the british psychological society
promoting excellence in psychology

British Journal of Health Psychology (2022), 27, 741–755

www.wileyonlinelibrary.com

Financial incentives for bowel cancer screening: Results from a mixed methods study in the United Kingdom

Sarah Wilding*, Daryl B. O'Connor and Mark Conner
School of Psychology, University of Leeds, UK

Objectives. The purpose of bowel cancer screening is to test for signs of cancer before symptoms develop. Financial incentives are one potential method to increase participation rates. Few studies have tested incentives in relation to bowel screening in the United Kingdom (UK). The current research explored reactions to different financial incentives to participate in population-level bowel cancer screening in a UK sample.

Design. An online mixed methods study. Recruitment was via a study recruitment website (https://prolific.ac/).

Methods. 499 participants (aged 60–74 years) completed a survey on invitations for population-level bowel cancer screening using different levels of financial incentives.

Result. Respondents were generally positive about the use of financial incentives. A £10 voucher was most frequently selected as the appropriate amount to incentivise screening participation. The current invitation method with no voucher was judged to be most acceptable but suggested to produce the lowest likelihood of others participating. Offering a £10 voucher that the NHS would not be charged for if not used was the second most acceptable invitation method. There were few differences between invitation methods on own perceived likelihood of participation in bowel screening. Offering a £10 voucher was seen as leading to the greatest likelihood of others participating in bowel screening. Findings were largely unaffected by participant demographics.

Conclusion. The use of small financial incentives to increase bowel cancer screening uptake was generally well received. Impacts of incentives on actual bowel screening rates in UK samples need to be established in the light of the current findings.

Statement of contribution

What is already known on this subject?

- Bowel cancer screening uptake in the UK is suboptimal, particularly in specific groups of the population including men and individuals from more deprived areas.
- Financial incentives have been suggested as one means to increase participation rates.
- Few studies have evaluated the acceptability of incentives in relation to bowel screening in the UK.

**Correspondence should be addressed to Sarah Wilding, School of Psychology, University of Leeds, Leeds LS2 9JT, UK (email: S.E.Wilding@leeds.ac.uk).*

DOI:10.1111/bjhp.12570

What does this study add?

- Respondents were generally positive about the use of financial incentives to increase screening uptake.
- A £10 voucher was most frequently selected as the appropriate amount to incentivise uptake.
- Interventions involving incentives were perceived to increase other's but not own participation.

Background

Cancer screening aims to check the body for cancer before any symptoms develop. This can help to diagnose and treat cancer at an early stage (Cancer Research UK, 2021) and contribute to reducing overall mortality. Bowel cancer is the fourth most common cancer in the United Kingdom, every year 42,000 people are diagnosed, and more than 16,000 people die from bowel cancer (Cancer Research UK, 2021). Early identification of bowel cancer could prevent a large number of deaths (Cancer Research UK, 2021). In the United Kingdom, individuals over 60 are invited to the routine bowel cancer screening every two years, but around 30–40% of people do not take part in screening. Screening in all UK nations now uses the Faecal Immunochemical Test (FIT), which requires individuals to provide a stool sample which is tested for traces of blood. Introduction of the FIT to Scotland in 2017 resulted in an increase in screening rates, although these have remained suboptimal in deprived populations (Public Health Scotland, 2021). While screening rates are above what is considered the 'acceptable threshold' (52% uptake) for screening, uptake varies across the UK nations. Research is therefore needed on how best to increase bowel screening rates in the United Kingdom, particularly in groups with low participation rates such as men and individuals from more deprived areas (Cancer Research UK, 2021). The aims of this research were to investigate the use of financial incentives to promote screening rates. In particular, the research focussed on perceptions of different types of financial incentives to inform the design of future interventions.

The effectiveness of financial incentives has been tested in a range of different health behaviours (Adams, Giles, McColl, & Sniehotta, 2014) and is suggested to incorporate a range of behaviour change techniques, including goal setting, behavioural monitoring and rewarding behaviour (Johnston & Sniehotta, 2010). Incentives provide short-term, certain rewards associated with the performance of a health behaviour, where usually any gain associated with the behaviour is uncertain and occurs in the future. It has also been suggested that incentives are most effective in relation to simple, discrete, time-limited health behaviours (Lynagh, Sanson-Fisher, & Bonevski, 2013). Bowel cancer screening incorporates all three of these aspects of behaviour. Despite this, a recent review of interventions to promote bowel screening (Tsipa et al., 2020) identified over 100 randomised controlled trials (RCTs) and reported that incentives were one of the least commonly used behaviour change techniques.

A systematic review by Mauro, Rotundo, and Giancotti (2019) reported little evidence for using financial incentives to improve breast or cervical screening rates but demonstrated some promising evidence in relation to increasing bowel screening, whilst noting the need for further research. Three recent RCTs from the United States reported a number of promising, but not always statistically significant, findings. Green et al. (2019) compared the effects of mailing an incentive ($10) following screening completion to being entered into a lottery (1 in 10 chance to win $50) and a control condition. This study found both interventions to significantly increase uptake compared to the control condition (incentive: 76.7%; lottery: 74.6%; control: 71.5% screening uptake) with the incentive condition yielding the largest effect. Other studies have demonstrated the benefits of a $10 incentive compared to no incentive (Lieberman et al., 2019; Mehta et al.,

2019). However, not all evidence supports a positive impact of incentives on bowel cancer screening. Gupta et al. (2016) found no effect of either a $5 or $10 incentive in a sample not up-to-date with their screening.

