has reported associations between directly measured osmolality and diabetes and renal impairment (assessed by estimated glomerular filtration rate (eGFR) and blood urea nitrogen (BUN))(14, 34, 35). It is important to note that there were few studies available for subgrouping and little information regarding severity of impairment.

Our meta-analysis found no clear difference in prevalence between older adults living with cognitive impairment and those who were cognitively able. Our findings contrast to other research which reports that higher serum or plasma osmolality is associated with increased dementia prevalence(34), poor mental status(35) and lower MMSE score(14). In our systematic review, cognitive impairment was assessed differently across included studies, which might explain why our findings contrast with existing literature. Study numbers per subgroup were also small. However, the issue still remains of the confounding factor of support resulting in the presence of a U-shaped curve, potentially mediating dehydration risk.

There was no clear difference in prevalence between age subgroups. Although some previous studies have reported an increased risk of low-intake dehydration with increasing age(112, 354), our findings are more consistent with the findings of the UK DRIE study which found no association between age and directly-measured serum osmolality(14). There is therefore mixed evidence as to whether ageing increases the risk of low-intake dehydration. The influence of age may again be explained by the mediating factor of support. If people receive adequate support and assistance with drinking as they age, it may be enough to disrupt any potential association between ageing and low-intake dehydration. There was no clear difference in prevalence between male and female older adults, which is consistent with existing literature(14, 38), suggesting that adequate support and assistance is more likely to be a mediating factor of the association between ageing and low-intake dehydration.

5.6.4 Methodological challenges of conducting this prevalence review

Although JBI and Cochrane guidance were sufficient for many stages of this systematic review(266, 267), there were specific challenges in conducting meta-analysis and assessing the certainty of evidence in this prevalence systematic review due to lack of guidance and limited clear guidance relating to critically appraising included studies(272). Risk of bias assessment of included studies is central to systematic reviewing(266, 267), yet this stage is not consistently conducted and reported in all prevalence systematic reviews(355, 356). Authors of a meta-epidemiological study reported that the risk of bias of included studies was not reported by study authors in 20% of systematic reviews of prevalence studies(355). The same study reported that over 50 quality assessment tools had been used in prevalence systematic reviews, including 24 non-validated tools, 24 newly-developed and unvalidated tools, five validated tools and six adapted, validated tools(355). These inconsistent practices potentially arise due to there being limited guidance for critically appraising studies for prevalence reviews. JBI have developed an extensively peer-reviewed critical appraisal tool for use with prevalence studies(272), which is approved by the JBI Scientific Committee. The 'JBI checklist for prevalence studies tool' was adapted for use within this systematic review. Clear guidance is needed to critically appraise included studies within prevalence systematic reviews(356) to ensure the reliability of systematic review findings. This is particularly important if quality scoring is used to weight the meta-analysis(274), as demonstrated within the present review.

Cochrane do not provide guidance for conducting meta-analyses with continuous data for prevalence and incidence studies(266) and JBI only provide limited guidance(267). There is limited software to conduct meta-analyses using prevalence data and there is no formal published guidance advising of the most suitable software(355). Systematic reviewers inconsistently conduct and report meta-analysis of prevalence data, which might lead to inaccurate findings and misleading reporting of prevalence systematic reviews. In the meta-epidemiological study, the authors reported that 93.4% of systematic reviews reported using a random-effects model, 4.6% used the fixed-effect model, whilst only 1.3% used the quality-effects model(355). Only 29.6% of studies included within the meta-epidemiological study reported how they transformed the prevalence estimates, required to stabilise the variance of prevalence data(355). Where authors reported conducting meta-analyses within their systematic review, 76.1% had an I^2 of >90%, indicating high heterogeneity. If an inappropriate model of meta-analysis is employed, or the data are not appropriately transformed, then the overall prevalence will vary, leading to inaccurate meta-analysis. If authors fail to accurately report the methods used to conduct meta-analysis, other authors cannot replicate this research. Developers of Meta-XL argue the inappropriateness of fixed-effects and random-effects models of meta-analysis for prevalence data, due to high heterogeneity from prevalence data and instead recommend stabilising the heterogeneity with the quality score, to perform a quality-effect model instead(273-275). In the present review, a quality-effects model meta-analysis using Meta-XL was conducted(273-275), which was not originally planned. Appropriate and clearer guidance on software for conducting meta-analyses using prevalence data is needed.

A key component, and final stage of systematic reviewing is assessing the quality of the overall body of evidence from the systematic review and meta-analysis, using the GRADE approach(276). GRADE assessment encourages transparent reporting of the body of evidence and enables healthcare professionals to make recommendations for policy and practice. In the meta-epidemiological study, only 9 out of 235 systematic review authors assessed the overall quality of the body of evidence; four employed the GRADE approach, whilst 3 systematic reviews used 3 different tools(355). The quality of the body of evidence was not assessed in 96% of systematic reviews(355), so readers were not provided with a summary of how certain the prevalence was from those systematic reviews. There is no specific GRADE approach for systematic reviews using prevalence studies because GRADE was initially developed for use with interventional studies(266, 276). There is limited formal guidance about how to use GRADE for the assessment of evidence about prognosis studies(357) and the Prevalence Estimates Reviews – Systematic Reviewing Methodology Group (PERSyst) recommended that prevalence systematic reviewers follow that guidance(355). The quality rating of our body of evidence was downgraded due to the inconsistency and imprecision of studies, in line with the GRADE approach(276), due to high heterogeneity and wide confidence intervals. However, the development of appropriate guidance for assessing the certainty of body of evidence from prevalence systematic reviews is encouraged, because high heterogeneity is characteristic of most prevalence systematic reviews(355) and heterogeneity is not reflective of unreliable or biased study conditions in these reviews.

5.6.5 Limitations of this review

There are several issues which might have affected the findings of this review. Directly-measured serum or plasma osmolality can only be used to provide a point prevalence of low-intake dehydration and thus dehydration status may fluctuate over short time periods. This measure may also be affected by whether participants were fasted prior to blood draw, laboratory processing and calibrating methodology. Another potential issue was that when authors did not provide raw data for the proportions of their sample who were dehydrated, the number of dehydrated participants was estimated based on normal distribution of osmolality, which will have introduced some small differences. It is important to note that in this review the stricter >300mOsm/kg cut-off for directly-measured serum or plasma osmolality to indicate low-intake dehydration(14) was applied, and so the prevalence would have been higher if the less stringent >295mOsm/kg cut-off for impending dehydration had been applied. The number of studies available to conduct subgrouping analyses were small, which might limit the findings. One final issue was that authors sometimes interchangeably used the terms osmolarity and osmolality. Where the correct term could be investigated by looking at the methodology, the correct term was used, but on occasions, it was not possible to interpret which measure was being reported.

5.7 Conclusion

This was potentially the first systematic review, using robust measures of dehydration to comprehensively assess the prevalence of low-intake dehydration in non-hospitalised older people globally. The review included 61 studies across 12 countries and a meta-analysis of 44 of those studies. The final meta-analysis of 21 studies which assessed dehydration using the reference standard of directly-measured serum or plasma osmolality found that 24% of non-hospitalised are dehydrated from not drinking sufficient fluids. The prevalence of dehydration in this sample ranged from 0-89%, suggesting that there is great variance between different groups of older adults. Whilst subgroup analyses did not indicate differences in dehydration prevalence for sex, functional dependency, diabetes, cognitive impairment, or age subgroups, they did indicate slightly higher dehydration prevalence for those with renal impairment and higher number of health conditions. It is likely that adequate support and individual barriers to drinking are useful in explaining the large variance in dehydration prevalence across studies and so influences of drinking should be investigated at an individual study level. An ethnography would be useful to explore what influences how non-hospitalised older adults consume drinks, preventing them from becoming dehydrated.

6. Drinking for people living with Dementia IN Care homes (D-DRINC study A) - Care home ethnographic case study

6.1 Aim and introduction to chapter

The study reported in this chapter ‘D-DRINC Study A’ aimed to explore how older people living with dementia drink in care homes. An ethnographic study could explore ways in which residents and staff frame drinking and drinking-related activities within their actions, interactions, language and body language within a care home environment over a 24-hour period. As discussed in Chapter Two, it could be argued that an ethnographic approach offers a way to gain and contextualise relevant robust and nuanced data on drinking practices in care homes(291). This chapter describes the rationale for D-DRINC Study A, how it involved public partners, the methodology used, its findings, their interpretation and discussion and how these findings may be useful for practice.

The introduction, methods, findings and discussion are described in line with the ‘Standards for reporting qualitative research (SPQR)’(358) to provide a transparent and comprehensive account of D-DRINC Study A.

This chapter is written in first person to reflect my active role in constructing the research, aligning with the social constructionist approach(286, 292) to this study.

6.2 Why is this ethnographic study needed?

As discussed in Chapter Two, a recent systematic review reported that 0.8-38.5% of care home residents were dehydrated when assessed using non-robust measures of low-intake dehydration(29). There is mixed and inconsistent evidence that reports an association between cognitive impairment, dementia and low-intake dehydration(14, 18, 36, 152, 153). It is thought that people living with dementia may be more at-risk of dehydration for reasons such as forgetting to drink, taste changes, not being able to perceive drinks in their vicinity and dependency on others to shop for, prepare and serve drinks(31, 32, 51). Multicomponent interventions designed to improve drinking and fluid intake for people living with dementia in care homes have previously not demonstrated sustainable improvements in fluid intake for these individuals(52, 55). It is therefore necessary for an ethnographic study to examine exactly how people living with dementia drink in care homes and identify the interplaying influences on what leads to drinking, to inform the design of more appropriate and sustainable hydration interventions for this group.

Qualitative studies involving direct observations have previously reported important insights on influences and various social actors, as significant and relevant for shaping drinking and hydration care within long-term care settings(56-61). Such influences can include routines enacted to provide drinks, resident characteristics which may affect their ability to consume drinks, such as dysphagia, and practices relating to hydration care, such as recording fluid intake and residents' choice of drink. Whilst some of these learnings have previously been implemented into drinking interventions to increase fluid intake of long-term care residents(52, 53), no intervention has been sustainable and effective long-term and some research has reported that care home residents living with dementia are dehydrated(52, 54, 55). A large proportion of research to date has sought insights from formal care staff and informal family caregivers into eating and drinking of care home residents and research has only sometimes included residents living with dementia themselves(59, 60, 237, 359). Previous research has involved staff assumed to be directly involved with hydration care, such as care staff, housekeeping, kitchen staff and speech and language therapists(61-63). Some drinking and mealtime research has involved older care home residents as participants(64-67), but to my knowledge, only four of these studies included residents living with dementia within the research(56, 58, 59, 61). Previous studies have also tended to deductively approach observations, by mostly attending to drinks provision and/or mealtimes when drinking opportunities are anticipated. Less attention has been given to how people living with dementia actually enact the activity of drinking within the wider context and system of a care home.

To understand how older people living in care homes drink, it is important to contextualise drinking within the complex system of the care or nursing home. This involves attending to the policies and legislation which set the standards for care, the ownership and management of the home which will also set standards and administer all care-related and financial decisions for the home, the workforce, care home environment, family caregivers/visitors, allied health professionals visiting the home and the resident’s wants, needs and preferences. Ethnography, as a research methodology, enables researchers to explore these interplaying factors of drinking within the context of a care home, via observations, as real-life unfolds(291), providing a more fine-grained and nuanced view of drinking. An ethnographic study in a care home is therefore useful to explore and examine what actions, routines and practices are in involved in how, and which staff meet residents’ daily needs, regarding gaining access to drinks and drinking. An ethnographic study may be able to illuminate the nuances of which interactions and practices between staff and residents facilitate residents drinking and explore how all social actors interact to deliver and receive hydration care within the complex setting of a care home. An inductive social constructionist approach(286) enables an ethnographer to generate new knowledge by observing how social actors engage with, and enact everyday activities, interactions, practices and routines in the care home and examine how drinks are accessed, provided and consumed within the setting over time and within interactions over a 24-hour clock. An inductive social constructionist approach(286) can also enable the ethnographer to observe occasions when residents do not drink, as well as opportunities for drinking, which have traditionally been reported to be mealtimes and tea trolley times.

6.3 Study purpose

This study aimed to explore and examine how older people living with dementia consumed drinks in the context of a single care home in the East of England. A social constructionist approach(286) enabled me to attend to the actions, interactions, routines, practices and language used by care staff, visitors and residents living with dementia within a care home environment and enabled me to examine influences which led residents living with dementia to drink.

6.3.1 Research question

This study aimed to answer the question:

How do older residents living with dementia drink in care homes?

6.4. Methods

An ethnographic case study using a social constructionist approach was conducted to examine how older care home residents living with dementia drink. Detailed methods are reported in Chapter Four (Section 4.4.2).

6.5 Findings

This five-month ethnography aimed to explore how people living with dementia consumed drinks in care homes, by examining staff and residents' actions, interactions, body language, language and care homes' routines, practices and environment. The study comprised 141 hours of direct non-participant unstructured observations of a single residential care home in the East of England (Appendix 6a for observations log). I observed the actions and interactions of 17 staff and five care home residents living with dementia within the care home and examined how these influences may have related to how residents consumed drinks.

6.5.1 Description of the case study setting

The following information about where this ethnography was set resulted from the time I spent observing during the familiarisation period in the care home.

The case study was set in a single residential care home in a rural area of the East of England, which will be known as ‘the care home’ from here onwards. The mid-sized (40+ rooms), private care home offered respite, residential and dementia care and had been assessed as “Good” overall by Care Quality Commission on its most recent inspection. The care home had six communal areas overall, but only four of these were regularly occupied by residents and each of the residents’ bedrooms had ensuite bathrooms. The care home advertised that it offers all staff regular and comprehensive training.

Description of the care home

The care home was a large period property surrounded by trees, as commonly found in East Anglia. The grounds felt calm and serene. There was a slight clinical smell as I entered the home. The home had large, light and airy communal rooms and the electric lights remained on in every communal room throughout the day. Electric room thermometers recorded communal room temperatures between 24-26 degrees throughout my time spent in the home. I often felt warm during my time spent in the home and staff frequently complained about the heat, occasionally resulting in them opening windows to allow for a cool breeze to filter through rooms.

Description of the communal areas

There were four communal areas regularly used by staff and residents in the home, whilst bedrooms were situated along long, windy corridors. Bedrooms were also situated on the first floor of the home, but I remained on the ground floor of the home in the communal spaces throughout the duration of this study. The home had 40+ bedrooms but was only half occupied when I began the study. The residents’ toilets in the communal areas of the care home were not used by residents and residents were instead taken by staff to their bedrooms for their personal care needs.

Of the four communal spaces, there was a quiet lounge, the main TV lounge, a small TV lounge and the main dining room. The quiet lounge was a large airy room, with a fireplace, wide windows, a bookcase, no TV and some soft seating positioned around the perimeter of the room. This room was only ever frequented by the same few residents. The main TV lounge was the largest communal space in the home, with large windows allowing light to fill the room, a TV, fireplace, kitchenette and water dispenser with paper cups. Some soft seats were placed along the boundary of the room, whilst a line of armchairs were positioned in the centre of the room. A small dining table with some dining chairs placed to the side of the room was occasionally used for activities, but not for mealtimes. The main TV lounge was used by up to seven of the same residents occupying the space at any one time. Small tables were positioned next to some residents' armchairs, for which activities, meals and drinks were placed upon.

The dining room was the busiest space in the home, used by both staff and residents. The dining room had a sideboard where napkins and cutlery were stored, a fireplace, and four dining tables with up to three dining chairs positioned around each. One of these dining tables was only occupied by staff completing residents' paperwork because the offices were occupied by management. The other dining tables were used by some residents for mealtimes. The dining room was a busy and often noisy space where I observed lots of 'comings and goings'. The dining room was a pass-through to other spaces in the home which saw staff move residents to different areas of the home, as well as staff undertaking different activities such as moving hoists and laundry bins. In the dining room, I could hear banging of pots and pans and staff chatter coming from the kitchen, staff talking in the dining room, noise from equipment and residents being moved in wheelchairs through the dining room. Sometimes staff turned the radio on which added to the noise.

The small TV lounge was situated in the newer part of the home. Residents whose bedrooms were closer to this communal space used the small TV lounge in the daytime. There was a water dispenser, TV, a dining table used by staff and armchairs tightly placed around the perimeter of the small room. A small table had jugs of squash, a box of straws, plastic cups and sometimes a bottle of fizzy drink placed upon it. There were also multiple small tables available in the tightly packed room, some of which were positioned beside or in front of residents' armchairs for activities, for food and drink to be placed upon. Kitchen staff delivered residents attending this lounge meals via a trolley. Although some residents were invited to attend some activities in other communal areas of the home, residents mostly remained seated in this communal area all day for their meals, drinks and activities.

Description of the care home routines

Routines which I observed mostly centred around mealtimes and medication rounds. Other routines such as personal care and staff handovers occurred in the home, but I did not have access to these events. Leisure activities and outings were not offered to residents for the duration of my time observing in the care home and only few visitors visited some residents in the home.

Residents began having breakfast around 7am and this ended between 10.30/11am for the last residents to receive their breakfasts. Breakfast mostly comprised cereal, porridge or Weetabix with an offer of a hot drink. The tea trolley was then circulated around the care home by one or two staff between 10.30am to noon. Initially this was facilitated by kitchen or care staff but as the study progressed, the morning tea trolley task became the responsibility of activity staff. The morning tea trolley often looked very appetising. The trolley usually contained jugs of tea, coffee, milk, tubs of thickener powder, straws, sweetener and sweet treats such as cake, fruit, mousses and jellies. Staff began preparing the dining room for lunchtime activities around noon by placing squash jugs and moving some residents into the dining room. Around 12.30pm, the dining room filled with a smell of food in which care and kitchen staff began retrieving hot meals from the kitchen and delivering them to residents' tables in the dining room, main TV lounge and quiet lounge. Some staff delivered trays of food and a drink to residents in their bedrooms. Residents were routinely offered a choice of two hot meal options and a pudding. Kitchen staff then wheeled a heated trolley to the small TV lounge to serve those residents food. The care staff in the small TV lounge poured squash into small plastic cups and laid out cutlery on residents' small tables in preparation for the heated trolley arriving. Lunchtime activities usually ended by 2.30pm when staff cleared plates. Staff moved residents from the main dining room to either their bedrooms or other communal areas. Kitchen or care staff circulated the afternoon tea trolley around 2.30/3pm, where residents were usually offered a biscuit and hot drink. Kitchen and care staff facilitated teatime around 4.30/5pm whereby residents were offered food such as sandwiches and soups wherever residents were already seated. After the teatime routine, staff began moving residents to their bedrooms for the bedtime routine. Night staff began the supper routine around 7.30pm after their handover coming onto shift. The night care staff circulated the trolley with sandwiches, yoghurts and drinks to residents in their bedrooms and the few remaining residents in the communal areas.

Description of regular activities available for residents

Most residents did not have visitors visit them in the home and residents did not regularly leave the home. When I first begun observations in the home, there was no activity schedule in the home nor fulltime activity staff and so activities did not happen. Residents either remained in their bedrooms or sat in communal areas, sometimes with the TV on. Sometimes staff spoke to some residents, but in general, I did not observe communal areas to be social spaces for residents. Staff mostly talked to residents when they enacted tasks on them, such as hoisting them into a different chair, wheelchair or when feeding residents food. Staff sometimes sat at the dining table in the dining room and the table in the small TV lounge completing paperwork. Staff mostly talked between themselves or completed residents' care records. Sometimes the radio in the dining room played music selected by staff and sometimes I could only hear the noise of staff talking in the kitchen or in other rooms as I conducted observations. During my data collection, an activities coordinator was employed to deliver an activities programme in the care home, which led to some residents receiving the opportunity to engage in activities. The activities programme included the routine of the morning tea trolley and the opportunity for some residents to complete colouring, painting and baking on occasions. Sometimes the activity coordinator engaged some residents in using an electronic device similar to an Ipad, but more often than not this was used as a means of watching TV for one of the residents in the quiet lounge. Activities were not consistently prioritised by staff and were viewed by some staff as getting in the way of more routine tasks, such as repositioning and personal care. Activity staff were obliged to take photos of residents completing activities, mostly for documenting evidence, instead of staff supporting or assisting the resident to actually engage with the activity. The duration of activities was often short-lived due to staff choice, rather than residents' choice. Although activities sometimes involved a small group, such as for ladies' afternoon tea, these were more commonly individual activities which residents completed seated, using tables to rest activities upon.

6.5.2 Gaining access into the home

I negotiated numerous types of access to gain access into the care home to conduct the D-DRINC study A, which I discuss below. To be transparent about the context in which I generated my findings, it is important to note that there were many occasions when I did not gain access to everyday activities. For one, I was a single ethnographer and could never observe or attend to everything happening in the care home at every moment. On one occasion, carers closed the doors to a communal room which I was observing into from a different room, so I was unable to observe the activities of that room any further. As part of my protocol, I was unable to observe in residents' bedrooms unless another person was present, which mostly prevented my access to the everyday activities within bedrooms. Staff sometimes whispered to each other so that I could not hear their conversations. Finally, most staff and residents did not give informed consent/assent to have data recorded about them which restricted my access around the home.

Contractual access

Ethical approvals and site agreements took five months to complete before I could conduct the study which was longer than anticipated. I sought gatekeeper access from the care home manager, formalised by them completing a form, which also gave me access to record details about the care home environment and routines.

Gatekeeper access

For the first five weeks of the study, I sought permission from the care home manager via email to attend the care home on any day that I intended to conduct observations. After this time, I then attended 'unannounced' as per the gatekeeper agreement. Each time the home was closed to visitors due to infectious outbreaks, I was required to seek permission from the care home manager before I could visit again. When I initially attended the home to conduct night observations, the night staff sought approval from the senior carer before the senior carer allowed me into the home, until they became familiar with me visiting.

Physical access

I was required to gain physical access into the home every day I conducted observations, via the visitors' entrance to the home, instead of the staff entrance, reaffirming my 'outsider' status. I was required to sign the confidential visitors book every visit; however, I had observed health professionals not complete this when they entered the home. For many weeks I rang the doorbell waiting for staff allow me to enter the care home. During one of my visits, a staff member informed me of the keypad code and I continued to use the keypad code to enter the home until the home changed the keypad code. I then resorted to ringing the doorbell until a staff member offered me the keypad code again, and I could then enter the home without announcing myself beforehand.

6.5.3 Conducting observations within the care home

I conducted 112.5 hours of direct non-participant unstructured observations, which comprised formal time observing and recording care home life and consenting staff and residents after the initial less formal hanging-out period where I became familiar with all social actors. Twenty percent of the observations were conducted between 6pm-6am. These observations ranged in duration from 1 hour 5 minutes to 6 hours 30 minutes. Although I occasionally visited residents' bedrooms alongside staff delivering food or drink to the respective residents, I mostly conducted my observations within four of the six communal spaces of the home: the quiet lounge, dining room, main TV lounge and the small TV lounge. I conducted observations in the care home over a 24-hour period across the full seven-day week. I was able to conduct longer periods of observation in twilight or nighttime observations because most residents were in bed and there was less general activity for me to observe. This led to me having less to attend to and remember and thus I was able to spend longer in the home conducting observations. During the daytime, especially Monday to Friday, I often attended to lots of activity and so I observed for shorter periods because I could not retain everything. These observations were often quite exhausting to attend to. I recorded details of participants' comings and goings, their conversations and interactions and information relating to the care home environment, such as the furniture, noise and décor. As the study progressed and I had become familiar with the usual practices and routines of the care home, I finetuned my observations to attend to intricacies of interactions between different social actors, as well as how residents interacted with drinking vessels and their environment. I developed analytical theories as the study progressed about what might affect drinking, and I would 'test' these theories out. For example, early on in the study, I noticed that staff used 'minimising' language when discussing drinking which they did not seem to connect with eating or food. This was one of the many theorising notions that I tested out throughout the study, noting and recording when staff may, or may not have used this type of language and what the consequences were for the resident.

I conducted ethnographic interviews which were 'in-the-moment' questions to seek clarification or explanation of something I had observed or heard and documented these as part of my fieldnotes. Although I planned to conduct unstructured interviews to examine how the ethnographic observations may compare with the interview findings, I decided that these were not appropriate to conduct, as I learned that the ethnographic interviews were more methodologically relevant for seeking further information from residents and staff.

I experienced five interruptions to fieldwork due to infectious outbreaks in the care home, each of which prevented my access to the care home. After each of these interruptions, it was difficult for me to re-establish myself within the setting. I conducted nighttime and twilight observations less regularly in the care home as I had responsibilities in my personal life. I felt more uncomfortable and less accepted into the care home during these shifts as some staff would ignore my presence and did not engage with me until several hours into the shift.

6.5.4 Recording observations in fieldnotes

As observations begun and no participants were involved in the study, I recorded generalised details of care home practices, routines and the environment, for which I had gatekeeper consent for. As more participants became involved in the study, I turned my attention to observing those participants. I firstly described the room which I was sat in, what I could see, how many people were in attendance and if the residents had any food or drink near them. I then continued jotting down everything I observed until I decided that I would end observations for the day, and then I wrote the reason for ending observations and the time.

At the beginning of the study, I recorded broader and less descriptive notes attending to everything that I had observed. Initially, at the end of each observation period, I wrote myself notes such as questions that my observations had raised, who I needed to recruit next or what I needed to focus my observations on next. This ensured that I approached the data collection systematically. Initially the practice of expanding my brief notes into fieldnotes did not take long, but as my notes became more detailed as the study progressed, this practice of expanding notes took many hours. I did not know of any practices which may have reduced the burden of expanding these brief notes into fieldnotes and accepted this as part of the ethnographic methodology.

As the ethnography progressed and more participants consented to their participation in observations, my notes became more detailed and specific as I recorded the nuanced details of interactions that I observed, as well as the practices, language, conversations of all participants. After prolonged exposure in the home, I learned what the usual practice was in the care home and was therefore alerted when practices deviated from the 'norm'. Eriksson, Henttonen and Meriläinen (2012) describe the process of writing fieldnotes as 'selecting' what to record and 'sense-making activities' and asks the ethnographer to critically reflect on the importance and relevance of what they attend to and record in fieldnotes(299). I recorded in my fieldnotes what may have diverted my attention, such as *"I noticed that there was music playing from only one radio now"* and *"I noticed that the new canvas prints were up on the walls* "when something in the care home environment had changed. I also specifically recorded when I made intentional decisions to attend to some activities or participants, and not others, particularly in instances when the dining room was busy, and so I could not attend to everything.

I also wrote within my fieldnotes my reflections on what I had observed and how I felt throughout my time observing. I had intended to record my reflections separately within a reflexive journal; however, I considered my reflections to be pertinent to how I described and experienced the observations within my fieldnotes. While collecting data I therefore reflected on and recorded how I attended to events, what ontological elements may have caught my attention during an observation, how an action or discourse might have affected me and when and why I ended data generation each day(286, 299). I often ended data generation because I was emotionally or physically exhausted from what I observed, occasionally felt unwell from the heat, but sometimes I ended observation for other pragmatic reasons such as I needed to do the school-run. These reflections were therefore useful to add another dimension to the fieldnotes.

Alongside fieldnotes, I sketched some of what I observed to diagrammatically record what I observed and how social actors were positioned near food and drink (Figure 6.1 and 6.2 below). I did not do this often because I found that care home life was often too dynamic to draw one moment in time and thus I instead opted to write brief notes, which I expanded into thick descriptions, but this was time-consuming.

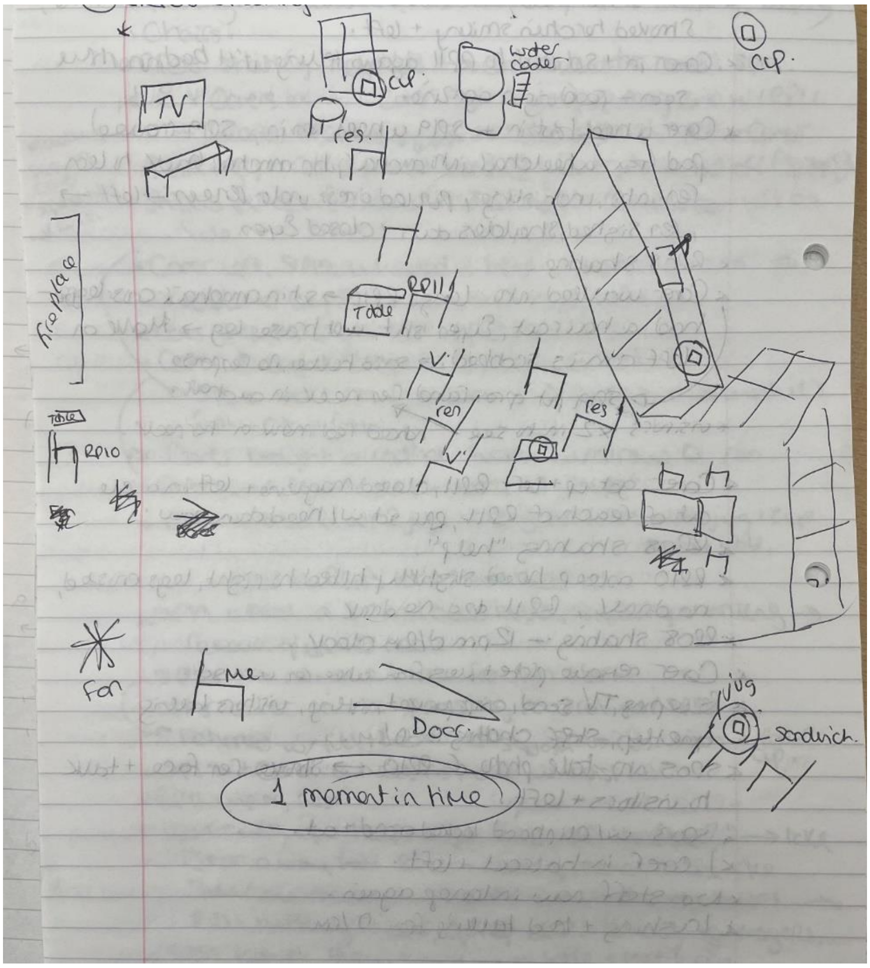


FIGURE 6.1: ETHNOGRAPHIC SKETCH OF ARRANGEMENTS OF PEOPLE AND OBJECTS IN THE MAIN TV LOUNGE

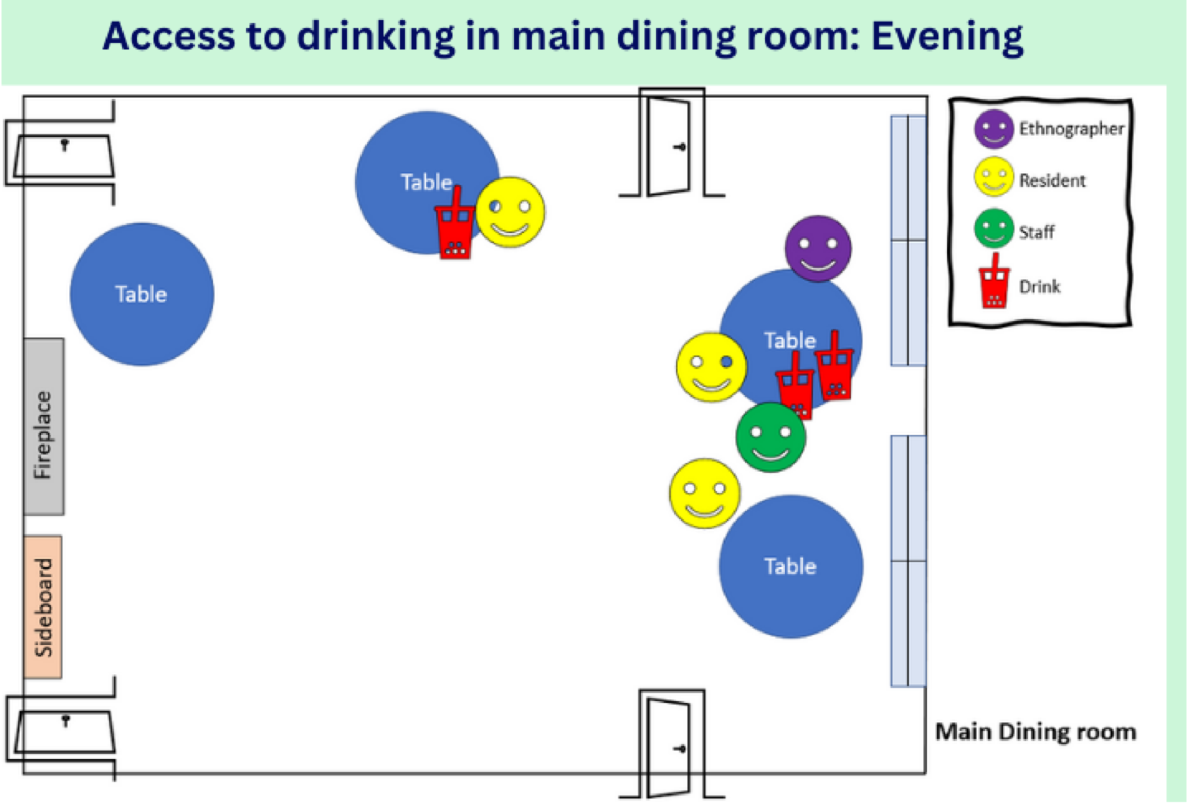


FIGURE 6.2: DIGITALISED ETHNOGRAPHIC SKETCH OF ARRANGEMENTS OF PEOPLE AND OBJECTS IN THE DINING ROOM DURING THE EVENING

I reported on my feelings during the study within my fieldnotes and reported specifically what impact certain events I had observed, had on me: *"I found this incredibly stressful and anxiety-provoking just observing someone in distress, and because no staff were present at all…".* The practice of reflexive fieldnote writing has been documented by other researchers(299, 327). Eriksson, Henttonen and Meriläinen (2012) recommend that ethnographers practice reflexivity during the entire research process instead of just one final end-of-project reflection(299) to enable the ethnographer to make sense of the data and their fieldnote meanings throughout, which aligns with the 'mediator of languages' observer perspective.

6.5.5 Conducting inductive, reflexive thematic analysis of the ethnographic case study data

I familiarised myself with the data by reading through the extensive dataset stored on NVivo 1.7.1(312). I made 721 annotations in the NVivo files(312) from my personal reflections of the observations. I then reviewed the dataset in NVivo(312) again, but this time I coded line-by-line to a total of 7072 lines.

I coded the main concept each line conveyed using words which were close to what was written in the text. This inductive process allowed me to stay close to the original dataset without applying any external meaning to the data, minimising any early interpretation or potential bias. I continued this line-by-line coding process for the first third of the dataset which consisted of contextual data, routines, practices and environmental details. This in-depth analytical process enabled me to formulate an initial sense of commonly occurring items in the dataset. Common occurrences included phenomena such as: ‘things which staff use to facilitate drinking’, ‘variety of staff involved in drinking’, ‘missed opportunities for drinking’, ‘food first approach’, ‘toilet assistance and pad usage’. Once I had become familiar with some of the initial patterns in the dataset, I inductively coded the remaining two thirds of the dataset, which consisted more of drinking interactions, actions and discourse. When coding, I used the terminology and language used by actors within the home e.g. “toileting, feeding”, rather than the terms I personally use,

After coding the entire dataset, I jotted down any initial themes on a notepad which seemed to link some of the codes together. I tested out some of the theories I had begun to develop through prolonged engagement with the dataset and my analytical thinking throughout my observations and in discussion with supervisors. To sustain focus in my analysis, I continually referred back to check the relevance of the themes I was generating to answer the research question, rather than simply being guided by my general varying interests.To test the initial themes generated, I reviewed the dataset again to assess the degree of fit between themes and codes. At this point, I had developed some higher-level categories which encompassed some themes and codes, such as “missed drinking opportunities”. However, other categories such as “lack of preparedness”, were clearly relevant and important to shaping the dataset, but codes fitted less neatly within it. To aid my analytical process, I created a visual map on *Canva* software(315) to visually formulate my theme generation (Figure 6.3) so as to then visually assess whether categories could be seen as relevant to the data generated. I named the final categories and tabulated the five higher-level categories and 25 lower-level categories, supported by quotes from the dataset (Appendix 6b).

How the residents living with dementia involved in this study consumed drinks was influenced by whether staff seized opportunities to support residents to drink, whether furniture and equipment was available to support drinking, whether staff were attentive and present to support drinking, whether residents could communicate and demand their needs are met and problem solve being able to drink and whether drinking was prioritised in the care homes activities and staff actions.

6.5.6 Participant characteristics

Resident characteristics

By the end of the study, I had recruited five residents into the study, three of whom were male. Residents were diagnosed with a variety of different dementia diagnoses, and they had a wide age range (Table 6.1). All residents were White British and had lived in the care home for less than three years. I collected this data from all participants using a short ‘participant demographic’ form after gaining initial informed consent.

TABLE 6.1: RESIDENT PARTICIPANT CHARACTERISTICS

Name	Gender	Age bracket	Abilities relevant to drinking
Joyce	Female	>85	Unable to mobilise independently. Able to problem-solve drinking vessels. Severe hearing impairment. Shouts to request drinks. Able to reach for drinks on table. Does not receive assistance from staff to eat or drink.
Roger	Male	65-74	Able to walk independently. Very rarely vocalises. Unaware of drinks in his vicinity. Staff feed him food and drink on every occasion
Mabel	Female	>85	Unable to mobilise independently. Can drink independently, but unable to problem-solve drinking vessels. Hearing impairment. Speaks very softly and quietly. Can sometimes reach for drinks from table. Staff sometimes assist her to eat and drink.
Geoffrey	Male	75-84	Unable to mobilise independently. Able to problem-solve drinking vessels. Speaks very softly and quietly. Mostly able to reach for drinks from table. Mostly did not receive assistance from staff to eat or drink.
Paul	Male	65-74	Able to walk independently. Vocalises, but cannot verbally communicate to make drinks requests. Unaware of drinks in his vicinity. Staff feed him food and drink on every occasion

<u>Staff characteristics</u>

Seventeen staff, of whom three were male, took part in the study. Staff were aged 20-64 years. One of the staff worked night shifts, whereas 16 worked predominantly day shifts. Staff carried out a range of duties from care work (8), housekeeping (3), activities (2), management (3) and kitchen work (1). Staff identified as White British, Indian, White Polish and White Romanian.

6.5.7 Vignettes

Vignettes are linguistic illustrations used to vividly transport the reader to the ethnographer's experience of fieldwork(300). I used the vignettes described here to portray specific moments during my fieldwork which illuminates how I attended to significant details, leading to my construction of the findings in this study.

Vignette 1: *Weekdays Late November – it was my first few days in the care home carrying out observations. I felt excited and slightly daunted to begin data collection, unsure where to start looking. I sat in a cosy armchair in the quiet lounge with my bundle of information sheets and consent forms on my lap. A resident was also in the lounge and was being spoken to by a carer. The carer introduced me to the resident as "the fluid lady". The carer was very friendly and welcoming to me and began telling me how they made drinks to residents' preferences including which drinks each resident preferred. The carer made a fuss of the resident. It seemed to me as if the carer could be performing to me, to show off their hydration knowledge, to me as audience. Beside the carer, was a steel trolley filled with black jugs, cups, beakers, straws and thickeners. Sweet treats accompanied the drinking objects on the trolley, such as cakes, fruit and cream. I was surprised to see the array of drinking equipment on the trolley as well as the carer's friendly and supportive approach in encouraging the resident to drink. I was not expecting to see such variety of food and drink.*

Analytical Commentary: When I began ethnographic observations in the care home, I did not know what to attend to and so started by attending to hydration care-related objects and routines. Some staff were initially very attentive towards me and to residents when I was present. What I noticed within a few weeks, as the ethnographic work progressed, is that despite the trolley looking appetising and laden with treats and choice of drinks, carers rarely actively offered residents a choice of drinks. Moreover, it became clearer that the trolley was for staff to eat from also, as well as residents and throughout the day and so not specifically for morning tea trolley time. I never saw staff give residents a choice of how their drink was made e.g. whether they had sugar, or stronger or weaker drinks. Residents were mostly always only offered one drink by staff and no refills. I also came to realise over time how staff did not support all residents to drink the full contents of a drink. Therefore, despite my initially noticing the drinking objects and interactions designed to facilitate drinking for people living with dementia, I came to construct how having drinks near residents did not always lead to residents consuming drinks.

Vignette 2: *Mid-December mornings. When I spent time in the small TV lounge, I increasingly noticed that drinks were provided differently to how they were provided in the other areas of the home. There was a small wooden table in the corner which had different* *bottles or jugs of drinks placed upon it, such as apple juice, soft drinks and squash. There was also a box of plastic straws and napkins on the table and a water cooler in the room. I had initially wondered if this greater availability of drinks in some areas may lead to more residents drinking in those areas. I noticed how only some of the residents had drinks placed on the tables positioned close to residents, whilst other residents did not have drinks on their tables. Each resident had a bowl in front of them on their tables. One staff member was busily visiting each resident with any food left in the bowls and spooning food from their bowls into residents' mouths and encouraging them to "eat". The staff continued this until the bowls of food were finished.*

Analytical commentary: I soon began to notice how staff giving residents food was prioritised over staff placing and giving drinks. Staff ensured that residents finished their food items but sometimes only offered residents a sip of drink. Sometimes drinks were used to 'wash down' the food or clear the resident's mouth, instead of sharing equal importance with food and eating. Despite drinks available on the small table, this did not lead to all residents having drinks available at all times, because residents were either unable to walk unaided or staff discouraged residents who were physical able to walk from moving around the lounge. The water coolers were never used by residents throughout the ethnography. After a couple of months, I began to develop a concept of 'drinking access' and 'drinks availability' relating to staff providing residents drinks and enabling residents to drink in the home. Residents needed drinks to be made and positioned on a table available to them, but also made specifically accessible to them e.g. within their reach. Unless staff did things to prioritise a resident drinking, then residents did not have drinks which were available or accessible to them. Other routines such as repositioning, delivering personal care or giving medications were prioritised over staff giving residents drinks. For example, staff moved drinks off residents' tables to make space for residents to take part in craft activities.

Vignette 3: *During my evening observations in the dining room in January, I observed one carer spooning food into the mouths of two residents who were informally known by staff as requiring assistance to eat and drink. The carer alternately held a cup to each of their mouths and tipped the cup until each resident had consumed most of the contents but neither resident fully consumed the drink. Meanwhile, I could see into the other lounge that one resident was sat with no table near them and thus no drink. Another resident was sat at a table alone in the dining room with a drink in front of them. I watched as the resident kept trying to touch the beaker with their fingertips but was unable to reach it to grasp it. These two residents were considered informally by staff to be able to drink independently and so were not known by staff to require drinking assistance. I had started to notice residents'* *varying abilities to consume drinks, as well as how staff physically assisting a resident to consume drink led to constructing those residents' drinking opportunities.*

Analytical Commentary: I noticed how staff consistently assisted residents who had been assessed as needing assistance to eat and drink, but they rarely gave support, encouragement or prompts to residents that were informally known by staff and perhaps documented somewhere in care records, as being able to drink independently. I repeatedly witnessed incidents showing how many of these 'independent' residents would have benefited from support from staff to drink. I observed how physical assistance from staff led to residents consuming drinks but that if staff stopped giving this physical assistance, residents stopped drinking. I soon began to notice how residents mostly did not receive drinks if they did not have a table positioned near them and occasionally also missed receiving drinks at routine times. I started to notice how staff often saw their role in 'drinking' as providing drinks, not to people, but to residents' tables for most residents, unless staff informally knew from other staff that the resident was designated as needing assistance. This did not include many as needing assistance. I began to see how drinking in care homes was not a single isolated event, but happened through constructing a process and staff providing residents a drink to their table was just one step in that process. I came to see how drinking was often deprioritised against other activities and routines in the home, such as food and eating.

Vignette 4: *Lunchtimes early February – I routinely experienced the dining room to be very noisy from the loud radio, staff chatter and the pulling of equipment, and I experienced it to be chaotic and busy with many staff moving in all directions, some moving equipment, some moving residents in wheelchairs and some carrying food. Whilst some staff were moving from the kitchen to the dining room carrying plates of food, other staff passed through the dining room moving hoists, wheelchairs and laundry trolleys in different directions. The radio played loudly with 80s pop music and staff laughed and chatted loudly. I noticed that I was now alerted to how only two residents independently used the jugs to pour their own squash. As I watched, one resident continued to murmur that they needed help but no staff responded to them. I was paying attention to what residents did, or didn't do, which led to them drinking and noticed how residents who were more easily able to drink independently were more likely to be given access to more drinks by staff. These drinkers could drink without staff needing to prompt or physically assist residents to hold cups or beakers. Staff were more likely to give these residents another jug of squash for them to pour themselves drinks from. Residents who took longer to drink smaller quantities of drink were less likely to be assisted by staff to drink. Sometimes staff did assist these residents by holding the beaker spout or straw, to the resident's mouth and gave them an opportunity to take a few* *sips, but staff rarely allowed residents enough time for these residents to finish the entire drink.*

Analytical Commentary: Mealtimes provided few opportunities for residents to socialise as staff allocated residents to table positions. The noise levels in the dining room were often too loud for residents with communication difficulties to communicate with each other. I had now begun attending to the characteristics of residents who drank independently and noticed that those individuals were more regularly offered drinks by staff than residents who required assistance or were slower drinking. Drinks provision was therefore not consistent despite there being routine opportunities. The loudness of the dining room made it difficult for residents with quieter voices get noticed by staff, which led to these residents not receiving assistance with their drinks. I came to construct how residents with quieter voices often only received drinks from staff at the set routine drinking opportunities. I also noticed how staff were more likely to assist residents to eat by spoon-feeding them, than assisting them to drink. This was another example of how drinking was deprioritised.

Vignette 5: *Early march, I had begun to further test out my theory of how food was prioritised over drinks. In the small lounge I saw how staff served food first to resident and then offered drink, in ways showing it as emphatically secondary to food. A resident had been asking for a drink, but the only staff member present was spooning porridge into a different resident's mouth. The same staff member then put a straw to the resident's mouth for them to sip for a few seconds and then placed the cup down on the table which the resident was unable to reach or grasp. The staff then finished spoon feeding the same resident porridge until they had emptied the bowl. The staff offered the resident three more sips of drink. This took longer than the spoon feeding. They then placed the drink down on the resident's table. The staff member left the room and the other resident waited with an empty cup on table until tea trolley time. This resident drank the full cup of tea as soon as it was served, but it was not refilled by staff. I could now clearly see how drinking was deprioritised against food and eating.*

Analytical commentary: The care home routines presented providing drinks as a one-time task for staff to carry out and complete and was not seen by staff as part of an ongoing process. I became able to see how the activities which contributed to and constructed residents' increased drinking, included staff delivering person-centred care for drinking, encouraging drinking or prompting a person to drink. I noticed how that, sometimes, even if a resident was able to communicate their want for a drink, staff did not always then provide them with a drink. Routine drinking opportunities mostly provided residents with a single drink and residents' drinks were not routinely refilled by staff. The staff actions and words were clearly emphasising how residents ‘needed’ to finish eating the contents of their bowl of food. In contrast, staff encouraged residents only to take some sips of drinks, rather than actively encouraging them to finish drinking the contents of the cup or beaker. This meant staff actions even when actually providing drinks, were constructing drinking as having less priority in care home routines.

Vignette 6: *Early April, early afternoon – while observing more closely after lunch, I saw a resident looking tired. The resident had a spouted plastic beaker placed on the small table positioned in front of them. The resident had grasped and lifted up the beaker and tried sipping through the straw stuck in the spout. The resident looked exhausted, and I noticed that they were no longer sucking any fluid up from the beaker through their straw. The resident tried again, then placed the beaker on the table and fell asleep. I increasingly noticed how many of the residents slept throughout the day. During medication round, a senior carer woke each resident who they were going to include in the medication round. Some residents had drinks on their tables, whilst others did not. The carer stood beside each resident, assisting them to drink the full contents of the small paper cup of water as this had been mixed with Laxido™ for residents experiencing constipation. The staff stood by, watching to ensure that the resident consumed all of the drink, before moving onto the next resident to give them their Laxido™. I saw how residents were not given choice over drinking equipment and ways in which this affected how residents consumed drinks. I also noticed that when staff were present in the communal spaces with residents and physically assisted or supports residents to drink, residents mostly always drank some drink.*

Analytical Commentary: I noticed how residents were rarely given a choice of drinking vessel but could nonetheless see how residents often seemed to drink more easily if they had an open-lidded cup. I also noticed that during medication rounds, residents who usually did not receive support to drink, did in these activities receive support from staff because they were required by staff to consume the medication. It was only during these times that I saw drinking prioritised in the home. I also noticed how staff only visited communal areas when carrying out routines relating to repositioning, delivering personal care, delivering medication, or delivering food or drink that staff did not often visit residents. I wondered how residents could possibly request drinks if staff were not around to be asked. I could now see drinking in care homes as being constructed within a process. How staff provided drinks was only one step in the process, but there were numerous interactive and dynamic influences on constructing how residents came to drink. So, as well as staff members providing drinks, they also needed to remain present, to be actively attentive to a person’s drinking and to provide residents with a preferred drink in a preferred drinking vessel, with appropriate support, to place priority on drinking.

6.5.8 Themes generated from the ethnography dataset

I generated five higher-level themes and 25 sub-themes, using inductive reflexive thematic analysis(294, 301) to analyse the corpus of data I generated from the ethnography.

The drinking map (Figure 6.3 below) shows how I observed drinking to be a continual process and how I observed many interplaying factors which enabled and disabled drinking from happening. Hydration care in the home was mostly enacted by staff placing a drink on a resident's table. The blue boxes show processes and acts which influenced whether a resident took a sip of their drink or not. The green boxes show 'resident characteristics' which influenced how well a resident was able to engage with the enablers of drinking on the map. The pink boxes show 'making drinks' which relate to how staff could maximise a resident's desire to consume a drink, therefore maximising their drinking opportunities. Residents were more likely to consume their full drink if staff facilitated more 'enablers' of drinking, such as facilitating routines, prompting residents to drink and staff assisted residents to drink, until the resident finished their drink.

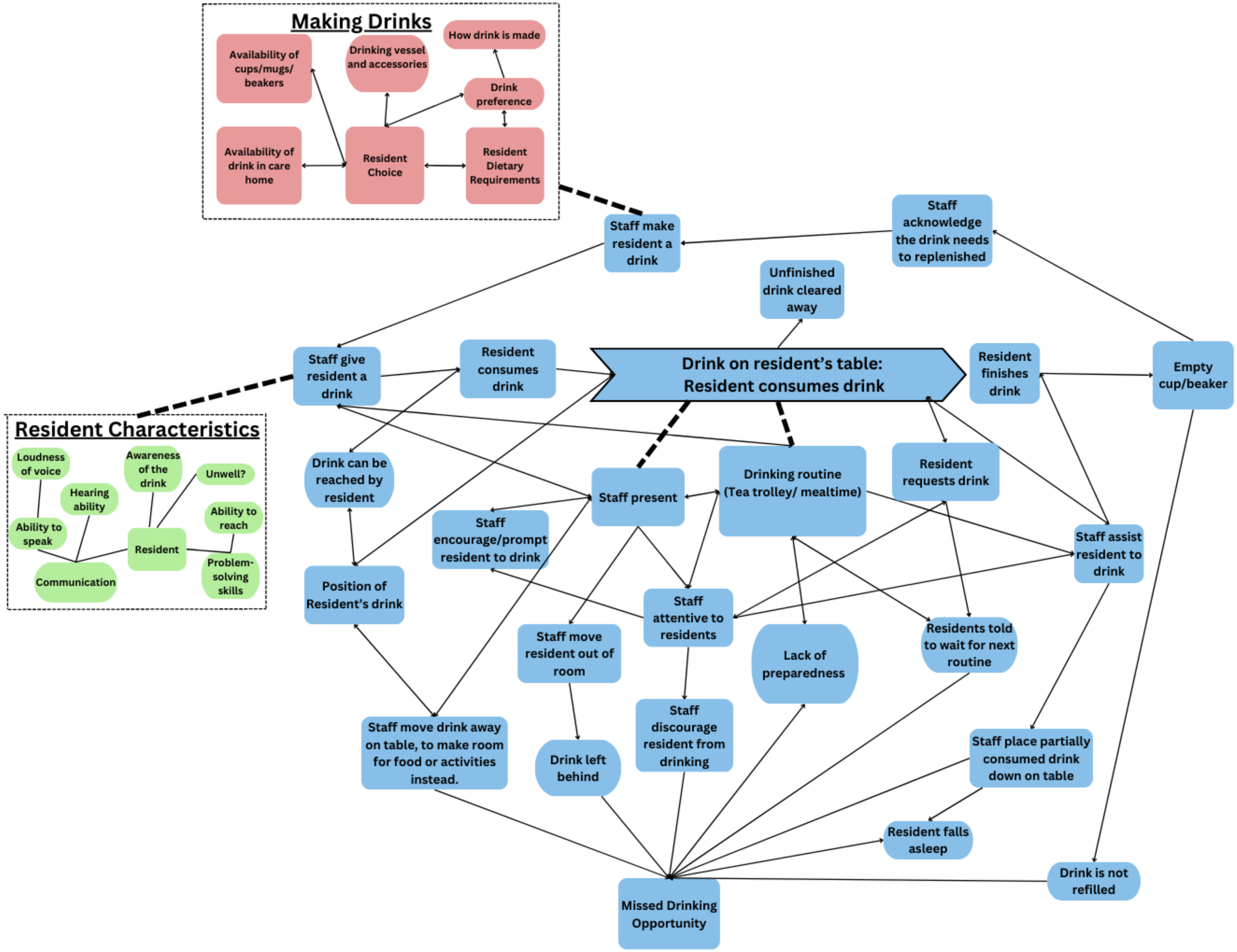
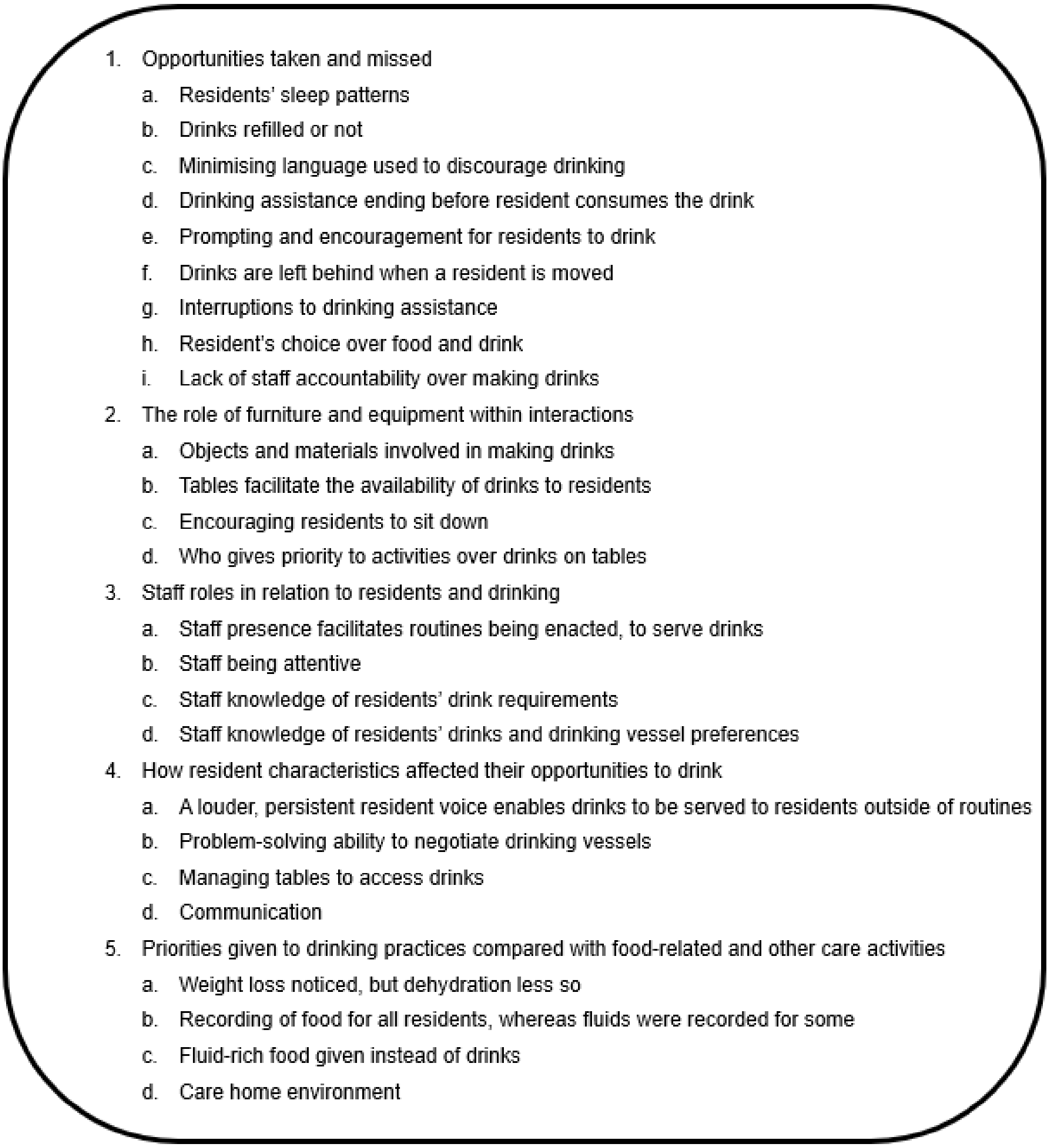


Figure 6.3: Visual representation of theme generation using Inductive Reflexive Thematic Analysis

The five higher level themes which related to how residents living with dementia consumed drinks, are:

1. Opportunities taken and missed
2. The role of furniture and equipment within interactions
3. Staff roles in relation to residents and drinking
4. How resident characteristics affected their opportunities to drink
5. Priorities given to drinking practices compared with food-related and other care activities



1. Opportunities taken and missed
    a. Residents' sleep patterns
    b. Drinks refilled or not
    c. Minimising language used to discourage drinking
    d. Drinking assistance ending before resident consumes the drink
    e. Prompting and encouragement for residents to drink
    f. Drinks are left behind when a resident is moved
    g. Interruptions to drinking assistance
    h. Resident's choice over food and drink
    i. Lack of staff accountability over making drinks
2. The role of furniture and equipment within interactions
    a. Objects and materials involved in making drinks
    b. Tables facilitate the availability of drinks to residents
    c. Encouraging residents to sit down
    d. Who gives priority to activities over drinks on tables
3. Staff roles in relation to residents and drinking
    a. Staff presence facilitates routines being enacted, to serve drinks
    b. Staff being attentive
    c. Staff knowledge of residents' drink requirements
    d. Staff knowledge of residents' drinks and drinking vessel preferences
4. How resident characteristics affected their opportunities to drink
    a. A louder, persistent resident voice enables drinks to be served to residents outside of routines
    b. Problem-solving ability to negotiate drinking vessels
    c. Managing tables to access drinks
    d. Communication
5. Priorities given to drinking practices compared with food-related and other care activities
    a. Weight loss noticed, but dehydration less so
    b. Recording of food for all residents, whereas fluids were recorded for some
    c. Fluid-rich food given instead of drinks
    d. Care home environment

FIGURE 6.4: 25 INTERACTIONAL INFLUENCES ON HOW A RESIDENT LIVING WITH DEMENTIA DRINKS IN A CARE HOME

Each theme is discussed below in relation to excerpts from my reflexive field notes.

Theme 1: Opportunities taken and missed

I observed numerous occasions when residents missed opportunities to consume their drinks in the care home or missed the opportunity to access more drink, such as residents sleeping, drinks being refilled, language used to discourage drinking, drinking assistance ending prematurely, encouragement and prompting to drink, drinks being left behind, interruptions to drinking assistance, residents' choice of drink and staff accountability over making drinks.

RESIDENTS' SLEEP PATTERNS

Most residents slept frequently in the daytime in the care home. Staff usually woke residents when they served drinks, which often remained on tables not fully consumed, when residents slept or woke periodically but then resumed sleeping. Staff sometimes assisted some residents to drink, but sometimes stopped assisting the residents when the resident had only partially consumed the drink. Sometimes staff stopped assisting residents due to beginning another care-related task or due to staff being interrupted, but this was mostly a staff decision to stop assisting, instead of a resident's decision to stop drinking. When the staff placed the partially consumed drink on the resident's table, the resident often then fell asleep. When residents were without staff assistance, some residents were unable to consume their drink as they could not handle the drinking vessel, or the drink was too hot to drink and so the resident fell sleep before consuming the drink, as here:

> ***-Mabel took a sip of her coffee through the spout of the beaker, looked at me and said "it's hot", so placed the beaker down on her table and shut her eyes-***
>
> ***(Mabel, Week 19, fieldnote p.126)***

Mabel showed an interest in wanting to drink the coffee through the beaker and took a sip, but because it was hot, Mabel chose to sleep instead. Mabel did not seek assistance from staff to cool the drink down and was not woken up when the drink had cooled down and so missed this drinking opportunity.

DRINKS REFILLED OR NOT

During the routine opportunities in the care home for residents to drink, which was tea trolley time and mealtimes, not all residents were enabled to drink all or some of the drinks apparently available. Residents were mostly only provided with one drink as part of the routine offering. Residents who drank more independently sometimes had their drinks refilled by staff. When residents required staff assistance to drink, staff mostly only ever assisted these residents to consume a maximum of one drink. Staff did not always assist residents to consume the full drink. When residents consumed a full drink, staff did not routinely offer them another drink, nor did staff offer to refill their drink.

-Staff member 9 then tipped up the beaker to Paul's mouth, until he pulled back. Paul then began swirling the drink round his mouth and started coughing… Staff member 9 then turned back from [watching two visitors who had just entered the dining room] to Paul and said "just a little dribble" and Paul slurped the last bit of drink from the beaker. Staff member 9 took Paul's apron off and walked off-

(Staff 9, Week 19, fieldnote p.103)

This fieldnote shows how the drinking act was 'done to' the resident by the staff member, rather than involving the resident as being an active partner in the process. It seemed that the carer was providing a drink at a faster rate than the resident could comfortably consume the drink and was distracted by the visitors as well. The staff member seemed focussed on getting the task of 'drinking' finished and did not follow this interaction up with the resident of offer an additional drink.

MINIMISING LANGUAGE USED TO DISCOURAGE DRINKING

Staff often used language, when serving drinks to residents or assisting residents to drink, which either encouraged residents to drink small amounts of drink or discouraged residents from drinking at all. Staff often used phrases to instruct residents that they needed to have a 'little sip' of drink or a 'little drink'. After the staff instruction, residents usually proceeded to drink one sip of drink. Sometimes when staff served hot drinks to residents, staff instructed the residents to wait for their drink to cool down or informed the resident that it was too hot to drink. Residents mostly did not then proceed to drink.

-Staff member 21 then asked Mabel "some wafers and a cup of tea? Cup of tea for Mabel?...Mabel, the tea's going to be quite warm, I've put a little more milk in there but you need to be more careful, cautious!....You like your tea though!"-

(Staff 21, Week 15, fieldnote p.91)

This fieldnote shows how at the routine tea trolley time, Mabel did not get a choice of drink and instead the staff member assumed what drink Mabel wanted. Mabel also did not get a choice in how the drink was made, as the staff member used milk to cool her drink. Despite the staff member attempting to engage with Mabel during tea trolley time, they discouraged Mabel from drinking and so Mabel began to eat her pink wafer instead of consuming her drink, perhaps for fear that it would be too hot to consume.

DRINKING ASSISTANCE ENDING BEFORE RESIDENT CONSUMES THE DRINK

Some residents drank better when staff attended to them and assisted them to drink. Some residents were unable to drink without staff assistance and so these residents always received staff support to eat and drink. Some residents were able to drink independently sometimes, but on other occasions, they benefited from having support from staff to hold the drinking vessel or straw for them. For these residents, the availability of staff support and assistance was inconsistent and unpredictable. When residents did receive support or assistance from staff to drink, the staff support often ended before the resident had consumed the full contents of the drink.

- Staff member 9 then walked over to Mabel and said “Mabel, would you like some more tea darling?”. Mabel responded “please!”. Staff member 9 continued standing, held the tea beaker for Mabel to drink from, and then placed a straw in the spout and placed the beaker down in front of Mabel. Staff member 9 then left Mabel, to sit beside another resident-

(Staff 9, Week 19, fieldnote p.107)

This staff member was overseeing multiple residents consume their breakfasts and morning drinks and clearing away their crockery and cups once finished. Mabel drank tea from the beaker when it was held by the staff member but did not consume anymore when the staff member placed the beaker down on the table and left her

PROMPTING AND ENCOURAGEMENT FOR RESIDENTS TO DRINK

Routinely when staff served residents drinks, they informed residents of the drinks being on their table and usually encouraged them to drink it. Whilst some staff later reminded or encouraged residents to consume the drink on their table, some staff did not remind residents. Most staff did not continually remind or encourage residents to drink; reminders or prompts were mostly a one-off. Some residents did not routinely drink unless prompted by staff or reminded of their drink on their table. One-off staff prompts rarely led to residents consuming a full drink.

-Staff member 12 then entered the TV lounge, turned the TV on, pointed to Mabel’s drink and said “Mabel, are you gonna drink some more of this?”. Mabel picked up the beaker and had a sip of the straw and nodded smiling at Staff member 12. I asked Staff member 12 what was in the beaker and Staff member 12 commented “milkshake”. Staff member 12 then walked out of the lounge-

(Staff 12, Week 20, fieldnote p.142)

Mabel had been identified as losing weight during weekly weigh-ins and so had been allocated a diet of two fortified milkshakes daily. This fieldnote shows how when Mabel was reminded by the staff member she took a sip of drink. However, Mabel did not drink anymore and the staff member left without providing any further assistance to Mabel. This was more surprising to me given Mabel was given the milkshake due to concerns around her weight loss and yet staff did not take extra time to assist Mabel or prompt her further to finish the drink. On this occasion, Mabel did not drink anymore and the milkshake was left at her table as staff took her to her bedroom.

DRINKS ARE LEFT BEHIND WHEN A RESIDENT IS MOVED

Some residents were unable to mobilise independently. These residents required staff to hoist them into wheelchairs to be moved around the care home. These residents did not often get a choice as to where staff moved them to. When staff moved residents to a different room in the care home, the staff did not take the drink with the resident. Drinks were always left behind.

-Staff member 16 and Staff member 12 then wheeled the hoist and Mabel out of the lounge in her wheelchair. I waved goodnight to Mabel and she smiled. The beaker of half-filled milkshake and a pink wafer biscuit were left behind on the small table by Mabel's chair-

(Staff 16 & 12, Week 20, fieldnote p.144)

This observation happened just before 6pm. No staff had remained in the lounge around this time, aside from when the chef briefly visited to serve supper, and carers had briefly entered and left. Staff did not continue to ensure residents finish their drinks over a longer period of time. Staff did not vary the ways in how they approached residents who did not drink easily. I did not observe any occasions where staff picked up drinks to take with the resident when they moved rooms.

INTERRUPTIONS TO DRINKING ASSISTANCE

Some residents received support or assistance from staff to consume their drinks. Staff enacted this support to residents by holding the drinking vessel or straw to a resident's mouth so they could drink. However, drinking assistance was sometimes interrupted by other care home duties or routines. I observed drinking assistance interrupted by staff needing to complete medication rounds, answer the phone, respond to a call bell, answer the door, go on staff breaks or needing to attend supervision. An example of this was when a staff member was serving drinks from the tea trolley in the main TV lounge and another staff member encouraged the staff member to “finish up” the tea trolley round because they were short-staffed and staff needed supervision.

> ***-Staff member 3 then entered the lounge quite hurriedly and told Staff member 21 “don’t focus too much on activities now as (name) has gone home”. Staff member 3 continued to repeat that she wanted a quick supervision with all staff this afternoon also, so encouraged Staff member 21 to quickly finish up the trolley-***
>
> ***(Staff 3 & 21, Week 15, fieldnote p.92)***

Staff did not always prioritise drinking assistance and residents’ time drinking was not protected. On this occasion, staff member 3 prioritised staff supervision over residents having assistance from staff member 21 to consume their drinks. The task of ‘drinking’ was mostly viewed by staff as the act of providing drink to residents and assisting residents to drink was viewed as an additional task if there was time and resources to do so. This fieldnote reflects the dynamic context of the care home in that a staff member had gone home leaving them short-staffed. Staff also required supervision, presumably as part of training or to meet regulations and so this was prioritised by the home management.

RESIDENT’S CHOICE OVER FOOD AND DRINK

Residents were routinely given a choice of two main meal options daily. Menu choices were written on the blackboard in the dining room and sometimes discussed with some residents, but this was not often an in-depth conversation with any resident. Some residents did not attend the dining room and so they would perhaps be unaware of these options. Residents who were unable to verbally communicate or less likely to make verbal requests, often did not get a choice of food at breakfast or teatime. At suppertime, staff served foods like sandwiches to residents. Residents were often served hot drinks at breakfast and tea trolley times, whereas at lunch and teatime, meals were often accompanied by cold squash. There were occasions when different drinks were offered, such as lemonade and milkshakes, but staff did not offer these as regularly. Some staff offered residents a choice of tea or coffee at routine times, but often residents were given the drink which staff assumed the resident wanted. If a resident was able to verbally communicate and were able to communicate loudly enough to be heard by staff, they were more likely to be able to request their preferred drink. Residents did not get to choose how their drink was made, in relation to the temperature, milkiness, thickness or sweetness. On just one occasion, I observed staff ask residents for what their favourite food options were and what meals they wanted for the forthcoming week. I observed that this involved limited interaction with residents and completed based on what the staff member thought the resident may want to eat. Whilst food preferences were documented by staff, residents were not asked about their drink preferences.

-Staff member 18 checked the temperature of the tea beaker and commented to me that she finds it difficult with the temperature of drinks because she doesn't want to "undermine" a resident's preference for drinks temperature, but also doesn't want to leave a resident with a burning hot drink. Staff member 18 then added more milk to the beaker and stirred the thickener with a spoon-

(Staff 18, Week 12, fieldnote p.84)

This fieldnote shows how the staff member was aware of them balancing the risk of providing a resident with a 'burning hot drink', whilst potentially making a drink not to their preference. On balance, the staff member chose to potentially jeopardise the taste of the drink to provide a cooler drink to the resident. The staff member did not involve the resident in these decisions. I did not routinely observe any other staff members actively reflect or discuss these decision makings.

