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Factors that influence treatment-seeking expectations in response to infectious intestinal disease: Original survey and multinomial regression

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ABSTRACT

Background: Infectious intestinal disease affects 25% of the UK population annually; 1 in 50 affected people consult health professionals about their illness.

Aims: We tested if anticipated treatment-seeking decisions for suspected infectious intestinal disease could be related to emotional response, tolerance of symptoms, or beliefs about the consequential benefits and harms of seeking treatment (or not).

Methods: Questionnaire survey of adults living in the UK with statistical analysis of responses. A vignette was presented about a hypothetical gastrointestinal illness. People stated their emotional reactions, expected actions in response and beliefs about possible benefits or harms from seeking treatment (or not getting treatment). Multinomial regression looked for predictors of anticipated behaviour.

Results: People were inclined to consult a GP when they believed that seeking treatment would be beneficial and that its absence would be harmful. Seeking treatment was less anticipated if the condition was expected to improve quickly. Respondents were also more likely to consult if they strongly disliked fever or headache, and/or if the illness made them feel anxious or angry. Treatment-seeking (or lack of it) was not linked to harms from treatment-seeking, other specific symptoms and emotional responses.

Conclusion: It was possible to link anticipated treatment-seeking behaviour to specific factors: expected prognosis, perceived benefits of seeking treatment, some emotions and some specific symptoms.

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Introduction

Infectious intestinal disease (IID) is a “substantial community and healthcare burden in the UK” [1]. Around 25% of the UK population have at least one IID each year, resulting in 19 million days of absence from work or school. The most commonly identified microbes in stool samples taken from ill cases are norovirus, sapovirus, *Campylobacter* spp. and rotavirus [2]. Illness caused by these pathogens is usually self-limiting and the majority of cases can be safely managed at home. Nevertheless, approximately one in fifty people consult their GP when they have IID symptoms, resulting in approximately one million general practice consultations annually in the UK [2].

Studies on treatment-seeking motives are typically based on data collected because of consultations. For instance, research in

the US state of Georgia found that norovirus was the most commonly identified pathogen among people who submitted fecal samples after seeking medical care for acute gastroenteritis. Bacterial pathogens were overall less common in this sample than viral ones [3]. Rotavirus was the most common pathogen (65%) linked to 400 cases of patients hospitalised for acute gastroenteritis in an Iranian study in 2005–2006 [4], while the enteric pathogens *Entamoeba histolytica* and *Giardia lamblia* each had prevalence around 27% among 96 Gaza kindergarteners with diarrhoeal symptoms in 2011 [5]. The true population disease burden may not be represented by these kind of data, however. Consent for samples may be harder to procure from individuals with more severe illness and will be absent from those with relatively mild illness. Factors such as patient’s age and ethnicity as well as whether the individual was experiencing vomiting, influenced whether Canadian physicians might ask an ill patient for a stool sample that could inform routine public surveillance [6]. Consultation rates declined with age in French and Swedish prevalence studies [7,8], even though morbidity and case fatality rates linked to severe gastroenteritis can

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be highest among the elderly [9,10]. Case-control studies can be excellent opportunities to collect data about symptom severity and factors motivating consultation, but typically a case-control study looks for causes of illness among clinically confirmed cases (people who received medical care) and not for patients who had a level of illness they could manage at home.

Hence, previous research has often described, at least in part, why people did consult a family doctor about IID. However, studies rarely explore why people *didn't* seek healthcare when they had IID, or tried to model both processes simultaneously. We know of no previous study that addressed expectations, emotional reactions or believed consequences if treatment was sought (or not) for IID. This information gap about motives among non-presenters exists even though it is widely documented that only a very small minority of people with IID ever consult a doctor. Poor information about true prevalence of IID seems to be a problem in all countries [11,12]. For instance, only 12% of respondents who had recently experienced acute gastroenteritis in a Swedish survey had sought medical advice about it (most often by telephone) [7]. The distribution of the hazard and exposure can also be difficult to recognise if only relying upon data about those who present for consultation. A population survey in the Netherlands found that the total disease burden of norovirus was much higher in the community than in institutions; although cases were much more likely to be recognised in institutions than in the community [9]. An Australian prospective community survey concluded that the true mix of pathogens responsible for most IID in community settings was likely to go undetected using routine surveillance methods [13]. Modelling the decision to seek care more completely could be valuable with regard to revealing opportunities to help estimate the true total IID burden. Establishing the viability of this type of modelling to represent non-presentations could inform future interventions that try to reduce unnecessary presentation for minor self-limiting illnesses as well as delayed consultation for serious illness (from IID or other diseases).