No published studies have investigated the influence of providing incentives to increase bowel cancer screening uptake in the United Kingdom. There have, however, been systematic reviews of financial incentives on smoking cessation (Giles, Robalino, McColl, Sniehotta, & Adams, 2014), and physical activity (Mitchell et al., 2020). These studies tended to report positive findings for the use of incentives. However, there may be some negative effects of providing incentives. One study in non-attenders to diabetic eye screening found that individuals offered a lottery incentive and fixed cash incentive were less likely to attend screening compared to usual care control (Judah et al., 2018).

Acceptability is a key requirement for successful behaviour change interventions (Moore et al., 2015; Sekhon, Cartwright, & Francis, 2017), this can include affective reactions to the intervention as well as its perceived effectiveness. It may not be considered morally or ethically appropriate to offer monetary incentives to encourage health behaviours (Lynagh et al., 2013). Previous work looking at the impact of incentives on bowel cancer screening has focussed only on their effectiveness to encourage uptake. It is therefore important to understand individuals' perceptions of the acceptability of incentives in this specific behaviour. This research was designed to increase our understanding of reactions towards the use of different financial incentives to promote bowel screening in the United Kingdom and inform the design of an RCT to test the effectiveness of such an intervention on screening rates. The research aimed, first, to assess the perceived acceptability to the use of incentives to promote bowel screening in the United Kingdom and explore how these vary by gender, age group, socio-economic status (SES) group and recency of screening. Second, to assess reactions to specified incentives that varied in the monetary value (based on previous research we focussed on £5 and £10 unconditional incentives) and what happened to any unconditional incentive if participants choose not to use it (i.e., not specified, NHS not charged if not used, unused vouchers could be returned to the NHS) compared to no incentive control. We also explored how these responses varied by gender, age group, SES group and recency of screening.

To summarise, our two main research questions were:

1. Are financial incentives for bowel screening acceptable to individuals living in the United Kingdom?
2. What are individuals' reactions to different levels of financial incentives for bowel screening and do these differ by demographic groups?

Method

Sample

A total of 499 respondents who would all be eligible for bowel screening based on their age (≥60 years), were recruited in May 2021 via Prolific (https://prolific.ac/), an online research recruitment website. All individuals were living in the United Kingdom and each of the four UK nations was represented. The respondents were recruited to ensure roughly equal numbers of men and women (249 women, 250 men) and under and over 65 years of age (250 aged ≤ 65; 249 aged > 65; Mean = 65.6, *SD* = 3.97). The vast majority of the sample were white (*N* = 488, 97.8%; non-white *N* = 11, 2.2%), precluding detailed

analysis of differences by ethnicity. Based on self-reported post-code, an Index of Multiple Deprivation (IMD) decile was calculated using the post-code lookup provided by each of the UK nations (Ministry of Housing, Communities, & Local Government, 2021; Northern Ireland Statistics & Research Agency, 2021; Scottish Government, 2021; Welsh Government, 2021) and 244 (48.9%) respondents were coded into the lower five deciles (most deprived SES group) and 255 (51.1%) into the upper five deciles (least deprived SES group). The majority of participants were up-to-date with their screening (up-to-date: past two years, N = 315, 63.1%; (overdue: longer than past two years/never, N = 184, 36.9%). The sample size was selected to have sufficient power (>90%) to detect small sized differences between different financial incentives in different groupings (i.e., gender, age, SES or recency of screening groups) with alpha = .05.

Measures

The main online questionnaire consisted of four sections (outlined in detail below): (1) Background information, (2) Open-ended questions on views about financial incentives, (3) Questions on acceptability and uptake on financial incentives, and (4) Questions on the usefulness and appropriate value of incentives.

1. Respondents completed measures to capture demographic information including gender, age, ethnicity, and postcode (which was converted into IMD). They also reported when they last took part in bowel cancer screening.
2. Respondents then completed open-ended questions on their views of different incentives for participating in bowel screening and what might make this more acceptable ('What are your views on offering a £5 or £10 voucher to encourage participation in bowel screening?'; 'What might make offering a £5 or £10 voucher to encourage participation in bowel screening more acceptable?').
3. Respondents were presented with seven different methods of being invited for bowel cancer screening (details below, see Table 1 for the invitation text presented to participants). Participants were asked to complete four questions on each invitation. The order in which the questions were asked remained the same but the order in which the different invitations were presented was randomised. The first two questions asked about how *happy* they would be invited in this way ('I would be happy to be invited to participate in bowel screening in this way', strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, strongly disagree; scored 7-1) and how *acceptable* it would be to invite everyone in this way ('This is an acceptable way to invite everyone to participate in bowel screening', strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, strongly disagree; scored 7-1). The second two questions asked about how likely they (*likely (self);* 'How likely would you be to use and return a bowel screening kit if invited in this way?', extremely likely, moderately likely, slightly likely, neither likely nor unlikely, slightly unlikely, moderately likely, extremely likely; scored 7-1) and others (*likely (others);* 'How likely do you think most people would be to use and return a bowel screening kit if invited in this way', extremely likely, moderately likely, slightly likely, neither likely nor unlikely, slightly unlikely, moderately likely, extremely likely; scored 7-1) would be to use and return a bowel screening kit if invited in this way.
4. Finally, four questions focussed on general thoughts on using financial incentives to promote bowel screening. Respondents rated how useful research on this topic

