



Applied nutritional investigation

Weight management needs in under-resourced communities elicited using storyboarding and a realist lens: a qualitative study



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ABSTRACT

Objective: Overweight and obesity are causing a growing public health, economic, and clinical burden, particularly within under-resourced communities. There is an urgent need to develop an in-depth understanding of experiences of weight management as well as preferences for support within under-resourced communities, with a view to developing more effective weight management interventions.

Methods: Focus groups were run in under-resourced communities using storyboarding, a method used to facilitate inclusive communication (n = 37). Thematic analysis was applied to textual and visual data, and a realist 'lens' applied to provide in-depth insight into weight management experiences and needs. We believe this is the first study to use this combined methodology to explore weight management experiences and needs.

Results: Combining storyboarding with a realist lens generated four themes. *Living circumstances* indicated that mental health, individual needs, and the cost of weight management services were key contextual factors. *Mechanisms of weight management* identified emotional eating and portion control as central to individual weight management. *Yo-yo dieting* centered on participants' experiences of weight regain after attempting weight loss. *Weight management intervention needs* indicated that psychological support was perceived as severely lacking and the only route to attain sustained weight management. Offering both in-person and online support for weight management was considered important to reach more people.

Conclusions: Moving weight management support from short to long term and incorporating more robust psychological support would better serve the needs of people living in under-resourced communities who are overweight or obese. Ideally interventions should be multicomponent and tailored to individual needs and circumstances.

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Background

Overweight and obesity are strongly linked to the risk of developing non-communicable diseases including cancer, coronary heart disease, and diabetes [1]. The global prevalence of overweight and obesity is significant at an estimated level of 37%, and this level is predicted to rise [2]. As such, overweight and obesity is causing an increasing public health, clinical, and economic burden [1,3]. By 2035, obesity is predicted to be the leading modifiable risk factor for non-communicable diseases [1]. The estimated cost of obesity in 2019 was equivalent to 1.8% of gross domestic product, and this is projected to rise to 3.6% by 2060 [3]. Furthermore, there are disparities in obesity prevalence, with a greater burden

experienced in marginalized areas due to under-resourcing limiting both individual opportunities and service provision [4]. In under-resourced communities, there is a lower likelihood of uptake of weight management interventions where these exist due to factors including employment, transport, and caregiving conflicts [4,5]. Obesity is a complex problem and requires in-depth understanding to develop solutions, particularly within under-resourced communities [6]. There are relatively few studies that have detailed the lived experiences and weight management needs of people with obesity. A qualitative synthesis of studies exploring the experiences of people living with obesity found that daily living circumstances and stigma were related to difficulties in accessing weight management services [7]. However, there is a need for further research to understand experiences and service opportunities to facilitate long-term weight management, particularly within under-resourced communities [6,7].

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There is a growing call for participatory research in under-resourced communities to understand complex needs and experiences, with the aim of increasing the effectiveness of interventions to promote equitable health in these populations [7,8]. For participatory research to work most effectively, techniques should be applied to increase engagement. Visual qualitative techniques offer a way to increase engagement by offering participants alternative ways to express themselves [9]. Storyboarding, originating from the film-making industry, is an innovative and creative visual method used as an inclusive approach to elicit rich participant insight [10–13]. Storyboarding typically uses a sheet of paper divided into sections representing a sequential narrative, such as moving from views before, to during and after an intervention, and invites participants to complete these sections using a variety of materials to enable expression through drawing, collaging, and/or writing [10]. Storyboarding is particularly suited to exploring emotive topics [11,12], such as weight management. In addition to methods to engage communities to understand needs, there is a growing recognition of the importance of understanding complexity to develop effective interventions for multiplex problems, such as obesity. Realist evaluation is increasingly applied to uncover key contextual and mechanistic factors that lead to particular outcomes, as well as uncover the elements that are needed for successful interventions [14].

We aimed to understand experiences of weight management and preferences for support in under-resourced communities using a novel combination of storyboarding and analysis through a realist ‘lens.’ To our knowledge, this is the first study to use this combined approach to explore weight management service needs.

Methods

Our novel approach used storyboard focus groups and a realist ‘lens’ to understand the views of weight management services. By combining storyboards with a realist ‘lens,’ we aimed to generate rich insight into the complex underlying thought processes of weight management needs and experiences. Ethical approval was granted by the Faculty of Medicine and Health Sciences Research Ethics Committee at the University of East Anglia and we followed the Standards for Reporting Qualitative Research ([Supplementary file 1](#)).

Focus groups were run by two researchers trained to use storyboarding to support visual and inclusive communication. Researchers were academics based outside of the under-resourced communities participating in the research, which may have influenced participant responses, and they took time at the start of each focus group to build rapport and trust. The storyboard approach was also designed to minimize any perceived power imbalance. Further, the storyboard template and topic guide were developed in conjunction with patient and public representatives. An informal meeting was held with patient and public representatives to trial the storyboard exercise. Amendments were incorporated based on their feedback, which centered on reducing the number of activities and increasing the focus group duration.