Candidate paradigms for care seeking behaviour include the Health Belief Model [14] and Self-Regulation Model [15]. These models assume that no action is the default, but treatment-seeking is caused by cues to action, such as “not coping” or intolerable anxiety. Alternatively, decision-making may follow the rules of dual processing theory (DPT) [16], which explicitly incorporates heuristics. DPT explains behaviour choices as a consequence of intuitive/emotional decision-making (termed System 1, because it operates first and fast, mostly unconsciously) combined with rational/reflective decision-making (System 2, which is slower and deliberate). Both systems anticipate harms and benefits from specific actions. The generalisability of any of these models to diverse cultures and country settings is subject to debate [17–19].

We collected original data that could draw on a wide range of potentially relevant criteria, to inform a model that might conform with many possible theoretical paradigms, to describe expected treatment-seeking behaviour.

Methods

No existing validated survey tool met our needs. We therefore wrote and administered an original survey of UK resident adults (Appendix A) about a hypothetical gastrointestinal infection (presented as a vignette, see Box 1). We asked people to state their likely responses and intentions about health-care seeking in response. Most questions were in Likert format, and asked about many things that might influence case-seeking, especially related to systems thinking. As previously stated, non-consultation reasons are not well-reported for IID. However, we reasoned that well-documented consultation motivators for other gastrointestinal problems could be relevant. All such literature mentions duration of symptoms;

Box 1: Survey vignette.

Almost three days ago you started having diarrhoea. You vomited twice in the first 12 hours but not since. You still have little appetite. You still have to rush to the toilet, sometimes. You can do most activities of ordinary daily life – but you feel ill and tired. You have mild stomach pain sometimes and you have had one or two brief spells of bad stomach pain (that last less than two minutes). Once yesterday, you saw a little bit of blood in your stools in the toilet. It is now early morning and you just visited the toilet with diarrhoea, where again, you saw a small amount of blood.

long duration of symptoms is often the most definitive reason for presentation [20]. Fear of a cancer diagnosis is a disincentive for many [21,22]. Younger people and women are more likely to seek advice for gastro-intestinal problems [21–23]; the disinclination of elderly people to consult may reflect more past experiences of similar self-limiting illness. The relationship between symptom severity or frequency and likelihood of consultation has been inconsistent in prior studies [20,24–26]. In a 1989 study on dyspepsia, consulters were rather more worried about activities of daily life being affected or having cancer, than non-consulters [24]. In a 2001 literature review about irritable bowel syndrome or dyspepsia, psychosocial factors such as a significant life event stress, psychological morbidity, personality, comorbidities, attitudes and beliefs were the important factors linked to consultation rates. The role of other psychosocial factors such as social support, coping style and knowledge about illness could not be determined [25]. Realistically, we did not have resources to collect full data for a large patient set on all these potential predictors. Therefore, we designed data collection to include motivators that especially fit with the paradigm of System 1 and System 2 thinking, with many motivators that could be categorised as potential harms or benefits.

The survey questions asked about:

- Emotional response to the illness.
- Expected prognosis, and experiences of previous similar illness.
- Expected efforts to get a doctor's advice.
- Predisposition towards System 1 or 2 in decision making.
- Consequences expected to arise from seeking or not seeking a doctor's advice.
- How intolerable were negative emotions, specific symptoms or practical consequences.
- Demographics (age band and gender).

First, we asked about emotional responses. Previous studies strongly suggested [14,15,27,28] that fear or anxiety responses were likely to be most closely linked to expected treatment-seeking behaviour, but we did not want omission of other emotions to prompt our respondents to focus on anxiety/fear over other possible motivators. We therefore listed many negative emotions that respondents could select. Questions were in the format “How much do you agree that you would be feeling...” (sad, angry, anxious, etc.) with five responses ranging from strongly disagree to strongly agree. Respondents were then asked about expected prognosis (“What is your best guess about how you would be feeling in the next 24 hours?”) and were twice asked about history of similar illness, both at start of the survey and again near the end. To keep manageable the time required to take the survey, only two demographic questions were asked (age band and gender).

Respondents were asked twice whether they thought they would see a doctor about the imaginary illness: soon after reading the vignette (when we expected an answer more biased by System 1), and again after being asked many expected benefits and harms questions when we expected answers more influenced by

System 2 thinking). Our modelling approach to focus on harms and benefit was informed by Prospect Theory [29] which postulates that many people make decisions based on perceived final net gains and losses, often using heuristics [30]. We thought that predisposition towards System 1 might be revealed by one of these factors: speed of expected decision making, strength of initial emotional response and/or self-assessment about proportion of logic vs. feeling in health care decisions.