Table 1. The seven invitations presented to participants

Invitation 1	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return
Invitation 2	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return. You'll also receive a £5 voucher (e.g., high street voucher or Amazon voucher) to encourage you to use and return the kit
Invitation 3	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return. You'll also receive a £10 voucher (e.g., high street voucher or Amazon voucher) to encourage you to use and return the kit
Invitation 4	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return. You'll also receive a £5 voucher (e.g., high street voucher or Amazon voucher) to encourage you to use and return the kit. If you decide not to spend the voucher, then the NHS will not be charged
Invitation 5	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return. You'll also receive a £10 voucher (e.g., high street voucher or Amazon voucher) to encourage you to use and return the kit. If you decide not to spend the voucher, then the NHS will not be charged
Invitation 6	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return. You'll also receive a £5 voucher (e.g., high street voucher or Amazon voucher) to encourage you to use and return the kit. You can choose to send the unused voucher to a provided address to ensure that the NHS will not be charged
Invitation 7	You are sent a standard written invitation to participate in bowel cancer screening plus a bowel cancer screening test to use and return. You'll also receive a £10 voucher (e.g., high street voucher or Amazon voucher) to encourage you to use and return the kit. You can choose to send the unused voucher to a provided address to ensure that the NHS will not be charged

might be ('Running a research study to test if using small financial incentives increases bowel cancer screening is a good idea', strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, strongly disagree; scored 7-1), the extent to which incentives in general might be useful ('Using small financial incentives to help increase bowel cancer screening is a good idea', strongly agree, agree, somewhat agree, neither agree nor disagree, somewhat disagree, disagree, strongly disagree; scored 7-1), and the most appropriate value for such incentives ('What do you think would be the right voucher value to offer to help increase bowel cancer screening?, £0, £5, £10, £20, £30, £40, £50, Other – specify amount; scored 0, 1, and 2 for the first three responses and 3 for all other responses). Finally, an open-ended question requested any further thoughts ('If you have any further thoughts on using small financial incentives to increase bowel cancer screening, please write them here').

Procedure and invitations

Respondents were recruited via Prolific (https://prolific.ac/) and were invited to take part in a 'cancer screening survey'. They gave informed consent and were then asked to complete the questionnaire via Qualtrics. On completion they were thanked and paid £1.25 for completing a 15-min survey.

Respondents were presented with seven invitations designed to examine different levels of reward voucher to encourage use of the bowel screening test kit (£0, £5, £10) and specifications of what happened to unused reward vouchers (i.e., unconditional incentive sent with the FIT). The order of presentation of these invitations was randomised. The seven invitations are reported in Table 1.

Ethical approval

Approval was granted by the University of Leeds, School of Psychology Ethics Committee (Ref: PSYC-264, Date: 11/05/2021). All participants provided informed consent prior to completing the online survey.

Analyses

We first content coded the three open-ended questions on general views of using financial incentives to encourage participation in bowel screening. Following the steps outlined by Elo and Kyngäs (2008), responses were read to ensure familiarity with the material and its context. Comments were coded by identifying recurring words or units of meaning and frequency of reporting each of these codes was calculated. Codes were grouped into categories and reread and compared to check for consistency of meaning based on the context of the comments. The frequency of reporting of these categories was calculated. A random 10% were double coded by a second reviewer and disagreements resolved by discussion. Chi-squared tests were used to test for differences in the coded responses by gender, age group, SES group and recency of bowel screening participation. Responses to the first open-ended question, requesting participant views on offering a financial incentive to encourage bowel cancer screening uptake, were coded as positive, negative, neutral, or mixed. The second open-ended question asked participants to report their views on how offering an incentive might be made more acceptable. The responses were coded into charity donation, voucher characteristics, saving the NHS money, advertising or other (not further analysed here).

Second, we examined responses to the three overall views questions and used between-subjects ANOVA to examine any differences by gender (male; female), age group (<65 years; >65 years), SES group (higher deprivation; lower deprivation) and recency of bowel screening participation (up-to-date: screened in past 2 years; overdue: screened more than 2 years ago/never screened). Third, we examined responses to the four questions about each of the seven invitations using a series of mixed ANOVAs to examine any differences by invitation (within-subject factor), gender, age group, SES group, and recency of bowel screening participation (between-subjects factors). The ANOVA focussed on main effects and 2-way interactions between invitations and other variables to avoid problems with small cell sizes and to be consistent with our power calculations. Quantitative analyses were performed in SPSS v.27. Any differences between invitations were assessed using *post-hoc* Bonferroni tests.

Results

Views on offering a financial incentive to encourage bowel cancer screening uptake

There was an 82% rate of agreement with the second reviewer in this coding. Overall, 40.7% (N = 203) of responses to this question were positive. The most commonly

reported positive views were that offering incentives was 'a good idea' and that it may save the NHS money in the long run by reducing future treatment costs (e.g., 'A good thing if it makes the difference between somebody completing the test, or not. It might even save the NHS money by reducing the number of expensive major interventions'). Several participants also reported that the incentives would be particularly welcome in the 'current climate', we interpreted this as referring to the current COVID-19 pandemic where people may be struggling financially. Additional quotes for each question, along with demographic information on the respondents are provided in Table S1.

A smaller proportion of responses were negative (34.7%; $N = 173$). Participants with negative views tended to report that it should not be necessary to provide people with incentives to encourage screening, while other participants reported that they did not think that providing incentives would be effective in increasing uptake (e.g., 'I do not think it would help'). Finally, participants also reported that they considered screening to be a personal responsibility (e.g., 'I think it's sad that some people need to be bribed to do something for the sake of their own health').

There were also a number of mixed or neutral (24.6%; $N = 123$) viewpoints shared. These opinions seemed to reflect that a number of participants felt that while it should not be necessary for people to require incentives to complete the screening, incentives would likely increase uptake and this was considered to be a good thing. While some participants also reported that while they personally would not need the incentive to carry out screening, it might influence others (e.g., 'Mixed feelings. I strongly feel that people should make the effort to look after their own health but am also aware of the financial burden on the NHS of those who do not').