Participant recruitment

Focus groups were conducted in community settings in the counties of Essex, Suffolk, and Norfolk, UK. To reach under-resourced communities, areas among the top 20% most deprived were targeted, based on the Index of Multiple Deprivation [15]. Adults (≥ 18 y) with a self-reported body mass index (BMI) ≥ 25 kg/m² and/or self-identifying as overweight or interested in receiving weight management support were included. We aimed to recruit six groups of six to eight participants, seeking to cease recruitment

once a sufficiently ‘data-rich’ sample had been recruited and data saturation reached [16,17].

To identify participants in under-resourced communities, we leveraged existing trusted networks and community channels. To reach a diverse range of participants, recruitment flyers, posters, electronic advertisements, and e-mail were used to facilitate in-person and remote recruitment. Community group leads aided participant recruitment where needed. Participants were compensated with a £50 voucher and up to £10 travel reimbursement for their time. Participants expressing an interest were supplied with a user-friendly demographics form and a short, user-friendly version of the full participant information sheet, designed in conjunction with patient and public representatives and community researchers with experience developing accessible study information (see Cherish research study [18]). Consent was taken formally at the start of the focus groups.

Data collection

Focus groups were conducted between February and April 2025. The semi-structured topic guide explored views and experiences of personal weight management, weight management services, and future service needs in under-resourced communities. The storyboard activity invited participants to complete an exercise sheet to break down their thoughts before, during, and after using a weight management service ([Supplementary file 2](#)). The storyboard exercise sheet prompted participants to consider contextual lifestyle factors, their feelings, barriers and enablers for their individual weight management needs, and what might encourage them to use a weight management service. As such, the guide was designed to elicit context-mechanism-outcome configurations (CMOCs) in line with the realist approach [14]. Participants could complete the sheets by collaging, drawing, or adding a few words about their feelings, barriers, and enablers [10]. Participants were encouraged to present and describe their storyboard to the rest of the group. This enabled researchers to understand the meanings behind the images participants had included or drawn on their storyboards. Focus groups were audio-recorded and transcribed verbatim. Data was pseudonymized by replacing names with a code to protect participant anonymity. Photographs were taken of the storyboards at the end of the session and participants were offered the chance to take their storyboard home if they wished to keep it. All boards were photographed before any storyboards were removed from the focus group setting.

Data analysis

A combination of both textual and visual analysis was applied, facilitated using NVivo version 14. Thematic analysis [19] was used to find key themes, similarities, and differences between participant reflections. Data were analyzed deductively, guided by questions in the topic guide, and inductively to identify unprompted themes. Transcripts were read and re-read, and codes were assigned to data segments to capture their core meaning. To analyze visual content, storyboards were viewed and re-viewed to facilitate data familiarization. A broad description was given to the overall storyboard to include the type of images selected and their positioning, and use of color to aid familiarization and data interpretation. To reduce ambiguity, image meanings were not analyzed in isolation but were interpreted based on the context and description given orally by the participant, consistent with visual qualitative analysis methodology [9,10]. Data analysis included initial participant descriptions of their storyboard and further data gleaned from probing by the researcher to clarify meanings behind

imagery. This was particularly important for more abstract visuals. Codes were assigned to image segments to capture core meaning and storyboards were reviewed to identify recurring patterns [12,13]. A realist 'lens' was applied to the data by using codes for each context, mechanism, and outcome present within transcripts and storyboards, to increase understanding of participant beliefs and offer explanations of phenomena [20]. Codes from both transcripts and storyboards were organized into groups to generate overall themes. Following initial analysis, linked coding [21] was used to generate causal explanations of how mechanisms triggered by experiences of weight management impact engagement with weight management services. CMOCs were extracted as either dyads (CO, MO, or CM combinations) or triads (full linked CMOCs). Where relationships were not explicit in the data, retroduction [22] was used to generate causal explanations. Analysis was conducted by the lead author (T. J. B.). A summary of the findings was shared with patient and public representatives, who 'sense checked' the outcomes and summarized views using a group storyboard, which was used to triangulate findings to enhance the credibility of analysis. To reduce ambiguity in interpretation of storyboard imagery or oral transcripts, a summary of the overall findings was additionally shared with participants for information and any feedback.

Results

Six focus groups were conducted in the community with a total of 37 participants taking part and completing storyboards. We concluded sampling after six focus groups, as we had reached the point of data saturation [16,17]. Session duration ranged from 82 to 95 min. All participants reported an interest in weight management, and all but one participant self-reported as overweight or obese, with a mean BMI of 34.9 (standard deviation: 6.77). Full participant characteristics are shown in Table 1. Groups were conducted in community settings across Norfolk, Suffolk, and Essex in Gainsborough, Great Yarmouth, Greenstead in Colchester, Jaywick, Norwich, and Whitton, all of which include some of the 20% most deprived areas in England [23].

