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PII: S0167-6296(17)30747-6
DOI: https://doi.org/10.1016/j.jhealeco.2018.09.008
Reference: JHE 2153

To appear in: *Journal of Health Economics*

Received date: 8-8-2017
Revised date: 20-9-2018
Accepted date: 26-9-2018

Please cite this article as: Kung CSJ, Johnston DW, Shields MA, Mental Health and the Response to Financial Incentives:Evidence from a Survey Incentives Experiment, *Journal of Health Economics* (2018), https://doi.org/10.1016/j.jhealeco.2018.09.008

Mental Health and the Response to Financial Incentives:Evidence from a Survey Incentives Experiment

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Abstract

Although mental health disorders such as anxiety and depression are common, there is little research on whether individuals in poor mental health react differently from others to financial incentives. This paper exploits an experiment from the UK Understanding Society Innovation Panel to assess how the participation response to randomly-assigned financial incentives differs by mental health status. We find that individuals in good mental health are more likely to respond when offered a higher financial incentive, whereas those in poor mental health are indifferent to the increased incentive. We find no comparable differences for physical health.

Keywords: Mental Health; Financial Incentives; Survey Incentives Experiment

JEL classification: I10; C93

1. Introduction

Every day individuals are faced with a myriad of financial incentives that encourage or discourage certain actions and behaviours. Financial incentives are a key tool used by policy-makers. Examples include: fines for poor driving, failing to meet parking restrictions, and not paying taxes on time; high taxes on tobacco and alcohol aimed at reducing consumption; incentivising people to return to work through changes in welfare benefits; and reducing health care usage through higher co-payments. Furthermore, a large body of research has demonstrated the importance of non-financial incentives, such as intrinsic motivation, reciprocity and social approval. When correctly designed, financial and non-financial incentives can act as complements for achieving policy goals (see, for example, Bowles and Polania-Reyes, 2012).

With estimates of around one-in-five adults in the UK (McManus et al., 2016; Mental Health Foundation, 2015) and US (Mental Health America, 2016) having a mental health condition, an important question is whether individuals with mental health problems respond differently to incentives from those in good mental health. This is salient, because common mental health conditions such as anxiety and depression are characterised by a range of symptoms that could affect economic preferences. These symptoms include persistent and excessive worry or fear, feelings of sadness or hopelessness, and a loss of energy (American Psychiatric Association [APA] 2013). Individuals with such symptoms therefore may experience a loss of pleasure from many daily activities, and falsely perceive others to be passing harsh judgments on their behaviour.

Differences in the response to incentives, if any, could be driven by a smaller marginal utility of consumption, particularly if the mental health condition is chronic or comorbid with poor physical health (Finkelstein et al., 2013). Another factor could be differences in one's intrinsic motivation to engage in prosocial behaviour; there is growing evidence from economics and other behavioural science literatures suggesting that effortful or time-consuming activity is a reflection not only of extrinsic financial incentives but also of intrinsic motivation and reputation as seen by oneself or others (Bénabou and Tirole, 2006; Fehr and Falk, 2002; Festré and Garrouste, 2015; Frey and Jegen, 2001; Gneezy and Rustichini, 2000). For example, experiments have found that standard financial incentives can fail when the incentivised activity is inherently interesting, or a noble undertaking (see, for reviews, Fehr and Falk, 2002; Gneezy et al., 2011; Kamenica, 2012). Amidst this rich experimental evidence, however, there is little investigation into whether mental health plays a role in the pattern of response to incentives.

It is important to better understand how individuals with poor mental health respond to incentives because an empirical literature has documented strong links between mental health and economic outcomes. In particular, mental health has been shown to affect individuals' educational attainment (e.g. Johnston et al., 2014; Leach and Butterworth, 2012), whether you work (e.g.

Chatterji et al., 2011; Frijters et al., 2014) and how much you earn (e.g. Kessler et al., 2008). Some of these differences may stem from a lack of response among those in poor mental health to incentives, either of a monetary nature such as higher wages, or a social nature such as prestige. The importance of this issue is exemplified by the enormous economic burden of mental health problems: in addition to direct costs of medical and social care, there are substantial indirect costs from losses to economic output and quality of life (Bloom et al., 2011; Levinson et al., 2010; Lim et al., 2008). In the UK, poor mental health is responsible for the largest burden of disease (Ferrari et al., 2013), and the estimated annual damage to the economy is estimated to be at least £70 billion, or 4.5% of GDP (OECD, 2014).

There is little economics research on whether mental health influences the response to incentives. However, there is a related literature consisting of laboratory experiments on emotions and economic decision-making. These experiments find that induced anxiety, sadness, and other affective states lead to economic decisions that differ from those made in a neutral mood (see, for examples, Capra, 2004; Capra et al., 2010; Engelmann et al., 2015; Ifcher and Zarghamee, 2011; Kuhnen and Knutson, 2011; Lerner et al., 2004; Rick and Loewenstein, 2008). In one review on poverty and economic behaviour, Haushofer and Fehr (2014) discussed how poor mental health caused by poverty can alter individuals' decision-making in ways that reinforce poverty. Examining the interplay between poverty, economic behaviours, and negative affect, they noted how existing laboratory findings support the mediating role of negative affect in the relationship between poverty and economic behaviours (e.g. time discounting, risk aversion). In a related laboratory experiment on motivation and incentives, Chumbley and Fehr (2014) assessed whether one's response to incentives is affected by self-reported "trait" reward motivation, and by induced "state" motivation. Trait but not state motivation was found to predict the effort exerted in response to monetary incentives. The authors argued that this suggests a fundamental decline in the response to incentives when motivation is psychiatrically disordered. Interestingly, in post hoc analyses the authors also found a significant negative association between trait anxiety and baseline effort.

We aim instead to directly investigate how individuals' mental health affects their response to financial incentives. We use a survey incentives experiment, grounding our hypotheses and interpretation of findings in a theoretical framework for incentives and behaviour. Specifically, we use the survey incentives experiment from the Innovation Panel of the United Kingdom Household Longitudinal Survey (also known as Understanding Society). In this experiment, individuals are randomly assigned to different survey incentive conditions to determine which best encourages survey participation. This data set allows us to observe how the impact of incentives on participation differs by individual levels of mental health.

Our main result is that after accounting for covariates that are correlated with mental health - including gender, wages, physical health, and socioeconomic status - we find a mental health gradient in the association between survey participation and financial incentive value. Specifically, the discrepancy in response between individuals receiving high and low incentive amounts is significantly smaller among those in poor mental health. We also find that among the group offered low financial incentives, those with poor mental health are more likely to participate than individuals with good mental health. These findings are robust across different econometric models and different mental health measures.

The rest of the paper is structured as follows: Section 2 outlines the theoretical framework for incentives and behaviour and suggests pathways via which response to incentives could differ by mental health status. Section 3 describes the experiment, and Section 4 details the data and empirical strategy. Section 5 discusses results from the main and robustness analyses. Section 6 summarises the paper's findings.