The coding of the 499 responses to this question did not differ by participant gender, age, or deprivation (ps > .40). However, there were differences when comparing up-to-date versus overdue/never screened respondents. A greater proportion of respondents who were not up to date with their screening reported positive views to offering incentives (52.4%; $N = 43/82$) compared to up-to-date participants (37.2%; $N = 123/331$). However, similar proportions of both groups reported negative views (not up-to-date: $N = 28/82$, 34.1%; up-to-date: $N = 117/331$, 35.3%) and the key difference between these groups appeared to be that more of the up-to-date participants reported mixed views ($N = 65/331$, 19.6%; not up-to-date: $N = 7/82$, 8.5%). This difference is likely to be due to more up-to-date participants reporting that while they personally would not need the incentive, it might work with other individuals.

Views on how offering an incentive might be made more acceptable

There was a 96% rate of agreement with the second reviewer in this coding. Of the 499 responses to this question, the most commonly reported responses to this were if the voucher could be donated to charity or back to the NHS ($N = 49$, 9.8%; e.g., 'I would like the money to go back to an NHS charity'; 'That the voucher were for a donation to various cancer charities') and if the voucher was easy to use and flexible ($N = 47$, 9.4%; e.g., 'A useful voucher (either general or flexible so could be used lots of places) and long expiry').

Participants also reported if providing the incentive was cost-effective for the NHS it would make the incentive more acceptable ($N = 25$, 5.0%; e.g., 'If it could be shown to be cost effective for the NHS'; 'It would hopefully catch bowel cancer early therefore saving money by not having to spend more money for treatment if it is more advanced'). Finally, some participants also reported that it would be worthwhile advertising the incentive to explain why it was being offered ($N = 47$, 9.4%; e.g., 'If it was widely known that it was

available as an incentive, maybe publicity'; 'An ad campaign explaining the decision'). Chi square analyses demonstrated that the proportion of participants reporting these four most commonly reported responses to this item (i.e., charity; voucher characteristics; saving the NHS money, and advertising) did not significantly differ by age, past behaviour, gender, or deprivation ($p > .44$).

The final open-ended question asked for any further thoughts on providing incentives to increase bowel cancer screening. The 272 responses to this question varied, with some participants using this as an opportunity to restate the point that the incentive should optionally be returned to charity ($N = 10$, 3.6%; e.g., 'It would be good if the voucher could also be sent to a cancer charity as an alternative'), a number of comments ($N = 55$, 20.2%) reported the belief that the incentive should only be received once the screening test was returned (a conditional incentive; e.g., 'I think the money voucher should be given after the kit has been completed and returned rather than given at same time as kit. Some people might spend the voucher but not use and return the kit.').

Overall views on using financial incentives

Most respondents thought conducting research on incentives was a good idea ($M = 5.89$, $SD = 1.34$) with 86.8% ($N = 433/499$) indicating they 'strongly agree', 'agree', or 'somewhat agree' with this statement. There were no differences by gender, $F(1, 483) = 0.19$, $p = .663$, age group, $F(1, 483) = 0.42$, $p = .520$) or SES, $F(1, 483) = 1.08$, $p = .300$, although there was by recency of bowel screening participation, $F(1, 483) = 3.99$, $p = .046$. Those who were up-to-date with screening ($M = 5.73$, $SE = .100$) were less positive about research on incentives compared to those who were overdue/never screened ($M = 5.98$, $SE = .076$). A smaller majority agreed that using incentives to promote bowel screening was a good idea ($M = 4.62$, $SD = 1.89$) with 310 (62.1%) indicating they 'strongly agree', 'agree', or 'somewhat agree' with this statement. There were no differences by gender, $F(1, 483) = 0.34$, $p = .562$, age group, $F(1, 483) = 0.39$, $p = .530$ or recency of bowel screening participation, $F(1, 483) = 1.00$, $p = .318$, although there were significant differences by SES, $F(1, 483) = 4.81$, $p = .029$. Those who were least deprived ($M = 4.40$, $SE = .128$) were less positive about research on incentives compared to those who were most deprived ($M = 4.78$, $SE = .121$). Finally, most respondents ($N = 433$, 86.8%) selected the three smallest amounts as the most appropriate amount for an incentive (£0, $N = 119$, 23.8%; £5, $N = 108$, 21.6%; £10, $N = 206$, 41.3%). There were no differences by gender, $F(1, 483) = 3.72$, $p = .054$, age group, $F(1, 483) = 0.27$, $p = .607$, or SES, $F(1, 483) = 1.10$, $p = .294$, although there was by recency of bowel screening participation, $F(1, 483) = 4.62$, $p = .032$. Those who were up-to-date ($M = 1.31$, $SE = .074$) selected lower incentives compared to those who were overdue/never screened ($M = 1.51$, $SE = .056$).

Reactions to different financial incentives

Regarding respondents' happiness to be invited to bowel screening in different invitation conditions, there were significant effects of invitation, $F(6, 2{,}964) = 42.60$, $p < .001$, but not gender, $F(1, 494) = 1.56$, $p = .212$, age group, $F(1, 494) = 0.00$, $p = .991$, SES, $F(1, 494) = 3.18$, $p = .075$, or recency of bowel screening participation, $F(1, 494) = 2.48$, $p = .116$. There was also one significant two-way interaction between invitation and recency, $F(6, 2{,}964) = 6.25$, $p < .001$. Table 2 (left-hand panel) shows the marginal means and (standard errors) *SE*s for each invitation split by bowel screening recency. In those

Table 2. Ratings of different screening invitation invitations split by recently and not recently screened for 'happy' and 'acceptable' ratings