Four main themes were generated, guided by a 'realist lens' encompassing key contextual circumstances influencing weight and weight management, mechanisms of change, weight management outcomes, and weight management needs. We focus on the experiences of participants, supplemented with insights from patient and public representatives. Causal explanations of how mechanisms triggered by weight management impact engagement with weight management services are summarized in Table 2.

Living circumstances

A strong theme related to difficulties in accessing weight management services, or facilities that would support weight management, such as sports facilities. Participants reported a lack of local services and limitations in transport to these services. Some participants referred to feelings that their local neighborhood was 'going downhill' and a sense of loss of community spirit due to lack of resources and closure of some services:

"When that [community center] was open they used to do lots of stuff down there, cooking and all different, but that shut down, didn't it?" (participant 005)

Other participants spoke positively of local initiatives to improve wellbeing, but there were some reports that these services were not well attended, indicating barriers beyond the simple

Table 1
Participant characteristics

Characteristics	Total, n = 37
Gender, n (%)	
Female	24 (64.86)
Male	13 (35.14)
Age (y), mean (SD)	56.35 (11.02)
18–25, n (%)	0 (0.00)
26–35, n (%)	1 (2.70)
36–45, n (%)	5 (13.51)
46–55, n (%)	12 (32.43)
56–65, n (%)	12 (32.43)
66–75, n (%)	6 (16.22)
> 75, n (%)	1 (2.70)
Ethnicity, n (%)	
White British or Irish	33 (89.19)
Asian or Asian British	2 (5.41)
Black or Black British	0 (0.00)
Mixed ethnic groups	1 (2.70)
Other ethnic groups	1 (2.70)
Employment, n (%)	
Full-time employee	6 (16.22)
Part-time employee	9 (24.32)
Self-employed	0 (0.00)
Contractor	0 (0.00)
Worker or casual employment	0 (0.00)
Retired	12 (32.43)
Long-term sick or disability	7 (18.92)
Volunteer	1 (2.70)
Unemployed	2 (5.41)
Qualifications, n (%)	
Higher education qualification	16 (43.24)
A-levels or equivalent	10 (27.03)
GCSEs or equivalent	6 (16.22)
None or not specified	5 (13.51)
Index of multiple deprivation (decile)*, n (%)	
1	12 (32.43)
2	3 (8.11)
3	3 (8.11)
4	2 (5.41)
5	4 (10.81)
6	3 (8.11)
7	2 (5.41)
8	2 (5.41)
9	3 (8.11)
10	3 (8.11)
BMI (kg/m²), mean (SD)	34.97 (6.77)
< 18.5 (underweight), n (%)	0 (0.00)
18.5–24.9 (healthy weight), n (%)	1 (2.70)
25–29.9 (overweight), n (%)	9 (24.32)
30–39.9 (obese), n (%)	21 (56.76)
≥ 40 (severely obese), n (%)	6 (16.22)

*Where decile 1 is the 10% most deprived, and decile 10 is the 10% least deprived. BMI, body mass index; SD, standard deviation

locality of services. Participants repeatedly referred to barriers such as low income and high costs of accessing healthier foods, physical activities, and weight management services:

"Can't afford to eat expensive, healthy food. . . I think that's the big thing with weight management, it is easy to fill up cheaply." (participant 019)

"Anything with weight attached or diet attached, money making. They're not overly there to help you I feel." (participant 020).

Participants spoke about the context of culture and an increasing access to less healthy foods and more sedentary lifestyles, which was described by one participant as a society 'drowning in obesity.' In part, this stemmed from historical cultural eating practices and giving 'love through food' perpetuating less healthy eating preferences. It was acknowledged that health care resources could only go so far to rectify this culture, and that individuals also