In contrast, answers to the consequences questions that we posed seemed likely to be more driven by System 2 processes because they addressed competing priorities or required risk calculations, with questions such as “I will miss work if I don’t get treatment”. Potential weightings for how much a specific emotional or physical response mattered to each survey-taker were indicated by answers to questions such as “I hate to be off my food” and “How much do you dislike...”.

PPI, recruitment and implementation

Four public advisors [31] piloted the survey, refining the vignette and our methods. Advertisements for respondents were distributed via social media and professional networks. The survey was only available to take online, from 5 to 30 June 2018. Only UK residents were eligible. Five respondents were rewarded (at random) with a shopping voucher (£10 value). The survey was administered using *Google Forms* and was planned to take 10–15 min to complete.

Data quality checks and questionnaire reliability

After 94 responses were received, another question was added “Please tick Strongly Disagree to show you read the question.” This addition allowed us to undertake sensitivity analysis for respondents who made poor efforts to fill in the survey correctly, by excluding missing or incorrect answers to this quality control question. Duplicate survey entries were also checked for (which could arise due to web server errors). Cronbach’s alpha statistics were generated for five groups of related questions, to see if seemingly related questions measured similar concepts. The questions were grouped for the reliability test as: emotional responses ($n=8$), consequences of seeking treatment or not seeking it (benefits or harms that could arise; $n=21$), discomfort with emotions ($n=6$), discomfort with physical symptoms ($n=9$) and prediction for treatment-seeking (2 questions).

Analysis

Stata v. 15.1 and Microsoft Excel were used. We ran multinomial logit regression models to test whether anticipated treatment-seeking could be predicted from other raw or derived survey data. Separate models were generated for each time the expected treatment-seeking question was asked. To select the final predictor variables, univariate regression was used to test all potential predictor variables; predictors with p -values <0.20 were trialled in adjusted models. Significance was set at $p \leq 0.05$. The designated best models included only significant predictors and minimised the Akaike Information Criterion (AIC) [32].

Data transformations and pooling

Likert scale answers were transformed to an ordinal scale which afforded opportunities to combine and reduce related survey answers to fewer factors (as long as the direction of worse outcomes remained the same for all pooled factors). Specific categories of questions (e.g., emotional responses) were inappropriate to use

together but individually in a statistical model (multicollinearity). Therefore, principal axis factors were generated for emotional responses (8 questions), symptoms or symptom combinations (10 questions), and consequences questions (23 questions), and then rotated to increase interpretability. Rotated factors with at least one loading ≥ 0.5 were interpreted and trialled in predictive modelling.

Results

Descriptive statistics

Ten entries were eliminated for being duplicates (evident because responses were identical for all 62 fields for multiple respondents). The final number of unique participants was 386. 87.3% of respondents were female, 12.2% male (two persons declined to state gender). The median age was between 46 and 55 years. A large proportion (43.5%) were women aged 46–64 years. Anonymised full survey replies are available from the corresponding author.

Table 1 shows some summary information about respondent demographics and responses to some of the questions about the imagined illness. The majority (70%) of respondents expected that they would feel at least one definite negative emotion about the illness (27% strongly or extremely so). Nevertheless, most people (56%) were optimistic that their condition would improve within 24 hours. 65% of respondents said that they would use less logic and more feelings to decide what to do about their illness. Vomiting was the most disliked symptom. Respondents were asked to mention any other symptoms that especially bothered them. The most disliked symptoms not already on our prespecified list were pain (2.8%) and dizziness (2.6%).

Data quality and validation

Few data were missing because most questions were close-ended and required a response. 16 (5.4%) of eligible 298 respondents (who had been asked the relevant question) did not select Strongly Disagree when asked to do so; most ($n=11$) of those who did not correctly tick this question ticked Strongly Agree instead. 118 (30.7%) filled in the entire survey without leaving contact details which meant that they were unable to win one of the reward vouchers (which could indicate carelessness or altruistic motives). The Cronbach alpha values indicated good reliability for related groups of questions: 0.8159 for emotional responses, 0.7943 for consequences of seeking treatment questions, 0.903 for discomfort with emotions, 0.789 for discomfort with physical symptoms, and 0.8538 for expected treatment decision.

Factor analysis

Factor analysis with rotation reduced the symptoms to three vectors: 1) vomiting, 2) headache and fever and 3) mild stomach pain and mild diarrhea. The emotional responses were reduced to 3 rotated factors: 1) embarrassed, ashamed and disgusted feelings, 2) anxious and scared reactions and 3) peeved and angry feelings. The 23 questions about consequences from seeking treatment were reduced to five rotated factors: 1) possible benefits of getting treatment (or harms of not getting treatment), 2) expected anger and anxiety linked to treatment-seeking, 3) Fear of self-soiling, 4) cost considerations (linked to treatment seeking or not obtaining treatment), 5) a factor with weightings >0.50 for two questions “Illness will make me miss work, training, studies or be unable to care for others” and “It is important to prevent others from catching my illness”. All of these eligible rotated factors were trialled in predictive models.