LACK OF STAFF ACCOUNTABILITY OVER MAKING DRINKS

Occasionally residents did not receive drinks from staff when no particular staff were identified as accountable for making the resident's drink. When staff delegated other staff to make a resident drink, sometimes these residents did not receive their drinks. An example of this was when three members of staff successively missed the opportunity to provide a resident with a drink:

-Staff member 4 then walked back into the dining room with an empty beaker and asked if someone could get Joyce some more tea-

No-one made the resident a drink as requested by the staff member. The resident shouted for help and so later on, another staff member attended to the same resident:

-When SP01 had said goodbye to the visitors, she walked into the quiet lounge and said "what the matter, Joyce?". Staff member 1 walked back into the dining room and said "can you just get Joyce another tea in there?" and handed Staff member 5 the beaker-

That staff member did not make the resident a drink either. Later on, a fourth staff member entered the room where the resident was sat, and the resident requested a drink from the staff member.

-Staff member 9 walked into the quiet lounge and I heard Joyce say loudly "get me a cuppa tea!"-

(Staff 4, 1 &9, and Joyce, Week 19, fieldnote p.107-8)

These notes show how in the busy context of a care home, it was easy for staff to forget to carry out certain tasks such as providing a resident a drink outside of routine drinking times. Staff requesting other staff to make a resident a drink did not facilitate Joyce getting her drink. Instead, when Joyce eventually shouted and staff attended to her and visited her, Joyce managed to get staff to make her a drink.

Theme 2: The role of furniture and equipment within interactions

I observed how staff used equipment and furniture to provide residents with drinks. If some particular furniture and equipment were not available, this could mean staff could not make and serve drinks to residents. I also observed how residents interacted with the furniture and equipment to enact drinking. In this next section I discuss how objects and materials were involved in making drinks, how tables facilitate making drinks available, residents were encouraged to sit down and how staff gave priority to activities over drinks on tables.

OBJECTS AND MATERIALS INVOLVED IN MAKING DRINKS

Cups, mugs, plastic beakers spoons, straws, sweeteners and thickeners were items and equipment often used to accompany the tea trolley. However, on some occasions at tea trolley times, there was insufficient equipment for drinks to be made. There were not always enough cups or mugs on the tea trolley for all residents to have a drink. Sometimes there was no sweetener on the tea trolley for residents to have drinks made to their preferred taste.

-Staff member 18 walked back into the lounge and collected Joyce's plate and beaker from Joyce's table and left. Staff member 18 walked into the lounge again and said "they haven't washed all the cups" and left the lounge again. Joyce looked at me and laughed-

(Staff 18 and Joyce, Week 20, fieldnote p.140)

Staff member 18 had just offered Joyce a lemonade and left the room to make this. Instead of bringing the lemonade, the staff member needed to retrieve Joyce's dirty plate and beaker to return to the kitchen so that Joyce could have a drink. Joyce was left without any drink until the staff member returned with the plastic beaker filled with lemonade.

TABLES FACILITATE THE AVAILABILITY OF DRINKS TO RESIDENTS

The availability of tables was central to any resident being provided with a drink. There was an informal and non-spoken rule in the care home that residents were to remain seated. Staff encouraged residents to sit down within the care home instead of moving around. If a table was not positioned near to a resident, then that resident did not receive a drink. Even when tables were positioned next to residents initially on a morning, sometimes these tables were moved by staff during the day which resulted in residents' drinks also being moved away from residents. Occasionally staff placed residents' drinks on windowsills, which were out of reach of residents, but this did not happen regularly.

-Staff member 16 moved the resident's table with drinks away from the resident, to make room to use the standaid-

(Staff 16, Week 14, fieldnote p.70)

If residents walked around the care home, they did not have drinks near to them and so these drinks were not provided with drinks until routine drinking opportunities.

-Roger *was laying on the floor (no drink)-*

(Roger, Week 19, fieldnote p.126)

These fieldnotes show how residents only had drinks provided to them, if they had a table positioned close to them, with the informal rule that residents were expected to remain seated.

ENCOURAGING RESIDENTS TO SIT DOWN

Staff acted to discourage residents from walking around or lying down on the floor. Residents who were mobile were encouraged to sit in chairs and remain seated. Some residents did wander around rooms of the care home but were mostly guided by staff to sit down in chairs to eat and drink. Residents were therefore dependent on staff to make them drinks and bring them drinks to where they were sitting. Staff were less likely to assist residents to drink when they were standing up or moving around.

> ***-Staff member 13 said to Roger "please, please, please, come on Roger" and walked Roger over to the armchair for him to sit down-***
>
> ***(Staff 13, Week 19, fieldnote p.119)***

The staff member was persistent in encouraging the resident to move to sit in an armchair. The staff member did not then proceed to spend time with the resident or offer him a drink. The staff member then left the room and Roger got up from the armchair and began to wander.

WHO GIVES PRIORITY TO ACTIVITIES OVER DRINKS ON TABLES

Because residents mostly remained sitting in chairs throughout the daytime, activities were often brought to residents. Activities were placed on residents' tables, such as colouring sheets, laminated pictures or threading. However, as activities were placed on residents' tables, staff either removed the drinks off residents' tables or moved the drinks to the far end of the tables so that the activity was within the resident's reach instead of the drink. For residents unable to verbally communicate, or less likely to make requests to staff, these drinks were then unavailable and inaccessible to residents

> ***-Staff member 5 moved Geoffrey's tea beaker and bowl from his table and placed on the staff table and put the activity crafts onto his table instead-***
>
> ***(Staff 5, Week 20, fieldnote p.137)***

This fieldnote shows practices whereby drinking and eating implements were replaced with activity equipment due to lack of space on the table.

Theme 3: Staff roles in relation to residents and drinking

I did not observe residents make or access drinks themselves, despite water coolers and a kitchenette being available in communal spaces. Residents were encouraged to remain seated by staff. Staff routinely made drinks for and provided drinks to residents, mostly during set routine times. Some staff assisted some residents to drink. I observed maintenance staff, kitchen staff, activities staff and care staff make and provide drinks to residents. I mostly observed activities and care staff assist residents to drink, though occasionally some kitchen staff also assisted. I observed some management staff prompt or remind residents to drink, as well as asking other staff to make residents drink. The following section discusses how staff presence facilitates routines being enacted, staff being attentive, staff knowledge of drink requirements and staff knowledge of residents' drinks and drinking vessel preferences.

STAFF PRESENCE FACILITATES ROUTINES BEING ENACTED, TO SERVE DRINKS

Residents did not access the kitchen and did not access the water coolers to make themselves drinks. Residents were therefore dependent on staff to make and serve them drinks. All residents had water jugs in their rooms, but many residents were not mobile and thus unable to access "their" water jug. Whilst some residents requested drinks outside of routine times, most residents only received drinks during the tea trolley times and mealtimes. If staff were not available, then routine drinking times, such as the tea trolley, could not be facilitated.

-Staff member 18 and Staff member 13 then walked into the lounge with the tea trolley. Paul was standing close to the trolley, wandering slowly and Staff member 18 turned to Paul and said "Hello Paul,, what you fancyin'? What you fancyin?"-

(Staff 18 and Paul, Week 19, fieldnote p.133)

Paul was unable to access drinks until the staff entered the room with the tea trolley and offered him a drink. Staff facilitate these drinking routines, enabling residents to access drink from the tea trolley provision.

STAFF BEING ATTENTIVE TO RESIDENTS' NEEDS

When staff paid attention to the wants and needs of residents, they provided residents with the drinks they requested and aided residents to consume the drinks. Staff often focussed on completing previously set tasks and routines and so were less aware of individual resident needs outside of set routine times, such as tea trolley and mealtimes. Occasionally, staff deviated from their tasks and had conversations with residents, which sometimes involved the staff member asking the resident if they wanted a drink. During these one-on-one conversations, the staff members were more likely to hear the requests of residents with much quieter voices. The voices of quiet residents were often drowned out by the noise and busy activities of the care home. Some staff were more attentive to residents who were unwell or had been identified as losing weight. Some staff spent longer encouraging residents to drink by holding the beaker or cup to the resident's mouth and making the drinking fun and part of a sociable interaction, until the resident had drained the whole drink.

-Staff member 5 then held the beaker for Mabel and put the straw to Mabel's mouth for her to drink. SP01 then left the lounge. Mabel finished the whole beaker of

milkshake. Staff member 5 jumped up and did a little dance and told Mabel that she was doing the milkshake dance and Mabel laughed-

(Staff 5 and Mabel, Week 19, fieldnote p.120)

Staff acted to encourage and help Mabel drink, by spending time with her and making drinking fun.

STAFF KNOWLEDGE OF RESIDENTS’ DRINK REQUIREMENTS

Different staff working on different shifts had different, sometimes conflicting, understandings of the dietary requirements of residents. Some residents with dysphagia were prescribed thickener and some residents had sweetener in their hot drinks, instead of sugar due to having diabetes. However not all staff were aware of these health needs. If staff were unsure of the residents’ health needs, staff either did not provide residents with an alternative drink to their resident’s preference, or on some occasions, residents not identified might not be provided with a drink.

-Staff member 18 mentioned to Staff member 3 that she didn't know the resident’s name and didn't know what she would eat or drink. Staff member 3 walked over to the staff table and commented that there would be something in her records which would indicate her preferences-

(Staff 18 and Staff 3, Week 14, fieldnote p.74)

Staff did not routinely ask residents about their own preferences. On this occasion, staff discussed this issue between themselves and the potential to check the resident’s preferences in their care records. Staff were unable to check the resident’s records, because they did not know the resident’s name. This highlights the importance of staff knowing residents well to provide optimal care and how staff knowledge, or presumed knowledge of residents’ preferences, facilitate residents receiving drinks to a degree.

STAFF KNOWLEDGE OF RESIDENTS’ DRINKS AND DRINKING VESSEL PREFERENCES

Staff presented most hot and cold drinks in the care home in plastic spouted beakers, sometimes with a straw poking through the spout. Some drinks, or some residents, were served in porcelain mugs. During medication rounds, staff served drinks in paper cups from the water cooler. Different staff working on different shifts had different knowledge of what they perceived the residents’ favourite drinks were, and the optimal drinking vessel for residents to drink from. Some staff said that some residents drank better with straws, whilst other staff made drinks for residents without straws. Some staff routinely made drinks in the same way for all residents irrespective of individual resident needs or preferences. Whereas some staff made drinks in the way that they thought the resident preferred the drinks, which was sometimes different to how other staff made and presented the same drinks.

> ***-Staff member 15 then wheeled the tea trolley into the lounge. Staff member 15 poured each resident tea into a china/porcelain mug… I asked Staff member 15 why he was using mugs, and asked if this was any set guidance around what mugs to use. In the daytime, I mostly saw these residents with plastic spouted beakers. Staff member 15 mentioned that these residents were all able to lift these mugs and that he knows the residents well-***
>
> ***(Staff 15, Week 13, fieldnote p.63)***

This fieldnote reflects how night staff had their own practices relating to providing drinks, which differed to daytime staff. This staff member actively selected mugs to enable more residents to drink, based on their knowledge and experience of the residents.

Theme 4: How resident characteristics affected their opportunities to drink

I observed how some residents had abilities which enabled them to drink drinks more efficiently and completely. I observed how some residents' abilities were variable across a day. Sometimes residents were able to drink more independently, whereas sometimes, the same residents needed assistance from staff to consume a cup, in the same day.

A LOUDER, PERSISTENT RESIDENT VOICE ENABLES DRINKS TO BE SERVED TO RESIDENTS OUTSIDE OF ROUTINES

Many residents had quiet voices and some of them were no longer able to verbally communicate. The care home was often noisy in the daytime making it difficult for staff, other residents or visitors to hear residents' voices over the background noise. Staff were not always present in the communal areas and so residents with quiet voices had no means of getting staff attention for them to request a drink. These residents often waited for staff to provide them with drinks during the set routine times, but without being noticed waiting. An example of this was:

-Geoffrey looked at the senior carer at the staff dining table, and muttered something quietly, with his arms resting on the arms of the armchair. Geoffrey muttered something quietly again but did not get the attention of the senior carer-

(Geoffrey, Week 19, fieldnote p.130)

In this case, Geoffrey ‘muttered quietly’ as a way of requesting support but this did not work to gain staff attention. Residents who were able to verbally communicate effectively with staff by shouting from where they were sat, eventually had their hydration needs met by staff outside of routine periods.

PROBLEM-SOLVING ABILITY TO NEGOTIATE DRINKING VESSELS

I observed that some residents were able to drink independently and how they made this possible by, for instance, puzzling out how to handle the plastic beakers to access the drink contained inside. These residents were able to lift and tilt the beaker to their mouth to consume the drink through the beaker spout. Some residents were able to remove the straw or lid from the beaker, enabling them to access the remaining fluid in the beaker:

-Joyce then lifted the lid off her beaker an, whilst holding the beaker lid and straw in her hand, poured the last dribble of tea from the beaker into her mouth-

(Joyce, Week 19, fieldnote p.114)

Some residents required numerous attempts at sucking through the straw or tilting the beaker to drain every drop of fluid. Some residents, despite attempting to finish the drinks, did not attempt different strategies to drain the drink through the straw or beaker and therefore sucked air and did not persist drinking any further. Beakers often remained on tables partially consumed.

-Mabel lifted her plastic beaker and sucked air through the spout of the beaker, then said “please let me go back to bed darling”... Line 5031: “Mabel picked up the tea beaker again and sucked air through the spout and said “help me darling”-

(Mabel, Week 19, fieldnote p.106)

Mabel was unable to reach the drink in her beaker due to being unable to lift and tilt the beaker. Mabel asked me for help, because I was in her vicinity and no staff were available.

MANAGING TABLES TO ACCESS DRINKS

Some residents were able to reach across their table to grasp their drink whilst others were unable to reach the cups, especially if other items were placed in front of the cup on the table, such as plates and activities. I observed one resident carefully and very slowly move the table towards them with their feet to reach the drink off their table. If residents were able to verbally communicate and staff were present and attentive, then residents could request assistance from staff to reach the drinks on their behalf.

> ***-As Staff member 4 was sorting the TV, I observed that Joyce was trying to reach the drinks on her table. Joyce then said "can you pass me them?". Staff member 4: "Do you want me to move the table for you?*"-**
>
> ***(Staff 4 and Joyce, Week 12, fieldnote p.58)***

Joyce was able to verbalise and clearly communicate to the staff member that she wanted the drinks closer to her. Joyce was able to communicate with this staff member because they were present and available in her vicinity. The staff member was responsive to Joyce's needs and moved the table with drinks positioned on it, closer to Joyce, to facilitate her access to drink.

STAFF AND RESIDENTS' COMMUNICATION

Most staff and residents communicated through spoken words, body language and facial expressions and through listening. However, not all residents were able to verbally communicate or understand verbal communication. It seemed particularly difficult for residents to communicate when staff were required to wear masks to protect against Covid-19 transmission. I often observed residents gesture to staff to pull their mask down and staff responded by pulling their mask down to their chin, to communicate to residents. Residents with hearing difficulties did not always accurately hear what staff verbally communicated to them. Some staff whose first language was not English, did not always understand what some residents had verbally communicated to them regarding food and drinks preferences:

> ***-Staff member 13 asked "what do you want for lunch?". Joyce said "I'm now having lunch?". Staff member 13 walked off laughing and said to me "I don't understand her, she kill me*"-**
>
> ***(Staff 13 and Joyce, Week 12, fieldnote p.61)***

Staff did not always give priority to meaningfully engage with residents. This was also the case around food and drinking interactions in which these interactions were not dyadic. Instead of resolving the misunderstanding that the staff member had alluded to, they continued with their task and left the room. This also highlights how little priority this staff member gave to the resident's lunch food preferences.

Theme 5: Priorities given to drinking practices compared with food-related and other care activities

I observed many instances in which staff prioritised food and eating over drinks and drinking within their actions and their language, within the care home. Food and eating were also prioritised within the care home environment. It seemed to me that staff assisting residents to eat was easier than assisting residents to drink. It was often quicker for staff to assist residents to eat than drink. I often observed staff ensure that a resident finished a meal or bowl of food, whereas staff were often less likely to assist a resident to finish a drink. Staff spoke about certain foods as being treats or enjoyable, whereas drinks were discussed as a task or activity that needed to be completed. In this next section I discuss how weight loss was noticed whilst dehydration was not, food intake was recorded whilst drinks intake was only recorded for some residents, fluid-rich food was given to residents instead of drinks and how the care home environment deprioritised drinking.

WEIGHT LOSS NOTICED, BUT DEHYDRATION LESS SO

Dehydration was not discussed or considered by staff within my time in the care home. Staff commented on residents' appearance as to whether residents may have lost weight. Some residents were weighed weekly using scales. All residents were weighed when they initially moved into the care home. During my time observing in the home, staff told me that some residents had lost weight after becoming unwell from the infectious outbreaks after which they then more closely monitored the weight of these residents. Staff sometimes provided these residents with fortified milkshakes to increase their calorie intake and compensate for their weight loss. Milkshakes were not usually a standard drink offered to residents in the care home as a drinks option.

-Staff member 18 then showed me an A4 sheet on top of the tea trolley which stated the names of the residents who were being monitored for weight loss, which included Roger and Mabel, and said that these residents needed to have fortified milkshakes twice a day-

(Staff 18, Week 20, fieldnote p.149)

The fieldnote shows how these milkshakes were only provided as part of a response to management concerns around residents' weight loss, rather than as part of a routine provision of enjoyable drinks for residents. Attention was incidentally placed on drinking as a way of encouraging residents to gain weight. There was no routine monitoring of dehydration or fluid intake across all residents.

RECORDING OF FOOD FOR ALL RESIDENTS, WHEREAS FLUIDS WERE RECORDED FOR SOME

I was informed by management and staff that the fluid intake goal for residents was 1000ml and that staff recorded the fluid intake of all new residents for the first month of them entering the care home. After that, staff recorded and monitored some residents' fluid intake if they consumed less than 750ml of fluids within a 24-hour period. However, staff recorded and documented the food intake for all residents in residents' care records. Staff informed me that staff did not always record how much fluids that residents consumed accurately.

-Staff member 15 told me that not all residents are on fluid charts and that he wasn't sure why some residents were. Staff member 15 told me that some residents are also put on fluid charts if they drink too much. Staff member 15 told me that some carers record how many ml they have provided in a cup to a resident, rather than deducting what didn't get drunk-

(Staff 15, Week 13, fieldnote p.65)

FLUID-RICH FOOD GIVEN INSTEAD OF DRINKS

Staff recorded soups, yoghurts and jellies as fluids on residents' fluid intake charts. Some staff recorded mousses as fluids, whereas other staff did not consider this to be a fluid. Most residents did not have their fluid intake recorded by staff and so the fluid intake charts were mostly for residents who were not consuming enough fluids.

-I asked Staff member 12 if yoghurts contributed to fluids on fluid charts. Staff member 12 told me that yoghurts count 75ml towards fluids-

(Staff 12, Week 15, fieldnote p.83)

This fieldnote shows how food is given more importance than drinking and potentially easier and quicker for staff to give fluid-rich food to some residents, rather than giving some residents drinks. For residents who were unable to eat or drink without assistance, I observed numerous instances where staff gave these residents fluid-rich food instead of the residents being offered drinks. I also observed numerous instances where the staff assisted these residents to consume some drink, but then gave the residents fluid-rich food to consume instead. I did not observe residents to get a choice about this.

> ***-I observed Staff member 17 touch Roger's mouth with a spoon, and then Roger would open his mouth for the spoon of jelly. When Roger had finished the small bowl of jelly, Staff member 17 wiped his face with a napkin, and cleared his plates, bowl and cutlery away. Staff member 17 did not make or offer Roger a drink-***
>
> ***(Staff 17 and Roger, Week 12, fieldnote p.56)***

Staff carefully attended to aspects of feeding and eating with Roger but did not apply the same attentiveness to Roger's drinking.

CARE HOME ENVIRONMENT

There were three water coolers in the care home, but I never observed a resident use these to access a drink. Staff used the water coolers to fill up their water bottles or to mix medication into cups to give to residents. Jugs of squash were placed on dining tables and on the sideboard in the main dining room during lunch and dinner times. In the small communal area, jugs of squash and straws were placed on the small table. Residents participating in this study did not access these drinks independently. Food was advertised in the care home environment whereas drinks were not. On one entrance to the dining room, there was a laminated picture of a plate of food and cutlery to signify the dining room. There was a menu board on display in the dining room which was updated by staff daily. The menu board always had two lunchtime meal options written on it as well as a pudding. There was also a 'specials' board in the dining room which had cakes and sweet treats written on it. There was no daily drinks menu.

> ***-I noticed on the board, painted on the back wall, that it said "Today's specials: homemade jam tarts and lemon curd, homemade lemon cake"-***

6.6 Discussion

This ethnographic study aimed to explore and examine how older care home residents living with dementia consume drinks. I employed a social constructionist approach(286, 292) to conduct this research which enabled me to examine how staff and residents' actions, interactions, body language, language and care home routines, practices and environment led to residents living with dementia drinking. This section discusses the findings generated from this study, notably the 25 interactional influences on drinking, that 'one size does not fit all' when considering how people living with dementia consume drinks and considering that residents' drinking in the care home comprised a cyclical process. The next section discusses the finding from this present study with the existing literature and evaluates the strengths and limitations of the research.

6.6.1 Summary of findings

When I first begun observations in the home, I initially attended to the more apparent routines which facilitated drinking opportunities, such as mealtimes and tea trolley times. At first, I broadly attended to the act of how staff supported some residents to drink, such as the equipment involved. However, as data collection progressed and more participants became involved with the study, I learned more about the predictable patterns of how hydration care was delivered in the home and so I attended to more of the nuances and intricacies of interactions, actions and language used between staff and residents, within the home. I was then able to examine which of these influences led to residents drinking over my prolonged engagement with the care home and the social actors within it. During the study, I learned how drinking happened in a cyclical process, in that if staff were present and attentive and ensured that potentially all 25 influences on a residents' drinking were supported (Figure 6.4), then residents would consume drink and have their drink replenished ensuring that the resident was hydrated (Figure 6.3).

I found that a 'one size does not fit all' when considering how people living with dementia consume drinks in a care home. In this study, all residents living with dementia demonstrated different drinking abilities, received varying levels of encouragement to drink by staff, were offered different opportunities to drink and attended to drinking in different ways. Some residents with louder and persistent voices were better able to get the attention of staff to make and serve them drinks outside of routine times.

Staff were integral to hydration care provided in the care home. Staff engaged with residents in different ways when providing hydration care. When staff were present and attentive, they enacted routines which led to residents being provided with drinks at routine times. Very occasionally, staff were more attentive to some residents and provided them with drinks outside routine times. Staff knowledge of residents' preferred drinks and drinking vessel sometimes led to residents consuming drinks, but sometimes the staff's knowledge of the resident's preference did not align with what the resident wanted at that moment in time.

I observed countless opportunities for residents to drink in the home, however sometimes these opportunities were seized by staff and sometimes they were missed (Figure 6.3). Residents had six routine opportunities to be provided drinks by staff during tea trolley times and mealtimes in the care home. Staff assisting residents to drink were sometimes interrupted by other staff, phone calls or the doorbell ringing, which often led to prematurely ending their assistance to residents, resulting in residents stopping drinking. Staff did not always actively take opportunities for residents to drink enough of their drinks during set drinking times. This included staff not assisting residents to finish a beaker of drink, not refilling their drinks after a full drink was finished, or not reminding and prompting residents to drink until the drink was fully finished.

Care home staff activities had the effect of deprioritising drinking-related activities compared to other care home activities such as eating, activities and personal care. Staff used language which minimised the act of drinking, such as ‘have a sip’ instead of encouraging and supporting residents to drink full contents of drinks, whereas eating activities were universally promoted in the home, care home environment and care processes. Sometimes, drinking activities were replaced by eating activities.

Type and placement of furniture and equipment within the care home facilitated or inhibited drinking, such as small resident tables, cups and sweetener. When staff did not fully prepare the equipment for routine drinking times, residents’ opportunities for drinking were limited. When residents had inadequate or inappropriate drinking equipment, which was not tailored to their needs, this also sometimes limited their resident’s ability to consume the drink.

6.6.2 How do these findings relate to the existing literature?

Actively managing opportunities for residents to drink

The home provided residents with six, daily routine opportunities for staff to provide residents with a drink. Despite these set opportunities for drinking, I observed how staff did not always actively enable and pursue residents’ drinking opportunities. Residents were sometimes left without drinks available to them or residents fell asleep before consuming their drink, and residents were not adequately supported nor prompted by staff to consume the full contents of the drink served to them. These findings are supported in the literature suggesting that there may be a lack of knowledge across care homes in how to maximise drinking opportunities. A researcher who conducted 43.5 hours of non-participant observations across eight days in a care home reported how ‘missed opportunities’ led to residents living with dementia not receiving drinks from staff(57). The authors reported how staff did not provide drinks to residents who were unable to verbally communicate their needs outside of routine times, which led to these residents being left for long period without access to drink(57). My observations confirmed how staff mostly did not offer residents drinks outside of routine times and also did not often refill residents' drinks. Other care home studies reported how care home residents were not provided with drinks outside of inflexible care home routines(57, 58, 60). If staff do not provide residents with additional drinks, then residents will not have drinks available to them and therefore will be unable to drink as and when they require. This demonstrates how whilst CQC's regulation 14 is satisfied by the care homes(70) to provide residents with routine drinks, it directly contrasts with regulation 9(71) which states that individual residents must have care tailored to them(71).

Residents' individual needs were rarely considered by staff providing drinks. Residents did not always receive the support they required from staff to consume drinks, nor did residents always get a choice of drink or drinking vessel. Some staff incorrectly assumed that some residents could drink independently, which led to residents not drinking the drinks available to them. In previous research, comprising focus groups and semi-structured interviews, staff involved in delivering nutritional care to care home residents reported that drinks should be readily available and accessible to residents, considering their individual needs(230). Some residents in the present study were less able to consume drinks in certain drinking vessels or with(out) straws which led to them being unable to consume the full contents of their drink. Other researchers have reported how staff gave inadequate support to residents and rarely considered individual needs or preferences(57, 58, 60, 65). Bak (2018) reported how staff mostly gave insufficient assistance to residents during their period of observations, which negatively influenced how much residents drank(58). Bak (2018) reported how staff often provided residents with the most convenient drink rather than asking residents what they would like to drink and taking the time to make it to residents' preference(58). Greene *et al*. (2021) reported that residents who were fully dependent on staff to assist them to drink were observed to consume the lowest fluid intake out of all the participants in their study(57). Greene *et al.* reported how residents did not get a choice of drinking vessel which has been shown to influence fluid intake(57). Greene *et al*. reported that whilst some staff used individual strategies to support residents to consume drink, staff mostly did not employ such techniques(57). Godfrey *et al.'s* (2012) study reported how residents' lack of choice of drinking vessel, drinks preference and appearance of drink affected their drinking experience(60). In the same study, residents reported how residents' frailty affected whether they drank independently and not all residents reported that they would seek assistance from staff to drink if it was needed(60). In all three studies, authors concluded how opportunities were missed by staff to prioritise and encourage residents' drinking(57, 58, 60). These findings demonstrate the importance for adequate drinking of meaningful, dyadic interaction between residents and staff, in which residents are empowered to request assistance or their preferred drinks and staff ensuring they enable and facilitate residents with those opportunities and seize opportunities for residents to consume their preferred drinks, in their preferred drinking vessels and receive the assistance they require to consume the drink, thus also adhering to the relevant CQC regulations(70, 71).

Residents did not always receive adequate opportunities to consume the drinks provided to them during the set drinking routine times. Residents often fell asleep prior to consuming their entire drink, which was sometimes as a result of residents not receiving adequate assistance from staff to consume the drink. Sometimes staff moved residents into a different room of the care home and staff did not move their drink with them. Bak (2018) reported an observation of when a resident was moved room by staff, the same resident did not receive the cup of tea they had requested, prior to being moved(58). Bak (2018) also reported how residents were moved to their bedrooms after dinner(58) and night staff did not often wake residents for their evening drink, if residents had already fallen asleep. These residents were often left without drinks between dinner and breakfast on the following morning. This demonstrates how care staff may deprioritise the hydration needs of residents against other care priorities, such as moving the resident. Staff did not provide many residents with additional drinks and staff rarely refilled drinks during routine drinking times. Bak (2018) also reported how staff did not refill drinks or provide residents with additional drinks(58). Godfrey *et al.* (2012) reported that drinking opportunities such as mealtimes were not used effectively by staff to encourage residents to drink, often due to a lack of time, despite staff acknowledging the importance of residents' drinking(60). This highlights that even during routine drinking opportunities, the activity of drinking is still not prioritised. Staff focus on providing drinks to residents instead of focussing on residents' drinks consumption. This is hardly surprising as the language used to refer to mealtimes and tea trolley times in the care home, refer to the act of providing meals or tea and does not refer to the act of residents consuming the drinks. This focus on staff providing drinks, instead of resident's' consuming drinks, has potentially led to the act of drinking being deprioritised in residents' list of care needs.

Staff did not always take responsibility for making and serving residents' drinks when residents requested them, which led to residents not receiving their drink. Staff did not prompt residents to drink until their drink was fully consumed. Occasionally, staff prompted residents on more than one occasion, but this was not always enough for residents to proceed to take a sip from the drink. Greene *et al.*, (2021) reported that as part of observations to inform their quality improvement project, staff were 'allocated' residents at the beginning of each shift which led to some staff not making drinks for residents they had not been allocated(57). Holmes (2018) reported how staff did not provide consistent prompting to residents, which led to some residents not consuming their drink(65). Holmes

(2018) reported how drinks provision was a low priority for carers, how staff did not always provide a drink to residents with their meal and staff did not always monitor their fluid intake(65). Whilst it is well-documented that fluid intake records are rarely accurate(98), the process of staff referring to fluid intake charts for residents in the current study who did have their fluid intake monitored, served as a prompt or reminder to staff to give those residents drinks. Drinking and hydration care appear to be deprioritised against residents' other care needs within care home routines and tasks, which leads to many opportunities for drinking being overlooked, dismissed or only partially fulfilled by staff. These missed opportunities may lead to residents not drinking sufficient quantities of fluids and/or not enjoying their experiences of drinking.

The role of furniture and equipment

Most residents who sat in the communal areas had small tables positioned beside or in front of them, which is where staff placed residents' drinks. Practices around tables were seen to be central to residents gaining or retaining access to drinks in the care home. When residents sat in communal areas, staff positioned small tables next to residents' chairs and for residents that sat in the dining room, residents were positioned at dining tables. A minority of care home residents experienced their mealtimes in the main dining room and most residents did not get to choose where they sat to eat or drink. Staff encouraged residents to sit down in chairs at all times. Other care home researchers have reported staff encouraging residents to sit, to prevent them from falling(61). Researchers report the limited freedom that some residents had to choose where they sat at mealtimes, as staff tended to group those residents by dependency or assistance level(61, 241, 255, 360). A CQC report detailed how the inspectors observed residents in wheelchairs positioned in the dining room for long periods before and after mealtimes(361). Despite this report being over ten years old, I also observed these same practices in the present study, where residents were left positioned at dining tables in wheelchairs sometimes with a drink, sometimes without a drink, and without staff assistance. Bak (2018) reported the importance of tables facilitating drinks being available and potentially accessible to residents(58). Bak (2018) reported that staff moved tables to attend to resident's' personal care and sometimes did not move the table back within the resident's reach(58). The authors reported how sometimes staff positioned tables out of a resident's reach to prevent residents from spilling drinks(58). In the present study, staff left residents' drinks behind when staff moved residents to different rooms, staff positioned plates of food placed in front of drinks on residents' tables or staff removed drinks from tables to make space for activities. These are all examples of how drinking and drinks are deprioritised against other care home activities and practices. Drinks are quite literally 'left behind'.

The stated purpose of the tea trolley provision is to facilitate additional drinking opportunities in many care homes(60). However, this routine alone cannot guarantee drinking opportunities for all residents. Holmes (2018) observed how staff left the room after providing residents with food and drink(65). This interaction demonstrates how staff may view the act of providing food and drink to residents as 'meeting the resident's hydration needs', however this is only the first step of the drinking process (Figure 6.3). It is another clear example of how staff can deprioritise the act of residents drinking. Bak (2018) reported how if residents were sleeping in their rooms after dinner, night staff did not offer drinks on the final tea trolley round of the day(58). Greene *et al.* (2021) reported how residents were often asleep during evening tea trolley round and night staff did not wake the residents or assist them to drink(57). Residents in their bedrooms were observed by researchers to receive fewer drinks than the residents who were able to be in the communal areas(57, 58). In the present study, the tea trolley was not always adequately prepared to provide all residents with drinks, for lack of cups, spoons or sweetener. Bak (2018) reported that in their study, when the trolley was unavailable to deliver drinks, staff delivered drinks on trays instead, which led to residents not getting a choice of drink(58). When staff did use the trolley to deliver drinks to residents, the trolley was not always stocked with equipment to accommodate individual needs, such as a variety of cups(58).

In the present study, most residents received drinks in plastic beakers, with a straw positioned in the beaker's spout. Godfrey *et al*. (2012) reported how staff provided residents with all drinks in plastic beakers with straws, instead of drinking vessels aids which were adapted to residents' individual needs(60). Bak (2018) also reported how the tea trolleys were loaded with universal cups, with the exception of two dysphagia cups, suggesting that staff had not considered all other residents' individual needs and preferences(58). Cups, trolleys and drinking implements such as straws, are designed to facilitate residents' drinking, however, if these are not used appropriately, this equipment may actually prevent some residents from drinking. Bak (2018) observed how sometimes staff were required to wash up dirty cups first before they had enough cups to make drinks for residents(58). They also reported how the kitchenettes were not always sufficiently stocked with drinks and thus staff had to stock up from the main kitchen, which added delays to the drinks routine(58). My observations demonstrated how staff sometimes had incompletely prepared for drinking occasions, yet had always attended to how cutlery, placemats and napkins were placed on dining tables in advance of residents eating at mealtimes. This demonstrates how drinking opportunities in care homes were often given less prominence in the practices of some staff, compared to other care needs.

Staff roles

Staff provided food and drink to residents and so residents were dependent on staff to meet their nutritional needs. Residents were made even more totally dependent on staff to provide drinks in the care home because staff encouraged residents to sit down, the kitchen and kitchenettes were unavailable to residents and so residents had to wait for staff to serve them food and drink. This dependence on staff to provide drinks is reflected in the existing literature(57, 58). Some residents were also totally dependent on staff to assist them to consume drinks. A CQC report (2012) which summarised observations from unannounced inspections of mealtimes in 500 care homes in 2012, stated that 41% of homes did not meet the standard of giving residents a choice of food and drink(361). The CQC have no further reports on food and hydration since, but both my observations and the existing literature show that residents do not universally and consistently choose what they eat and drink(361). The CQC report detailed how staff did not offer residents a choice of what food and drinks they consumed in 87 of the homes and there were not always enough staff available to assist residents to eat and drink(361). Yet the CQC require all care providers to record the nutritional needs and food and drinks preferences of all residents(361). The CQC reported how staff did not support residents living with dementia or communication difficulties to make a choice over food or drink in the 87 homes inspected(361). My observations support existing literature which shows how some residents do not receive adequate support from staff to eat and drink and residents' fluid intake is not consistently recorded or recorded accurately by staff(98, 99). This may indicate how staff may view hydration care provision as a one-time event, rather than as one step in a wider and more ongoing process of residents' drinking and hydration (Figure 6.3). For care home routines to be constructed, staff had to be present and active in communal areas, remaining attentive to residents' individual needs and preferences. Kitwood and Bredin (1992) described the importance of individualised care and staff attentiveness for the wellbeing of people living with dementia over 30 years ago(245). This study illuminates how drinking is not a 'one size fits all' for residents living with dementia and is influenced by care home routines, whether staff seize opportunities for drinking, whether furniture and equipment is available to facilitate drinking and whether drinking is prioritised in the care home. Staff are kept busy in care homes and thus it requires staff to be more specifically attentive to residents, providing a person-centred approach(245) during drinking opportunities, to better meet residents' hydration needs. The observation findings showed many ways which might distract or interrupt staff attending to residents' drinking activities.

The CQC reported how staff did not display awareness of residents' dietary requirements, and these dietary requirements were not documented in a way that was readily available to staff providing hydration care to residents(361). In the present study, not all staff were aware of some residents' dietary needs and staff often consulted with each other about residents' dietary requirements, instead of referring to the resident's care records. Holmes (2018) observed how residents who had more dietary requirements were more likely to have fewer choices of drinks than residents without dietary requirements(65). This may result in these residents less likely consuming their preferred drink. Bak (2018) reported how staff were confused by some residents' dietary requirements and observed how some diabetic residents did not receive their preferred drink due to this uncertainty(58). Bak (2018) reported how staff made assumptions about residents' drink preferences, instead of referring to the resident's documented preferences which were recorded in care plans and locked away(58). This supports what the CQC inspectors observed in almost a fifth of the homes they inspected(361). The literature widely documents staff not giving residents a choice of drink or drinking vessel(57, 58, 60, 65). If staff do not provide residents with drinks they prefer, nor drinking vessels they can drink from successfully, residents will be less likely to consume adequate fluids, if at all. Residents may suffer more serious consequences if staff do not provide residents with drinks at all, due to uncertainty of their dietary requirements, or provide residents with a drink which is unsuitable for the resident, such as consistency of liquid to drink or allergens. This is another area where residents' hydration needs can be seen to not consistently get due attention and consideration from staff, as other care needs and tasks take priority.

Merrell *et al.* (2012) conducted an ethnography of two Welsh care homes, which involved 16 hours of observations of food preparation and mealtimes, focus groups with kitchen and care staff, interviews with families and residents and a review of nutrition-related documents(210). The authors reported that they observed staff assisting the residents who required support to eat, but most residents ate and drank independently(210). Staff involved with hydration care reported that although they had completed basic food hygiene training, they used their own personal knowledge to accommodate residents' needs due to lack of nutrition education or training(210). Whilst the staff reported that the understood residents' specific dietary requirements from residents, families or the GP, the authors observed how staff often made decisions around food and drink preferences for residents, instead of consulting with residents and this happened more commonly for drink choices(210). The authors reported that they observed this type of paternalism more with residents who were unwell or unable to express choice due to mental capacity(210). These findings support the findings of the present study which identified how staff did not always consider residents choice or preferences, also well-documented elsewhere(57, 58, 65, 99). This process requires staff to be present and attentive to support residents to make choices, as part of being responsive to residents' needs, when providing drinks in the care home. As shown in Figure 6.3, this is only one step in the process which may lead to residents drinking and staff need to complete the process to ensure that residents' hydration needs are sufficiently considered and met.

Resident characteristics

The findings from the current study demonstrate how reasons explaining whether people living with dementia are able to drink are not conveyed in a it is not a 'one size fits all' account. I observed residents with different abilities which made it easier or more difficult for them to drink. Residents were required to reach drinks on their tables to access drinks. In this setting, the ability to reach was made crucial for all residents, even those with no mobility issues, because all residents were encouraged to sit down, particularly at eating and drinking opportunities. Bak (2018) also observed how staff did not always leave drinks in reach of residents(58) and reported how residents who remained in their bedrooms, perhaps because their dementia was more advanced, did not always receive drinks on their trays at mealtimes(58). This highlights how some residents are more likely to receive drinks than others based on their abilities or disease progression and whilst some residents are provided with drinks, they may still not be accessible to residents. There were similarities between resident characteristics in the present study and Mentes' (2006) seminal study exploring hydration care in two American nursing homes(227). However, because residents were encouraged to sit down in the present study, all residents would fit the "physically dependent" category, amongst other categories. Mentes (2006) acknowledged in their paper that whilst each group was designed to be stand-alone, there may be some overlap in characteristics between groups(227). Whilst Mentes' typology is useful(227), it does not capture the 'reaching ability' of residents which was identified in this study and others(57, 58, 61), which is crucial for residents being able to access and consume any available drink in their vicinity.

As dementia progresses, neuronal loss can lead to communication difficulties, which may prevent people living with dementia being unable to verbally communicate their wants and preferences(362) to the staff supporting them, though these residents may demonstrate different ways of communicating instead. I observed how some residents tapped their tables or cups or tried to make eye contact with staff at times. Bak (2018) also reported how some residents made subtle cues, such as tapping their table, when they sought the staff attention to get them a drink, however, Bak (2018) reported that these subtle cues were not noticed by staff when the care home was busy or noisy(58), yet staff responded to a resident who had been shouting for a period of time. In the present study, I observed how staff mostly did not offer residents with quieter voices or those unable to verbally drinks between routines, and these residents did not get the attention of staff, whereas residents who persistently shouted loudly were more likely to eventually be provided with drinks by staff between routine drinks provision times. Holmes (2018) reported observing family visitors asking for drinks on behalf of the residents(65). There were very few visitors into the care home in this present ethnography. In the present study, I consistently observed six opportunities for residents to be served drinks and each plastic beaker, which was most commonly used in the home, contained a maximum of 200ml and so residents were unable to drink the European recommended minimum oral fluid intake of 1600ml for women and 2000ml for men(2) by relying on drinks rounds alone. Unless residents were able to shout persistently to get the attention of staff and eventually receive an additional drink from staff who were attentive and responsive, residents would be unable to drink enough. Instead, residents need to receive individualised hydration care in care homes, alongside supportive and consistent routine provision of a variety of drinks.

Another resident characteristic observed in this study, which Mentes' (2006) typology(227) does not capture, is residents' 'problem-solving' ability to negotiate or navigate drinking vessel and equipment. I observed that some residents were able to negotiate removing a straw from a spouted beaker, whilst other residents without this problem-solving ability stopped persisting to consume drink. Holmes (2018) reported an example of this problem-solving ability; a resident was holding a cup, but the staff member had positioned the straw facing away from the resident and the resident "struggled for several minutes" with the straw before they were able to drink from it(65). Bak (2018) reported how staff assisted residents who had been identified as needing staff assistance, whilst residents who required prompting to drink, were less likely to receive staff assistance to drink(58). Bak (2018) reported how the residents who staff perceived to drink independently received more drinks from staff, whilst residents who required assistance to drink mostly only received drinks during mealtimes(58). This demonstrates how residents unable to problem-solve drinking vessels and equipment may not be able to adequately consume their drinks if they do not receive attention or appropriate support from staff. This is more pertinent because as I have already reported, residents' preferences around drinking vessels and equipment, such as straws, were not considered by staff and thus these residents may consistently be provided with drinks that are served in drinking vessels that are inaccessible to them, leading to residents not drinking enough.

In the present study, I did not observe the following typologies proposed in Mentes' paper: "dysphagics", "end of life care" and "fear incontinence"(227) and this was likely because I only involved and observed five residents living with dementia, which may not have been representative of all residents living within the residential care home, who may have presented with these typologies. There are several potential reasons as to why I did not observe residents at end of life, despite them being eligible to take part in the study; these residents did not spend time in the communal areas, where I spent the majority of my time, and these residents were not suggested as being potential participants by the care home manager who was my gatekeeper to the residents in the home. I did not observe residents who restricted drinking due to fear of incontinence. One reason for this is that I was unable to explore feelings of 'fear' with the epistemological and ontological approach I chose for this study and the other being it was most common for residents to wear pads and staff delivered personal care to residents as part of a set routine, as has been documented elsewhere(58, 65). Residents who restrict drinking due to fear of incontinence may be more cognitively able than the residents in my study as Mentes' (2006) findings showed that the residents who feared incontinence had very low Cognitive Performance Scale scores(228), suggesting they were not cognitively impaired(227). I did not observe residents in the study having difficulties drinking due to any swallowing difficulties. I also did not observe any of the residents consume thickened drinks or receive support for swallowing. Some literature states that residents are less likely to consume thickened drinks due to the taste, but this has been contested(58, 60, 227). In an interview study, care assistants reported that they sat residents known as "choke risks" together at mealtimes, who had swallowing difficulties(255). Residents with swallowing difficulties did not get a choice who they sat with, or where they sat during mealtimes, but did receive assistance from staff to eat and drink(255). One qualitative study specifically explored the eating and drinking experiences of care home residents living with dementia and dysphagia(61). The researcher interviewed relatives, staff, Speech and Language Therapists and residents, using a Talking Mat to focus the conversation and observed residents, using DCM(61), who were unable to participate in interviews. The researcher concluded that residents living with dementia and dysphagia were infantilised by staff and consequently became less independent and autonomous because staff rushed mealtimes, so fed residents and gave them drinks instead(61). The researcher observed how staff did not offer residents a choice of food and drink, but this happened more for residents living with dementia and dysphagia and these residents also lacked social opportunities more than residents without dementia or dysphagia(61). It is therefore not clear from the literature or the present study if swallowing difficulties affects fluid intake, or whether other influences such as lack of social opportunities, lack of pleasurable drinking experiences, lack of drinks preferences and dependence on staff may limit opportunities for drinking for these residents instead.

Drinking is often deprioritised against food and other care activities.

In this study, staff regularly acted to de-prioritise drinking relative to other care home activities, such as delivering personal care and enacting medication rounds. During mealtimes and tea trolley times, when drinks and food were often served together, staff often directly deprioritised the activity of drinking against eating at these times. Several care home researchers have reported how hydration can be overlooked by staff, or how other care tasks, such as "pad rounds" take priority over hydration care(58, 61, 65, 210). Fewer researchers have reported the direct prioritisation of food and eating, over drinks and drinking in care homes, though there are instances in the existing literature(58, 65, 210). Examples of these practices are staff not offering drinks to residents at all; staff offering nutritionally supplemented drinks to residents instead of food due to the resident losing weight; staff giving residents fluid-rich foods instead of drinks; staff moving drinks out of residents' reach and acting and speaking to discourage residents from drinking 'too much'. It could be viewed that residents receive more drinks from staff when identified as losing weight, instead of viewing drinking to be deprioritised by staff, however there are three issues with this argument. The first issue is that from the five residents who were participant in this study, only two had been identified as losing weight and consequently benefited from receiving the calorie-dense milkshakes, leaving three resident participants without these additional drinks. Secondly, these calorie-dense drinks were only provided to residents for a temporary period to improve weight loss and were not provided as part of a continued permanent drinks provision. Thirdly, although residents identified as losing weight were given calorie-dense drinks by staff, they did not receive any additional support from staff to consume the drinks and so I observed residents leave the milkshakes partially consumed. Participant observations can therefore make visible specific practices which deprioritise drinking which led to residents' not drinking enough. I will explore these practices now.

Staff practices and talk often deprioritised residents' hydration in the care home, in favour of other care tasks. Residents' hydration care was a scheduled and routine event in the care home, instead of a continual provision which met the residents' individual needs and preferences. Despite water coolers being positioned in communal areas and water jugs in residents' bedrooms, residents were encouraged to remain seated in the care home and so water coolers and jugs were unavailable and inaccessible to residents. Residents therefore depended on routine drinking times to receive drinks. Residents who required staff assistance to drink were sometimes interrupted by staff answering a phone call or attending to the doorbell. Bak (2018) reported how even during the set times in the day for residents to be provided with or assisted to drink, staff sometimes attended to “pad rounds” or took breaks instead(58). The residents in Holmes’ (2018) study reported how their requests for drinks sometimes were forgotten by staff who attended to different care home tasks instead(65). In Godfrey *et al.*’s (2012) study, a care assistant who was describing the busyness of their shifts, commented how they “change the pad, fluids afterwards”(60). This demonstrates how personal care is a higher priority in care home practices whilst fluids are considered to be a lower priority. Holmes (2018) concluded hydration as being deprioritised by care staff as they observed staff interrupting drinking times to complete medication rounds(65). The deprioritisation of drinks was also visible in Bak’s (2018) study in how staff moved tables with drinks on to attend to residents’ personal needs, but never returned the table to the resident, or how staff moved a table with a cup away from a resident to prevent them from spilling it(58). The CQC report highlighted how 70 care homes did not monitor residents’ food and fluid intake and reported how staff placed food and drinks out of reach of residents, or placed food and fluids on tables which were positioned too low for the resident(361). Although this report is over 10 years old, it signifies how residents’ nutritional needs are not consistently and universally prioritised in care homes compared to other tasks such as delivering personal care or delivering medications(361).

Drinking and drinks were deprioritised by staff practices in favour of regularly attending to residents’ food and eating. A nurse in Bak’s study (2018) commented that they do not give cups of tea with residents’ lunch meals because it prevents the residents from eating(58). Holmes (2018) observed how some staff delivered food instead of drinks to residents, concluding that resident hydration was often overlooked and not prioritised by care staff(65). Often in care homes, researchers have observed how residents who are identified as losing weight are either given calorie-rich milkshakes to “build them up”(61) or provided with nutritionally-supplemented drinks to increase residents’ calorie intake(210). Although CQC recommends that staff should document and monitor all residents’ food and fluid intake, Bak (2018) reported how staff only sometimes documented residents’ fluid intake and this was not always documented accurately nor timely(58). These findings support what I observed in the care home, where staff encouraged residents to eat lots, whilst using language which discouraged residents from drinking lots, such as ‘*take a sip’* or ‘*have a little…*’. This mundane and everyday language which deprioritised drinking during drinks provision and drinks assistance, along with the care home environment, practices and routines all favouring food intake, led to residents mostly only ever sipping some of their drinks, rather than fully consuming drinks.

6.6.3 How has social constructionism added value to addressing this research puzzle?

In viewing care home life through a social constructionist lens(292), I was able to attend to the language, practices, routines, actions and interactions used by social actors to deprioritise drinking and residents' hydration, in favour of other care home activities and tasks. A social constructionist approach(292) enabled me to explore potential influences of drinking across the whole care home system using a bottom-up approach. The approach allowed me to develop my ongoing construction of the care home as the study progressed, rather than my going into the care home with preconceived notions of 'facilitators and barriers to drinking' which may have limited what I attended to in the care home. This enabled me to attend to granular details within actions and interactions within the care home, which may have routinely and consistently led up to drinking opportunities, providing opportunities for drinking. My prolonged engagement in the care home, using a social constructionist approach(292), enabled me to attend to moments when these routines were different and perhaps did not lead to drinking. From this, I was able to fine-tune my attention to these significant routines and practices and examine what influenced how a resident consumed a drink, such as the language used by staff to engage the resident in the drinking activity. The social constructionist approach(292) therefore enabled me to attend to the mundane and everyday activities and elements of which did or did not lead to residents drinking. Direct observations using a social constructionist approach(292) also enabled me to involve participants who may not have otherwise been able to participate in the study due to communication difficulties or time burden.

6.6.4 Assessing the robustness of this study

The issue of whether I conducted a quality or rigorous study requires subjective judgements to resolve. Assessing my study against standardised quality criteria would not be appropriate for a social constructionist ethnographic methodology which sees events and judgements as dynamic and ongoing(286, 292). I instead consider 'reflexive methodological accounting' suggested by Seale (1999) as more appropriate for accounting for the rigor and quality of my methodology and findings(363) by systematically approaching my observations, applying reflexivity throughout my data collection and analysis and applying Yin's(2014)(284) principles for conducting quality case study research. In line with Yin's(2014)(284) guidance, I developed and followed my study protocol guiding my actions throughout the study and compiled all data generated from the study, including field notes, reflexive journal entries and ethnographic interview notes into one NVivo 1.7.1 file(364) which served as my case study database. I demonstrated my ‘chain of evidence’ by detailing my steps of data analysis and providing supporting quotes to evidence my findings to address reliability. I also transparently reported my methods and findings in line with the SRQR(358).

I developed a study which adopted a methodology to be flexibly appropriate and consistent with my social constructionist approach(286, 292). I reported each methodological decision transparently together with consequences of each of these decisions on the data generated. I recruited groups of staff and residents with diverse characteristics into this study, not excluding any groups of people from having the optportunity to participate. Employing an ethnographic approach helped ensure that the data collection methods were less likely not exclude groups of people whose lived experience would be relevant to those people whose lives health research seeks to improve. This contributed to the quality and rigor of this study. I recruited five residents with varying dementia diagnoses, wide age range and both sexes.

The familiarisation period enabled me to become familiar with the care home’s routines, people and practices and to become familiar with refining my role of becoming an ethnographer. My prolonged exposure to everyday life and activity in the care home enabled me to form a picture of what were usual care home routines and practices, which in turn, enabled me to then attend to what happened when these routines or practices changed. I observed at different times over the 24-hour cycle in different communal spaces of the care home. This helped me identify how drinking-related activities happened across the care home at different times. All of these strategies increased the rigour of the study as I ensured that I employed a robust methodology.

I used thick descriptions to report my fieldnotes and provided quotes from these within my findings, to enable the reader to view contextual information which I related to the observations(290). I reported a thorough and transparent description of my methodology and analysis to enable the reader to judge how I generated my findings from the data. I aimed to be critical, reflexive and iterative in my approach to data analysis, constantly referring back to the research question to assess how appropriately I generated themes.

I received regular supervision with one of my supervisors with specific expertise in ethnography and work in care homes (FP). These discussions supported me to actively reflect on my own positioning as an ethnographer, develop my fieldnote writing, actively reflect on my process of developing my analytical thinking, giving me space to consider my successive analytical thoughts as the study progressed. This process in turn encouraged me to write with honesty and transparency about how my ethnographic skills developed in writing up this study progressed. Seale (1999) characterises research work as a type of “apprenticeship” in which researchers will learn best by applying themselves to the fieldwork(363), guided by pragmatic, methodological quality principles.

6.6.5 Reflecting on ethical issues which arose in this study

I faced many ethical issues during this study. Gaining ethical approval to conduct this study was initially challenging due to the REC’s concerns around my potential incidental exposure to personal information of non-participants in the care home. The REC required me to seek advice from the CAG to assess whether I needed CAG approval for the study, which would have led to all people within the care home being consented into the study, thus removing people’s choice to take part. Some ethnographers choose to use an ‘opt out’ method to conduct observations, however this may not be appropriate for residents living with severe dementia or communication abilities unable of opting out of the observations(318). I chose to conduct ethnography using a social constructionist approach(286, 292) to enable people living with dementia to be involved within the research, because this group of people have previously been reported as being more at-risk of dehydration and yet had previously often been excluded from taking part in hydration research.

As has been widely documented regarding ethnographic fieldwork(318, 319), my ethical obligations did not stop at gaining ethical approval. In practice, I was required to make numerous ‘in-the-moment’ ethical decisions throughout fieldwork. I conducted non-participant observations which determined that I had minimal interaction with the social actors or setting. However, there were occasions when I intervened in the everyday activities in the care home for fear of a resident’s wellbeing or safety. I encountered several instances in which I was had to pause observations, seek help for the resident, record this in my fieldnotes and then return to observations. Other care home ethnographers have reported the need to intervene during fieldwork to ensure residents’ safety and act ethically rather than preserve the purity of the data in relation to the methodology(318). Initially, I found it difficult to assess what my boundaries were as to when and whether I intervened to assist residents. Some residents were often distressed or asking for help and although I found this very difficult to observe, I did not intervene. If I observed a resident at risk of imminent physical harm, I decided that this was my duty of care to intervene. I am not aligned to any professional registration, like allied health professionals whom might have clearer boundaries or codes of conduct to follow whether they are undertaking ethnography or not(318). However, I decided what were my own ethical and moral values that I chose to adhere to and also as representing the UEA and its values when conducting the research.

6.6.6 Limitations of this study

There are several areas which may be seen as limitations this study: restricted access to social actors in the ethnographic setting, the study's findings were contextualised within a single care home which may limit the transferability of these findings, the findings were generated by a single ethnographer with one specific theoretical approach and that social actors' behaviour may have been influenced by my presence and observations. A sample of residents and staff with varied characteristics were participants in this study, but there were some resident characteristics that I did not observe in my observations, such as ethnic or cultural diversity, residents who were in advanced stages of dementia, residents who remained in their beds and did not access communal areas and residents who were able to access the toilet independently. The study findings that I generated therefore may only relate to residents who accessed communal spaces for White British older people living with dementia. I acknowledge that the hydration needs and preferences and how these residents consumed drinks, may have been different to the participant sample recruited in the present study. It should be noted that this participant sample did not aim to be representative of other care home residents or other care homes. In the same way, the study was conducted in a single residential care home, so I do not claim for these findings to be representative of care homes, or care home practices in general. My ethnographic reflections have raised many contextual issues to consider for caregivers and researchers to consider in other long-term care settings.

It must be noted that I was a single ethnographer in the care home and therefore could only attend to some activities in the care home at any time. How I constructed the study boundaries also affected what data I could include. I was mostly unable to observe in residents' bedrooms because these residents were not participants in the study and because staff only tended to provide fleeting visits to these residents to provide food or drink for me to observe. If several ethnographers had conducted observations in the home, different data could have been generated. However, I purposively selected times to conduct observations, across 24-hours, so that I had diversity of staff, routines, practices and actions, across observations. I completed a 'hanging-out' period in the care home before formal observations, for staff and residents to get to know me and ask questions about the study. I recorded reflexive fieldnotes throughout the study and described in my notes instances when I thought staff may have been aware of my presence. I sought to explore what influenced how residents consumed fluids, and social constructionist research does not seek an objective truth and thus this data was still relevant and significant for the aims of my research aim. As other ethnographers have already noted(365), it is unlikely for staff to change their practice, language and routines, which have been embedded within the care home culture over time, for the five months that I conducted observations. I do not therefore claim for this study to represent all care homes, care home workforce, nor all care home residents living with dementia. Instead, this robust single ethnographic case study has made visible certain influences of interaction, practice and place, on residents' drinking which have previously not been identified or evidenced in the care home hydration literature.

6.7 Summary and conclusions for this case study of drinking practice in one care home

This ethnographic study examined care home routines, practices and staff and residents' actions and interactions to explore how residents living with dementia consume drinks. The ethnography involved 141 hours of non-participant direct observations with five residents and 17 care home staff, along with ethnographic interviews, conducted over five months in a single residential care home in the East of England. Observations identified 25 types of interactional influences on how residents living with dementia were consuming drinks in one care home East of England. The analysis of observations showed how care staff practices deprioritised residents' drinking and drinks in the care home in favour of residents' eating and other care practices and routines. Staff were not seen to give consistent priority to providing drinks to residents. Staff often saw providing drinks mostly as routine and as separate single tasks. Staff need to consider the process of drinking as cyclical, rather than a one-time, routine event. When staff made drinks available and accessible to residents and enabled opportunities for residents to drink (Drinking map Figure 6.3), then residents were more likely to sip from their drinking vessel.

This study illuminated how staff practices and care home routines, which may be designed to promote drinking opportunities, such as tea trolley rounds, deprioritise drinking activities for residents living with dementia. Drinking ability cannot be generalised to a group of residents and therefore a 'one size fits all' approach to drinking should not be considered for hydration care for care home residents living with dementia. Third sector websites and support guidance, along with some academic literature, suggest that people living with dementia universally and consistently have difficulties in drinking and this ethnographic study provides evidence to contradict this view. This study provides important insights into how interactional influences within care homes can enable residents living with dementia to consume drinks, which may be used to inform appropriate and sustainable hydration interventions for this group. Residents require staff to be present and attentive to make and provide them with regular access to drinks of their preference. Some residents may require extra support and continued prompting, as well as appropriate and tailored drinking equipment, to promote their drinking ability. This study may be useful for encouraging health and social care staff to consider how to ensure that drinking activities are consistently given more priority in care homes routines and interactions. This might include ensuring residents have their preferred drinks readily available and accessible to them, with any required appropriate support or assistance from staff. Such changes in practice could encourage more residents to drink enough.

7. Drinking for people living with Dementia IN Care homes (D-DRINC study B) - Online forum analysis

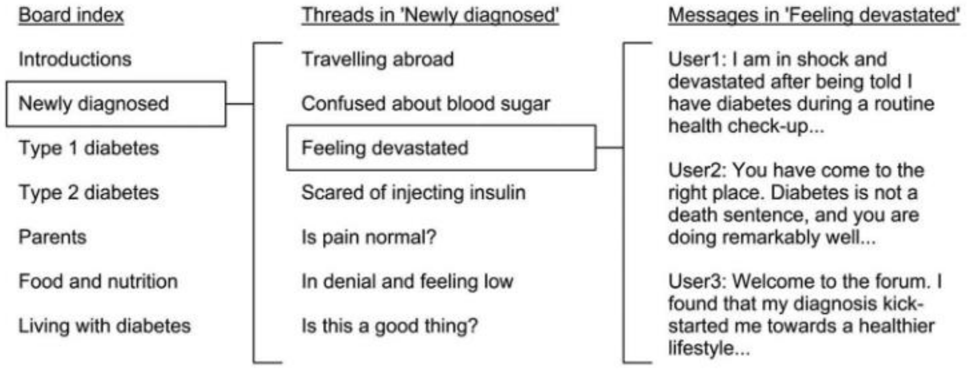
7.1 Aim and introduction to chapter

The study which I describe in this chapter 'D-DRINC Study B' provides a novel and unique perspective on how people frame drinking within their written contributions to the online public discussion forum 'Dementia Talking Point'(303). The aim of this study was to explore how carers of people living with dementia frame drinking in care homes, by examining the public discourse on the 'Dementia Talking Point' forum(303). In this chapter I introduce the concept of public discussion forums, report the rationale of this study and ethical issues arising from forum research and report the findings from D-DRINC Study B.

7.2 What are online forums?

Online public discussion forums (hereafter referred to as forums) are websites usually hosted for a particular reason, such as sharing hobbies, shared interest, disease/illness etc., and enable other online users to virtually interact with each other. These forums are sometimes known as "peer-to-peer communities"(366) or "virtual communities"(367). Online forums exist on a wide array of topics; some of these include various hobbies(1, 368, 369), parenting(370, 371), health support(305, 370, 372-374), as well as for conducting illegal activities(375, 376). Forum users might engage with online discussion forums to seek information about a phenomenon(368, 377-379), share information about a phenomenon(368, 378-380), to form or maintain relationships with others(368), to meet likeminded people(368) and/or signpost support to others on the forum(378-380). The number of people seeking health-related information online has increased significantly over the past decade(381, 382) due to the convenience and accessibility of the internet for internet users being able to search for health information.

Some forums are considered to be more private, whereby users are required to register and become a 'member' prior to gaining access to posting or reading the posts on the forum, whilst some forums are considered to be more public, whereby membership is not required prior to viewing or posting on the forum and so posts are available to anyone with internet access(383). When members register to use a forum, they might be required to acknowledge a set of terms and conditions for using the site, which may include information about how their data might be used for research purposes(383). Forums commonly feature a “tree-like structure”(367) (Figure 7.1), where, depending on the size of the forum, the forum will feature several discussion boards. Each discussion board will focus on a particular topic relating to the forum’s overall theme or topic e.g. disease symptoms, disease support, disease management. Within each of the discussion boards, users are able to contribute messages to the boards, also known as ‘posts’, to interact with other users about that particular topic(1). Other users are then able to respond to others’ ‘posts’; this creates a ‘thread’ of messages(1). Forums can therefore be viewed as “tree-like” because of how discussions and threads branch off from an original post or discussion board(1). Forums grow larger in size, the more users contribute ‘posts’ and respond to others’ ‘posts’ which creates threads and when users create new discussion topics. Some forums allow users to post messages in ‘real time’ and therefore users can respond to each other synchronously(305), whereas others are moderated so that users ‘posts’ are reviewed by moderators prior to being posted onto the forum, meaning that only asynchronous interactions are feasible within those forums(305). It is the role of moderators to stimulate activity on the discussion boards, share information via ‘posts’ and to monitor for the appropriateness of users’ ‘posts’, and if required, moderators have the ability to remove ‘posts’ from forums(383). As well as these administrative tasks, moderators are reported to provide support to online users by describing their own personal experiences in post, or offering coping strategies to other users(384).



User1: I am in shock and devastated after being told I have diabetes during a routine health check-up...

User2: You have come to the right place. Diabetes is not a death sentence, and you are doing remarkably well...

User3: Welcome to the forum. I found that my diagnosis kick-started me towards a healthier lifestyle...

Figure 1. The hierarchical, tree-like structure of forums.

FIGURE 7.1: EXAMPLE OF HOW THE TREE-LIKE STRUCTURE OF AN ONLINE FORUM THREAD IS DEVELOPED FROM SMEDLEY AND COULSON (2021)(1)

7.2.1 Why might people engage with online forums?

In the UK in 2020, the National Office for Statistics reported that 60% of over-16s had searched for health information online at least once that year(382). Health-seeking behaviour in the UK in 2020 was higher amongst women (67%) compared to men (53%)(382). This could be for several reasons. The UK's Department for Health and Social Care (DHSC) launched a survey in 2021 to inform the Women's Health Strategy in England, which received over 110,000 responses(385). The survey found that 84% of female survey respondents did not always feel listened to by healthcare professionals and were more likely to search a search engine or online blog than rely on health information from healthcare professionals, the non-emergency helpline or the NHS website(385). The survey also revealed that 60% of women could not conveniently access health services due to their location and so seeking health information from online forums might be more convenient for them(385). Forums are one form of online platform which provide a means for internet users to seek health-related information and related support online(366, 373, 374, 386, 387). Others being search engines, blogs and social media sites(368, 385). However, search engines and blogs do not offer dyadic communication like forums and social media sites do.

7.2.2 How can online forums be used for research?

For the past decade, an increasing number of researchers have used forums to collect retrospective textual data(305) detailing online users' experiences of living with particular health conditions, and/or supporting others with a particular health condition(325, 366, 386, 388-390), because the data is publicly available and may offer different insights from people who may be more likely to participate in research by more traditional means. There are three methodological approaches for researchers using online forums for research purposes and there are pros and cons for each approach. The arguments for and against using each research approach to conducting research using only forum data depends on the epistemological and ontological approach of each study, as to what is appropriate and relevant.

The first methodological approach to using online forums in research is known as the 'passive/unobtrusive' approach(305). With this approach, researchers do not engage or interact with online users, but instead select which forums, threads and posts might be relevant to the research question, download the selected posts and analyse them, usually using thematic analysis or content analysis(305). The second approach is known as the 'active/engaged approach' in which some researchers covertly interact with online users on forums(305) meaning they play a role in the data being constructed on the forums(391). Some researchers set up bespoke online discussion forums for research participants to consent to participating in and researchers interact with the participants by creating posts for participants to engage with(1, 323). The third approach is the ‘hybrid/triangulation’ approach in which the ‘passive/unobtrusive’ approach is triangulated with more traditional methods of research such as interviews or focus groups(305).

There are many benefits of using forum data for research purposes. There is already an abundant source of publicly available data online within forums and so data collection is less resource intensive for researchers compared to some other data collection methods, where researchers are required to recruit participants such as interviews and/or observations. Forums are constructed by different online users creating posts and responding to others’ posts online. As users respond to others’ posts, generating threads of posts, users’ posts become more detailed, increasing the quantity and content of textual data available(367). Online forums might also provide researchers with data that they are unable to access through synchronous human interaction. Forum users might construct a different discourse in textual data compared to discourse they construct verbally, because the internet provides the opportunity of anonymity to online users via the use of nicknames and the information that users post online cannot be verified(367). When researchers adopt the ‘passive/unobtrusive approach’ to forum research, the data is free from researcher influence, which might enable the online users to speak more freely than in other data collection methods, such as interviews where participants might feel restricted in opening up to an interviewer(367). With both the ‘active/engaged’ and ‘hybrid/triangulation’ approaches, participants would be aware of being researched which may impact what the post to the forum and consequently the data offered(305). Similarly, online posts are generated by forum users whose data might differ demographically from data collected from offline research participants recruited from more traditional data collection methods, in terms of geographic location and possibly other characteristics. In summary, online forums offer access to abundant textual data for researchers to analyse the discourses of a phenomenon, which may not be able to be captured in methodologies focussing on different ontologies.

There are some potential disadvantages of using forum data for research purposes but these are mostly based on positivist assumptions(367). In the ‘passive/unobtrusive’ approach to forum research, researchers cannot interact with the forum user or read body language cues to clarify or elaborate on users’ forum posts, which could lead to the researcher misunderstanding or misinterpreting the data(1). Social constructionists do not seek an objective truth from the data, rather, they seek to understand how users construct discourse on forums. This could also be seen as a benefit of online forum research where the researcher uses the passive/unobtrusive approaches, as the researcher does not influence the online interaction(1). Another argument for the potential disadvantage of using forum data is that researchers cannot know if posts are truthful online, as researchers cannot verify the validity and reliability of the posts or users, but this is the case for any research (quantitative or qualitative) using self-reported information(1). Positivists would argue that forum data is unreliable because the accuracy of a user's self-reported identity cannot be verified(1). However one study compared the online profiles of 946 online instant-messaging users to their self-reported information during interviews and found that there was only a 5.9% discrepancy of self-reported gender and 11.2% discrepancy in ages reported by participants(392). Although this study was conducted with a younger population than the Dementia Talking Point forum(303), the authors concluded that the discrepancies and risks of users reporting misinformation were relatively small(392). The study highlights that any discrepancies within the data provided by online users do not detract from the discourse users constructed online, which is of interest for discourse analysts using forum data for research purposes. In qualitative research, participants' accounts are not verified and researchers do not seek an objective truth(291). Instead, a phenomenon is explored and/or seek insights from participants' lived experiences and their perspectives on these.

7.2.3 How can forum data be analysed?

Qualitative and quantitative methods can be used to analyse forum data and the text can either be reduced into categories or themes, using methods such as thematic analysis or content analysis, or researchers can use "text-enhancing methods"(367) to explore the meaning of the discourse using discourse analysis(1, 367). Discourse is about how people use spoken word to do things and thus with forum research, discourse analysts are concerned with making sense of data by examining how online users use discourse to position a particular phenomenon. More recently, dementia forum researchers called for researchers to qualitatively analyse Dementia Talking Point forum posts inductively to explore themes on the site(324, 325), which would provide a more nuanced and deeper understanding of discourses on the site. To my knowledge, no research has yet examined how online users use forum discourse to construct how long-term care residents living with dementia drink. The words that online users write in their posts and how they frame drinking, in relation to other activities within their written communication, has important implications for researchers to understand the public discourse around how people living with dementia drink in long-term care settings.