2. Theoretical Framework

The survey incentives experiment was conducted on the Innovation Panel of the United Kingdom Household Longitudinal Survey. This experiment, which is detailed in Section 3, involves inducing survey participation by using (randomised) financial incentives and by appealing to individuals' intrinsic motivation to engage in prosocial behaviour. To better understand how individuals' response to incentives may be a function of mental health, we draw upon the economic framework of behaviour in Bénabou and Tirole (2006). They theorised that decisions regarding behaviour that is primarily beneficial to others and costly to selves, also termed prosocial behaviour, are based on:

$$\max_{a \epsilon A}\{(v_a + v_y y)a - C(a) + \mu_a E(v_a|a,y) - \mu_y E(v_y|a,y)\} \quad (1)$$

wherein a is the level of participation in behaviour A that comes with a utility cost $C(a)$ and yields a material reward ya. v_a and v_y reflect the intrinsic appraisal of a and of monetary incentives, respectively. μ_a and μ_y are the societal valuation of prosociability and greed, respectively, scaled by the salience of behaviour A. As such, $\mu_a E(v_a|a,y)$ reflects the image consciousness with regard to, or the valuation of appearing to oneself and others as, being prosocial; $\mu_y E(v_y|a,y)$ relates to being non-greedy or disinterested. Differentiating Equation (1) yields:

$$C'(a) = v_a + v_y y + \mu_a \frac{\partial E(v_a|a,y)}{\partial a} - \mu_y \frac{\partial E(v_y|a,y)}{\partial a} \quad (2)$$

which highlights how an individual's marginal undertaking of a is the sum of three sources of motivation: (1) intrinsic or altruistic motivation; (2) material self-interest including extrinsic incentives; and (3) reputational motivation, particularly social or self-image concerns. This multidimensional variation in $C'(a)$, stemming from these three sources of heterogeneity, is useful in hypothesising whether and how observed a might differ by mental health status.[1]

First, individuals experiencing poor mental health may be less intrinsically motivated to engage in prosocial behaviour, or many other activities, thereby reducing v_a. One of the main symptoms of major depressive disorder is anhedonia (APA 2013). Anhedonia is the loss of interest in, and an inability to experience pleasure from, enjoyable behaviours. This includes a reduction in the motivation to participate in activities (motivational anhedonia) and a reduction in the level of experienced enjoyment (consummatory anhedonia).

Second, the valuation of monetary incentives v_y also may be a function of mental health. Anhedonia implies a smaller marginal utility of consumption, particularly when chronic and comorbid with poor physical health (Finkelstein et al., 2013). Therefore, sufferers' appraisal of money v_y may be weaker. This may be particularly pertinent if the monetary incentives are to be received in the future, because mentally ill individuals might apply a higher discount rate to future remunerations than those in good health (Haushofer and Fehr, 2014).[2]

Third, perceptions of one's own behaviour and of how others in society regard that behaviour also may differ by mental health status. For instance, anxiety involves a persistent and excessive worry, or fear of things that are difficult to control. This includes social phobia, or a marked fear of being exposed to possible scrutiny by other individuals (APA 2013). Individuals prone to such symptoms may falsely perceive others to pass harsh judgments on their behaviour, thus inflating societal perceptions μ.[3]

Note also the potential for incentive amount y to alter intrinsic motivation v_a. A non-zero incentive could, perhaps even falsely, signal the unattractiveness of the incentivised behaviour, suggesting that it is difficult and/or time-consuming. It also can signal a distrust of their intrinsic motivation, or an undermining of their ability to demonstrate such behaviour (Bénabou and Tirole, 2003; Gneezy et al., 2011). These negative signals can lower intrinsic motivation, and perceptions

[1] While this model helps us to understand responses to incentives among individuals with common anxiety and depressive symptoms, it may not be appropriate to apply it to individuals with certain severe disorders, such as schizophrenia or dementia.

[2] This applies to both exponential and hyperbolic discounting, wherein those in poorer mental health can show a higher discounting of the future in general, and/or a higher present-orientation (i.e. smaller correction for valuation of future remunerations) (Eisenberg and Druss, 2015).

[3] Some mental health conditions may be associated with a lower regard for social disapproval, particularly severe illnesses. However, evidence suggest that people with less severe conditions, such as mild or moderate depression, benefit more from positive social interactions and suffer more from negative social interactions, relative to mentally healthy people (Steger and Kashdan, 2009).

of such signals can be irreversible, possibly leading to undesired effects when the incentive is reduced or removed (Gneezy and Rustichini, 2000). This runs parallel to the psychology literature on how incentives can "crowd out" intrinsic motivation (for a comprehensive review, see Festré and Garrouste, 2015). Bénabou and Tirole (2006) explain that whether incentives "crowd out" (or "crowd in") intrinsic motivation depends on the substitutability (complementarity) of the incentive and the social norms attached to the incentivised behaviour. For such counterproductive incentives, a sufficiently large incentive would be necessary to compensate for the drop in intrinsic motivation (i.e. "pay enough or don't pay at all"; Gneezy and Rustichini, 2000).

3. Survey Incentives Experiment

The United Kingdom Household Longitudinal Study (UKHLS or Understanding Society) collects high-quality longitudinal information on socioeconomic circumstances, health, behaviours, and attitudes, primarily from individuals aged 16 and over (Boreham and Constantine, 2008). The Innovation Panel is an annual household survey that is separate from, but similar to, the main survey in terms of design, content, and data collection procedures (Burton and Lynn, 2015). Importantly, it contains experiments on survey procedures and questionnaire designs aimed at improving mainstage data collection and quality. The Innovation Panel began in 2008 (Wave 1) on a sample of 1,489 households, encompassing 2,866 adults.

A survey incentives experiment has been included in Waves 1 to 8 of the Innovation Panel. However, our empirical analysis is based only on the experiments conducted in Waves 2 to 5. We do not analyse the response to incentives in Wave 1, because our estimation sample necessarily consists of only those individuals who chose to participate in the Wave 1 survey. In other words, among our estimation sample of 2,385 individuals there is 100% participation in Wave 1. This decision is necessary because it is from this wave that we obtain most of the individual-level information, including mental health. We also do not analyse the response to incentives in Waves 6 to 8. In these waves, there were several changes to the incentive experiment, such as combining it with an interview mode experiment. Therefore, we cannot cleanly isolate the effect of incentives. In summary, these combined restrictions mean that our estimation sample contains observations from Waves 2 to 5, from individuals who participated fully in Wave 1.

In the survey incentives experiment, each household was randomly assigned to an incentive condition, and each adult in the household received the same condition. There were three unique incentive conditions in Waves 1-5: (i) each adult receives £5 (*low*); (ii) each adult receives £10 (*high*); and (iii) each adult receives £5, but receives an extra £5 (£10 in total) if all eligible adults in the household are interviewed (*social*). These payments were given in the form of High Street gift vouchers that could be spent in a wide range of merchandise and department stores, specialty

retailers, food and beverage outlets, and attractions. These include major high street names such as Argos, Debenhams, Gap, Halfords, House of Fraser, Iceland, Mothercare, River Island, Superdrug, TK Maxx, and WHSmith, and thus cover the majority of goods consumed by households.[4] Importantly, although the payment was not made in cash, the vouchers should be easy to spend (including on-line and in-store) and thus act as a financial incentive.

The assignment of households to incentive conditions was conditional on their assigned condition in the previous wave. This approach is part of the Innovation Panel's aim of continually improving survey methodology. For instance, Wave 3 aimed to determine whether participation would drop if *low* instead of *high* incentives were administered. As such, households in the *high* condition at Wave 2 were randomly assigned into *low* and *high* conditions at Wave 3, whereas those in the *low* condition at Wave 2 continued in the *low* condition. In Section 5, we show that the incentive condition received in the previous Wave *t*-1 had no effect on participation in the current Wave *t*. Importantly, this finding holds true for individuals with either high or low mental health.