	Happy				Acceptable			
	Recently screened		Not recently screened		Recently screened		Not recently screened	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Invitation 1	6.85	$.028_{b}$	6.19	$.075_{c}$	6.69	$.043_{c}$	6.38	$.053_{d}$
Invitation 2	5.90	$.134_{a}$	5.68	$.101_{a}$	4.85	$.151_{ab}$	5.05	$.104_{a}$
Invitation 3	5.84	$.139_{a}$	5.73	$.099_{a}$	4.83	$.159_{a}$	5.06	$.107_{a}$
Invitation 4	6.03	$.129_{a}$	5.84	$.095_{ab}$	5.09	$.151_{ab}$	5.35	$.100_{c}$
Invitation 5	6.02	$.131_{a}$	5.95	$.092_{b}$	5.11	$.151_{b}$	5.32	$.101_{bc}$
Invitation 6	5.87	$.139_{a}$	5.75	$.094_{a}$	4.96	$.154_{ab}$	5.13	$.102_{ab}$
Invitation 7	5.98	$.130_{a}$	5.77	$.100_{a}$	4.97	$.153_{ab}$	5.20	$.102_{abc}$

Note. Means in a column that do not share a post-script letter were significantly different from one another (Bonferroni test, $p < .05$).

recently screened, the current invitation method with no incentive (i.e., invitation 1) was most preferred. *Post-hoc* Bonferroni tests indicated that invitation 1 was rated more positively than each of the other invitations that did not significantly differ from one another. In those not recently screened, the current invitation method with no incentive (i.e., invitation 1) was again most preferred, although the differences compared to other invitations was attenuated (but remained significant in each case). *Post-hoc* Bonferroni tests also indicated that invitation 5 (£10 voucher with NHS not charged if voucher not used) was the second most preferred. It was significantly less preferred to invitation 1 but significantly more preferred to invitations 2 and 3 plus invitations 6 and 7 (no difference with invitation 4).

In relation to the perceived acceptability for others to be invited to bowel screening in different invitations, there were significant effects of invitation, $F(6, 2{,}964) = 143.94$, $p < .001$, but not gender, $F(1, 494) = 0.00$, $p = .970$, age group, $F(1, 494) = 0.14$, $p = .708$, SES, $F(1, 494) = 2.14$, $p = .144$, or recency of bowel screening participation, $F(1, 494) = 0.90$, $p = .343$. There was also one significant two-way interaction between invitation and recency, $F(6, 2{,}964) = 4.42$, $p < .001$. Table 2 (right-hand panel) shows the marginal means and SEs for each invitation split by bowel screening recency. In those recently screened, the current invitation method with no incentive (i.e., invitation 1) was perceived to be most acceptable to others. *Post-hoc* Bonferroni tests indicated that this invitation was rated significantly more positively than each of the other invitations. They also indicated that invitation 5 was perceived to be significantly more acceptable to others compared to invitation 3. No other differences between invitations were statistically significant. In those overdue/never screened, the current invitation method (i.e., invitation 1) with no incentive was again judged to be most acceptable, although the differences compared to other invitations was attenuated (but remained significant in each case). *Post-hoc* Bonferroni tests also indicated that invitations 4 and 5 were the next most acceptable. Invitation 4 was significantly more acceptable than all other invitations except 5 and 7 (plus 1), while invitation 5 was significantly more acceptable than all other invitations except 4, 6 and 7 (plus 1). No other differences between invitations were statistically significant.

In relation to how likely respondents would be to use and return a bowel screening kit in different invitations there were significant effects of invitation, $F(6, 2{,}964) = 3.45$, $p = .002$, but not gender, $F(1, 494) = 2.14$, $p = .144$, age group, $F(1, 494) = 0.16$, $p = .692$, or SES, $F(1, 494) = 3.69$, $p = .055$. There was a significant difference by recency of bowel screening participation, $F(1, 494) = 34.24$, $p < .001$ with higher ratings of likelihood in the group who were overdue/never screened. There was also one significant two-way interaction between invitation and gender, $F(6, 2{,}964) = 4.42$, $p < .001$. Table 3 (left-hand panel) shows the marginal means and *SE*s for each invitation split by gender. *Post-hoc* Bonferroni tests indicated that in women the only significant differences was between invitation 1 and 6, with bowel screening kit use perceived to be more likely in the former. In men, the only significant difference was between invitation 5 and 6, with bowel screening kit use perceived to be more likely in the former.

Regarding others' likelihood to use and return a bowel screening kit in different invitations, there were significant effects of invitation, $F(6, 2{,}964) = 56.50$, $p < .001$, but not gender, $F(1, 494) = 1.07$, $p = .302$, age group, $F(1, 494) = 0.98$, $p = .324$, SES, $F(1, 494) = 3.03$, $p = .082$ or recency of bowel screening participation, $F(1, 494) = 0.97$, $p = .324$. There were also significant two-way interactions between invitation and gender, $F(6, 2{,}964) = 2.35$, $p = .029$, invitation and age group, $F(6, 2{,}964) = 2.78$, $p = .011$, and invitation and recency, $F(6, 2{,}964) = 2.95$, $p = .007$. Table 3 (right-hand panel) shows the marginal means and SEs for each invitation split by gender, while Table 4 shows the marginal means and *SE*s for each invitation split by age and recency. Invitations 3 and 5 were perceived to lead to the highest rates of bowel screening kit use in others by both women and men. *Post-hoc* Bonferroni tests indicated that in women invitation 3 and 5 (i.e., £10 voucher) were perceived to lead to significantly higher rates of bowel screening in others than all other invitations (although the difference between invitation 3 and 7 was not significant). In addition, in women, invitations 1 and 6 were perceived to lead to significantly lower rates of bowel screening kit use in others than all other invitations. *Post-hoc* Bonferroni tests indicated that in men invitations 3, 5, and 7 (i.e., £10 voucher) were perceived to lead to significantly higher rates of bowel screening kit use in others than all other invitations. In men, invitation 2 was perceived to lead to significantly higher rates of bowel screening kit use in others than invitation 1.