7.3 Rationale for this study

In this study, I examined written contributions of family caregivers to an online forum to understand the public discourse around how people living with dementia drink in long-term care settings. The 'Dementia Talking Point[8]' forum is hosted by the Alzheimer's Society UK and was established over 20 years ago: https://forum.alzheimers.org.uk/. The forum is advertised as a source of support for people affected by dementia (whether they have the condition themselves or care for people with these conditions), where online users can ask for advice, read other's stories, "offload" about dementia concerns and share helpful advice and information(303). Forum data provide a novel ontological perspective to explore how people frame drinking in a forum in comparison to how people might frame drinking within their actions, spoken word, body language and interactions within an ethnographic study, or within spoken word during interviews and focus groups. An added value of forum data is that anyone who has access to the internet can contribute posts to forums, thus offering data from a wider and/or different sample of people and possibly offering different insights to those generated from a single care home. This study was conducted when UK Covid-19 lockdown measures were in place restricting care home visiting(285). Although there is not much known about the characteristics of online forum users, Pendry and Salvatore (2015) proposed that people affected by, or seeking support or information for stigmatising issues, might reap social benefits from engaging with online forums as they might find it easier to share sensitive information within the more 'anonymous' online forum, which they might not feel prepared to discuss in offline interactions(368). Dementia is still associated with social stigma(378, 393) and thus the 'Dementia Talking Point' forum might be used by users who feel less able to seek support or information in offline interactions. These forum users may contribute posts relating to drinking and hydration care in care homes either seeking support or offering support to other users on the forum.

7.4 Ethical issues in conducting forum research

For the past decade there has been debate as to how researchers can ethically use forum data. There are many elements of online forum research which might be viewed as being unethical, partly because traditional ethical guidelines cannot be applied practically with online research, e.g. taking informed consent in-person(383). In 2021, the British

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[8] 'Dementia Talking Point' forum's name was changed to 'Dementia Support Forum' on 3rd October 2023 as I was writing up this research.

Psychological Society (BPS) updated their guidance for ‘internet-mediated research’ to reflect the nuances in ethical decision making and considerations in online research(323). This guidance describes online research in the broadest sense, including conducting online interviews and surveys and does not provide specific guidance for research involving online forums. In a systematic review of 132 studies involving discourse analyses of publicly available online data from sources such as forums, video-sharing platforms, social media, etc., approximately two thirds of the studies did not report on any ethical issue associated with using online data for research purposes, because researchers did not consider it necessary to consider ethical issues within forum research(394). Some researchers perceive forum data to be textual data in a publicly accessible space, whereas some researchers take an ontological perspective that this data belongs to human participants and therefore ethical frameworks must be applied to protect the users.

7.4.1 Private vs public spaces?

Within their guidance on conducting internet-mediated research, the BPS states that researchers conducting online forum research must consider whether their potential data is obtained from public or private domains(323). The BPS acknowledge that sometimes the ‘private/public’ distinction can be blurred with online research and depends on how someone perceives something to be public or private(323). There is no consensus in the literature as to whether forums are considered private or public spaces, which might depend on what type of online community is being examined and whether they would expect their data to be used for research purposes(305, 323, 383). Some researchers consider online forums to be public when the written posts are publicly available(1, 383) whilst others propose that the privacy of forums depends on the sensitivity of the topic being discussed, e.g. a pro-Ana forum which is for people living with eating disorders or forums where self-harm is being discussed would be considered more ‘private’(391). This is because forums of a more sensitive nature are more likely to require users to register in order to view posts online and thus seen as a closed community or private forum. Some researchers assert that forums requiring membership to access their site are clearly private(305). The Association of Internet Researchers (AOIR: | Association of Internet Researchers (aoir.org)) is a global, member-based, academic organisation which commits to ethical internet research. The AOIR highlights that despite some people perceiving that any data posted onto the internet is public property, the online users posting that material might consider that to be private material intended only for a particular online community(395). Online users might post about sensitive topics on online forums without expecting their posts to be used for research purposes and if they find their data reported within research publications, they may find this to be an invasion of their privacy(367). Forum users may access forums to seek help and support and thus may share sensitive or personal information(368, 385) which they would not expect to be used in research. To mitigate this potential invasion of privacy, the BPS recommends that researchers using online forum data should consider seeking approval from forum moderators to use the site for research purposes, to prevent what is known as ‘digital trespassing’(325). Researchers should not report any direct or literal quotes from the forum which contains personally identifiable information or has the potential of identifying an online user via traceability, whereby literal quotes can be traced back to online users via search engines(323).

7.4.2 Seeking informed consent

The BPS suggests that researchers should exercise ethical caution about the online community they examine and if no harm can result for users of those online spaces, then it may be deemed reasonable to use data without gaining consent(323). Some forums will have terms and conditions and user agreements relating to the use of users’ data in research(395), but not all will, and forum users might not expect their data to be of interest to researchers(383). It may not be feasible to seek informed consent from thousands of online users(376, 383), some of whom may no longer be active on the forum. In cases where researchers seek agreement from the site’s moderation team to use the forum data for research, it may be ethically questionable for a moderator to decide upon the informed consent of all online users of that particular site(376).

Another issue is whether researchers should overtly inform online forum users about their research or whether researchers should use forum data without informing online users(323, 376). One example was when a researcher was advised by the ethics committee to inform online users of their presence on the site via a written post, re-posted on a weekly basis and the researcher attempted to gain informed consent from all online users(383). The researcher received some abusive messages from online users on some posts, on four out of the six forums they posted in(383). The researcher then re-visited the ethics committee, who consequently advised them to collect the data covertly and not advise online users of their presence(383). This case highlights several issues. There is limited guidance for researchers using online forums for research purposes, which can lead to online users feeling violated, researchers being subjected to abuse and research ethics committees being unsure of what appropriate and relevant mitigations should be implemented to prevent harm from online forum research(383). It also highlights how different people can view their data as being more or less private than others.

7.4.3 Right to withdraw

There is an ethical tension that if online users are unaware of their data being used within research and therefore have not consented to their data being used, then they are left unable to withdraw from the study. The BPS recognises this as an issue for some online research and advises researchers to therefore anonymise all data and anything which could potentially identify online users, as a way of preventing harm to the user, from learning that their data had been used without permission(323).

7.4.4 Seeking ethical approval

The BPS and AOIR make reference to the need for ethics committees to be aware of the unique ethical issues associated with internet-mediated research, but do not assert explicit requirement for researchers to seek ethical approval for conducting research using online forum data(323, 395).

7.4.5 Theoretical positioning

It is important for researchers using online forum data to consider what their ontological perspective is. Sugiura *et al.,* (2016) states that there is an ethical distinction between online forum data being viewed as "public documents rather than ethnographic interactions"(383). This distinction underpins how the researcher approaches using online forum data in research. If researchers simply view forum data as "public documents" or textual data, then they will only be concerned with the fact its publicly available textual data available for analysis; this reflects a more 'passive/unobtrusive' approach to online forum research(305). If researchers view online forums as forums of "ethnographic interactions", then researchers might consider seeking informed consent from online users, because the data is considered to belong to human participants. This approach might be more appropriate to an 'active/engaged' approach to online forum research, where a researcher actively interacts with online users to generate data or where researchers have developed a bespoke forum for research participants to interact within, as part of their data collection method(305).

7.4.6 Online users' right to anonymity

Ethical guidelines on internet-mediated research advise that any identifying information about online users should not be reported in research publications(323). One issue with online forums is 'traceability'. Researchers can reduce the risk of traceability by ensuring they de-identify any online forum data used within their analysis(323, 395). Some researchers previously reported quotes in ways which could potentially identify online users, by reporting un-anonymised verbatim quotes and/or providing hyperlinks to the original posts from which the verbatim quotes were taken(394). Some researchers attempted to respect the users' right to anonymity by using pseudonyms when reporting literal quotes from the online posts, yet this still does not prevent traceability(394). Some doctoral researchers "Google-proofed" their verbatim quote, by changing some wording from the quotes and searching for the quote back in Google to check the original post was not retrieved from the search(376) and did not publish quotes which could identify the user. In some cases where researchers decided to remove all risk of traceability and identification of online users, by not reporting literal quotes, they amalgamated several quotes from online users or para-phrased users' quotes(323, 367, 386, 394). The latter practice is recommended by the BPS, as being least likely to cause harm to online users(323). Not all researchers consider how their anonymisation practices relate to traceability of the forum posts(394).

7.4.7 Safeguarding protocol for concerning posts

It is the role of moderators to monitor concerning posts on online forums or offer support to online users in need(308, 384). Despite researchers reporting on using many different online health forums for their research, I have not read any reports of how researchers managed any concerning posts which they read online. The BPS highlights this as an ethical issue and potential harm to researchers, but they do not provide guidance on its mitigation(323).

7.4.8 Interaction of researcher with the posts

The BPS advises that it is good practice for researchers to contact moderators in advance of using online forums for research purposes when researchers want to remain as 'participant observers' on the forums to prevent any harm or disruption to the social structures and communities(323). The BPS advise that if researchers enter an online forum which might be perceived as being private by the online community using it, then it would be socially responsible for the researcher to make the community aware of their presence and intentions to conduct research on the site(323). The BPS advises that if the research is considered to be scientifically valuable, then the researcher might consider passively observing the online community and its posts, instead of interacting with the community(323).

7.4.9 Forum ethics section summary

This section outlined how researchers can use forums to provide a unique ontological perspective on health issues. However, the use of forums in health research generates numerous ethical issues which researchers must consider when conducting ethically-informed internet-mediated research. The present study explored how carers of care home residents living with dementia drink by examining written contributions of a large UK-based dementia-specific online forum- the Dementia Talking Point forum: https://forum.alzheimers.org.uk/ (D-DRINC study B).

7.5 Methods

A thematic discourse analysis of textual data from online posts on the publicly-available Dementia Talking Point Forum was conducted. Detailed methods are reported in Chapter Four (Section 4.4.3).

7.6 Findings

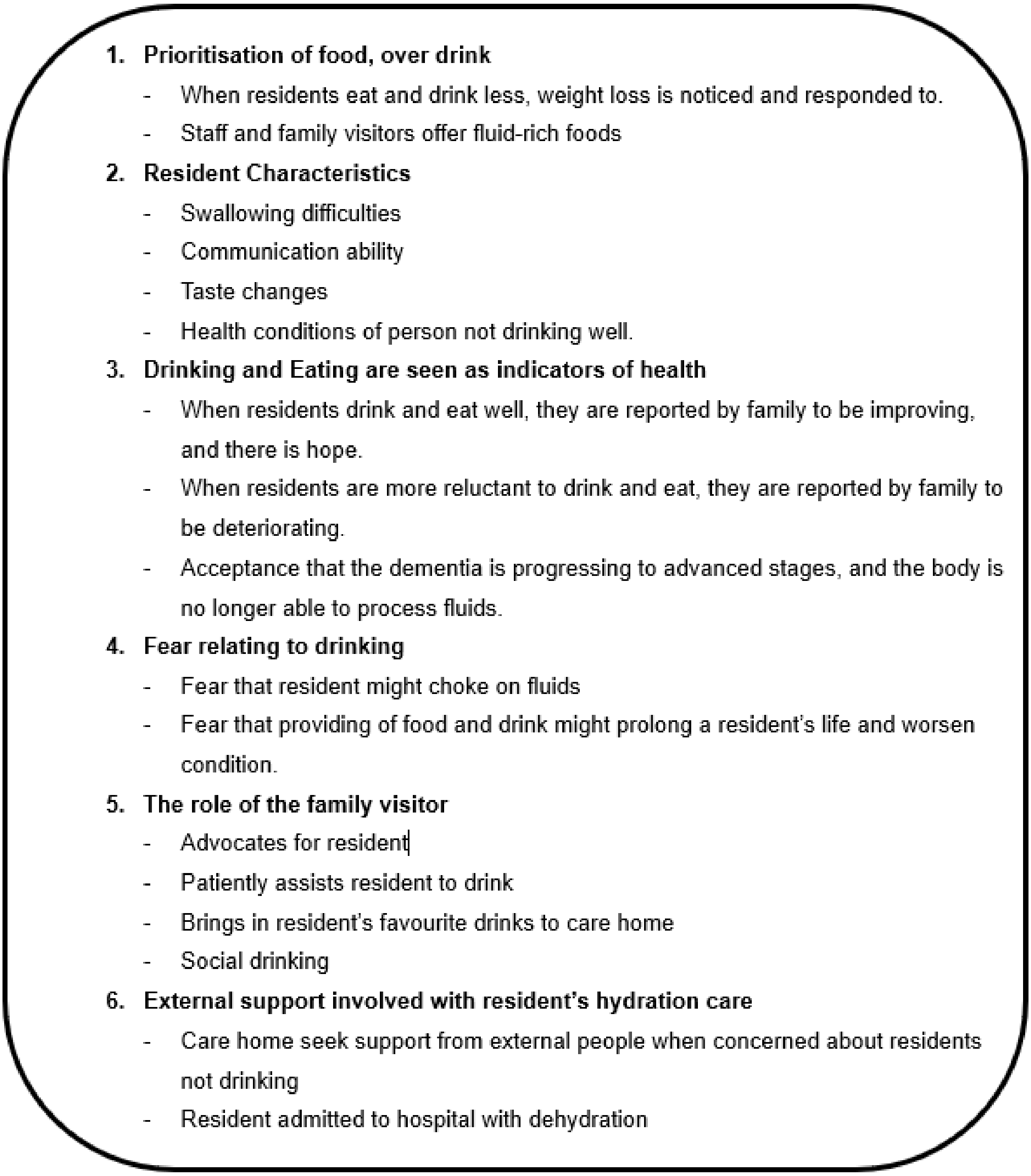
I use “them/they/their” or “the resident” to refer to social actors in this findings section to protect the anonymity of forum users.

7.6.1 Reflexive thematic analysis

As I examined posts on the forum, I kept a reflective journal and noted any reflections I had whilst reading the forum posts within the Word document(311). My reflections contributed to my early analytical thoughts about commonly occurring items and important that I read in the dataset. I reflected on the how forum users engaged with the site when they had hit “crisis” point with the person they might be supporting with dementia. I noted that “*people seem to seek support on the Dementia Talking Point when they have already hit a crisis, or fast deterioration*”. Users, when writing about end of life, employed emotive language about how the end might be near, or there had been a rapid decline in the resident’s wellbeing. This reflects how forum users used the site to seek and offer support from other users in times of anguish. Without details of the residents discussed on the forum, assumptions about the residents’ characteristics or disease progression cannot be made.

I read some posts where users strongly expressed their views on the role that different actors should play in facilitating drinking, or not. I read comments where users expressed discontent in how they perceived care home staff to force residents to drink. On the contrary, I read posts where users described how they perceived care staff to not support residents to drink enough. Caregivers wrote about their frustration of how their loved one is cared for in care homes. Some users wrote how they perceived the resident to not drink as a deliberate act to indicate they were ready to die. I reflected on the tensions between different actors involved in supporting someone living with dementia to drink in long-term care settings. I wrote in my reflective journal: “*the tensions between medical obligations to maybe ‘force’ drinking, due to fear of legal action, and then the more spiritual nature of some carers who* *reflect on refusal of drinks as the body giving up, or last bit of control, or 'a sign'"*. In adherence with CQC Regulation 14, care staff are legally obliged to ensure that residents have enough to drink and receive appropriate support to drink(70). Whilst care staff must follow clear guidance and adhere to regulations relating to hydration care, family caregivers hold their own views and values of 'care', for how they want the resident to be cared for, and act in the resident's best interests and wishes. I reflected on how it might be problematic to deliver care to a resident when key people in the resident's life may hold conflicting viewpoints on the resident's care.

I triangulated notes from my reflexive journal by reading the online posts with the textual data of the online posts to generate six themes from the dataset, with 17 sub-themes (Figure 7.2 below), relevant to how residents living with dementia drink in long-term care settings.



1. **Prioritisation of food, over drink**
    - When residents eat and drink less, weight loss is noticed and responded to.
    - Staff and family visitors offer fluid-rich foods
2. **Resident Characteristics**
    - Swallowing difficulties
    - Communication ability
    - Taste changes
    - Health conditions of person not drinking well.
3. **Drinking and Eating are seen as indicators of health**
    - When residents drink and eat well, they are reported by family to be improving, and there is hope.
    - When residents are more reluctant to drink and eat, they are reported by family to be deteriorating.
    - Acceptance that the dementia is progressing to advanced stages, and the body is no longer able to process fluids.
4. **Fear relating to drinking**
    - Fear that resident might choke on fluids
    - Fear that providing of food and drink might prolong a resident's life and worsen condition.
5. **The role of the family visitor**
    - Advocates for resident
    - Patiently assists resident to drink
    - Brings in resident's favourite drinks to care home
    - Social drinking
6. **External support involved with resident's hydration care**
    - Care home seek support from external people when concerned about residents not drinking
    - Resident admitted to hospital with dehydration

FIGURE 7.2: 17 INFLUENCES ON HOW A RESIDENT LIVING WITH DEMENTIA DRINKS IN A CARE HOME

Theme 1: Prioritisation of food, over drink

Forum users wrote in their posts how they noticed when the resident living with dementia began to eat and drink less and often linked this with the resident noticeably losing weight or looking "thin". Users of the forum reported that they (family caregivers) or the care staff provide residents with nutritionally supplemented drinks or calorie-dense milkshakes to improve the weight or calorie intake of the resident. Although inferences of prioritising food and eating, over drinking, was often described more subtly in the text by forum users, occasionally users wrote more explicitly about the importance of prioritising eating over drinking:

"When we visit [the care home] we give them an energy drink and treats trying to boost their intake. Also more of a focus on eating and weight loss, than drinking."

When users wrote about difficulties of eating and drinking for the individual living with dementia, the users often reported the importance of providing residents with fluid-rich foods. Quite often within these written posts, the user did not write about providing the resident with drinks as well. In these instances, drinks are written about for the purpose of improving calorie intake, instead of improving hydration. In the paraphrased quote below, it is clear how the user focusses on eating as the primary concern and the nutritional drinks used for weight gain, rather than hydration:

"they now eat, when they do eat, 4 oz yogurt and boost nutritional drinks"

Theme 2: Resident characteristics

Some forum users described how the residents they visited in care homes had quieter or weak voices. The forum users occasionally linked this with the resident no longer being able to communicate effectively with others, who they depended on to provide drinks or other care needs. An example of this is within the paraphrased quote below where the resident is described as speaking weakly and not drinking much:

"They were fairly awake yesterday but didn't want to drink much. They couldn't talk very clearly, their voice was weak"

This contrasts with the following paraphrased quote, whereby a resident is able to make a "little" noise and communicate that they are thirsty:

"They grinned at me and had a little voice when they said 'yes they were thirsty'."

Some forum users wrote how the resident developed a preference for stronger, sweeter or more intense flavours as their dementia progressed. These forum users advised other site users to try offering drinks with stronger or sweeter flavours to promote drinking for the resident.

“***keep reminding them and encouraging them to have a drink of squash or diluted juice. Sharp flavours have been preferred, cranberry”***

A number of users wrote about how their loved one who did not drink and eat so well after having a Covid-19 infection. Some of these users also wrote in their posts that this was linked to the resident losing their sense of taste and smell as a result of the Covid-19 infection.

“the care home nurse rang to inform me that they had tested positive for Covid-19 but was asymptomatic but two days on from there, the staff reported that they started sleeping more, and refusing food and drink.”

Forum users commonly reported that the person they visited within the care home had numerous health conditions, including recurrent infections, falls, pressure sores, Covid-19, constipation and sometimes had been hospitalised to be re-hydrated. Users wrote about these in different ways. Some users directly made the link between residents drinking too little and as a consequence became unwell:

“after the umpteenth UTI they began to refuse food and drink”

Whereas some users wrote more subtly about the consequences of residents not drinking enough and experiencing health problems as a result:

“They’re drinking a little, not passing urine and they’re constipated. They’re going to be catheterised again”

Many forum users wrote about the challenges of swallowing for the resident. Forum users wrote about how swallowing difficulties made drinking more difficult for those individuals, particularly around choking incidents and the individual forgetting to swallow.

“The nursing home staff tell us that they are forgetting to swallow, they are holding food and pouching liquids in their mouth as if they no longer understand what to do with them”

Theme 3: Drinking and eating are seen as indicators of health

Forum users often wrote on the site when residents were not drinking and eating as well as normal. This is something I had already attended to within my reflections as it was a common occurrence and concurred with the purpose of the forum being used for support and help-seeking. Withing the written posts, some forum users associated the resident’s reduced eating and drinking as being an indication of the resident’s health deteriorating. The users described feeling helpless and wrote seeking strategies from other forum users to improve eating and drinking for the resident. For some forum users, they linked the resident's reduced eating and drinking with their belief that the resident was approaching the end stages of the disease and that this was a sign their body was 'giving up' and no longer able to process fluids. Forum users who wrote about having this perspective on reduced eating and drinking, often wrote about having feelings of acceptance and reassurance that the resident would not be hassled to drink lots:

"offering food and/or drink as much as possible but not forcing. They explained that this commonly happens in the later stages of dementia and there's not a great deal they can do."

On the contrary, forum users wrote how a resident's improved eating and drinking, following a period of 'deterioration', was an indication that the resident was improving. With this perspective, the forum users wrote about feeling hopeful for the resident's' 'recovery', that the residents were no longer at the end of their life and the resident had 'turned a corner':

"when it was just the two of us they managed to hold a regular glass to drink some ginger beer and a double handled cup to have a cup of tea. Then they ate a biscuit by themselves. They have clearly turned the corner again"

Theme 4: Fear relating to drinking

Some forum posts described how users feared the resident choking on drinks. Some users who wrote about this issue in their posts and wrote how they would not offer drinks to the resident any more after the resident had choked on some of the drink. The users also wrote about how care staff persisted to offer drinks to residents after choking incidents, when the family caregivers perceived this to be more problematic for the resident's health:

"trying to keep them hydrated and fed but the staff at the home aren't acknowledging that it might be worsening their condition, that trying to make them remember swallowing is basically choking them."

Forum users sometimes reported in their posts that they were concerned that drinking and eating was prolonging the life of a resident:

"Yes they need to drink, especially when it's so warm, but when you know its almost delaying the inevitable, you do question why"

Users wrote about how they would prefer for care staff to just offer small amounts of drink and/or food to make the resident 'comfortable'. On the forum, users expressed a tension between care staff feeling obliged to persist with and evidence drinks provision to care home residents, whilst some forum users did not want their loved one to be hassled or forced to drink and/or eat. This is another theme which I had attended to within my initial reflections, because of how emotive some of these written posts were.

Theme 5: The role of the family visitor

It was consistently reported throughout the written posts, that users who were family caregivers, advocated for the residents living with dementia whom they visited in care homes. This advocacy happened in several ways. Users wrote about how they kept a ‘check’ on their relative’s care by checking fluid intake charts and addressing any inaccuracies of the fluid charts with care home staff. Users wrote about trialling different hydration care approaches with the residents, when the resident was drinking less, by means of offering mouth swabs, ice chips or saliva spray to keep the resident’s mouth from becoming dry or offering Jelly Drops™, which are a sweetly flavoured-gummy filled with a small amount of liquid. Users also wrote about how they ensured the resident received drinks by staff, by asking for drinks for the resident during their visit to the care home.

“Staff have already tried a straw, the new jelly drops that melt, yoghurts, frozen lollies and some other things but they forcefully refused them”

Forum users wrote how they spent time offering and providing drink to their relative during their visits in the care home. Users described feeling a sense of purpose and usefulness from being able to assist in this way and to relieve care staff from this duty.

“I reciprocate by seeing that they have enough to drink, or feed them ice cream if they are offered and I can relieve staff from at least one of their duties”

Forum users, who were likely to be family visitors, often wrote about bringing their relative their favourite drink and food into the home for them to enjoy, which might not usually be stocked by the care home.

“They were able to reach out to lift a glass when I visited on Tuesday as they drunk half a glass of energy drink that I’d brought in”

Family visitors wrote about taking their relative on trips out of the care setting to the pub or café for something to drink and eat. Users wrote about how as their relative’s dementia progressed, they arranged to have café trips within the care home, where they might bring in a flask or their relative’s favourite drink and something to eat, to share a social opportunity together.

“They used to take in coffee in a flask and some Turkish treats for the resident and they loved it.”

Theme 6: External support involved with resident’s hydration care

Forum users wrote about incidents when the GP assessed the resident’s health to have deteriorated. The users wrote how the GP would arrange the involvement of other professions such as speech and language therapists, district nurses or dietitians. Some forum users also wrote about sharing their concerns about the resident not drinking, or not being adequately provided with drinks by care staff, to their relative’s social worker.

“The resident’s Social Worker says they will ring me after their visit on Tuesday and said that they will inform the manager that the resident was not given a drink when I asked for one for them”

Forum users wrote about how occasionally the resident’s care homes called for paramedics to review the resident if their health had deteriorated and these residents were often then admitted to hospital for re-hydration due to severe dehydration.

“we all find it hard to get them to drink enough fluids and consequently they get dehydrated and ends up going back into hospital needing a drip despite all of our efforts.”

This quote shows how drinking is perceived as an effort by the user, but also how there appears to be a number of social actors involved with supporting the resident’s’ drinking.

7.6.2 Discourse analysis

Within this discourse analysis, I purposively sampled and selected seven written posts from the thematic analysis dataset which related to the theme of how food and eating is prioritised over drinking. To prevent traceability, I reduced the length of these posts to only encompass the drinking-related text. I also changed some words, added in some filler words and re-ordered some words to prevent the sections of text being traced back to the original poster on the ‘Dementia Talking Point’ forum. All social actors are referred to as “they/them/their” to ensure anonymity and prevent traceability. In all instances, I retained the semantics of the text so as to not lose meaning. I searched all parts of the paraphrased written posts through the ‘Dementia talking Point’ forum to ensure the original post could not be retrieved.

Discourse analysis Post One:

“They also sleep most of the time and barely eats or drinks. Their care home and GP has them on various fortified drinks. I think you can just buy them from the pharmacy. There is [Brand of fortified drink] which are like milkshakes, or [Brand of fortified drink] which is like fruit juice. Full of extra calories. The resident doesn’t really like the taste of either which is a struggle…Don’t worry about all the healthy eating stuff and focus on just getting calories into them. Full-fat milk, cream, butter all those things we would normally avoid you can now fill up on. Sweet tasting things seem to work well… There is definitely something with the resident where their sense of taste has changed due to the dementia and I’ve had to adapt”

Words used to relate to drinks/drinking

- Barely eats or drinks
- Getting him on various fortified drinks
- Milkshakes
- Fruit juice
- Full fat milk

Discourse analysis

1. User posting in Post One posts to describe the resident as sleeping most of the time, presented as the context for the resident hardly eating or drinking [they combine eating and drinking, but list eating].
2. The user describes the care home and GP as “getting them on” fortified drinks but doesn’t explain what purpose the drinks will serve – eating or drinking, or both.
3. The user describes one fortified drink as being like a milk shake and another as being a fruit juice but now being “packed with extra calories”
4. The drinks which the care home provide are presented as providing extra calories.
5. The user describes the resident as not really liking the taste of either [the fortified drinks [and so not preferring these drinks]
6. This account goes on to say “this is a struggle” presenting the resident as someone who is active but potentially resisting this change in dietary intake
7. The user advises the other user to forget about healthy eating and focus on “getting calories into” them. This presents feeding (eating or drinking) as focusing towards getting calories in, over drinking.
8. Again, this presents feeding as being less about being a shared activity but one where carers may need to overcome their resident’s (potential active) resistance

9. The user continues to advise on what products in whatever form or activity can help to increase calorie intake: full fat milk, cream, butter but they simply drop any mention of drinking.
10. NB They do not explicitly say “don’t attend to drinking”, they simply do not separately identify it. They simply imply eating and “increasing calories” are now the focus.

Commentary

This post demonstrates how the user highlights the care home and GP managing feeding this resident by introducing fortified and other drinks. They increasingly highlight as desirable *Packing with extra calories* and feeding the resident by *getting extra calories in him*, to increase calorie intake whether via eating or drinking but not addressing drinking itself as a qualitatively distinct and separately valued activity.

Discourse analysis Post Two:

“When I visit the resident we share chocolates and biscuits. Their care home supplies biscuits, cake and desserts, especially in the lead up to Christmas. They even put sugar in their coffee now…They are in their 80s with advanced dementia and no other health concerns. Food items - particularly sweeter things - are one of their few pleasures left. They have put on a little weight but that doesn't matter at this stage of life”

Words used to relate to drinks/drinking

- Has sugar in [cup/mug of] coffee

Discourse analysis

1. User posting in Post Two posts to describe how they share chocolates and biscuits when visiting the resident.
2. The user describes how the care home provides sweet food items leading up to Christmas.
3. The user describes that the resident “even” has sugar in their coffee. This implies that previously the resident may not have had sugar in their coffee.
4. The user describes sweet food items as being one of the resident’s last few pleasures. This shows food described as being pleasurable.

Commentary

This post demonstrates how sweet foods are described to be pleasurable, which can be shared and enjoyed during social occasions. The user describes the resident as still having coffee. The sweetened coffee was described in the context of enjoying sweet foods. The user specifically states that food items are one of the resident's last few pleasures, omitting any mention of pleasure in drinking.

Discourse analysis Post Three:

"I'm sure they probably did check their weight on entry [into the care home]. Whilst they were in hospital, I noticed a note to weigh them daily on a chart and the district nurse visits them quite regularly to dress their leg ulcers so I'm guessing it must be in their [care] records…I hadn't considered dehydration, but that's a very good point. The staff are always trying to get them to drink – They've always been a nightmare for not drinking enough fluids all the time I've known them. They would have a cup of coffee with their breakfast, one in the afternoon and that was it! They never wanted a drink with their meal neither. They never liked cold drinks full stop - even when it's been hot weather."

Words used to relate to drinks/drinking

- Hadn't considered dehydration
- Always trying to get them to drink
- A nightmare for not drinking enough fluids
- Cup of coffee with breakfast
- One [cup of coffee] in the afternoon
- "and that was it!"
- Never wanted a drink
- Never liked cold drinks

Discourse analysis

1. User posting Post Three describes the resident recently leaving hospital and moving into a care home.
2. The user describes how the resident was "probably" weighed on entry into the care home and had read a note in hospital stating they needed to be weighed daily.
3. The user reports that they hadn't considered dehydration [Weight loss had been noticed, and the resident was being routinely weighed].

4. The user describes that the care staff are always trying to get them to drink. This describes repeated efforts from care staff and reluctance from the resident.
5. The user describes how the resident had always been “a nightmare” for not drinking enough fluids. This comment negatively describes their reluctance to drink. It also provides a temporal context for the resident as having “always” been reluctant to drink.
6. The user’s post goes on to describe how the resident has a cup of coffee with breakfast and one in the afternoon. This describes how drinking would happen as part of a routine but brings awareness to how little the resident drinks.
7. The user states “and that was it!” after describing how the resident only drank two cups of coffee a day. This comment emphasises that the resident only drinks the quantity of drinks, which the user had written about, and no more.
8. The user describes that the resident “never” drank with meals. This comment highlights how they totally refuse to have drinks alongside meals.
9. The user continues to describe how the resident doesn’t like any cold drinks and caveats the comment with “even in hot weather”. This comment again reinforces the upmost refusal of the resident to break routine of two cups of coffee a day.

Commentary

This post begins by describing the importance of monitoring weight loss and the importance of noticing weight loss due to its visibility and apparency. Meanwhile, dehydration had not been considered. The post contextualises the resident’s current drinking within their history of rarely drinking. The post suggests how it might be customary to have a drink alongside a meal and infers that it might be unusual for someone to choose not to have a drink with a meal. The post emphasises how drinking can be a battle between persistent staff, versus reluctant and ‘nightmarish’ residents. The user demonises the resident for not conforming with the care staff’s obligation for them to drink more than two cups of coffee a day.

Discourse analysis Post Four:

“Three weeks ago the [care home] GP called me… The resident was refusing to eat or drink. The GP said my other half was near ‘end of life'. … I have been visiting every day and they have gathered themselves. They eat a spot of lunch if I spoon-feed them and if they are sat in a chair in their bedroom every day when I arrive at the home around 11.30am. They talk a lot some days, other days they snooze… God help me to weather this storm.”

Words used to relate to drinks/drinking

- Refusing to eat or drink [*The GP said my other half was near 'end of life'*].

Discourse analysis

1. User posting Post Four posts to describe how the care home GP telephoned them to inform them that they had just examined their relative.
2. The user describes how the GP informed them that the resident was refusing to eat or drink and was near 'end of life'. This comment highlights that the relative was dying.
3. The user continues to describe how since the care home has allowed them to visit every day, "they have gathered themselves". The user relates their daily visits to the resident's health improving. The user describes the health improvement as the resident sitting in a chair and eating some food when they spoon feed the relative.
4. The user asks God to help them "weather the storm". This comment seems to refer to their caring responsibilities.

Commentary

This post describes how the GP advises the user that the relative is at end of life and are no longer eating and drinking. The user describes how their daily visits led to the resident's health improving. The user describes their experience as a "storm" and calls upon God to help them cope. Although the post discusses both eating and drinking together, the user writes an example whereby they support the resident to eat, though they do not write about support drinking. The user directly relates their efforts to spoon feed the resident food, as to why the resident's health is improving. This post again highlights how eating is not a shared occasion, but instead one that is enacted upon a resident. It also shows how the resident who had been classified as 'end of life' where perhaps drinks may not be provided as freely, now seemed to be eating sat in a chair and perhaps no longer considered 'end of life'.

Discourse analysis Post Five:

"the resident loved sweet things too and was thin and losing weight. The home fed them high calorie food items including milk shakes made using fresh fruit, cream, full-fat milk and ice cream. They had honey spread on toast and had at least one fresh cream cake a day and constant access to the tins of biscuits. We still took their favourite sweets and chocolates into the care home-Goodness, they have dementia, why not"

Words used to relate to drinks/drinking

- High calorie food items including milk shakes
- Full-fat milk

Discourse analysis

1. User posting Post Five posts to describe how the resident was losing weight and liked "sweet things".
2. The user goes on to describe how the [care/nursing] home 'feeds' them "high calorie foods including milk shakes". This comment shows how milkshakes are perceived as being a high-calorie food. It also describes how the "feeding" activity is being enacted by the nursing staff.

Commentary

This post describes how a milkshake, which is more commonly known as being a drink, is described as being a food by this user, for the purpose of "feeding" the resident with "calories", to counteract their weight loss. The interaction is unbalanced. The nursing staff are actively "feeding" the resident, whilst the resident is passively receiving the "high calorie foods". The post reports how the resident has constant access to the biscuit tin but omits any mention of supply or access to drinks. Again, this post reiterates how weight loss is visible and therefore responded to by the nursing home providing drinks to residents to increase calorie intake, instead of meeting their hydration needs.

Discourse analysis Post Six:

"The GP was asked [by the care home] to visit the resident in the care home as they were not wanting to eat (refusing to open their mouth to eat or drink) or bringing up what they had [in his mouth]. The GP examined the resident, as best as they could as the resident was sleeping. The GP's opinion is now that the resident has had a final decline and either there is a blockage somewhere or doesn't want to eat the food anymore…The resident will obviously be offered food and drink, but if they refuse then that is ok"

Words used to relate to drinks/drinking

- refusing to open their mouth to eat or drink

- be offered food and drink

- refuses [food and drink]

Discourse analysis

1. This user posting Post Six posts to describe how the GP was called into the care home because the resident was not eating. The user makes an additional comment in brackets, that the resident is refusing to open their mouth to eat or drink. This comment shows how the user has directly linked the refusal of the resident to open their mouth, with them not wanting to eat or drink.

2. The user writes that the GP assessed the resident to have a “final decline” and might not “want to eat the food anymore”. This comment reflects that although the resident is refusing to eat or drink, the GP is reported to only be attending to the resident’s eating.

3. The user later writes that the resident will “obviously be offered food and drink”. This comment implies that the nursing staff will continue to offer food and drink. By writing “obviously”, the user removes any doubt that the resident would not be offered food and drink. This seems in direct contrast to the user’s judgement that the resident does not “want” food.

4. The user goes on to write that if the resident refuses [food and drink], then that will be ok. This comment shows how the GP has permitted the resident to refuse to open their mouth for food and drink, which has potentially mitigated the care staff’s obligation to persist with supporting drinking.

Commentary

This post shows how the GP and user conclude that the resident’s refusal to open their mouth for food and drink, as resulting from the resident not “wanting” food and drink. Although the user describes that the resident is not eating or drinking, the GP attends to the eating throughout their examination of the resident. This demonstrates how the resident’s actions of refusing to open their mouth for food and drink is permitted by the GP, because they are in the “final decline”. The user describes that the resident will be offered food and drink, but its ok if they refuse. The way in which the user describes the resident’s refusal at the end of their post is in stark contrast to the way they described the potential refusal, at the end of the post, because the refusal has been permitted by the GP and therefore considered acceptable.

<u>Discourse analysis Post Seven:</u>

"I've been into the care home today with the resident. They look awful. Half asleep, very thin. Had breakfast, got a temperature. They are drinking a little, not passing urine and constipated. They [staff] will be catheterising the resident again. Hopefully the resident will pass urine. They're [staff] getting an end of life just in case box organised"

Words used to relate to drinks/drinking

- He's drinking a bit

Discourse analysis

1. This user posting Post Seven describes how "bad" the resident's health condition is in the care home. The user writes that the resident is "drinking a bit" within the context of their poor health.
2. The user writes that the resident "had breakfast" but had been "drinking a bit". This comment shows that breakfast was a one-time event, whereas drinking was happening gradually.

Commentary

This post shows how "drinking a bit" is written within the context of the resident's wider health problems. The description of "a bit" implies that the resident is drinking small quantities of fluids. The user finishes writing their post with "Don't think it's going to be too long", implying that the resident will soon die. "Drinking a bit" is therefore written within the context of describing a dying resident.

Analytical summary of the discourse analysis

It is clear from analysing this subset of written posts from the 'Dementia Talking Point' forum, that drinking is not seen as a distinct activity from eating. From reviewing the forum posts sampled in this study, drinking was not prioritised more than eating in any post. Users write about noticing weight loss or write about how the resident 'refuses' to open their mouth to eat and drink. Users also write about residents not eating and drinking within the context of wider ill-health. When residents living with dementia are reported to not be eating and drinking well, they are reported to be 'fed' nutritional drinks to provide calories. The purpose of drinking is therefore not to increase fluid intake, but instead, drinks serve the purpose of providing food with 'extra calories' to compensate for weight loss. As well as food being reported to increase calorie intake within the posts, food is described positively by users with words such as 'treats' and 'pleasure'. Meanwhile, drinking is described as being 'a struggle'.

Eating and drinking are sometimes described as being a conflict between a ‘refusing’ and uncooperative resident and persistent care staff. When residents do not comply with the care staffs’ need for them to eat and drink, users write this as the resident ‘refusing’. This conflict between staff and residents regarding eating and drinking activities is only reported to be mediated when the care home GP is reported to make the decision that the resident is at end-stage dementia and therefore staff should just keep the resident ‘comfortable’.

The prioritisation of food over drink is most commonly framed subtly within the written posts by users writing about ‘eating and drinking’ but only discussing food and eating and omitting any further reference to drinks and drinking. Drinking is discussed within more negative contexts by forum users, compared to when users write about food and eating, considered to be pleasurable, enjoyable and a treat. There are, however, more obvious instances of the prioritisation of food over drink, where the users write about “feeding” residents with drinks for the purpose of increasing calorie intake, or where users explicitly write to other users on the site advising them to *“focus on just getting calories into them”.*

7.7 Discussion

To my knowledge, this was the first study to use publicly available data from the Alzheimer’s Society’s UK ‘Dementia Talking Point’(303) to examine how people living with dementia consume drinks in care homes, within the public discourse of online posts. This innovative approach to considering an alternative exploration of difficulties faced by carers of people living with dementia arose from the constraints of in-person data collection imposed by the Covid-19 lockdown measures, and as a result, I have been able to include forum postings of family caregivers of care home residents living with dementia to provide a unique ontological perspective of hydration care in care homes. Family caregivers are often over-burdened and time-constrained, finding interviews and surveys difficult to complete, whereas many seek support and offer support on the ‘Dementia Talking Point’ forum, contributing to the vast corpus of data.

I reported this study in line with principles from the SRQR(358) and ensured transparency in how I reported the methodological approach to this study as well as describing the type of analyses I conducted. To ensure trustworthiness and rigour I outline here steps I took to ensure a robust approach to the study. The study was pre-planned and a protocol developed which received ethical approval by an NHS REC. I sampled and analysed textual data from an online public discussion forum which is the largest online forum specifically for people affected by dementia in the UK, which may ensure that the research findings are relevant or useful to caregivers of people affected by dementia. My study was informed by a social constructionist approach(292), and I took an ontological perspective of textual data, leading me to attend to acting words in the text relating to drinking. This ensured that my analysis remained focussed and ensured transparency of research processes. I rigorously conducted the analysis and was guided by Braun and Clarke's (2021) guidance for assessing the research quality of thematic analysis(302). I conducted an inductive reflexive thematic analysis to generate themes from patterns within the textual data and then conducted a discourse analysis to explore deeper and generate meaning from the dataset. I immersed myself within both analyses and familiarised myself with textual dataset, noting down any reflections that I had before beginning the analysis. This thorough immersive, reflexive and iterative approach to my analysis ensured that it was a robust process. Throughout analysis, I discussed analytical approaches and findings with my supervisor (FP) to ensure a rigorous approach to analysis.

7.7.1 Summary of findings

In reviewing and analysing posts from the 'Dementia Talking Point' forum, I found many reported influences on whether a care home resident living with dementia drank fluids or not. Drinking was often framed as a lower priority than eating and thus food provision was prioritised over drinks provision by relatives. Family visitors were framed to play a pivotal role in advocating for residents in care homes as well as providing attentive and patient hydration care. Certain personal characteristics made it more difficult for some residents to drink, such as swallowing, having communication difficulties, or having other health conditions. Care home residents were supported by external support agencies when they drank less than usual. Family visitors and care staff linked drinking and eating with being indicators of health status and when someone did not drink so well, they were viewed as deteriorating and vice versa. Lastly, some family relatives and care staff shared fears of residents drinking, particularly if family relatives felt the resident was at end stages of the disease or if they had swallowing difficulties.

7.7.2 How do these findings relate to the existing literature?

Forum users prioritise food over drinking.

In this study, I attended to how forum users prioritised food and eating over drinks and drinking within their discourse on the forum. Within the discourse analysis, I commented on how food was described as being 'pleasurable' within the written posts whereas drinks were described more functionally. Interestingly, CQC regulation 14(70) states that a "variety of nutritious, appetising food should be available…served at an appropriate temperature" with snacks or other food made available throughout the day. Meanwhile, regarding hydration, regulation 14(70) states that “water must be available and accessible to people at all times. Other drinks should be made available periodically throughout the day and night”. This infers a more functional approach to hydration instead of the important role of aesthetics and enjoyment of drinking in promoting drinking. Whilst hydration and food are discussed separately in the regulation, drinks are not described as “appetising” (70). This description in itself is problematic for the narrative of drinking being an act which is done to residents by care staff rather than being an ‘appetising’ and ‘enjoyable’ experience. Moreover, regulation 14 states that residents should be served a “variety” of foods whereas only water should be available to residents throughout the day and night and other drinks should be served to residents “periodically”(70). This regulation determines how care providers provide food and drink to residents and thus perpetuates how food tends to be preferred and prioritised over drinks and drinking.

Concurrent with the findings of this study, a recently published paper acknowledges how, in contrast with malnutrition, there has been less attention paid to dehydration in the literature, leading to more research gaps(93). Researchers, family caregivers and formal care staff subtly prioritise food and eating over drinking within examples from the literature, as has already been extensively discussed in Chapter Six(57, 58, 61, 65). In one study where the researcher explored residents’ experiences of mealtimes, the researcher focussed on reporting on residents’ eating practices or food preferences, instead of considering drinking to be an equal part of a mealtime experience(64). Regulation 14 does not state that residents should be served drinks during mealtimes(70). Meals might be considered to be the predominant aspect of mealtimes, however, as one forum user wrote about in Post Three in the discourse analysis, it is often customary to have a drink available alongside a meal. Similarly, in a study which aimed to explore how long-term settings met the nutritional needs of their residents, the researchers decided to focus only on observing food preparation and asking staff and families questions about residents’ food intake(210). In this example, drinking was discounted as contributing to residents’ nutritional needs(210). Merrell *et al*. (2011) reported that whilst care staff often made assumptions about residents’ food and drink choices, residents had less choice over what beverages they consumed, compared to their choice over food(210). This was also observed within service evaluation observations, where residents lacked the choice over what drinks they drank(57). If residents do not get to choose their preferred drink, they might find drinking less enjoyable. This example reinforces how food should be enjoyed, whereas drinks should just be tolerated. If formal and informal caregivers do not prioritise drinking for care home residents and residents do not get a choice over their hydration care, residents are left unable to prioritise their own drinking.

Regulation 14 states that care staff must provide “appropriate support” to any resident requiring assistance with eating and drinking(70). In the discourse analysis, users wrote about staff persistently ‘trying to get residents to drink’, however, there are also examples from the discourse analysis where informal carers supported the resident to eat but omitted any reference to them supporting the resident to drink. In one study where researchers interviewed care staff, the staff reported that they ate with residents during breakfast club to support residents to eat well(237). However, the care staff omitted any reference to supporting residents to drink well during breakfast club(237). This could be because they do not perceive drinking to be a social opportunity, like the act of eating is perceived to be. Greene *et al.,* (2021) observed how “staff did not socially drink with the residents” and yet when the researchers observed healthcare assistants persisting in encouraging residents to drink, residents drank more(57). This highlights variation in how staff might interpret regulation 14’s statement about providing “appropriate support” to residents who are unable to drink independently(82).

Collins’s (2020) conducted a study which aimed to explore eating and drinking for people living with dementia and dysphagia in long-term care settings(61). When Collins interviewed staff and family caregivers about residents’ eating and drinking activities, the interviewees’ responses focussed on discussing topics relating to food or eating activities(61). Researchers conducted a scoping review of 79 publicly-available policy and guidance documents relating to dehydration and malnutrition in residential care and recommended eight strategies for improving nutrition and hydration in this population(396). One of the recommendations included the need for further research involving residents, families and care staff to identify positive and negative practices associated with hydration in care homes(396). It is necessary for future research to unpick why formal and informal caregivers deprioritise drinking for care home residents living with dementia.

Another way in which family caregivers and care staff prioritised food and eating over beverages and drinking in long-term care settings, within the written forum posts, was when staff and caregivers were reported to offer nutritionally supplemented fluids or fluid-rich foods to increase residents’ calorie intake. Some forum users described how residents ‘ate’ milkshakes to improve the resident’s weight loss. Regulation 14 states that a resident’s food should be “liquidized” if they have been assessed as needing their diet modified in this way(70). Regulation 14 does not state that liquidised food should replace drinks(70). In Kayser-Jones *et al.’s* four-year anthropological study, researchers observed that care staff mixed pureed food into cups of milk for residents living with dementia and assisted the residents to drink the “milk-food mixture” (p.69)(242) as this was quicker for care staff. In Cook *et al.’s* (2018) study, researchers observed that care staff gave ice creams and ice pops to residents who might have been thirsty but did not drink so well, instead of staff providing additional drinks(208). These examples highlight how drinking is an activity which is done to residents and if care staff’s time is limited, care staff might resort to making the drink into food, to feed the resident instead.

Resident characteristics

In this study I attended to how forum users linked certain characteristics to residents’ ability to drink within their written posts. These characteristics included residents finding swallowing of food and drink difficult, having quieter voices or unable to verbally communicate to request their preferred drinks, inform staff about taste changes linked with dementia which might change what drinks a resident would prefer to consume and health conditions of the resident which forum users linked as a consequence of the resident not drinking enough. It is well documented in the literature that residents with swallowing difficulties find drinking more difficult, which might lead to reduced fluid intake(58, 61, 237, 397). Residents with undiagnosed dysphagia may not accept drinks if they choke or cough on fluids(56). Some forum users wrote in their written posts how the person living with dementia did not like the taste and texture of thickened fluids which are sometimes prescribed to improve swallowing function, which led to the resident not drinking the thickened fluids. In one qualitative study, the researcher reported that people living with dementia who had swallowing difficulties, sometimes had thickener added to their drinks to aid their swallow, however a member of care staff reported that residents did not like thickened drinks because they tasted like “wallpaper paste” (p.191)(61). There is mixed evidence for using thickened fluids for people living with dementia and dysphagia(148). Care providers should therefore evaluate the impact of thickening fluids for residents living with dementia, in cases where residents might begin to drink less. However, staff might not always feel prepared or confident in responding to residents’ swallowing difficulties(237).

Low-intake dehydration is well-documented in the literature to be associated with a number of significant health problems and increased risk of mortality in older people(4, 14, 18, 93). Within the current study, forum users tended to write about residents’ poor drinking in the context of the resident’s ill-health. Forum users sometimes linked residents drinking less due to having another health condition, such as Covid-19, within their written posts, or residents experiencing ill-health directly resulting from not drinking enough fluids. Lea *et al.* (2017) interviewed care staff and reported that care staff were aware of some health concerns associated with residents not drinking enough such as residents having falls, UTIs, delirium and being admitted to hospital(58). There is less focus on informal caregivers and people living with dementia's perceptions of drinking in the literature, compared to the focus on care staff awareness of residents' hydration needs. However, some studies have reported that family caregivers and people living with earlier stage dementia are unaware of the changes relating to hydration needs as dementia progresses(62, 398). The authors of these studies concluded that people living with dementia may not perceive themselves as being likely to experience hydration problems in the future and so cannot relate to this issue(398). Authors highlight the need to educate caregivers of the hydration changes relating to dementia progression to ensure adequate hydration as people age(62). It could be assumed that when forum users wrote about the context of wider-ill health problems for their resident who was not drinking well, the resident was experiencing hydration changes as a result of dementia progressing to later stages of the disease, which they may or may not have been aware of.

Forum users sometimes wrote about how the resident had a quieter voice or sometimes it was written that the resident was unable to communicate with care staff to request drinks and therefore family caregivers requested drinks on their behalf. Greene *et al.,* (2021) observed how care staff did not always spend time working to establish effective communication with residents(57). Greene *et al.,* (2021) reported how if residents were unable to express a clear answer after being questioned by care staff about their desire for a drink, these residents were sometimes not provided with a drink(57). Greene *et al*., (2021) commented that most carer interaction with residents was verbal(57), however a carer from Cook *et al.'s,* (2018) study was quoted emphasising the importance of visually showing residents choices of drinks for those who cannot communicate very well(208). In Cook *et al.,*'s (2018) study, caregivers are also quoted discussing the importance of considering residents' taste preferences(208). However, in the same study, carers discuss the routines of how they serve certain drinks at set times which seems to somewhat remove consideration for all residents' choice and preference and contradicts the interview quotes(208). It is clear that effective, reciprocal communication is fundamental between carers and residents for residents to be provided with their preferred drinks, with consideration for how taste preferences might change as dementia progresses.

Drinking and eating are seen as indicators of health

A commonly occurring theme within the posts, was that some forum users wrote linking a resident's ability to drink with their health status. This was visible within the discourse analysis, by how forum users linked residents' worsening drinking ability with preparing for end-of-life care. Sustained reduced food and fluids intake is associated with dementia progression(31). Professionals working in the field of dementia care report that people living with dementia may consume less food and fluid as dementia progresses and reduced food and fluid consumption can be indicative of dementia progression(30, 31, 399). Within an ethnographic study of an older person's nursing unit, the researcher noted that the ward physician and ward manager concluded that a resident's health had "got worse", as the resident was "barely eating"(400), demonstrating the narrative of how health deterioration is linked to reduced eating and drinking, whether the resident has been medically assessed or not. In the present study, depending on how the forum user wrote about why the resident living with dementia was no longer drinking well, e.g. whether this was due to disease progression, or whether it was a temporary state of refusal to drink, impacted on how the forum user wrote about how they responded to the resident's hydration needs. There appeared to be a tension in the dataset that care staff had a legal obligation to 'persist' with giving drinks to residents, whilst family caregivers, depending on how they perceived the resident's health, may pursue a moral obligation to either provide the resident with drinks or allow them to not drink, if they believed that was in the resident's best interests. To summarise, how family caregivers, paid care staff and dementia professionals perceive why a resident might be drinking less than usual is associated with what level of support they provide to the resident with dementia to consume fluids.

Fear relating to drinking

In the thematic analysis, I attended to how some forum users described fearing the resident choking from being given fluids or feared prolonging the resident's 'condition', by supporting the resident to drink. In contrast to these findings, Collins (2020)'s study of care home residents living with dementia and dysphagia, reported how family caregivers were more likely to take risks in relation to providing family members living with dementia thickened drinks or treats which were the incorrect texture, showing little regard to the care home assessments for that particular resident(61). Collins (2020) concluded this as potentially being because family caregivers were less aware or concerned about the risks relating to dysphagia and instead doing what they "felt was best" for the resident(61). Collins (2020) reported that although care staff felt they knew what was best for the resident, they were unable to deviate from the resident's care plan for eating and drinking due to "fear of repercussions"(61). As previously discussed, this emphasises how care staff might experience their own moral tensions between the legal constraints of their job and what they feel what might be best by the resident on a human level. It reflects how both informal and formal caring can be a fearful experience for people providing care to people living with dementia in long-term care settings. This fear might be related to how confident formal and informal caregivers feel in relation to caring for someone living with dementia and dysphagia. Collins (2020) reported that speech and language therapists did not always trust care staff to follow recommendations that they had provided to the care home(61). Collins (2020) also reports that when family members trusted care staff, they were more likely to follow recommendations on hydration and nutrition support to the resident(61). It is therefore important that care staff and family caregivers communicate and collaborate well to understand what hydration needs the resident has, so that all parties can support the resident as well as possible to prevent the feelings of fear.

In the UK, speech and language therapists should assess resident's swallowing if a care home raises concerns, but it is reported by care staff that this is a slow and lengthy referral process. Several studies have previously reported that care staff referred to residents by their "medical labels", such as "normal diet" or "choke risk" (p.624)(255), or "the feeds" (p.174)(61), which implies that these residents had been assessed on their ability to eat and drink. Not only do these labels control what level of support care staff must provide to the resident to support them to drink, it also sometimes determines where residents will sit to eat and drink. Stöhr *et al.,* (2022) reported how they observed residents positioned at dining tables according to resident's mealtime supports needs: "*A care assistant sits at a table with four residents and assists two residents in eating. Another care assistant sits at a table with six residents and assists three of them in eating… At another table there are three residents who do not need any support, eat independently…"*(400). This quote demonstrates how professionals' classifications of a resident's eating and drinking abilities can have wider implications for their care in terms of which residents they have contact with during mealtimes and when and where they eat and drink, which may impact on how much drink residents are supported to consume.

The role of the family visitor

The majority of written posts I reviewed within the thematic analysis appeared to be written by family caregivers of people living with dementia living in long-term care settings. The written posts mostly related to the forum users seeking help or writing support and advice in response to other users' posts. Forum users wrote about how they advocate for the resident in terms of request drinks on their behalf or checking the resident's fluid chart for accuracy. Forum users reported the family caregiver's role to include providing social opportunities for drinking, assisting with drinking and supplying the resident's preferred drink items. The role of family caregivers in residents drinking, was well-reported in the literature(60, 66). In qualitative studies exploring how older people are supported to drink in care homes, family caregivers were reported to take residents' favourite drinks into the home(60, 66) as well as attending social activities within the care home, aimed to promote residents' drinking such as high teas(66, 256). Family caregivers may assist residents to drink by physically supporting the resident to hold a beaker or by pouring and prompting residents to drink(60, 61, 208). Collins (2020) reported that family caregivers maintained positive relationships with the resident living with dementia through occasions where they could share food and drink when they visited the resident in the care home(61). Collins (2020) reported how, whilst conducting observations, they attended to how residents sat alone for long periods of time, with no engagement from care staff, and so when food and drink was presented to residents, as part of care home routines, these were opportunities for residents to engage with staff(61). Consequently, when family caregivers visited the resident in the care home, this provided the resident with more social engagement opportunities as well as drinking opportunities. Collins (2020) reported how family caregivers sharing drinks with residents benefitted the family caregiver also, by giving them opportunities to not sit alone at home during mealtimes but also in terms of them feeling useful(61). Family caregivers have been reported in the literature to check residents' fluid charts(58) for whether care staff have completed the records accurately, but also to assess how much the resident had been drinking. These findings demonstrate the vital role that families see themselves as having of the family caregiver in advocating for and supporting the resident living with dementia to have their hydration needs met by care staff. However, not all care home residents will have visitors visit them. Moreover, care staff may not necessarily appreciate the input of family caregivers, particular if it seen to be interfering(171).

External support involved with resident's hydration care

The thematic analysis of written posts from the 'Dementia Talking Point' forum(303) highlighted how users wrote about residents living with dementia in care homes receiving external support from their family caregivers, the GP, social workers, speech and language therapists, nutritionists and district nursing teams to meet their hydration needs. The discourse analysis particularly identifies how care home GPs have the power to assess and conclude whether a resident is required to continue drinking the same quantities as before or whether the resident can be left to just drink as and when needed, if assessed as being 'end of life'. Regulation 14 states that care providers must provide residents with "suitable and nutritious food and hydration which is adequate to sustain life and good health"(70), unless it is not in the resident's best interests, which would be assessed using the Mental Capacity Act (2005)(322). The care home GP therefore is usually directed as being responsible for assessing the resident's mental capacity to make their own eating and drinking decisions(70). Within the thematic and discourse analyses it became clear how GPs often make the 'final' decision over residents' ability to drink and what support they should receive from care staff, relating to their hydration needs. The GP perhaps mediates the contention of formal caregivers feeling obliged to give drinks when the resident appears to not want to drink.

Collins' (2020) study highlighted how speech and language therapists provide guidance to the care home staff on how they should meet residents' hydration needs when residents have both dementia and dysphagia(61). Although speech and language therapists provide guidance they do not always trust care staff to enact the guidance appropriately(61). Within their longitudinal, observational study, Kayser-Jones *et al*. (1997) observed that a social worker, nursing and care staff and dietetic staff were all present at times, during mealtimes and the authors concluded that quality mealtime care should involve families, as well as nursing staff, physicians, activities staff and speech and occupational therapists(242) to provide different perspectives on mealtime care. However, this study focussed on American care homes(242) and is now dated and thus service provision may now be different. It is important to note that despite all the additional support services available to residents, the researcher still reported less than optimal hydration care delivered to residents. Regulation 14 legislates that medical professionals or allied health professionals must assess a resident's eating and drinking ability if care staff notice any changes in residents' food or fluid intake(70). Whilst the types of external support may be relevant to how a resident living with dementia drinks, previous research suggests that the consistency of care and communication across healthcare professionals and caregivers may be more relevant(230). The qualitative study, comprising focus groups and interviews with staff experienced in providing nutritional care in care homes, reported that hydration and nutritional care provision was sometimes inconsistent due to ineffective communication processes between professionals and caregivers(230). However, consistency of care improved when food and drinks were prioritised by staff involved with hydration care(230).

7.7.3 Limitations of this study

This study has several potential limitations. It could be argued that as I did not engage with users of the forum, I was unable to ask any follow-up questions to the data that I collected, which might have deepened my understanding of the user's account or experiences. This might have been relevant had I opted to examine users' experiences of events. However, I approached this study taking a passive/unobtrusive approach(305) to analysing textual data from the forum and thus this fitted with my ontological perspective of examining how people living with dementia consume drinks in care homes. I chose to use one online public discussion forum from which to collect my data from. It could be assumed that the forum users were digitally literate and were mostly family caregivers of someone living with dementia. I could have potentially analysed data from a different online platform such as a Facebook group, with which to compare and contrast findings with this study. I may have restricted my search results by the drinking/hydration terms I used and because the forum restricts all search results to ten pages. However, I developed this exploratory study to examine and learn from the public discourse which people may have used to justify their actions and views, to contextualise what I read when working on this study. The discourse analysis made visible how drinking was framed as being less of a priority compared to food and eating within a small sample of posts, highlighting the importance of refuting positivist notions when considering qualitative data. Moreover, I conducted an ethnographic case study in a single care home (Chapter 6- D-DRINC Study A) which I triangulated the findings from this study with, which is discussed in Chapter Eight to assess the representativeness and transferability of the findings. The forum users whose written posts I analysed within this study were anonymous and thus I was unable to report on the characteristics of the forum users and I am unable to comment on what type of care they provided for the residents they described. This is important for inferring what stage of dementia the residents were being described within the posts. Eating and drinking abilities are documented in the literature to deteriorate with dementia progression and thus these study findings might be more reflective of people living with dementia in the later stages of the disease. However, this is speculative and cannot be confirmed.

7.8 Summary and conclusions from Chapter Seven

This study offers a way to view how ‘Dementia Talking Point’ forum users use discourse within their written posts, to frame how people living with dementia drink in care homes. Specifically, I suggest that forum users use discourse to prioritise and emphasise the importance of eating and food over residents’ hydration needs. The finding that food and eating activities are prioritised over drinking activities by forum users, who I mostly inferred to be family caregivers, is concerning. This study also confirms previous findings in the literature which report that hydration care is facilitated by numerous professionals, as well as family caregivers. These findings illuminate how certain resident characteristics and dementia stage can make drinking more difficult for some residents living with dementia. This study has important implications for how drinking and fluids are presented, communicated about and considered by family caregivers, care staff and professionals, within long-term care settings. This study highlights the important role of family caregivers in advocating for and supporting care home residents living with dementia to drink and spending time with them to meet their hydration needs. This study provides a novel perspective on how all parties involved with how a resident living with dementia drinks in a care home place importance on drinking or not.

8. Discussion of findings

8.1 Aim and outline of chapter

This chapter presents the integrated findings from this mixed-methods thesis, comprising three studies, which explored and examined the prevalence of dehydration in older adults living in non-hospital settings and hydration care of older people, including those living with dementia in care homes. This chapter presents an overview of each study before describing the integrated research findings and meta-inference of this thesis. The integrated findings are then discussed within the context of existing research to evaluate to what extent the thesis met its aims to generate knowledge of how many older people are dehydrated and how people living with dementia drink in care homes. In this chapter, the strengths and limitations of the thesis are discussed and the conclusions of the thesis are presented.

This thesis aimed to answer the questions:

How many older people are dehydrated and how do older people living with dementia drink in care homes?

8.2 Summary of each study

8.2.1 Systematic review and meta-analysis: Chapter Five

The prevalence of low-intake dehydration amongst older people was not known, although commonly reported that older people are dehydrated. This study aimed to estimate the prevalence of low-intake dehydration using robust measures of dehydration in non-hospitalised older people by conducting a systematic review and meta-analysis using robust measures of dehydration assessment. The systematic review followed Cochrane(266) and JBI guidance(267) and included 61 eligible studies globally. The quality-effects meta-analysis included 21 studies which assessed dehydration using directly-measured serum or plasma osmolality, the reference standard of low-intake dehydration in older people. This systematic review reported that 24% of older adults were dehydrated. The prevalence of low-intake dehydration in community-dwelling older people was 19% and 34% for those living in long-term care settings. Subgroup analyses did not indicate differences in dehydration prevalence for care setting, sex, functional dependency, diabetes, cognitive impairment, or age subgroups, but did indicate slightly higher dehydration prevalence for those with renal impairment and higher number of health conditions. It is likely that individual variation in drinking support and ability explains the findings from the subgroup analyses. The meta-analysis revealed a range of 0-89% dehydration prevalence across all 21 studies, showing that whilst dehydration is prevalent, it is also preventable and not an inevitable consequence of aging.

8.2.2 Single care home ethnographic case study (D-DRINC Study A): Chapter Six

There was inconsistent evidence in the literature suggesting that people living with dementia were more at-risk of dehydration, yet many studies exploring this association have previously excluded people living with dementia from participating in care home research due to their dementia being ‘too severe’ or participants not being assessed as having the mental capacity to provide informed consent to participate in research. Research involving people living with dementia is therefore needed to examine how people living with dementia drink fluids, so that appropriate drinking interventions can be designed for this population. This study aimed to explore how people living with dementia consume drinks in care homes and comprised a five-month ethnographic case study within a single care home in the East of England. The ethnography involved 141 hours of non-participant observations of staff and residents’ drinking actions, interactions, language, body language and care home routines, practices and environment. A social constructionist approach(292) identified 25 interactional influences on how drinks were made accessible and available to residents, facilitating their drinking. These influences centred around the five key themes of ‘opportunities taken and missed’, ‘the role of furniture and equipment within interactions’, ‘staff roles in relation to residents and drinking’, ‘how resident characteristics affected their opportunities to drink’ and ‘priorities given to drinking practices compared with food-related and other care activities’ which each influenced how a care home resident living with dementia came to drink or not. The study illuminated how drinking was a cyclical process (Figure 6.3). Observations identified how staff often enacted drinks provision as a one-time task as part of a routine, instead of a continual process. The social constructionist approach(292) to this study made visible how a diagnosis of dementia does not determine whether someone is able to drink or not. The study brought to light how people had individual needs and preferences in drinking and therefore that actions and new practices are needed to ensure drinks are made available and accessible to residents. People caring for residents living with dementia should therefore not employ a ‘one size fits all’ approach to hydration care.

8.2.3 Online discussion forum analysis (D-DRINC Study B): Chapter Seven

This study also aimed to explore how people living with dementia drink in care homes. This study was also guided by social constructionism(292) taking the ontological perspective that the data here constituted texts. The study involved searching the ‘Dementia Talking Point’(303) online forum for any written contributions including one of the eligible hydration-related search terms and discussed a care home resident living with dementia. The majority of online posts were contributed by informal, family caregivers. A sample of 282 eligible written posts which included details of hydration care and people living with dementia in care homes were selected for thematic discourse analysis. The dataset was firstly analysed using inductive, reflexive, thematic analysis and then a small subset of posts were analysed using discourse analysis. Themes generated from the forum analysis included how family caregivers deprioritised drinking against food and eating in their written discourse, how caregivers’ fears of drinking and choking led to not providing residents with drinks, how resident characteristics either promoted drinking or made drinking more difficult, how forum users often contextualised drinking and eating as indicators of health, the role of the family visitor in the resident’s drinking and how family caregivers and care homes employed external support relating to hydration care. A thematic discourse analysis made visible how forum users, mostly family caregivers, deprioritised drinking against food in their written posts which may have had implications on how those caregivers provided hydration care to care home residents living with dementia. It is necessary for informal caregivers to prioritise drinking for residents living with dementia so that residents are supported to drink enough.

8.3. Integration of the findings

In total, 11 themes were generated from the two D-DRINC studies (Table 8.1). As seen in Table 8.1, both studies converged on the themes of ‘resident characteristics’ and ‘deprioritisation of drinking’ as influences on how people living with dementia drink in care homes. In D-DRINC Study B, the themes ‘fear relating to drinking’, ‘drinking as an indicator of health’, ‘the role of the family visitor’ and ‘external support relating to drinking’ were not generated from the D-DRINC Study A (ethnographic study dataset). The next section explores reasons for convergence and divergence of findings.