Table 1
Descriptive summary of collected survey data.

Expected prognosis in next 24 h (I expect to feel.)		Worse 3.9%	Same or unsure 39.5%	Better 56.3%	
Expected speed of initial decision, what if anything to do about illness	0–20 s 17.3%	20 s–2 min 29.7%	2–5 min 17.1%	>5 min 35.8%	
% of respondents in each age band					
Under 26 years n = 31, 8.0%	26–35 years n = 62, 16.1%	36–45 years n = 61, 15.8%	46–55 years n = 82, 21.2%	56–65 years n = 105, 27.2%	
66 years+ n = 45, 11.7%					
Answers to question “In this situation, would you try to see a doctor about this illness?”					
	Definitely not	Probably not	Unsure	Probably yes	Definitely yes
First time asked.	35.8%	6.5%	13.2%	27.5%	17.1%
Second time asked.	8.0%	31.3%	13.0%	31.1%	16.6%
% who changed mind	89.1%	60%	56.9%	33%	37.9%
Self assessment of how logical or feelings-based their decision-making is in health care matters (% out of respective total population for that gender)					
	Very based on feelings	Mostly on feelings	Equal mix	Mostly logical	Very logical
Males	23.4%	46.8%	21.3%	6.4%	2.1%
Females	30.6%	36.8%	23.4%	7.1%	2.8%
Percentage who would be bothered a lot or find these symptoms intolerable					
Mild stomach pain 7.5%	Mild diarrhoea 23.6%	Loss of appetite 9.8%	Headache 44.3%		
Fever 59.3%	Lethargy 61.4%	Vomiting ($\leq 3x/day$) 72.0%	Any blood in stools 74.9%	Vomiting ($>3x/day$) 93.6%	

Regression analysis

Almost all of the candidate predictors had $p \leq 0.20$ in single variate modelling and so were trialled in multivariate models (Appendix B). The candidate predictors least related (p always >0.20) to the outcomes in single variate models were initial emotion responses: sad, peeved, angry, embarrassed, ashamed or disgusted. Tables 2 and 3 show the adjusted relative risk ratios in the best multivariate models, each time respondents were asked “Would you try to see a doctor about this illness?” For all predictors, a risk ratio >1 means that treatment was more likely with an increase in this factor; relative risk ratios <1 meant that anticipated treatment-seeking was less likely.

The first time respondents answered about decision to seek treatment

Table 2 shows the model results for the first time respondents were asked about treatment-seeking. Factors most strongly positively linked to decision to seek treatment were expected benefits of treatment (consequences factor 1), speed of decision (faster decision makers were the respondents most likely to say “Definitely Yes”) about seeking treatment, and responding with anxiety or fear to the illness. The factor most negatively linked to the decision to get treatment was expecting to feel better in 24 h.

The second time respondents answered about decision to seek treatment

Table 3 shows the model results for the second time respondents were asked if they thought they would seek a doctor’s advice. Expected prognosis, anxiety and expected benefits of treatment-seeking were still significant predictors. Anger and how bothered they were by fever/headache also appear in this model.

Quality check

Restricting the dataset to just entries with correct answers ($n = 282$; see Appendix C) for the survey validation question (‘Please click strongly disagree’) generated very similar models to models

generated by using the full dataset. The same factors were significant for each decision point and in the same directions.

Discussion

Expectations about visiting a GP for IID were related to expectations about prognosis and consequences of seeking treatment (or not). These results are relevant to opposing problems faced by health services everywhere: unnecessary consultations for brief and mild illness, or delayed presentation for serious illness. Treatment-seeking was more likely in our study when respondents strongly disliked fever or headache, while vomiting was listed as the most disliked symptom, so support to manage these specific problems may foster successful home treatment for IID (and potential other illnesses that produce similar symptoms). Emotional responses were strongly linked to treatment-seeking expectations in our survey. Treatment-seeking paradigms [14,15,27,28] predict that this link between emotional response and care-seeking is replicated for many other health problems (not just IID). Addressing the emotional aspects of illness may help give patients confidence to deal with self-limiting conditions at home, as well as confidence to seek help sooner when needed. Observational studies should be encouraged that collect data related to emotional response and disease progression expectations for diverse health conditions and relate these data to presentation rates.