Table 3. Ratings of different screening invitation invitations split by gender for likelihood of 'self' and 'others' ratings

	Likely (self)				Likely (others)			
	Women		Men		Women		Men	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Invitation 1	6.47	$.094_{b}$	6.44	$.089_{ab}$	5.15	$.071_{a}$	5.21	$.071_{a}$
Invitation 2	6.27	$.109_{ab}$	6.45	$.088_{ab}$	5.40	$.083_{b}$	5.44	$.076_{b}$
Invitation 3	6.30	$.109_{ab}$	6.53	$.080_{ab}$	5.69	$.080_{cd}$	5.83	$.067_{c}$
Invitation 4	6.32	$.105_{ab}$	6.43	$.091_{ab}$	5.43	$.076_{b}$	5.38	$.076_{ab}$
Invitation 5	6.35	$.106_{ab}$	6.54	$.079_{b}$	5.75	$.078_{d}$	5.77	$.073_{c}$
Invitation 6	6.25	$.107_{a}$	6.41	$.088_{a}$	5.20	$.083_{a}$	5.34	$.082_{ab}$
Invitation 7	6.32	$.107_{ab}$	6.54	$.079_{ab}$	5.55	$.084_{bc}$	5.72	$.074_{c}$

Note. Means in a column that do not share a post-script letter were significantly different from one another (Bonferroni test, $p < .05$).

Table 4. Ratings of different screening invitation invitations split by age or recency of screening for likelihood 'others' ratings

	Likely (others)				Likely (others)			
	Younger		Older		Recently screened		Not recently screened	
	M	*SE*	*M*	*SE*	*M*	*SE*	*M*	*SE*
Invitation 1	5.12	$.075_{a}$	5.23	$.074_{a}$	5.31	$.080_{ab}$	5.06	$.066_{a}$
Invitation 2	5.43	$.076_{bc}$	5.40	$.082_{a}$	5.45	$.087_{b}$	5.40	$.069_{bc}$
Invitation 3	5.82	$.069_{e}$	5.69	$.076_{bc}$	5.82	$.078_{c}$	5.70	$.065_{e}$
Invitation 4	5.49	$.070_{cd}$	5.32	$.081_{a}$	5.39	$.084_{ab}$	5.42	$.066_{bc}$
Invitation 5	5.77	$.074_{e}$	5.74	$.076_{c}$	5.83	$.081_{c}$	5.69	$.065_{de}$
Invitation 6	5.28	$.078_{ab}$	5.26	$.086_{a}$	5.24	$.095_{a}$	5.29	$.070_{b}$
Invitation 7	5.65	$.080_{de}$	5.60	$.078_{b}$	5.72	$.085_{c}$	5.54	$.070_{cd}$

Note. Means in a column that do not share a post-script letter were significantly different from one another (Bonferroni test, $p < .05$).

As shown in Table 4 (left-hand panel) there were a number of significant differences by age group. In the younger participants, invitations 3 and 5 were perceived to be likely to lead to significantly higher rates of screening in others compared to each of the other invitations, while invitation 7 was perceived to lead to significantly more screening than invitations 1, 2, 4, and 6. In the older participants, invitation 5 was perceived to lead to significantly more screening than all other invitations except invitation 3. Invitation 3 and 7 were perceived to lead to significantly more screening than invitations 1, 2, 4, and 6, but were not significantly different from one another.

There were also significant differences by recency of screening Table 4 (right-hand panel). In up-to-date participants, invitations 3, 5, and 7 were perceived to lead to significantly more screening than all other invitations. Invitation 2 was perceived to lead to significantly more screening than invitation 6. In overdue/never screened participants, invitations 3 and 5 were perceived to lead to significantly more screening than invitations 1, 2, 4, and 6 (invitation 3 was also significantly higher than invitation 7). Invitation 1 was perceived to lead to significantly lower rates of screening in others compared to all other invitations.

Discussion

The study presented here examined reactions to different financial incentives to participate in population-level bowel cancer screening in a UK sample The research aimed to assess the perceived acceptability of the use of incentives to promote bowel screening in the United Kingdom and explore how these vary by gender, age group, SES group and recency of screening; along with reactions to specified incentives to promote bowel screening and the value of incentive judged to be most acceptable.

One of the key requirements of a successful intervention is that it is perceived as acceptable (Sekhon et al., 2017). In relation to the first research question, whether incentives for bowel screening are acceptable, abroad range of views were observed, although most comments (65.3%) were positive or neutral. Negative comments tended to focus on the idea that individuals should not *need* to be incentivised to perform bowel screening. The proportion of positive, negative and neutral responses did not differ by

gender, age group, or SES group, although they did differ by whether recently screened. A greater proportion of respondents overdue for screening reported positive views (52.4%) compared to up-to-date participants (37.2%). This might support the use of financial incentives given the focus being on increasing screening rates in those not recently screened provided it is not off-putting to the recently screened. Despite the suggestion that providing incentives may raise moral and ethical objections (Lynagh et al., 2013), this was not strongly supported by the participants in this study. The reasons identified that might make offering incentives for bowel screening more acceptable varied, although ensuring unused vouchers could be donated to charity or back to the NHS (9.8%) or making the voucher easy to use and flexible (9.4%) were the most frequently mentioned. Some also suggested that highlighting that providing incentives could be cost effective to the NHS (5.0%) or advertising why the incentive was being offered (9.4%) could improve the acceptability. Although not a common response in this section, some respondents (20.2%) emphasised that making the incentive conditional on participating in bowel screening would be a good idea. As noted earlier such use of conditional financial incentives might be less appealing from a practical perspective given the need to additionally identify and then send out incentives to those who complete screening.