Prior to their survey participation decision, individuals received a letter in the mail that contained their voucher for participation (either £5 or £10). Interviewers did not hand out vouchers during the interview. Any vouchers owing to those who satisfied the conditions of the *social* incentive were recorded by interviewers in a promissory note and were sent after the interview.[5] No advance vouchers were recalled by interviewers, so vouchers were left with the sample members regardless of interview outcome, including refusal or ineligibility.[6] Note also that individuals received their incentive voucher regardless of survey participation status in the previous wave. In other words, even if individuals refused to participate in Wave *t*-1, they still received individual advance mail and incentives (i.e. were 'treated'), and the interviewers still attempted to contact them in Wave *t*.[7]

The letter including the incentive voucher also contained a document requesting participation in the survey (see Appendix A for a copy of the document). Importantly, it is made clear to individuals that participation is "completely voluntary", but the document also emphasises that survey participation is important for the UK: for example, it states that "it will help us understand the long term effects of social and economic change in the UK and assist in future decision making." A follow-up survey information leaflet reinforced the public good nature of

[4] For a full list see https://www.highstreetvouchers.com/gift/where-to-spend-love2shop-vouchers.
[5] For those who reportedly did not receive the advance mail and incentive, regardless of whether the interviewer believed they were truthful, the appropriate incentive also was recorded in the promissory note, but only if they completed the interview.
[6] This is a limitation of the incentive experiment, which could act to reduce the incentive effect. However, our later result that a larger incentive significantly increases survey participation for the whole sample suggests that the experiment had saliency.
[7] One exception was that individuals who refused to participate at both Waves 3 and 4 were removed from the sample at Wave 5.

participation by including statements indicating that survey participation will help "to improve everyone's lives" (see Appendix A for a copy of the leaflet). It is therefore likely that for many individuals survey participation was driven by prosocial behaviour in addition to financial reward.

The first contact with each sample household was a face-to-face personal visit by the interviewer designed to build rapport and avoid attrition. After that first contact, subsequent contact could be made by telephone, for example to arrange or check on appointment times. Individual interviews were attempted with every adult household member, even if initially absent due to work or education. The interviewer was expected to make reasonable attempts to contact the sample member, including making multiple visits.[8]

For our analysis, we define participation as completing the individual interview, which on average took 32.5 minutes. Non-participation is defined as refusing to complete the interview.[9] Table 1 displays the sample size for each incentive condition and wave for our estimation sample, along with the corresponding rates of survey participation. Survey participation rates in Wave 1 equal 100% for all conditions because our estimation sample consists of only those individuals who completed the Wave 1 survey.[10] Overall, most households received the *low* £5 incentive across Waves 2-5, and relatively few households received the *social* £5-£10 incentive; in Wave 1 only, though, the split was roughly equal. The raw data suggest that participation rates were higher for individuals assigned to the *high* £10 incentive: across Waves 2-5 the participation rate in the *high* incentive was 4.4 percentage points higher than in the *low* incentive group (*t*-statistic equals 3.70).

This survey incentives experiment differs from a laboratory experiment and from many types of field experiments (namely artefactual and framed) in that: (a) the subject pool is not primarily made up of students; (b) it is in a context where the commodity, task and/or information set are naturally usable by subjects; (c) it is conducted in an environment where the treatment and behaviours of interest would typically take place; and (d) the subjects are unaware they are being experimented on. These differences are detailed in full in Harrison and List (2004). However, regarding point (c), it is important when observing economic decisions across individuals with varying mental health states that we allow them to pay attention not only to the task (survey

[8] If no contact was able to be made, the interviewer took steps to trace the sample member, such as by asking or leaving a tracing letter with neighbours and/or stable contacts. Sample members who moved were followed to their new address, either by the interviewers themselves or by the Understanding Society team, except those who moved outside the UK and those in prison. Those who moved into a new household or an institution remained eligible for interviews at their new address; these individuals were issued a new advance mail and an incentive if they went on to be interviewed. Proxy interviews (with a nominated proxy, a close relative, or another adult in the household who knows the respondent well) did not qualify for vouchers, and were only conducted if the interviewer was completely certain that productive interviews were not possible.

[9] There were a small number of partially completed interviews. These observations were omitted from the estimation sample.

[10] In the full study sample, the number of individuals and percent participating in wave 1 for each incentive condition equal: 873 and 94.3% for the low incentive group; 956 and 95.9% for the high incentive group; and 956 and 95.8% for the social incentive group.

participation) or treatment (incentives), but also to their natural environments, which can contain other influential factors (e.g. other household and social group members). The cost at which an individual engages in an incentivised behaviour may differ between the laboratory and their natural environment, which is a more representative setting of the behaviour in which we are interested. For example, participants have to accommodate household members' preferences and to trade off extrinsic incentives with time spent engaging in other productive activities, in comparison with laboratory tasks that involve only the individual, along with unnatural scrutiny by strangers (Levitt and List, 2007).

4. Data and Methods

4.1. Mental Component Summary Score

The mental health measure used in this paper is derived from the 12-item Short-Form Health Survey (SF-12v2), a reliable, valid, and generic measure of quality of life. It is widely used to examine health status and to monitor health outcomes in general and specific populations. In Wave 1, trained interviewers administered the standard four-week recall version of the questionnaire as part of the computer-assisted personal interview. The SF-12v2 contains eight health scales, each comprising either one item or two items. These scales are Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional, and Mental Health. From these scales, Physical Component Summary (PCS) and Mental Component Summary (MCS) scores are derived via standardisation of the scale scores, and then aggregated with factor score coefficients as weights (Ware et al., 2002). The resulting summary scores are then further standardised such that the within-sample mean and standard deviation equal zero and one, respectively, with higher scores indicating better health.

The reported symptoms that drive low MCS scores, such as often feeling "downhearted and depressed" and rarely feeling "calm and peaceful", are commonly experienced by individuals suffering from depression and anxiety. However, it is important to avoid over-attributing differences in MCS scores to any one specific clinical condition. Certain emotions may present as symptoms in multiple types of mental disorders. For instance, current practice views anxiety symptoms as also present in various bipolar, depressive, trauma- and stressor-related, and obsessive-compulsive disorders (APA, 2013). In addition, symptoms may be indicative of comorbid mental disorders (e.g. comorbid anxiety and depression; Zbozinek et al., 2012).

The validity of the MCS, besides the extensive evidence reviewed in the SF-12v2 manual (Ware et al., 2002), is clearly demonstrated in studies measuring impairment from various mental disorders. For instance, impairment from drug abuse and dependence (Compton et al., 2007), generalised anxiety disorder (Grant et al., 2005), personality disorders (Grant, Hasin, et al., 2004),

and MDD (Grant, Stinson, et al., 2004) significantly predict scores on the MCS when these disorders are considered independently or in comorbidity with other disorders. As in-sample evidence for its construct validity, we find that a single standard deviation increase in Wave 1 MCS is associated with a drop in the propensity of having a concurrent diagnosis of clinical depression by 3.1 percentage points.

For further evidence on the reliability of the MCS, we focus on stability, given that we examine the response to incentives across Waves 2 through 5 as a function of Wave 1 mental health. This assumes that the MCS can reliably measure respondents' underlying mental health status over a five-year period. We empirically investigate this assumption by estimating transitions for the bottom MCS quartile (i.e. poorest mental health) across Waves 1 through 5. Among individuals in the bottom MCS quartile at Wave 1, 44.8 percent of their MCS scores over the next four years also fall within this quartile. Other respondents in Wave 1 only have 15.8 percent of their future MCS scores falling within this quartile. In other words, those in poor mental health are about three times as likely as those in better health at Wave 1 to report poor mental health over the following four years.

We additionally estimate linear regression models of Wave 2-5 mental health on Wave 1 mental health and a full set of wave 1 control variables. The coefficient on Wave 1 mental health from regressions of Wave 2, Wave 3, Wave 4 and Wave 5 mental health equals 0.46, 0.43, 0.38 and 0.37, respectively. The similarity of estimates across waves suggests considerable stability in underlying mental health across time. Nevertheless, it is probable that our regression coefficient estimates will suffer from some attenuation bias due to the fact that mental health from Wave 1 is a mismeasured proxy for true mental health in Waves 2-5.