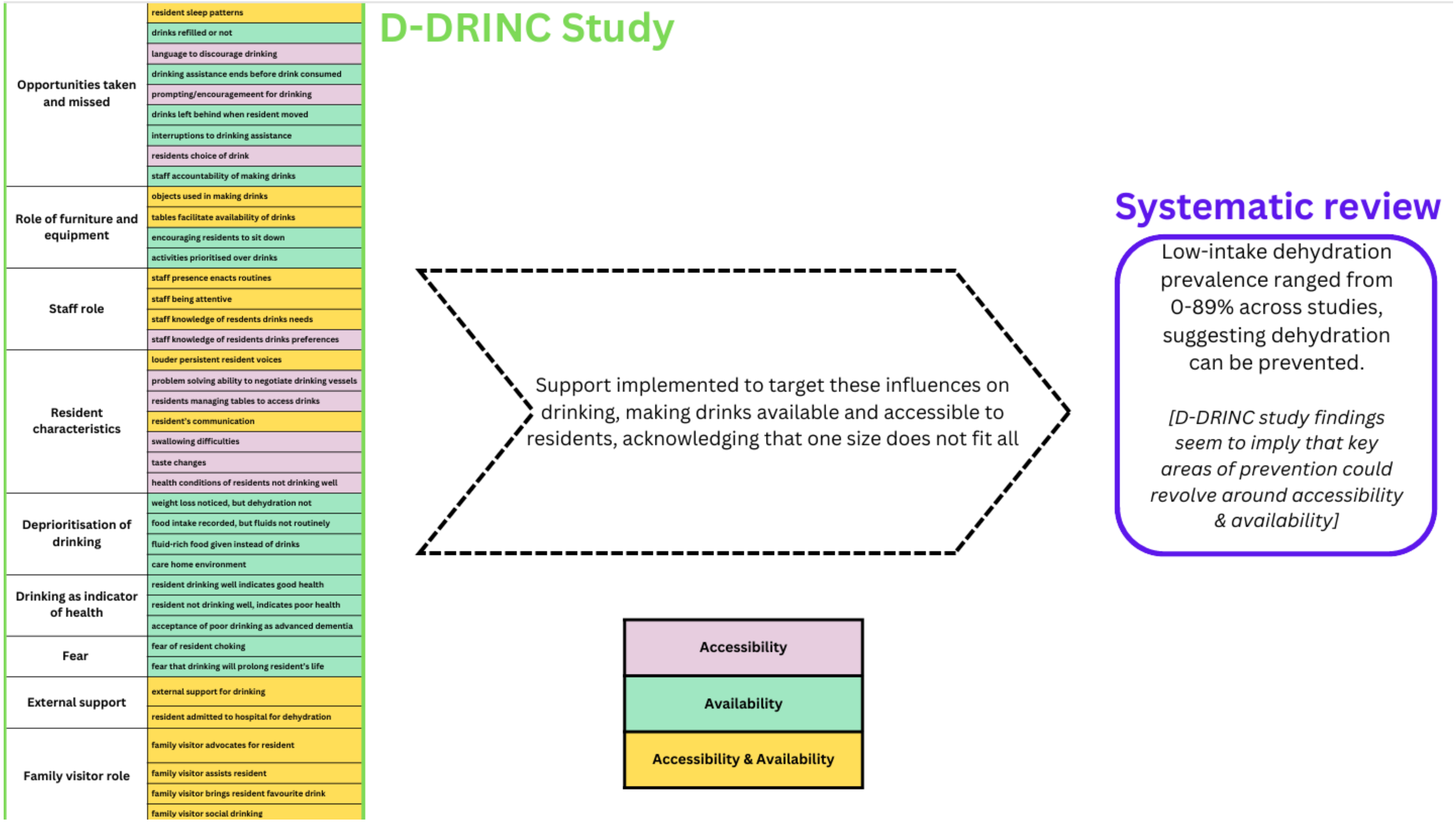
TABLE 8.1: THEMES GENERATED FROM THE D-DRINC STUDY

D-DRINC Study A: Ethnography	D-DRINC Study B: Forum analysis
De-prioritisation of drinking *Drinking was positioned by care staff as a lower priority in care homes compared to food,*	**De-prioritisation of drinking** *Drinking was positioned by forum users (mostly family caregivers) as a lower priority in care homes*

eating and other activities such as medication rounds and personal care.		*compared to food, eating and other activities such as medication rounds and personal care*
Resident characteristics *Residents with louder voices, better problem-solving skills to negotiate drinking vessels, those that could reach across and manage their tables to access drinks and those with more communication abilities were more likely to receive drinks in the care home.*		**Resident characteristics** *Swallowing difficulties, communication abilities, taste changes and health conditions of person not drinking well were all identified by forum users as potentially influencing whether a care home resident drank or not.*
Opportunities taken and missed *Opportunities were presented to residents in the care home to drink, but were either seized or missed by care home staff depending on the following influences: whether the resident was sleeping, whether the drink was refilled, whether minimising language was used when discussing drinks, whether drinking assistance ended prematurely, whether residents received prompts or encouragement from staff to drink, whether the drink was left behind when the resident was moved, whether drinking assistance was interrupted, whether residents had choice of drinks or drinking vessels and whether staff were accountable of giving residents drinks.*		**The role of the family visitor in drinking** *Family caregivers who visited residents living with dementia in care homes were identified by forum users as advocating for the resident, patiently assisting with giving drinks, providing opportunities for social drinking and bringing in the residents' favourite drinks.*
Staff role in drinking *Residents were more likely to consume drinks if staff were present and attentive and had knowledge of residents' dietary requirements, drinks and drinking vessel preferences.*		**External support in drinking** *Residents were reported by forum users to occasionally need hospitalisation for dehydration and care homes sought support from externally agencies to support drinking, such as GPs, nurses and speech and language therapists.*
The role of furniture and equipment within interactions *Drinks were more likely to be provided to residents if relevant objects and equipment were available for staff to make drinks, if tables were available for drinks to be placed upon, whether residents were seated and if no other activities were given priority over drinks on the table.*		**Fear around drinking** *Forum users wrote about how they may be less likely to provide drinks to residents who choked on drinks or if they perceived the drink to prolong or worsen the residents' life.*

	■	**Drinking and eating seen as indicators of health** *Forum users seemed to determine a residents' health status by whether they were drinking or not. Residents who were reported to not be drinking were perceived as deteriorating, whereas when residents began drinking, they were reported to be improving.*

The diagrammatic representation of the three studies integrated via 'joint displays'(263) is presented in Figure 8.1 below. Findings from the D-DRINC studies can be categorised to either influence the availability, accessibility or both availability and accessibility of how people living with dementia drink. The arrow in the middle depicts the potential link between the influences on drinking, identified from both D-DRINC studies and the systematic review findings which reported a range of 0-89% dehydration prevalence across studies. This wide prevalence range indicates that dehydration is preventable because not all groups of older people were dehydrated and thus is not just a part of ageing. The wide range of dehydration prevalence reported in the systematic review may be explained by the variety and effectiveness of strategies used in settings to improve hydration for older people. Individual characteristics of people living with dementia may influence how they can engage with compensatory strategies to increase fluid intake. Whilst the systematic review subgroup analyses did not identify that cognitively impaired older adults were more at-risk of dehydration, older people living with dementia may find drinking more problematic, requiring more support to drink. However, the approach to subgroup analyses in the systematic review may have prevented this association being seen so clearly. Also, the way in which studies included in the systematic review assessed cognitive impairment and/or dementia varied widely between studies. The D-DRINC study findings can be implemented within hydration interventions specifically to increase fluid intake for older people living with dementia, reducing their risk of dehydration. This is discussed more specifically in Section 8.7.2.



Opportunities taken and missed	resident sleep patterns	🟨
	drinks refilled or not	🟩
	language to discourage drinking	🟪
	drinking assistance ends before drink consumed	🟩
	prompting/encouragemeent for drinking	🟪
	drinks left behind when resident moved	🟩
	interruptions to drinking assistance	🟩
	residents choice of drink	🟪
	staff accountability of making drinks	🟩
Role of furniture and equipment	objects used in making drinks	🟨
	tables facilitate availability of drinks	🟨
	encouraging residents to sit down	🟩
	activities prioritised over drinks	🟩
Staff role	staff presence enacts routines	🟨
	staff being attentive	🟨
	staff knowledge of resdents drinks needs	🟨
	staff knowledge of residents drinks preferences	🟪
Resident characteristics	louder persistent resident voices	🟨
	problem solving ability to negotiate drinking vessels	🟪
	residents managing tables to access drinks	🟪
	resident's communication	🟨
	swallowing difficulties	🟪
	taste changes	🟪
	health conditions of residents not drinking well	🟪
Deprioritisation of drinking	weight loss noticed, but dehydration not	🟩
	food intake recorded, but fluids not routinely	🟩
	fluid-rich food given instead of drinks	🟩
	care home environment	🟩
Drinking as indicator of health	resident drinking well indicates good health	🟩
	resident not drinking well, indicates poor health	🟩
	acceptance of poor drinking as advanced dementia	🟩
Fear	fear of resident choking	🟩
	fear that drinking will prolong resident's life	🟩
External support	external support for drinking	🟨
	resident admitted to hospital for dehydration	🟨
Family visitor role	family visitor advocates for resident	🟨
	family visitor assists resident	🟨
	family visitor brings resident favourite drink	🟨
	family visitor social drinking	🟨

FIGURE 8.1: INTEGRATION OF QUALITATIVE AND QUANTITATIVE FINDINGS FROM EACH STUDY

8.4 Convergence and divergence of D-DRINC study A and B findings

Denzin's kaleidoscope analogy acknowledges how different data collection methods help to reveal different perspectives on reality(401). In D-DRINC Study B, forum users wrote about fear of residents choking due to dysphagia or fear of giving drinks to the resident and prolonging their life. In the D-DRINC Study A ethnographic study, the theme around 'fear relating to drinking' was not reported. The residents who consented to take part in ethnographic observations did not have dysphagia and were not considered by staff to be at 'end-of-life' and thus these resident characteristics may have differed between datasets, which may explain why this theme was not generated across both datasets. Previous research has identified how care staff refrain from giving foods to residents living with dementia prone to choking, but there was no reference of drinking(61). In D-DRINC Study B, forum users wrote about assessing the residents' health in relation to their food and fluid intake. The D-DRINC Study A ethnographic study, did not report a theme around 'food and drink intake as an indicator of health', because only actions, interactions, routines and practices which led to people living with dementia to drink were attended to, instead of attending to how care staff may have classified residents based on their health. However, a theme around 'staff attentiveness' was reported, which described how staff gave residents who were unwell more attention. This finding appears to diverge from the finding in D-DRINC B, in which forum users wrote about being less likely to offer drinks to residents if they assessed the resident to be deteriorating, although it is difficult to know whether the deterioration of residents was comparable across datasets. The residents described on the online forum by users, may have been at 'end-of-life' and thus the profile of residents may be different between participant samples. This divergence may also relate to and indicate differences in how care staff and informal caregivers respond to providing hydration care to residents when they are assessed to be unwell, because most forum users were considered to be informal caregivers. In D-DRINC Study B, forum users wrote about external support involved in hydration care of the care home resident living with dementia, specifically paramedics, GPs, social workers, district nurses and speech and language therapists. In D-DRINC Study A, no external care or health providers gave consent to take part in the study and thus the ethnography could not report on external support, though ethnographic interviews revealed that the GP was often consulted for support when residents were not drinking well. It is possible that the 'external support' theme relates to those at 'end-of-life' though, which may also explain why this theme was not reported in the care home ethnographic study. In D-DRINC Study B, a strong theme generated from the dataset was that of the role of the family visitor in hydration care in the care home. However in D-DRINC Study A, no family caregivers gave consent to take part in the study and thus the ethnography was also unable to report on this potential influence on drinking. Previous care home research has identified the role of family caregivers providing drinks to residents in care homes during visits(61, 65, 171). To conclude, it was useful to use an additive approach to integrate the findings from both D-DRINC studies, as each could be seen to provide unique and contextualised insights on how people living with dementia drink in care homes.

8.5 Integrated findings from this thesis

Figure 8.1 shows how the D-DRINC study findings can be used to explain the high heterogeneity and wide range of dehydration prevalence reported in the systematic review and meta-analysis. The two D-DRINC studies combined generated 39 influences on how people living with dementia drink in care homes. Each of the 39 influences could lead to a resident drinking a drink within a care home setting. The qualitative findings may help to identify, contextualise and explain the high heterogeneity identified in the systematic review and meta-analysis. When the influences on drinking are supported by formal and informal caregivers, this may lead to increased drinks intake of residents, leading to residents' lower risk of low-intake dehydration.

The qualitative and quantitative 'strands' of findings were then merged(402) using joint displays(263), to generate four integrated findings and meta-inferences. Relational meta-inferences are generated when relationships are identified between two or more meta-inferences(402). The four integrated findings and meta-inferences relating to the hydration care of older people are described below and shown in Figure 8.3 below. Further details about integration are in Section 4.7.

8.5.1 Invisibility of drinking

Drinking was found to be made invisible in this research. In the D-DRINC A and B studies, care home routines, practices and language consistently worked to deprioritise drinking, as well as in how users of the 'Dementia Talking Point(303)' forum framed drinking in their written contributions to the online forum. The term 'hydration care' was seen to relate to the provision of drinks to residents but did not include the act of drinking. In D-DRINC study A, whilst there were routines which focussed on providing drinks to residents, staff did not routinely support residents to consume drinks, nor did staff wait in communal areas until residents consumed drinks. The act of drinking was made invisible in D-DRINC study B also where users of the online forum referred to residents not eating and drinking but would proceed to write in their posts about how to improve residents' eating, sometimes instead of drinking.

The systematic review and meta-analysis reported high heterogeneity (I^2=97%) and the prevalences ranged from 0-89%, demonstrating that different groups of older people had different likelihoods of dehydration. The range of prevalences show that dehydration is not a guaranteed part of aging and thus the heterogeneity in dehydration prevalence may be explained by how visible drinking is within a care setting and what attention and focus is placed upon drinking. However, the limited number of studies available for subgroup analyses made it difficult to explore heterogeneity further and there were not enough studies to conduct meta-regression.

8.5.2 Characterising residents' need for support with drinking

The research found that individual variation in drinking ability and support strategies to promote drinking may contribute to the high heterogeneity in dehydration prevalence amongst older people. The systematic review only found significant differences in the means of dehydration prevalences for those with renal impairment and higher number of health conditions. The wide range in dehydration prevalence (0-89%) indicates that this heterogeneity may be better explained by more nuanced processes and/or behaviours, rather than the higher-level categories used in subgroup analyses. The D-DRINC A and B studies found that caregivers' perceptions of residents choking risk, caregivers' perceptions of residents' deterioration or stage of dementia/life, along with residents' sleepiness, taste preferences, problem-solving abilities, communication abilities and swallowing ability all influenced how a care home resident was likely to be provided with drinks, be supported to drink and be able to drink. A 'one size fits all' approach cannot be applied to hydration care because each resident's' ability and desire to drink will differ and how caregivers respond to these needs and wishes may also vary.

8.5.3 Availability of drinking support

As briefly mentioned in the previous section (section 8.5.2), support strategies may account for some of the heterogeneity in dehydration prevalence amongst older people. Every older person will differ on what, and how much, support they receive from others to consume drinks, thus preventing low-intake dehydration. The D-DRINC A and B studies reported a breadth of support available to care home residents, including formal caregivers, informal caregivers and external support such as GPs, speech and language therapists and nurses.

Importantly, the D-DRINC A study found that the presence of staff alone, was not enough for some residents to consume drinks. Staff were required to be attentive to residents' needs and accountable to making residents drinks and providing these to residents themselves, instead of asking colleagues to make the drink on their behalf. The availability of drinking support influences how well an older person may drink and how well their needs are responded to by others. If support is not available to residents who are unable to drink independently, then these residents may be more likely to become dehydrated.

8.5.4 Care home infrastructure for drinking

This research made visible how care homes lacked appropriate infrastructure, including equipment, furniture, routines and culture to prioritise and support residents' drinking. These organisational-level influences on drinking were identified from the qualitative research which found that sufficient mugs or beakers were not consistently available for tea trolley rounds and staff were infrequently available in communal areas outside of mealtimes to attend and/or respond to residents' hydration needs. Some residents who had been identified by management as needing to receive assistance from staff to drink, often had their drinking times interrupted by other staff, the doorbell or phones ringing. A care home culture in which drinking and the infrastructure to support drinking is prioritised, is needed to promote drinking for care home residents to prevent low-intake dehydration.

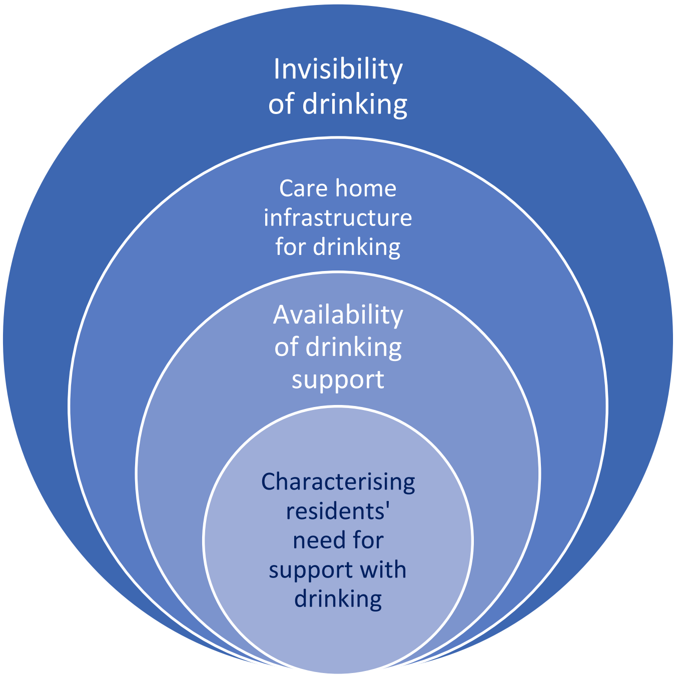


FIGURE 8.3: INTEGRATED FINDINGS FROM THIS THESIS

8.5 Contextualising the integrated findings with the wider literature

The research questions this mixed-methods thesis sought to answer were:

How many older people are dehydrated and how do older people living with dementia in care homes drink?

To answer these questions, three mixed-methods studies: a systematic review and meta-analysis, a single care home ethnographic case study (D-DRINC Study A) and an online forum analysis (D-DRINC Study B) were conducted. A convergent parallel mixed methods design was employed to conduct each of the studies separately and study findings then integrated once each of the studies were complete, to generate a meta-inference and answer the research questions.

The meta-inference from this thesis is that dehydration is prevalent amongst older people, across settings, but it could be prevented. Different drinking practices are also prevalent and varied in care home settings. In this thesis, influences on how people living with dementia drink in care homes were comprehensively and robustly examined to understand more fully drinking in care homes and to identify possible strategies to increase residents' drinks intake. The risk of low-intake dehydration varies widely amongst subgroups of older people, and so risk of dehydration should be considered for all older people and prevention considered on an individual basis because dehydration prevalence ranged widely and there was high heterogeneity. When considering people living with dementia specifically, it is important to note that there are many cognitive domains involved in the process of drinking and subgroup analyses likely do not reflect the nuances of this(36, 152). Previous research has discussed the different cognitive domains which may be associated with fluid intake and how not everyone living with cognitive impairment or dementia may experience deficits in all those cognitive domains(36, 152). A nuanced and individual approach is therefore necessary to support hydration care of older people, including those living with dementia. The four integrated findings generated from this thesis suggest that hydration care can be addressed at the cultural/societal level, individual level, interpersonal level and the care home leadership level: 1) invisibility of drinking, 2) characteristics requiring support for drinking, 3) availability of drinking support, 4) care home infrastructure for drinking (Figure 8.3). These integrated findings will be discussed in turn, in relation to the wider literature on hydration care of older people.

Cultural invisibility of drinking

This thesis found a culture of drinking invisibility, whilst routines and practices relating to hydration care were more visible in care homes. Drinks and drinking were seen to be actively deprioritised against food and eating and other care activities. Congruent with these findings, is a growing body of hydration literature highlighting the deprioritisation of drinking and hydration affecting older people in care settings(53, 58, 59, 169, 403). It is also documented in the literature that there is limited hydration research compared to nutrition and food research(53, 145). Much of the supporting evidence was generated using observational methods(58, 375, 403). Examples of deprioritisation of drinking, amongst older people, in the literature include the absence of recording fluid intake charts for care home residents which then leads to low fluid intake going unnoticed by staff(59, 361). Drinking and drinks have been reported to be given less priority compared to 'changing pads', medication rounds and other personal care needs(58, 60, 65). Busy care home staff have been reported to forget residents' requests for drinks(65) as well as staff moving drinks away from residents to prevent spills(58). Although based in acute care, a qualitative study examining person-centred care for patients living with dementia also found that staff did not prioritise hydration care for people living with dementia on three hospital wards compared to other care activities, as hydration-related routines were inflexible and outsourced to a contracted company to deliver instead of being considered fundamental hospital care(403). This highlights that the deprioritisation of drinking and drinks is perhaps not isolated to care home settings and instead is a more complex phenomenon and potentially a wider societal issue. This thesis builds upon these reported instances of drinking deprioritisation as well as emphasising how whilst routines and practices exist to facilitate drinking, such as tea trolley rounds, there is less attention given to the act of residents' drinking and how residents consume drinks. This is a novel finding which deserves further research to explore further to most effectively support residents' drinking.

Participant characteristics requiring support for drinking

This thesis found that care home residents living with dementia had different characteristics which made it easier or more difficult to drink, as shown in Figure 8.1. With appropriate support to increase the availability and accessibility of drinks, residents living with dementia in care homes may consume more fluids, reducing their risk of low-intake dehydration. Care home residents living with dementia are therefore not predisposed to dehydration. This thesis did not generate evidence supporting the narrative that people living with dementia refuse drinks, which is also supported by observations recorded in existing qualitative care home research(58, 59). Mentes'(227) seminal work on drinking typologies in long-term care home residents (Can drink, can't drink, won't drink) is perhaps too simplistic in that it does not account for the nuanced interactions and actions involved in drinking and the de-prioritisation of drinking reported in this thesis and existing research(58, 59). Specifically, when formal and informal caregivers prioritised residents' drinking and implemented appropriate strategies responding to residents' drinking abilities, residents were seen to drink. Individual drinks preference and enjoyable drinking experiences are influences which are consistently associated with increased fluid intake amongst older care home residents(55, 59, 99, 125, 169). Godfrey *et al.,* reported that residents reported drinking less fluids when there was a focus on purely drinking the drink, instead of its aesthetics(60), which perhaps contrast with the 'invisibility of drinking' theme. However, it may also support the theme because it shows how some care staff may just focus on residents needing to drink, without implementing strategies which may best support residents to drink such as preparing aesthetically pleasing and preferred drinks. This thesis also illuminated how differently residents were able to problem-solve and negotiate drinking vessels to drain the fluids, which has not been reported in the literature previously. There is much individual variation in how residents living in care homes drink, which requires a vast range of practices to be used to support hydration care in care homes. This variation in drinking abilities and support offered in response to these characteristics, may contribute to the heterogeneity of dehydration prevalence reported across community and long-term care settings.

This thesis did not report evidence of toilet issues or urinary incontinence influencing fluid intake. However, previous research has identified how older people may restrict fluid intake to prevent needing to use the toilet(125). Residents in D-DRINC Study A did not use the toilet independently and relied on staff enacting ‘pad rounds’(404). The social constructionist approach to conducting these observations made visible how care home residents’ drinking ability did not appear to relate to when staff took them to their bedrooms for personal care. Observations reported from another care home study did not find evidence of residents restricting fluid intake due to toilet issues and instead found that residents drank more when they were offered preferred drinks and provided with adequate support to drink(58, 59). Other ethnographic research has reported on the routine of ‘pad culture’ and how people living with dementia are sometimes expected to use ‘pads’, whether it was necessary or not(404). It therefore remains unknown whether care home residents living with dementia using continence pads restrict their fluid intake to prevent needing to use the toilet. Mentes’ typology(227) identified that residents who restricted fluid intake for fear of incontinence, had less cognitive impairment compared to residents who did not restrict fluids for fear of incontinence. Further research is therefore warranted into which groups of older people may restrict their fluid intake for fear of incontinence and how continence care may influence drinking for care home residents living with dementia.

Availability of drinking support

This thesis reported finding a wide range of social actors involved with hydration care in care homes, including informal caregivers, formal caregivers, care home management, care home maintenance staff, activity staff and health professionals, such as GPs, speech and language therapists and paramedics. Much of the hydration literature had focussed on the role of formal and informal caregivers in hydration care, but it is clear from this thesis that drinking support may take many forms. The way in which these social actors respond to residents’ hydration needs will also vary. Kitwood and Bredin’s(245) importance of a person-centred approach and staff attentiveness is therefore relevant for placing these thesis findings. Qualitative hydration research has reported that when residents were offered more of their preferred drinks and received support to drink, then residents were observed to drink more, often draining the cup of fluids or requesting for their drink to be refilled(58, 59). This shows how when drinking support is available and staff are attentive to residents’ needs, residents are able to drink. An example in the ethnographic study of staff being attentive to a resident’s hydration needs, leading them to draining the cup of fluids, was when Staff member 5 held the beaker for Mabel and put the straw to Mabel’s mouth for her to drink. There were many more instances reported in the ethnographic study when drinks were left behind or moved by staff or not consumed by residents. Opportunities to respond to residents' hydration needs need to be maximised and for staff to provide appropriate support for residents to consume drinks, without interruption. These findings support the role of protected drinks time, which was implemented in previous research(58, 59), which may also work towards making drinking more visible in care homes.

Care home infrastructure for drinking

Organisational factors such as workforce, leadership, furniture and equipment to support drinks provision and hydration training for formal and informal caregivers is crucial for ensuring residents drink optimally. Communication between staff is vital for providing any care to residents in care homes, however research found that communication relating to hydration care was informal and not documented between nursing staff and healthcare assistants, which led to residents not having their hydration needs met(59). In the same study, staff assumed they knew residents' drink preferences, which resulted in residents not being provided with a drink of their choice and drinks consequently not being consumed(58, 59). This thesis reported the importance of staff showing accountability when responding to residents' requests for drinks to ensure that residents receive those drinks. Other qualitative research reported that clearly allocating roles relating to making and providing drinks led to more residents drinking(58, 59).

The tea trolley routine in care homes acts to provide residents with drinks. However, this thesis found that these routines did not consistently meet residents' hydration needs, due to not enough drinks being served, inappropriate or inadequate drinking equipment, limited choice of drinks and not enough routine drinking opportunities to meet residents'' daily fluid intake requirements(5, 85).

This thesis did not report specific findings relating to care home management or leadership. However, leadership has been consistently reported in the literature as being necessary to implement changes to hydration care in care homes(53, 58, 59). A quality improvement project found that whilst increased drinking opportunities, provision of preferred drinks and staff available to provide support to residents drinking resulted in more residents drinking, there was little sustained effect due to lack of leadership driving the change(58, 59). Strong leadership is necessary to implement improvements to hydration care, such as the implementation of a drinks menu, staff offering more drinks to residents and staff being available to support residents' drinking(58, 59).

The hydration literature consistently reports the need for staff to have an awareness of hydration care and be suitably trained to meet residents' hydration needs, however this is not routinely the case in care homes(53, 59, 169, 235, 396) and it is not currently mandated by CQC for staff to be trained in hydration care(70). All social actors involved in hydration care must feel suitably competent to respond to residents' hydration needs(53). Hydration promoting initiatives and training and education around hydration are reported to be effective at increasing fluid intake and raising awareness of the impacts of low-intake dehydration(52, 125, 169) however in all cases, long-term impacts of interventions are not sustained. Good role modelling from care home leaders is therefore vital for sustaining drinking interventions in care homes(58, 59). This thesis found how staff were not always prepared for routine drinking opportunities and the care home was not always stocked with preferred drinks or drinking equipment. Care home leaders should ensure that the care home is suitably equipped to meet all residents' hydration needs, so that staff can fulfil their caring duties and responsibilities.

Murphy *et al.,* proposed an evidence-model for providing person-centred nutritional care in care homes(230). The model highlights the importance of dementia stage, psychosocial factors such as a resident's mood, life histories, health conditions, generational factors and cultural factors in providing optimal person-centred nutritional care(230). The model identified the role of the resident's dining environment, involvement in nutritional activities, consistency of care, availability of food and drinks and what information and training staff received about nutritional care delivery in how people living with dementia receive optimal nutritional care from care staff(230). Consistent with the main principle of Murphy *et al.'s* model, this thesis found that individual variation in drinking could explain some of the heterogeneity of dehydration prevalence amongst older people and thus when caregivers support older people with making drinks available and accessible, residents are more likely to consume drinks and reduce their personal risk of dehydration. Heterogeneity in dehydration prevalence across studies and settings may also arise from variation in drinks provision and compensatory strategies supporting residents' drinking. Cook *et al.,* (2024) developed the 'hydration trine' which emphasises the importance of a whole care home approach to hydration care for supporting people living with dementia to drink in care homes(203). The hydration trine highlights the need for a drink friendly care home (policies), strategies and practices used by staff to deliver hydration care and a focus on a hydration-competent workforce(203).Whilst the framework does not specifically describe prioritising drinks, the authors describe the importance of emphasising drinking by staff using positive body language, making drinking enjoyable and sociable and staff using encouraging and pleasant interactions with residents during hydration care(203). Importantly, individual residents were thoroughly assessed on their drinking abilities prior to the intervention beginning(203). However, the feasibility trial of a multicomponent intervention using the hydration trine approach was not effective at increasing fluid intake of residents in six intervention care homes over 3-months(203). The authors explained this may be due to care staff recording fluid intake more accurately post-intervention compared to pre-intervention, but they also noted barriers to implementation including staff absence from training, participant attrition, staff turnover and cost of improving hydration equipment and care home environment(203, 405). It is clear that drinking should be prioritised in care homes and drinks provision should be individualised, with residents supported to drink by formal and informal caregivers by them making drinks available and accessible to every resident.

8.5.1 Strengths of this thesis

There are many strengths of this mixed-methods thesis. The first strength results from methodological triangulation. Findings from D-DRINC study A and D-DRINC study B were triangulated. Each study used different data collection methods and participant samples to answer similar questions as to how people living with dementia in care homes drink. The findings from both qualitative studies were then integrated with findings from the systematic review, all of which used different data collection methods and approaches, increasing the overall reliability and validity of the thesis findings, minimising bias and weakness of methodologies of each individual study.

This study involved people living with dementia who did not have the mental capacity to provide informed consent for their research participation. People living with dementia, particularly those who do not have the mental capacity to provide informed consent for research participation have previously often been excluded from care home research exploring drinking and dehydration. This study included written contributions from informal caregivers via online forums, at a time when they were unable to visit care homes due to the UK government's Covid-19 lockdown measures. The inclusive data collection methods used in this thesis enabled some seldom heard voices be involved in research, generating knowledge on how people living with dementia consume drinks. This knowledge can be used to inform more appropriate and sustainable hydration interventions for residents living with dementia, with the aim of increasing fluid intake and potentially reducing their risk of dehydration.

This ethnographic study may be considered the first study to examine drinking in care homes over a 24-hour period. The study included 141 hours of observations of which 20% were conducted between 6pm-6am. This new knowledge of drinking and drinks provision in the care home is a useful and important addition to the literature. New knowledge was generated about drinking in care homes by adopting a social constructionist approach to examine influences on drinking within the care home, as well as how forum users framed drinking within their written contributions to the forum. Some of the knowledge generated from these studies would not be able to be generated by more constrained data collection methods such as interviews or focus groups. The social constructionist approach made visible the processes involved in what leads a care home resident living with dementia to drink and how drinking was deprioritised in the setting.

Another strength of this thesis was that the comprehensive systematic review estimated the prevalence of low-intake dehydration using the reference standard. This was the first systematic review and meta-analysis to have estimated the prevalence using robust measures of dehydration in non-hospitalised older people, including domiciliary settings. This robust prevalence figure can be used to inform economic analyses, evidence-based drinking interventions and to raise awareness of dehydration in older adults to the public and health and social care staff. Integrating the systematic review findings with the qualitative findings offered potential explanations for why there was a wide range of dehydration prevalences reported and high heterogeneity. The integration of findings supports a deeper and more comprehensive understanding of hydration care of older people, including those living with dementia in care homes.

A final strength of this thesis is the extent of dissemination of findings into the public domain already (Chapter Nine). Thesis findings have been shared widely including to the PPI panels which advised on this study initially, to the public, researchers and health and social care staff via conference presentations, webinars, local media, a peer-reviewed publication and via blogs. The systematic review findings were widely disseminated by collaboratively designing evidence-based dehydration posters with older people and health staff and delivered them to approximately 400 health and social care settings across Norfolk and Waveney. Not only was this research shared with PPI panels as part of dissemination, but insights were sought from PPI contributors to feed into the methodological design of the qualitative studies in this thesis, to ensure the topic was relevant and necessary as well as seeking best ways to approach recruitment of participants into D-DRINC A study.

8.5.2 Limitations of this thesis

A limitation of this thesis was the time constraint in conducting three robust and comprehensive empirical studies within three years. In particular, the ethnographic case study could have comprised its own PhD project alone. The government’s Covid-19 lockdown measures and subsequent care-home visiting restrictions led partly to the design of a single case ethnographic study instead of visiting multiple care homes. Whilst the single case study may limit the transferability of the findings to other settings, the case study approach enabled a robust, comprehensive and empirical approach to undertaking the ethnographic study, generating numerous useful insights for hydration care for people living with dementia. Delays resulting from waiting on ethical approval and site agreements limited time available to observe and generate data in the care home to a five-month period. A longer period of observations by multiple ethnographers may have generated different insights.

Finally, although not necessarily a limitation, the qualitative studies in this mixed-methods thesis involved one online discussion forum site and one care home. These studies identified and illuminated many practice-based influences on drinking, some providing novel insights. However, findings generated from these studies may not be representative of all care homes or all forum users and so cannot be generalised. An ethnography in a different care home or analysis of a different online discussion forum, or a different ethnographer using a different methodological approach, may have generated different findings. However, this study aimed to be explorative, and to offer rich, contextualised observations, which it achieved in an empirically robust way.

8.5.3 Challenges and reflections

Challenges of this thesis related to personal reasons and life stressors whilst undertaking a PhD and longer timescales to conduct the studies than initially anticipated. However, the biggest challenge related to the Covid-19 pandemic. In October 2020 when this PhD began, the UK government was still encouraging social distancing measures and there was restricted care home visiting for relatives and researchers. In the autumn of 2021, the UK experienced the Omicron variant wave of Covid-19 and the UK government announced another lockdown from December 2021. At the time of planning the D-DRINC Study in the summer of 2021, a care home manager advised that they would not allow researchers to observe across multiple homes due to the risk of cross-transmission of Covid-19 from other homes to their own home. The D-DRINC study protocol was continuously reconsidered and redesigned due to the ever-changing care home visiting guidance. To encompass this changing guidance, The D-DRINC study protocol was submitted to the NHS REC in summer 2022 including Plans A, B and C to anticipate and respond to different eventualities resulting from potential care home visiting guidance changes, or governmental lockdown measures. Although this was a challenging element of the PhD journey, it potentially benefited the whole project because it enabled more innovative approaches to research methods to be considered. This approach enabled findings to be triangulated using two different data collection methods providing more robust research findings to answer similar research questions.

There were lengthy delays between submitting the ethics application to the NHS REC, receiving ethical approval and then receiving a signed site agreement from the care home to begin research activities in the care home. In total, this amounted to approximately five months. Although this still enabled a long enough to become immersed in care home life to conduct observations, it exposed the study to many interruptions due to winter bugs and Covid-19 in the home which impacted and delayed timescales to conduct data analysis.

Initially, the scope for the systematic review and meta-analysis was very large at full text screening stage. The scope of the systematic review was therefore reviewed and revised for it to be more manageable and achievable with project timescales. To mitigate this risk on study timelines, the decision to remove studies assessing dehydration using BUN:Cr was made, but also to separate the review into two: hospitalised and non-hospitalised populations. On reflection, this decision meant that the more tightly-framed systematic review was more specifically relevant for informing this thesis which focussed on non-hospital settings.

8.6 Conclusions of this thesis

This mixed-methods thesis employed a systematic review and meta-analysis, an ethnographic single care home case study and an online forum analysis to examine the hydration care of older people. The thesis found that low-intake dehydration, when assessed using the reference standard for low-intake dehydration, is prevalent in a quarter of older people and ranged from 0-89% in individual studies, suggesting that dehydration can be prevented. No clear difference in dehydration prevalence was reported for subgroups split by care setting, age, sex, functional ability, cognitive impairment, diabetes. Dehydration prevalence was higher for people living with renal impairment compared to those without, and for people with a higher number of comorbidities. The D-DRINC A and B studies examined how older care home residents living with dementia drink. This thesis challenges the rhetoric that people living with dementia refuse drinks or are unable to drink. Individual variation and influences on drinking, relating to the availability and accessibility of drinks in care homes, are likely to explain the high heterogeneity in dehydration prevalence amongst older people. This mixed methods thesis was able to identify ways in which informal caregivers deprioritised drinking within their written discourse on online forums, whilst care home staff similarly deprioritised drinking in their actions, discourse and routines.

The mixed-methods thesis reported four integrated findings: 1) invisibility of drinking, 2) characteristics requiring support for drinking, 3) availability of drinking support, 4) care home infrastructure for drinking. These were strongly reinforcing and illuminative findings which were also able to identify opportunities for care homes to go on instead to re-prioritise drinking in their processes, practices, routines and culture. Invisibility of drinking relates to how despite drinks being mostly provided in material ways in long-term care settings to people living with dementia, there is less attention given to understanding the act of drinking and the actions which support the accomplishment of drinking. The findings suggest that residents be observed regularly, perhaps on at least a weekly basis, to examine how they are drinking and how they are engaging with drinking vessels and equipment. Residents' drinking abilities and strengths should be identified and how care staff may be responding proactively in relation to these, and how to make available a range of support from informal and formal caregivers to health professionals. Finally, organisational processes such as availability of drinks and drinking equipment, frequency of routines, and drink-promoting language were identified as means for care homes to affect and potentially promote drinking. The findings reported in this mixed-methods thesis make an important contribution towards explaining why there is contradictory evidence in the hydration literature about the relationship between low-dehydration and cognitive impairment and dementia. These findings specify how this is because individual drinking abilities, settings and support strategies offered are so varied. This mixed-methods thesis therefore provides unique and novel insights into the existing hydration care of older people, along with relational and practical recommendations for policy and practice.

8.7 Implications for policy, practice and further research

8.7.1 Implications for policy

ESPEN published updated nutrition and hydration guidance for people living with dementia in 2024(31). This thesis mostly supports the hydration-related recommendations in the published guidance, particularly those centring on sufficient staffing to support people with dementia to drink, staff offering enjoyable drinks regularly, the consideration and accommodation of individual preferences of drinks and drinking vessels and for drinking occasions to be shared with others to improve the drinking experience(31). However, recommendation 8 states that there should be routine screening of people living with dementias' nutrition and hydration needs(31). There are currently no diagnostically accurate validated screening tools to assess for low-intake dehydration in older people(96). Recommendation 9 advises that only when screening tools indicate a positive test, should residents be systematically assessed(31). This thesis highlights the need for care home residents living with dementia to be routinely observed, preferably on a weekly basis, to assess how someone drinks and how they engage with different drinking vessels and accessories, such as straws. This encourages a proactive approach in working with, and responding to, a care home resident's drinking abilities, ensuring that their hydration care is personalised and maximising their drinking opportunities.

CQC's Regulation 14 sets the standard for care providers to meet the hydration and nutrition needs of people using their settings(70). This thesis highlights the need for aspects of the regulation to be updated. Regulation 14(4)(a) states that care providers are responsible for ensuring the "*receipt of suitable and nutritious food and hydration which is adequate to sustain life and good health*"(70). However, this should be amended to "ingestion of suitable and nutritious food and hydration…" to reflect the act of drinking, because it currently only reflects the provision (receipt) of drinks. This aspect of the regulation potentially contributes to the 'invisibility of drinking'.

CQC's Regulation 14(4)(a) also states that "*Nutrition and hydration needs should be regularly reviewed during the course of care…*"(70). As mentioned above, this should be operationalised by care staff observing how residents consume drinks and engage with drinking vessels for at least 30 minutes a week, so that care staff are responding appropriately to residents' individuals drinking abilities. The regulation also states that "*water must be available and accessible to people at all times. Other drinks should be made available periodically throughout the day and night and people should be encouraged and supported to drink*" (70). The regulation should be amended to state that drinks should be available and accessible to all residents, instead of just water being available to residents. However, it should also provide examples of how the drinks may be accessible to residents, because many residents cannot access the water jug, water cooler or kitchenette. This may include staff physically supporting residents or verbally prompting or reminding residents to drink or enabling residents to access a kitchenette.

Regulation 14(4)(d) states that "*people should be encouraged to eat and drink independently. They should receive appropriate support, which may include encouragement as well as physical support*"(70). This regulation should include staff using hydration-promoting language throughout the care home. Care homes need to consider how residents' hydration needs can be met, with staff potentially physically supporting, if staff are not present in communal spaces. One staff member, at least, should be available in communal spaces to recognise and respond to residents' hydration needs.

8.7.2 Implications for practice

Risk of low-intake dehydration to older people

The public, including older adults and health and care professionals, should be made aware of the 1 in 4 risk of low-intake dehydration to older adults. This can be done by further sharing the evidence-based dehydration posters already developed (Figures 9.1 and 9.2) across long-term care settings, healthcare settings and primary care practices nationally, potentially using NHS Digital as the vehicle for displaying the posters. There would also be value in sharing the posters in public spaces such as libraries, community centres and supermarkets to inform the public about the 1 in 4 risk of low-intake dehydration in older age.

Supporting older residents to drink in care homes

This thesis identifies numerous influences on drinking, centring around promoting the availability and accessibility of drinks along with prioritising drinking in the care home. One way of implementing this research into care homes is to develop an audit tool which can be used by care home management on a weekly basis to self-audit, as well as CQC to audit hydration care in care homes during inspections. The form could centre around the four domains identified in Figure 8.3: 1) invisibility of drinking, 2) characteristics requiring support for drinking, 3) availability of drinking support, 4) care home infrastructure for drinking**.** The audit form would enable care home management to identify areas influencing hydration care which may need improvement. The pure notion of implementing an audit tool, which is reviewed by management on a weekly basis, acts to prioritise drinking and hydration care in care homes and encourages organisational decision making which may influence staff prioritisation and culture around drinking.

1) Invisibility of drinking

- At least one member of care staff should be available in communal areas to attend to residents with quieter voices, or those unable to verbally communicate, to respond to their hydration needs.

- Caregivers should be mindful not to move drinks out of residents' reach when organising other activities within the residents' reach, e.g. arts and crafts or plates of food, or when moving residents to different rooms.

- A range of enjoyable drinks should be on offer for residents, day and night.

- Residents drinks should always be refilled

- Caregivers should support or encourage residents to drink the entire contents of a drink.

2) Characteristics requiring support for drinking

- Residents should always have at least one drink available to them and within their reach, in a drinking vessel they can lift, tilt and use, and made to their preference.

- Caregivers should maximise opportunities for residents to drink when they are awake.

- Caregivers should consider observing and assessing how each resident drinks on a morning and afternoon to identify any characteristics the resident has which may influence their drinking, e.g. can they lift and tilt a cup, can they reach across the table to lift a cup. Caregivers should then update care plans and inform all staff of any insights from how the resident consumed the drink, to support and assist the resident (where necessary) going forwards.

3) Availability of drinking support

- Informal caregivers should be encouraged to visit the home and share drinks with the resident and support with drinking.

- If a resident asks a caregiver for a drink, that caregiver should be accountable for making and giving the drink to the respective resident.

- Caregivers should consider using multiple methods of communicating with residents to discuss drinks preferences, needs and requests.

- Care home managers may consider seeking additional support from external agencies if a residents’ drinking reduces, to prevent potential deterioration.

- If a care home perceives a resident to be choking on drinks, they should seek additional input from the GP or speech and language therapists.

- Care staff should allocate enough time to support residents to drink

4) Care home infrastructure for drinking.

- When drinks are offered to residents, these should be preferred drinks at palatable temperatures.

- All staff roles should be involved with making residents’ drinks and thus should be aware of residents’ dietary requirements and receive appropriate training to deliver hydration care.

- Caregivers should ensure that drinking equipment and materials, such as spoons, preferred drinking vessels and drinking aids, sweetener and a variety of drinks are prepared and available during tea trolley times.

- Care home managers could consider implementing protected drinks times, so that when staff are supporting residents to consume drinks, these residents will not be interrupted.

- Care home managers should reflect on the frequency of their drinking opportunities and the volume of fluids that residents are provided with at each opportunity, ensuring the total meets the minimum daily fluid intake requirements.

- Care staff and family caregivers should use hydration-promoting language instead of minimising drinking, e.g. “can you finish that” “I’ll get you another drink” “drink that whilst it’s the perfect temperature”

- Drinks provision should be enacted by staff as a cyclical process in care homes to increase the availability of drinks to residents.

8.7.3 Implications for research

This research identified several areas for further research:

- A systematic review and meta-analysis should synthesise the evidence for and estimate the prevalence low-intake dehydration in hospital studies. We are currently undertaking this review within the UEA Hydrate group.

- Clinical trials and research studies should include multicomponent hydration interventions designed as cyclical processes within study designs (similar to Figure 6.3) to increase the availability of drinks to residents.

- Multicomponent interventions should focus on making drinks available and accessible to residents, addressing individual needs, such as swallowing, communication, reaching abilities to maximise residents’ opportunities for drinking and prioritising drinking.

- Low-intake dehydration remains under-researched in older people. For drinking interventions to be effective and sustainable, researchers must first generate knowledge about the influences on drinking across more settings, including staff knowledge of CQC regulations 9 and 14.

- Future research could explore whether the findings from the ethnographic case study are transferable across other care home settings, or whether new insights are generated.

8.7 Novel contributions of this thesis to knowledge of hydration care for older people

This thesis presents several novel findings relating to hydration care of older people. The first systematic review and meta-analysis using robust and accurate assessments to estimate the prevalence of low-intake dehydration in older people. The systematic review identified that one quarter of older people are dehydrated, as assessed by the reference standard, and 77% of older people do not drink at least 1.5L of fluids in 24 hours. This evidence is vital for informing the public and health and social care staff supporting older people about the importance of optimal hydration in preventing dehydration.

This thesis builds upon the growing literature which illuminates how drinking and drinks are deprioritised against food and eating, as well as other care activities(53, 58, 59, 169, 403). The specific novel contribution of this thesis is how drinking is deprioritised in the language people use to talk and write about drinks. The thesis has also illuminated the issue of drinking being invisible. Some practices and routines within care homes are centred around providing drinks to residents in routine ways, however there is much less attention and care given to how people actually engage with those drinking vessels and drink. This highlights another novel contribution of this thesis. The literature consistently reports residents' characteristics which may make drinking more difficult, such as communication and swallowing difficulties and mobility and cognitive issues. However, these are broad categories which ignore any individual variation or nuance in how someone engages with a drink. This thesis illuminated the importance of residents' problem-solving skills in negotiating drinking vessels to be able to drink. This requires staff to be attentive to how residents drink, how they hold a drinking vessel, how they may negotiate any accessories, such as straws, to drain the vessel of drink. There has been more focus on how drinks are provided to residents and too little focus on how residents then come to consume those drinks. This thesis fills that gap.

9.Dissemination from this thesis

9.1 Aim and outline of chapter

This chapter outlines the dissemination activities I undertook, why these were important to this PhD project and what impact I hoped to achieve from these activities.

9.2 Why is dissemination important?

Dissemination is the act of sharing research findings with people who can use them(406) whilst ensuring the findings are useful. The World Medical Association's (WMA) Declaration of Helsinki states that all researchers are obliged to disseminate their research findings and make these publicly available(407). The National Institute for Health and Care Research (NIHR) lists four principles of good dissemination: identify and engage with relevant stakeholders, produce appropriate and tailored outputs to disseminate to relevant audiences, maximise opportunities to disseminate findings at networking events and consider the context and timing of dissemination(406). Dissemination is important because it is the first step in the process of impact generation. The NIHR state that whilst dissemination occurs as a one-way process, knowledge mobilisation is a two-way process(19). Knowledge mobilisation involves a two-way dialogue between researchers and research users about the research findings, which can create new knowledge(19). The final stage of sharing research findings is impact generation, in which the research findings are implemented and make a contribution to the real world(19). All dissemination activities have the potential to generate impact, depending on who receives the knowledge and how the knowledge is mobilised to generate change or improvement.

9.3 Dissemination activities resulting from this thesis

Throughout this thesis, I planned the research to be meaningful to the people I sought to benefit and so I shared research findings with relevant groups in a timely manner. I disseminated to other researchers and academics, the public, PPI groups and health and social care staff. In the next section, I detail my dissemination activities, the intended audiences and the potential impact of these activities.

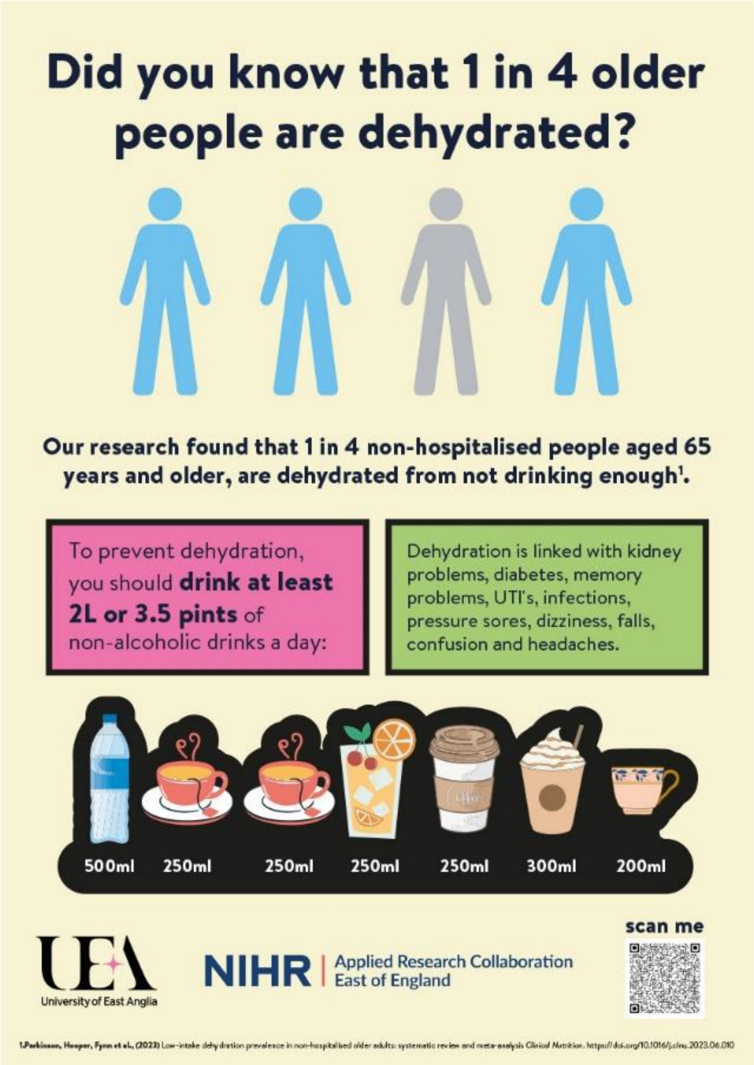
Social media

Throughout this PhD, I regularly wrote online posts about research findings and learnings from the research on LinkedIn and Twitter/X. I posted advertisements for opportunities for online users to take part in PPI activities on LinkedIn and Twitter/X, indirectly raising my academic profile and the profile of the PhD project. I used social media to engage with researchers, academics and the public about my research findings, enabling space for a two-way dialogue. I primarily aimed to engage with academics and researchers within the field of gerontology for my findings to inform their future research. Whilst the majority of my followers were academics and researchers working in gerontology, some followers lived with dementia or were caregivers of people living with dementia or people from the health and social care workforce. I also aimed for other researchers to share the thesis research findings across their own networks, disseminating the findings further afield. I used social media to engage with health and social care staff and occasionally informal caregivers to raise awareness of hydration care in older people and provided findings in accessible formats in written posts online to inform hydration care practices amongst these groups. As a result of this dissemination, the public, other researchers and caregivers may be better educated about the risk of dehydration to older people and better informed about ways to increase drinking amongst older people living with dementia in care homes. Increased awareness of such issues may improve hydration care practices, which may consequently increase or improve drinking for people living with dementia receiving care from others.

Dehydration posters

The systematic review and meta-analysis (Chapter 5) reported that one in four older people are dehydrated from insufficient fluid intake. When designing the systematic review protocol, I specifically planned to disseminate the findings and risk of low-intake dehydration to older people via evidence-based posters. I planned to raise awareness of the risk amongst the public and health and social care staff. To initiate this project, I applied to the UEA’s FMH Impact Fund for funding to reimburse PPI members for co-designing the posters and for postage and packaging costs. I was awarded funding to undertake the project. I organised an online PPI workshop which I advertised on social media channels, word-of-mouth and via relevant PPI networks. I facilitated a workshop in June 2023 with one co-facilitator and five older people. I received email feedback from three health and social care staff who reviewed the posters. Feedback included suggestions such as changing text size, change of colours and visuals, the need for the posters to be simple and easy-read and for the posters to be visible amongst many other posters displayed. I revised the visual appeal, font size and simplicity of the posters after considering the feedback and sent a new version to all PPI members to review and approve. After reviewing several iterations of designs from a graphic design company, I approved the final design and sent the A3 posters to be professionally printed. Two posters were devised: one for public-facing spaces and one for clinical areas to educate healthcare staff: UEA - A3 posters x2.V3.HR (Figures 9.1 and 9.2). I packaged and distributed the posters with a letter and QR code linking to my website to 17 hospitals,108 GP practices and 253 long-term care settings across Norfolk and Waveney.

I received emails from a number of settings thanking me for the posters and sometimes requesting more posters. In December 2023, I generated a brief survey asking poster recipients what impact, if any, the posters had on them or their staff. I shared the survey link on social media and within the Norfolk and Suffolk Care e-newsletter, predominantly delivered to health and social care managers. One recipient reported that the posters were an *"Excellent quick look reminder to staff*" and that "*Staff are reminded the importance of Hydration with the residents".* The NIHR ARC EoE created a webpage to highlight the project: The risk of dehydration to older people: Raising public awareness in Norfolk | ARC East of England (nihr.ac.uk). This dehydration poster campaign potentially led the public and health and social care staff to become better informed about hydration care in older people and so older people may drink more, and/or staff may provide older people with more drinks.



Did you know that 1 in 4 older people are dehydrated?

Our research found that 1 in 4 non-hospitalised people aged 65 years and older, are dehydrated from not drinking enough[1].

To prevent dehydration, you should **drink at least 2L or 3.5 pints** of non-alcoholic drinks a day:

Dehydration is linked with kidney problems, diabetes, memory problems, UTI's, infections, pressure sores, dizziness, falls, confusion and headaches.

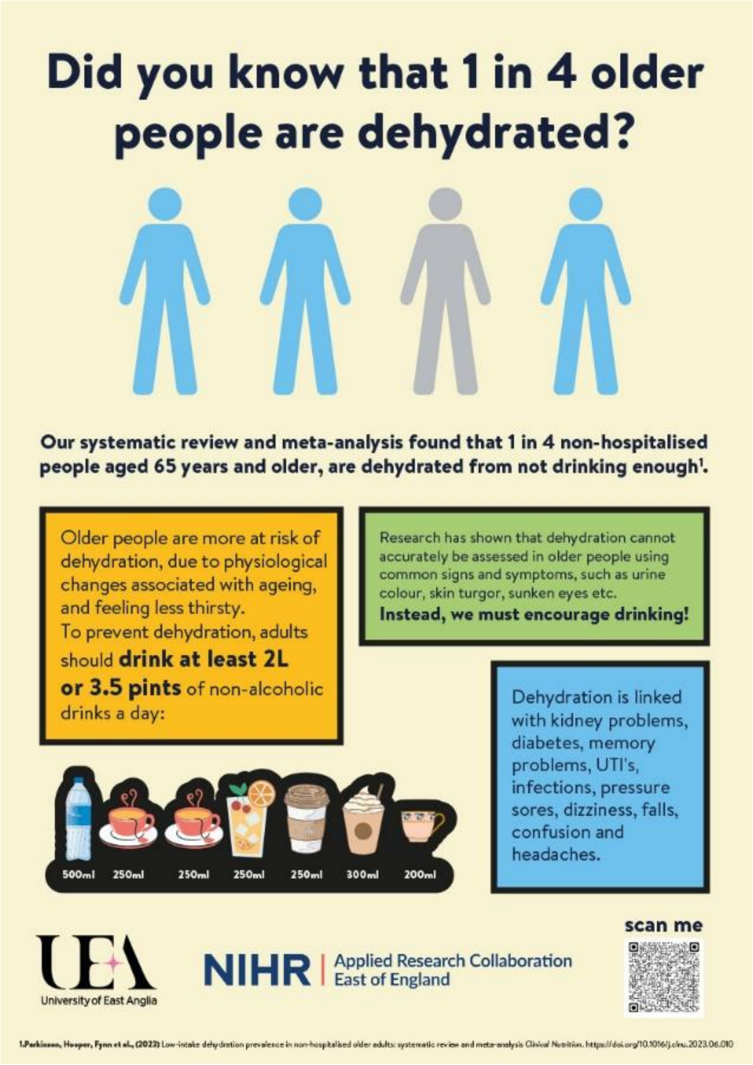
scan me

University of East Anglia

NIHR | Applied Research Collaboration East of England

[1] **Parkinson, Hooper, Fynn et al., (2023)** Low-intake dehydration prevalence in non-hospitalised older adults: systematic review and meta-analysis *Clinical Nutrition*. https://doi.org/10.1016/j.clnu.2023.06.010

Figure 9.1: Posters for public



Did you know that 1 in 4 older people are dehydrated?

Our systematic review and meta-analysis found that 1 in 4 non-hospitalised people aged 65 years and older, are dehydrated from not drinking enough[1].

Older people are more at risk of dehydration, due to physiological changes associated with ageing, and feeling less thirsty.
To prevent dehydration, adults should **drink at least 2L or 3.5 pints** of non-alcoholic drinks a day:

Research has shown that dehydration cannot accurately be assessed in older people using common signs and symptoms, such as urine colour, skin turgor, sunken eyes etc.
Instead, we must encourage drinking!

Dehydration is linked with kidney problems, diabetes, memory problems, UTI's, infections, pressure sores, dizziness, falls, confusion and headaches.

scan me

University of East Anglia

NIHR | Applied Research Collaboration East of England

[1] **Parkinson, Hooper, Fynn et al., (2023)** Low-intake dehydration prevalence in non-hospitalised older adults: systematic review and meta-analysis *Clinical Nutrition*. https://doi.org/10.1016/j.clnu.2023.06.010

Figure 9.2: Posters for clinical spaces

Regional media

As part of the publicity around the dehydration poster campaign, UEA released a press release: UEA researchers launch campaign to reduce dehydration among over 65s | UEA. BBC Radio Norfolk asked me to participate in an interview as a result: https://www.bbc.co.uk/sounds/play/p0g39d6z?partner=uk.co.bbc&origin=share-mobile

I discussed the systematic review findings, the importance of hydration in older age and dispelled some myths around what constitutes hydration. According to the radio staff, the interview was received well and generated a lot of interest from listeners:

"it was a great interview which really got people talking, we had loads of comments"

BBC Radio Norfolk covers a population of over 900,000 adults which may have led to increased awareness of dehydration to listeners, also potentially impacting on their drinking and hydration care of others.

Newsletter articles

I wrote a brief and accessible summary of the systematic review findings (Chapter 5) which was published in the Tyndall Climate Change Centre newsletter and the UEA FMH newsletter including a hyperlink to the peer-reviewed publication. This dissemination intended to raise awareness of the risk of dehydration to older adults to academics and researchers.

The Norfolk and Suffolk Care team invited me to submit an article about older people's dehydration in their bi-annual newsletter. I wrote an accessible 1-page article of key findings from the D-DRINC Studies and how these findings could be used to improve the hydration care of older people: Norfolk Care News spring summer 2024 - online version (fliphtml5.com). Health and care managers were the likely audience of this article. This group of staff is most likely able to implement and embed changes of processes and routines within their care homes, consequently enabling residents to receive more drinks which are available and accessible to them.

Peer-review publications

I wrote and published one peer-review article in the Journal of Clinical Nutrition, disseminating the systematic review findings: Low-intake dehydration prevalence in non-hospitalised older adults: Systematic review and meta-analysis - Clinical Nutrition (clinicalnutritionjournal.com).

I published in this journal because of its international audience, its focus on nutrition and impact factor of 6.6. This publication was most likely read by academics, scientists and researchers, which may have increased their knowledge or awareness of the prevalence of dehydration and may have informed others' research.

Academic blogs

I wrote three blogs during this PhD project (Table 9.1). The first blog introduced the D-DRINC A study predominantly to care home researchers and managers through the NIHR's Enabling Research in Care Homes (ENRICH) website. The second blog was an accessible summary of the key systematic review findings (Chapter 5) aimed at a similar audience via the British Society of Gerontology's (BSG) care home special interest groups' blog site. The third blog discussed the systematic review findings and the dehydration poster project, highlighting the importance of older people's hydration to an audience of health and care researchers and academics mostly. This increased awareness of research findings and projects can inform others' work in geriatric research.

TABLE 9.1: BLOGS

Blog	Topic and link	Date
NIHR's ENRICH	Introducing the D-DRINC Study – how do people living with dementia drink in care homes? | ENRICH (nihr.ac.uk)	09/2022
BSG Care home SIG	1 in 4 Non-hospitalised Older People are Dehydrated - Care Homes Research Blog (bsgsigcarehomesblog.co.uk)	08/2023
ARC East of England	Developing posters to tackle dehydration in older people | ARC East of England (nihr.ac.uk)	12/2023

Conference presentations

Throughout the PhD project, I presented research proposals, study progress and study findings to regional, national and international audiences at conferences (Table 9.2). Audiences included academics, researchers, scientists, the public, health and social care staff, people living with dementia and family caregivers. At each of these conferences I networked and expanded my connections within the older people's nutrition field, care home research and dementia field. These dissemination activities led to increased knowledge amongst delegates of my research and research findings, which may have led to the sharing of knowledge amongst others, as well as changes to hydration-related practices and routines.

TABLE 9.2: CONFERENCE PRESENTATIONS

Event	Presentation	Date
NIHR ARC EoE Fellow's Showcase	Poster – systematic review proposal	03/2021
UEA FMH PGR conference	Oral – systematic review update	05/2021
NIHR ARC EoE ECR Event	Oral – systematic review findings	01/2022
Hydration for Health conference and ECR award	Oral – systematic review findings Conference Replay - Hydration for Health	06/2022
UEA FMH PGR Conference	Poster – Embedding PPI within my PhD	06/2022
British Society of Gerontology	Oral – systematic review findings	07/2022
Malnutrition Taskforce learning event	Oral - Drinking in older age UKMAW22 Conference Report | Malnutrition Task Force	10/2022
UEA FMH PGR conference	Poster – Ethical dilemmas in ethnography	06/2023
British Society of Gerontology	Poster – D-DRINC Study A ethnography	07/2023
Alzheimer Europe (Finland)	Poster – D-DRINC Study A ethnography	09/2023
Alzheimer Europe (Finland)	Poster – D-DRINC Study B forum analysis	09/2023
Malnutrition Taskforce learning event	Oral – D-DRINC Study findings #UKMAW2023 Learning Event Presentations | Malnutrition Task Force	11/2023
Norfolk and Suffolk Care conference	Oral – D-DRINC Study findings	11/2023

Care home staff training

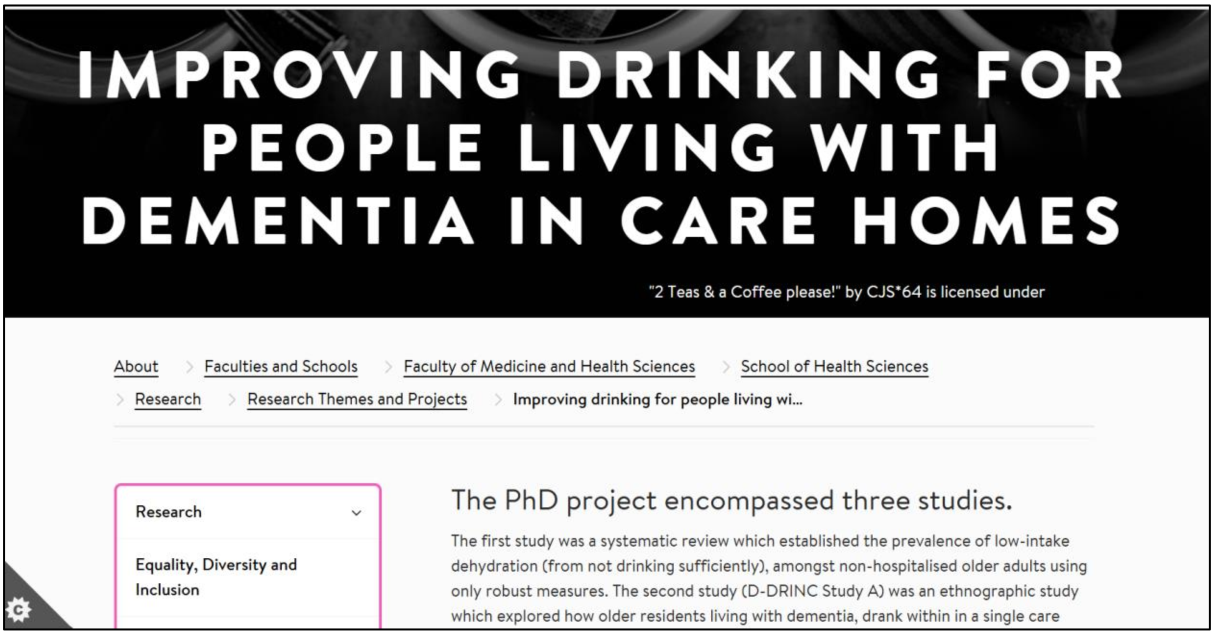
A director of a company which owned a small number of care homes, approached me on LinkedIn and asked if I could deliver hydration training to one of the care homes in the Midlands. I co-designed and co-delivered training with Dr Diane Bunn on 27th October 2022 to care staff. The training included dissemination of the '1 in 4 risk' of dehydration to older people. The director confirmed that the care home would use daily flash meeting, the global staff messaging system and a 'lessons learned' document to cascade learning from the training to all staff. This training was designed to improve knowledge and practices of care staff around hydration care of older people.

Higher education teaching

During the PhD project, I co-delivered a hydration-related lecture to trainee nursing associate students in which I educated them about the risk of dehydration to older people. I also taught various groups of first year medical students about the risk and prevalence of dehydration to older people. These students will meet older people within their work and will hopefully have received appropriately training to ensure adequate hydration of older people.

Websites

I updated my UEA webpage as the PhD project progressed, with study findings and links to downloadable documents (Figure 9.3): [Improving drinking for people living with dementia in care homes - About (uea.ac.uk)](). I have two webpages at ARC EoE; one for the PhD project (Figure 9.4): [Improving drinking for people living with Dementia in care homes | ARC East of England (nihr.ac.uk)]() and one for the dehydration poster campaign project: [The risk of dehydration to older people: Raising public awareness in Norfolk | ARC East of England (nihr.ac.uk)](). The UEA and ARC EoE partners with the public, academic institutions, third sector organisations and local authorities and thus these webpages may be viewed by a wide range of people. These webpages aim to inform and educate people about dehydration and drinking in older people, which may lead to better awareness and improved drinking or drinks provision to others.



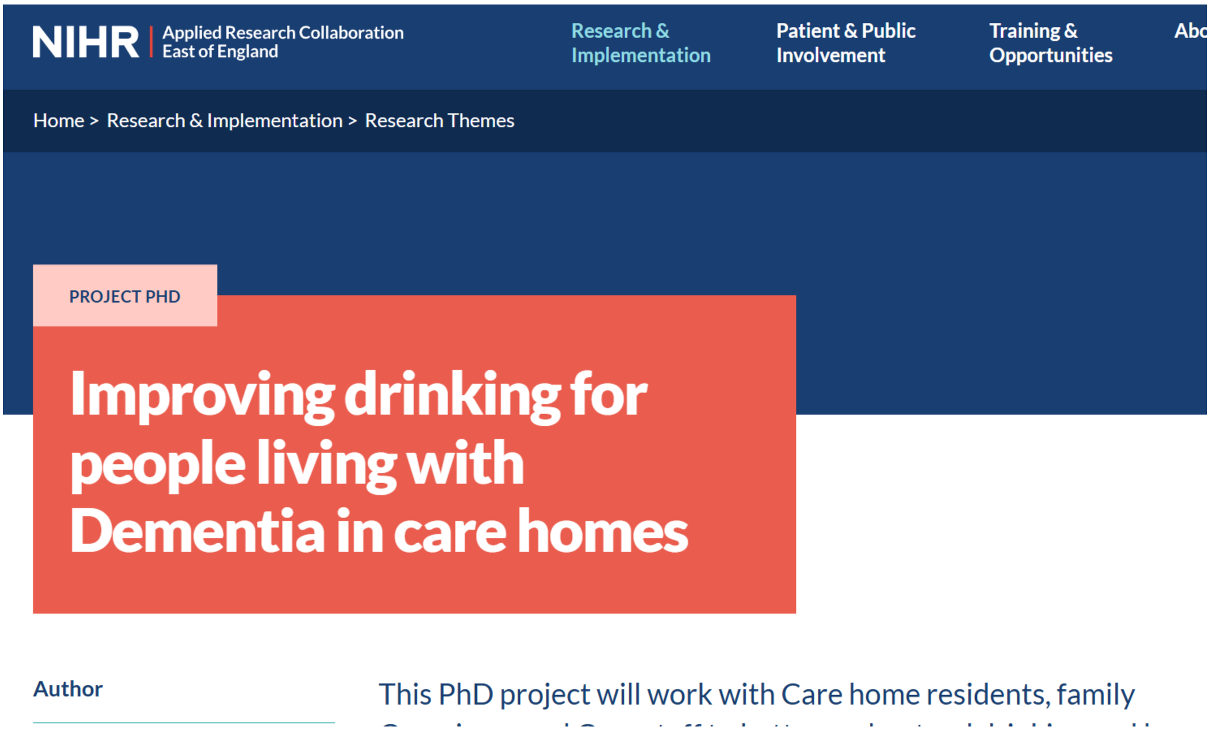
IMPROVING DRINKING FOR PEOPLE LIVING WITH DEMENTIA IN CARE HOMES

"2 Teas & a Coffee please!" by CJS*64 is licensed under

The PhD project encompassed three studies.

The first study was a systematic review which established the prevalence of low-intake dehydration (from not drinking sufficiently), amongst non-hospitalised older adults using only robust measures. The second study (D-DRINC Study A) was an ethnographic study which explored how older residents living with dementia, drank within in a single care

Figure 9.3: UEA PhD webpage



PROJECT PHD

Improving drinking for people living with Dementia in care homes

Author

This PhD project will work with Care home residents, family

FIGURE 9.4: ARC EOE PHD WEBPAGE

Webinars

I participated in a webinar to share the systematic review proposal with fellow students, whilst raising awareness of the issue of dehydration amongst older people (Table 9.3). I was invited to present at the Realist Research and Evaluation Group (RREG) and NIHR's CREDTalk which are academic forums attended by researchers, students and health and social care staff interested in applied research and evidence-based practice. I aimed to educate attendees at the RREG and CREDTalk about the process of drinking in care homes and how caregivers can support residents living with dementia to consume drinks, ensuring optimal hydration. These webinars potentially impacted how caregivers delivered hydration care in their own settings.

TABLE 9.3: WEBINARS

Event	Topic	Date
UEA FMH Bitesize seminars	Systematic review proposal	04/2021
Realist evaluation group (RREG)	Ethnography	01/2024
NIHR CREDTalk	D-DRINC Study findings CRED Talk: Working with care homes to help residents eat and drink well | NIHR ARC Wessex	03/2024

Podcasts

I was invited to take part in three Dementia Researcher podcasts (Table 9.4) which are listened to by health and social care staff, the public and academics and researchers working in the field of dementia. In each of the podcasts, I discussed all aspects of my research and the overall issue of dehydration in older people, particularly those living with dementia. These podcasts had the potential to increase listeners' awareness of dehydration and drinking problems in older adults, as well as evidence-based recommendations for hydration care practice.