The findings also indicated that participants were in favour of research on this topic and the use of incentives to promote bowel screening. An incentive voucher of £10 value was the most popular stated value (41.3% of respondents), followed by £0 value (23.8% of respondents), and £5 value (21.6% of respondents). This finding is in line with the study by Lieberman et al. (2019) that found that a $10 (£7.10) financial incentive, but not a $5 incentive (£3.55), increased FIT screening uptake compared to a non-incentive condition (82.4% vs. 74.8%).

In relation to the second research question, focussing on reactions to specified incentives that varied in the monetary value and what happened to the unconditional incentive, findings were mixed. The current method of invitation was judged to be the most acceptable to individuals (self) and to others, but this was perceived to be less likely to encourage screening uptake. Invitation methods where the NHS would not be charged for unused vouchers without the need to return the vouchers (i.e., invitations 4 and 5) were the next most acceptable. However, there were few significant differences between invitations in terms of which was most likely to make the individual use and return a bowel screening kit (Table 3).

Regarding perceptions of others likelihood of using and returning a bowel screening kit after receiving different invitations, there were several significant differences (Tables 3 and 4). Invitations with the larger voucher (i.e., £10) were generally perceived to lead to the greatest participation rates while the current invitation with no voucher was perceived to lead to the lowest participation rates. There was also some evidence that being informed that the NHS would not be charged for unused vouchers (invitations 4 and 5) or that unused vouchers could be returned (invitations 6 and 7) were viewed more positively. These findings, combined with those on perceived acceptability suggest that while higher incentives are perceived as more effective, offering no incentive was perceived as most acceptable. This supports the need to identify and highlight ways of increasing perceived acceptability of incentives.

One argument against the use of incentives as a behaviour change technique is the suggestion that they may in fact discourage performance of the behaviour. One study in consistent non-attenders to diabetic eye screening found that offering a lottery or fixed cash incentive did not increase attendance and attendance was in fact slightly lower in these two conditions compared to usual care control (Judah et al., 2018). Based on the

reactions provided in this study, the proposed offer of incentives in bowel cancer screening did not support this finding. This research indicates considerable variation in reactions to using incentives to increase bowel screening rates in the United Kingdom. Although the majority of individuals are positive or neutral, a sizeable minority are negative about the use of incentives in this way. A key concern expressed was that individuals should not need to be incentivised to perform this self-protection measure.

Using relatively modest incentives (up to £10), advertising why incentives are being offered, explaining the potential cost saving to the NHS, and ensuring the NHS was not charged if the incentive was not used were stated at factors that might make the use of incentives more acceptable. These findings, plus the views supporting further research in this area, would support the idea of using a large-scale RCT to test the effectiveness of different incentives in a UK sample. Such an RCT might seek to employ relatively modest incentives (e.g., £5 and £10) compared to the current no incentive invitation and provide reassurance that unused incentives would not be charged to the NHS. The use of shopping vouchers might be one way to achieve this provided that vouchers were not charged for if unused by a specific date. Although some mentioned the idea of incentives being conditional on participating in bowel screening, this was a small minority and the additional costs of having to monitor screening and then additionally post out such conditional vouchers may make such a procedure less appealing.

The reactions to specific incentives were also mixed with the existing method of invitation (no incentive) being seen as most acceptable to the respondent and to others. While the existing method of invitation was seen as leading to the highest participation rates for the self, this invitation was also seen as likely to lead to the lowest rates of screening in others. Clearly, such perceptions would be best tested in an RCT comparing the existing no incentive method of invitation compared with other incentivised methods.

Strengths and weaknesses

Strengths of the study include its large sample size and recruitment of individuals from both areas of greater and lesser deprivation, from across the four nations of the United Kingdom. However, the majority of the participants were White (98%), which over-represents this particular ethnic group when compared to the whole of the UK population. This is a limitation of the study and suggests that the views of ethnic minority groups on this topic were under-represented in this study. Related to this, the study may have been influenced by self-sampling bias. However, just over 1/3rd of the sample were overdue for screening or had never completed screening before, which is around or slightly higher than the current screening rates in the population.

In conclusion, the current research extends previous research in the United States (Mehta et al., 2019) on the use of incentives to promote bowel screening attendance in the United Kingdom. Views on such incentives are clearly mixed although a large majority favour further research on the potential effectiveness of such incentives in the UK context. The current findings would support the use of modest incentives (£5 or £10), emphasis on why incentives are being offered, and ensuring that the NHS was not charged for unused vouchers. However, effects on actual bowel screening participation rates in the United Kingdom, using a strong design (e.g., RCT), need to be assessed.

Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Sarah Wilding: Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (equal); Writing – original draft (equal); Writing – review & editing (equal). **Daryl B. O'Connor:** Conceptualization (equal); Investigation (equal); Methodology (equal); Resources (equal); Validation (equal); Writing – original draft (equal); Writing – review & editing (equal). **Mark Conner:** Conceptualization (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Writing – original draft (equal); Writing – review & editing (equal).

Data availability statement

Data are available on request from the corresponding author.