Table 2
Context-mechanism-outcome configurations of weight management needs

CMOCs	Illustrative quotes	Intervention needs
CMOC 1 If individuals perceive that their body weight is high relative to others, and uncontrollable (C), then individuals may perceive low self-esteem (M) and be less likely to manage weight or access weight management services (O)	<i>"I think it's also to do with confidence as well, that stops people from... this; the feeling of being ashamed, of being how big you are, you don't wanna burden people"</i> (participant 029) <i>"In society, expectations with social media, weight results in the papers, advertisements of losing weight, they can all be overwhelming to somebody who's trying to lose weight."</i> (participant 034)	Incremental lifestyle support that is respectful, encouraging and builds confidence
CMOC 2 If individuals perceive no immediate weight-related health concerns (C), then individuals may experience behavioral apathy (M) and be less likely to manage weight or access weight management services (O)	<i>"I've got no idea if there are any weight management services available, probably because I haven't looked."</i> (participant 017) <i>"I'm a head in the sand person, don't worry about something until it happens."</i> (participant 036)	Positive lifestyle support focusing on gain to overall quality of life and preventive health care
CMOC 3 If individuals experience mental health conditions or a negative emotional state (C), then individuals may experience a loss of self-control and emotional eating (M), and be less likely to manage weight or access weight management services (O)	<i>"Comfort eating and the way my mental health sort of manifests itself."</i> (participant 004) <i>"For people who have mental health problems, I think basically a lot of the issues behind eating is comfort and pleasure. And I don't think that that's being addressed."</i> (participant 011)	Holistic lifestyle support incorporating psychological support
CMOC 4 If individual needs and circumstances, such as co-morbidities, are not met (C), then individuals may perceive reduced competence (M) and be less likely to manage weight or access weight management services (O)	<i>"You get on a steady path and all of a sudden they get a new drug that makes everything else different, so you have to readjust, and that's where I find the diabetes can be a little bit baffling. You need to have that control and you need the information to control your diabetes."</i> (participant 001) <i>"I injured my spine, had two back ops, had a knee op, I don't do anything now and I've put on two stone. So when it's cold and miserable now, I will have a cup of tea and a chocolate. Before, I'd be hitting the water or the gym and the weights."</i> (participant 011)	Tailored person-centered lifestyle support
CMOC 5 If individuals are less informed in maintaining a healthy lifestyle (C), then individuals may experience lower understanding (M) and be less likely to manage weight or access weight management services (O)	<i>"Not a lot of people understand how to lose weight or what foods to put together."</i> (participant 034) <i>"In terms of knowledge of what to eat, I'm not great at. I know there's all these fats—healthy fats, bad fats. I have an understanding, but I wouldn't say I'm an expert and I don't think that the knowledge about it is out there properly."</i> (participant 014)	Lifestyle support that builds knowledge and skills
CMOC 6 If individual sociocultural experiences perpetuate less healthy lifestyles (C), then individuals may experience feelings of reduced motivation (M) and be less likely to manage weight or access weight management services (O)	<i>"When you're on your own, not working, day in, day out, I just sit there... and eat, through boredom."</i> (participant 010) <i>"You go and watch a game of football, then it's a half-time pie and a half-time beer and a before-the-game pie and an after-game drink."</i> (participant 015)	Lifestyle support incorporating peer support
CMOC 7 If individuals have previously tried and failed to maintain healthier lifestyle habits (C), then individuals may experience lower self-efficacy and emotional eating (M), and be less likely to manage weight or access weight management services (O)	<i>"I do feel guilty if I've either put on weight or eaten something that I probably shouldn't have done. Or if I've gone over my calories for a day or something, I'll just feel really guilty and start comfort eating and then I've gone downhill again."</i> (participant 014) <i>"I get so I don't care during. And motivational loss. And then I just think why bother? I know that's really negative and I don't mean to be negative but that's just my journey with it."</i> (participant 008)	Longer-term support that builds self-efficacy
CMOC 8 If the cost of weight management services, healthier foods and lifestyle activities are high and individuals have low financial resources (C), then individuals may experience feelings of disempowerment (M) and be less likely to manage weight or access weight management services (O)	<i>"I couldn't afford to keep doing it, so just sad that I couldn't keep it going and seeing it through. I've put on some of the weight that I lost."</i> (participant 009) <i>"It's often cheaper to buy junk food than it is healthy food. It's a no brainer when you're on a budget with five people in the household, what you gonna go and buy?"</i> (participant 023)	Long-term affordable lifestyle support
CMOC 9 If individuals experience logistical barriers in accessing weight management services, healthier foods and lifestyle activities (C), then individuals may experience feelings of disempowerment (M) and be less likely to manage weight or access weight management services (O)	<i>"If it's in-person then for me, it means more time and effort is needed and possibly transport."</i> (participant 031) <i>"I've got sort of mobility problems which hinders activities and it's not an excuse, but sometimes people feel you're using that as an excuse. And that plays in with the mobility, like location of services."</i> (participant 022)	Lifestyle support that is easy to access and engage with, available both in-person and online

CMOCs, context-mechanism-outcome configurations.

played a role in their behaviors. Participants commonly selected images of less healthy foods and images of sitting down to illustrate their perceptions of their lifestyle before a weight management intervention (Fig. 1).

However, there were significant barriers to initiating positive behavioral changes due to medical conditions, disabilities, mental health needs, and living circumstances. Co-morbidities frequently contributed to weight gain and also resulted in barriers to physical activity and undertaking daily activities:

"Large doses of steroids three times a day, and that's making me put on weight. That makes me put on weight, a lot of weight, and that's really hard to deal with. And that's also a problem when it becomes going to the gym, because if I overwork myself I end up having an... attack, because I can't control my body heat. So I can't do too much exercise either. So that is a big part of my weight problem is because I'm on steroids, still on steroids three times a day. And then obviously probably my food is not helping on top of that." (participant 002)



Figure 1. Storyboard extract, participant 015.

Some participants represented thoughts of personal barriers on their storyboards using sad or anxious faces to illustrate their feelings (Fig. 2).