Table 2 presents the sample means of the MCS scores by incentive condition and wave (Row 1). There are mental health differences between individuals assigned to different incentive conditions at each wave, but none of these differences are statistically significant at the 10% level.[11] This suggests that the randomisation process was successful in balancing mental health between treatment arms. In the remaining rows of Table 2, the sample means are displayed for physical health (PCS) and selected individual characteristics. Again, we find that the covariate distributions are similar across conditions. The one exception is that the number of children in the household is significantly different across incentive conditions in Wave 4.

[11] To test for statistical differences, we estimated a multinomial logit model of incentive condition (*low*, *high* or *social*) at each wave on the vector of Wave 1 MCS scores and covariates. Bonferroni-adjusted *p*-values for multiple comparisons were then calculated to determine significance levels.

4.2. Regression Model

To test for heterogeneity in the effect of incentives, we estimate a linear regression model of participation including binary indicators for assigned incentive (*high*, *social*), our continuous measure of mental health (*mcs*), and their interactions:

$$p_{it} = \beta_1 high_{it} + \beta_2 social_{it} + \beta_3 mcs_{i1} + \beta_4 (high_{it} \cdot mcs_{i1}) + \beta_5 (social_{it} \cdot mcs_{i1}) + X'_{it}\gamma + \varepsilon_{it} \quad (3)$$

where p_{it} is a binary indicator of survey participation. The *low* incentive is the omitted base category, hence β_1 and β_2 equal the percentage point differences in the probability of participation for individuals with average mental health (given $\overline{mcs}$= 0) who have received *high* and *social* incentives, relative to the *low* incentive group. Similarly, β_3 equals the effect of mental health on participation for individuals who have received the *low* incentive, while $\beta_3 + \beta_4$ equals the effect of mental health on participation for individuals who have received the *high* incentive.[12]

The vector of covariates X_{it} include individual-level characteristics measured in Wave 1 and time-varying survey conditions. The individual-level characteristics include gender, age, marital status, number of children in the household, number of adults in the household, years of education, employment status, and weekly earnings. It is also important to control for physical health, given the potential for co-morbidities between mental and physical health conditions. In our main specification we use the Physical Component Summary (PCS) score from the SF-12v2, and in robustness specifications we use a binary indicator of a long-standing illness or disability. The sample means of the covariates by wave and incentive group are presented in Table 2. The standard deviations of the continuous covariates, which aid in the interpretation of coefficient magnitudes, equal 17.7 for age, 6.4 for years of education, 211.8 for wages, 0.9 for number of adults, and 0.9 for number of children. The mental and physical health indices are standardised and so have a standard deviation of one.

The covariate vector X_{it} also includes the incentive condition received in Wave 1 ($high_{i1}$ and $social_{i1}$), given that the random assignment of incentives in Waves 2 to 4 are conditional on the Wave 1 incentive. However, these variables are not statistically significant predictors of participation in any estimated model. We also control for the concurrent survey mode experiments that were conducted independently from our incentives experiment (Burton and Lynn, 2015). Specifically, we control for telephone versus face-to-face interviews (Wave 2), the paper self-completion versus computer-assisted self-interviewing (Waves 4 and 5), and the online versus face-

[12] It is possible that the estimates of β_3, β_4 and β_5 will suffer from attenuation bias due to the fact that mental health from Wave 1 is a mismeasured proxy for mental health in Waves 2-5. The mental health gradients found in Section 5 may therefore under-estimate the true level of heterogeneity.

to-face interviews (Wave 5). Finally, we control for wave dummies given the likely trend in participation over time.

Importantly, levels of mental health are not randomly distributed among sampled individuals; low mental health scores are significantly more likely among females (*t*-stat = 4.48), non-employed individuals (*t*-stat = 5.44), and singles (*t*-stat = 2.96). Therefore, it is important that we test whether the estimated coefficients in Equation (3) are sensitive to the addition of interactions between these characteristics and the incentive conditions (e.g. addition of $high_{it} \cdot male_{i1}$ and $social_{it} \cdot male_{i1}$). These robustness models are presented in Section 5.2. We also test the robustness of our results to the use of alternative estimation models, including probit, random-effects and fixed-effects models.

5. Results

5.1. Main Analysis

In Column (1) of Table 3 we present estimates from a parsimonious version of Equation (3) that contains the incentive condition indicators, the continuous mental health score, their interactions, and controls for interview wave and mode. The estimates suggest that an individual with average mental health who was assigned to the *high* £10 incentive is 4.2 percentage points more likely to participate in the survey than an individual with average mental health who was assigned to the *low* £5 incentive; this effect is significant at the 1% level.[13] As expected, higher financial rewards increase survey participation.

In contrast, there are no significant differences between individuals assigned to the *social* and *low* incentive conditions, despite the potential additional payment of £5 per person if all eligible household members participated. One possible explanation for this finding is that the potential additional payment of £5 served as an anchor when deciding whether the incentive already received was a fair compensation for their time. This effect would be exacerbated in multiple person households, where it was less likely that all eligible members would participate; thus the additional £5 was 'lost'. This explanation is supported by the estimate in Column (3) indicating a significantly negative interaction effect between the *social* incentive condition and number of adults in the household: participation in the *social* incentive condition is estimated to decrease by an extra 6.4 percentage points for every additional household member, compared with participation in the *low* incentive condition.

Notably, in column (1) the coefficient on the Mental Component Summary (MCS) score is significantly negative, suggesting that among individuals assigned to the *low* £5 incentive,

[13] Standard errors are calculated allowing for clustering within individuals across time.

individuals with good mental health were significantly *less* likely to participate than individuals with poor mental health. The value of -0.019 indicates that participation decreases by 1.9 percentage points with a single standard deviation increase in mental health. This finding contrasts with the positive mental health gradient for individuals assigned to the *high* incentive condition. The estimate for this group reveals that participation increases as mental health improves, by 1.1 percentage points per standard deviation (-0.019 + 0.030 = 0.011); however, the effect is not statistically significant at the 10% level.[14] Another equally valid interpretation of these results is that providing a low financial incentive generates a significant negative effect of good mental health on participation.

Figure 1 graphically represents the estimated effects from Column (1) of Table 3. Figure 1a shows the estimated mental health gradients of individuals who are randomly assigned to the *high* and *low* incentive schemes, and Figure 1b shows the estimated difference in these gradients. The mental health gradient for individuals assigned to the *social* incentive is very similar to the *low* incentive gradient, so for clarity purposes is not presented. Overall, Figure 1 implies that individuals with poor mental health (e.g. MCS $\leq$ -1) are indifferent to their incentive condition in this experiment, whereas individuals with good mental health respond more strongly to *high* financial incentives than to *low* financial incentives.

In Column (2) of Table 3 we can see whether the findings of Column (1) are robust to the inclusion of controls for individual-level characteristics and Wave 1 incentive conditions. The estimates in the top panel of Table 3 are little changed, indicating that the findings are robust. For example, the estimated main effect of the *high* £10 incentive increases from 0.042 to 0.043, while the estimated main effect of mental health equals -0.019 in both specifications. Of these additional covariates, the strongest predictor of participation is the quadratic age function. A possible explanation for this finding is that the economically active are less available for interviews or require greater compensation for their time than their younger (e.g. students) and older counterparts (e.g. retirees). Another interesting finding is how living with more adults decreases the likelihood of participation: moving from one adult in the household to two adults is estimated to reduce participation by 3.8 percentage points. The result may be due to diffusion of responsibility within the household. The more adults present, the less likely that refusal (which can be at the household level) can be attributed to any one individual. This could equate to a smaller reputational motivation μ_a in our behavioural framework. On the other hand, the marginal contribution of each individual towards completion of the survey diminishes with the number of adults, given that only one

[14] The aggregated mental health effect across all three incentive conditions equals -0.013 (with standard error 0.006), indicating that participation decreases by 1.3 percentage points with a one standard deviation increase in mental health. This negative effect is driven by the strong negative mental health gradient associated with the low incentive group. The aggregated physical health effect equals 0.006 and is not statistically significant.

respondent is required to provide household-level information. This marginal contribution effect would work in the opposite direction.