TABLE 9.4: PODCASTS

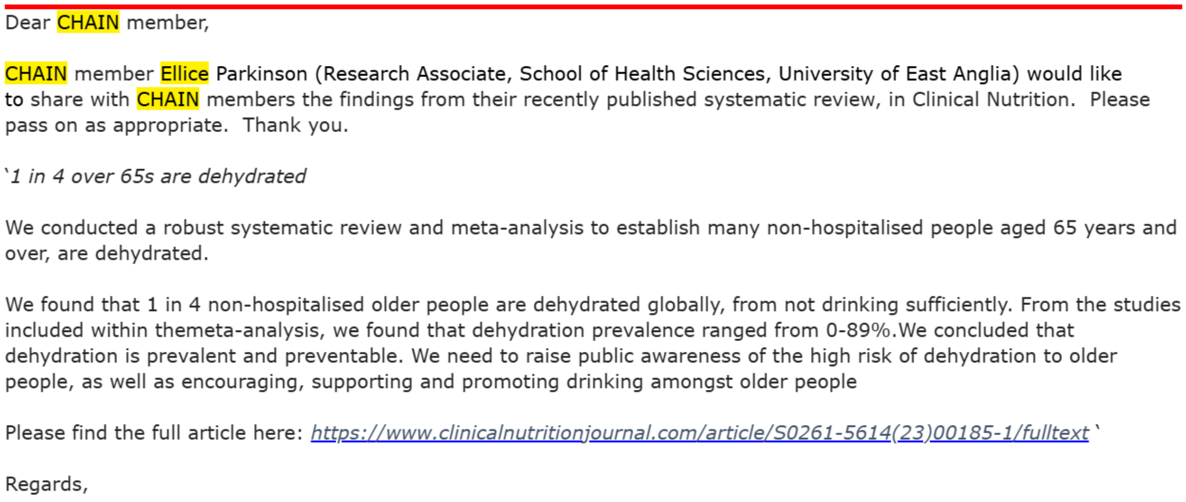
Event	Topic	Date
Dementia Researcher charity chatathon	Guest speaker for session: *"The essentials - lighting, drinking, good care"*	12/2022
Dementia researcher podcast	Invited guest speaker for session: "Thirst for Knowledge, Hydration & Dementia" Podcast – Thirst for Knowledge: Hydration & Dementia (nihr.ac.uk)	07/2023
Dementia researcher podcast	Ethics in dementia research	09/2023

PPI panels

When I began the PhD, I presented to the Alzheimer Society's Research Network Panel and NIHR's public, patient and carer voice in research (PPIRes) group to seek feedback and comments on my initial ideas for the PhD. I considered all of the comments, many of which contributed to how I designed the individual studies. Early in the PhD project, I decided that once I had completed all PhD studies, I would feed back to the PPI groups which supported me and the project. I attempted to contact the Alzheimer Society's Research Network on numerous occasions but unfortunately did not receive a response. I presented to PPIRes on 17th July 2023 and to UEA's Citizen's Academy on 26th September 2023 to show my process of meaningful PPI and report the PhD project's findings. This may have educated attendees about the research findings which may have also impacted people's own drinking habits or hydration care of others. I intended to demonstrate my appreciation and gratitude towards PPI members for their involvement and suggestions in the research. I hoped that by completing the feedback loop this may build trust with researchers, because too often PPI members do not receive feedback about how their contributions were used by researchers.

Miscellaneous

I contacted the contact, help, advice, and information network (CHAIN), an online network of health and social care workers to disseminate a brief summary of my systematic review findings (Figure 9.5). After publishing my systematic review, I included a hyperlink to the publication within my email signature so that anyone I emailed had the opportunity to access the paper.



Dear CHAIN member,

CHAIN member Ellice Parkinson (Research Associate, School of Health Sciences, University of East Anglia) would like to share with CHAIN members the findings from their recently published systematic review, in Clinical Nutrition. Please pass on as appropriate. Thank you.

'*1 in 4 over 65s are dehydrated*

We conducted a robust systematic review and meta-analysis to establish many non-hospitalised people aged 65 years and over, are dehydrated.

We found that 1 in 4 non-hospitalised older people are dehydrated globally, from not drinking sufficiently. From the studies included within themeta-analysis, we found that dehydration prevalence ranged from 0-89%.We concluded that dehydration is prevalent and preventable. We need to raise public awareness of the high risk of dehydration to older people, as well as encouraging, supporting and promoting drinking amongst older people

Please find the full article here: *https://www.clinicalnutritionjournal.com/article/S0261-5614(23)00185-1/fulltext* '

Regards,

FIGURE 9.5: CHAIN NETWORK DISSEMINATION

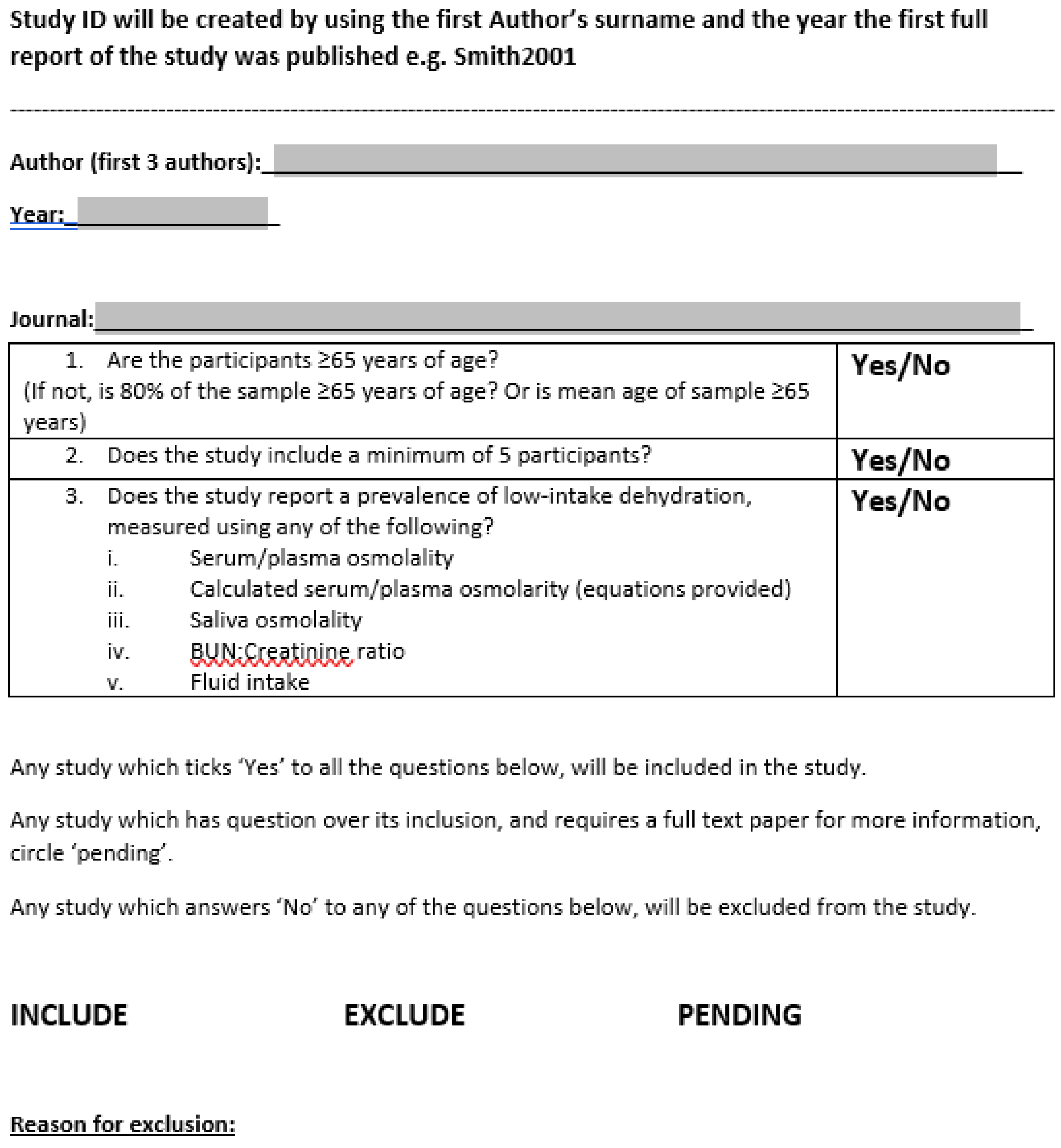
The UEA's HYDRATE Group collaborated with AGE UK Norwich to develop some drinking resources for community-dwelling mid-older adults. Although I was not involved in this work, the systematic review findings reporting the '1 in 4 risk' of dehydration to older people was featured within the AGE UK digital resources, training and press releases: Age Age UK Norwich and UEA team up to tackle dangerous dehydration in older people. I was involved with evaluating and updating the UEA HYDRATE Group's evidence-based care home toolkit to improve drinking called the DrinKit: DrinKit - Groups and Centres (uea.ac.uk). The DrinKit was updated with some of the thesis research findings such as the '1 in 4 risk of dehydration to older people' along with recommendations to ensure that drinks are available and accessible to care home residents. This dissemination may lead to older people across both community and long-term care settings being better informed of their risk of dehydration and may impact their own drinking habits, hydration care of others and/or lead to receiving improved hydration care.

9.4 Conclusion

I disseminated to a diverse range of audiences through a wide variety of activities during this PhD project. I mostly aimed to increase awareness of dehydration in older people and educate people of its prevalence and its consequences. I aimed to educate people about how people living with dementia consume drinks, how drinks must be available and accessible to residents for them to be able to drink and how drinking is a cyclical process, but often enacted by staff as a one-time task. I networked and communicated a lot with fellow dementia researchers and academics to share knowledge which may inform future research and hydration interventions. Throughout the PhD, I ensured that I disseminated findings to communities who were most likely to benefit from the findings, whilst I also plan on publishing more peer-reviewed articles post-thesis submission.

Appendices

Appendix 4a Study Inclusion Form



Study ID will be created by using the first Author's surname and the year the first full report of the study was published e.g. Smith2001

Author (first 3 authors):____

Year:______________

Journal:____

1. Are the participants ≥65 years of age? (If not, is 80% of the sample ≥65 years of age? Or is mean age of sample ≥65 years)	**Yes/No**
2. Does the study include a minimum of 5 participants?	**Yes/No**
3. Does the study report a prevalence of low-intake dehydration, measured using any of the following? i. Serum/plasma osmolality ii. Calculated serum/plasma osmolarity (equations provided) iii. Saliva osmolality iv. BUN:Creatinine ratio v. Fluid intake	**Yes/No**

Any study which ticks 'Yes' to all the questions below, will be included in the study.

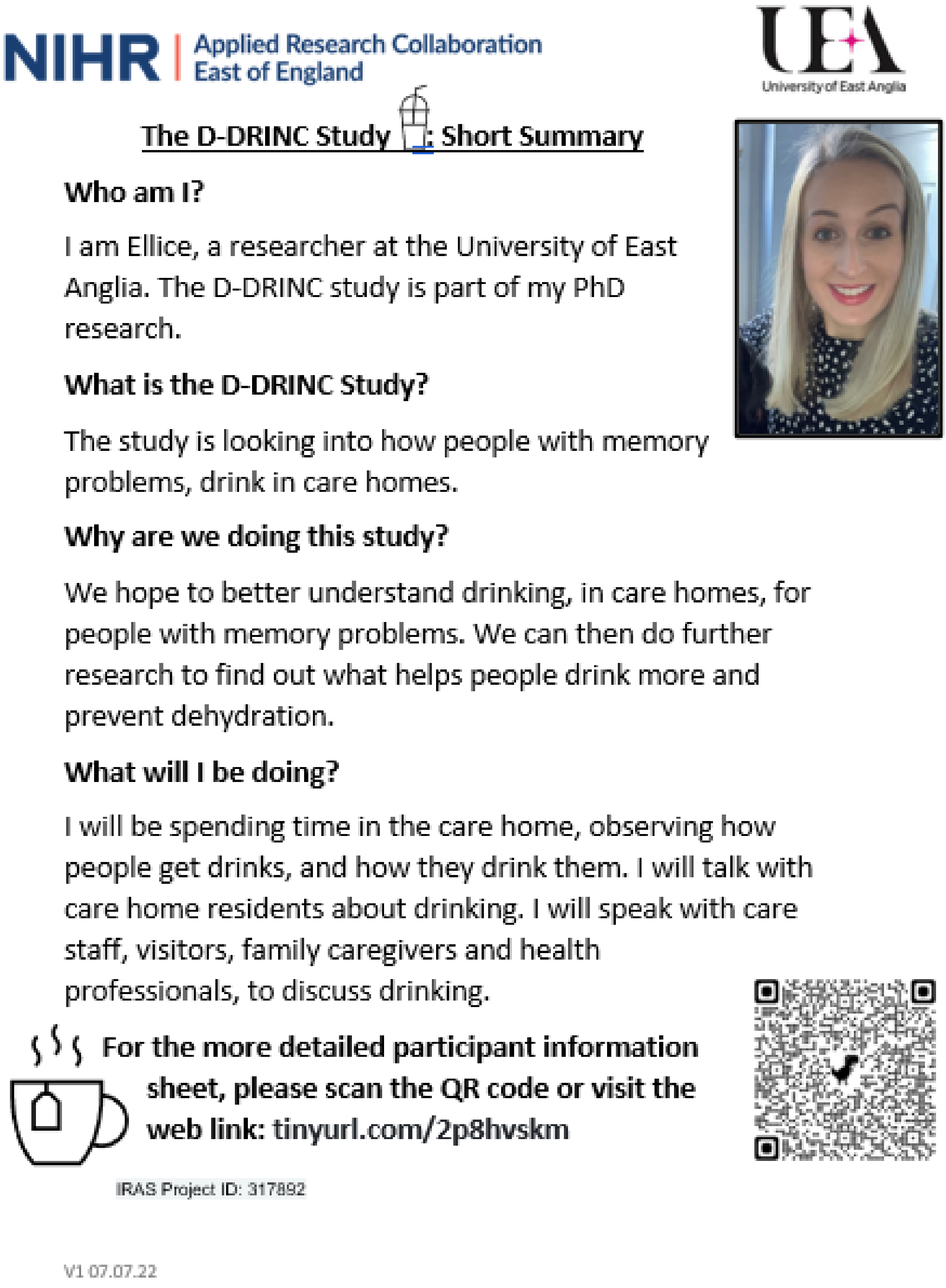
Any study which has question over its inclusion, and requires a full text paper for more information, circle 'pending'.

Any study which answers 'No' to any of the questions below, will be excluded from the study.

INCLUDE **EXCLUDE** **PENDING**

Reason for exclusion:

Appendix 4b Short study summary



NIHR | Applied Research Collaboration East of England

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The D-DRINC Study : Short Summary

Who am I?

I am Ellice, a researcher at the University of East Anglia. The D-DRINC study is part of my PhD research.

What is the D-DRINC Study?

The study is looking into how people with memory problems, drink in care homes.

Why are we doing this study?

We hope to better understand drinking, in care homes, for people with memory problems. We can then do further research to find out what helps people drink more and prevent dehydration.

What will I be doing?

I will be spending time in the care home, observing how people get drinks, and how they drink them. I will talk with care home residents about drinking. I will speak with care staff, visitors, family caregivers and health professionals, to discuss drinking.

For the more detailed participant information sheet, please scan the QR code or visit the web link: tinyurl.com/2p8hvskm

IRAS Project ID: 317892

V1 07.07.22

Appendix 4c REC notification of provisional opinion and actions needed

Dear Ms Parkinson,

Following the REC meeting I am pleased to provide the following update regarding the status of your application. The Research Ethics Committee reviewed the application on 19 August 2022 and issued a Provisional Opinion. Please provide the following information in order for a final ethical opinion to be issued:

Number	Action Required	Response from the applicant
1	As discussed during the REC meeting, the Committee remain concerned that individuals who do not consent, or for whom consultee advice to include them has not been provided, will inadvertently be involved in the study due to the location of the researcher. Please therefore provide a further explanation and reassurance to the Committee as to how you will ensure that these individuals are not included in any aspect of the research. Please note where consent is not obtained from all participants where the ethnographic observations are taking place, there is a likelihood for the researcher to have incidental access to personal identifiable information of those who have not provided consent to be observed, and therefore a legal basis to access such data would not be in place. The Applicant is therefore advised to liaise with the Confidentiality Advisory Group to ensure further regulatory approvals (section 251 support) are not required for the study. The CAG precedent set review pathway - Health Research Authority (hra.nhs.uk) The researcher could take mitigating actions such as mapping the footprint/layout of the care home to ensure if feasible that observations take	

	place in areas that have been reserved for people who have consented or for whom there is consultee advice.	
2	Linked to Condition 1 above, provide further detail about the process that will take place to ensure that the privacy of participants is upheld throughout the study. This information should be added to the Protocol and appropriate PIS documents.	
3	*The Committee request for the following changes to be made to the Easy Read PIS:* a) Remove the statement referring to information obtained from the study would be kept 'private' due to conversations held are not in private areas. b) Add a disclaimer noting that due to the study being conducted in a care home environment that you cannot guarantee complete privacy (e.g. safeguarding issues/GDPR).	
4	Add a consent clause to all appropriate Consent/Declaration Forms to indicate the researcher will request that care home staff access the home's nursing records to ascertain the diagnosis of dementia. The researcher may wish to design a simple proforma to capture this information. The researcher may not access these records herself.	
5	Provide further information on what the cooling off period timescales would be for participants who wish to take part in the study. As discussed during the REC meeting, the Committee recommend 48 hours. Please add this information to the Protocol.	
6	Provide separate Information Sheets for both 'Personal Consultees' and	

	'Nominated Consultees' with appropriate Declaration Forms.	
7	Provide updated Demographic Form (with updated version control) to replace the space to include the participant's name with a pseudonymisation/Study ID.	
8	The Committee request that the PIS to include a statement explaining how audio recordings would be managed and stored.	
9	The Committee request that all Information Sheets and Consent/Declarations Forms include the researcher and research team's full name at least once. This could be by way of a footnote, for example.	
10	As discussed during the REC meeting, it should be explicitly clear if a participant that lacks capacity expresses the wish to withdraw from being observed, they should be automatically withdrawn without further discussion, and not involved again It is also noted if the applicant's presence in the care home causes any distress to a participant who lacks the capacity to consent then the participant should also be withdrawn from the study with immediate effect, and not involved again, and the researcher should move areas to observe elsewhere.	
The Committee delegated authority to confirm its final opinion on the application to the Vice-Chair [REDACTED NAMES]		

	Recommendation
1	The Committee recommends that further information is sought in respect of translational support offered by the NIHR given the study is partly funded by the NIHR. https://www.nihr.ac.uk/documents/health-technology-assessment-hta-programme-stage-2-guidance-notes-realms/27817
2	The Committee strongly recommends that the study is registered on a public database.

A response should be submitted by no later than 29 September 2022.

Please provide a response to the requested information through IRAS by referring to the instructions on how to submit a response to provisional opinion electronically. Please provide your answers in the table above and then submit this, with revised documentation where appropriate, underlining, tracking or otherwise highlighting the changes which have been made and giving revised version numbers and dates. You do not have to make any changes to the IRAS application form unless you have been specifically requested to do so.

Membership of the Committee
[REDACTED REC]
Attendance at Committee meeting on 19 August 2022

Committee Members:

[REDACTED NAMES]

Appendix 4d My response to the REC comprising part of my resubmission.

27th September 2022

Dear [REDACTED NAMES]

Thank you for your provisional opinion for the D-DRINC study (IRAS ID: 317892) which was discussed at the REC meeting on 19th August, and for your recommended revisions. I have provided a detailed response to each recommended revision in a separate document [“Response to the REC V1 RE-SUBMISSION COPY 27.09.22].

The main issue raised was regarding my potential incidental exposure to confidential personal information of non-consenting people within the care home, as a consequence of using ethnographic methodology to achieve the aims of this study.

Thank you for raising this issue with me, because it encouraged me to speak to many other care home researchers, who have experience of using ethnographic methodologies in care home settings, and I was able to discuss the issues raised by yourselves. Please find a list of ethnographic studies at the end of this letter, which have all received favourable opinions from a number of UK RECs.

As a result of your own advice, discussions with other care home researchers and reading their ethics submissions, as well as consulting with CAG (as you advised), I have amended and extended my procedures to reduce the risk of incidental exposure to personal information of non-consenting people, whilst undertaking ethnographic observations. The amendments to my protocol and methodology, are set out in the “Response to the REC V1 RE-SUBMISSION COPY 27.09.22” document, as well as in the protocol V3. The detailed email response from CAG is included within this letter, as well as being uploaded to IRAS. The CAG state that it is unlikely that the CAG ‘S251’ pathway is required and the local level data controller (UEA research sponsor) have also written an email, which is uploaded to IRAS, to confirm that they are happy with the methodology and the study design.

“Thankyou for your query.

By way of overview, the remit under which the CAG can advise is defined in Regulation 5 of the Control of Patient Information (COPI) Regulations and s251 of the NHS Act 2006, which enables the common law duty of confidentiality to be temporarily lifted so that confidential patient information can be processed for specific purposes, without seeking consent from the individual patient, and without the controller being in breach of this common law duty.

Support under Regulation 5 is only to be applied for as a last resort, should no other legal basis to process the confidential patient information be available. The CAG would expect that you explore whether seeking consent from patients is feasible and, if not, an explanation as to why consent cannot be sought will be requested in the application form.

The CAG can advise you on the considerations it takes into account, based upon its regulatory framework, but will not take the decision on whether support is required on behalf of applicants or other data controllers. You may find it helpful to review the information available on our website, https://www.hra.nhs.uk/about-us/committees-and-services/confidentiality-advisory-group/guidance-confidentiality-advisory-group-applicants/ particularly the "Determining the need for a CAG application" document and the "about the law" and the "role and remit of CAG" as these will provide guidance on the issues to consider when preparing an application.

There is potential precedent set CAG category for this; 10. Incidental disclosures of identifiable information made to an applicant who is observing practices and procedures within a health and social care setting (https://www.hra.nhs.uk/about-us/committees-and-services/confidentiality-advisory-group/cag-precedent-set-review-pathway/). We are however making changes to this category to try to make it easier to understand.

The basic premise is, if the researcher is only observing somewhere which is publicly accessible – ie, generally in the ward, then no 's251' support should be required (as the researcher should ask any patient who is in the vicinity if it is ok to stay and observe clinical practice) . If the patients are not ok with the observation (even if they are not the subject of interest), then the researcher should leave the area. Posters should be placed around the ward to inform patients of the observations, with an opt out option, and staff should be reminded of their duty of confidentiality. I think the general feeling was that as these are spaces where visitors could also be, it would not be normal clinical practise to be discussing confidential patient information (CPI) anyway in these spaces, and it should be possible to avoid any breaches via verbal consent from patients in the vicinity for the researcher to stay, and reminding staff not to discuss CPI in these areas if possible.

If observations are undertaken in closed meeting spaces where it would not be possible for the general public to be in, ie. privileged areas such as MDT meetings, or other areas like this, then 's251' support could be required if it is not possible to consent all the patients who will be discussed in that meeting.

Similar studies that have come through CAG are noted in the minutes below, so you can see if your study fits any that have been recently supported.

22/CAG/0102 From 08/07/2022 PS - https://s3.eu-west-2.amazonaws.com/www.hra.nhs.uk/media/documents/07._Precedent_Set_Minutes_-_08_July_2022_sg7XQ3U.pdf
22/CAG/0048 From 04/03/2022 PS https://s3.eu-west-2.amazonaws.com/www.hra.nhs.uk/media/documents/17._Precedent_Set_Minutes_-_04_March_2022.pdf
21/CAG/0175 and 22/CAG/0176 From 26/11/2021 PS https://s3.eu-west-2.amazonaws.com/www.hra.nhs.uk/media/documents/12._Precedent_Set_Minutes_-_26_November_2021.pdf

To note, CAG are only concerned with confidential patient information, not anything to do with staff, and so you would not require a CAG application regarding staff, as their information is not CPI, and not in scope for any CAG application. The only element you need to be concerned about regarding the common law duty of confidentiality, is any patients that are in the vicinity (which you should verbally consent), or any patients whose confidential patient informaiton may be discussed at any meeting you observe.

As your study sounds as though it will be entirely in a public space, it does not sound as though 's251' support will be required, but this will be for you to decide locally.

Hope that helps,
Thanks

[REDACTED NAME]

Confidentiality Advisor

Confidentiality Advice Team - Health Research Authority"

I hope that you find that the revisions are satisfactory, and I look forward to hearing from you in due course.

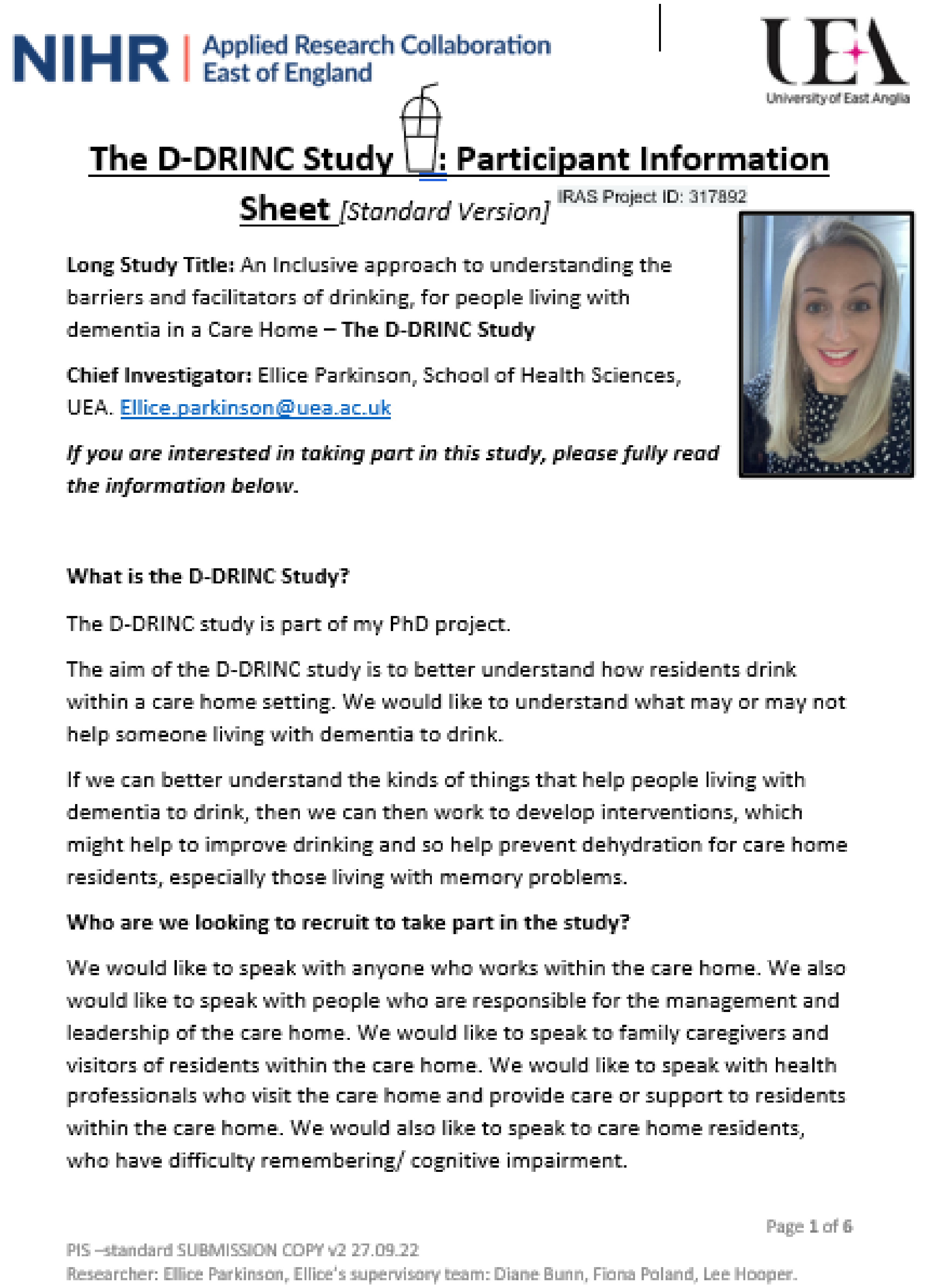
Kind Regards

Ellice Parkinson

List of approved ethnographic studies from UK RECs:

https://pubmed-ncbi-nlm-nih-gov.uea.idm.oclc.org/31826892/
https://pubmed-ncbi-nlm-nih-gov.uea.idm.oclc.org/34170522/
https://www-ncbi-nlm-nih-gov.uea.idm.oclc.org/pmc/articles/PMC6630159/
https://research-portal.uws.ac.uk/en/publications/an-ethnographic-study-of-cultural-diversity-and-dementia-in-scott
https://onlinelibrary-wiley-com.uea.idm.oclc.org/doi/pdf/10.1111/1467-9566.12461
https://www.hra.nhs.uk/planning-and-improving-research/application-summaries/research-summaries/ethical-and-spiritual-care-in-residential-care-for-older-people/
https://leicester.figshare.com/articles/thesis/Understanding_hospital_transfers_from_care_homes_in_England_An_ethnographic_study_of_care_home_staff_decision-making/15060003/1
https://www.alzheimers.org.uk/research/our-research/research-projects/reducing-resistance-personal-care-advanced-dementia
Digging deep: how organisational culture affects care home residents' experiences | Ageing & Society | Cambridge Core
https://www-cambridge-org.uea.idm.oclc.org/core/journals/the-british-journal-of-psychiatry/article/psychodynamic-approaches-to-the-experience-of-dementia-perspectives-from-observation-theory-and-practice-edited-by-sandra-evans-jane-garner-and-rachel-darnleysmith-routledge-2020-2699-pb-268-pp-isbn-9780415786652/E633CB58927CB330A89C815B34028EB1

Appendix 4e Staff and resident participant information sheet



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The D-DRINC Study : Participant Information Sheet *[Standard Version]*

IRAS Project ID: 317892

Long Study Title: An Inclusive approach to understanding the barriers and facilitators of drinking, for people living with dementia in a Care Home – **The D-DRINC Study**

Chief Investigator: Ellice Parkinson, School of Health Sciences, UEA. Ellice.parkinson@uea.ac.uk

If you are interested in taking part in this study, please fully read the information below.

What is the D-DRINC Study?

The D-DRINC study is part of my PhD project.

The aim of the D-DRINC study is to better understand how residents drink within a care home setting. We would like to understand what may or may not help someone living with dementia to drink.

If we can better understand the kinds of things that help people living with dementia to drink, then we can then work to develop interventions, which might help to improve drinking and so help prevent dehydration for care home residents, especially those living with memory problems.

Who are we looking to recruit to take part in the study?

We would like to speak with anyone who works within the care home. We also would like to speak with people who are responsible for the management and leadership of the care home. We would like to speak to family caregivers and visitors of residents within the care home. We would like to speak with health professionals who visit the care home and provide care or support to residents within the care home. We would also like to speak to care home residents, who have difficulty remembering/ cognitive impairment.

What will study participation involve?

Care home resident

If you are a **care home resident**, and you decide to take part in this study, the researcher (Ellice) will ask you some questions about the study, and if she is happy that you understand the study, then she will ask you to complete a consent form. You can change your mind about taking part in the study and are free to stop taking part in the study at any point.

To take part in the study, we will ask if you are happy to take part in research observations. The research observations will involve Ellice watching the usual daily routines within the care home and taking some notes. Research observations will usually happen within communal areas, such as corridors, the sitting room or dining room. Observations might also happen in bedrooms, because some residents spend more time in their bedroom. Bedroom observations will only ever occur when there is another person present, when there is no intimate personal care being given and only if you agree to this. During observations, Ellice might also ask you some questions around drinking. Observations will be carried out during the day and night, at different times and on different days, for an extended period of time. This is so that Ellice gets to know the care home, and life within the care home, well. Ellice will check that you are happy to be observed, on each interaction. There might be times during the study, that you decide that you do not want to be observed. That is ok.

Ellice will also ask your care staff/ caregivers for some basic, personal information about you, such as how long you have lived in the care home, how much help you need in everyday living, your age and any health conditions. This might also involve getting information from your nursing records.

You might find it confusing or upsetting when Ellice is in your home. Ellice will understand if you ask her to leave and to stop asking questions. Ellice can also find someone you know well, to talk to, if you would like that. You might also consider speaking to friends or family or your GP.

Family caregiver/visitor, Health Professionals and Care Staff

If you are a **family caregiver or visitor, health professional or care staff**, we will ask if you are happy to take part in research observations. These observations will involve a researcher (Ellice) watching the usual daily routines within the care home and taking some notes. Observations will usually happen within communal areas. Observations might also happen in bedrooms, for when residents spend more time in their bedroom. Bedroom observations will only ever occur when there is another person present, and when there is no intimate personal care being undertaken. During observations, Ellice might also ask you some questions around drinking. Observations will be carried out during the day and night. Observations will be carried out during the day and night, at different times and on different days, for an extended period of time. This is so that Ellice gets to know the care home, and life within the care home, well. Ellice will check that you are happy to be observed, on each interaction. There might be times during the study, that you decide that you do not want to be observed. That is ok.

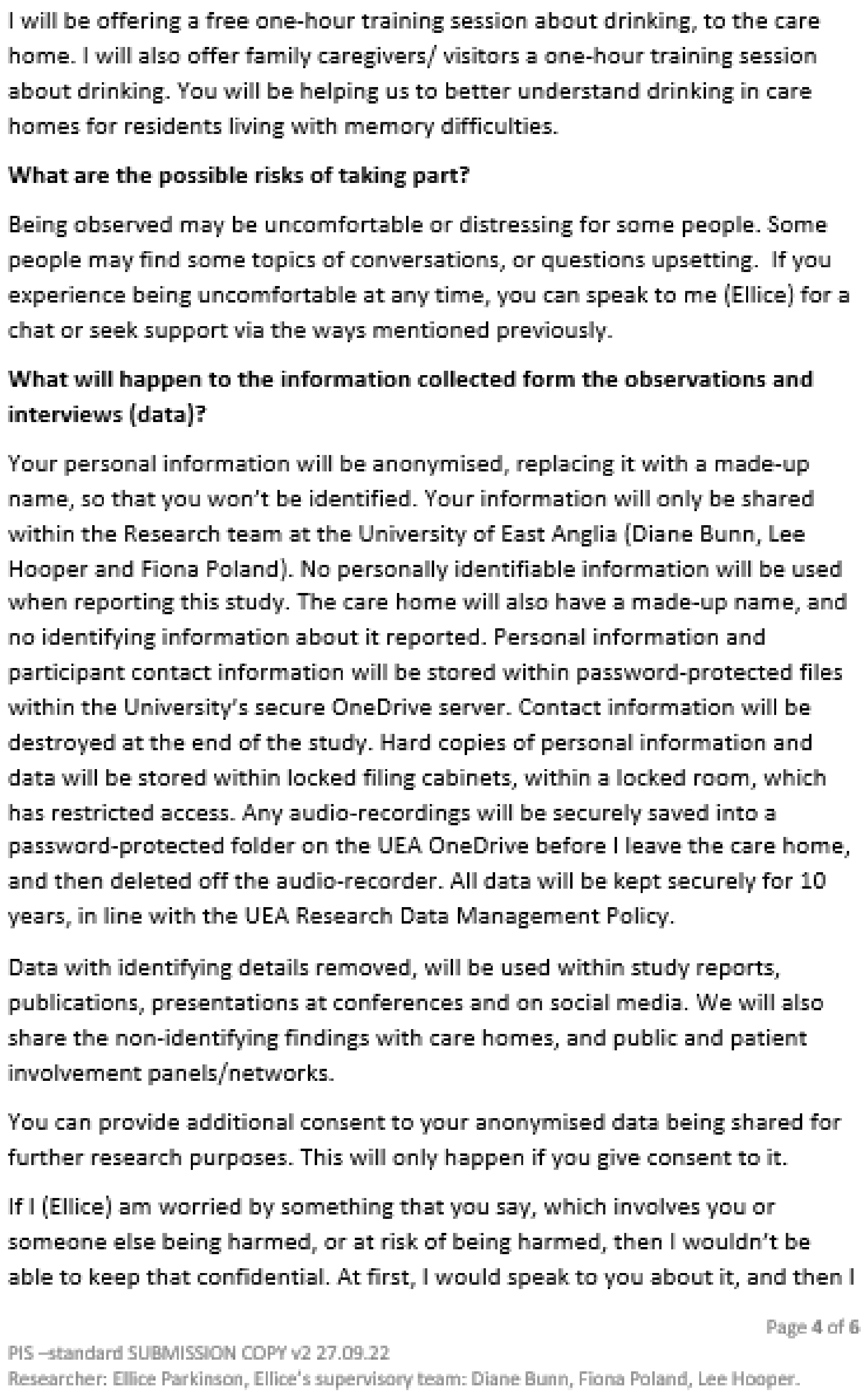
Ellice will also invite you to take part in an interview about drinking and drinks provisions within the care home. The interview will be recorded and for up to one hour. You will be able to choose whether you would like these interviews face to face within a private room of the care home, or online via Microsoft Teams or Zoom. Ellice will be flexible in setting times to meet for the interview, so that it can be convenient for you. You might find that the interview raises certain emotions; if you feel emotional or upset at any time, you can choose to pause, or end the interview. If you need more support, please ask me (Ellice) for a chat. You might also consider speaking to friends or family, your GP, or other organisations offering support which you might prefer are:

- Samaritans: 116 123 24 hours a day, 365 days a year
  or jo@samaritans.org
- SANEline: 0300 304 7000 (4.30pm-10.30pm)
- Dementia Connect: 0333 150 3456 and Dementia Talking Point Online

You are free to choose to take part or not. If you choose to take part, you will be asked to complete and sign a consent form. Even if you decide at that point, to take part, you are free to withdraw from the study and free to request that your data is withdrawn from the study, prior to analysis. If you want to withdraw from the study, please email ellice.parkinson@uea.ac.uk.

What are the possible benefits of taking part?

There are no direct benefits from taking part in this study.



I will be offering a free one-hour training session about drinking, to the care home. I will also offer family caregivers/ visitors a one-hour training session about drinking. You will be helping us to better understand drinking in care homes for residents living with memory difficulties.

What are the possible risks of taking part?

Being observed may be uncomfortable or distressing for some people. Some people may find some topics of conversations, or questions upsetting. If you experience being uncomfortable at any time, you can speak to me (Ellice) for a chat or seek support via the ways mentioned previously.

What will happen to the information collected form the observations and interviews (data)?

Your personal information will be anonymised, replacing it with a made-up name, so that you won't be identified. Your information will only be shared within the Research team at the University of East Anglia (Diane Bunn, Lee Hooper and Fiona Poland). No personally identifiable information will be used when reporting this study. The care home will also have a made-up name, and no identifying information about it reported. Personal information and participant contact information will be stored within password-protected files within the University's secure OneDrive server. Contact information will be destroyed at the end of the study. Hard copies of personal information and data will be stored within locked filing cabinets, within a locked room, which has restricted access. Any audio-recordings will be securely saved into a password-protected folder on the UEA OneDrive before I leave the care home, and then deleted off the audio-recorder. All data will be kept securely for 10 years, in line with the UEA Research Data Management Policy.

Data with identifying details removed, will be used within study reports, publications, presentations at conferences and on social media. We will also share the non-identifying findings with care homes, and public and patient involvement panels/networks.

You can provide additional consent to your anonymised data being shared for further research purposes. This will only happen if you give consent to it.

If I (Ellice) am worried by something that you say, which involves you or someone else being harmed, or at risk of being harmed, then I wouldn't be able to keep that confidential. At first, I would speak to you about it, and then I

Page 4 of 6

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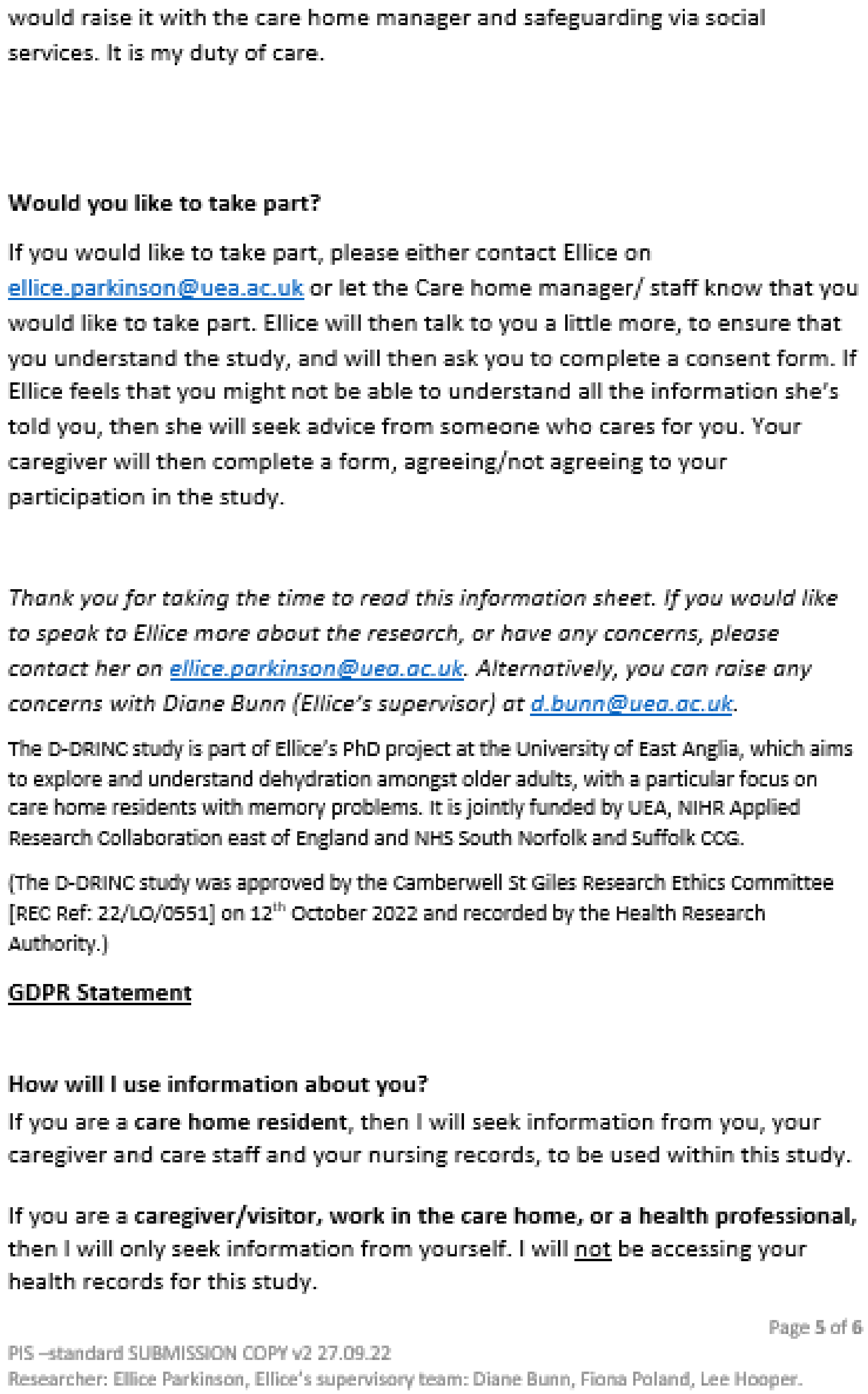
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.



would raise it with the care home manager and safeguarding via social services. It is my duty of care.

Would you like to take part?

If you would like to take part, please either contact Ellice on ellice.parkinson@uea.ac.uk or let the Care home manager/ staff know that you would like to take part. Ellice will then talk to you a little more, to ensure that you understand the study, and will then ask you to complete a consent form. If Ellice feels that you might not be able to understand all the information she's told you, then she will seek advice from someone who cares for you. Your caregiver will then complete a form, agreeing/not agreeing to your participation in the study.

Thank you for taking the time to read this information sheet. If you would like to speak to Ellice more about the research, or have any concerns, please contact her on ellice.parkinson@uea.ac.uk. Alternatively, you can raise any concerns with Diane Bunn (Ellice's supervisor) at d.bunn@uea.ac.uk.

The D-DRINC study is part of Ellice's PhD project at the University of East Anglia, which aims to explore and understand dehydration amongst older adults, with a particular focus on care home residents with memory problems. It is jointly funded by UEA, NIHR Applied Research Collaboration east of England and NHS South Norfolk and Suffolk CCG.

(The D-DRINC study was approved by the Camberwell St Giles Research Ethics Committee [REC Ref: 22/LO/0551] on 12th October 2022 and recorded by the Health Research Authority.)

GDPR Statement

How will I use information about you?

If you are a **care home resident**, then I will seek information from you, your caregiver and care staff and your nursing records, to be used within this study.

If you are a **caregiver/visitor, work in the care home, or a health professional,** then I will only seek information from yourself. I will not be accessing your health records for this study.

This information will include your name, age and health conditions. I will use this information to do the research study. Regulatory bodies might also check this information to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will be linked to a made-up name instead.

We (the research team) will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. Ellice will write the study reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

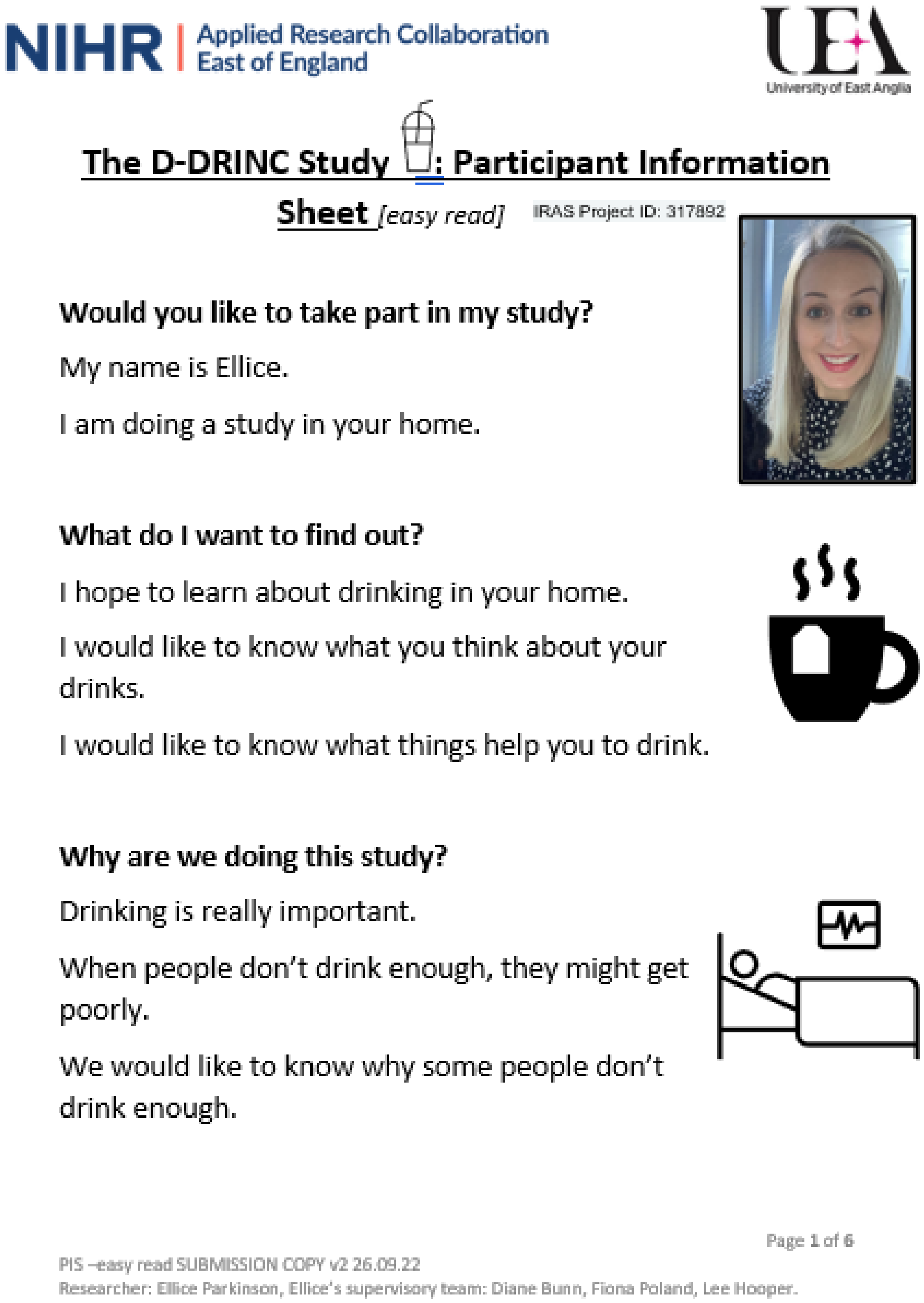
- You can stop being part of the study at any time, without giving a reason, until the study reaches analysis stage, where everyone's data will be combined. At that point, we will be unable to untangle your data from anyone else's.
- We (the research team) need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you, once you have given it to the study.

Where can you find out more about how your information is used?

You can find out more about how we (the research team) will use your information

- by visiting the D-DRINC study website: tinyurl.com/2p8hvskm
- by asking one of the research team: Diane Bunn d.bunn@uea.ac.uk
- by sending an email to ellice.parkinson@uea.ac.uk

Appendix 4f Easy-read participant information sheet



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University of East Anglia

The D-DRINC Study: Participant Information Sheet *[easy read]*

IRAS Project ID: 317892

Would you like to take part in my study?

My name is Ellice.

I am doing a study in your home.

What do I want to find out?

I hope to learn about drinking in your home.

I would like to know what you think about your drinks.

I would like to know what things help you to drink.

Why are we doing this study?

Drinking is really important.

When people don't drink enough, they might get poorly.

We would like to know why some people don't drink enough.

Page 1 of 6

PIS –easy read SUBMISSION COPY v2 26.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

Why am I asking you to take part?

I would like to speak to you because you live in [redacted].

You might also have problems remembering sometimes, such as remembering to drink and the kinds of drinks you like.

What will happen in this study?

I will be spending time in your home.

I would like to get to know you.

I would like to see the kinds of drinks you like.

I will sometimes ask you some questions about drinking.

It's ok if you don't have an answer.

I will also ask for some of your personal information from the people who care for you, and from your home's records.

Can I say No to joining the study?

Yes, you can say 'NO'.

It's ok to say 'NO'.

If you say 'YES', you can change your mind at any time.

You don't need to say why you have changed your mind.

What should I do if I want to say YES to joining the study?

Speak to your family or a Carer.

Ask them to contact me (Ellice), to say you would like to take part.

I will then meet with you to talk about the study.

You can ask me any questions.

I will ask you some questions about the study.

If you would like to take part, I will ask you, or someone you trust to sign a 'consent form'.

The 'consent form' shows that you said 'YES' to the study.

Could joining the study be bad for me?

You could get upset while I am in your home.

You could find it confusing when I am in your home.

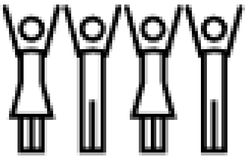
I understand if you get upset.

You can ask me to leave.

You can ask me to stop asking questions.

I will find someone you know well to talk to, if you would like that.

Could joining the study be good for me?



You will be helping us to understand how we can help people who find it difficult to remember things, to drink better.

This is really important.

You might enjoy taking part in the study.

Will I keep things private?

Our conversations may not always be private. Other people might hear our conversations and hear your information.

I will take notes when I'm sitting in your home and talking with you.

I will keep these notes private.

Only the Research team (Diane, Lee, Fiona) will see these.

If I take any audio-recordings of our conversations, I will save them securely on my computer. I will then delete them from the recorder before I leave your home.

If I am worried by something that you say, which involves someone hurting you, then I can't keep it private.

I will tell someone who cares for you, or social services, to help.

What will you do with my information?

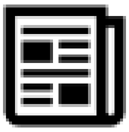
I will not use your name on any of my notes. I will give you a fake name instead.

I will share what I've learned from you and your home at:

Conferences

Meetings

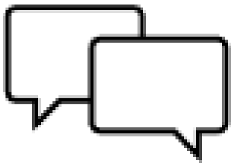
In articles



On the internet

What if I'm not happy?

If you are worried about the study, or want to complain, you can tell me, **Ellice**.



If you would like to tell someone else that you're not happy, you can tell **Diane.**

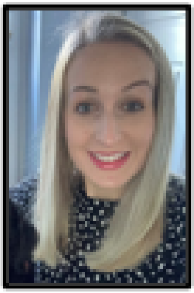
Diane is in the Research team.

Diane's email and telephone number are: 01603 591966; d.bunn@uea.ac.uk

You can also contact Sally Hardy (Dean of school of Health Science, UEA): s.hardy@uea.ac.uk

You can also tell the people who care for you, that you're not happy.

Would you like to take part in the study?



You can contact me **(Ellice)** at ellice.parkinson@uea.ac.uk

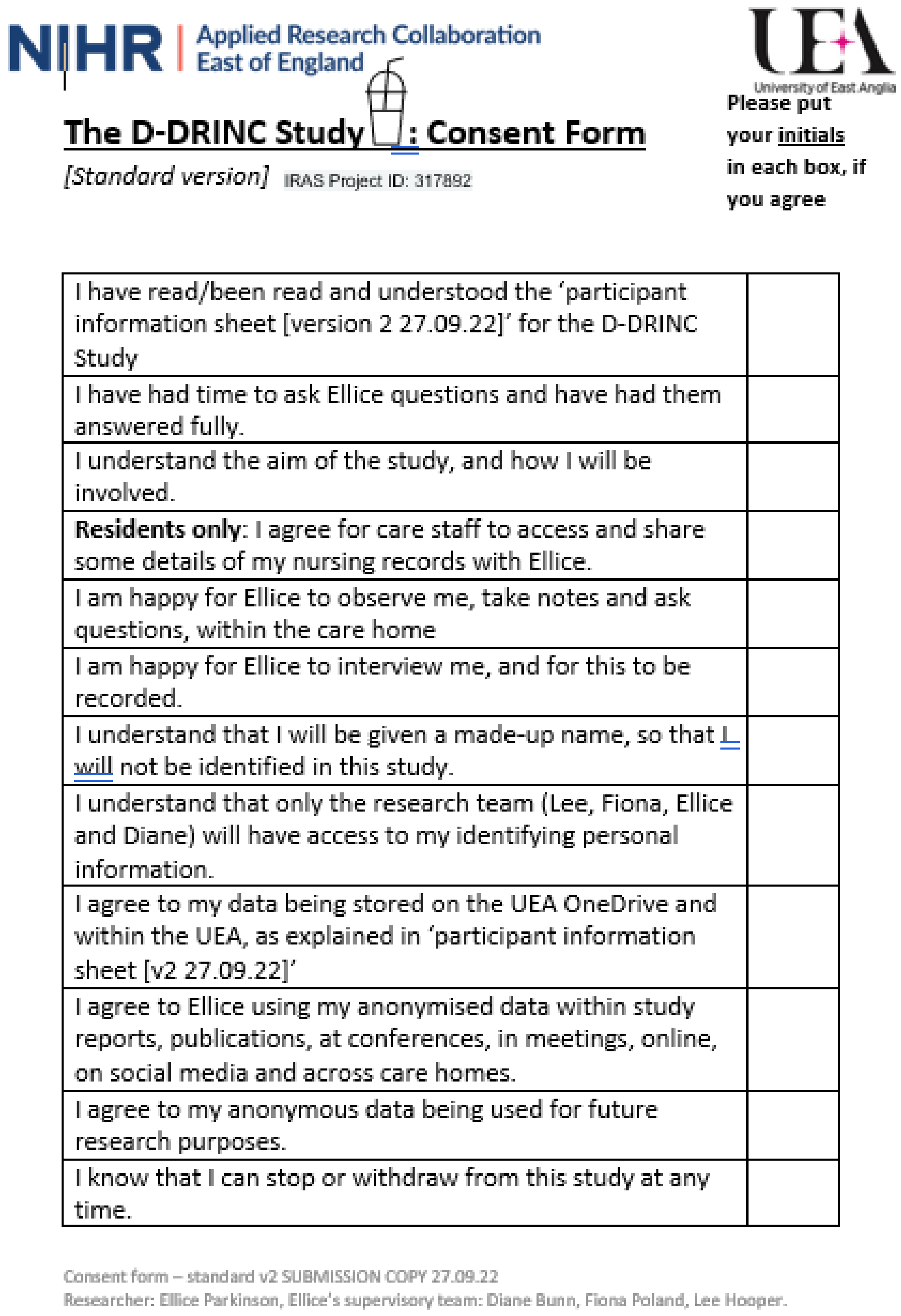
You can tell someone who cares for you, that you would like to take part.

You can also contact **Diane** at 01603 591966; d.bunn@uea.ac.uk

Thank you for taking the time to read this information sheet. If you would like to speak to Ellice more about the research, or have any concerns, please contact her on ellice.parkinson@uea.ac.uk. Alternatively, you can raise any concerns with Diane Bunn (Ellice's supervisor) at d.bunn@uea.ac.uk.

The D-DRINC study is part of Ellice's PhD project at the University of East Anglia, which aims to explore and understand dehydration amongst older adults, with a particular focus on care home residents with memory problems. It is jointly funded by UEA, NIHR Applied Research Collaboration east of England and NHS South Norfolk and Suffolk CCG.

Appendix 4g Staff and resident consent form



NIHR | Applied Research Collaboration East of England

UEA University of East Anglia

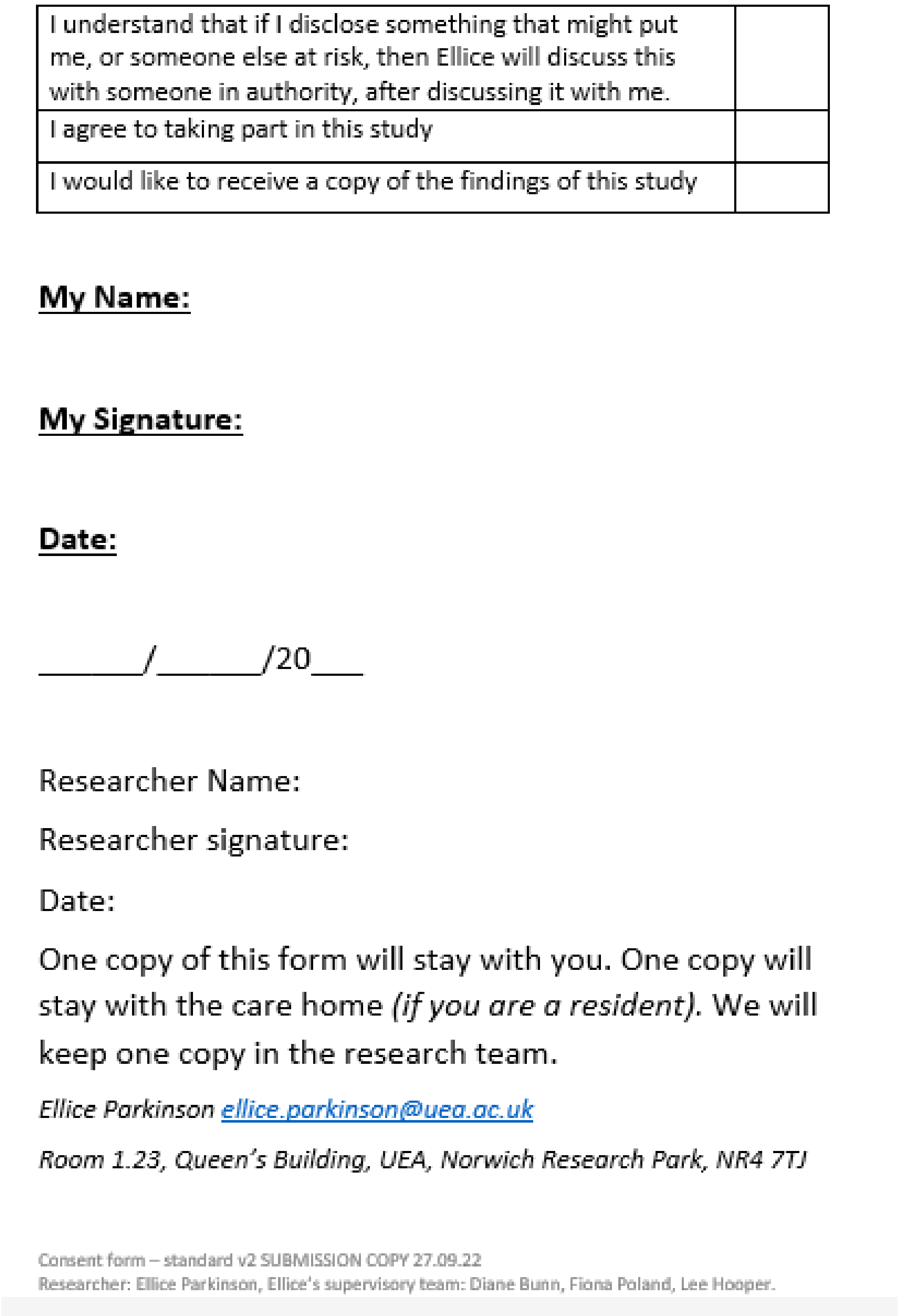
The D-DRINC Study : Consent Form

[Standard version] IRAS Project ID: 317892

Please put your <u>initials</u> in each box, if you agree

I have read/been read and understood the 'participant information sheet [version 2 27.09.22]' for the D-DRINC Study	
I have had time to ask Ellice questions and have had them answered fully.	
I understand the aim of the study, and how I will be involved.	
Residents only: I agree for care staff to access and share some details of my nursing records with Ellice.	
I am happy for Ellice to observe me, take notes and ask questions, within the care home	
I am happy for Ellice to interview me, and for this to be recorded.	
I understand that I will be given a made-up name, so that I will not be identified in this study.	
I understand that only the research team (Lee, Fiona, Ellice and Diane) will have access to my identifying personal information.	
I agree to my data being stored on the UEA OneDrive and within the UEA, as explained in 'participant information sheet [v2 27.09.22]'	
I agree to Ellice using my anonymised data within study reports, publications, at conferences, in meetings, online, on social media and across care homes.	
I agree to my anonymous data being used for future research purposes.	
I know that I can stop or withdraw from this study at any time.	

Consent form – standard v2 SUBMISSION COPY 27.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.



I understand that if I disclose something that might put me, or someone else at risk, then Ellice will discuss this with someone in authority, after discussing it with me.	
I agree to taking part in this study	
I would like to receive a copy of the findings of this study	

My Name:

My Signature:

Date:

______/______/20___

Researcher Name:

Researcher signature:

Date:

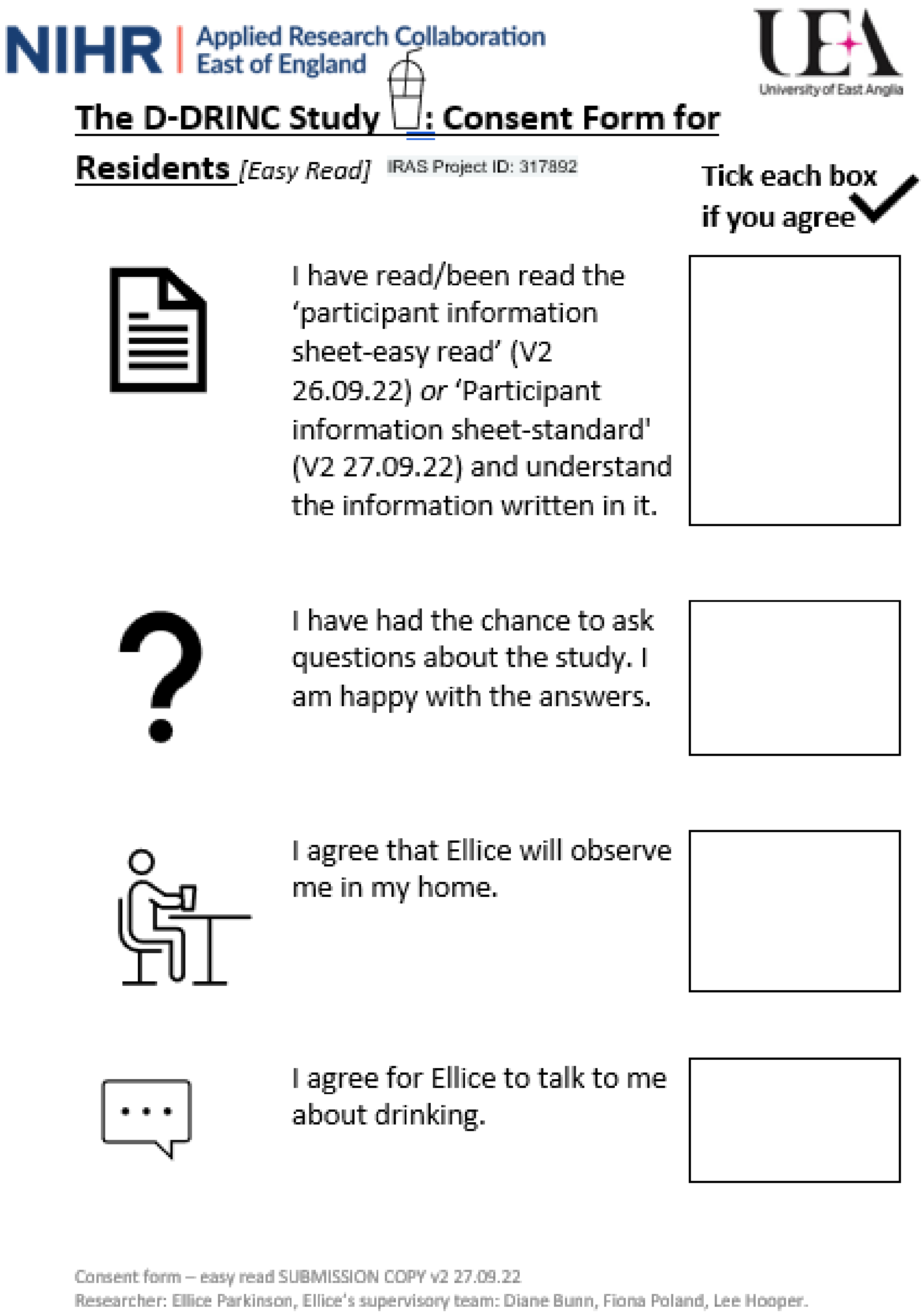
One copy of this form will stay with you. One copy will stay with the care home *(if you are a resident)*. We will keep one copy in the research team.

Ellice Parkinson *ellice.parkinson@uea.ac.uk*

Room 1.23, Queen's Building, UEA, Norwich Research Park, NR4 7TJ

Consent form – standard v2 SUBMISSION COPY 27.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

Easy-read consent form



NIHR | Applied Research Collaboration East of England

UEA University of East Anglia

The D-DRINC Study: Consent Form for Residents *[Easy Read]* IRAS Project ID: 317892

Tick each box if you agree ✓

I have read/been read the 'participant information sheet-easy read' (V2 26.09.22) *or* 'Participant information sheet-standard' (V2 27.09.22) and understand the information written in it. ☐

I have had the chance to ask questions about the study. I am happy with the answers. ☐

I agree that Ellice will observe me in my home. ☐

I agree for Ellice to talk to me about drinking. ☐

Consent form – easy read SUBMISSION COPY v2 27.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

____

I agree that Ellice may take some notes whilst she is observing me or talking to me ☐

I agree for care home staff to access and share some of my medical records with Ellice ☐

I agree that my information will be stored on a computer. ☐

I understand that my name will be changed, so that I can't be identified. ☐

____

The researchers will learn about how to help people to drink well.

They can share the things they learn from this study, in public, on the internet and in writing. ☐

My information (without my name) can be used for future research. ☐

I want to be in this study ☐

If I say something that worries the researcher, and makes them think that ☐

I could be harmed, then the researcher will tell someone who cares for me, or social services. ☐

I know that I don’t have to take part in this study. ☐

I can stop if I want to.

I would like to know what this study finds out ☐

My Name:

My Signature:

Date:________/______/20___

Researcher Full Name:

Researcher Signature:

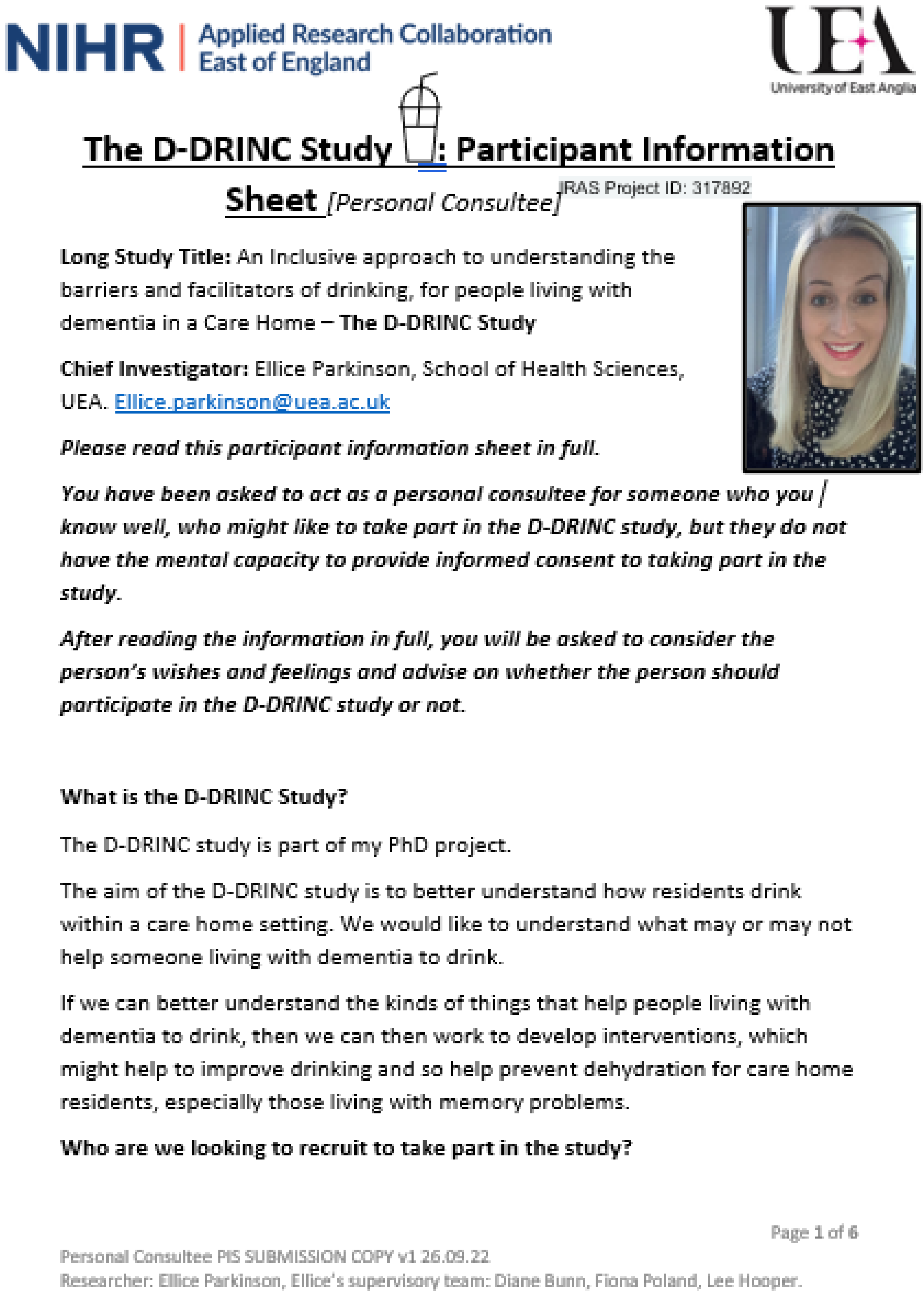
Date:

One copy of this form will stay with you. One copy will stay with the care home. We will keep one copy in the research team.