Participants spoke about mental health challenges and how mental health contributed to weight gain due to mental health medication, food ‘addiction,’ and by limiting opportunities for physical activity and getting out into the community. Participants expressed strong feelings of frustration in the lack of support and advice for weight maintenance in the context of co-morbidities, mental health, and individual needs:

Participant 021

“Overweight is an addiction ‘cause you’re addicted to food! There’s no help out there. No help out there. You can get help for alcohol, drug use— Yeah.”

Participant 023

“But eating a lot you can’t.”

Participant 021

“And it costs us to go somewhere to try and lose it.”

A number of participants referred to chronic life changes that acted as barriers, including an increase in weight due to aging, a gradual reduction in the capacity to exercise, or—specific to women—the menopause. Acute life events could also act as significant barriers, including deeply personal traumatic events from childhood or adulthood. The most commonly reported chronic life events were illness and physical incapacity reducing activities and causing medication-related weight gain. Becoming a parent was also raised, with participants reporting barriers to weight management due to lack of time and prioritizing children. Lack of time due to working circumstances was additionally raised as a limiting factor. Living alone, isolation, or lack of a partner were also perceived as barriers to eating healthily:

“I just don’t see the point. Living on your own you’re just cooking for one.” (participant 010)

Where life events were attributed to weight-related factors, this could prompt participants into action to make behavioral changes and manage their weight:

“It took me to have four heart attacks before I realized that’s what I needed to do.” (participant 003)

Mechanisms of weight management

A variety of living circumstances triggered a variety of different emotional responses that could motivate or demotivate participants to engage with weight management support or make individual changes. A strong theme was the influence of negative thoughts, including anxiety, stress, depression, and fatigue, which prompted emotional eating:

“I just love food! And I find it gives me a lift and it gives me a comfort and it gives me a friend, it gives me a companion. And it’s terrible to say that, I know, but that’s the truth.” (participant 008)

Participants represented the influence of negative thoughts and emotional eating on their storyboards by selecting or drawing images of despondent people and using images of ‘treat’ foods (Fig. 3).

Participants spoke of a loss of control, particularly relating to portion sizes, which was often described as ‘self-sabotaging’ behavior:

“I’m happy. When I’m eating it. It’s only afterwards, once I’ve finished eating it, that actually I’m not any happier because of it, but in that moment I am. So that’s where I struggle with the self-sabotaging behavior, I think.” (participant 022)

Maintaining weight was almost universally perceived as formidable and laborious, particularly during the winter months, when participants believed they experienced an increase in negative thinking. Conversely, when participants felt more positive, they

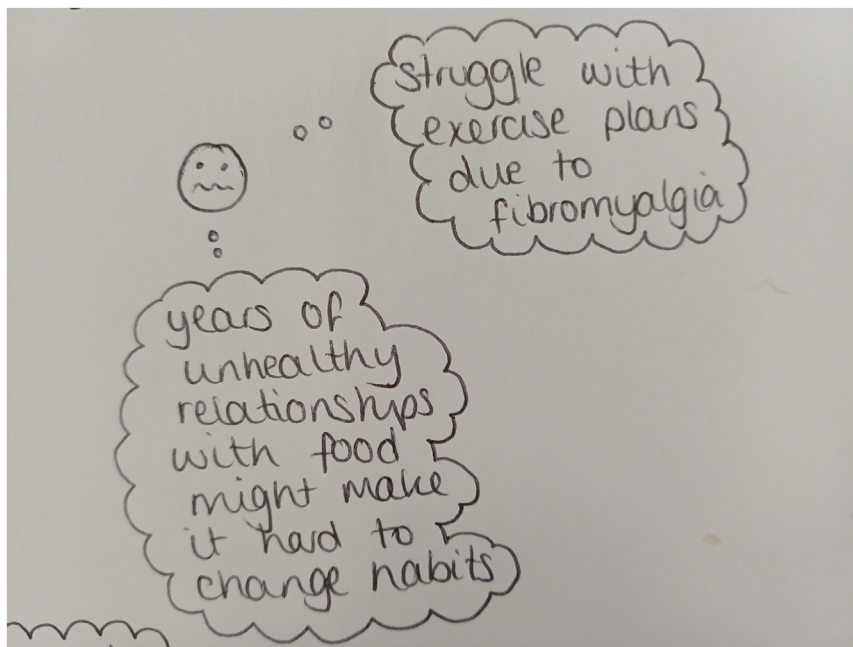


Figure 2. Storyboard extract, participant 033.

expressed greater feelings of self-control or were better able to adapt to stay on track:

"It's all about obviously getting your head in the right place as well, to then think right, long-term hopefully I can achieve my goals and lose the weight and reverse the damage I've done." (participant 010)

Positive or negative thinking was a predictor for the transition from a state of pre-intention to action for weight management. Interwoven through this was the perception of body image. A desire for an idealistic body image and greater self-worth could

motivate action. By contrast, participant perceptions of their body image could induce feelings of shame, low self-esteem, and feelings of judgment. Participants selected images or magazine word clippings relating to models in comparison to their perceptions of themselves to express their perception of their own body image (Fig. 4).