In Column (3) we add interactions between the control variables and the incentive conditions. None of the interactions are statistically significant for the *high* incentive condition, and only the interaction with number of adults in the household is statistically significant for the *social* incentive condition. Correspondingly, the mental health interaction effects decrease only slightly: from 0.033 in Column (2) to 0.029 in Column (3).[15] The estimated main effect of the *high* incentive drops from 0.043 in Column (2) to 0.015 in Column (3). However, this change is due solely to the fact that it now represents the estimated effect of receiving the *high* incentive for individuals with zero values of each of the interaction variables.[16]

It is somewhat surprising that responses to financial incentives are similar between those with poor and good physical health. Finkelstein et al. (2013) concluded from their analysis of data from the US Health and Retirement Study that marginal utility significantly declines with number of chronic diseases (defined as hypertension, diabetes, cancer, heart disease, chronic lung disease, stroke and arthritis). It is possible that the Physical Component Summary (PCS) score from the SF-12v2 is not fully measuring chronic illness, so we additionally estimated a specification that included interactions between incentive conditions and an indicator for a "long-standing illness, disability or infirmity". Again, we find no significant interaction effects between this indicator and the *high* and *social* conditions.

One potentially restrictive assumption inherent in Equation (3), and in the findings in Table 3 and Figure 1, is the linearity of the relationship between mental health and participation. To explore this issue, we re-estimate the participation model with MCS quintile indicators and interactions between the MCS quintile and incentive indicators. Table 4 presents the estimates from this model, which is based on the Column (2) specification from Table 3. They show that the differences in participation between *high* and *low* incentive conditions are driven largely by differences for individuals in the top two quintiles (MCS Q4 and MCS Q5). For these mental health groups, estimated participation is 6.8 percentage points and 8.3 percentage points higher for individuals in the *high* incentive condition than for individuals in the *low* condition. Individuals in

[15] The regressions shown in Table 3 do not contain household income as a covariate. Our approach was to use a parsimonious regression specification, especially with regard to the number of interaction terms. In addition, age, gender, education, employment and household size are all strongly correlated with income. Robustness models that include income show that it: is not a significant predictor of participation (once controlling for other characteristics); does not diminish the impact of receiving a high incentive; and does not affect the main mental health effect and the mental health interaction effect with the high incentive.

[16] We have additionally estimated models with lagged incentive conditions, to determine whether the history of incentive payments are a determinant of participation behaviour. Coefficients on the lagged incentive payment variables are small and statistically insignificant. Our interpretation of this result is that only the current incentive payment is pertinent to decision-making.

the bottom two quintiles (MCS Q1 and MCS Q2) behave similarly, regardless of the incentive they receive. The estimated participation rate of *high* incentive individuals in the middle quintile of mental health (MCS Q3) is 4 percentage points higher than that of *low* incentive individuals in the middle quintile, but the difference is not statistically significant.[17]

Figure 2 presents these estimates graphically. The left-hand side graph shows that among individuals assigned to the *low* incentive, those with mental health in the top quintile (MCS Q5) are 4.8 percentage points less likely to participate than those in the bottom quintile (MCS Q1). Among those in the *high* incentive, the difference in participation between the top and bottom mental health quintiles equals 2.3 percentage points (0.083 - 0.048 - 0.012 = 0.023), but is not statistically significant at the 10% level. The difference between the fifth and second quintiles of mental health is larger, equalling 5.3 percentage points (p-value = 0.12). The right-hand side graph illustrates that differences in participation between incentive conditions are driven by differences among individuals with good mental health.

One possible explanation for our findings is that individuals with poor mental health: (i) have a low valuation of monetary incentives, for example due to anhedonia (small υ_y in Equation 1); and (ii) are particularly concerned with how others regard their behaviour due to low self-esteem or anxiety, thus finding it difficult to refuse an interviewer at their doorstep (high μ_a in Equation 1). A small υ_y would drive the finding that individuals with poor mental health are less responsive to their incentive condition. A high μ_a would drive the finding that in the *low* incentive condition, individuals with poor mental health have higher participation rates than individuals with good mental health.

A related, but slightly different, explanation is that the negative mental health gradient for the *low* incentive group is driven not by high μ_a among individuals with poor mental health, but rather by a low intrinsic motivation among individuals with good mental health due to a 'crowding out' effect. As mentioned in Section 2, financial incentives could (falsely) signal the unattractiveness of survey participation, being difficult and time-consuming, while also signalling a distrust of participants' intrinsic motivation. In such a situation, a sufficiently large incentive would be necessary to compensate for the drop in intrinsic motivation, and £5 may be too low.

5.2. Robustness Analysis

This subsection explores the robustness of our main findings by varying the baseline specification shown in Column (2) of Table 3 and the estimation sample. First, we test the sensitivity of the

[17] Regarding the different groups used in Table 4, the participation rates for mental health quintiles 1-5 in the low incentive group equal 0.83, 0.81, 0.80, 0.81 and 0.79, and the participation rates for mental health quintiles 1-5 in the high incentive group equal 0.88, 0.86, 0.87, 0.89 and 0.89.

estimated mental health interaction effects to alternative measures of mental health. In Columns (1) to (4) of Table 5, we replace the MCS with the SF-12v2 health scales that primarily load onto the MCS: (i) Vitality ("have a lot of energy"); (ii) Social Functioning ("physical health or emotional problems interfered with your social activities"); (iii) Role Emotional ("problems with your work or other regular daily activities as a result of any emotional problems"); and (iv) Mental Health ("felt calm and peaceful", "felt downhearted and depressed"). Unlike the MCS, these scales are based on a small range of values, so we operationalise them as binary indicators: individuals in poor mental health (roughly the bottom 20%) are assigned the value 0, and individuals in fair and good mental health are assigned the value 1. These are defined precisely in the notes of Table 5. In Column (5) of Table 5 we use an entirely different mental health scale: the Centre for Epidemiologic Studies Depression Scale (CES-D), which measures symptoms defined by the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-V) for a major depressive episode. Again, this scale is operationalised by transforming it into a binary measure using the validated cut-point for clinical depression (≤20 on the reverse-scored scale; Andresen et al., 1994).

The estimated interaction effects in Columns (1) to (5) represent differences in the probability of survey participation relative to those in fair and good mental health who are receiving the *low* £5 incentive. The group that is most significantly different from this base category are those in fair and good (better) mental health who are receiving the *high* £10 incentive. When we use the Vitality, Social Functioning, Role Emotional, Mental Health and CES-D scales to characterise mental health, our estimates suggest that participation is increased by 4.7, 5.7, 6.1, 5.7 and 5.7 percentage points, respectively (all significant at the 1% level). In other words, higher financial incentives significantly increase participation for those who are *not* mentally unwell, regardless of the mental health scale used. In contrast, for those who have poor mental health, differences in participation between those receiving *low* £5 and *high* £10 incentives are not statistically significant across the five measures (*p*-values = 0.374, 0.364, 0.165, 0.643 and 0.308 for Columns 1 to 5), and are not even consistent in sign across the measures.[18]

Next we explore how the estimated effects of the financial incentives and their interactions change over time. Our *a priori* expectation was that financial incentives would become more important after repeated waves, corresponding to a decline in the importance of prosocial behaviour, especially among individuals in good mental health: after several waves, mentally well individuals may legitimately feel that they have contributed sufficiently to the public good, and are therefore happy to say "no" to the interviewer. The results in Table 6 support this expectation. The

[18] Care must be taken when evaluating the statistical significance of individual effects in Table 5, given the multiple estimates presented (i.e. the multiple comparisons problem). For this reason, we focus only on those estimates that are statistically significant at the 1% level.

effect of the *high* £10 incentive is larger and statistically significant for the Waves 4 and 5 sample, suggesting that the incentive amount was more important for the average individual in later waves. Similarly, the mental health and *high* £10 incentive interaction effect is large and statistically significant for Waves 4 and 5 (0.052), but close to zero and insignificant for Waves 2 and 3 (-0.001).