Believing in the benefits of seeking treatment (consequences factor 1) was very much the strongest predictor for anticipated behaviour. Expecting the illness to resolve itself soon also meant less likelihood of seeking treatment. Theoretical models about care-seeking tend to assume that fear is the most (maybe only) motivating emotion [14,15,27,28]. In our models, fear and anxiety were indeed significant, but anger (or at least mild irritation = peeved) was also relevant. Negative findings in this research are important too; for instance, although harms from over-diagnosis and/or unnecessary treatment are important problems [33–35], our survey respondents did not seem to share this concern.

Blood in stools and frequent vomiting were the most disliked IID symptoms. Yet, expected behaviour was not quite linked to these same symptoms in adjusted models. Being bothered by blood in stools approached our significance threshold the second time respondents were asked about consulting a doctor ($p = 0.0537$).

Table 2
Multinomial logistic regression to predict expected treatment-seeking behaviour the first time asked.

When respondent believes that they will feel better within 24 h (p < 0.001)			Make decision in 20–120 s (p < 0.001)		
Treatment expectation	RRR	95% CI	Treatment expectation	RRR	95% CI
Definitely not	1.0 (ref)	–	Definitely not	1.0 (ref)	–
Probably not	6.20	0.69–56.01	Probably not	0.46	0.14–1.49
Not sure	0.26	0.12–0.59	Not sure	5.44	0.62–47.59
Probably yes	0.08	0.04–0.17	Probably yes	0.81	0.26–2.55
Definitely yes	0.08	0.03–0.19	Definitely yes	0.40	0.12–1.31
Consequences factor 1, linked to benefits expected from seeking treatment (p < 0.001)			Make decision in 2–5 min (p < 0.001)		
Treatment expectation	RRR	95% CI	Treatment expectation	RRR	95% CI
Definitely not	1.0 (ref)	–	Definitely not	1.0 (ref)	–
Probably not	0.23	0.10–0.55	Probably not	0.17	0.03–0.99
Not sure	4.30	2.53–7.29	Not sure	4.26	0.46–39.27
Probably yes	7.57	4.53–12.65	Probably yes	0.53	0.15–1.89
Definitely yes	10.04	5.67–19.09	Definitely yes	0.08	0.18–0.33
Emotional factor 2, linked to anxious/scared (p < 0.001)			Need >5 min to make a decision (p < 0.001)		
Treatment expectation	RRR	95% CI	Treatment expectation	RRR	95% CI
Definitely not	1.0 (ref)	–	Definitely not	1.0 (ref)	–
Probably not	0.57	0.24–1.33	Probably not	0.15	0.04–0.67
Not sure	1.99	1.16–3.43	Not sure	4.52	0.53–38.38
Probably yes	1.59	0.95–2.67	Probably yes	0.68	0.22–2.05
Definitely yes	3.39	1.92–5.99	Definitely yes	0.05	0.1–0.18

Notes: RRR = relative risk ratio. Time-to-decide = 0–20 s used as reference value. See text for other more explanation about predictor variables. Pseudo R² = 32.6%, Log ratio of $\chi^2 = 370.09$ (p < 0.001). AIC = 820.
Bold font indicates significance at p ≤ 0.05.

Table 3
Multinomial logistic regression to predict expected treatment seeking behaviour the second time asked.

Emotional factor linked to anxiety/fear (p < 0.001)			Emotion factor linked to anger (p = 0.001)		
Treatment expectation	RRR	95% CI	Treatment expectation	RRR	95% CI
Definitely not	1.0 (ref)	–	Definitely not	1.0 (ref)	–
Probably not	1.67	0.71–3.95	Probably not	0.54	0.26–1.12
Not sure	4.40	1.65–11.77	Not sure	0.33	0.13–0.79
Probably yes	3.83	1.44–10.15	Probably yes	0.33	0.14–0.77
Definitely yes	6.95	2.50–19.31	Definitely yes	0.14	0.05–0.37
When respondent believes that they will feel better within 24 h (p < 0.001)			Headache/fever symptom factor 2 (p = 0.011)		
Treatment expectation	RRR	95% CI	Treatment expectation	RRR	95% CI
Definitely not	1.0 (ref)	–	Definitely not	1.0 (ref)	–
Probably not	0.15	0.02–0.99	Probably not	4.90	1.90–12.64
Not sure	0.04	0.01–0.28	Not sure	3.74	1.30–10.74
Probably yes	0.02	0.00–0.17	Probably yes	5.39	1.91–15.20
Definitely yes	0.02	0.00–0.14	Definitely yes	4.75	1.59–14.15
Consequences factor 1, linked to expected benefits from seeking treatment (p < 0.001)					
Treatment expectation	RRR	95% CI			
Definitely not	1.0 (ref)	–			
Probably not	21.53	6.48–71.51			
Not sure	76.8	20.5–287.7			
Probably yes	189.6	50.5–712.2			
Definitely yes	570.1	139.5–2329.6			

Notes: RRR = relative risk ratio, pseudo R² = 33.89%, log ratio of $\chi^2 = 390.34$ (p < 0.001). AIC = 809.
Bold font indicates significance at p ≤ 0.05.