Participant emotions appeared to be mediated by a range of internal and external factors. Key facilitators were receiving support for weight management, losing weight, feeling the benefits, and experiencing higher perceptions of capabilities. Perceiving encouragement from social, peer, and family groups was also

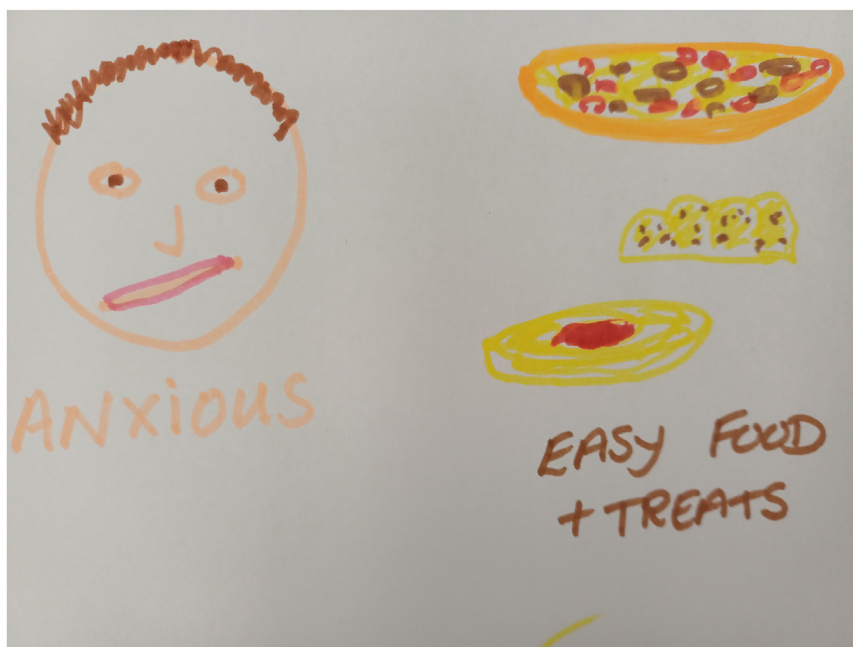


Figure 3. Storyboard extract, participant 026.

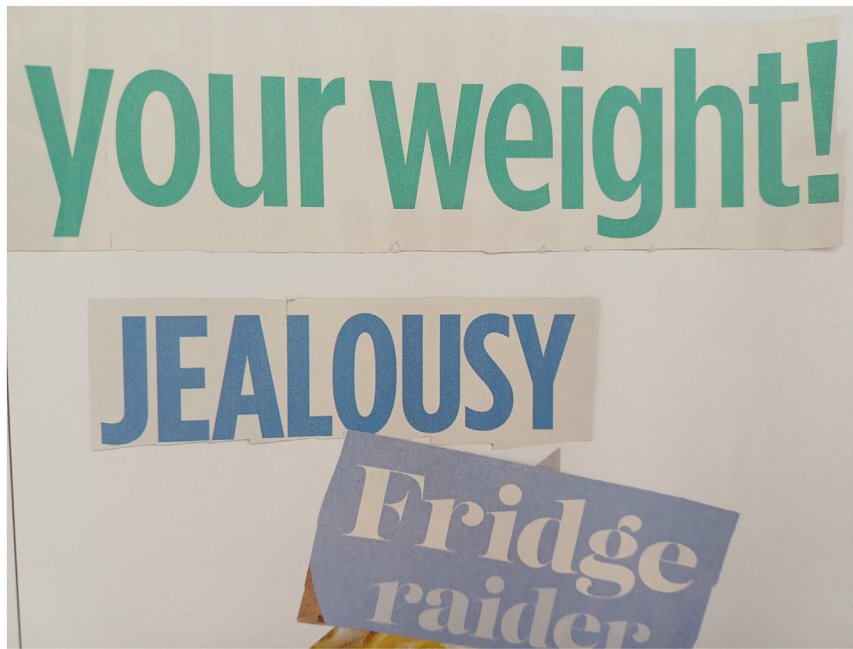


Figure 4. Storyboard extract, participant 007.

closely related to feelings of confidence and success. Participant capabilities appeared to be strongly related to having a more in-depth knowledge of nutrition, cooking skills, and how to undertake moderate activity that fitted into daily lifestyle. Greater exposure to facilitatory factors enabled the development of coping strategies and increased feelings of commitment to weight management:

"You learn new things, tips, that kind of thing. You connect with your colleagues, your friends that are doing it, you feel boosted." (participant 028)

'Yo-yo dieting'

A combination of contextual living circumstances and causal mechanisms of weight management influenced success in weight maintenance or the perceived failure to maintain weight. A strong theme related to 'yo-yo dieting,' a term participants applied to their constant cycling of weight changes. Participants perceived this as a vicious cycle that was frequently viewed as inescapable (Fig. 5).