Finally, we explore the robustness of the estimates to alternative estimators. Appendix B presents estimates from a linear random-effects model, a probit model and a linear fixed-effects model. For the random-effects and probit models, the interaction between the MCS score and the *high* £10 incentive condition is significantly positive, supporting our main finding that individuals with good mental health are more responsive to financial incentives than are individuals with poor mental health. However, in the fixed-effects model the interaction effect is not statistically significant. There are two explanations for this result. First, around 30% of individuals are assigned to both the *low* £5 and *high* £10 incentive conditions in Waves 2 to 5. Thus, the fixed-effect estimate is identified from a relatively small sample. Second, the vast majority of this within-individual variation occurs in Waves 2 and 3. Therefore, the fixed-effects estimate relates primarily to the effect of financial incentives in these early waves. As Table 6 demonstrates, that effect was smaller than in later waves.

6. Conclusion

Every year, up to 20% of adults in the UK and US experience common mental health conditions, such as anxiety and depression. Given the extensive role that financial incentives play in public policy with regard to encouraging and discouraging certain actions and behaviours, it is important to understand whether individuals in poor mental health react differently to those in good mental health to the same economic stimuli. Individuals in poor mental health often experience a loss of pleasure in daily activities, and feel that others are critically judging their behaviour; as such, they may show a different pattern of response to financial incentives.

For a theoretical motivation to our empirical analysis, we draw upon the economic framework of behaviour by Bénabou and Tirole (2006). Within this framework, we suggest that the common symptoms experienced by those with anxiety and depression lead to the hypotheses that there is a mental health gradient in individuals' marginal utility of consumption, and that prosocial behaviour differs by mental health status. If this is the case, and poor mental health acts to dampen the response to incentives, then this might help to explain the lower investment in education and lower employment rates found for those with mental health conditions.

There is little research on this issue, so to shed some new light, we assess whether effort exerted in response to financial incentives varies as a function of mental health. Our analysis is grounded in the context of a survey incentives experiment that incorporates a real-world effort task. In particular, the data come from the survey incentives experiment on the Innovation Panel of the UK Household Longitudinal Study, which is conducted in an environment where the treatment and behaviour of interest would typically take place and where subjects are unaware of the experiment.

As expected, we find that a higher financial incentive increases survey partication. However, while individuals in good mental health are significantly more likely to participate in the survey when financial incentives are higher, the likelihood of participation amongst individuals in poor mental health is unrelated to the level of financial incentives. Interestingly, we find no such differential response by physical health status. These results are robust to controlling for differential response by age, gender and socioeconomic status, and to various measures of mental and physical health.

Our study is not without limitations. First, although the survey experiment is conducted in a natural environment that allows us to distinguish between those in good and poor mental health, the value of the financial incentives are modest. However, given that we find that these amounts induce significantly increased survey participation only for those in good mental health, it might well be the case that a dampened response for those in poor mental health would also be found for the larger financial incentives typically used by policy-makers. Further research on this topic using larger financial incentives, and in contexts other than survey participation, would therefore be valuable. Second, it is not possible for us to precisely isolate the differences in economic preferences that cause this pattern of results. Possible theoretical motivations include that those with poor mental health have a low marginal utility of consumption, a high valuation of prosocial behaviour, and are driven by a heightened concern with how others regard their actions. Again, hopefully future research will be able to distinguish between these mechanisms and provide new insights into this important issue.

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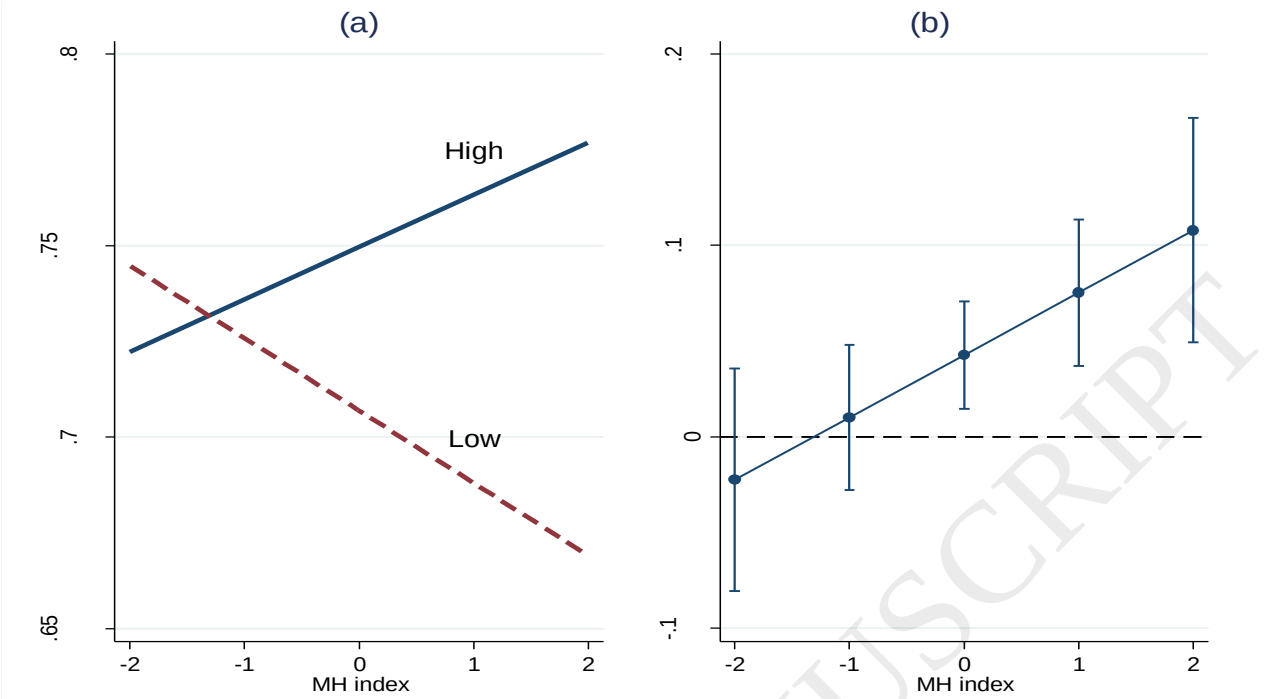
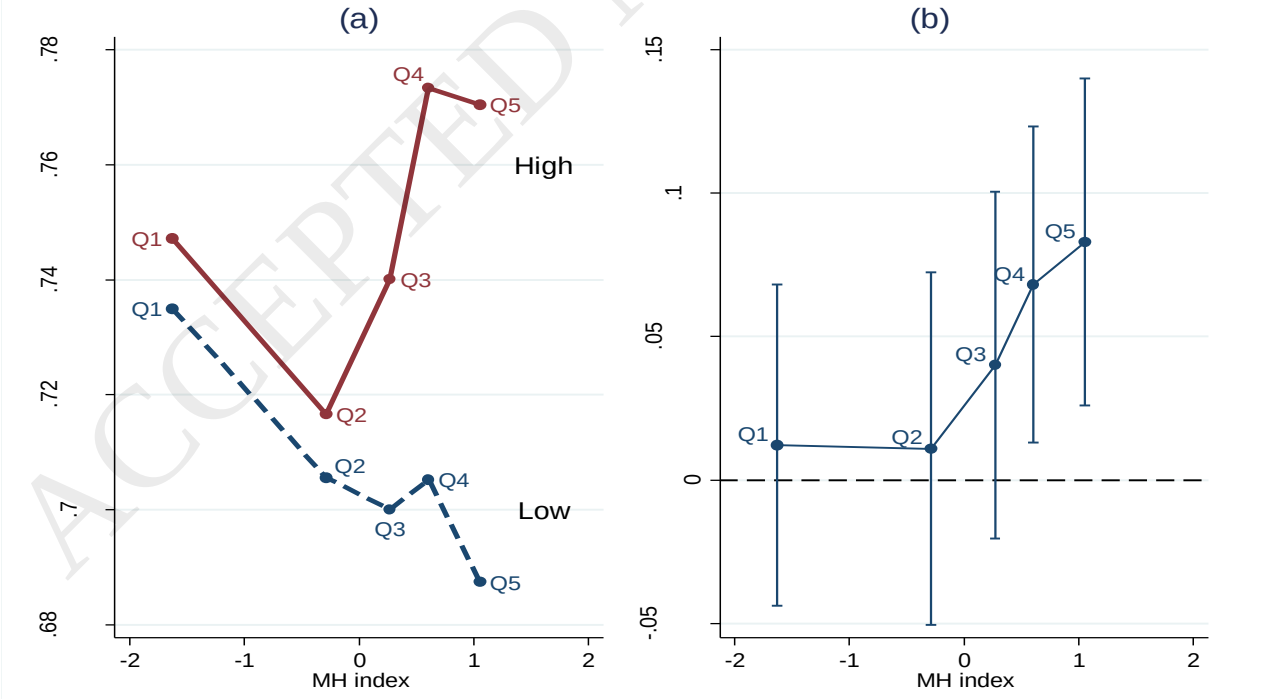
Figure 1. Estimated Effects of Mental Health on Participation in High and Low Incentive Conditions, and the Difference in Effects