References

Adams, J., Giles, E. L., McColl, E., & Sniehotta, F. F. (2014). Carrots, sticks and health behaviours: A framework for documenting the complexity of financial incentive interventions to change health behaviours. *Health Psychology Review*, *8*(3), 286–295. http://dx.doi.org/10.1080/17437199.2013.848410

Cancer Research UK. (2021). Bowel cancer incidence statistics. Retrieved from https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/bowel-cancer/incidence

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115. http://dx.doi.org/10.1111/j.1365-2648.2007.04569.x

Giles, E. L., Robalino, S., McColl, E., Sniehotta, F. F., & Adams, J. (2014). The effectiveness of financial incentives for health behaviour change: Systematic review and meta-analysis. *PLoS ONE*, *9*(3), e90347. http://dx.doi.org/10.1371/journal.pone.0090347

Green, B. B., Anderson, M. L., Cook, A. J., Chubak, J., Fuller, S., Kimbel, K. J., Kullgren, J. T., Meenan, R. T., & Vernon, S. W. (2019). Financial incentives to increase colorectal cancer screening uptake and decrease disparities. *JAMA Network Open*, *2*(7), e196570. http://dx.doi.org/10.1001/jamanetworkopen.2019.6570

Gupta, S., Miller, S., Koch, M., Berry, E., Anderson, P., Pruitt, S. L., Borton, E., Hughes, A. E., Carter, E., Hernandez, S., Pozos, H., Halm, E. A., Gneezy, A., Lieberman, A. J., Sugg Skinner, C., Argenbright, K., & Balasubramanian, B. (2016). Financial incentives for promoting colorectal cancer screening: a randomized, comparative effectiveness trial. *Official journal of the American College of Gastroenterology ACG*, *111*(11), 1630–1636. http://dx.doi.org/10.1038/ajg.2016.286

Johnston, M., & Sniehotta, F. (2010). Financial incentives to change patient behaviour. *Journal of Health Services Research & Policy*, *15*(3), 131–132. http://dx.doi.org/10.1258/jhsrp.2010.010048

Judah, G., Darzi, A., Vlaev, I., Gunn, L., King, D., King, D., Valabhji, J., & Bicknell, Col. (2018). Financial disincentives? A three-armed randomised controlled trial of the effect of financial Incentives in Diabetic Eye Assessment by Screening (IDEAS) trial. *British Journal of Ophthalmology*, *102*(8), 1014–1020. http://dx.doi.org/10.1136/bjophthalmol-2017-311778

Lieberman, A., Gneezy, A., Berry, E., Miller, S., Koch, M., Ahn, C., Balasubramanian, B. A., Argenbright, K. E., & Gupta, S. (2019). Financial incentives to promote colorectal cancer screening: A longitudinal randomized control trial. *Cancer Epidemiology Biomarkers & Prevention*, *28*(11), 1902–1908. http://dx.doi.org/10.1158/1055-9965.epi-19-0039

Lynagh, M. C., Sanson-Fisher, R. W., & Bonevski, B. (2013). What's good for the goose is good for the gander. Guiding principles for the use of financial incentives in health behaviour

change. *International Journal of Behavioral Medicine*, *20*(1), 114–120. http://dx.doi.org/10.1007/s12529-011-9202-5

Mauro, M., Rotundo, G., & Giancotti, M. (2019). Effect of financial incentives on breast, cervical and colorectal cancer screening delivery rates: Results from a systematic literature review. *Health Policy*, *123*(12), 1210–1220. http://dx.doi.org/10.1016/j.healthpol.2019.09.012

Mehta, S. J., Pepe, R. S., Gabler, N. B., Kanneganti, M., Reitz, C., Saia, C., Teel, J., Asch, D. A., Volpp, K. G., & Doubeni, C. A. (2019). Effect of financial incentives on patient use of mailed colorectal cancer screening tests. *JAMA Network Open*, *2*(3), e191156. http://dx.doi.org/10.1001/jamanetworkopen.2019.1156

Ministry of Housing, Communities & Local Government. (2021). English indices of deprivation 2019. Retrieved from https://imd-by-postcode.opendatacommunities.org/imd/2019

Mitchell, M. S., Orstad, S. L., Biswas, A., Oh, P. I., Jay, M., Pakosh, M. T., & Faulkner, G. (2020). Financial incentives for physical activity in adults: Systematic review and meta-analysis. *British Journal of Sports Medicine*, *54*(21), 1259–1268. http://dx.doi.org/10.1136/bjsports-2019-100633

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., Moore, L., O'Cathain, A., Tinati, T., Wight, D., & Baird, J. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *BMJ*, *350*(mar19 6), h1258–h1258. http://dx.doi.org/10.1136/bmj.h1258

Northern Ireland Statistics and Research Agency. (2021). NI Multiple Deprivation Measures. Retrieved from https://deprivation.nisra.gov.uk/

Public Health Scotland. (2021). Scottish bowel screening programme statistics. Retrieved from https://beta.isdscotland.org/find-publications-and-data/conditions-and-diseases/cancer/scottish-bowel-screening-programme-statistics/

Scottish Government. (2021). Scottish Index of Multiple Deprivation 2020. Retrieved from https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/

Sekhon, M., Cartwright, M., & Francis, J. J. (2017). Acceptability of healthcare interventions: an overview of reviews and development of a theoretical framework. *BMC Health Services Research*, *17*(1), 1–13. http://dx.doi.org/10.1186/s12913-017-2031-8

Tsipa, A., O'Connor, D. B., Branley-Bell, D., Day, F., Hall, L. H., Sykes-Muskett, B., Wilding, S., Taylor, N., & Conner, M. (2020). Promoting colorectal cancer screening: A systematic review and meta-analysis of randomised controlled trials of interventions to increase uptake. *Health Psychology Review*, 1–24. http://dx.doi.org/10.1080/17437199.2020.1760726

Welsh Government. (2021). Welsh Index of Multiple Deprivation: index guidance. Retrieved from https://gov.wales/welsh-index-multiple-deprivation-index-guidance

Received 8 July 2021; revised version received 22 September 2021

Supporting Information

The following supporting information may be found in the online edition of the article:

Table S1. List of themes identified, the number of comments reporting these and quotes representing each.