Relapse to weight gain was frequently reported by participants and was also a commonly expressed experience among patient and public representatives. A perceived increase in body size or breaking a goal resulted in feelings of failure, guilt, and a lack of motivation to continue:

"I do feel guilty if I've either put on weight or eaten something that I probably shouldn't have done. Or if I've gone over my calories for a day or something, I'll just feel really guilty and start comfort eating and then I've gone downhill again." (participant 014)

"I get so I don't care during. And motivational loss. And then I just think why bother? I know that's really negative and I don't mean to be negative but that's just my journey with it." (participant 008)

Psychological mechanisms when compounded by contextual factors resulted in a greater likelihood of relapse. Key contextual

factors playing a role included cost of food, cost of support, and loss of support:

"That was the 12-week free course from the council, but after that I couldn't afford to keep doing it, so just sad that I couldn't keep it going and seeing it through." (participant 009)

A minority of participants reported moving from 'yo-yo' dieting to a state of continued success in weight management. For these participants, success appeared to relate to taking small steps, making manageable changes that fitted with their lifestyle and were sustainable over time:

"No diet, no special diet, just eating sensibly, and just having little walks here and there, rather than use a car to go to the shops, walk up to the shop, things like that. That's what helped me adjust and lose the weight." (participant 003)

"I'm pretty disciplined on what I eat. I try to do... rounded sort of meals but I try to use healthy ingredients. And the other thing is instead of using a large plate, I use a smaller bowl so you can get less in it so you eat less." (participant 025)

Weight management intervention needs

Participants expressed that 'one size doesn't fit all' in terms of desired weight management support. There was agreement that ideally a service would offer options for both in-person and online or remote support, and would offer both group sessions and one-to-one meetings. Offering multiple options was thought to be important to ensure convenience and enable optimal fit with lifestyle. Participants also expressed that support should be affordable and easy to access and engage with. Participants were seeking support that included guidance for balanced, flavorful eating, in addition to providing usable options for physical activity throughout the seasons.

There was a strong desire for longer-term support, or for a program to include strategies that would boost individual capacities



Figure 5. Storyboard extract, participant 030.

to maintain weight beyond an initial weight-loss program. Two such strategies were improving knowledge and providing psychological support. Providing knowledge to extend understanding of weight management was thought to enable greater long-term self-management of weight. Greater psychological support was also viewed as key to move from 'yo-yo dieting' to long-term weight maintenance. Participants believed that there was a current lack of psychological support and a lack of support to address emotional eating, frequently perceived as the root cause of weight gain:

"A lot of the issues behind eating is comfort and pleasure. And I don't think that that's being addressed." (participant 011)

"Someone might be struggling with their wellbeing or something in their background that needs to be addressed, that then they can focus on weight loss a little bit more and be healthier, 'cause then they can break away from anything that's impacting them." (participant 034)

Participants believed that any program should be respectful and encouraging in nature, to enable building of confidence and to support making changes one step at a time. There was a need for holistic support, rather than a focus on change in BMI; an index perceived as unhelpful. Tailored support to meet individual needs and preferences was expressed as the ideal.

Patient and public representatives collectively depicted the journey of moving from before, to during and after an initial weight management program. Their group storyboard reflected the same barriers and facilitators expressed by participants, and a universal desire for long-term support and maintenance (Fig. 6).

Discussion

Storyboarding and the application of a realist 'lens' were used to understand the needs and experiences of weight management in under-resourced communities, and this is the first study to use this combined approach to explore weight management needs. Key contextual barriers were cost and difficulties in accessing weight management services, healthy foods, and exercise

opportunities. Key mechanisms acting as barriers to weight management were negative thinking and emotional eating, which resulted in cyclical 'yo-yo dieting.' Participants sought a weight management service that was flexible and that offered both in-person and remote support. For long-term weight maintenance, participants believed it was crucial to provide extended support and to include psychological support to address the underlying causes of overeating. There was a desire for a service that was tailored to individual needs and medical circumstances.

Given the growing use of obesity medication [24], and evidence that weight regain is higher following cessation of medication compared with cessation of behavioral support [25], it is perhaps ever more important to identify which elements of behavioral weight management interventions are key for long-term weight maintenance, particularly within under-resourced communities. Our findings of key elements to include in a weight management program add to and extend those in the literature. Through an increased understanding of the complex interplay between obesogenic contextual factors, and the key mechanisms (e.g., self-control), through which these factors operate, we have been able to offer recommendations for how interventions might be refined to achieve sustained weight management outcomes. Obesity drivers include a complex interplay between structural determinants and individual-level determinants [26]. NICE guidance for overweight and obesity bases recommendations on the success of multicomponent interventions that are tailored to individuals and address long-term needs [27], consistent with individual-level determinant barriers that we identified including individual behaviors, co-morbidities, and mental health conditions. Participants taking part in our research believed there was a lack of weight management interventions that were easy to access and of low cost, congruent with key structural determinants of obesity [28]. Structural determinants refer to 'upstream' drivers, which in turn drive individual behaviors [26,29], and relate to a combination of the local built environment, economy, commercial, sociocultural, and political landscape [26,28,29]. For overweight and obesity, structural determinants manifest as unhealthy food and low active environments, unhealthy food marketing, and political power imbalance, creating