Notes: Graphs constructed using the estimates presented in Column (1) of Table 3. Bars in (b) represent 95% confidence intervals.

Figure 2. Estimated Effects of Mental Health using Mental Health Quintiles



Notes: Graphs constructed using the estimates presented in Table 4. Bars in (b) represent 95% confidence intervals.

Table 1. Numbers of Individuals and Percent Participating per Incentive Condition and Wave in Main Estimation Sample

	Wave 1	**Wave 2**	**Wave 3**	**Wave 4**	**Wave 5**	**Waves 2-5**
Low £5 incentive	738	1589	1753	995	886	5223
	[100%]	[80.6%]	[76.7%]	[72.7%]	[78.1]	[77.3%]
High £10 incentive	834	407	207	707	710	2031
	[100%]	[86.3%]	[84.8%]	[77.6%]	[82.1]	[81.7%]
Social £5-£10 incentive	813	389	383	331	0	1103
	[100%]	[81.2%]	[78.4%]	[65.2%]	[-]	[75.4%]
Total	2385	2385	2343	2033	1596	8357
	[100%]	[81.8%]	[77.8%]	[73.0%]	[79.9%]	[78.2%]

Notes: Low=£5 for each responding adult in the household; high=£10 for each responding adult in the household; social=£5 for each responding adult in the household but rising to £10 if all eligible adults responded. Figures in square brackets are percentages indicating participation rate. Calculations of percentage participating do not include missing values (i.e. those showing responses other than participating and refusing to participate, such as proxy interview, deceased, moved, no contact able to be made, too elderly, ill, away).

Table 2. Means of Wave 1 Mental Health and Selected Characteristics by Incentive Treatment and Wave

	Wave 1			**Wave 2**			**Wave 3**			**Wave 4**			**Wave 5**	
Wave 1 measurements	**Low**	**High**	**Social**	**Low**	**High**	**Social**	**Low**	**High**	**Social**	**Low**	**High**	**Social**	**Low**	**High**
Mental health index	0.03	0.02	-0.05	0.05	-0.04	-0.18	0.05	-0.07	-0.17	0.06	0.02	-0.17	0.01	-0.02
Physical health index	-0.00	0.03	-0.03	0.04	-0.05	-0.09	0.02	0.00	-0.09	0.03	0.07	-0.07	-0.00	0.10
Male	0.45	0.45	0.46	0.45	0.43	0.47	0.45	0.42	0.47	0.45	0.43	0.47	0.45	0.44
Age	49.7	48.5	48.6	48.6	50.2	48.9	49.3	48.4	49.0	48.8	49.4	48.6	48.9	48.8
Years of education	18.9	19.2	19.1	19.2	18.7	18.7	19.2	18.9	18.8	19.1	19.1	18.8	19.2	19.1
Employment	0.54	0.57	0.56	0.57	0.51	0.54	0.56	0.55	0.54	0.58	0.57	0.55	0.59	0.58
Net weekly wages	175.4	178.1	173.9	179.6	161.4	175.6	177.4	170.1	176.6	178.4	176.1	181.7	186.1	186.1
No. of adults in HH	2.2	2.2	2.1	2.2	2.1	2.0	2.2	2.3	2.0	2.2	2.2	2.0	2.2	2.2
No. of children in HH	0.5	0.5	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.6	0.5	0.7*	0.6	0.5
Sample size	738	834	813	1589	407	389	1753	207	383	995	707	331	886	710

Notes: HH=household. Health and covariates are measured at Wave 1. Mental health and physical health indices refer to the Mental Component Summary (MCS) and Physical Component Summary (PCS), respectively, from the SF-12v2. These two scores are standardised to have mean 0 and standard deviation 1 with higher scores indicating better health, following the norm-based scoring in Ware et al. (2002). Sample size equals 2385 individuals with nonmissing MCS at Wave 1 (10742 observations from Waves 1 through 5 with nonmissing incentive information). To test for differences in variable distributions between incentive conditions, a multinomial logit model is used to regress incentive condition on the row variables at each wave. Hypothesis tests for differences in marginal effects between conditions are then conducted using Bonferroni-adjusted p-values. Low is retained as base condition (standard errors clustered at the individual level), but similar results are seen with High as base condition. *, ** and *** denote statistical significance at 0.10, 0.05 and 0.01 levels.