Headache or fever were positively linked to anticipated treatment-seeking, but only the second time respondents were asked. Previous research had suggested that presence of diarrhoea itself might be the most perturbing symptom. The IID2 study in the UK [36] noted that the most common symptom among patients who consulted their GPs for IID was diarrhoea (>90%), with >50% of patients describing the condition as 'severe'. Among this group who did present to GPs, the next most common symptoms were abdominal pain and loss of appetite (both had prevalence around 80%, of

which about half of patients described the symptom as 'severe'). Research in Sweden on community prevalence also reported that diarrhoea was the most commonly recalled IID-type symptom [7].

Consultation rates for specific pathogens vary greatly between countries, for unclear reasons [37]. No prior studies collected data to the extent we did on such a wide range of possible motivating factors, or delved in as much detail into the factors that lead to non-presentation for IID. Other related previous studies mostly focused primarily on rates of presentation rather than reasons for presen-

tation (or not). Retrospective telephone surveys in France [8] and Germany [38] attempted to calculate the rate of presentation to GP surgeries for IID; in both studies about 35% of possible cases consulted with medical professionals, but these last two studies can be criticised for likely under-ascertainment problems [2] and thus over-estimating presentation rates. Where community surveys have sought information about motivations for treatment-seeking, they focused on symptoms rather than emotional responses or beliefs about the value of health advice. For instance, a Canadian study asked telephone respondents about IID symptoms in the past year, and found that neither diarrhoea nor nausea without vomiting were strongly predictive of actual healthcare seeking, but presence many other symptoms such as any vomiting, abdominal pain, chills, fever, tiredness and headache were significantly linked to seeking advice [6].

Limitations

Our survey addressed anticipated not observed behaviour. With regard to observed consultation rates, the IID2 study [2] prospectively monitored patients in the community for IID and recorded their frequency of IID symptoms and rates of attendance to British GP surgeries; with adjustments for under-ascertainment, they calculated that 1.77% of individuals potentially ill with IID had presented for consultation with a family doctor. The risk of under-ascertainment was related to age, sex, duration of symptoms and GP practice, but IID2 did not ask about many other possible factors, such as patient belief in prognosis, emotional response, intolerable symptoms, etc.

The specific predictors that were most important in our models may not describe non-UK populations well; UK residents seek treatment for IID less often than other Europeans [37]. Our research methods should be replicated in other countries to look for cultural or geographic variations in motivating factors. That the survey was only advertised and available to take online means that the population of respondents was self-selecting. Respondents were especially female and middle-aged. We tried only limited data analysis, data collection and modelling methods. The key dependent variable response was very specific around seeing a “doctor”; which in the UK context for relatively mild illness, would usually mean appointment with a general practitioner. We did not ask about seeing other types of health professional (such as a pharmacist) or other forms of advice seeking (such as talking to friends). Only two demographic questions were asked (age band and gender) so that we could keep the survey brief.

Studies about reasons for delayed presentation for colorectal cancer (CRC) seem relevant in that blood in stools was part of our vignette and is a key symptom of CRC. However, delayed presentation for CRC is typically measured in months, not days [20,39,40]. Few IID cases last as long as one month. Delayed presentation for subsequent CRC diagnosis is often linked with socio-economic characteristics or travel distance to health care providers, which also seem relevant to treatment-seeking for IID. We did not collect socio-economic or travel distance data to avoid making our survey onerously long. We had feedback from our public advisors who piloted the survey that it needed to be short for people like themselves to be willing to engage and complete.

Conclusion

This is a novel and original study in a little researched area. A large range of potential motivating factors were asked about (emotional responses, practical consequences, and physical symptoms). There was good internal consistency in the survey questions. Strong relationships were established between anticipated behaviour and

some potential motivators; equally important, some potential motivating factors that might seem important or intuitively relevant, were not linked to expected behaviour. Our study format could be replicated for other clinical themes, either self-limiting such as cold viruses or for more serious conditions such as symptoms of diabetes and STIs. Models that predict presentation for many types of illness as well as community studies that directly observe non-presentations with information solicited for actual non-presentation could support better estimates of true disease burdens (for IID and other illnesses) and strategies to facilitate better self-management of self-limiting illness.