Figure 6. Patient and public representatives storyboard of weight management needs.

inequity, disparities in obesity, and a higher prevalence of obesity within under-resourced communities, particularly for individuals of low socioeconomic status and for ethnic minorities [26,28]. Effective policies and population-level interventions are needed to address this power imbalance and increase access to weight management services and to affordable healthier foods and physical activities [26,28,29]. The financial cost of programs and transport limitations are recognized as barriers, particularly for low socioeconomic groups [30,31], and the inclusion of digital interventions may aid weight management within groups of lower socioeconomic status by providing an additional route of access [30]. Other barriers to accessing weight management support include health service factors such as low referral rates and inadequate communication with patients [7,31]. Perceived stigma of overweight and obesity, and limited support to address emotional eating, also play significant roles [7,31]. To address stigma, we identified respect and encouragement to be important facilitators to encourage access and engagement with weight management services. We also found that participants perceived greater encouragement where small step changes with realistic goals were recommended. A review of behavior change techniques essential for weight loss also found that goal-setting, self-monitoring, and commitment were important elements to include for success [6]. Participants sought increased knowledge and skills to address both nutrition and physical activity barriers, and to understand emotional eating; therefore, addressing both nutrition and physical activity is recommended to increase the effectiveness of weight management programs [27]. Specific recommendations to include psychological therapies for supporting mental health in weight management programs are lacking, in part due to lack of evidence for an effect [32]. However, there is growing recognition that psychological support, if added to traditional weight management programs, would aid self-control of emotional eating [32,33].

Study strengths and limitations

The strengths of this study lie in the storyboarding methodology, which enabled an inclusive approach and expression from

seldom-heard voices. Allowing participants to express themselves through pictures or writing, in addition to expressing themselves orally, was valuable in collecting in-depth views of the emotive topic of weight management. Viewing storyboards using a realist 'lens' enabled us to pinpoint key contextual and mechanistic factors that had an influence on weight management outcomes. This was a novel approach that provided a unique insight into experiences of overweight and weight management services. However, participants tended to present storyboards that focused on their personal journeys, rather than taking a wider view of weight management needs, which could be perceived as limiting generalizability [34]. Key findings were shared with participants, and patient and public representatives married well with the study findings, which we believed increased the validity of our results.

Approaching overweight individuals within community groups was challenging due to the stigma of weight, eating disorders, privacy concerns, and inclusivity. The criteria of 'self-identifying' as overweight was therefore emphasized, rather than a focus on BMI, and community groups that focused on weight management or wellbeing were included. People who self-identify as overweight or who take part in weight management programs would likely more readily engage with weight management research in comparison to the general population, which may have reduced transferability of our findings. Nevertheless, we reached some participants who were not motivated to engage with weight management services. We also sought views of experiences before, during, and after the use of a weight management service to capture more information on the pre-contemplation phase. Reaching participants of a low socioeconomic status was also challenging. While areas within the top 20% most deprived were targeted, participants did not all live within the targeted postcode areas. Postcode by Index of Multiple Deprivation was not stipulated as an inclusion criterion, as this would have been difficult to control for in community group settings. Reaching a socio-demographically diverse sample was also challenging, in part because the Faculty of Medicine and Health Sciences Ethics Committee requested that

socio-demographics were collected following consent, which limited purposive sampling. As a result, our sample contained few participants from ethnic minority groups, or who were of a younger age, or who were less well-educated. The study was also limited to three counties in the east of England. As such, our findings may lack transferability and may not be applicable to more ethnically diverse or geographically distinct communities. Challenges in recruiting participants of lower socioeconomic status are widely recognized in the literature [35]. Irrespective of socioeconomic and demographic status, the views of participants were broadly similar, with data saturation reached after six focus groups.

Recommendations for further research

Further research is needed to test the success of interventions addressing the specific contextual and mechanistic factors that we have identified as key to weight management within under-resourced communities. Repeating this research with a more diverse sample, including under-represented groups, would also be beneficial to test the generalizability of our findings.

Conclusions

Our findings suggest that programs to support weight management in under-resourced communities should include greater psychological support to address the root causes behind weight gain, alongside advice or signposting to long-term support needs. Programs should be low cost and easy to access, and ideally tailored to individual needs and circumstances. We recommend that policy-makers and practitioners incorporate these specific needs into weight management programs to enable a move from 'yo-yo' dieting to long-term weight maintenance.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Tracey J Brown: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Kate Mahoney:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Felix Naughton:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Natalie An Qi Tham:** Writing – review & editing, Investigation. **Zarnie Khadjesari:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Data curation, Conceptualization.

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Data availability

Data supporting the study findings are not publicly available due to privacy and ethical restrictions. The participants of this study did not agree to have their data shared publicly.

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Supplementary materials

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