Table 3. Estimated Effects of Incentives, Mental Health and their Interactions from OLS Regressions Models of Participation

	(1)		**(2)**		**(3)**	
High £10 incentive	0.042***	(0.013)	0.043***	(0.014)	0.015	(0.086)
Social £5-£10 incentive	-0.025	(0.020)	-0.005	(0.023)	0.076	(0.124)
Mental health score	-0.019**	(0.008)	-0.019**	(0.008)	-0.018**	(0.008)
High incentive x mental health	0.030**	(0.013)	0.033**	(0.013)	0.029**	(0.013)
Social incentive x mental health	-0.006	(0.016)	-0.006	(0.016)	-0.003	(0.017)
Physical health index			0.006	(0.007)	0.008	(0.009)
Male			-0.007	(0.013)	-0.004	(0.016)
Age in years / 10			0.104***	(0.022)	0.106***	(0.023)
$Age^2/100$			-0.010***	(0.002)	-0.011***	(0.002)
Years of education / 10			0.014	(0.010)	0.009	(0.012)
Employed			0.045	(0.063)	0.038	(0.063)
Number of adults in household			-0.038***	(0.008)	-0.033***	(0.010)
Number of children in household			-0.017**	(0.008)	-0.008	(0.010)
High Wave 1 incentive			0.024	(0.016)	0.023	(0.017)
Social Wave 1 incentive			-0.012	(0.019)	-0.012	(0.019)
Interactions with high incentive						
Physical health index					0.001	(0.016)
Male					-0.007	(0.026)
Age in years / 10					-0.000	(0.010)
Years of education / 10					0.004	(0.018)
Employed					0.043	(0.031)
Number of adults in household					0.014	(0.016)
Number of children in household					-0.022	(0.017)
Interactions with social incentive						
Physical health index					-0.009	(0.021)
Male					-0.001	(0.038)
Age in years / 10					-0.002	(0.014)
Years of education / 10					0.051*	(0.027)
Employed					-0.002	(0.047)
Number of adults in household					-0.064***	(0.024)
Number of children in household					-0.011	(0.020)
Interview mode and wave controls	✓		✓		✓	
Number of observations	6954		6954		6954	
Number of individuals	2255		2255		2255	
R-Squared	0.005		0.033		0.038	

Notes: Dependent variable is a binary indicator equalling 1 if the individual participates and equalling 0 if the individual refuses to participate. Model (3) additionally controls for full wave-incentive interactions. Mental health and physical health indices are standardised to have mean 0 and standard deviation 1, with higher scores indicating better health. Omitted incentive category is 'Low £5 incentive'. Standard errors clustered at the individual level are shown in parentheses. *, ** and *** denote statistical significance at 0.10, 0.05 and 0.01 levels.

Table 4. Estimated Effects of Mental Health Quintiles from the OLS Regressions Model of Participation

MCS Q2 (20-40th percentile)	-0.029	(0.025)
MCS Q3 (40-60th percentile)	-0.035	(0.026)
MCS Q4 (60-80th percentile)	-0.030	(0.025)
MCS Q5 (80-100th percentile)	-0.048*	(0.026)
High £10 incentive * MCS Q1	0.012	(0.029)
High £10 incentive * MCS Q2	0.011	(0.031)
High £10 incentive * MCS Q3	0.040	(0.031)
High £10 incentive * MCS Q4	0.068**	(0.028)
High £10 incentive * MCS Q5	0.083***	(0.029)
Social £5-£10 incentive * MCS Q1	0.023	(0.039)
Social £5-£10 incentive * MCS Q2	-0.024	(0.043)
Social £5-£10 incentive * MCS Q3	0.027	(0.047)
Social £5-£10 incentive * MCS Q4	-0.054	(0.049)
Social £5-£10 incentive * MCS Q5	0.014	(0.047)
Number of observations	6954	

Notes: Dependent variable is a binary indicator equalling 1 if the individual participates and equalling 0 if the individual refuses to participate. The sample is disaggregated into MH quintiles, with higher quintiles reflecting better mental health. This regression follows the specification in Column (2) of Table 3. Omitted incentive category is 'Low £5 incentive'. Standard errors clustered at the individual level are shown in parentheses. *, ** and *** denote statistical significance at 0.10, 0.05 and 0.01 levels.

Table 5. Estimated from OLS Regressions Models of Participation using Alternative Dimensions of Mental Health as Covariates

	Vitality (1)	**Social Function (2)**	**Role Emotional (3)**	**Mental Health (4)**	**CES-D (5)**
High incentive & poor MH	0.066**	0.025	-0.007	0.037	-0.029
	(0.029)	(0.031)	(0.032)	(0.023)	(0.030)
High incentive & better MH	0.047***	0.057***	0.061***	0.057***	0.057***
	(0.016)	(0.016)	(0.015)	(0.017)	(0.017)
Low incentive & poor MH	0.038*	0.054**	0.040*	0.026	0.004
	(0.022)	(0.022)	(0.022)	(0.018)	(0.022)
Low incentive & better MH	-	-	-	-	-
Social incentive & poor MH	0.070*	0.029	0.065*	0.015	0.012
	(0.040)	(0.042)	(0.037)	(0.033)	(0.044)
Social incentive & better MH	-0.010	0.002	-0.009	0.002	-0.022
	(0.025)	(0.025)	(0.025)	(0.027)	(0.028)
Percentage classified as 'better'	0.833	0.840	0.843	0.712	0.781
Number of observations	6954	6954	6954	6954	5581
Number of individuals	2255	2255	2255	2255	1790
R-Squared	0.033	0.033	0.034	0.032	0.033

Notes: Dependent variable is a binary indicator equalling 1 if the individual participates and equalling 0 if the individual refuses to participate. Mental health dimensions in Columns (1) to (4) are SF-12v2 health scales, whereas Model (5) uses the Centre for Epidemiologic Studies Depression Scale (CES-D). Dichotomisation to 'better mental health' ('poor' otherwise) is as follows: (1) "have a lot of energy" all, most, or some of the time; (2) "physical health or emotional problems interfered with your social activities" a little or none of the time; (3) responses are a little or none of the time to "as a result of any emotional problems, accomplished less than you would like" and a little or none of the time to "as a result of any emotional problems, did work or other activities less carefully than usual"; (4) responses are all, most, or some of the time to "felt calm and peaceful", and a little or none of the time to "felt downhearted and depressed"; (5) scoring ≤20 on the reverse-scored CES-D, following the validated cutpoint identifying depressive symptomatology related to clinical depression (≥10 on the original CES-D scale; Andresen et al. 1994). All regressions follow the specification in Column (2) of Table 3. Omitted incentive category is 'Low incentive & better mental health'. Standard errors clustered at the individual level are shown in parentheses. *, ** and *** denote statistical significance at 0.10, 0.05 and 0.01 levels.

Table 6. OLS Regressions Models of Participation Estimated Separately by Wave

	Waves 2 & 3 (1)		**Waves 4 & 5 (2)**	
High £10 incentive	0.038	(0.023)	0.041**	(0.019)
Social £5-£10 incentive	0.031	(0.026)	-0.071**	(0.032)
Mental health score	-0.012	(0.009)	-0.029**	(0.012)
High incentive x mental health	-0.001	(0.020)	0.052***	(0.018)
Social incentive x mental health	0.001	(0.017)	-0.023	(0.025)
Physical health index	0.011	(0.009)	-0.002	(0.010)
Male	0.002	(0.015)	-0.018	(0.018)
Age in years / 10	0.109***	(0.026)	0.097***	(0.030)
$Age^2/100$	-0.012***	(0.003)	-0.009***	(0.003)
Years of education / 10	0.006	(0.012)	0.024**	(0.012)
Employed	0.051	(0.083)	0.039	(0.083)
Number of adults in household	-0.039***	(0.009)	-0.036***	(0.010)
Number of children in household	-0.020**	(0.009)	-0.013	(0.010)
High Wave 1 incentive	0.027	(0.021)	0.023	(0.021)
Social Wave 1 incentive	-0.025	(0.023)	0.002	(0.024)
Number of observations	3858		3096	
Number of individuals	2195		1806	
R-Squared	0.030		0.041	

Notes: Dependent variable is a binary indicator equalling 1 if the individual participates and equalling 0 if the individual refuses to participate. Mental health and physical health indices are standardised to have mean 0 and standard deviation 1, with higher scores indicating better health. All regressions follow the specification in Column (2) of Table 3. Omitted incentive category is 'Low incentive & better mental health'. Omitted incentive category is 'Low £5 incentive'. Standard errors clustered at the individual level are shown in parentheses. *, ** and *** denote statistical significance at 0.10, 0.05 and 0.01 levels.