Ellice Parkinson ellice.parkinson@uea.ac.uk

Room 1.23, Queen's Building, UEA, Norwich Research Park, NR4 7TJ

Appendix 4h Personal consultee information sheet



NIHR | Applied Research Collaboration East of England

UEA University of East Anglia

The D-DRINC Study : Participant Information Sheet *[Personal Consultee]*

IRAS Project ID: 317892

Long Study Title: An Inclusive approach to understanding the barriers and facilitators of drinking, for people living with dementia in a Care Home – **The D-DRINC Study**

Chief Investigator: Ellice Parkinson, School of Health Sciences, UEA. Ellice.parkinson@uea.ac.uk

Please read this participant information sheet in full.

You have been asked to act as a personal consultee for someone who you know well, who might like to take part in the D-DRINC study, but they do not have the mental capacity to provide informed consent to taking part in the study.

After reading the information in full, you will be asked to consider the person's wishes and feelings and advise on whether the person should participate in the D-DRINC study or not.

What is the D-DRINC Study?

The D-DRINC study is part of my PhD project.

The aim of the D-DRINC study is to better understand how residents drink within a care home setting. We would like to understand what may or may not help someone living with dementia to drink.

If we can better understand the kinds of things that help people living with dementia to drink, then we can then work to develop interventions, which might help to improve drinking and so help prevent dehydration for care home residents, especially those living with memory problems.

Who are we looking to recruit to take part in the study?

Page 1 of 6

Personal Consultee PIS SUBMISSION COPY v1 26.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

We would like to speak with anyone who works within the care home. We also would like to speak with people who are responsible for the management and leadership of the care home. We would like to speak to family caregivers and visitors of residents within the care home. We would like to speak with health professionals who visit the care home and provide care or support to residents within the care home. We would also like to speak to care home residents, who have difficulty remembering/ cognitive impairment.

What will study participation involve?

Care home resident

The researcher (Ellice) will spend time in the care home carrying out research observations, paying attention to the usual daily routines within the care home and taking some notes. Research observations will usually happen within communal areas, such as corridors, the sitting room or dining room. Observations might also happen in bedrooms, because some residents spend more time in their bedroom. Bedroom observations will only ever occur when there is another person present, when there is no intimate personal care being given and only if you agree to this. During observations, Ellice might also ask the person some questions around drinking. Observations will be carried out during the day and night, at different times and on different days, for an extended period of time. This is so that Ellice gets to know the care home, and life within the care home, well. Ellice will check that the person is happy to be observed, on each interaction. There might be times during the study, that they decide that they do not want to be observed and that is ok.

Ellice will also ask care staff/ caregivers for some basic, personal information about the resident, such as how long they have lived in the care home, how much help they need in everyday living, their age and any health conditions. Ellice will also ask care home staff to access their nursing records to ascertain certain health information.

The resident might find it confusing or upsetting when Ellice is in their home. Ellice will understand if they ask her to leave and will stop asking questions. Ellice will also find someone they know well to talk to, such as care home staff, or friends and family.

As a personal consultee, we are asking if you think the individual would like to take part in the study or not. If you feel that they would like to take part, then we will ask you to complete a personal consultee declaration form. If the person does take part in the study and shows any sign of distress, discomfort or expresses that they do not want to take part in the study, then they will be withdrawn and will not be able to re-join.

What are the possible benefits of taking part?

There are no direct benefits from taking part in this study.

I will be offering a free one-hour training session about drinking, to the care home. I will also offer family caregivers/ visitors a one-hour training session about drinking. The resident's participation will be helping us to better understand drinking in care homes for residents living with memory difficulties.

What are the possible risks of taking part?

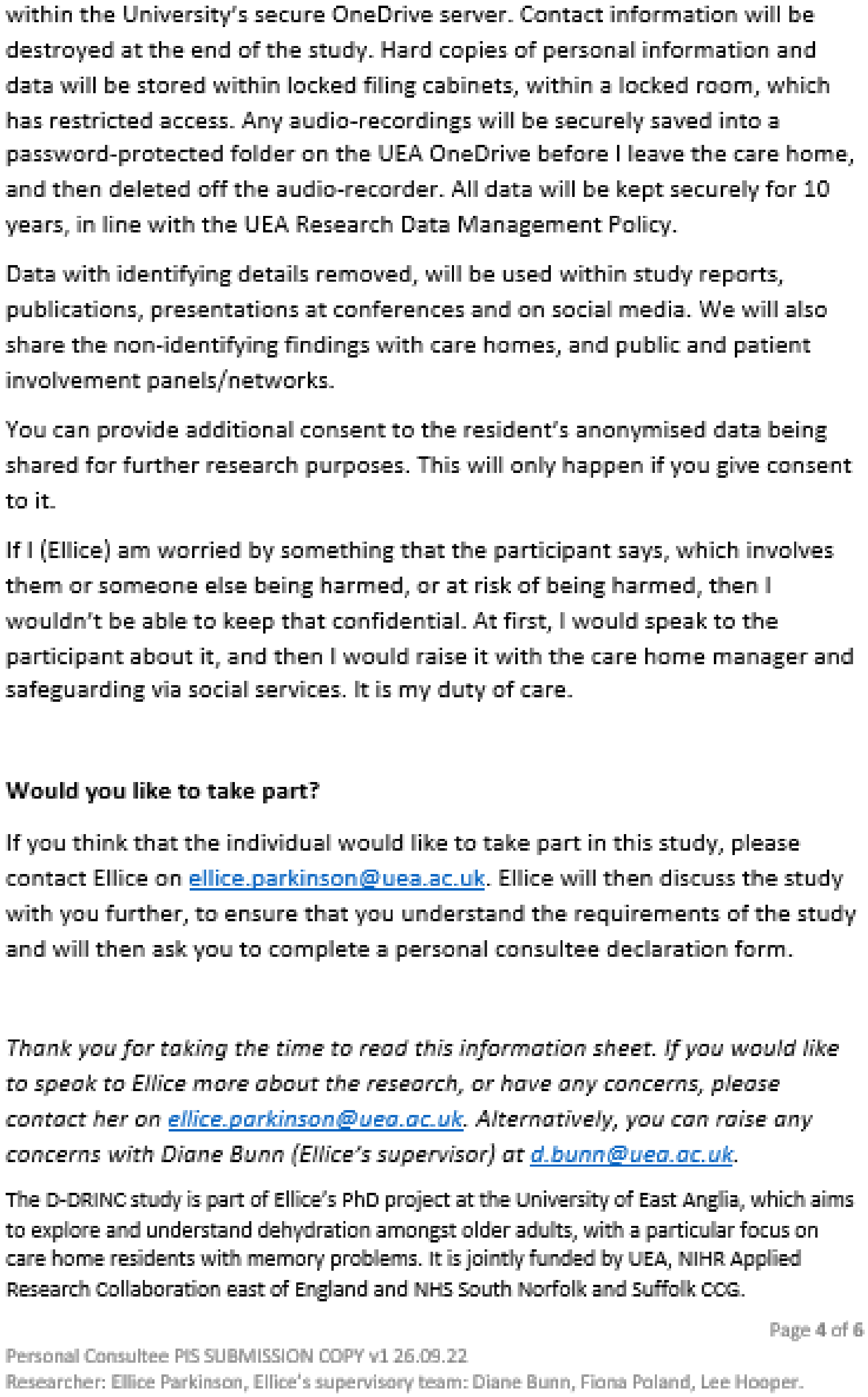
Being observed may be uncomfortable or distressing for some people. Some people may find some topics of conversations, or questions upsetting. If the person shows any sign of discomfort or distress by taking part in the study, then they will be withdrawn from the study, and the researcher (Ellice) will withdraw from that area of observation in the home.

If you need support, please ask me (Ellice) for a chat. You might also consider speaking to friends or family, your GP, or other organisations offering support which you might prefer are:

- Samaritans: 116 123 24 hours a day, 365 days a year
  or jo@samaritans.org
- SANEline: 0300 304 7000 (4.30pm-10.30pm)
- Dementia Connect: 0333 150 3456 and Dementia Talking Point Online

What will happen to the information collected form the observations and interviews (data)?

The resident's personal information will be anonymised, replacing it with a made-up name, so that they won't be identified. Their information will only be shared within the Research team at the University of East Anglia (Diane Bunn, Lee Hooper and Fiona Poland). No personally identifiable information will be used when reporting this study. The care home will also have a made-up name, and no identifying information about it reported. Personal information and participant contact information will be stored within password-protected files



within the University's secure OneDrive server. Contact information will be destroyed at the end of the study. Hard copies of personal information and data will be stored within locked filing cabinets, within a locked room, which has restricted access. Any audio-recordings will be securely saved into a password-protected folder on the UEA OneDrive before I leave the care home, and then deleted off the audio-recorder. All data will be kept securely for 10 years, in line with the UEA Research Data Management Policy.

Data with identifying details removed, will be used within study reports, publications, presentations at conferences and on social media. We will also share the non-identifying findings with care homes, and public and patient involvement panels/networks.

You can provide additional consent to the resident's anonymised data being shared for further research purposes. This will only happen if you give consent to it.

If I (Ellice) am worried by something that the participant says, which involves them or someone else being harmed, or at risk of being harmed, then I wouldn't be able to keep that confidential. At first, I would speak to the participant about it, and then I would raise it with the care home manager and safeguarding via social services. It is my duty of care.

Would you like to take part?

If you think that the individual would like to take part in this study, please contact Ellice on ellice.parkinson@uea.ac.uk. Ellice will then discuss the study with you further, to ensure that you understand the requirements of the study and will then ask you to complete a personal consultee declaration form.

Thank you for taking the time to read this information sheet. If you would like to speak to Ellice more about the research, or have any concerns, please contact her on ellice.parkinson@uea.ac.uk. Alternatively, you can raise any concerns with Diane Bunn (Ellice's supervisor) at d.bunn@uea.ac.uk.

The D-DRINC study is part of Ellice's PhD project at the University of East Anglia, which aims to explore and understand dehydration amongst older adults, with a particular focus on care home residents with memory problems. It is jointly funded by UEA, NIHR Applied Research Collaboration east of England and NHS South Norfolk and Suffolk CCG.

Page 4 of 6

Personal Consultee PIS SUBMISSION COPY v1 26.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

(The D-DRINC study was approved by the Camberwell St Giles Research Ethics Committee [REC Ref: 22/LO/051] on 12th October 2022 and recorded by the Health Research Authority.)

GDPR Statement

How will I use information about you?

If you are a **care home resident**, then I will seek information from you, your caregiver and care staff and your nursing records, to be used within this study.

If you are a **caregiver/visitor, work in the care home, or a health professional,** then I will only seek information from yourself. I will not be accessing your health records for this study.

This information will include your name, age and health conditions. I will use this information to do the research study. Regulatory bodies might also check this information to make sure that the research is being done properly.

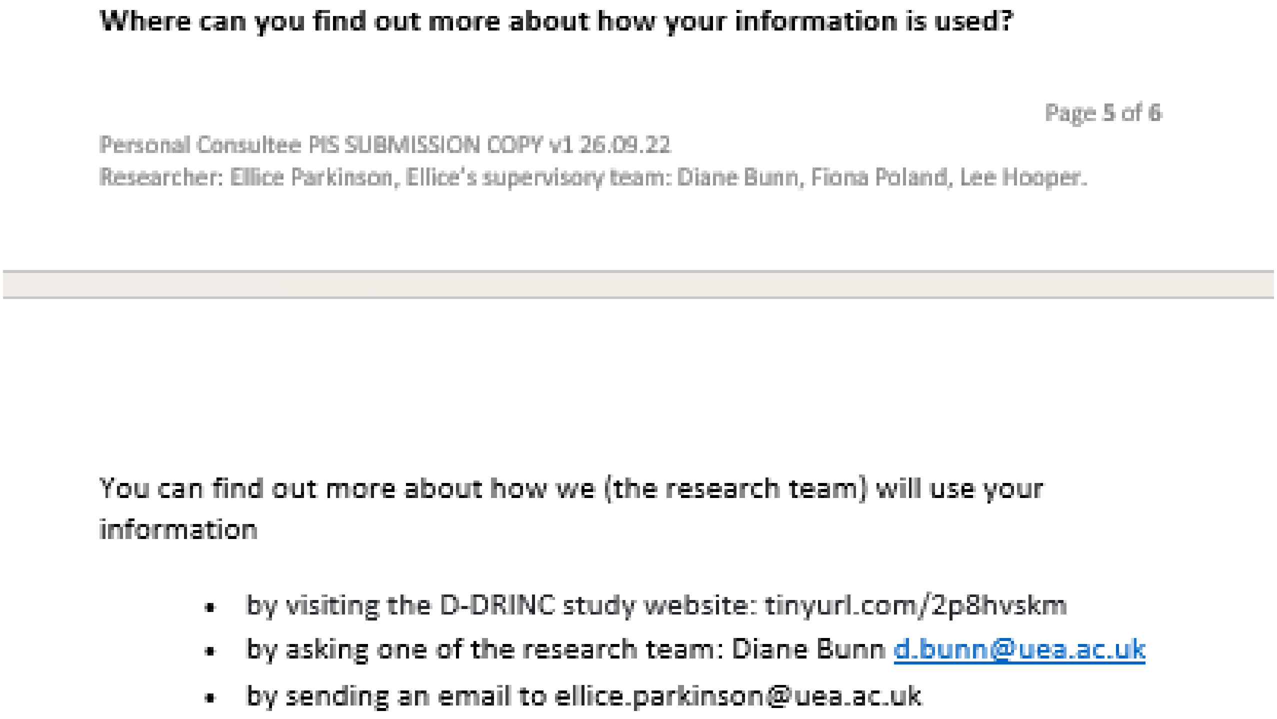
People who do not need to know who you are will not be able to see your name or contact details. Your data will be linked to a made-up name instead.

We (the research team) will keep all information about you safe and secure.

Once we have finished the study, we will keep some of the data so we can check the results. Ellice will write the study reports in a way that no-one can work out that you took part in the study.

What are your choices about how your information is used?

- You can stop being part of the study at any time, without giving a reason, until the study reaches analysis stage, where everyone's data will be combined. At that point, we will be unable to untangle your data from anyone else's.
- We (the research team) need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you, once you have given it to the study.



Where can you find out more about how your information is used?

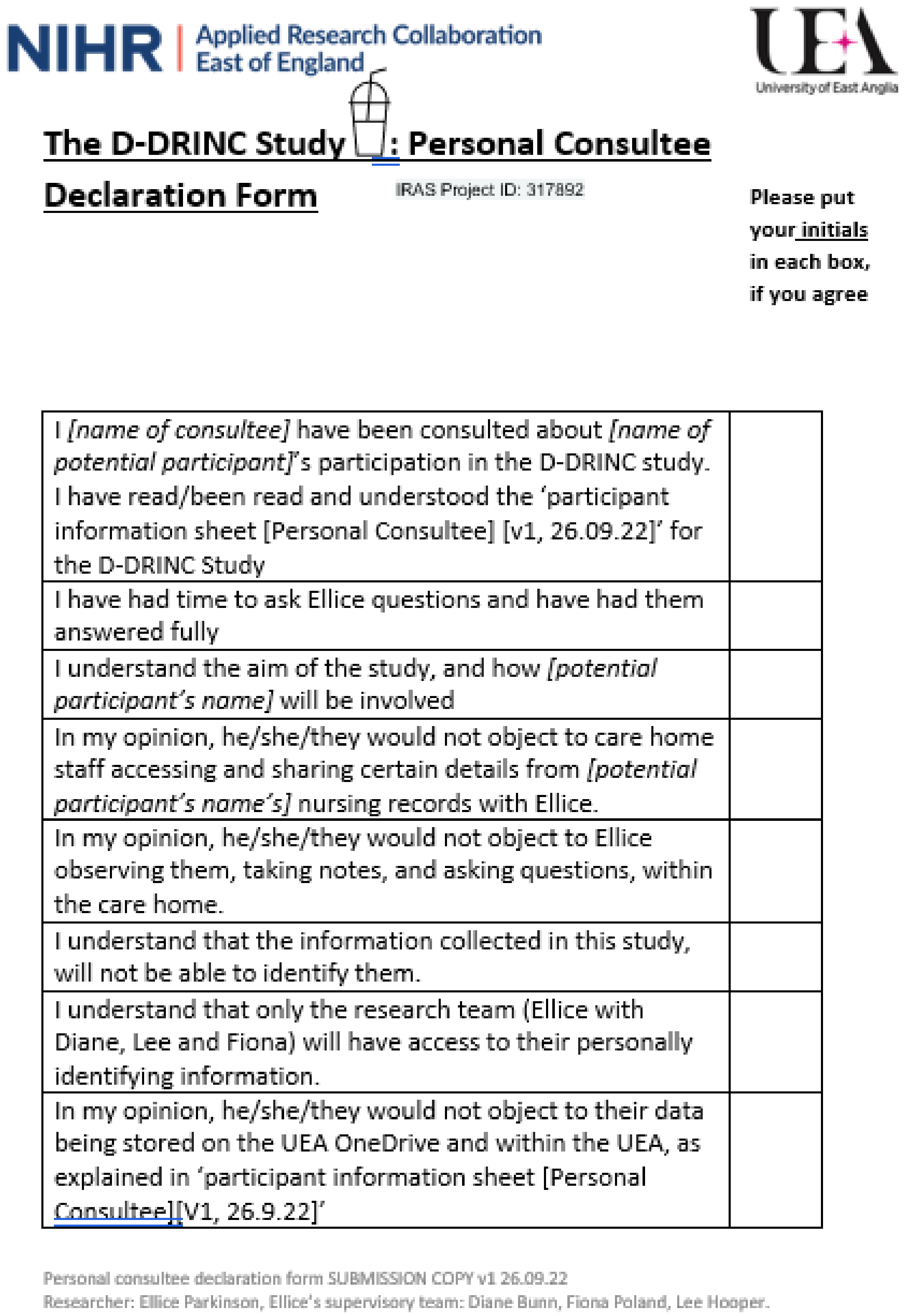
Page 5 of 6

Personal Consultee PIS SUBMISSION COPY v1 26.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

You can find out more about how we (the research team) will use your information

- by visiting the D-DRINC study website: tinyurl.com/2p8hvskm
- by asking one of the research team: Diane Bunn d.bunn@uea.ac.uk
- by sending an email to ellice.parkinson@uea.ac.uk

Appendix 4i Personal consultee declaration form



NIHR | Applied Research Collaboration East of England

UEA University of East Anglia

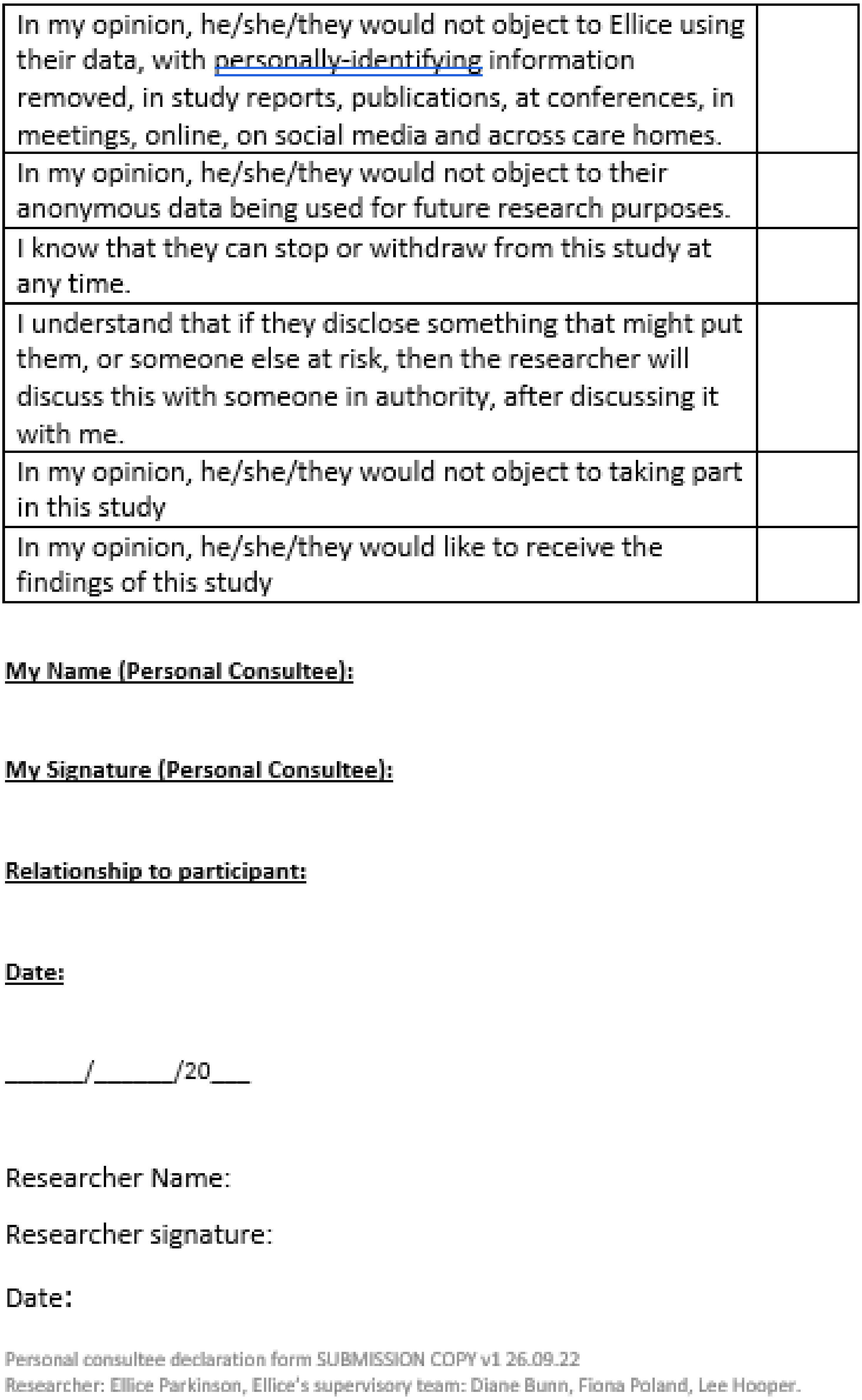
The D-DRINC Study: Personal Consultee Declaration Form

IRAS Project ID: 317892

Please put your initials in each box, if you agree

I *[name of consultee]* have been consulted about *[name of potential participant]*'s participation in the D-DRINC study. I have read/been read and understood the 'participant information sheet [Personal Consultee] [v1, 26.09.22]' for the D-DRINC Study	
I have had time to ask Ellice questions and have had them answered fully	
I understand the aim of the study, and how *[potential participant's name]* will be involved	
In my opinion, he/she/they would not object to care home staff accessing and sharing certain details from *[potential participant's name's]* nursing records with Ellice.	
In my opinion, he/she/they would not object to Ellice observing them, taking notes, and asking questions, within the care home.	
I understand that the information collected in this study, will not be able to identify them.	
I understand that only the research team (Ellice with Diane, Lee and Fiona) will have access to their personally identifying information.	
In my opinion, he/she/they would not object to their data being stored on the UEA OneDrive and within the UEA, as explained in 'participant information sheet [Personal Consultee][V1, 26.9.22]'	

Personal consultee declaration form SUBMISSION COPY v1 26.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.



In my opinion, he/she/they would not object to Ellice using their data, with personally-identifying information removed, in study reports, publications, at conferences, in meetings, online, on social media and across care homes.	
In my opinion, he/she/they would not object to their anonymous data being used for future research purposes.	
I know that they can stop or withdraw from this study at any time.	
I understand that if they disclose something that might put them, or someone else at risk, then the researcher will discuss this with someone in authority, after discussing it with me.	
In my opinion, he/she/they would not object to taking part in this study	
In my opinion, he/she/they would like to receive the findings of this study	

My Name (Personal Consultee):

My Signature (Personal Consultee):

Relationship to participant:

Date:

______/______/20___

Researcher Name:

Researcher signature:

Date:

Personal consultee declaration form SUBMISSION COPY v1 26.09.22
Researcher: Ellice Parkinson, Ellice's supervisory team: Diane Bunn, Fiona Poland, Lee Hooper.

Appendix 4j Dementia Talking Point Forum research team’s approval of research

Hi again Ellice,

Just to follow up, our Research team have given approval for you to go ahead with analysing data on the community. Thank you also for confirming anonymity, and that individuals won't be able to be identified.

We wish you the best of luck in your research!

Best wishes,

[REDACTED NAME]

Appendix 5a Clinical Nutrition publication

Clinical Nutrition 42 (2023) 1510–1520

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Meta-analyses

Low-intake dehydration prevalence in non-hospitalised older adults: Systematic review and meta-analysis

Ellice Parkinson [a, *], Lee Hooper [b], Judith Fynn [b], Stephanie Howard Wilsher [b],
Titilopemi Oladosu [b], Fiona Poland [a], Simone Roberts [c], Elien Van Hout [a], Diane Bunn [a]

[a] School of Health Sciences, University of East Anglia, Norwich, NR4 7TJ, United Kingdom
[b] Norwich Medical School, University of East Anglia, Norwich, NR4 7TJ, United Kingdom
[c] The Centre for Research in Public Health and Community Care (CRIPACC), University of Hertfordshire, Hatfield, United Kingdom

ARTICLE INFO

Article history:
Received 24 January 2023
Accepted 5 June 2023

Keywords:
Systematic review
Dehydration
Dementia
Aged
Geriatrics
Prevalence

SUMMARY

Background & aims: Low-intake dehydration amongst older people, caused by insufficient fluid intake, is associated with mortality, multiple long-term health conditions and hospitalisation. The prevalence of low-intake dehydration in older adults, and which groups are most at-risk, is unclear. We conducted a high-quality systematic review and meta-analysis, implementing an innovative methodology, to establish the prevalence of low-intake dehydration in older people (PROSPERO registration: CRD42021241252).

Method: We systematically searched Medline (Ovid), Cochrane CENTRAL, Embase (Ovid), CINAHL and Proquest from inception until April 2023 and Nutrition and Food Sciences until March 2021. We included studies that assessed hydration status for non-hospitalised participants aged ≥65 years, by directly-measured serum/plasma osmolality, calculated serum/plasma osmolarity and/or 24-h oral fluid intake. Inclusion, data extraction and risk of bias assessment was carried out independently in duplicate.

Results: From 11,077 titles and abstracts, we included 61 (22,398 participants), including 44 in quality-effects meta-analysis.

Meta-analysis suggested that 24% (95% CI: 0.07, 0.46) of older people were dehydrated (assessed using directly-measured osmolality >300 mOsm/kg, the most reliable measure). Subgroup analyses indicated that both long-term care residents (34%, 95% CI: 0.09, 0.61) and community-dwelling older adults (19%, 95% CI: 0.00, 0.48) were highly likely to be dehydrated. Those with more pre-existing illnesses (37%, 95% CI: 0.14, 0.62) had higher low-intake dehydration prevalence than others (15%, 95% CI: 0.00, 0.43), and there was a non-significant suggestion that those with renal impairment (42%, 95% CI: 0.23, 0.61) were more likely to be dehydrated than others (23%, 95% CI: 0.03, 0.47), but there were no clear differences in prevalence by age, sex, functional, cognitive or diabetic status. GRADE quality of evidence was low as to the exact prevalence due to high levels of heterogeneity between studies.

Conclusion: Quality-effects meta-analysis estimated that a quarter of non-hospitalised older people were dehydrated. Widely varying prevalence rates in individual studies, from both long-term care and community groups, highlight that dehydration is preventable amongst older people.

Implications: One in every 4 older adults has low-intake dehydration. As dehydration is serious and prevalent, research is needed to better understand drinking behaviour and assess effectiveness of drinking interventions for older people.

1. Introduction

Studies report that many older adults have low-intake dehydration, caused by insufficient fluid intake [1–3], though robust prevalence data are lacking. It is unclear how consistent dehydration prevalence is across different older populations and reports

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[*] Corresponding author. School of Health Sciences, University of East Anglia, Norwich, NR4 7TJ, United Kingdom

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often use unreliable measures of hydration status. Low-intake dehydration negatively impacts the health of older adults and is associated with urinary tract infection, hospitalisation, multiple long-term health conditions and mortality [1–4]. While low-intake dehydration appears to contribute substantially to economic costs and pressures on health and social care systems [5–7], economic burden analyses of low-intake dehydration are difficult to conduct without robust prevalence data.

Older adults are at higher risk of low-intake dehydration than younger adults due to an interplay of physiological, physical, cognitive, psychological and communication factors. Ageing results in kidneys becoming less effective at concentrating urine, so older adults are less able to conserve fluid [8] while loss of the thirst sensation (the usual stimulus to drink) [8] reduces fluid intake. Diuretic medication stimulates fluid loss [9,10], while reduced strength, grip and mobility [11] can impede access to drinks. Impaired cognition may lead to forgetting to drink, whilst fewer social opportunities to drink [12] and fear of urinary incontinence often leads to reduced fluid intake. While the UK National Health Service (NHS) recommends that adults consume 6–8 cups of drink daily (1.5–2 L) [13], the European Society of Clinical Nutrition and Metabolism (ESPEN) recommends that women should consume 1.6 L of drinks daily and men 2 L in addition to 20% fluid from food [14]. However, these guidelines might not be known by older people [15]. Communication difficulties, cultural differences and language barriers may also result in reduced fluid intake where older adults depend on others to provide drinks [16]. Despite many risk factors having been evidenced, it remains unclear whether risk of dehydration continues to increase with increasing age or whether certain groups of older adults are at higher risk, associated with other factors, such as frailty and impaired physical and cognitive abilities. Where dehydration risk factors are modifiable there is potential to decrease this risk with appropriate interventions, thus contributing to healthy ageing.

The reference standard for assessing low-intake dehydration in older adults is directly-measured serum or plasma osmolality (>300 mOsm/kg) [14,17–19], which assesses the osmotic concentration of blood serum or plasma. With low-intake dehydration, plasma and serum become more concentrated, so osmolality rises [20]. Calculated serum or plasma osmolarity using the Khajuria and Krahn equation can be used to accurately estimate osmolality, though other equations are less useful [20]. While salivary osmolality demonstrates moderate diagnostic utility in older adults [21,22] it is not commonly used as the technology is underdeveloped and susceptible to common confounding factors (including medications, recent food, and fluid intake), [22]. These confounding factors are more easily accounted for in research settings. BUN/Creatinine ratio is accessible, thus routinely used, but lacks specificity to low-intake dehydration in older adults due to its reliance on healthy kidney function which decreases in ageing kidneys [1]. Commonly used clinical signs and symptoms of dehydration, such as skin turgor or urine colour, are not diagnostically accurate among older adults [17,23]. Oral fluid intake may be recorded for clinical and research purposes but is infrequently reported over a complete 24 h in community and long-term care settings [16,24]. Records are frequently inaccurate as drinks intake is commonly estimated and not measured. Robust measurement of fluid intake involves measuring the contents of drinking vessels, making exact records of drinks consumed and accounting for fluids not consumed. The UK Fluid Intake Study in our Elders (FISE) study reported substantial differences between researcher-observed 24-h drinks consumed by care home residents and care home drinks records [25].

Although a recent systematic review of 19 studies reported that 0.8%–38.5% of nursing home residents were dehydrated [26], there are some eligible studies which were not included within the original review, as well as newer papers meeting inclusion, since the review was published. The authors of the 2018 systematic review also included some datasets twice, included some less robust measures of dehydration and did not investigate dehydration amongst community-dwelling adults [26]. Accurate prevalence data and identification of groups most at risk of low-intake dehydration would enable targeted development and implementation of evidence-based interventions to prevent dehydration and its associated poor outcomes. In this systematic review, we aimed to establish the global prevalence of low-intake dehydration among adults aged ≥65 years in non-hospital settings, using robust measures of dehydration and investigated differences in dehydration prevalence between care settings, by age, sex, multiple long-term health conditions and dependency level through robust systematic review methodology for prevalence studies [27,28].

2. Methods

This systematic review and meta-analysis was pre-registered on PROSPERO (CRD42021241252) [29], followed Cochrane and Joanna Briggs Institute guidance for prevalence reviews [27,28] and is reported in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [30]. We did not require or seek ethical approval, as this was secondary research.

2.1. *Searches*

We developed a complex search strategy (peer-reviewed using the Peer Review of Electronic Search Strategies (PRESS) 2015 guidelines), following the format: *[aged] and [prevalence or incidence] and [dehydration or fluid] and [human]*. The full text of the Medline search strategy, including Boolean operators, truncation, text and indexing terms, is available in the PROSPERO register. We searched Medline (Ovid), Cochrane CENTRAL, Embase (Ovid), CINAHL Complete/Ultimate, Proquest Dissertations Theses A&I/Global from inception until 20th April 2023 and Nutrition and Food Sciences from inception until 18th March 2021 (we were unable to update this search). There were no restrictions on publication status or language. We applied Cochrane's sensitive search filter to search for "humans", within Medline (Ovid) and Embase (Ovid) [28]. We also examined the reference lists of dehydration-related systematic reviews, reviews and included studies.

2.2. *Eligibility criteria*

We assessed titles and abstracts, then full text papers, using Covidence software [31], independently in duplicate, against the inclusion criteria:

Participants: Adults aged ≥65 years living in community or long-term care settings, in any part of the world, receiving fluids orally (sample mean age ≥65 years, or ≥80% of the sample was aged ≥65 years, or where separate data was available for participants aged ≥65 years from a larger sample).

Exposure: Hydration status assessed by directly-measured serum or plasma osmolality, calculated serum or plasma osmolarity, salivary osmolality and/or 24-h oral fluid intake (where fluids had been accurately measured for ≥24 h).

Study type: Case studies, cross-sectional, cohort, or case–control studies, controlled clinical trials or before-after studies, each with at least five participants aged ≥65 years.

We resolved any conflicts on study inclusion by discussion or by involving a third reviewer to arbitrate and make an overall decision. Members of the review team (DB and LH), who had relevant literature in the field, did not screen or data-extract their own papers.

We initially included studies that reported low-intake dehydration for participants from any setting within this review. Given the large number of included studies we then split the systematic review into two, with hospital setting studies being separated and considered in a separate review [32]. This paper reports on studies from community and long-term care settings. We originally included the BUN:Creatinine ratio as an outcome measure. However this was later excluded as it does not accurately distinguish between impaired renal function and dehydration amongst older adults [1].

2.3. *Data extraction*

The review team were trained in assessing inclusion, data extraction, risk of bias assessment and Covidence software [31]. The whole review team piloted our data extraction template in Covidence using five papers, and the forms were edited for clarity (wording amendments and an additional question on delirium). We completed data extraction of the remaining papers independently in duplicate, resolving disagreements, when there were discrepancies in data extracted, by discussion. Multiple reports (conference abstracts, publications and/or reports) from the same study were merged in Covidence to create one study. Wherever possible, we sought further information from linked papers, study websites and corresponding authors. In the case of 105 studies which referred to large cohorts, we sought the original datasets via study websites and authors. We excluded studies where key inclusion data were missing. Data extraction and risk of bias assessment were carried out independently in duplicate within Covidence. We extracted detailed data on bibliographic details, study and participant characteristics and outcome measures. Reviewers had fluent proficiency in spoken and written English, Dutch and German, and a good level of proficiency in spoken and written French and Spanish, to translate articles. We used the Microsoft Word translation tool and Google Translate to translate two articles from Korean and Japanese, for which we did not have language skills in, and used both tools to corroborate and validate each tool's translations.

2.4. *Risk of bias assessment*

We assessed risk of bias using an adapted version of the Joanna Briggs Institute 'Checklist for prevalence studies' [33]. See Appendix 1 (Supplementary material) for our adaptations and Appendix 2 (Supplementary material) for how study-wide risk of bias was calculated and how it was used within quality-effects meta-analysis. We assessed studies as low risk of bias if they scored at least 2 out of 3 on questions 1–4, which related to the reliability of how fluid intake/dehydration was measured, how appropriately participants were recruited and how well described the participants and setting were described.

2.5. *Data analysis*

Where study authors had provided data on the number of people dehydrated within their sample, in line with our recognised cut-offs (>300 mOsm or <1.5 L),[1] we used these numbers alongside the sample size. When these data were not provided, we used mean osmolality, osmolarity or oral fluid intake[2] and the measure of variance to estimate the number of people dehydrated based on a normal distribution. If no relevant data were provided, studies were ineligible for meta-analysis and narratively synthesised using Synthesis Without Meta-Analysis in Systematic-Reviews (SWiM) [34] guidance and treated as missing data within the meta-analysis. Some large datasets were downloaded from study websites, or requested from authors (NU-AGE [20,35], NHANES 2017–March 2020 [36] and National Irish Survey [37]) and the datasets used to calculate numbers with low-intake dehydration, within relevant subgroups directly.

We used Meta-XL version 5.3 to conduct meta-analysis to determine the prevalence of low-intake dehydration within this systematic review [38,39]. We had planned to use random-effects meta-analysis, however this over-dispersed prevalence data, where there was gross heterogeneity, resulting in an unweighted average [38,39]. Instead, on the advice of the Meta-XL developer (Suhail Doi [38,39]), we used a quality-effects model, weighted by quality score using double arcsine transformation which the developers argue is superior in handling the heterogeneity in prevalence data (See Appendix 3). We assessed heterogeneity using I^2 and used forest plots and tables to present the meta-analyses, sensitivity, and subgroup analyses. For studies that assessed more than one measure of hydration status we used the highest quality measure in meta-analysis for preference, the first of: directly-measured serum or plasma osmolality, calculated serum or plasma osmolarity and 24-h oral fluid intake. Meta-XL does not allow formal assessment of heterogeneity between subgroups, so we assumed that subgroups were distinct from each other when the mean assessment of heterogeneity was different by more than 0.2.

Our first meta-analysis was subgrouped by the measure of dehydration used. We planned to combine all outcome measures for further analyses if results from these subgroups were homogeneous; but if found to be heterogeneous, focus on the data from the most reliable measures of dehydration, serum or plasma osmolality, as our main analysis.

We planned sensitivity analyses removing studies at high risk of bias, as well as limiting to the most robust measures of low-intake dehydration: directly-measured serum or plasma osmolality and calculated serum or plasma osmolarity using the Khajuria and Krahn equation [40].

We used subgroup analyses to explore the following pre-specified sources of heterogeneity (detailed in the PROSPERO register):

- Care setting: long-term care setting, community setting
- Age: mean age 65–74, 75–84, 85+
- Health conditions (Diabetes, cognitive impairment and renal impairment were found to be associated with low-intake dehydration in the UK DRIE study, and so we explored this further in subgrouping): <2 conditions, ≥2 conditions *(Diabetes, cognitive impairment and renal impairment)* (Appendix 4)
- Renal impairment: No renal impairment *(<20% within sample)*, renal impairment *(sample has some renal impairment prevalence ≥20%)*
- Cognitive impairment: No impairment, low impairment (>0–29% of sample has cognitive impairment/dementia) Middle impairment (30–59% of sample has cognitive impairment/dementia), High impairment (60–100% of sample has cognitive impairment/dementia)
- Diabetes: No diabetes *(<20% within sample)*, diabetes *(sample has some diabetes prevalence ≥20%)*

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[1] The NHS recommends 1.5 L–2.0 L (6-8 cups) of oral fluid intake, which varies to other global guidelines, so we decided to use 1.5 L as a minimum, for our oral fluid intake cut-off.

[2] Oral fluid intake sometimes included fluids from foods – specific details of this are included within Appendix 6 'characteristics of included studies table'.

- Dependency on others: fully independent, mixed dependency *(a mixed sample of participants with varying dependency levels, for assistance with drinking)* (Appendix 4)
- *Sex: Male, Female (not pre-specified, carried out post-hoc in response to peer-reviewer comments).*

We used individual participant information from study datasets (where available) to conduct subgroup analyses. Where this was not possible, we included the whole study in the most appropriate subgroup.

3. Results

3.1. Search results

Searches identified 11,077 titles and abstracts, deduplicated in Covidence to 9193 titles and abstracts. Screening independently in duplicate identified that 7052 titles and abstracts were irrelevant and 2234 were assessed as full texts. Of these, 61 were found to be eligible and included in the review. Full text studies were excluded for reasons such as wrong age group, wrong method of assessing hydration status, hospital setting (Appendix 5). Forty-four studies had sufficient data to be included within the meta-analysis (Fig. 1).

3.2. Characteristics of the studies included

The characteristics of all included studies are detailed in the supplementary file (See Appendix 6). Of the included studies, 29 reported directly-measured serum or plasma osmolality *(2955 participants;* 60.3% females [1,17,35,41–67]) (of which 21 could be included in meta-analysis) (Table 1), six calculated serum or plasma osmolarity *(3891 participants*, all 6 included in meta-analysis), 25 reported oral fluid intake *(15,232 participants)* (17 included in meta-analysis), and one salivary osmolality *(53 participants)* (not included in meta-analysis).

One osmolality study (included within meta-analysis) [49] was translated from Japanese into English, and one oral fluid intake study (not included within meta-analysis) was translated from Korean into English, using translation tools.

The 29 included studies reporting directly-measured serum or plasma osmolality (shown in Table 1) were from a total of 12 countries. Twenty studies [17,35,41–47,49,50,52,53,58–60,62–65,67] recruited community-dwelling older adults (mean age range: 67–82 years) and nine [1,48,51,54–57,61,66] included those living in long-term care settings (mean age range: 75–88 years). The prevalence of cognitive impairment was reported in eight studies [1,35,41,51,52,54,55,66], but unreported in 18 studies [42,45,47–50,53,56,57,59–65,67]. The prevalence of renal impairment was reported in eleven studies [1,35,46,49,52,54,58,59], but unreported in 12 studies [41,44–46,49,50,53,55,57,59,60,65]. The prevalence of diabetes was reported in eight studies [1,35,47,51,52,54,56,62], but unreported in 18 studies [41,42,44–46,48–50,55,57,59–61,63–67]. Nine studies specifically excluded participants who had cognitive impairment, and/or renal impairment, and/or diabetes [42,43,46,53,57,58,62,66,67].

Six studies reported including participants with mixed functional dependency [1,51,54,57,62,66], fourteen only included participants who were functionally independent [42,43,45,46,49,50,52,58–60,63–65,67], while functional dependency of participants was unclear or unreported in seven studies. Although some authors reported functional dependency using assessment scales such as the Barthel Index or the Dependency in Activities of Daily Living from the Minimum Dataset (MDS-ADL), most authors did not report the method used to assess functional dependency. The

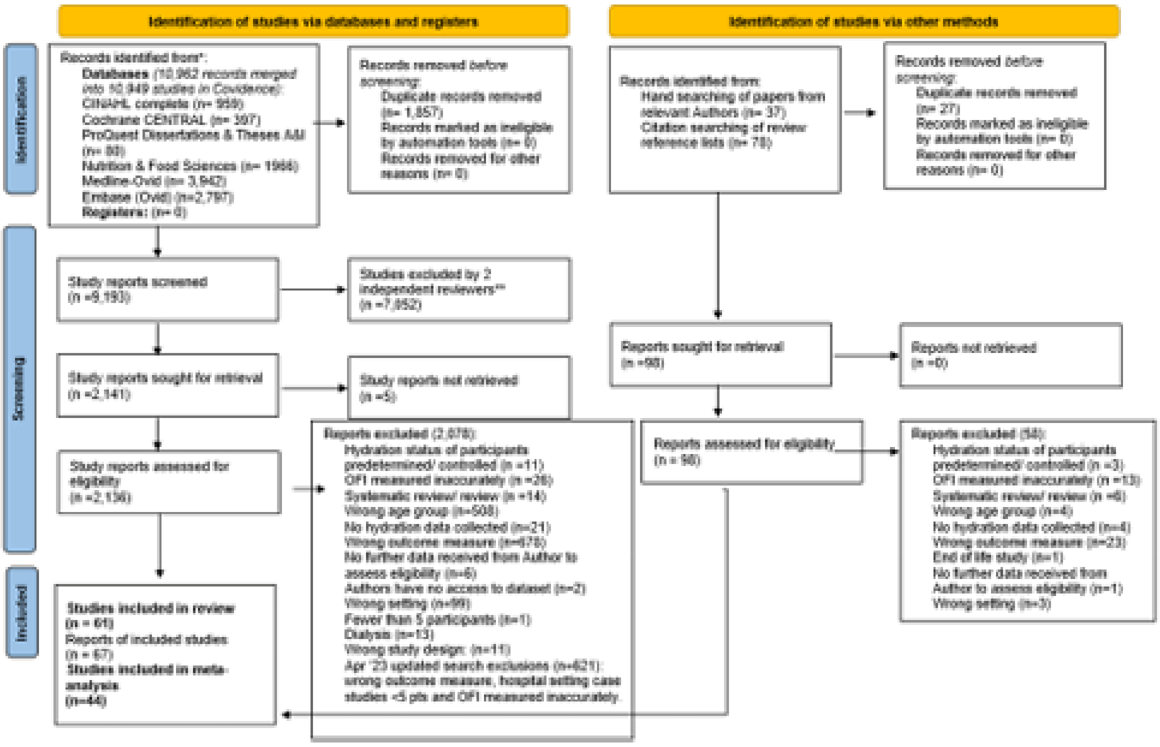

Fig. 1. PRISMA flow diagram.

Table 1
Brief characteristics of included studies reporting serum or plasma osmolality.

Author	Setting	Country	Sample size	Study Design	Mean Age	Health Conditions	Mean Osmolality
[a]Albert et al. (1989) [41]	Community	United States	18	Non-randomised experimental study	Control gp: 65 (SD 2) years Experimental gp: 68 (SD 3) years.	Cognitive impairment 50%	Experimental gp: 313 mOsmol/kg (SEM 4) Control gp: 300 mOsmol/kg (SEM 3)
[a]Bossingham et al. (2005) [42]	Community	United States	21	3-arm crossover non-randomised intervention study	Men: 72 years (SD 4) Women: 75 years (SD 4)	None	Men: 291 mOsm/kg (SD 12) Women: 291 mOsm/kg (SD 4)
Crowe et al. (1987) [43]	Community	United Kingdom	6	Cross-sectional	72 years	None	285 mOsm/kg
Engelheart et al. (2021) [44]	Community	Sweden	56	Cohort study	Home health care sample (n = 69): 82 years	Cognitive impairment	299 mOsmol/kg
Farrell et al. (2008) [45]	Community	Australia	12	Non-randomised experimental study	68 years (SD 3)	NR	283.5 mOsm/kg
Fraser et al. (1989) [46]	Community	United Kingdom	27	Cross-sectional	NR (Age range: 70–83)	Cognitive impairment 0%	289 U/L
Kakeshita et al. (2022) [47]	Community	Japan	211	Cohort study	NR (Median age of CKD group (n = 121): 71 years, Non-CKD group (n = 90): 65 years)	Renal impairment 57.3% Diabetes 23.2%	NR
[a]NUAGE and Hooper et al. (2015) [20]	Community	United Kingdom, Italy, Netherlands, France, Poland	1088	Cross-sectional	71 years (SD 4)	Cognitive impairment 1% Renal impairment 16% Diabetes 4%	303 mOsm/kg (SD 12.1)
[a]Hooper et al. (2016) [1]	LTC	United Kingdom	188	Cohort study	86 years (SD 8)	Cognitive impairment 54% Renal impairment 42% Diabetes 19%	293.4 mOsm/kg (SD 8.1)
[a]Johnson et al. (2018) [48]	LTC	Sweden	55	Cohort study	84 years	Renal impairment 22%	307.5 mOsmol/kg (SD 8.9)
[a]Kajii et al. (2005) [49]	Community	Japan	71	NR	77 years (SD 7)	NR	287.1 (SD 5.3) mOsm/L
[a]Mack et al. (1994) [50]	Community	United States	8	Non-randomised experimental study	69 years (SE 2)	NR	287 (SD 1) mOsmol/kg/H_20
[a]Marra et al. (2016) [51]	LTC	United States	132	Cross-sectional study	83 years (SD 11)	Cognitive impairment 76% Renal impairment 22% Diabetes 29%	298.9 mOsm/kg (SD 8.8)
[a]McKenna et al. (1999) [52]	Community	Republic of Ireland	24	Non-randomised experimental study	HONK gp: 71 years Diabetes gp: 71 years Control gp: 70 years	Diabetes 67%	HONK gp: 293.5 (SD 2.8) mmol/kg Diabetes gp: 286.8 mmol/kg (SD 2.0) Control gp: 287.3 mmol/kg (SD 2.5)
[a]Morgan et al. (2003) [53]	Community	United States	35	Cross-Sectional study	77 years (SD 8)	NR	286.56 mOsm/kg (SD 6.87)
[a]Nagae et al. (2020) [54]	LTC	Japan	89	Prospective, observational study	88 years (SD 6)	Cognitive impairment 56% Renal impairment Diabetes 11%	288.5 (SD 6.1) mOsm/kg
[a]O'Neill et al. (1989) [55]	LTC	United Kingdom	39	Cross-Sectional study	83 years	Cognitive impairment	302 mOsm/kg (SD or SE 8)
[a]O'Neill et al. (1990) [56]	LTC	United Kingdom	58	Cohort study	81 years (SD 7)	Renal impairment 2% Diabetes Mellitus 2%	304 mOsmol/kg (SD 8)
[a]O'Neill et al. (1997) [57]	LTC	United Kingdom	12	Cross-sectional study	Gp A: 83 years Gp B: 80 years	NR	Gp A: 294.2 mOsmol/kg Gp B: 293.8 mOsmol/kg
[a]Phillips et al. (1984) [58]	Community	United Kingdom	7	Non-randomised experimental study	71 years	NR	288.4 mOsmol/KgH_20 (SE 1.3)
Phillips et al. (1991) [59]	Community	Australia	7	Non-randomised experimental study	70 years	NR	Pre-isotonic infusion gp: 283 mOsm/kg Pre-hypertonic infusion gp: 279 mOsm/kg
[a]Phillips et al. (1993) [60]	Community	Australia	10	Non-randomised experimental study	NR (Range: 64–76 years)	NR	290.4 mOsmol/kgH_20 (SE 3.1)
[a]Simmons et al. (2001) [61]	LTC	United States	28	Non-randomised experimental study	Intervention gp: 89 years (SD 7) Control gp: 86 years (SD 6)	Renal impairment	Intervention gp: 303.6 (SD 9.1) Control gp: 303.4 (SD 8.5)
[a]Sri-On et al. (2023) [62]	Community	Thailand	704	Cohort study	NR (Median age: 72 years).	Renal impairment 0% Diabetes 25.1%	NR

[a]Stachenfeld et al. (1996) [63]	Community	United States	6	Non-randomised experimental study	72 years (SE 2)	Renal impairment 0%	286 mOsm/kg (SE 1.5)
Stachenfeld et al. (1997) [64]	Community	United States	6	Cross-sectional study	70 years (SD 2)	NR	Time Control gp: 293 mOsmol-kg-1 H_2O Head out water Immersion gp: 294 mOsmol-kg-1 H_2O
Takamata et al. (1999) [65]	Community	Japan	9	Non-randomised experimental study	70 years (SE 3)	NR	294 mOsm/kg H_2O
[a]Wu et al. (2011) [66]	LTC	Taiwan	111	Cross-sectional study	75 years	Cognitive impairment 18%	287.85 mmol/kg (SD 10.51)
[a]Zappe (1996) [67]	Community	United States	6	Non-randomised experimental study	67 years (SD 1)	NR	292 mOsmol/kgH_2O (SE 2)

Glossary: LTC: long term care, Gp: group, SD: standard deviation, SEM: standard error of mean, SE: standard error, NR: not reported, U/L: units per litre, HONK: Hyperglycaemic hyperosmolar non-ketotic coma, CKD: Chronic kidney disease.

[a] included in meta-analysis.

characteristics of studies using other methods of assessment of dehydration are summarised in Appendix 6.

3.3. Risk of bias of included studies

Risk of bias assessments for all 61 included studies are shown in the supplementary material (Appendix 7), of which 30 were assessed as being at low risk of bias. Of the 29 included studies reporting serum or plasma osmolality, we assessed 15 as being at low risk of bias, and 14 as high risk of bias.

3.4. Meta-analysis and narrative synthesis

We initially conducted a quality-effects weighted meta-analysis including all 44 studies eligible for meta-analysis, subgrouped by hydration measure, with each study represented only once. Dehydration prevalence assessed using directly-measured serum or plasma osmolality was 0.26, 95% CI 0.107–0.46, $I^2 = 97\%$, using 24-h oral fluid intake: 0.77, 95% CI 0.56–0.95, $I^2 = 97\%$, and using calculated osmolarity: 0.26, 95% CI 0.00–1.00, $I^2 = 100\%$ (Fig. 2). As the mean prevalence was different between subgroups by more than 0.2, further analyses were conducted using studies providing data on serum or plasma osmolality only, as this was the most robust measure.

3.5. What is the prevalence of dehydration assessed using osmolality?

The prevalence of low-intake dehydration, assessed using 21 studies reporting serum/plasma osmolality, the reference standard, was 26% (95% CI: 0.07, 0.46). The proportions of dehydrated older adults between individual studies was highly heterogeneous ($I^2 = 96\%$) and ranged from zero to 0.89 (Fig. 2). The prevalence of low-intake dehydration (assessed using any dehydration measure) was stable to sensitivity analyses of studies only at low risk of bias (27%, 95% CI: 0.06,0.53, I^2 99%, 23 studies), as well as osmolality studies combined with calculated osmolarity studies using the Khajuria and Krahn [40] equation (23%, 95% CI: 0.10,0.41, I^2 97%, 22 studies) (Appendix 8). This suggests that the prevalence of low-intake dehydration varies in different groups of older adults and is very high in many groups.

We are aware of some data missing from the meta-analyses. Data from eight community-based studies, which assessed dehydration using serum or plasma osmolality [43–47,59,64,65], could not be included because they either did not report the number of participants dehydrated from their study, nor provided relevant data for us to estimate this number. Numbers of participants in these eight studies were relatively small, the largest study had 211 participants [47]. The funnel plot for the quality-effects meta-analysis (Appendix 9) was asymmetrical, which could be explained by publication bias or by the many small studies with high heterogeneity across studies [68]. We explored factors that may influence prevalence and cause heterogeneity in subgroup analyses (Table 2).

3.6. Which groups of older people are most at-risk?

Within community settings, 19% of older people were dehydrated (95% CI: 0.00, 0.48, I^2 98%), and within long-term care settings, 34% were dehydrated (95% CI: 0.09, 0.61, I^2 97%). While subgroup analyses revealed a lower prevalence of dehydration in community groups, there was no statistically significant difference between these two subgroups, and study means differed by less than 20% (Fig. 3).

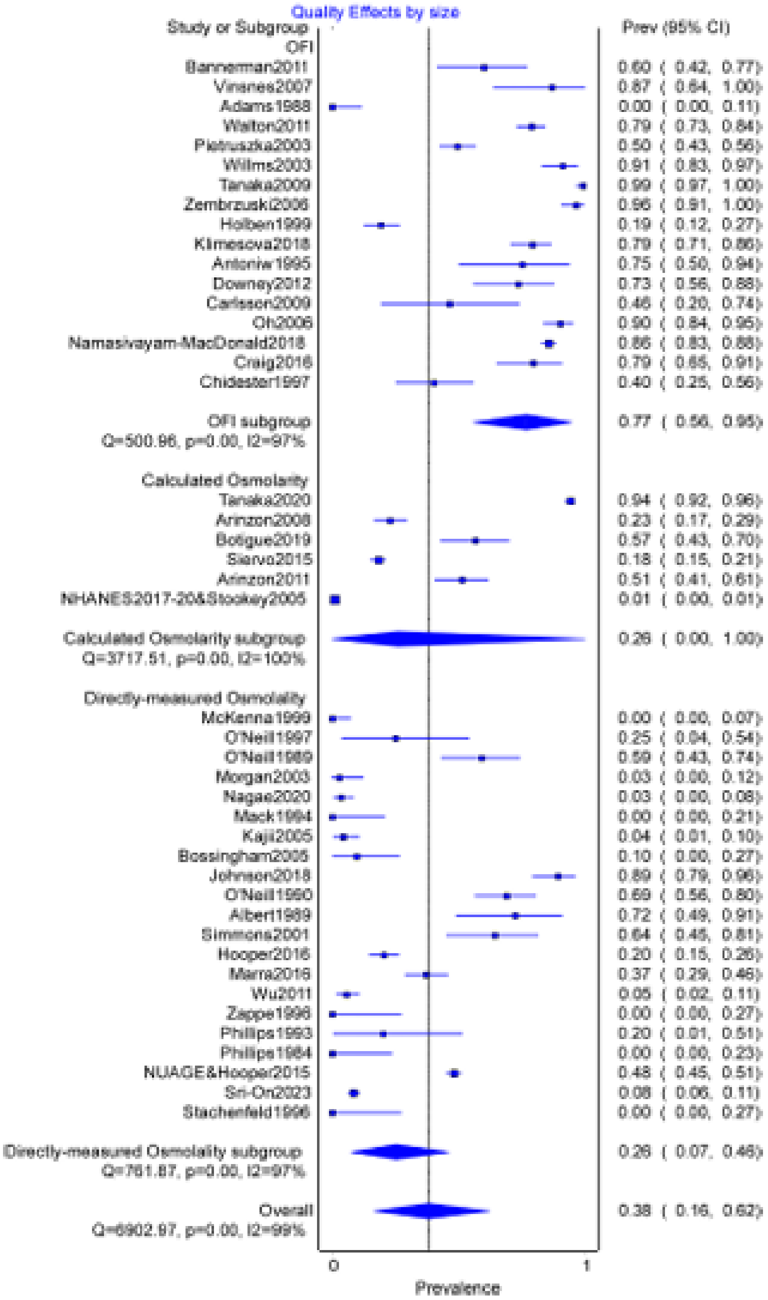

Fig. 2. Forest plot of studies reporting serum or plasma osmolality, oral fluid intake, and calculated serum or plasma osmolarity (n = 44).

Similarly, no clear relationship was found between prevalence of dehydration and mean age, dependency, diabetes, renal impairment, cognitive impairment, or sex. Effects differed between subgroups by less than 20%, our prespecified limit. However, participants with more health conditions were at greater risk of dehydration, and those with renal impairment were not significantly more at risk than those without, but very close (Table 2).

We were unable to conduct meta-regression analyses, to explore the relationship between serum or plasma osmolality and secondary outcomes (such as renal impairment and cognitive impairment), because we did not have sufficient continuous data, relating to studies assessed due to inconsistent methods of reporting.

3.7. GRADE assessment of quality of evidence

GRADE assessment of the body of evidence from this systematic review was low quality, irrespective of care setting or any other subgroup (Table 3). It is unsurprising that the prevalence

Table 2
Summary of subgroup analyses.

	Subgroups	Prevalence % (95% CI)	Heterogeneity (I^2)	# Studies (participants)
Mean Age Group	65–74 years	29 (0.00, 0.66)	95%	10 (1070)
	75–84 years	38 (0.17, 0.60)	96%	10 (745)
	85+ years	17 (0.00, 0.51)	96%	3 (234)
Cognitive Impairment	Cognitively able	31 (0.06, 0.60)	94%	13 (1418)
	Low cognitive impairment	50 (0.00, 1.00)	99%	2 (166)
	Medium cognitive impairment	17 (0.00, 1.00)	98%	2 (117)
	High cognitive impairment	16 (0.00, 0.78)	98%	4 (249)
Renal Impairment	Low renal impairment	23 (0.03, 0.47)	97%	18 (2205)
	High renal impairment	42 (0.23, 0.61)	93%	3 (376)
Diabetes	Low diabetes	24 (0.03, 0.49)	95%	15 (1496)
	High diabetes	25 (0.03, 0.53)	99%	5 1082)
# of Health Conditions	<2 conditions	15 (0.00, 0.43)	94%	16 (1155)
	≥2 conditions	37 (0.14, 0.62)	98%	5 (1555)
Functional Dependency	Fully independent	5 (0.02, 0.09)	0%	8 (153)
	Mixed dependency	13 (0.02, 0.27)	94%	6 (1236)
Sex	Male	26 (0.00, 0.59)	97%	7 (793)
	Female	24 (0.01, 0.53)	99%	4 (1257)

Table 3
Summary of Findings Table showing GRADE assessment of certainty of the evidence.

No of Studies	Certainty Assessment						Prevalence			Certainty
	Study design[a]	Risk of bias[b]	Inconsistency[c]	Indirectness[d]	Imprecision[e]	Other considerations	Proportion	95% CI	Range	
29 (2955 participants)	–	–	↓	–	↓	N/A	0.24	0.07, 0.46	0–0.89	Low

[a] Study design was not downgraded, because observational studies are seen to be appropriate for inclusion in prevalence and prognosis systematic reviews.
[b] Risk of bias was not downgraded, because sensitivity analyses using risk of bias assessment showed little variation to the prevalence.
[c] Inconsistency was downgraded once because there was large heterogeneity, as demonstrated by the high I^2, and also downgraded for imprecision, which is related.
[d] Indirectness was not downgraded, because the population was specific, and serum or plasma osmolality is a robust measure of low-intake dehydration.
[e] Imprecision was downgraded due to the wide confidence intervals, showing large variance in prevalence rates.

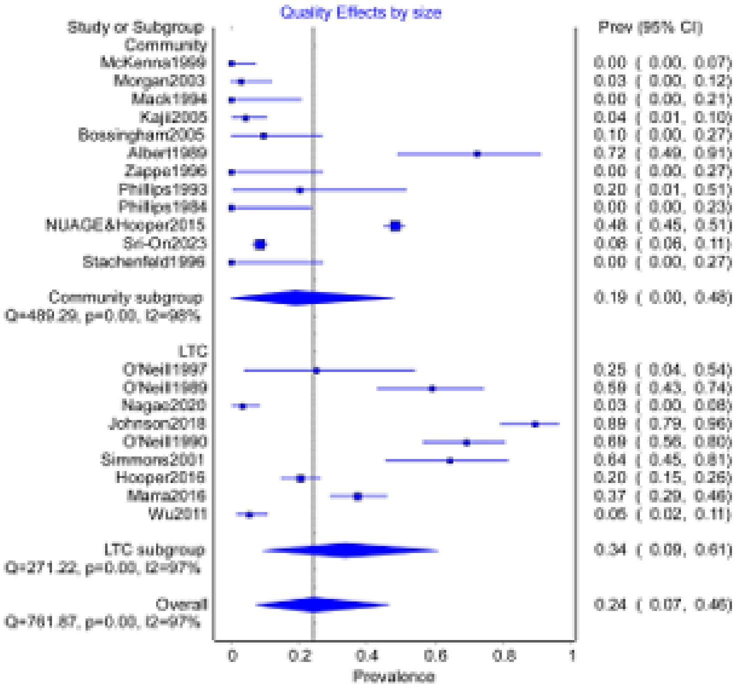

Fig. 3. Forest plot of the prevalence of low-intake dehydration measured by directly-measured serum or plasma osmolality, subgrouped by care setting. LTC: long-term care.

estimation has low certainty given the wide range of prevalence rates reported amongst included studies.

4. Discussion

4.1. How many older people are dehydrated?

This is the first robust systematic review to methodically seek studies reporting high-quality measures of dehydration in non-hospitalised older adults and using meta-analysis to summarise low-intake dehydration prevalence in a variety of settings in 12 upper-middle and high-income countries. We found that older adults are at high risk of low-intake dehydration, with point prevalence of nearly a quarter (24%, 95% CI: 0.07, 0.46, using the reference standard directly measured serum or plasma osmolality, >300mOsm/kg)). There was no statistically significant difference between prevalence of low-intake dehydration in long-term care settings (34%, 95% CI: 0.09, 0.61, range: 5−89%) or the community (19%, 95% CI: 0.00, 0.48, Range: 0−72%). The prevalence was very different across individual studies, irrespective of setting.

A recent systematic review reported that 0.8−38.5% of older people living in nursing homes were dehydrated [26], lower than our findings of 34% (range 3−89%) of older adults living in long-term care. They suggested (but did not assess) that the wide range of prevalence rates within their systematic review, might be explained by the variance in how dehydration was measured [26]. However, our more comprehensive systematic review suggests that heterogeneity exists even when assessment is limited to the reference standard measure for older adults, directly-measured serum or plasma osmolality, at the cut-off of >300 mOsm/kg [14]. We discuss possible explanations for this high heterogeneity below.

4.2. Explanations for high heterogeneity in these studies

We conducted subgroup analyses to investigate the heterogeneity of the prevalence of low-intake dehydration amongst older adults. While prevalence was higher in older adults with more pre-existing health conditions, and appeared higher though not statistically significantly so in older adults in care settings or with renal impairment, other factors such as age, sex, diabetes, and cognitive function did not explain the heterogeneity. It is likely that this heterogeneity reflects individual differences within the older adult population, with regards to variance in factors such as opportunities for social drinking, degrees of drinks provision, support, encouragement and assistance by others to drink, and cultural factors such as usual drinks patterns, routines, quantities, and concerns over continence, which needs to be investigated at individual study level. Mentes (2006) discusses the variation of hydration habits in her typology of hydration for nursing-home residents as to those who “can drink”, “can't drink” and “won't drink” [69]. Mentes (2006) discussed individual barriers to drinking, which included fear of incontinence, dysphagia, appropriate drinking vessels, effective communication between staff and residents, knowledge of the recommended fluid intake guidelines, drinking socially and verbal prompts to drink [69].

Additionally, hydration risk may be a balance between a composite of cognitive and physical frailty and support, where support partially or fully compensates for frailty, and frailty is a composite of factors such as age, functional status, renal, diabetic and cognitive function, number of pre-existing conditions etc. For example, low-intake dehydration may be more common in older people who have more pre-existing conditions, cognitive impairment or renal failure, but are receiving less support for drinking. It would be less common in those who are less frail and in frail individuals receiving high quality support (which is more likely to be in place as frailty worsens), creating a U-shaped curve with individual frailty indicators such as age or renal failure. Such complex relationships are difficult to see in subgroup analysis but these conflicting influences may be driving some of the patterns of dehydration risk with age and cognitive status (Table 2). We had insufficient data to conduct meta-regression, within this systematic review, and so this issue needs to be addressed at individual study level. The timing of blood draw might have also contributed to the heterogeneity, as older people are more dehydrated in the morning, and this effect may increase if they also fasted (and limited drinks as a result) overnight. Only 8 [46,50,52,55,57,58,62,64] of the 29 serum or plasma osmolality studies reported timing of the blood draw, which varied between early morning to afternoon blood collections.

4.3. Which older adults are at most risk of low-intake dehydration?

While meta-analytic subgrouping found that dehydration is more prevalent in those with more pre-existing conditions, we found only a suggestion of higher prevalence in older adults with renal impairment compared to those with no renal impairment and no relationship with diabetes. Previous studies have reported associations between directly measured osmolality and both diabetes and renal impairment (assessed by estimated glomerular filtration rate (eGFR) and blood urea nitrogen (BUN)) [1,51,54]. However, our ability to see any relationships was limited by small numbers of studies available for subgrouping and little information on severity.

Our meta-analysis found no clear difference in prevalence between older adults living with cognitive impairment and those who were cognitively able. In contrast to our findings, in other research, higher serum or plasma osmolality has been associated with increased dementia [54], poor mental status [51] and lower MMSE score [1]. Our findings might contrast with this existing literature, due to variation in how cognitive impairment was assessed and measured within the included studies, and the confounding issue of support resulting in the presence of a U-shaped curve.

We also found no clear differences in prevalence between age subgroups. Despite some previous studies demonstrating an increased risk of low-intake dehydration with increasing age [70,71], our findings are more consistent with the findings of the DRIE study where no association was found between age and serum osmolality [1]. The evidence is therefore inconsistent regarding whether ageing increases the risk of low-intake dehydration. As people age, they are more likely to require more assistance with activities of daily living and face more barriers to drinking, which will lead to low-intake dehydration. However, if people receive appropriate support and assistance with drinking as they age, then this might be enough to disrupt any association between ageing and low-intake dehydration.

We found no clear differences in prevalence between male and female older adults, which is consistent with existing literature [1,51].