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Conflict of interest

None declared.

Ethics approval and consent to participate

Institutional approval to run the study was granted by our Faculty of Medicine and Health Sciences Research Ethics Committee, University of East Anglia. Informed consent was obtained from participants to use their anonymised data for the study.

Availability of data

Anonymised data are available from the authors.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.jiph.2019.10.007>.

References

- [1] O'Brien SJ, Rait G, Hunter PR, Gray JJ, Bolton FJ, Tompkins DS, et al. Methods for determining disease burden and calibrating national surveillance data in the United Kingdom: the second study of infectious intestinal disease in the community (IID2 study). *BMC Med Res Methodol* 2010;10(1):39.
- [2] Tam CC, Rodrigues LC, Viviani L, Dodds JP, Evans MR, Hunter PR, et al. Longitudinal study of infectious intestinal disease in the UK (IID2 study): incidence in the community and presenting to general practice. *Gut* 2011;gut.2011.238386.
- [3] Hall AJ, Rosenthal M, Gregoricus N, Greene SA, Ferguson J, Henao OL, et al. Incidence of acute gastroenteritis and role of norovirus, Georgia, USA, 2004–2005. *Emerg Infect Dis* 2011;17(8):1381.
- [4] Hamkar R, Yahyapour Y, Noroozi M, Nourijelyani K, Jalilvand S, Adibi L, et al. Prevalence of rotavirus, adenovirus, and astrovirus infections among patients with acute gastroenteritis in Northern Iran. *Iran J Public Health* 2010;39(2):45.
- [5] Al Laham N, Elyazji M, Al-Haddad R, Ridwan F. Prevalence of enteric pathogen-associated community gastroenteritis among kindergarten children in Gaza. *J Biomed Res* 2015;29(1):61.
- [6] MacDougall L, Majowicz S, Dore K, Flint J, Thomas K, Kovacs S, et al. Under-reporting of infectious gastrointestinal illness in British Columbia, Canada: who is counted in provincial communicable disease statistics? *Epidemiol Infect* 2008;136(2):248–56.