4.4. What are the limitations of this study?

We encountered several issues which might have affected the findings. Directly-measured serum or plasma osmolality is used in included studies, only to provide point prevalence of low-intake dehydration, and dehydration status may vary over short time periods. When authors did not provide raw data for the proportions of their sample who were dehydrated, we estimated the number of dehydrated participants based on normal distribution of osmolality, which will have introduced small errors. We applied the stricter >300 mOsm/kg cut-off for directly-measured serum or plasma osmolality to indicate low-intake dehydration (as recommended by the European Society for Clinical Nutrition and

Metabolism, ESPEN) [14]), prevalence would be higher if we had applied the less stringent >295 mOsm/kg cut-off for impending dehydration. Although we focussed on studies which assessed dehydration using the reference standard (serum or plasma osmolality), these varied in terms of whether participants were fasted prior to blood draws and a lack of reporting of collection, storage, laboratory processing and calibration methodology. Authors also sometimes confused, or interchangeably used the terms, directly-measured “osmolality” with calculated “osmolarity”.

5. Conclusion

This is the first robustly conducted, high quality and comprehensive assessment of the prevalence of low-intake dehydration in non-hospitalised older people worldwide. We included 61 studies from 12 countries and conducted a meta-analysis of 44 of those studies which assessed dehydration using directly measured osmolality, the reference standard.

Our meta-analysis suggested that while approximately a quarter of older people are dehydrated (so needing to drink more) the proportion varies a great deal between different groups of older adults (prevalence ranged from zero to 89% across included osmolality studies). This heterogeneity highlights that dehydration is not inevitable with age, but preventable and avoidable. Subgroup analyses suggested higher prevalence of dehydration in those with more pre-existing diseases, and possibly also in those with poorer renal function or living in care, but did not suggest significant differences in low-intake dehydration prevalence by sex, functional dependency, diabetes, cognitive impairment, or age. Therefore, the heterogeneity is likely to result from individual differences in drinking behaviours, a generic measure of frailty, and the levels of care and support provided to older people. We suggest that a cohort study would be useful to measure more specifically the individual differences which might affect low-intake dehydration. The findings from our systematic review and meta-analysis are also important for raising public awareness of the high prevalence of low-intake dehydration to the older adult population globally, which can be prevented by sufficient drinking.

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Author contributions

Ellice Parkinson: Conceptualization, Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft, Writing - Review & Editing, Visualization, Project administration **Lee Hooper:** Conceptualization, Methodology, Formal analysis, Investigation, Data Curation, Writing - Review & Editing, Supervision, Funding acquisition **Judith Fynn:** Investigation, Writing - Review & Editing **Stephanie Howard Wilsher:** Investigation, Writing - Review & Editing **Titilopemi Oladosu:** Investigation, Writing - Review & Editing **Fiona Poland:** Conceptualization, Writing - Review & Editing, Supervision, Funding acquisition **Simone Roberts:** Investigation, Writing - Review & Editing **Elien Van Hout:** Investigation, Writing - Review & Editing **Diane Bunn:** Conceptualization, Methodology, Investigation, Writing - Review & Editing, Supervision, Funding acquisition.

Conflicts of interest

Ellice Parkinson: None.

Lee Hooper: Hooper led some of the included prevalence studies. She was not involved in data extraction or risk of bias assessments on these studies, though did provide additional data where requested.

Judith Fynn: None.

Stephanie Howard Wilsher: None.

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Fiona Poland: None.

Simone Roberts: None.

Elien Van Hout: None.

Diane Bunn: Bunn was involved in some of the included prevalence studies. She was not involved in data extraction or risk of bias assessments on these studies.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnu.2023.06.010.

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Appendix 5b Characteristics of all included studies table

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
Albert et al. (1989), United States *(High Income)* (1) **Setting:** Community: Attending outpatient setting	**Design:** Non-randomised experimental study **Aim:** To improve discrimination of normal and diminished vasopressin levels for subjects with Alzheimer's disease and age- and sex-matched controls. **Recruitment methods:** Individuals with Alzheimer's Disease were recruited from the outpatient facilities and age and sex matched controls were recruited from family members and friends.	**Baseline characteristics:** Mean age for Controls (n=9): 65 years (SD 2), Experimental group (n=9): 68 years (SD 3), Gender: Male (n=10, 55.6%), Female (n=8, 44.4%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment (Alzheimer's Disease: n=9, 50%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** Experimental group: 1.Alzheimer's Disease 2.Aged >55yrs 3.Normal evaluation of: FBC, electrolyte panel, screening metabolic panel, thyroid function, vit B12 & folate, tests for syphilis, urinalysis, ECG and Chest X-ray. had CT scans, all had psychiatric evaluation Control Group: 1.No Alzheimer's Disease diagnosis 2.Age & sex matched with experimental group. 3.No evidence of intellectual dysfunction 4.Normal functioning in daily living 5.Informed consent **Exclusion criteria:** 1.Acute delirium states associated with renal, hepatic or metabolic dysfunction 2.CNS structural lesions 3.Decompensated congestive heart failure 4.Pulmonary dysfunction 5.Renal dysfunction with creatinine >2.0mg/dL 6.Medications which may impact on vasopressin secretion (diuretic meds were allowed but withheld the day prior to the procedure).	**Outcome measure:** Serum osmolality **How was outcome assessed?** Methods for measuring serum osmolality NR. Bloods were fasted.	**Sample with dehydration data:** n=18 **Mean SOsm:** Experimental group (n=9): 313 mOsmol/kg (SEM 4) Control group (n=9): 300 mOsmol/kg (SEM 3) **Median SOsm:** NR **SOsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	**Cut off Used:** >300 MOsm/kg **# dehydrated according to cut off:** 13 (72.2%)	HIGH	Fluids withheld overnight.

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
Bossingham et al. (2005), United States *(High Income)* (2) **Setting:** Community	**Design:** 3-arm crossover non-randomised intervention study **Aim:** To use a strictly controlled diet protocol to assess the effect of age on markers of water input, output, and balance in healthy men and women. **Recruitment methods:** Adults were recruited to participate in this study through advertisements in local newspapers and community postings.	**Baseline characteristics:** Mean age (n= 21 older adults): Men 72 years (SD 4, Range: 63-79), Women 75 years (SD 4, Range: 70-81), Gender: Male (n=10, 47.6%), Female (n=11, 52.4%), Ethnicity: NR, Functional Dependency: Independent **Health Characteristics:** NR (see exclusion criteria) **Inclusion Criteria:** 1.Provide consent 2. Screened to determine: clinically normal kidney, heart, liver, thyroid, BP; (and if on meds to achieve this, still included) 3. Bladder control 4. Non-smoker 5. Post-menopausal (women) **Exclusion criteria:** 1.Incomplete blood and stool samples	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Fasted blood samples collected on day 12. Osmolality was determined using an osmometer in a lab.	**Sample with dehydration data:** n=21 **Mean POsm:** Men (n=10): 291 MOsm/kg (SD 12; range: 281-321) Women (n=11): 291 MOsm/kg (SD 4; range: 282-297) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** >300mOsm/kg **# dehydrated according to cut off:** 2 (9.5%)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	
Crowe et al. (1987), UK *(High Income)* (3) **Setting:** Community	**Design:** Cross-sectional **Aim:** To investigate the effects of age upon the thirst, vasopressin and renal responses to an oral water load and so determine whether the ability to excrete excess water is altered among older adults **Recruitment methods:** NR	**Baseline characteristics:** Older group info (n=6): Mean age:72 years (Range: 63-80 years), Gender: Male (n=6, 100%), Ethnicity: NR, Functional dependency: Independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR (see inclusion criteria) **Inclusion Criteria:** 1.Healthy (full medical history, physical examination, biochemical and haematological screening, absence of cardiac, respiratory, neuro or renal conditions) 2. Normotensive 3. No medications 4. Living independently at home	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Osmolality assessed by freezing point depression. Alcohol was avoided for 24 hr before study, and tea and coffee were not consumed on the morning prior to blood sampling.	**Sample with dehydration data:** n=6 **Mean POsm:** 285 mOsm/kg **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	1.Osm values not given in text, only on graph, which was difficult to interpret. 2.Could not interpret SEM from graph.

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
		Exclusion criteria: NR					
Engelheart et al. (2021), Sweden *(High Income)* (4) **Setting:** Community: home health care recipients	**Design:** Cohort study **Aim:** Describe the different dimensions and longitudinal changes of nutritional status in a population of older people in home health care. **Recruitment Methods:** Older adults who had received home health care for >3 months, were invited in writing, to take part in the study.	**Baseline characteristics:** Mean age of home health care sample (n=69): 81.9 years (range: 65-97), Gender (for whole sample): Male (n=25, 36%), Female (n=44, 64%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: Mean MMSE score (n=53): 25 (Range: 12-30), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.≥65 years old. 2.Recipient of home health care for >3m. 3. lived in a geographically defined area in a middle-sized city in Sweden. **Exclusion criteria:** 1.Palliative care 2.Acute hospitalisation	**Outcome measure:** Serum osmolality **How was outcome assessed?** NR: unsure if it was directly-measured or calculated osmolarity (refer to comments).	**Sample with dehydration data:** N=56 **Mean SOsm:** 299 **Median SOsm:** NR **SOsm Range:** 284-323 **Cut off Used:** Both >300 mOsmol/kg and >300mmol/L reported. **# dehydrated according to cut off:** 25/56 (45%)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	It is unclear whether this is directly-measured serum osmolality or whether it was calculated serum osmolarity, so this data was not included in the meta-analysis – We emailed the authors on 27/04/23 to seek clarification.
Farrell et al. (2008), Australia *(NR but assumed from Author details) (High Income)* (5) **Setting:** Community (Setting is assumed, due to healthy participants being	**Design:** Non-randomised experimental study **Aim:** investigate the generation of thirst in older and younger subjects by infusion of hypertonic saline. **Recruitment methods:** NR	**Baseline characteristics:** Mean age: 68.1 years (SD 3.4), Males (n=12) 100%, Ethnicity: NR, Functional dependency: Functionally independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** NR **Exclusion criteria:** 1. any disorders or medications likely to influence fluid balance or cerebral blood flow.	**Outcome measure:** plasma osmolality **How was outcome assessed?** It was NR how Osm was measured. Participants were instructed to only have a light breakfast with only 150ml of juice or water on the morning before bloods were sampled.	**Sample with dehydration data:** n=12 **Mean POsm:** 283.5 mOsm/kg **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	SD of SOsm NR

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
recruited for the experiment)							
Fraser et al. (1989), UK *(High Income)* (6) **Setting:** Community	**Design:** Cross-sectional **Aim:** To examine hypotheses A-C, we assessed the analytical and biological components of variation for a range of serum analytes in a cohort of healthy older adults over a period of 20 weeks. **Recruitment methods:** The subjects were selected from the National Health Service (NHS) register of patients of a U.K. urban GP surgery. After reviewing the medical records, 32 subjects were invited by a letter from their GP to participate in the study.	**Baseline characteristics:** Mean age: NR, Age Range: 70-83 years, Gender: Male (n=14, 52%), Female (n=13, 48%), Ethnicity: NR, Functional Dependence: 100% functionally independent **Health Characteristics:** Cognitive impairment: (Dementia: n=0, see exclusion criteria), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Aged 70 years or older 2.Live at home independently 3.Require no help with feeding, toileting, or maintaining hygiene **Exclusion criteria:** 1.Any chronic condition (inc. dementia) 2.History of gastrointestinal surgery 3.Current drug therapy	**Outcome measure:** serum/plasma osmolality **How was outcome assessed?** Osmolality assessed by freezing point depression. Bloods were fasted.	**Sample with dehydration data:** n=27 **Mean Osm:** 289 U/L **Median Osm:** NR **Osm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	SD/SE for mean Osm NR
Hooper et al. (2016), UK *(High Income)* (7) DRIE study **Setting:** LTC: 56 Care homes in Norfolk, UK	**Design:** Cohort study **Aim:** To assess a wide range of cognitive, functional, and health-based potential risk factors for dehydration (assessed by serum osmolality) in older people living in long-term care **Recruitment methods:** Care homes were contacted by letter and a FU phone call. CH managers identified participants and their key relative and staff were	**Baseline characteristics:** Mean age (n=188): 85.7years (SD 7.8, Range: 65-105), Gender: Male (n=64, 34%), Female (n=124, 66%), Ethnicity: NR, Functional Dependency: Mixed (Mean Barthel Index: 67.4, SD 26.1) **Health Characteristics:** Cognitive impairment (Mean MMSE: 21.8, SD 5.7), Renal impairment (Mean eGFR (n=178): 63, SD 18.6), Diabetes (n=36, 19%) **Inclusion Criteria:** 1.Care home residents who provided informed consent or consultee agreement. **Exclusion criteria:** 1.Receiving palliative care	**Outcome measure:** Serum osmolality **How was outcome assessed?** Bloods were nonfasted. Measured by freezing point depression in the lab.	**Sample with dehydration data:** n=188 **Mean SOsm:** 293.4 mOsm/kg (SD 8.1) **Median SOsm:** NR **SOsm Range:** NR **Cut off Used: Impending Dehydration:** 295-300mOsm/kg, Current Dehydration: >300 mOsm/kg **# dehydrated according to cut off:** Impending dehydration: n=52 (28%)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
	informed via letters, inviting them to meet the researcher to participate.	2.Illness suggesting they were unlikely to survive for at least three months 3.Diagnosis of renal or cardiac failure 4.CH manager stating that the resident is too anxious to participate 5. CH manager stating that the resident's Dementia is too severe to participate 6. CH manager stating that the resident is too frail to participate		Current dehydration: n=38 (20%)			
Johnson et al. (2018), Sweden *(High Income)* (8) **Setting:** LTC: Nursing home	**Design:** Cohort study **Aim:** To assess the incidence of a high FRI in residents living in an LTC unit. Secondary aims were to evaluate possible relationships between FRI and the plasma osmolality, as well as how well these measures correlate with the clinical examinations commonly used to diagnose dehydration. **Recruitment methods:** NR, other than relatives were consulted for people living with dementia.	**Baseline characteristics:** Mean age (n=60): 84 years (Range: 64-103 years), Gender: Male (37%), Female (63%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment (chronic diagnosis: n=13, 22%), Diabetes: NR **Inclusion Criteria:** 1.Living in one of 4 nursing homes in Sweden **Exclusion criteria:** 1.Inability to void	**Outcome measure:** Serum Osmolality **How was outcome assessed?** Blood was sampled on a morning and processed to measure osmolality. It was NR if bloods were fasted or not.	**Sample with dehydration data:** n=55 **Mean SOsm:** 307.5 mOsmol/kg (SD 8.9) **Median SOsm:** NR **SOsm Range:** 279-335 mOsmol/kg **Cut off Used:** >300 mOsmol/kg **# dehydrated according to cut off:** n=52 (89%)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	
Kajii et al. (2005), Japan *(High Income)* (9) **Setting:** Community	**Design:** NR **Aim:** determine the relationship between blood hypernatremia or hyperosmolarity and risk factors associated with water intake, as well as the symptoms associated with	**Baseline characteristics:** Mean age: 76.6 years (SD 7), Gender: Males (n=25, 35.2%), Females (n=46, 64.8%), Ethnicity: NR, Functional dependency: Functionally independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1. Frail	**Outcome measure:** serum osmolality **How was outcome assessed?** It was NR how Osm was measured, or if bloods were fasted or not.	**Sample with dehydration data:** n=71 **Mean SOsm:** 287.1 (SD 5. 3) mOsm/ l **Median SOsm:** NR **SOsm Range:** 277-303mOsm/l **Cut off Used:** >300 mOsm/l	N/A because Authors provided data in line with the appropriate cut-off.	LOW	This paper was translated via Microsoft Word Translation function, so might not be

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
	hypertonic dehydration among frail older adults at home. **Recruitment methods:** Researchers presented survey to home-based older adults, as part of a larger research project.	2. Aged ≥65 years 3. At risk of protein energy malnutrition **Exclusion criteria:** NR		**# dehydrated according to cut off:** 3 (4.2%)			a completely accurate translation.
Kakeshita et al. (2022), Japan *(High Income)* (10) **Setting:** Community: CKD outpatient clinic	**Design:** Cohort study **Aim:** Investigate the association among urine biomarkers in the CKD cohort. **Recruitment Methods:** CKD patients followed up at outpatient clinic	**Baseline characteristics:** Median age: CKD gp (n=121)=71 (Range:61-78), Non-CKD control gp (n=90)=65 (Range:49-71), Gender: CKD gp: Male (n=89, 74%), Female (n=32, 26%), Non-CKD control gp: Male (n=50, 56%), Female (n=40, 44%), Ethnicity: NR, Functional Dependency: Unclear. **Health Characteristics:** Cognitive impairment: NR, Renal impairment: CKD: 121/211, Diabetes: CKD gp (n=29/121, 24%) and Non-CKD control gp (n=20/90, 22%). **Inclusion Criteria:** 1.Outpatients with clinically stable conditions to treat CKD. 2.Estimated glomerular filtration ratio (eGFR)<60 mL/min/1.73 m^2. 3.Control gp Inclusion: those with eGFR ≥60 mL/min/1.73 m^2. **Exclusion Criteria:** 1.Patients dependent on hemodialysis 2. Those receiving vasopressin type-2 receptor antagonist 3.Those receiving antidepressants.	**Outcome measure:** Serum osmolality **How was outcome assessed?** Fasted bloods were obtained from patients. Serum osmolality measured by freezing-point depression.	**Sample with dehydration data:** CKD gp: n=121, Non-CKD gp: n=90 **Mean SOsm:** NR **Median SOsm:** CKD gp: 295 (IQR: 288-300), Non-CKD gp: 291 (IQR: 288-293). **SOsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	LOW	

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
Mack et al. (1994), United States *(High Income)* (11) **Setting:** Community (NR, but presumed that community-dwellers participated in the experiment)	**Design:** Non-randomised experimental study **Aim:** To examine the osmotic control of thirst and free water clearance in healthy older (>65-yr- old) and young (<28-yr-old) individuals during a 6.5-h dehydration-rehydration protocol **Recruitment methods:** NR	**Baseline characteristics:** Mean age (n=10 older adults): 69.2 years (SE 2, Range: 65-78/79), Gender Male (n=10, 100%), Ethnicity: NR, Functional Dependency: Independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Pass a stress test **Exclusion criteria:** NR	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Bloods were processed in the lab to measure plasma osmolality – no further details given. Alcohol and caffeinated drinks were avoided for 12 hours prior to blood sampling.	**Sample with dehydration data:** n=8 **Mean POsm:** 287 (SD 1) mOsmol/kg/H_20 **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	**Cut off Used:** >300 MOsm/kg **# dehydrated according to cut off:** 0	LOW	2 age ranges reported: 65-78 & 65-79.
Marra et al. (2016), United States *(High Income)* (12) **Setting:** LTC: 8 community-based LTC facilities in Texas	**Design:** Cross-sectional study **Aim:** To objectively assess hydration status and the adequacy of total water intakes among LTC residents who encompass the range of body mass index (BMI) categories and to identify relationships between hydration status, total water intakes, and BMI. **Recruitment methods:** Recruited from within the LTC facilities.	**Baseline characteristics:** Mean age (n=247): 82.9 years (SD 11.3), Gender: Male (n=53, 21.5%), Female (n=194, 78.5%), Ethnicity: Non-Hispanic white (n=169, 68.4%), Non-Hispanic black (n=78, 31.6%), Functional Dependency: Average MDS-ADL score was 18.75 (moderate degree of functional dependence) **Health Characteristics:** Cognitive impairment (Mean MMSE: 12, SD 8.1, Dementia: n=188, 76.1%), Renal impairment (n=54, 21.9%), Type 2 Diabetes (n=71, 28.7%) **Inclusion Criteria:** 1.Long stay resident 2.Not receiving enteral or parenteral nutrition 3.Not receiving hospice care 4.Have a written order for daily caloric supplementation (between-meal snacks or ONS) **Exclusion criteria:** NR	**Outcome measure:** Serum osmolality **How was outcome assessed?** Blood samples were collected by research nurses, but it is not clear if bloods were fasted or not. SOsm was measured by freezing point depression in the lab.	**Sample with dehydration data:** n=132 **Mean SOsm:** 298.9mOsm/kg (SD 8.8) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 49 (38.3%)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	
McKenna et al. (1999), Republic	**Design:** Non-randomised experimental study	**Baseline characteristics:** *Mean age of HONK group* (n=8): 70.6 years (range 61-86), *Mean age of Diabetes Mellitus group* (n=8):	**Outcome measure:** plasma osmolality	**Sample with dehydration data:** n=24	**Cut off Used:** >300 MOsm/kg	LOW	

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
of Ireland *(High Income)* (13) **Setting:** Community	**Aim:** To test the hypothesis that subnormal thirst sensation could contribute to the development of the hypernatremia characteristic of hyperosmolar coma **Recruitment methods:** HONK patients who had been discharged from hospital 3m prior.	70.5 years (range 61-82), *Mean age of Control group* (n=8): 69.8 years (range 62-78), Gender: *HONK group:* 2/8 (25%) female, *Diabetes Mellitus group*: 1/8 (12.5%) female, *Control group:* 1/8 (12.5%) female, Ethnicity: NR **Health Characteristics:** Cognitive impairment (n=0, 0%, Dementia: n=0, 0% -exclusion criteria), Renal impairment: NR, Diabetes (n=16, 66.7%) **Inclusion Criteria:** 1. HONK group had made a full recovery (3m after discharge) and normal cognitive function **Exclusion criteria:** 1.Cardiac failure 2.Hypertension treated with two anti-hypertensive drugs 3.Renal impairment 4.Cerebrovascular disease 5.Localising neurological signs or abnormal computerised brain tomography at the time of hyperosmolar coma	**How was outcome assessed?** Measured by freezing point depression. 12 hour fasted blood samples.	**Mean POsm:** *HONK group*: 293.5 (SD 2.8) mmol/kg *Type 2 diabetic group*: 286.8mmol/kg (SD 2.0) *Control group*: 287.3mmol/kg (SD 2.5) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	**# dehydrated according to cut off:** 0		
Morgan et al. (2003), United States *(High Income)* (14) **Setting:** Community	**Design:** Cross-Sectional **Aim:** To determine the hydration status of independent, community-dwelling older individuals **Recruitment methods:** Clinic patients reported to the Exercise Physiology Laboratory as part of a larger investigation	**Baseline characteristics:** Mean age (n=37): 76.8 years (SD 8.3, Range: 65-93 years), Gender: Males (12/37=32.4%), Females (25/37=67.6%), Ethnicity: NR, Functional Dependency: Unclear, but participants were required to be "functionally limited", though independent community-dwellers. **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Subjects were included if they required ≥12 seconds to climb 21 stairs and if they scored ≤24 on the MOS Health Survey (SF-36).	**Outcome measure:** Serum osmolality **How was outcome assessed?** 12 hour fasted blood samples. Blood samples (10 mL) were collected from antecubital veins from participants. Serum tubes were centrifuged at 10°C at 2500 rpm for 15 min and an aliquot of serum was reserved for analysis for osmolality.	**Sample with dehydration data:** n=35 **Mean SOsm:** 286.56 mOsm/kg (SD 6.87) **Median SOsm:** NR **SOsm Range:** NR **Cut off Used:** 1. 284-292 mOsm/kg 2. 281-297 mOsm/kg **# dehydrated according to cut off:** 0	**Cut off Used:** >300 MOsm/kg **# dehydrated according to cut off:** 1 (2.9%)	HIGH	Note: Healthy community dwellers, but participants with diabetes, or taking diuretics, were excluded. Original study had lots of excluded

	Serum (SOsm) or plasma (POsm) osmolality							
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**	
		Exclusion criteria: 1.Diabetic 2.Reported to have not fasted for the requisite 12 hours 3.Resting blood glucose level of >115 mg/dL, 4.Taking a diuretic medication. Exclusion criteria for the larger investigation included known cardiovascular, respiratory, or musculoskeletal conditions that would contraindicate 10 minutes of moderate intensity exercise.					health conditions.	
Nagae et al. (2020), Japan *(High Income)* (15) **Setting:** LTC: 5 Nursing homes in Aichi Prefecture	**Design:** Prospective, observational study **Aim:** To identify risk factors for chronic dehydration diagnosed based on serum osmolality in older nursing home residents in Japan and to verify the validity of using ultrasound to measure IVC or IVC collapsibility as a method for diagnosing chronic dehydration **Recruitment methods:** Nurses in each home completed the survey questionnaire and clinicians checked the responses.	**Baseline characteristics:** Mean age (n=108): 87.8 years (SD 6.4), Gender: Male (n=15, 16.9%), Female (n=74, 83.1%), Ethnicity: NR, Functional Dependency: Mixed, no other details NR. **Health Characteristics:** Cognitive impairment (Dementia: n=50, 56.2%), Renal impairment (Mean eGFR: 62, SD 24.3), Diabetes (n=10, 11.2%) **Inclusion Criteria:** 1.Living in nursing home for at least 1 week without needing urgent medical care for acute illness. **Exclusion criteria:** 1.IV fluid infusion 2. Dialysis 3. Use of ventilator, continuous positive airway pressure or home-oxygen.	**Outcome measure:** Serum osmolality **How was outcome assessed?** Blood samples were obtained by experienced nurses, 1m after survey conducted (NR if they were fasted or not). Serum osmolality was measured by freezing point depression.	**Sample with dehydration data:** n=89 **Mean SOsm:** 288.5 (SD 6.1) mOsm/kg **Median SOsm:** NR **SOsm Range:** NR **Cut off Used:** Chronic dehydration was classified as: ≥295 mOsm/kg) **# dehydrated according to cut off:** 15 (16.9%)	**Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 3 (3.4%)	LOW		
NU-AGE cohort study	**Design:** Cross-sectional study **Aim:** To assess which osmolarity equation best predicts directly measured serum/plasma osmolality and	**Baseline characteristics:** Mean age (n=1088): 71years (SD 4), Gender: Male (n=484, 44.5%), Female (n=604, 55.5%), Ethnicity: NR, Functional Dependency: Independent	**Outcome measure:** Serum osmolality and Calculated serum osmolarity **How was outcome assessed?**	**Sample with dehydration data:** n=1088 **Mean serum osmolality:** 303 mOsm/kg (SD 12.1)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	1.UK had data for 236 participants, so European	

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
NUAGE & Hooper et al. (2015), UK (16) *[Additional data from NU-AGE cohorts in Italy, Netherlands, France and Poland (All High Income Countries at time of study)* (17) **Setting:** Community	whether its use could add value to routine blood test results through screening for dehydration in older people. This study uses baseline data from the NU-AGE multi-centre RCT. **Recruitment methods:** NR	**Health Characteristics:** Cognition (MMSE <24: n=12, 1.1%), Renal function (eGFR <60: n=169, 15.5%, Diabetes: n=47, 4.3% - mean glucose 8 (SD 1.5)) **Inclusion Criteria:** 1.Aged 65-79 years 2.Community-dwelling (and responsible for own shopping and cooking) 3.Free of disease compromising 2-year survival **Exclusion criteria:** 1.Presence of frailty 2.Heart failure 3.Overt disease such as cancer or dementia 4.Organ failure (unstable, renal, respiratory, liver) 5.Food allergy/ intolerance requiring a special diet 6.Diabetes mellitus type I or Diabetes mellitus type 2 with insulin therapy 7.Chronic use of corticosteroid medication 8.Recent use of antibiotics 9.Change in habitual medication use 10.Malnutrition (BMI <18.5 kg/m2, or >10% weight loss within 6 months)	*Serum osmolality:* Bloods were fasted for ≥8 hours, but participants were encouraged to drink water. SOsm measured by freezing point depression. *Calculated serum osmolarity:* ***Calculated using the*** Khajuria and Krahn equation: [1.86 × (Na+ + K+) + 1.15 × glucose + urea + 14]	**Median serum osmolality:** 300mOsm/kg **Serum osmolality Range:** 269-340 mOsm/kg **Cut off Used:** 1.>295mOsm/kg 2.>300 mOsm/kg **# dehydrated according to cut off:** 1.815 (74.9%) 2.523 (48.1%) **Mean Calculated serum osmolarity:** 302 mOsm/L (SD 10.4) **Median Calculated serum osmolarity:** 299mOsm/L **Calculated serum osmolarity Range:** 271-341 mOsm/L **Cut off Used:** 1.>295mOsm/L 2.>300 mOsm/L **# dehydrated according to cut off:** 1.815 (74.9%) 2.464 (42.6%)			data has been added to this. 2.SOsm data >340mOsm/kg was not included (n=85)
O'Neill et al. (1989), United Kingdom *(NR but assumed from Author details) (High Income)* (18)	**Design:** Cross-Sectional **Aim:** 1.To confirm preliminary findings. 2. To determine whether the development of a hyperosmolar state was related to the degree of confusion and what effect the fluid intake had on osmolality.	**Baseline characteristics:** Mean age (n=39): 83 years (Range:72-93), Gender: Female (n=39, 100%), Ethnicity: NR, Functional Dependency: Mixed-Only 4 residents were ambulant independently. **Health Characteristics:** Cognitive impairment (Mean MSQ on 'non-confused ward': 8, and 0 on 'General ward') , Renal impairment: NR, Diabetes: NR	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Single sample of blood taken at 2pm. Used the depression of freezing point method (Roebling osmometer) to measure plasma osmolality.	**Sample with dehydration data:** n=39 **Mean POsm:** 302 mOsm/kg (SD or SE 8). **Median POsm:** NR **POsm Range:** 280-317 mOsm/kg **Cut off Used:** 295 mOsm/kg	**Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 23 (59.0%)	HIGH	Unsure if SD or SE was reported for plasma osmolality

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
Setting: LTC: 2 continuing care wards.	**Recruitment methods:** 2 Female long stay wards. All residents were recruited to the study.	**Inclusion Criteria:** All residents of 2 female continuing care wards: Ward 1 admitted heavily dependent people, who were either minimally confused or not confused, and ward 2 had no selection procedure. **Exclusion criteria:** None	It was NR if bloods were fasted or not.	**# dehydrated according to cut off:** 32 (82.1%)			
O'Neill et al. (1990), United Kingdom *(Country presumed due to Author details) (High Income)* (19) **Setting:** LTC: 6 Continuing care wards	**Design:** Cohort study **Aim:** To examine the relationship between osmolality and mortality at 2 years for functionally limited older adults in continuing care units **Recruitment methods:** Continuing care ward residents were drawn at random to take part in the study.	**Baseline characteristics:** Mean age (n=58): 81 years (SD 7, Range: 67-101), Gender: Male (n=25, 43.1%), Female (n=33, 56.9%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment (Moderate impairment: n=1, 1.7%), Diabetes Mellitus: (n=1, 1.7%) **Inclusion Criteria:** 1.Resident on a continuing care ward for at least 3 months 2.No medication changes in the previous 2 weeks 3.No clinical illness at the time of study or in the 3 weeks prior **Exclusion criteria:** NR	**Outcome measure:** Plasma osmolality **How was outcome assessed?** POsm measured using freezing point depression. Bloods were not fasted.	**Sample with dehydration data:** n=58 **Mean POsm:** 304mOsmol/kg (SD 8) **Median POsm:** NR **POsm Range:** 285-322 mOsmol/kg **Cut off Used:** 1.>296 mOsmol/kg 2.Author stated accepted normal range was: 281-297 mOsmol/kg **# dehydrated according to cut off:** 51 (88%) were not within the normal range (2).	**Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 40 (69.0%)	HIGH	
O'Neill et al. (1997), United Kingdom *(NR but assumed from Author details) (High Income)* (20) **Setting:** LTC: 4 Continuing care wards	**Design:** Cross-sectional **Aim:** To provide information on average fluid intake, POsm and arginine vasopressin (AVP) in residents of continuing care wards, and to examine the thirst, POsm and AVP responses to dehydration in these individuals. **Recruitment methods:** All residents of four continuing	**Baseline characteristics:** *Mean age of Group A-* Group A, 82.5 years (95% CI:76.1-88.9), *Mean age of Group B:* 80.2 years (95% CI: 74.1-86.3), Gender: NR, Ethnicity: NR, Functional Dependency: Assessed using the Crichton Royal Scale -*Group A:* 13.5 (8.6-18.4), *Group B:* 14.5 (10.9-18.1) **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Resident of a continuing care ward	**Outcome measure:** Fluid Intake and Plasma Osmolality **How was outcome assessed?** *Plasma osmolality* was measured at freezing point depression. 16 hour fasted blood samples. *Fluid intake* was measured by nursing staff (for group	**Sample with dehydration data:** N=12 **Mean POsm:** Group A (n=6): 294.2mOsmol/kg (95% CI: 289.5-298.9) Group B (n=6): 293.8 mOsmol/kg (95% CI: 289.1-298.5) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR	Osm **Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 3 (25%) OFI **Cut off Used:** >1.5l	LOW	1. Fluid intake also measured, but measures of variance NR.

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
	care wards who wished to take part, and who were able to give written informed consent were included in the study.	2.Able to give written informed consent **Exclusion criteria:** NR	A), whom were asked to tip from a 1l jug of water a quantity of fluid equal to what the participant had just consumed for each drink throughout a 24-hour period.	**# dehydrated according to cut off:** NR **Sample with OFI data:** n=12 **Mean 24hr FI:** Group A (n=6)-1100ml **Median 24hr FI:** NR **FI Range:** NR **Cut off Used:** NR **# not meeting cut off:** NR	**# dehydrated according to cut off:** 5 (41.7%)		
Phillips et al. (1984), UK *(High Income)* (21) **Setting:** Community	**Design:** Non-randomised experimental study **Aim:** To determine whether responses to dehydration are altered with age. **Recruitment methods:** voluntary participation, no further details provided.	**Baseline characteristics:** Mean age (n=7): 71, Age Range: 67-75), Gender: Male (n=7, 100%), Ethnicity: NR, Functional Dependency: Independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Community-living 2.No medications 3.Fitness determined by clinical history, physical examinations, biochemical and hematologic investigations 4.Normotensive **Exclusion criteria:** 1.Renal, cardiovascular, respiratory, and neurologic diseases	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Plasma osmolality: Tea & coffee restricted morning of blood sample and alcohol restricted for 24 hrs before. Osmolality measured using a vapor pressure osmometer.	**Sample with dehydration data:** n=7 **Mean POsm:** 288.4mOsmol/kgH_20 (SE 1.3) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	**Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 0	LOW	
Phillips et al. (1991), Australia *(High Income)* (22) **Setting:** Community	**Design:** Non-randomised experimental study **Aim:** To define further the deficit in thirst in the elderly by investigating their thirst responses to an osmotic stimulus.	**Baseline characteristics:** Mean age (n=7): 70, Age Range: 65-78), Gender: Male (n=7, 100%), Ethnicity: NR, Functional Dependency: Independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:**	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Overnight fasting bloods and abstained from alcohol for 24 hrs.	**Sample with dehydration data:** n=7 **Mean POsm:** Pre-Isotonic infusion group: 283 mOsm/kg Pre-hypertonic infusion group: 279 mOsm/kg	Unable to calculate, so study excluded from the meta-analysis	HIGH	1.Unable to interpret measure of variance from the graph.

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
	Recruitment methods: voluntary participation, no further details provided.	1.Normal, unrestricted diet 2.Taking no medications 3. Passed clinical biochemical and hematologic screening to ensure fitness **Exclusion criteria:** NR	Osmolality measured using a vapor pressure osmometer.	**Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR			
Phillips et al. (1993), Australia *(High Income)* (23) **Setting:** Community	**Design:** Non-randomised experimental study **Aim:** To determine whether the oropharyngeal preabsorptive influences on thirst, AVP, and ANP are also altered by age. **Recruitment methods:** NR	**Baseline characteristics:** Mean age (n=10): NR, Age Range: 64-76), Gender: Male (n=10, 100%), Ethnicity: NR, Functional Dependency: Independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Underwent clinical, biochemical, and hematologic screening to ensure medical fitness before the experiment 2. No medications 3. Normal unrestricted diet **Exclusion criteria:** NR	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Plasma osmolality: Tea & coffee restricted morning of blood sample and alcohol restricted for 24 hrs before. Osmolality measured using a vapor pressure osmometer.	**Sample with dehydration data:** n=10 **Mean POsm:** 290.4mosmol/kgH$_2$0 (SE 3.1) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	**Cut off Used:** >300 MOsm/kg **# dehydrated according to cut off:** 2 (20%)	HIGH	
Simmons et al. (2001), United States *(High Income)* (24) **Setting:** LTC: nursing home	**Design:** Non-randomised experimental study **Aim:** To evaluate a three-phase, behavioural intervention to improve fluid intake in nursing home residents. **Recruitment methods:** Incontinent participants were identified by nursing staff for the larger trial.	**Baseline characteristics:** Mean age for intervention group (n=48): 88.7years (SD 7.1) Mean age for control group (n=15): 86.3years (SD 6.1), Gender: Male (n=9, 14.3%), Female (n=54, 85.7%), Ethnicity: Intervention group (White: n=45, 94%), Control group (n=14, 93%), Other ethnicities NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment (Mean eGFR: 54.8, SD 13.7), Diabetes: NR **Inclusion Criteria:** LARGER TRIAL: 1.Incontinent of urine but free of a catheter	**Outcome measure:** Serum osmolality **How was outcome assessed?** NR how SOsm was measured, or whether bloods were fasted or not.	**Sample with dehydration data:** Intervention group: n=14, Control group: n=14 **Mean SOsm:** Intervention Group: 303.6 (SD 9.1) Control group: 303.4 (SD 8.5) **Median SOsm:** NR **SOsm Range:** NR **Cut off Used:** >305 reflected dehydration **# dehydrated according to cut off:** Intervention group: n=15 (88%), Control group: n=10 (67%)	**Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:** 18 (64.3%)	LOW	1.Osm units were NR.

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
		2.Aged ≥65 years 3.Able to comprehend English or Spanish, 4.Able to pass a responsiveness screen **Exclusion criteria:** NR					
Sri-on et al. (2023), Thailand *(Upper-middle income)* (25) **Setting:** Community	**Design:** Cohort study **Aim:** Determine the prevalence of HD and factors affecting HD in older adults and to develop a risk score that could be used to predict HD among community-dwelling older adults in an Asian country. **Recruitment Methods:** Participants screened from the population-based 'Bangkok Falls Study' for eligibility. Researchers used snowball sampling to recruit further participants.	**Baseline characteristics:** Median age(n=704): 72 (IQR: 68-77), Gender: Male (n=215, 30.5%), Female (n=489, 69.5%), Ethnicity: NR, Functional Dependency: Mixed-dependency (233 ,27.1%, assumed to be functionally independent) **Health Characteristics:** Cognitive impairment: Median 6-CIT score was 6 (IQR:4-8), Renal impairment: 0 (exclusion), Diabetes Mellitus (total sample): 177/704 (25.1%), Non-HD group: 103/493, 20.9%, Current HD group: 29/59, 49.2%. **Inclusion Criteria:** 1.Adults aged ≥60 years 2. Lived in one of 5 subdistricts of the Dusit District, Bangkok. 3.Walk at least 6 meters 4.Lived in the community for at least 2 years **Exclusion criteria:** 1. Unable to speak Thai 2. Severe cognitive impairment of >12 points on the 6-item cognitive screening test 3. Blindness 4. Deafness 5. Congestive heart failure 6. End stage renal disease (at least stage 3, eGFR <60ml/min) 7. Missing serum osmolality data	**Outcome measure:** Serum osmolality **How was outcome assessed?** 12ml of non-fasted venous blood collected from participants by lab technologists between 8-9am, and 6ml was used to measure serum osmolality using an automatic osmometer using freezing point depression method.	**Sample with dehydration data:** N=704 **Mean SOsm:** NR **Median SOsm:** NR **SOsm Range:** NR **Cut off Used:** **1.**>300 mOsm/kg **2.**>295mOsm/kg **# dehydrated according to cut off:** **1.** 59 (8.4%, 95% CI: 6.4-10.7) **2.** 152 (21.6%, 95% CI: 18.6-24.8)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	
Stachenfeld, et al. (1996), United	**Design:** Non-randomised experimental study	**Baseline characteristics:** Mean age (n=6): 72 (SE 2, Range:67-76), Gender: Male (n=3, 50%),	**Outcome measure:** Plasma osmolality	**Sample with dehydration data:** N=6	Cut off Used: >300 MOsm/kg	LOW	SOsm data taken from Fig.1B, which

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
States *(High Income)* (26) **Setting:** Community	**Aim:** Compare the thirst, drinking, and renal responses of healthy older and younger subjects during a hypertonic saline infusion and a subsequent 3-hr ad libitum drinking period. **Recruitment Methods:** Healthy participants (6 older, 6 younger) were required to pass a physical exam and provided written informed consent.	Female (n=3, 50%), Ethnicity: NR, Functional Dependency: Functionally Independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: 0, Diabetes: NR **Inclusion Criteria:** 1. Healthy and passed a physical examination. 2. Aged >65. **Exclusion criteria:** 1.Hypertension	**How was outcome assessed?** Plasma was drawn off for the immediate analysis of Posm (freezing-point depression, model 3Dll Advanced Instruments).	**Mean POsm:** 286mOsm/kg (SE 1.5) **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	# dehydrated according to cut off: 0		was difficult to read.
Stachenfeld, et al. (1997), United States *(High Income)* (27) **Setting:** Community (Setting is assumed, due to healthy participants being recruited for the experiment)	**Design:** Cross-sectional **Aim:** examined the role of central volume expansion in the thirst and drinking behaviour in older individuals. **Recruitment methods:** 6 older and 6 younger healthy people were recruited to the study. Subjects passed a physical exam.	**Baseline characteristics:** Mean age of Older group (n=6): 70 years (SD 2, Range: 65-76 years), Gender: 3/6 50% female, Ethnicity: NR, Functional Dependency: Functionally independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: None (Mean eGFR: *'Time control' group*- 88.9, SD 15.8, '*Head out water immersion' group*- 101.1, SD 10.6), Diabetes: NR **Inclusion Criteria:** 1. Pass a physical exam 2. Screened for cardiovascular disease **Exclusion criteria:** 1. Cardiovascular disease	**Outcome measure:** Plasma osmolality **How was outcome assessed?** 2ml of blood collected from each participant 30 mins after arriving at the laboratory (Caffeine and alcohol avoided 24 hr prior to sample collection). Plasma osmolality was measured at freezing point depression.	**Sample with dehydration data:** N=6 **Mean POsm:** *Time Control group*= 293mOsmol-kg-1 H_20, *Head out water Immersion group*= 294mOsmol-kg-1 H_20 **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	Standard Error reported on the graph, but difficult to interpret from the graph.
Takamata et al. (1999), Japan *(High Income)* (28) **Setting:** Community	**Design:** Non-randomised experimental study **Aim:** To test the hypothesis that older people have the ability to increase blood volume (BV) and to improve body fluid regulatory responses to thermal dehydration after a	**Baseline characteristics:** Mean age of Older group (n=9): 70 (SE 3), Gender: Male (n=9, 100%), Ethnicity: NR, Functional Dependency: Functionally independent **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1. Had to pass a physical examination	**Outcome measure:** Plasma osmolality **How was outcome assessed?** Used the depression of freezing point method to measure plasma osmolality. Bloods were presumed to be non	**Sample with dehydration data:** n=9 **Mean POsm:** 294 mOsm/kg H_20 **Median POsm:** NR **POsm Range:** NR **Cut off Used:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	SE is reported on Figure 2, but difficult to interpret

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
	6-day repeated exercise-heat acclimation exposure program **Recruitment methods:** NR	**Exclusion criteria:** NR	fasted, as authors state that participants had a "light breakfast" prior to blood sampling.	**# dehydrated according to cut off:** NR			
Wu et al. (2011), Taiwan *(Upper-middle Income)* (29) **Setting:** LTC: Nursing homes in Kaohsiung.	**Design:** Cross-sectional **Aim:** To investigate fluid intake, dehydration and the key factors affecting nursing home residents' fluid intake and dehydration. **Recruitment methods:** Convenience sampling of participants in nursing homes, either directly, or via family members.	**Baseline characteristics:** Mean age (n=111): 74.9years, Age range: 41-103 years (83.8% ≥65 years), Gender: Male (n=46, 41.4%), Female (n=65, 58.6%), Ethnicity: NR, Functional Dependency: Mixed (73% totally dependent for ADLs) **Health Characteristics:** Cognitive impairment (Dementia: n=20, 18%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Nursing Home resident >30days 2.Willing to participate 3.Normal renal function (Cr <1.5, units not stated) **Exclusion criteria:** 1.Severe renal or heart failure requiring fluid restriction	**Outcome measure:** Serum osmolality and Fluid Intake **How was outcome assessed?** *Serum osmolality:* It was NR if bloods were fasted or not, and no information about how SOsm was measured, other than in a lab. *Fluid Intake:* Food and fluids were recorded by Nurse Aides for 3 consecutive days.	**Sample with Osm data:** N=111 **Mean SOsm:** 287.85mmol/kg (SD 10.51) **Median SOsm:** NR **SOsm Range:** 253.2-313.8mmol/kg **Cut off Used:** ≥300mmol/kg **# not meeting cut off:** 6 (5.4%) **Sample with OFI data:** n=111 **Mean 24hr FI:** 2083ml (SD 876.4) **Median 24hr FI:** NR **FI Range:** 900-3612ml **Cut off Used:** 1.Skipper's formula [100ml/10kg bw for first 10kg; then 50ml/kg bw for next 10kg, then 15mls/kg bw for remaining kg of bw]: 1959ml (SD 192). 2.<1500ml **# dehydrated according to cut off:** 1.Skipper's formula: 50 (45.1%) 2.<1500ml: 24 (21.6%)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	Barthel Index was measured but NR.
Zappe (1996) United States *(High Income)* (30)	**Design:** Non-randomised experimental study **Aim:** To examine renal excretory, fluid intake, and plasma hormonal responses to	**Baseline characteristics:** Mean age (n=6): 67 years (SD 1, Range:62-70), Gender: Male (n=6, 100%), Ethnicity: NR, Functional Dependency: Independent	**Outcome measure:** Plasma osmolality and fluid Intake **How was outcome assessed?**	**Sample with dehydration data:** N=6 **Mean POsm:** 292mOsmol/kgH_20 (SE 2) **Median POsm:** NR	<u>**Osm**</u> **Cut off Used:** >300 mOsm/kg **# dehydrated according to cut off:**	HIGH	1.Participants consumed 600mg (16.2mmol) of lithium

	Serum (SOsm) or plasma (POsm) osmolality						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of bias assessment**	**Comments**
Setting: Community	prolonged exercise in healthy, active, older men. **Recruitment methods:** NR	**Health Characteristics:** Cognitive impairment: NR, Renal impairment: n=0-exclusion criteria (Mean GFR:57, SE6) Diabetes: NR **Inclusion Criteria:** 1.Normotensive (< 140 mmHg systolic and <90 mmHg diastolic pressure) 2. No prior history of renal disease or allergic reactions 3.Not taking any medications 4. Deemed safe to exercise for prolonged periods in a warm environment. **Exclusion criteria:** NR	*Plasma osmolality:* Blood sampling NR, but osmolality measured by freezing point depression. *Fluid Intake:* Self report	**POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR **Sample with OFI data:** n=6 **Mean 24hr FI:** 23 ml/day/kg body weight (SE 2) **Median 24hr FI:** NR **FI Range:** NR **Cut off Used:** NR **# not meeting cut off:** NR	0 (0%) OFI **Cut off Used:** >1.5l **# dehydrated according to cut off:** 0 (0%)		carbonate the night before the experiment.

	Calculated serum or plasma osmolarity						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	Risk of Bias assessment	**Comments**
Arinzon et al. (2008), Israel *(High Income)* (31) **Setting:** LTC: Long stay psychogeriatric wards	**Design:** Randomised controlled trial **Aim:** The purpose of this study was to examine whether enteral nutrition is an effective tool in improving survival, nutritional and functional status in very dependent older adults with dementia, and its correlation with nutritional parameters **Recruitment methods:** Residents of 3 psychogeriatric wards for terminal (advanced vascular and degenerative types of dementia) older adults were included in the study.	**Baseline characteristics:** Mean age (n=167): 80.17 years, Gender: Male (n=41, 25%), Female (n=126, 75%), Ethnicity: NR, Functional Dependency: ENG group included 57 severely dependent older adults with dementia, 74% (42/57) of those from the ENG group received nutrition through NGT and the remainder by PEG. **Health Characteristics:** Cognitive impairment (n=57, 34.1%), Renal impairment (CKD-n=48, 28.7%), Diabetes Mellitus (n=41, 24.5%) **Inclusion Criteria:** NR **Exclusion criteria:** NR	**Outcome measure:** Calculated plasma osmolarity **How was outcome assessed?** Calculated using the following formula: [2x (Na + K) + (glucose/18) + BUN/28]. NR whether if bloods were fasted or not.	**Sample with dehydration data:** n=167 **Mean Calculated POsm:** Control group (n=110): 290.24mmol/kg (SD/SE 11.66) ENG (enteral nutrition) group (n=57): 292.18 (SD/SE 13.51) **Calculated POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** **Control group: 15 (13%)** **ENG group: 15 (26%)**	**Cut off Used:** >300 mmol/L **# dehydrated according to cut off:** 38 (22.8%)	LOW	Measure of variance for calculated plasma osmolarity was not clarified- either SD or SE
Arinzon et al. (2011), Israel *(Country presumed due to Author details) (High Income)* (32) **Setting:** LTC: 3 long-stay geriatric wards	**Design:** Prospective study **Aim:** To examine factors associated with delirium in older adults living with dementia, who are functionally limited and living in a LTC	**Baseline characteristics:** Mean age (n=92):79.86 (SD 6.31, Range: 65-93), Gender: Male (n=18, 20%), Female (n=74, 80%), Ethnicity: NR, Functional Dependency: Mixed	**Outcome measure:** Calculated plasma osmolarity **How was outcome assessed?** The calculation for osmolarity was: [2x (Na + K) + (glucose/18+BUN/28)]. It was NR if bloods were fasted or not.	**Sample with dehydration data:** n=92 **Mean Calculated POsm:** Cluster 1 (n=25): 298.02 (SD 21.41) Cluster 2 (n=50): 301.05 (SD 21.83) Cluster 3 (n=17): 303.43 (SD19.15)	**Cut off Used:** >300 mmol/L **# dehydrated according to cut off:** 47 (51.1%)	LOW	Units for Osmolarity were NR.

	Calculated serum or plasma osmolarity						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	Risk of Bias assessment	**Comments**
	setting and how the factors influence the duration and outcome of delirium. **Recruitment methods:** Any resident who was admitted to the long-stay geriatric ward.	**Health Characteristics:** Cognitive impairment (Mean MMSE: 2.59, Dementia n=83, 90%), Renal impairment (chronic renal failure n=28, 30.4%, Diabetes Mellitus (n=26, 28.2%) **Inclusion Criteria:** 1.All residents aged ≥65 years admitted to 3 long stay geriatric wards for one week or more **Exclusion criteria:** 1.Expected life of <24 hours.		**Median Calculated POsm:** NR **Calculated POsm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR			
Botigue et al. (2019), Spain *(High Income)* (33) **Setting:** LTC: 156 bed nursing home	**Design:** Cross-sectional study **Aim:** To identify the factors associated with dehydration and the individuals most at risk." **Recruitment methods:** Residents were randomly selected to participate.	**Baseline characteristics:** Mean age(n=53): 86.5years (SD 8.1), Gender: Male (n=11, 20.8%), Female (n=42, 79.2%), Ethnicity: NR, Functional Dependency: Mixed (80% totally dependent (BI<20), 20% severely dependent (BI<60)). **Health Characteristics:** Cognitive impairment (MMSE score <23: n=38, 71.7%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:**	**Outcome measure:** Calculated serum osmolarity and Fluid Intake **How was outcome assessed?** *Calculated osmolarity:* No calculation provided, or details of blood sampling *Fluid Intake:* Collected over 24hrs/day for a week. Caregivers responsible for recording OFI of the same residents all day, and all drinks were served in measuring cups.	**Sample with dehydration data:** n=53 **Mean Calculated SOsm:** NR **Median Calculated SOsm:** NR **Calculated SOsm Range:** NR **Cut off Used: >**300mmol/L **# dehydrated according to cut off:** 30 (28.3%) **Sample with OFI data:** n=53 **Mean 24hr FI:** 1768.5ml (SD 542.2) **Median 24hr FI:** NR **FI Range:** 737-3440ml **Cut off Used:** Skipper's formula and <1500ml/day	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	Very limited details about calculated serum osmolarity.

	Calculated serum or plasma osmolarity						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	Risk of Bias assessment	**Comments**
		1.Nursing home residents **Exclusion criteria:** NR		**# not meeting cut off:** Skipper's formula: 50 (94.3%) <1500ml: 42 (79.2%)			
NHANES cohort study NHANES 17-20 & Stookey et al. (2005), United States *(High Income)* (34) *[With NHANES data from 2017-March 2020] (35)* **Setting:** Community	**Design:** Cross-sectional study **Aim:** NHANES is a nationally representative survey set up to track the nutritional status of Americans **Recruitment methods:** Households are randomly selected using a statistical process 9 sampled using a stratified, multistage probability cluster design) using U.S. Census Information. NHANES interviewers then contact participants in person and assess eligibility. Volunteers are not accepted.	**Baseline characteristics:** Mean age (n=1999): 73.3 years (SD 5.4) Range: 65-80+ years, Gender: Male (n=1026, 51%), Female (n=973, 49%), Race/Hispanic origin: *Hispanic* (inc *Mexican American)*- n=312, 15.6%, *Non-Hispanic White*-n=1011, 50.5%, *Non-Hispanic Black*-n=447, 22.4%, Asian-n=153, 7.7%, *Multi-Racial or other*-n=76, 3.8%, Functional Dependency: Unclear **Health Characteristics**: Cognitive impairment: NR, Renal impairment (n=175, 8.8%), Diabetes: (n=653, 32.7% - 3.9% of these were borderline) **Inclusion Criteria:** 1.Aged over 65years, listed on the US Census 2.Non-instituionalised	**Outcome measure:** Serum/plasma osmolarity **How was outcome assessed?** 9 hour fasted blood draw and osmolarity is calculated using the following equation: (1.86*Na) + (GLUC/18) + (BUN/2.8) + 9 (Sodium, Glucose and BUN units unclear).	**Sample with dehydration data:** n=1999 **Mean calculated osmolarity:** 283.8 mmol/kg (SD 6.2) **Median calculated Osm:** 284 mmol/kg **Calculated Osm Range:** 252-310 mmol/kg **Cut off Used:**>295mmol/kg and ≥300 mmol/kg **# dehydrated according to cut off:** >295mmol/kg: 84 (4.2%) >300 mmol/kg: 15 (0.75%)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	1.NHANES 19-20 data collection was suspended due to the Covid-19 pandemic in March 2020 (18/30 survey sites had collected data). The data from the 18 survey sites were not nationally representative, so they were combined with data from the NHANES 2017-18 cycle. A special weighting process was applied to the 2017-March2020 pre-pandemic data files. 2.Participants aged 80+ were classified as '80' due to disclosure concerns, so the reported mean age is likely to be low. The weighted mean age for those aged 80+ is 85 years. 3.Serum/plasma osmolarity values <250 & >340 were excluded

	Calculated serum or plasma osmolarity						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	Risk of Bias assessment	**Comments**
		Exclusion criteria: Adults living in LTC settings					
Siervo et al. (2015), UK *(High Income)* (36) **Setting:** Community and LTC: Participants were eligible from whichever setting.	**Design:** Cohort study **Aim:** To assess whether objectives measures of hydration (ie. serum osmolarity and haematocrit concentration) modified the association between the impedance index (HT2/Z) and TBW using baseline data from the Newcastle 85+ Study **Recruitment methods:** Participants were identified via the GP	**Baseline characteristics:** Mean age (n=677): 85years, Gender: Male (n=274, 40.5%), Female (n=403, 59.5%), Ethnicity: Caucasian (99%), other ethnicities NR, Functional Dependency: NR **Health Characteristics:** Cognitive impairment: NR, Renal impairment (Mean eGFR: 54.8, SD 13.7), Diabetes: NR **Inclusion Criteria:** 1.Born in 1921 2.Registered with a Newcastle or North Tyneside GP, in the UK **Exclusion criteria:** 1.Recent deaths 2.Terminal illness	**Outcome measure:** Calculated serum osmolarity **How was outcome assessed?** Blood samples were fasted and collected by a trained nurse. The Khajuria and Krahn equation was used to calculate osmolarity [1.86x(Na+K)+1.15x glucose+urea+14].	**Sample with dehydration data:** n=677 **Mean SOsm:** 294mOsm/L (SD 6.8) **Median SOsm:** NR **SOsm Range:** NR **Cut off Used:** Impending dehydration:295-300mOsm/L Dehydration: >300mOsm/L **# dehydrated according to cut off:** Impending dehydration: 195 (28.7%) Dehydration: 122 (17.9%)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	
Tanaka et al. (2020), Japan *(High Income)* (37) **Setting:** Community	**Design:** Retrospective cross-sectional study **Aim:** To investigate the seasonal variation in hydration status among the	**Baseline characteristics:** *Spring:* Mean age (n=235): 69.5years (SD 4.6), Gender: Male (n=174,	**Outcome measure:** Calculated Plasma osmolarity **How was outcome assessed?** Bloods were fasted for overnight.	**Sample with dehydration data:** Spring: n=235 Summer: n=265 Autumn: n=213 Winter: n=190	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	

	Calculated serum or plasma osmolarity						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	Risk of Bias assessment	**Comments**
	community-dwelling older adults in Japan **Recruitment methods**: Records from older adults attending an annual health check up at the Nihon University Hospital between January- December 2019.	74%), Female (n=61, 26%), Ethnicity: NR, Functional Dependency: NR *Summer:* Mean age (n=265): 69.4years (SD 4.4), Gender: Male (n=206, 77.7%), Female (n=59, 22.3%), Ethnicity: NR, Functional Dependency: NR *Autumn:* Mean age (n=213): 69.6years (SD 4.1), Gender: Male (n=133, 62.4%), Female (n=80, 37.6%), Ethnicity: NR, Functional Dependency: NR *Winter:* Mean age (n=190): 69.8years (SD 5.2), Gender: Male (n=117, 61.6%), Female (n=73, 38.4%), Ethnicity: NR, Functional Dependency: NR **Health Characteristics:** Cognitive impairment (Dementia: n=121, 99.2%), Renal impairment (Mean eGFR: *Spring*- 65.9, SD 11.6, *Summer*- 66.9, SD 11.6,	Calculation for plasma osmolarity: 2 × (sodium [mEq/L] + potassium [mEq/L]) + glucose [mg/dL] ∕ 18 + BUN [mg/dL] ∕ 2.8.	**Mean Calculated POsm:** Spring: 306.1 mOsm/L (SD3.9) Summer: 305.1 mOsm/L (SD3.8) Autumn: 305.0 mOsm/L (SD4) Winter: 305.3 mOsm/L (SD4.2) **Median Calculated POsm:** NR **Calculated POsm Range:** NR **Cut off Used:** >300 mOsm/L **# dehydrated according to cut off:** Spring: 225 (95.7%) Summer: 251 (94.7%) Autumn: 196 (92%) Winter: 176 (92.6%)			

	Calculated serum or plasma osmolarity						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	Risk of Bias assessment	**Comments**
		Autumn- 65.3, SD 11.6, *Winter*- 66.8, SD 12.6), Diabetes Mellitus (*Spring*: n=38, 16.2%, *Summer*: n=27, 10.2%, *Autumn:* =15, 7.0%, *Winter*: n=28, 14.7%) **Inclusion Criteria:** 1.Aged ≥65 years 2.Attending the hospital for a check up during the set time frame. **Exclusion criteria:** 1.eGFR <30 mL/min/1.73 m2 2.Missing data on the study laboratory parameters					

		Salivary Osmolality					
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Mentes et al. (2019), United States *(High Income)* (38) **Setting:** Community – users of Senior centres and Day centres.	**Design:** Cross-sectional **Aim:** To examine the relationship between hydration status as measured by salivary osmolality and personal hydration habits in a community-dwelling population of older adults. **Recruitment methods:** Convenience sampling of older adults who use 2 senior centres and 1 adult day care centre in Los Angeles.	**Baseline characteristics:** Mean age (n=53): 79.91 years (SD 7.84), Median age (n=53): 81 years (IQR 12), Gender: Male (n= 13, 24.53%), Female (40, 75.47%), Ethnicity: Black or African American (n=15, 28.3%), White or Caucasian (n= 38, 71.7%), Functional Dependency: NR **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes (n=22, 41.5%) **Inclusion Criteria:** 1.Aged 65 years or older 2. Can speak and read English or Farsi 3. Able to give informed consent. **Exclusion criteria:** 1.Medically unstable - hospitalized within the past month 2.Unable to drink fluids 3.Receiving dialysis 4.Terminally ill	**Outcome measure:** Salivary Osmolality **How was outcome assessed?** Using a freezing point depression salivary osmometer morning and early afternoon, by trained research assistants.	**Sample with dehydration data:** n=53 **Mean Osm:** Morning osmolality: 143.6 mOsm/kg (SD 65.8), Afternoon osmolality: 125.3 mOsm/kg (SD 56.8). **Median Osm:** Morning osmolality: 125 mOsm/kg Afternoon osmolality: 110.25 mOsm/kg **Osm Range:** NR **Cut off Used:** NR **# dehydrated according to cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	Author confirmed that they collected no dehydration data.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Adams (1988), United States *(High Income)* (39) **Setting:** LTC: Nursing home and Community	**Design:** Cross-sectional **Aim:** To describe and compare the fluid intake practices of community-dwelling older adults and older adults living in LTC settings, in relation to time pattern, amount and type of fluid intake. **Recruitment methods:** Older adults selected from 3 long term care facilities and convenience sample of personal contacts with friends and neighbours in the community for community-dwelling participants.	**Baseline characteristics:** Mean age (n=60): NR (Range: 65-85 years), Gender: NR, Ethnicity: NR, Functional Dependency: NR **Health Characteristics:** NR (see exclusion criteria) **Inclusion Criteria:** 1. Living in care homes (n=30) or the community (n=30), aged 65-85 years **Exclusion criteria:** 1.Cognitive impairment 2.Major disabilities 3.Diabetes mellitus	**Outcome measure:** Fluid intake **How was outcome assessed?** Participant were instructed on how to record their fluid intake for 3 consecutive days.	**Sample with OFI data:** n=60 **Mean 24hr OFI:** Care home residents:1507ml, Community dwellers:2115ml **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** 1500ml **# not meeting cut off:** 0 (0%)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	Measure of variance NR for OFI

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Antoniw (1995), United States *(High Income)* (40) **Setting:** LTC: 122 bed Skilled nursing facility	**Design:** Cross-sectional study **Aim:** To gain insight on the prevalence and effectiveness of using liquids thickened with commercial thickeners to assist older adults living in LTC settings, who have difficulty swallowing thin liquids, in meeting their daily nutrient needs **Recruitment methods:** The Chief Dietician or Food Service Director from each nursing home was contacted via phone to complete the survey, and also sought their approval to conduct the 2nd part of the study in their homes.	**Baseline characteristics:** Mean age (n=16): 84.4 years, Age Range: 67-94 years, Gender: Male (n=4, 25%), Female (n=12, 75%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** NR **Inclusion Criteria:** 1.Aged ≥65 years 2.Have dysphagia 3.On a diet including commercially thick liquids 4.Receive all nutrition from food orally. **Exclusion Criteria:** NR	**Outcome measure:** Fluid Intake **How was outcome assessed?** Food and fluid intake recorded by nursing staff and visually inspected by Dietician over 3 days.	**Sample with OFI data:** n=16 **Mean 24hr OFI:** From commercial thickened liquids: 1204ml (SD 399) **Median 24hr OFI:** From commercial thickened liquids:1455ml **OFI Range:** 645-1670ml **Cut off Used:** Mean fluid requirement of the dysphagic residents had been calculated as: 1511ml (SD 296) [multiplying a subject's current body weight in kg by 30ml per kg body weight] **# not meeting cut off:** NR	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 12 (75%)	HIGH	
Bannerman et al. (2011), UK *(High Income)* (41) **Setting:** LTC: 3 care homes in Scotland	**Design:** Cross-sectional **Aim:** To evaluate and compare energy, protein, non-starch polysaccharide, and fluid intakes of a care home population consuming a texture modified diet (TMD) with those on a standard diet. **Recruitment methods:** Three CQC registered care homes were randomly selected from Edinburgh, Scotland and approached regarding their involvement in the study.	**Baseline characteristics:** Mean age: *Standard texture diet group* (n=15): 88.7 years (SD 3.7, 95% CI 86.7-90.7), *Texture modified diet* (n=15): 87.4 years (SD 7.1, 95% CI 83.5-91.3), Gender: Male: *Standard texture diet group (n*=5, 33%) *Texture modified diet (n*=0, 0%), Female: *Standard texture diet group* (n=10, 66%) *Texture modified diet (n*=15, 100%), Ethnicity:	**Outcome measure:** Fluid Intake (from food and drinks) **How was outcome assessed?** Fluid intake was estimated using standard cup weights, along with observation of how much fluid was consumed.	**Sample with OFI data:** 30 **Mean 24hr OFI:** Standard texture diet group (n=15): 1611ml (SD 362, 95% CI 1411-1812), Texture modified diet (n=15): 1196ml (SD 288, 95% CI 1036-1355). **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** 1.30ml per kg body weight 2.Minimum requirement set at 1500ml/day	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 18 (60%)	HIGH	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		NR, Functional Dependency: Mixed Dependency: Need for assistance with meals: *Standard texture diet group*: No assistance – 11, Limited assistance – 2, Assistance - 2 *Texture modified diet*: No assistance – 2, Limited assistance - 3 Assistance – 10 **Health Characteristics:** Cognitive impairment (n=11, 36.7%, Dementia: n=12, 40%), Renal impairment: NR, Diabetes:NR **Inclusion Criteria:** 1. All residents (males and females, aged >60 years) within the 3 care homes were eligible to participate **Exclusion criteria:** 1.Younger than 60 years 2.Nil by mouth (no oral food or fluid intake) 3.Received artificial nutritional support 4.Had a fluid restriction 5.Acutely unwell at the time of data collection period		**# not meeting cut off:** 7 (23.3%) (based on cut off 1).			