- [7] Hansdotter FI, Magnusson M, K uHIMANN-BereNzON S, Hulth A, Sundstr om K, Hedlund K-O, et al. The incidence of acute gastrointestinal illness in Sweden. *Scand J Public Health* 2015;43(5):540–7.
- [8] Van Cauteren D, De Valk H, Vaux S, Le Strat Y, Vaillant V. Burden of acute gastroenteritis and healthcare-seeking behaviour in France: a population-based study. *Epidemiol Infect* 2012;140(4):697–705.
- [9] Verhoef L, Koopmans M, van Pelt W, Duizer E, Haagsm a J, Werber D, et al. The estimated disease burden of norovirus in The Netherlands. *Epidemiol Infect* 2013;141(3):496–506.
- [10] Lindsay L, Wolter J, De Coster I, Van Damme P, Verstraeten T. A decade of norovirus disease risk among older adults in upper-middle and high income countries: a systematic review. *BMC Infect Dis* 2015;15(1):425.
- [11] Gibbons CL, Mangan M-JJ, Plass D, Havelaar AH, Brooke RJ, Kramarz P, et al. Measuring underreporting and under-ascertainment in infectious disease datasets: a comparison of methods. *BMC Public Health* 2014;14(1):147.
- [12] Kim YS, Lee SH, Kim SH, Joo Y, Bahk GJ. Investigation of the experience of food-borne illness and estimation of the incidence of foodborne disease in South Korea. *Food Control* 2015;47:226–30.
- [13] Sinclair MI, Hellard ME, Wolfe R, Mitakakis TZ, Leder K, Fairley CK. Pathogens causing community gastroenteritis in Australia. *J Gastroenterol Hepatol* 2005;20(11):1685–90.
- [14] Rosenstock IM. Historical origins of the health belief model. *Health Educ Behav* 1974;2(4):328–35.
- [15] Leventhal H, Leventhal EA, Contrada RJ. Self-regulation, health, and behavior: a perceptual-cognitive approach. *Psychol Health* 1998;13(4):717–33.
- [16] Gerrard M, Gibbons FX, Houlihan AE, Stock ML, Pomery EA. A dual-process approach to health risk decision making: the prototype willingness model. *Dev Rev* 2008;28(1):29–61.
- [17] Lai JC, Cheng S-T. Health beliefs, optimism, and health-related decisions: a study with Hong Kong Chinese. *Int J Psychol* 2004;39(3):179–89.
- [18] Guess CD. Decision making in individualistic and collectivistic cultures. *Online Read Psychol Cult* 2004;4(1):3.
- [19] Lin YP, Furze G, Spilsbury K, Lewin RJ. Misconceived and maladaptive beliefs about heart disease: a comparison between Taiwan and Britain. *J Clin Nurs* 2009;18(1):46–55.
- [20] Courtney R, Paul C, Sanson-Fisher R, Macrae F, Attia J, McEvoy M. Current state of medical-advice-seeking behaviour for symptoms of colorectal cancer: determinants of failure and delay in medical consultation. *Colorectal Dis* 2012;14(5):e222–e9.
- [21] Newton JL. Care of the elderly with gastrointestinal problems in family practice. *Best Pract Res Clin Gastroenterol* 2001;15(6):1013–25.
- [22] Svendsen RP. Cancer alarm symptoms and healthcare-seeking behaviour in the general population. *Syddansk Universitet*; 2014.
- [23] Oberoi DV, Jiwa M, McManus A, Hodder R. Men's help-seeking behavior with regards to lower bowel symptoms. *Am J Health Behav* 2015;39(2):212–21.
- [24] Lydeard S, Jones R. Factors affecting the decision to consult with dyspepsia: comparison of consulters and non-consulters. *J R Coll Gen Pract* 1989;39(329):495–8.
- [25] Koloski NA, Talley NJ, Boyce PM. Predictors of health care seeking for irritable bowel syndrome and nonulcer dyspepsia: a critical review of the literature on symptom and psychosocial factors. *Am J Gastroenterol* 2001;96(5):1340–9.
- [26] Chaplin A, Curless R, Thomson R, Barton R. Prevalence of lower gastrointestinal symptoms and associated consultation behaviour in a British elderly population determined by face-to-face interview. *Br J Gen Pract* 2000;50(459):798–802.
- [27] Prentice-Dunn S, Rogers RW. Protection motivation theory and preventive health: beyond the health belief model. *Health Educ Res* 1986;1(3):153–61.
- [28] Witte K. Putting the fear back into fear appeals: the extended parallel process model. *Commun Monogr* 1992;59(4):329–49.
- [29] Floyd DL, Prentice-Dunn S, Rogers RW. A meta-analysis of research on protection motivation theory. *J Appl Soc Psychol* 2000;30(2):407–29.
- [30] Kahneman D, Tversky A. Prospect theory: An analysis of decision under risk. *Handbook of the fundamentals of financial decision making: part I. World Scientific*; 2013. p. 99–127.
- [31] NIHR. INVOLVE: NHS; 2018. Available from: <http://www.invo.org.uk/>. [updated 2018; cited 2018 July 6].
- [32] Akaike H. Akaike's information criterion. *International encyclopedia of statistical science*. Springer; 2011. p. 25.
- [33] Daneman N, Bronskill SE, Gruneir A, Newman AM, Fischer HD, Rochon PA, et al. Variability in antibiotic use across nursing homes and the risk of antibiotic-related adverse outcomes for individual residents. *JAMA Int Med* 2015;175(8):1331–9.
- [34] Carter SM, Rogers W, Heath I, Degeling C, Doust J, Barratt A. The challenge of overdiagnosis begins with its definition. *BMJ* 2015;350:h869.
- [35] Newman M, Campbell D. Patients put at risk by 'aggressive' treatment at Great Ormond Street. *The Guardian*. 2018 14 April.
- [36] Tam C, Viviani L, Adak B, Bolton E, Dodds J, Cowden J, et al. The Second Study of Infectious Intestinal Disease in the Community (IID2 Study). 2012 November. Report No.
- [37] Haagsm a J, Geenen P, Ethelberg S, Fetsch A, Hansdotter F, Jansen A, et al. Community incidence of pathogen-specific gastroenteritis: reconstructing the surveillance pyramid for seven pathogens in seven European Union member states. *Epidemiol Infect* 2013;141(8):1625–39.
- [38] Wilking H, Spitznagel H, Werber D, Lange C, Jansen A, Stark K. Acute gastrointestinal illness in adults in Germany: a population-based telephone survey. *Epidemiol Infect* 2013;141(11):2365–75.
- [39] Siminoff LA, Rogers HL, Thomson MD, Dumenci L, Harris-Haywood S. Doctor, what's wrong with me? Factors that delay the diagnosis of colorectal cancer. *Patient Educ Couns* 2011;84(3):352–8.
- [40] Forbes LJ, Warburton F, Richards M, Ramirez A. Risk factors for delay in symptomatic presentation: a survey of cancer patients. *Br J Cancer* 2014;111(3):581.