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		6.Receiving palliative care					
Carlsson et al. (2009), Sweden *(High Income)* (42) **Setting:** LTC: 6 group-living facilities for people with Dementia in Sweden.	**Design:** Feasibility study **Aim:** To investigate the feasibility of serving drinkable yoghurt enriched with probiotic bacteria to older adults with Dementia and to test whether the drink could have any possible effect on constipation and BW. **Recruitment methods:** Dietician provided study information to relatives of older adults living in group-living facilities, with dementia.	**Baseline characteristics:** Mean age (n=15): 83.7 years, Age Range: 69-93 years, Gender: Male (n=2, 13.3%), Female (n=13, 86.7%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment (Alzheimer's Disease/Dementia: n=15, 100%), Renal impairment: NR (see exclusion criteria), Diabetes (n=2, 13.3%) **Inclusion Criteria:** 1.Aged ≥65 years 2.Diagnosis of Dementia 3.Diagnosis of constipation **Exclusion criteria:** 1.Those with an expected survival period of <6 months 2.Those expected to deteriorate severely within a corresponding time 3.Terminal illnesses, such as renal failure,	**Outcome measure:** Fluid Intake **How was outcome assessed?** OFI was collected by multiple sources/carers over a 14 day period.	**Sample with OFI data:** n=13 **Mean 24hr OFI:** 1510ml (SD 318) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** 1500ml **# not meeting cut off:** NR	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 6 (46.2%)	LOW	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		severe heart failure and malignant disorders. 4.Dairy intolerance					
Chidester et al (1997), United States *(High Income)* (43) **Setting:** LTC: Nursing home	**Design:** Observational **Aim:** To compare the fluid intake with recommended fluid intake derived from two standards and to observe 24-hour fluid intake (from beverage and food sources) of an older adult population living in long term care **Recruitment methods:** Unclear	**Baseline characteristics:** Mean age (n=40): 86.2 years (Range: 65-100), Gender: Male (n=5, 12.5%), Female (n=35, 87.5%), Ethnicity: White (100%), Functional Dependency: Mixed: 60% needed some physical assistance to move between locations and 23% needed to be fed by staff. **Health Characteristics:** Cognitive impairment (n=25, 63%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Living in long term care	**Outcome measure:** Fluid intake **How was outcome assessed?** Participant observation for 3 consecutive days and FI recorded from food and drink per 24 hours.	**Sample with OFI data:** n=40 **Mean 24hr OFI:**1632ml (SD 573) **Median 24hr OFI:** NR **OFI Range:** 871-3558ml **Cut off Used:** Standard 1:30ml/kg body weight: Mean OFI 1,754 +/-383ml Standard 2: 100ml/kg for first 10kg body weight, 50ml/kg for next 10kg body weight and 15ml/kg for remaining kg of body weight: Mean OFI 1399+/-342ml Standard 3: 1ml/kcal energy consumed: Mean FI 2077+/-192ml **# not meeting cut off:**	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 16 (40.9%)	LOW	*total water intake from food and drinks.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		Exclusion criteria: 1.Acute illness and infection 2.Receiving enteral feeding		Standard 1: 21 (52%) Standard 2: 24 (60%) Standard 3: 36 (90%)			
Craig (2016), Canada *(High Income)* (44) **Setting:** LTC: LTC facilities in Canada and US	**Design:** Cross-sectional study **Aim:** To compare hydration status and fluid intake of older adults on thickened fluid diets to those on thin fluid diets who are residing in long-term care facilities in the United States and Canada **Recruitment methods:** Purposive sampling of care home residents' records to identify those receiving thickened liquids.	**Baseline characteristics:** Mean age (n=39): 88.9 years (SD 6.84), Gender: Male (n=11, 28%), Female (n=28, 72%), Ethnicity: NR, Functional Dependency: Mixed **Health Characteristics:** Cognitive impairment (a range of severe dementia and mild cognitive impairment), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Nursing home residents **Exclusion criteria:** 1.Renal failure 2.Chronic kidney disease 3.Heart disease. 4.Receiving IV fluids 5.Residents on thickened	**Outcome measure:** Fluid Intake **How was outcome assessed?** 3 day average fluid intake calculated from meal consumption charts	**Sample with OFI data:** n=39 **Mean 24hr OFI**: 1283ml **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** <1500ml **# not meeting cut off:** 31 (79%)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	No measure of variance reported for OFI.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		liquids >5 days prior to data collection.					
Dowd et al. (1996), United States *(High Income)* (45) **Setting:** Community: Midwest urban community	**Design:** Randomised controlled trial **Aim:** The following research questions guided the present study: (a) Will women age 50 and over who increase their fluid intake by at least 500 cc have fewer UI (urinary incontinence) episodes? (b) Is there a relation between caffeine intake and UI episodes? **Recruitment methods:** Participants were recruited through local newspapers and via personal and professional contacts	**Baseline characteristics:** Mean age: 70.25 years (Range: 52-89), Median age: 71 years, Gender: Female (n=32,100%), Ethnicity: NR, Functional dependence: Independent. **Health Characteristics:** Cognitive impairment (MMSE score <20: n=0, 0%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Aged ≥50 years. 2.Had UI for 6 months or more 3.Independent in self care 4.Scored over 20 on MMSE 5.English speaking	**Outcome measure:** Fluid Intake **How was outcome assessed?** Women were instructed to record intake using the same measuring cups and glasses for the duration of the study (5 weeks)	**Sample with OFI data:** 32 **Mean 24hr OFI:** Maintain group (n=8): 1748cc, Increase group (n=14): 1804cc, Decrease group (n=10): 1365cc **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** NR **# not meeting cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	LOW	1.SD/SE of Mean OFI NR 2.Had to score over 20 on MMSE

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		Exclusion criteria: 1. If diaries were not sufficiently complete to be included in analysis					
Downey (2012), United States *(High Income)* (46) **Setting:** LTC: 2 long term sub-acute care facilities in New York	**Design:** Retrospective chart review **Aim:** To evaluate the hydration status of nursing home residents who receive thickened liquid consistencies compared to regular liquid consistency and to determine if older adults receiving thickened liquids consume adequate fluids daily. **Recruitment methods:** Information obtained via 50 deidentified medical charts, from 2 agreeing long term care facilities.	**Baseline characteristics**: Mean age: NR, Gender: NR, Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Needed to be medically stable 2.Care home residents aged ≥65 years **Exclusion criteria:** 1.Chronic kidney disease 2.Renal failure 3.Liver disease 4.Reciving IV fluids	**Outcome measure:** Fluid Intake **How was outcome assessed?** From nursing records.	**Sample with OFI data:** n=30 **Mean 24hr OFI:** Thickened fluids: 1290ml/day **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** <1500ml **# not meeting cut off:** Thickened fluids group: 22 (73%)	N/A because Authors provided data in line with the appropriate cut-off.	HIGH	There was a lot of missing information in this thesis.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Gaspar (1999), United States *(High Income)* (47) **Setting:** LTC: 1 urban nursing home in Utah and 2 rural skilled nursing homes in South Dakota	**Design:** Observational study **Aim:** To explore the adequacy of water intake among nursing home residents and to identify variables associated with the adequacy of water intake **Recruitment methods:** Convenience sampling in nursing homes.	**Baseline characteristics**: Mean age (n=99): 85 years, Gender: Male (N=23, 23.2%), Female (N=76, 76.8%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Not on restricted fluids 2.Not receiving tube feedings 3. 70 years of age or older **Exclusion criteria:** NR	**Outcome measure:** Fluid intake **How was outcome assessed?** OFI (from food and drink) was observed per 24 hr period.	**Sample with OFI data:** n=99 **Mean 24hr OFI:** 1968ml (from food and drink), 1468ml (from fluids only) **Median 24hr OFI:** NR **OFI Range:** 597-2988ml (from food and drink), >500ML-2470ml (from fluids only) **Cut off Used:** 1600ML/M_2 BSA (food and drink) <1500ml (fluids only) **# not meeting cut off:** 91 (92%)	Unable to calculate, so study excluded from the meta-analysis	LOW	Measure of variance NR for OFI
Holben et al. (1999), United States *(High Income)* (48) **Setting:** LTC: LTC facility in US	**Design:** Cross-sectional study Aim: To determine actual fluid intake in a group of residents based on 3-day diet record, to compare actual fluid intake to 4 standards of fluid intake, and to assess symptoms of dehydration and the effect of physical and mental dependency factors on fluid intake **Recruitment methods:** NR	**Baseline characteristics:** Mean age (n=121): 84 years (SD 7, Range: 65-99), Gender: NR, Ethnicity: NR, Functional Dependency: Bedbound (n=5, 4.1%), Total dependency (n=28, 23.1%), Extensive assistance (n=11, 9.1%), Limited assistance (n=31, 25.6%), Supervision (n=22, 18.2%) Independent (n=24, 19.8%)	**Outcome measure:** Fluid intake **How was outcome assessed?** OFI recorded by dietary and nursing staff for 3 consecutive days	**Sample with OFI data:** n=121 **Mean 24hr OFI:** 1982ml (SD 549) **Median 24hr OFI:** NR **OFI Range:** 894-4656ml **Cut off Used:** Standard 1: 30ml fluid per kg actual body weight Standard 2: 30ml fluid per kg actual body weight, with a minimum of 1500ml Standard 3: 1ml fluid per kilocalorie energy consumed	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 23 (19.0%)	HIGH	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		Health Characteristics: Cognitive impairment ("Confused": n=95, 78.5%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1. Aged 65-99 years 2. Free of acute illness 3. Resident in LTCF under investigation **Exclusion criteria:** NR		Standard 4: 100ml fluid per kg for the first 10kg actual body weight, 50ml fluid per kg for the next 10kg actual body weight, and 15ml fluid per kg for the remaining kg actual body weight **# not meeting cut off:** NR **% Dehydrated:** Standard 1: 61 (50%) Standard 2: 61 (50%) Standard 3: 39 (32%) Standard 4: 60 (49%)			
Klimesova et al. (2018), Czech Republic *(High Income)* (49) **Setting:** Community	**Design:** Cross-sectional study **Aim:** To assess hydration status and the fluid intake, to determine gender differences in hydration status and fluid intake, and to determine the role of physical activity on hydration status among community-dwelling older adults **Recruitment methods:** Older adults were recruited via printed advertisements at 20 Seniors clubs in Olomouc.	**Baseline characteristics:** Mean age (n=105): 67.2years (SD 3.7, Range: 60+), Gender: Male (n=50, 48%), Female (n=55, 52%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Aged ≥60 years 2.Able to provide informed consent 3.Absence of metabolic diseases 4.Not currently taking diuretics, or other	**Outcome measure:** Fluid Intake **How was outcome assessed?** 4 day weighed food diaries, based on beverages and soups.	**Sample with OFI data:** n=105 **Mean 24hr OFI:** 1144.4ml (SD 445.2) **Median 24hr OFI:** NR **OFI Range:** Men (250-2467.5ml/day), Women (680-1775ml/day) **Cut off Used:** 1.6l/day for Women and 2l/day for Men (for beverage consumption) **# not meeting cut off:** Women: 40 (72.7%), Men: 48 (96%)	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 83 (79%)	HIGH	The authors report # of sample and % of sample dehydrated using consumption of beverages only.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		medications that affect the water content in the body 5.Collection of full information on anthropometric measures 6.Collection of all four urine samples 7.Completion of 4-day food weighed records **Exclusion criteria:** 1.Lack capacity to provide informed consent.					
McCormick et al. (2008), Republic of Ireland *(High Income)* (50) **Setting:** LTC: Geriatric care facility	**Design:** Cross-over study **Aim:** To assess whether the use of pre-thickened, standardised consistency fluids resulted in an increase in fluid and nutrient intake, reduced constipation rates and improved hydration status in dysphagic LTC residents **Recruitment methods:** Care home residents had been identified as being at risk of aspiration and requiring thickened fluids.	**Baseline characteristics:** Mean age (n=11): 76 years (Range: 51-109 years), Gender: Male (n=3, 27%), Female (n=8, 73%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.At risk of aspiration requiring thickened fluids **Exclusion criteria:** NR	**Outcome measure:** Fluid Intake **How was outcome assessed?** Recorded by nursing staff at each drinking occasion using graduated measuring cups.	**Sample with OFI data:** n=11 **Mean 24hr OFI:** NR **Median 24hr OFI:** Usual thickener Group:785ml, (IQR:202ml,25-75%ile:701-903) Pre-thickened group: 795ml (IQR 346ml, 25-75%ile:745-1091) **OFI Range:** NR **Cut off Used:** NR **# not meeting cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Namasivayam-MacDonald et al. (2018), Canada *(High Income)* (51) **Setting:** LTC: 32 Canadian LTC homes from 4 provinces	**Design:** Cross- sectional study **Aim:** To report the average fluid intake of a large and diverse sample, and proportion consuming less than the recommendations, and identify factors associated with fluid intake in LTC residents when adjusting for covariates **Recruitment methods:** Participants were recruited by trained staff in the homes, as part of the larger Making the Most of Mealtimes(M3) study.	**Baseline characteristics:** Mean age (n=622): 86.8years (SD 7.84), Gender: Male (197, 31.7%), Female (n=425, 68.3%), Ethnicity: NR, Functional Dependency: Mixed (23% of residents required physical assistance with eating) **Health Characteristics:** Cognitive impairment (Mean CPS score of the InterRAI LTCF: 2.8, SD 1.77, moderate/severe impairment: n=344, 55.3%, Dementia: n=179, 28.8%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.≥65 years 2.Medically stable (no hospital admission in previous month or palliative) 3. Been a resident for at least one month 4.Consumed food orally 5.Typically ate in the dining room **Exclusion criteria:** 1.Receiving palliative care	**Outcome measure:** Fluid Intake **How was outcome assessed?** OFI data was collected by trained research staff over 3 non-consecutive days. Food and drinks were weighed and checked by research staff in the daytime and nursing staff were responsible during the night.	**Sample with OFI data:** n=622 **Mean 24hr OFI:** Males: 1233.4ml (SD 401.6), Females: 1044.2ml (SD 353.3) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** IoM-Males:3700ml, Females: 2700ml. <1500ml **# not meeting cut off:** **IoM cut-off:** 622 (100%) <1500ml: 532 (85.5%)	N/A because Authors provided data in line with the appropriate cut-off.	LOW	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Oh et al. (2006), South Korea *(High Income)* (52) **Setting:** LTC: 4 Nursing facilities	**Design:** Cross-sectional study **Aim:** To examine the amount of daily fluid intake among nursing home residents and to explore the caregiver's perceived barriers to older adults' fluid intake **Recruitment methods:** Researchers identified nursing care facilities by reviewing the list registered with Ministry of Health and Welfare located at Chungcheongji Station**.** Nursing facility staff helped to identify eligible resident to participate.	**Baseline characteristics:** Mean age (n=111): 77.7 years (SD 6.97, Range: 65-104), Gender: Male (n=43, 38.7%), Female (n=68, 61.3%), Ethnicity: NR, Functional Dependency: Mixed (Modified Barthel Index: 87.75 (SD 27.89)). **Health Characteristics:** Cognitive impairment (Mean MMSE-K: 16.7, SD 7.99, score of <24: n=86, 77.5%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Aged ≥65 years 2.Conscious (maybe means that participants had capacity to consent?) 3.Able to communicate **Exclusion criteria:** 1.Receiving parenteral nutrition 2.Diseases which affect fluid balance: heart failure, kidney disease etc.	**Outcome measure:** Fluid Intake **How was outcome assessed?** Daily FI is the average of 3 random, discontinuous days of measuring drinks, soups and porridge (not fluid from solid foods like fruit and vegetables). Research staff were trained in measuring FI and residents drank from measuring cups. Nursing staff were responsible for recording night time FI.	**Sample with OFI data:** n=111 **Mean 24hr OFI:** 1035ML (SD 359) **Median 24hr OFI:** NR **OFI Range:** 210-2050ml **Cut off Used:** <1100ml **# not meeting cut off:** 58 (52.3%)	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 100 (90.1%)	LOW	This paper has been translated via Microsoft Word Translation function, which might not be a completely accurate translation.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Omli et al. (2010), Norway *(High Income)* (53) **Setting:** LTC: 6 nursing homes in Norway	**Design:** Cross-sectional study **Aim:** To determine whether PPD is a reliable measure of incontinence volumes in nursing home residents. Furthermore, the association between UTI, PPD and fluid intake was studied. **Recruitment methods:** NR	**Baseline characteristics:** Mean age (n=153): 83 years (SD 8.2), Gender: Male (n=48, 31.4%), Female (n=105, 68.6%), Ethnicity: NR, Functional Dependency: Mixed (Mean Barthel Index (n=149): 8) **Health Characteristics:** Cognitive impairment (Dementia: n=66, 43%), Renal impairment: NR, Diabetes (n=29, 19%) **Inclusion Criteria:** 1.Living in one of the 6 nursing homes, included in this study. **Exclusion criteria:** 1.Terminally ill 2.Being treated with antibiotics at baseline 3.Had a permanent catheter	**Outcome measure:** Fluid Intake **How was outcome assessed?** Recorded on a form for 48 hours, but no other reports of how FI was measured, or by whom.	**Sample with OFI data:** n=153 **Mean 24hr OFI:** 1242ml **Median 24hr OFI:** NR **OFI Range:** 138-2425ml **Cut off Used:** <1200ml **# not meeting cut off:** 72 (47%)	Unable to calculate, so study excluded from the meta-analysis	HIGH	Measure of variance for mean Barthel Index NR.
Pietruszka et al. (2003), Poland *(Upper-middle income)* (54) **Setting:** Community	**Design:** Cross-sectional **Aim:** The aim of the study was to assess the average daily total water and beverage intake of the community-dwelling older adults from the Warsaw region. **Recruitment methods:** Participants were randomly selected from a population aged 75-80 years living in	**Baseline characteristics:** Mean age (n=206): NR (Range: 75-80 years), Gender: Male (N=98, 47.6%), Female (N=108, 52.4%), Ethnicity: NR, Functional Dependency: NR **Health Characteristics:** Cognitive impairment:	**Outcome measure:** Fluid Intake **How was outcome assessed?** Dietary diary method during three consecutive days, always including one weekend day. Weighing, household measures or a catalogue of pictures of individual food portions were used to	**Sample with OFI data:** n=206 Mean 24hr FI: 1504g (SD 390) **Median 24hr OFI:** NR **OFI Range:** 690g-3266g **Cut off Used:** Total: 2271g (SD 187), Men: 2340g (SD 175), Women: 2211g (SD 390) (mean of each participant's estimated	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 102 (49.5%)	LOW	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
	urban, suburban and rural areas.	NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Community living adults aged 75-80 **Exclusion criteria:** NR	assess the portion size, validated by researchers.	cut off individually), using the guideline: 100g of water x 10 kg (for the first 10 kg of body mass) + 50 g of water x 10 kg (for next ten kg of body mass) + 20 g of water x each kg above 20 kg of body mass as recommended intake **# not meeting cut off:** Men: 30 (30%), Women: 40 (37%)			
Salas et al. (2014), Spain *(High Income)* (55) **Setting:** Community	**Design:** Case control study **Aim:** To assess the validity of urinary TCAA as an exposure biomarker of ingested TCAA in drinking water in a study on cancer and evaluate if age, the use of medications, and the presence of comorbidities is associated with the performance of urinary TCAA for exposure assessment **Recruitment methods:** A sub-set of participants from a larger multi-case control study of colorectal cancer in Spain, were contacted via phone call to take part in this study.	**Baseline characteristics:** Mean age (n=120): 73.6 years (SE 0.5, Range: 63.1-85.3years), Gender: Male (n=79, 65.8%), Female (n=41, 34.2%), Ethnicity: NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Type 2 Diabetes (n=26, 21.7%) **Inclusion Criteria:** 1.Aged >60 years 2.Availability of lifetime estimates of THM exposure 3.Living in Barcelona metropolitan area **Exclusion criteria:** NR	**Outcome measure:** Fluid intake **How was outcome assessed?** 48-hour drinking water intake and service sizes of drinks were measured.	**Sample with OFI data:** n=120 **Mean 24hr OFI:** 4127ml (SE 146) per 48 hours **Median 24hr OFI:** NR **OFI Range:** 1344-9108ml **Cut off Used:** NR **# not meeting cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	HIGH	OFI data was provided in 48 hour time frame, not 24 hours.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Spangler et al. (1999), United States *(High Income)* (56) **Setting:** LTC	**Design:** Cross-sectional **Aim:** To evaluate directly observed food and fluid intake, selected motor and cognitive skills obtained from the MDS, and the provision and frequency of medications, and their associations with possible dehydration. **Recruitment methods:** From within one nursing home – “intermediate care facility”	**Baseline characteristics:** Mean age (n=40): 86.2 years (Range: 65-100), Gender: Female (n=35, 87.5%), Male (n=5, 12.5%), Ethnicity: White (n=40, 100%), Functional Dependency: *functionally dependent:* n=15 (62.5%) *functionally independent*: n= 25 (37.5%) **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Residents within the nursing home **Exclusion criteria:** 1.Acute illness or infection 2.Receiving enteral feedings	**Outcome measure:** Fluid Intake **How was outcome assessed?** Daily fluid intake (from food and drink) for three 24-hour consecutive days – Data collected by direct observation.	**Sample with OFI data:** n=28 **Mean 24hr OFI:** 1767.4ml (Mealtimes: 1410.26ml, Non-mealtimes: 357.14ml) **OFI Range:** NR **Cut off Used:** *Standard 1*: 30 mL fluid per kg actual body weight (Chernoff, 1994), *Standard 2:* 1 mL fluid per kcal energy consumed (Food and Nutrition Board, 1989), *Standard 3:* 100 mL fluid per kg for the first 10 kg actual body weight, 50 mL fluid per kg for the next 10 kg actual body weight and 15 mL fluid for the remaining kg actual body weight (Skipper, 1993. **# not meeting cut off:** Standard 1: 19 (67.9%) Standard 2: 11 (39.3%) Standard 3: 26 (92.9%)	Unable to calculate, so study excluded from the meta-analysis	LOW	Individual fluid intake (n=28) from figures 2-6 used to calculate % of sample dehydrated
Specht et al. (2002), United States*(High Income)* (57) **Setting:** LTC: Dementia special care units within 13 LTCs	**Design:** Cross-sectional **Aim:** describe the prevalence, patterns and complications of UI in older adults residing on dementia SCUs **Recruitment methods:** Convenience sampling within dementia special care units	**Baseline characteristics:** *Mean age* (n=145): 83.32 years (SD 7.7, Range: 53-103 years), *Female*: n=93 (64%), *Ethnicity*: NR, *Functional dependency*: Mixed-47% ambulatory,	**Outcome measure:** Fluid Intake **How was outcome assessed?** Nursing staff completed daily fluid balance charts.	**Sample with OFI data:** n=47 **Mean 24hr OFI:** 1200cc **Median 24hr OFI:** NR **OFI Range:** 600-2400CC **Cut off Used:** NR **# not meeting cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	LOW	SD of mean OFI NR

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		24% walk with help, 25% chair fast, 4% bedfast. **Health Characteristics:** Cognitive impairment (Dementia: n=138, 95%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1. All SCU residents were eligible to participate in the continence study. **Exclusion criteria:** None					

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Strippoli et al. (2011), Australia *(High Income)* (58) **Setting:** Community	**Design:** Cross-sectional study **Aim:** To determine whether there was a cross-sectional association between fluids and nutrient intake and the prevalence of CKD, at a 5-year interval **Recruitment methods:** 2 surveys as part of a door-to-door census; the first was conducted 1992-4 and the second survey was conducted 1997-9.	**Baseline characteristics:** *Cross-section 1*: Mean age (n=2744): 66.4 years, Age Range: 49-80+, Gender: Male (n=1249, 45.5%), Female (n=1495, 54.5%), Ethnicity: NR, Functional Dependency: NR *Cross-section 2*: Mean age (n=2476): 65.4 years, Age Range: 49-80+, Gender: Male (n=1066, 43.1%), Female (n=1410, 56.9%), Ethnicity: NR, Functional Dependency: NR **Health Characteristics:** Cognitive impairment: NR, Renal impairment (Cross-section *1*: eGFR <60-n=10, 1.6%, *Cross-section 2*: eGFR <60-n=2, 0.6%), Diabetes (*Cross-section 1*: n=200, 7.6%, *Cross-section 2*: n=241, 9.7%) **Inclusion Criteria:** 1.Adults aged ≥49 years 2.Permanent residents of the Blue Mountains region of Australia **Exclusion criteria:** 1.Not living in long term care.	**Outcome measure:** Fluid Intake **How was outcome assessed?** FI was recorded by participants using a food frequency questionnaire (FFQ), which they were asked to complete prior to visiting the research clinic.	**Sample with OFI data:** *Cross-section 1:* n=2744 *Cross-section 2*: n=2476 **Mean 24hr OFI**: 2.5l (from food and drink) **Median 24hr OFI:** *Cross-section 1:* 2448ml *Cross-section 2*: 2413ml **OFI Range:** Average range for study: 1.7-3.3l/day **Cut off Used:** NR **# not meeting cut off:** NR	Unable to calculate, so study excluded from the meta-analysis	LOW	1,Measure of variance NR for Median or mean OFI. 2.The authors note a limitation of the study in recording OFI: The FFQ did not have a specific question asking about water intake, so reported OFI is likely to be underreported.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Tanaka et al. (2009), Japan *(High Income)* (59) **Setting:** LTC: 17 Nursing homes	**Design:** Before and After Study **Aim:** To investigate whether a strategy was able to increase the intake of fluids and food, and to reduce the proportion of residents using pads, and the size of their pads, thus leading to an enhanced quality of life **Recruitment methods:** Participants were selected from 17 nursing homes	**Baseline characteristics:** Mean age (n=122): 85.2 years, Gender: Male (n=18, 14.8%), Female (n=104, 85.2%), Ethnicity: NR, Functional Dependency: Mixed Dependency J1 (independent) (n=0, 0%) J2 (n=0, 0%) A1 (n=7, 5.8%) A2 (n=15, 12.4%) B1 (n=28, 23.1%) B2 (n=52, 43%) C1 (n=7, 5.8%) C2 (dependent) (n=12, 9.9%) **Health Characteristics:** Cognitive impairment (Dementia: n=121, 99.2%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.To maintain a sitting position 2.To express their wish to defecate **Exclusion criteria:** 1.Ineligible to receive our individualized and comprehensive care 2. Been discharged from their facilities	**Outcome measure:** Fluid Intake **How was outcome assessed?** Fluids from food and drink per day.	**Sample with OFI data:** n=122 **Mean 24hr OFI:** 881.1ml (SD 263.8) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** 1200-1500ml for fluids **# not meeting cut off:** NR	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 121 (99.1%)	LOW	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Vinsnes et al. (2007), Norway *(High Income)* (60) **Setting:** LTC: Teaching nursing home.	**Design:** Quality Improvement Project **Aim:** Evaluate if a unit-based educational program in a teaching nursing home (TNH) had any effect on six measures related to urinary incontinence among frail older adults prior to and 3 months after the educational intervention **Recruitment methods:** Participants were informed about the quality improvement project and its activities, at the teaching nursing home.	**Baseline characteristics:** Mean age: 83 years (SD 5.27), Gender: Male (n=2, 11%), Female (n=16, 89%), Ethnicity: NR, Functional Dependence: unclear. **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Dependent urinary incontinence **Exclusion criteria:** 1.Permanent indwelling catheter 2. Participant being transferred to another unit	**Outcome measure:** Fluid Intake **How was outcome assessed?** Fluid intake was recorded for 24 hours, before the educational program began (presumably by nursing staff involved in the quality improvement project).	**Sample with OFI data:** n=15 **Mean 24hr OFI:** 1125ml (SD 370) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** NR **# not meeting cut off:** NR	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 13 (86.7%)	LOW	
Walton et al. (2011), Ireland *(High Income)* (61) **Setting:** Community	**Design:** Cross sectional survey **Aim:** To provide up-to-date quantitative, habitual food consumption data separately for all eating occasions over each of four days at the level of the individual and is suitable for a wide range of applications related to food safety and nutrition **Recruitment methods:** A sample of adults was randomly selected from a database of names and addresses held by Data	**Baseline characteristics:** Mean age of Older adult group (n=226): NR (Range: 65-90 years), Gender: Male (n=106, 47%), Female (n=120, 53%), Ethnicity: NR, Functional Dependency: NR. **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR	**Outcome measure:** Fluid Intake **How was outcome assessed?** 4-day food diary to collect and weigh food and beverage data- checked by the researcher.	**Sample with OFI data:** n=226 **Mean 24hr OFI:** Total beverages (excluding alcohol): 1018g/d (SD 604) Total fluid intake (inc. food and alcohol): 2015 g/d (SD 776) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** NR **# not meeting cut off:** NR	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 178 (78.8%)	HIGH	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
	Ireland. An introductory letter and information leaflet were posted to each person selected from the database. A researcher called potential respondents' homes to introduce the survey and invite participation.	**Inclusion Criteria:** 1.Free living adults (18+) on the Data Ireland database **Exclusion criteria:** 1.Not pregnant or breastfeeding					
Willms et al. (2003), Germany *(High Income)* (62) **Setting:** LTC: Nursing home	**Design:** Before/After study **Aim:** To achieve a daily intake of fluids of 1.3l/a day according to the new reference values of D-A-CH set up in 2000 **Recruitment methods:** NR	**Baseline characteristics:** Age Range (n=181): 64->100, Gender: Male (n=24, 13.3%), Female (n=157, 86.7%), Ethnicity: NR, Functional Dependency: NR. **Health Characteristics:** Cognitive impairment: NR, Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Residents requiring nursing care levels 1,2,3 **Exclusion criteria:** 1. Residents requiring nursing care level 0 2.Exclusively fed enterally 3.Medical reason for limited fluid intake	**Outcome measure:** Fluid Intake **How was outcome assessed?** Fluid intake measured by nursing staff who used calibrated cups when providing drinks.	**Sample with OFI data:** n=68 **Mean 24hr OFI:** 956ml (SD 413) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** <1310ml/day D-A-CH guidance **# not meeting cut off:** 19 (27%)	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 62 (91.2%)	HIGH	1.This paper was translated using Microsoft Word and Google translate, as well as by someone German speaking. 2.The Authors report that the OFI equates to 73% of the recommended intake, but does not report how many individuals meet the recommended intake.

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
Zembrzuski (2006), United States *(High Income)* (63) **Setting:** LTC: Senior nursing facility	**Design:** Non-randomised experimental study **Aim:** To investigate whether a group of residents living in a skilled nursing facility (SNF), who received adequate support with drinking to reach their optimal fluid intake, would experience a reduction in postural BP and falls, compared to residents receiving usual care. **Recruitment methods:** Nursing Supervisor or Resident Care Coordinator seemed to identify those meeting eligibility criteria within the SNF, and PI took informed consent	**Baseline characteristics:** Mean age (n=82): 87.1 years (SD 6.83), Gender: Male (n=14, 17.1%), Female (n=68, 82.9%), Ethnicity: White (n=79, 96.3%), other ethnicities NR, Functional Dependency: Unclear **Health Characteristics:** Cognitive impairment (Mean MMSE: 18.66, SD 7.89, score of <18 suggesting likelihood of dementia: n=32, 39%), Renal impairment: NR, Diabetes: NR **Inclusion Criteria:** 1.Aged ≥ 75 years 2.Had capacity to consent or had a proxy who gave informed consent if a resident's MMSE score was <18 3.Able to weight-bear or sit upright for at least one minute 4.Able to accept or reject oral fluids offered to them. **Exclusion criteria:** 1.Participant or proxy refused participation 2.On therapeutic diets that alter fluid balance	**Outcome measure:** Fluid Intake **How was outcome assessed?** FI was measured using calibrated cups, and fluids provided during medication administration were observed. Investigator and researchers monitored and documented FI over 3 days. FI included fluids and soups and gelatinized or frozen fluids.	**Sample with OFI data:** n=82 **Mean 24hr OFI:** Control group (n=34): 1118.28ml (SD 284.71), Intervention group (n=48): 1078.33ml (SD 183.3) **Median 24hr OFI:** NR **OFI Range:** NR **Cut off Used:** Formula 1: 30ml/kg body weight Formula 2:1500mls/day Formula 3:100mls/kg body weight for first 10kg, then 50ml/kg body weight for second 10kgs, then 15ml/kg body weight for remaining kgs **# not meeting cut off:** Formula 1: NR Formula 2: Baseline OFI NR Formula 3: 82 (100%)	**Cut off Used:** <1.5l **# dehydrated according to cut off:** 79 (96.4%)	HIGH	

	24-hour Oral Fluid Intake						
Author, Country of Study *(World Bank classification of Economy of country at time of study)*, and setting	**Study Design, aims and method**	**Participants: Selection and Baseline characteristics**	**Outcome Measure**	**Prevalence of dehydration (from Study Authors)**	**Prevalence of dehydration (our estimation)**	**Risk of Bias assessment**	**Comments**
		3.Diagnosed dysphagia as indicated in the medical record 4. Enterally fed (through gastric or nasogastric tubes) 1 week prior to, or during the study 5. Parenterally fed (partial or complete nutrients administered through central or peripheral intravenous tubes) 1 week prior to, or during the study 6.Unstable congestive heart failure 7.Receiving hospice care 8.Transferred from the SNF during the study					

1. Table Glossary: SD: standard deviation, NR: not reported, FBC: full blood count, ECG: electrocardiogram, SOsm: Serum osmolality, POsm: Plasma osmolality, FI: fluid intake, OFI: oral fluid intake, CNS: central nervous system, N/A: not applicable, BP: blood pressure, Osm: osmolality, SEM: standard error of the mean, SE: standard error, IQR: Interquartile range, MMSE: mini mental state examination, eGFR: estimated glomerular filtration rate, LTC: long term care, HD: Hypertonic dehydration, MDS-ADL: Minimum dataset-activities of daily living assessment, ONS: oral nutrition supplements, HONK: Hyperglycaemic hyperosmolar non-ketotic coma, MOS: Medical outcomes study, rpm: revolutions per minute, IV: intravenous, US: United States, RCT: randomized controlled trial, MSQ: mental status questionnaire, AVP: arginine vasopressin, ANP: atrial natriuretic peptide, ADLs: activities of daily living, Cr: creatinine, bw: body weight, NGT: nasogastric tube, PEG: percutaneous endoscopic gastrostomy, CKD: chronic kidney disease, BI: Barthel Index, BUN: blood urea nitrogen, TBW: total body water, IQR: interquartile range, CQC:

CARE QUALITY COMMISSION, CI: CONFIDENCE INTERVALS, CC: CUBIC CENTIMETRE, UI: URINARY INCONTINENCE, BSA: BODY SURFACE AREA, LTCF: LONG TERM CARE FACILITY, IOM: INSTITUTE OF MEDICINE, MMSE-K: KOREAN VERSION OF THE MMSE, PPD: PAD USE PER DAY, UTI: URINARY TRACT INFECTION, TCAA: TRICHLOROACETIC ACID, THM: TRIHALOMETHANES, MDS: MINIMUM DATASET, SCU: SPECIAL CARE UNIT, D-A-CH: NUTRITION SOCIETIES OF GERMANY, AUSTRIA AND SWITZERLAND, PI: PRINCIPAL INVESTIGATOR.

2. ETHNICITY REPORTED USING AUTHORS' DESCRIPTION
3. EGFR: <60 ML/MINUTE/1.73 M2 INDICATES IMPAIRED RENAL FUNCTION

Appendix 5c Risk of bias assessment of all included studies

TABLE OF CRITICAL APPRAISAL RESULTS FOR ALL 61 INCLUDED STUDIES USING AN ADAPTED VERSION OF THE JBI-PREVALENCE CRITICAL APPRAISAL CHECKLIST

	Was dehydration measured in a standard, reliable way for all participants?	Was fluid intake measured in a standard, reliable way for all participants (if measured)?	Were study participants recruited in an appropriate way?	Were the participants and setting described in detail?	Was the sample frame appropriate to recruit older adults ≥65?	Was data analysis conducted with sufficient coverage of the sample?	Was there appropriate statistical analyses?	Was the response rate adequate, and if not, was the low response rate managed appropriately?	**Risk of Bias**
Adams (1988) [1]	N/A	HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Albert et al. (1989) [2]	LOW	N/A	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	**HIGH**
Antoniw (1995) [3]	N/A	HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Arinzon et al. (2008) [4]	HIGH	HIGH	LOW	LOW	LOW	LOW	HIGH	HIGH	**LOW**
Arinzon et al. (2011) [5]	HIGH	N/A	LOW	LOW	LOW	HIGH	HIGH	LOW	**LOW**
Bannerman et al. (2011) [6]	N/A	HIGH	LOW	HIGH	LOW	LOW	LOW	LOW	**HIGH**
Bossingham et al. (2005) [7]	LOW	LOW	HIGH	HIGH	HIGH	LOW	LOW	HIGH	**HIGH**
Botigue et al. (2019) [8]	HIGH	LOW	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Carlsson et al. (2009) [9]	N/A	HIGH	LOW	LOW	LOW	LOW	HIGH	HIGH	**LOW**
Chidester et al (1997) [10]	N/A	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	**LOW**
Craig (2016) [11]	N/A	LOW	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Crowe et al. (1987) [12]	LOW	N/A	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	**HIGH**
Dowd et al. (1996) [13]	N/A	LOW	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	**LOW**
Downey (2012) [14]	N/A	HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Engelheart et al. (2022) [15]	HIGH	N/A	LOW	HIGH	LOW	LOW	LOW	HIGH	**HIGH**
Farrell et al. (2008) [16]	LOW	N/A	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	**HIGH**
Fraser et al. (1989) [17]	LOW	N/A	HIGH	HIGH	LOW	HIGH	HIGH	LOW	**HIGH**
Gaspar (1999) [18]	N/A	LOW	LOW	HIGH	LOW	LOW	LOW	HIGH	**LOW**
Holben et al. (1999) [19]	N/A	HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Hooper et al. (2016) [20]	LOW	N/A	LOW	LOW	LOW	LOW	LOW	LOW	**LOW**
Johnson et al. (2018) [21]	LOW	N/A	LOW	HIGH	LOW	LOW	LOW	HIGH	**LOW**
Kajii et al. (2005) [22]	LOW	N/A	LOW	HIGH	LOW	LOW	LOW	LOW	**LOW**
Kakeshita et al. (2022) [23]	LOW	N/A	LOW	LOW	LOW	LOW	HIGH	LOW	**LOW**
Klimesova et al. (2018) [24]	N/A	LOW	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Mack et al. (1994) [25]	LOW	N/A	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	**LOW**
Marra et al. (2016) [26]	LOW	LOW	LOW	LOW	LOW	HIGH	LOW	LOW	**LOW**
McCormick et al. (2008) [27]	N/A	HIGH	HIGH	LOW	LOW	HIGH	HIGH	HIGH	**HIGH**
McKenna et al. (1999) [28]	LOW	N/A	HIGH	LOW	HIGH	LOW	HIGH	HIGH	**LOW**
Mentes et al. (2019) [29]	LOW	N/A	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	**HIGH**
Morgan et al. (2003) [30]	LOW	N/A	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
Nagae et al. (2020) [31]	LOW	N/A	HIGH	LOW	LOW	LOW	LOW	HIGH	**LOW**

	Was dehydration measured in a standard, reliable way for all participants?	Was fluid intake measured in a standard, reliable way for all participants (if measured)?	Were study participants recruited in an appropriate way?	Were the participants and setting described in detail?	Was the sample frame appropriate to recruit older adults ≥65?	Was data analysis conducted with sufficient coverage of the sample?	Was there appropriate statistical analyses?	Was the response rate adequate, and if not, was the low response rate managed appropriately?	**Risk of Bias**
Namasivayam-MacDonald et al. (2018) [32]	N/A	LOW	LOW	HIGH	LOW	LOW	LOW	LOW	**LOW**
NHANES 2017-March 2020 cohort study [33] & Stookey et al. (2005) [34]	HIGH	N/A	LOW	LOW	LOW	LOW	LOW	HIGH	**LOW**
NUAGE cohort study [35] & Hooper et al. (2015) [36]	LOW	N/A	HIGH	LOW	LOW	HIGH	LOW	HIGH	**LOW**
Oh et al. (2006) [37]	N/A	LOW	HIGH	LOW	LOW	HIGH	LOW	LOW	**LOW**
Omli et al. (2010) [38]	N/A	HIGH	LOW	HIGH	LOW	LOW	HIGH	HIGH	**HIGH**
O'Neill et al. (1990) [39]	LOW	N/A	HIGH	HIGH	LOW	HIGH	LOW	HIGH	**HIGH**
O'Neill et al. (1989) [40]	LOW	HIGH	HIGH	HIGH	LOW	LOW	LOW	LOW	**HIGH**
O'Neill et al. (1997) [41]	LOW	LOW	HIGH	LOW	LOW	HIGH	HIGH	LOW	**LOW**
Phillips et al. (1993) [42]	LOW	N/A	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	**HIGH**
Phillips et al. (1991) [43]	LOW	N/A	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	**HIGH**
Phillips et al. (1984) [44]	LOW	N/A	HIGH	LOW	LOW	HIGH	HIGH	HIGH	**LOW**
Pietruszka et al. (2003) [45]	N/A	LOW	LOW	LOW	LOW	HIGH	LOW	HIGH	**LOW**
Salas et al. (2014) [46]	N/A	LOW	HIGH	HIGH	LOW	LOW	HIGH	LOW	**HIGH**
Siervo et al. (2015) [47]	LOW	N/A	LOW	LOW	LOW	LOW	LOW	LOW	**LOW**
Simmons et al. (2001) [48]	LOW	N/A	LOW	HIGH	LOW	HIGH	LOW	LOW	**LOW**
Spangler et al. (1999) [49]	N/A	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	**LOW**
Specht et al. (2002) [50]	N/A	HIGH	LOW	LOW	LOW	HIGH	HIGH	HIGH	**LOW**
Sri-On et al. (2023) [51]	LOW	N/A	HIGH	LOW	LOW	LOW	LOW	LOW	**LOW**
Stachenfeld et al. (1996) [52]	LOW	N/A	HIGH	LOW	LOW	LOW	HIGH	HIGH	**LOW**
Stachenfeld, et al. (1997) [53]	LOW	N/A	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	**HIGH**
Strippoli et al. (2011) [54]	N/A	HIGH	LOW	LOW	HIGH	HIGH	HIGH	LOW	**LOW**
Takamata et al. (1999) [55]	LOW	N/A	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	**HIGH**
Tanaka et al. (2009) [56]	N/A	HIGH	LOW	LOW	LOW	LOW	HIGH	HIGH	**LOW**
Tanaka et al. (2020) [57]	HIGH	N/A	LOW	HIGH	LOW	LOW	LOW	LOW	**HIGH**
Vinsnes et al. (2007) [58]	N/A	HIGH	LOW	LOW	LOW	LOW	HIGH	LOW	**LOW**
Walton et al. (2011) [59]	N/A	LOW	HIGH	HIGH	LOW	LOW	HIGH	HIGH	**HIGH**
Willms et al. (2003) [60]	N/A	HIGH	HIGH	HIGH	LOW	LOW	LOW	HIGH	**HIGH**
Wu et al. (2011) [61]	HIGH	LOW	HIGH	LOW	LOW	HIGH	LOW	HIGH	**HIGH**
Zappe et al. (1996) [62]	LOW	LOW	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	**HIGH**
Zembrzuski (2006) [63]	N/A	LOW	HIGH	HIGH	HIGH	LOW	HIGH	LOW	**HIGH**

Appendix 6a Observation hour log from the ethnography

	Date	Time	Hours	Location
Hanging out period (28 hours 35 mins)	24/11/22	NR	3 hours	Quiet lounge, TV lounge and dining room
	D&V outbreak			
	05/12/22	12.35-15.10	2 hours 35 mins	Dining room and TV lounge
	06/12/22	08.40-12.30pm (-1 hour for meeting)	2 hours 50 mins	TV lounge, quiet lounge and dining room
	07/12/22	08.25-13.30	5 hours 5 mins	Dining room, small TV lounge.
	08/12/22	08.25-14.50	6 hours 25 mins	TV lounge, dining room, small TV lounge, quiet lounge
	13/12/22	09.15-12.30pm	3 hours 15 mins	TV lounge, small TV lounge, pool room, quiet lounge,
	14/12/22	08.25-11.45am	3 hours 20 mins	Small TV lounge
	15/12/22	08.25-10.30	2 hours 5 mins	Small TV lounge
	CHRISTMAS BREAK			
	COVID-19 outbreak			
Ethnographic Observations begin (112 hours 25 mins)	12/01/23	08.40-11.30	2 hours 50 mins	Small TV lounge
	13/01/23	12.30-15.00	2 hours 30 mins	TV lounge, small TV lounge
	16/01/23	11.40-14.55	3 hours 15 mins	TV lounge
	17/01/23	09.10-11.20	2 hours 10 mins	Dining room
	18/01/23	13.50-14.55	1 hour 5 mins	Small TV lounge
	19/01/23	08.30-11.30	3 hours	Small TV lounge
	21/01/23	19.30-12.00am	4 hours 30 mins	Dining room and visited some bedrooms
	22/01/23	07.45-10.45	3 hours	TV lounge
	23/01/23	12.10-15.00	2 hours 50 mins	Small TV lounge
	24/01/23	11.00-14.05	3 hours 5 mins	TV lounge
	25/01/23	14.10-17.40	3 hours 30 mins	Small TV lounge
	27/01/23	08.40-12.00	3 hours 20 mins	TV lounge
	31/01/23	08.35-11.30	2 hours 55 mins	Dining room
	02/02/23	12.55-14.00	1 hour 5 mins	Dining room
	03/02/23	20.50-03.00am	6 hours 10 mins	Dining room, small TV lounge and visited one bedroom

	04/02/23	17.30-00.00	6 hours 30 mins	Dining room, small TV lounge
	07/02/23	13.00-15.00	2 hours	Small TV lounge
	08/02/23	15.10-17.35	2 hours 25 mins	Dining room and visited two bedrooms
	09/02/23	08.30-12.00pm	3 hours 30 mins	Dining room and quiet lounge
	15/02/23	18.10-23.50	5 hours 40 mins	Small TV lounge
	16/02/23	22.25-01.30am	3 hours 5 mins	Dining room
	I had a sickness bug			
	23/02/23	08.40-12.10pm	3 hours 30 mins	Small TV lounge
	27/02/23	08.40-11.45	3 hours 5 mins	Small TV lounge
	28/02/23	11.20-15.00	3 hours 40 mins	Dining room and TV lounge
	Covid-19 outbreak			
	D&V outbreak			
	25/03/23	02.50-06.35	3 hours 45 mins	Dining room
	26/03/23	06.00-08.50	2 hours 50 mins	Dining room
	28/03/23	08.30-12pm	3 hours 30 mins	Dining room and TV lounge
	29/03/23	12-3pm	3 hours	Small TV lounge
	30/03/23	10.40-13.55	3 hours 15 mins	Quiet lounge
	31/03/23	10.45-14.25	3 hours 40 mins	TV lounge
	01/04/23	13.55-16.05	2 hours 10 mins	Small TV lounge
	02/04/23	09.10-11.45	2 hours 35 mins	TV lounge
	03/04/23	07.50-11.35	3 hours 45 mins	Small TV lounge and Quiet lounge
	04/04/23	15.45-18.05	2 hours 20 mins	TV lounge
	05/04/23	07.40-10.35	2 hours 55 mins	Dining room
	End of Data Collection			

Appendix 6b Table of themes and supporting evidence from the ethnography

Theme	Codes	Evidence
Missed Opportunities	Resident Sleeping	**Line 3760: "***RP20 was now asleep in his wheelchair, with a beaker full of tea and a slice of toast on a plate, left on his table in front of him*." **Line 4727:** "*I noticed that RP11 was asleep with half a beaker of tea left on her table."* **Line 5005:** "*RP11 was dozing at the same table as I was sat with 50ml of her tea drank from her 200ml beaker, SP19 was sat at the staff table…"* **Line 5984:** "*RP11 took a sip of her coffee through the spout of the beaker, looked at me and said "it's hot", so placed the beaker down on her table and shut her eyes*." **Line 6796:** "*RP11 was asleep with an empty bowl, a beaker half filled with milkshake and a beaker half filled with lemonade left on the small side table by her chair*." **Line 5449:** "*SP21 continued assisting RP10 until the cup was half empty, then pulled a height adjustable table next to RP10's armchair and placed the cup onto it.RP10 then fell asleep in the armchair."*
	Drink not refilled after resident consumed it	**Line 4992:** "*SP09 then stood next to RP22, held the red cup of milk to RP22's mouth, until it was quickly finished. This was only a small cup and RP22 was not offered any more drink after this cup."* **Line 2719:** "*RP08 then picked up her paper cup, saw that it was empty and put it back down on her table. RP08 then touched her beaker of tea, but picked up another piece of toast instead, and continued to watch TV. RP08 then picked up her squash beaker*

		and drank the dribble that was left at the bottom, and continued to eat her toast.” **Line 2732**: “*RP08 had two empty beakers, an empty paper cup and a small plate of crusts left on her table*”. **Line 2611**: “*I observed that the room water jug was empty*” **Line 4872:** “*SP09 then tipped up the beaker to RP22’s mouth, until he pulled back. RP22 then began swirling the drink round his mouth and started coughing… SP09 then turned back from to RP22 and said “just a little dribble” and RP22 slurped the last bit of drink from the beaker. SP09 took RP22’s apron off and walked off*”.
	Minimising language relating to drinking	**Line 4308:** “*SP21 then asked RP11 “some wafers and a cup of tea? Cup of tea for (name)?...(name), the tea’s going to be quite warm, I’ve put a little more milk in there but you need to be more careful, cautious!....You like your tea though!”*” **Line 1832:** “*SP05 then came back into the lounge to check on the activity and the told SP06 to “join in with them, have a little tea or coffee”*”.
	Staff assist resident to consume only some of the drink.	**Line 5047:** “*SP09 then walked over to RP11 and said “(name), would you like some more tea darling?”. RP11 responded “please!”. SP09 continued standing, held the tea beaker for RP11 to drink from, and then placed a straw in the spout and placed the beaker down in front of RP11. SP09 then left RP11 to sit beside another resident*.” **Line 4771**: “*SP06 then returned from the entrance hall with a paper cup filled with water, showed RP11 and then asked if she would prefer the water in a beaker instead to which RP11 said “yes please”. SP06 poured the water into a plastic beaker and placed a straw in the spout for RP11, gave it to her and asked “is that better?”. RP11 took a sip and swallowed it, and then SP06 looked at me, smiled and left*.”

		Line 5449: *"SP21 continued assisting RP10 until the cup was half empty, then pulled a height adjustable table next to RP10's armchair and placed the cup onto it"*
	Staff prompting/encouragement to resident to drink, is not followed up.	**Line 3768**: "*SP01 then entered the lounge, saw me, then walked over to RP20 who was asleep, leaned over, stroked his arm and said "you've got a cuppa tea there, you gonna drink your tea?". RP20 took the beaker from SP01, then put it down and picked up a ½ slice of toast*." **Line 6010**: "*SP01 said "keep drinking". RP11 took another sip of coffee from the beaker and then walked out of the lounge. RP11 then reached for her napkin and wiped her nose. RP11 turned to me and said "I don't know what to do darling"*." **Line 6724**: "*SP12 then entered the TV lounge, turned the TV on, pointed to RP11's drink and said "(RP11's name), are you gonna drink some more of this?". RP11 picked up the beaker and had a sip of the straw and nodded smiling at SP12. I asked SP12 what was in the beaker and SP12 commented "milkshake". SP12 then walked out of the lounge*."
	Drinks left behind, when residents are moved	**Line 50767:** *"The carer placed her foot on the plate and then wheeled RP11 into the TV lounge. RP11's tea beaker with the straw in the spout was left on the dining room table, along with the plate of cake which she did not eat."* **Line 6813**: *"SP16 and SP12 then wheeled the hoist and RP11 out of the lounge in her wheelchair. I waved goodnight to RP11 and she smiled. The beaker of half-filled milkshake and a pink wafer biscuit were left behind on the small table by RP11's chair."*
	Interruptions	**Line 5907:** "*RP11 sipped some water from the cup, but still didn't swallow the table, so drank some more water. RP11 then gagged, so drank some more water and seemed to have then swallowed the tablet. SP13 told me that she makes herself vomit taking medication. SP13 then told RP11 she needed to take a second tablet and*

		RP11 shook her head. SP13 said "please". RP11 put the tablet in her mouth and again tried to swallow it, along with water from the paper cup. SP13's phone then rang and so she got up and left the lounge without saying goodbye" **Line 4327:** *"SP03 then entered the lounge quite hurriedly and told SP21 "don't focus too much on activities now as (name) has gone home". SP03 continued to mentioned that she wanted a quick supervision with all staff this afternoon also, so encouraged SP21 to quickly finish up the trolley"* **Line 2800:** *"SP03 then entered the dining room and asked SP18 "Can I steal you?". It seemed unfortunate timing... SP18 commented that she had no-one around who she could leave the trolley with"*
	Lack of choice over food and drinks	**Line 6611:** *"SP05 was sat in a chair next to another resident, across the room from RP08, and asked RP08 what she wanted to eat for snack. RP08 shouted "I can't hear a word you're saying". SP05 stood up and plated up some cheese for RP08 and also gave RP08 a packet of crisps and placed them on RP08's table"* **Line 2791:** *"SP18 checked the temperature of the tea beaker and commented to me that she finds it difficult with the temperature of drinks because she doesn't want to "undermine" a resident's preference for drinks temperature, but also doesn't want to leave a resident with a burning hot drink. SP18 then added more milk to the beaker and stirred the thickener with a spoon."* **Line 6620**: *"SP05 then said "I'll tell you what you like....meatballs". RP08 shouted over to SP05 "salad!". SP05 said something back to RP08 and RP08 shouted "I can't hear what you're saying!""* **Line 6538:** *""What d'ya have for breakfast? Toast, don't ya!". RP20 muttered something but SP05 did not listen to him. SP05 then completed the rest*

		of the meal options form for RP20 and took a photo of him next to the meal options sheet." **Line 3693:** "*SP12 then walked into the lounge and placed a small China plate of 2 slices of buttered toast onto the height adjustable table in front of RP20's wheelchair, as well as a spouted plastic beaker of tea. SP12 then sighed and left the lounge.*" **Line 3308**: "*Once SP16 had assisted the resident into the armchair, SP16 said "your usual for breakfast, [name]?".*" **Line 5169:** "*SP12 then walked over to RP20 and asked " (RP20 name), do you want salmon or chicken? Salmon or chicken?". RP20 had his eyes shut, with his arms resting on the sides of the armchair. SP12 said "salmon" and walked over to the chef and waited as he continued to serve up food onto plates. SP12 said "salmon for (RP20's name) please". SP12 then took a plate over to RP20, placed it down on his table in front of him and said "there you go!".*" **Line 5863**: "*SP19 then placed a bowl of mousse and a teaspoon onto RP11's table, behind her plate, and looked at RP11. RP11 was not offered a choice, or asked"* **Line 4173:** *"SP21 then asked RP11 "would you like a dessert darling?". SP19 then gave RP11 a mousse from the tea trolley"*
	Lack of staff accountability over making resident drinks	**Line 5041:** "*SP04 then walked back into the dining room with an empty beaker and asked if someone could get RP08 some more tea.*" **Line 5070:** "*I can then hear RP08 from the quiet lounge shouting "help! Help! I want a drink!". No-one made the tea beaker up for RP08, as asked by SP04*"… **Line 5083**: "*When SP01 had said goodbye to the visitors, she walked into the quiet lounge and said "what the matter, (RP08's name)?". SP01 walked back into the dining*

		room and said "can you just get RP08 another tea in there?" and handed SP05 the beaker."…**Line 5088:** *"SP09 walked into the quiet lounge and I heard RP08 say loudly "get me a cuppa tea!"."*
The role of furniture and equipment	Degree of preparedness to make drinks	**Line 6123**: *"SP16 entered the TV lounge with a trolley and said "I managed to find some cups!" and began putting some cutlery into the cutlery tray on the small table and said "should be enough there""* **Line 6649:** *"SP18 walked back into the lounge and collected RP08's plate and beaker from RP08's table and left. SP18 walked into the lounge again and said "they haven't washed all the cups" and left the lounge again. RP08 looked at me and laughed."* **Line 5332:** *"SP12 was sat at the staff table and commented to SP06 then he wasn't allowed that mug, and that it needed to be in a non-breakable mug. SP06 asked where she might get one of those from and SP12 told her that she needed to go to the main kitchen to get a plastic beaker. SP06 left the lounge still holding the mug."* **Line 4313**: *"SP21 then told me that she was leaving her trolley because she had forgotten sweetener in the kitchen"* **Line 3874**: *"I noticed that there were only 3 mugs/teacups on the trolley and then some cups."* **Line 3892:** *"SP 12 then told SP19 "I'll got get some cups" and left the lounge. SP12 then reentered the lounge with teacups."*
	Tables facilitate drink being served to resident	**Line 3304:"** *SP16 moved the resident's table with drinks away from the resident, to make room to use the standaid"* **Line 6128:** *"SP18 moved the resident's table closer to him to complete the activity, which also meant that the red cup on the table was now in his reach."* **Line 3693**: *"I noticed that the table was very close to RP20's legs, as the legs of the*

		table had not been adjusted to increase the height. RP20 lifted his plastic, spouted beaker with his right hand, moved the laminated sheet and sipped some tea through the spout of the beaker" **Line 3258:** "*SP14 walked over to the table and moved it closer to the new resident*" **Line 6405:** "*There were no tables in front of residents, and no drinks made near residents*." **Line 2696**: "*As SP04 was sorting the TV, I observed that RP08 was trying to reach the drinks on her table. RP08 then said "can you pass me them?". SP04: "Do you want me to move the table for you?" As SP04 began angling the table so that RP08 could reach, SP04 said "Is that any better? No, that's not any better, hang on, I'm going to move it". SP04 then took the items off the table and adjusted the height of the table using the knobs, and then positioned it slightly to the left of RP08, but angled so that RP08 could reach items off of it. This was the first time I've seen a staff member adjust the height of the tables*." **Line 5964**: "*RP10 was laying on the floor (no drink)*"
	Residents are always encouraged to sit down	**Line 5926**: "*SP13 said to RP10 "please, please, please, come on (RP10's name)" and walked RP10 over to the armchair for him to sit down on*" **Line 4778:** "*SP05 then guided RP10 through the dining room door, holding his arm and encouraged him to sit down on a dining chair, at a table closest to the dining room door*" **Line 5441**: "*I then heard SP21 say "come on Mr" to RP10 and then saw SP21 leading RP10 into the quiet lounge by his arm, as his eyes were shut, and continued to say "that's better than crawling on the floor" and guided him into sitting in an armchair.*"

	Activities on tables take priority over drinks	**Line 6501**: "*SP05 moved RP20's tea beaker and bowl from his table and placed on the staff table and put the activity crafts onto his table instead*"
The role of staff	Staff presence facilitates routines being enacted, to serve drinks	**Line 4871**: "*SP09 then stood up and reached for the beaker of tea for RP22. SP09 put the open beaker to RP22's mouth and RP22 jumped. SP09 did not talk to RP22. SP09 then tipped up the beaker to RP22's mouth, until he pulled back*." **Line 2584:** "SP12 later then said that she thought they'd ought to start sorting drinks." **Line 5992:** "*SP07 then wheeled the trolley into the TV lounge saying "Hiii! Guess who's here!". SP07 opened a packet of crisps and placed them on a table in front of one resident,, along with some pink wafer biscuits. SP07 then walked over to RP11 and said "(RP11's name), look who's here" and placed some pink wafer biscuits onto a napkin on RP11's table and said she would pour RP11 a "fresh coffee" and "I'll get rid a that other one, (RP11's name)". SP07 told RP11 that the fresh coffee was hot*" **Line 2599:** "*I then followed SP17 to RP08's bedroom with a tray of food and a spouted beaker of tea with a straw. When we entered RP08's room, I observed the resident reach across to her side table, and took a sip from the straw. SP17 then gave RP08 her sandwiches (2 small triangles – looked like corned beef filling) on a small plate*" **Line 6333**: "*SP18 and SP13 then walked into the lounge with the 'happy trolley'. RP22 was standing close to the trolley, wandering slowly and SP18 turned to RP22 and said "Hello (RP22's name), what you fancyin'? What you fancyin*?"" **Line 3434: "***At 11.30am, SP18 entered the small TV lounge with the happy trolley*"

		Line 4111: *"SP21 asked RP11 "would you like some squash?" and then poured squash into RP11's cup. RP11 was using knife and fork independently to eat her dinner"*
	Staff attentiveness	**Line 5908:** *"SP13 then pulled an armchair next to RP11, brought a paper cup filled with water and gave RP11 a table to swallow. RP11 was sucking her cheeks in trying to swallow the tablet, and occasionally shook her head. RP11 sipped some water from the cup, but still didn't swallow the table, so drank some more water"* **Line 6648**: *"RP08 asked SP18 "Can you get me a drink?". SP18 paused, lifted the beaker from RP08's table and said "yes, would you like a lemonade? Something cold?". RP08 said "yes". SP18 replied "yes please"."* **Line 5443**: *"SP21 then asked RP10 "would you like a drink?", to which RP10 replied "that's better". SP21 repeated "that's better" laughing and commented to me that she doesn't usually hear him respond. SP21 left the lounge and returned with a small cup of orange squash, stood next to RP10 and put the cup to RP10's mouth as he opened his mouth and drank it*". **Line 4770**: *"SP06 then walked over to RP11 and asked if she was ok. RP11 told SP06 "my throat's sore". SP06 responded "would you like some water?" and RP11 responded "yes please"."* **Line 4775:** *"SP09 then left the kitchen, walked over to RP11, lifted her beaker so that the straw was near RP11's mouth and said "name, have a little more of your tea". SP09 then looked at me and said "she's got this awful chest infection"."* **Line 5687:** *"SP05 then held the beaker for RP11 and put the straw to RP11's mouth for her to drink. SP01 then left the lounge. RP11 finished the whole beaker of milkshake. SP05 jumped up and did a little*

		dance and told RP11 that she was doing the milkshake dance and RP11 laughed.”
	Staff knowledge of residents’ dietary requirements	**Line 7062**: “*SP18 and SP07 trying to establish what drinks pre-diabetic residents could and couldn’t have, and SP18 said that it was because the milkshake syrup was sweetened and pre-diabetic resident couldn’t have the sugar. SP07 commented “it’s so confusing” and mentioned that RP22 had gallstones and they didn’t know what he could and couldn’t have really. SP18 then said that the resident could have a coffee with cream to add some sweetness, so then went into the kitchen to put a carton of cream on the trolley. SP07 advised that the same resident could have 7up*.” **Line 7023**: “*SP07 then asked SP18 “can (name) have sweetener on his breakfast?””* **Line 6337:** “*SP18 then said to SP12 “He quite likes milkshake”. SP12 said “He can’t have milkshake unless its made with his special soya”. SP18 then said “he loves fruit”. SP12 said that she would make him a milkshake with soya milk and then said “I’ll take him through”.”* **Line 2791:** “*RP08 then shouted “I’ll have a scone when you’re ready”. SP18 said “They’ve got sugar in them, I’ll get you a cake, I did forget”. The scones were presented on the trolley on a three tier cake stand. SP18 gave RP08 a slice of lemon cake (which supposedly was diabetic friendly). RP08 shouted “that’s not a scone, I want a scone!”. RP08 got quite angry and shouted “you’re fired” at SP18. SP18 calmly explained to RP08 that she was diabetic and so she wasn't able to eat the scones.”* **Line 3451:** *“SP18 mentioned to SP03 that she didn't know the resident’s name and didn't know what she would eat or drink. SP03 walked over to the staff table and commented that there would be*

		something in her records which would indicate her preferences" **Line 3891:** *"SP19 commented to SP12 "she doesn't have any thickener or something?". SP12 replied "no" and so SP19 then moved the cup of tea closer to the resident on the table."*
	Staff knowledge of residents' drinks and drinking vessel preferences	**Line 6317:** *"SP13 said that she finds some residents do drink better from the paper cup, and then said that she would now offer another resident a drink from a paper cup. SP13 left the lounge and then re-entered with another paper cup"* **Line 4775**: "*SP06 then returned from the entrance hall with a paper cup filled with water, showed RP11 and then asked if she would prefer the water in a beaker instead to which RP11 said "yes please". SP06 poured the water into a plastic beaker and placed a straw in the spout for RP11, gave it to her and asked "is that better?". RP11 took a sip and swallowed it*" **Line 2942:** "*SP15 then wheeled the tea trolley into the lounge. SP15 poured each resident tea into a china/porcelain mug… I asked SP15 why he was using mugs, and asked if this was any set guidance around what mugs to use. In the daytime, I mostly saw these residents with plastic spouted beakers. SP15 mentioned that these residents were all able to lift these mugs and that he knows the residents well."*
Resident characteristics	A louder, persistent resident voice enables drinks to be served to residents outside of routines	**Line 6173**: "*RP20 looked at the senior carer at the staff dining table, and muttered something quietly, with his arms resting on the arms of the armchair. RP20 muttered something quietly again but did not get the attention of the senior carer"* **Line 5403:** "*RP08 then shouted "help, help!" loudly again and I could hear SP21 in the dining room asking SP09 "has she got the TV on?". SP09 responded "No, take it through". RP08 then took the lid off her plastic beaker and tipped the empty contents into her mouth. RP08 shouted "help, help!" loudly again …***Line 5408:** *SP21 then wheeled in the Ipad TV to the*

		quiet lounge and RP08 asked SP21 "am I going to bed?". SP21 replied "not yet (RP08 name), after lunch". RP08 asked "what time's my lunch?" and SP21 replied "half past 12, you have over an hour to wait. Would you like to watch some TV?..Would you like some tea?" and RP08 replied "yes please". SP21 then plugged the TV in and turned it on, whilst commenting that she would now go make her cup of tea. SP21 left the lounge... **Line 5416**: *SP21 then hurried into the quiet lounge and gave RP08 the plastic beaker of tea with a straw through the spout. RP08 commented "did you get held up*?"" **Line 7012**: "*SP07 then walked into the quiet lounge and gave RP08 her beaker of tea. RP08 was then holding her beaker of tea and SP07 left the quiet lounge. SP07 walked into the kitchen and said to SP09 "I've given RP08 tea and 3 biscuits""* **Line 6596**: "*RP08 then turned to me, smiling and jokingly said "I think they forget they put me here". In all honesty, I think she had been forgotten about too. RP08 turned and looked at me again, started shuffling her body and then shouted "help!". SP05 then walked into the doorway of the quiet lounge and said "Oooh, hang on, how long you been up? you been too quiet!"….***Line 6608***: "SP05 then walked into the quiet lounge with a plastic beaker filled with tea, with a straw pushed through the spout, pulled the height adjusted table (which had been adjusted high) over to RP08 and placed the beaker on the table beside RP08. RP08 said "thank you"."*
	Problem-solving ability to negotiate drinking vessels	**Line 6639:** "*RP08 sipped her tea through the straw in the spout of her beaker. I could hear RP08 suck air three times she sipped. RP08 then took the straw out of the beaker, took the lid off, tipped the cup to her mouth, drank all the tea from the cup and placed the beaker and lid on her table."*

		Line 5357: "*RP08 took the straw out of the spout of her plastic beaker, which had been placed on the side of her armchair, and drank for the spout to drink the remainder of the tea from the beaker*." **Line 5397:** "*RP08 then lifted the lid off her beaker an, whilst holding the beaker lid and straw in her hand, poured the last dribble of tea from the beaker into her mouth*." **Line 6208:** "*RP20 moved his tea beaker slightly. RP20 then reached for the paper cup on his table and tipped it slightly and looked in it and then tipped the red cup on his table and looked in it*." **Line 6451:** "*RP20 picked up his beaker, elbows resting on the arms of the armchair, angling the beaker as he drank from the spout, and the tea was still dribbling out of his mouth. I could see RP20 moving the angle of the spout slowly and now there was no tea coming through the spout of his beaker. RP20 placed the beaker down on the table*"… **Line 6461:** "*RP20 lifted his beaker, with his elbows resting on the arms of the armchair, tipped the beaker to his mouth and I could see that no tea was coming into the spout. RP20 lowered the beaker back down onto his table. RP20 had a cornflake on his lip and he used his spoon to try move the cornflake. RP20 then lifted his beaker with two hands and lifted his elbows off the arms of the armchair and sipped tea through the spout and then coughed twice. RP20 placed the beaker on the table".* **Line 5016:** "*RP11 lifted her plastic beaker and sucked air through the spout of the beaker, then said "please let me go back to bed darling"...* **Line 5031**: *"RP11 picked up the tea beaker again and sucked air through the spout and said "help me darling"."* **Line 2761:** "*RP08 looked at her table, looked at her cup, saw a dribble of fluid at*

		the bottom of the tea beaker, took the lid off the beaker and drank the last dribble. RP08 then took the lid off her empty squash beaker, poured it into her mouth (nothing) and put her tongue into the beaker.” **Line 4992**: *“RP11 picked up her beaker with two hands, very shakily, tipped it back and started sucking. RP11 was resting her elbows on the sides of her wheelchair, when lifting the beaker, and I could see that she was unable to tilt the beaker back any further, and so was only sipping a tiny amount of tea through the spout. ... I then saw RP11 tip the beaker with one hand, and could see that now no fluid was actually going into the spout for her to drink.”* **Line 2751**: *“RP08 inspected two cups and put them both down.”*
	Ability to reach across table for drinks	**Line 2600:** *“When we entered RP08’s room, I observed the resident reach across to her side table, and took a sip from the straw”* **Line 2696:** *“As SP04 was sorting the TV, I observed that RP08 was trying to reach the drinks on her table. RP08 then said “can you pass me them?”. SP04: “Do you want me to move the table for you?””*
	Communication	**Line 6621:** *“SP05 then said “I’ll tell you what you like....meatballs”. RP08 shouted over to SP05 “salad!”. SP05 said something back to RP08 and RP08 shouted “I can’t hear what you’re saying!”.”* **Line 2850:** *“SP13 asked “what do you want for lunch?”. RP08 said “I’m now having lunch?”. SP13 walked off laughing and said to me “I don’t understand her, she kill me”.”*
Food first	Weight loss was noticed, whereas dehydration was not.	**Line 6904:** *“SP09:“I sometimes think it’s too early for ‘em, but its difficult when you need to get 3 meals in them and they’re losing weight”. SP09 then told me that 6 residents were being closely monitored for weight loss due to Covid-19 and norovirus.”*

		Line 7068: *"SP18 then showed me an A4 sheet on top of the happy trolley which stated the names of the residents who were being monitored for weight loss, which included RP10 and RP11, and said that these residents needed to have fortified milkshakes twice a day"* **Line 3782***: "SP01 asked where SP12 and SP19 were and then commented to me that she'll have to leave them a note, and then mentioned about needing resident's weights."*
	Recording of food for all residents, whereas fluids were recorded for some.	**Line 3073**: "*SP15 told me that not all residents are on fluid charts and that he wasn't sure why some residents were. SP15 told me that some residents are also put on fluid charts if they drink too much. SP15 told me that some carers record how many ml they have provided in a cup to a resident, rather than deducting what didn't get drunk*." **Line 3920**: "*SP12 told me that yoghurts count 75ml towards fluids and told me that because she is a new resident, she will be on a fluid chart for a month and will then be reviewed."* **Line 4195:** *"I then heard SP21 asking SP09 what certain residents had eaten and SP09 responded telling SP21 what the residents had eaten*"
	Food given instead of drinks	**Lines 3490**: "*SP14 then walked over to RP20 and asked "you want some juice?" and assisted RP20 to take two sips of drink. SP14 looked at me whilst offering RP20 the drink. SP14 then asked RP20 "you want yoghurt?", RP20 nodded and SP14 began spooning yoghurt into RP20's mouth until the pot was finished*." **Line 2626**: "*I observed SP17 touch RP10's mouth with a spoon, and then RP10 would open his mouth for the spoon of jelly. When RP10 had finished the small bowl of jelly, SP17 wiped his face with a napkin, and cleared his plates, bowl and cutlery*

		away. SP17 did not make or offer RP10 a drink." **Line 5100:** "*RP11 was sat asleep in her comfy chair with a table in front of her, with a small plate of broken chocolate, but no drink*" **Line 5950**: "*SP13 then walked over to RP11, smiling and asked RP11 if she would like another mousse. RP11 said "no thank you, that was delicious" and SP13 removed the bowl and left the lounge. RP10 was now snoring on the floor, RP11 sat with her hands resting on her legs and her head down. RP11 looked at me and whimpered "I want to go home darling", and then put her head down, pushed her glasses back up on her nose and shut her eyes. There was still a paper cup on her table, so I stood up to see if there was any fluids left in there, and there was not."* ***Line 5865: "****SP19 then placed a bowl of mousse and a teaspoon onto RP11's table, behind her plate, and looked at RP11. RP11 was not offered a choice, or asked. SP07 then walked into the lounge and started to scoop up a bowl of pudding from the trolley. SP07 then offered to cut up RP11's fish and chips for her, which she did and then SP07 left the lounge*." …***Line 5894:*** *"RP11 was now asleep next to me in her chair and still did not have a drink."* **Line 4181***: "I asked SP21 if mousse contributes to fluid intake on the fluid charts. SP21 walked over to the folders on the staff table and said that she would check. I told SP21 not to worry right now as I didn't want to take her away from what she was doing but she said that she wanted to know for herself in any case. SP21 looked through the folders and commented that someone had recorded mousse on a fluid chart, but she thought that it was just soup, jelly and yoghurt which contributed to fluids on the fluid charts".*

		Line 3921: *"I asked SP12 if yoghurts contributed to fluids on fluid charts. SP12 told me that yoghurts count 75ml towards fluids*"
	Care home environment	**Line 4103:** "*I noticed on the board, painted on the back wall, that it said "Today's specials: homemade jam tarts and lemon curd, homemade lemon cake"."* **Line 1889:** "*I noticed that the dining room door, which remains open, has a small, laminated sign showing a plate of food and cutlery. I wondered why this didn't have a picture of a drink and if this goes some way to reinforcing the idea that food is more important than fluid?"* **Line 2147**: "*The menu board is changed everyday, and this evening, I noticed that it only ever writes food options"*

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