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# Dysfunctional presenteeism: Effects of physical and mental health on work performance

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## Abstract

Poor health in the workforce is costly to employers and the economy. This is partly due to health problems causing people to spend less time at work but is also due to people being less productive while at work. In this paper, we investigate the causes of dysfunctional presenteeism, defined as reduced productivity at work due to health problems. We find that both physical and mental health significantly predict the probability of dysfunctional presenteeism, and the effects of mental health problems seem to be worse than physical health. In comparison, changes to most other characteristics have little or no effect.

## KEYWORDS

mental health, physical health, presenteeism

## JEL CLASSIFICATION

I14; J24

## 1 | INTRODUCTION

Poor health in the workforce is costly to employers and the economy. This is partly due to health problems causing people to spend less time at work, for example via unemployment, worklessness, reduced hours and absenteeism, but is also due to people being less productive while at work. Research suggests that being present at work without being in full health (often referred to as 'presenteeism') is a widespread phenomenon. In 2015, 58% of workers in the EU reported working while sick in the previous 12 months (Eurofound, 2015). Recent estimates suggest that,

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in the United Kingdom, 1.5 days of work time are lost due to presenteeism for every one day lost due to absenteeism, and the cost of presenteeism to business is double that of absenteeism, amounting to about £21.2 billion per year (Parsonage & Saini, 2017). Another survey estimates that the equivalent of 35 days per person per year is lost to presenteeism in the United Kingdom (Financial Times, 2019). Low productivity has long been argued to be a problem for the UK economy,<sup>1</sup> so it is important to understand the potential causes and formulate policy responses.

Not all presenteeism is bad. Attending work while not in full health can aid recovery and poor health does not necessarily lead to reduced functioning at work. However, presenteeism that does have an adverse impact on work performance and productivity can be described as dysfunctional (Karanika-Murray & Biron, 2019), and it is this dysfunctional presenteeism that is the focus of this paper.

Measuring dysfunctional presenteeism (productivity loss due to ill-health) is very difficult. Objective measures of work performance have limited use as they are often occupation specific (e.g. words typed per minute or the number of items produced per hour) and thus cannot be applied generally across all jobs. Most studies that focus on dysfunctional presenteeism adapt subjective measures where employees assess their own productivity. These measurement tools are routinely used in small-scale surveys covering a specific workplace or sector and hence the findings lack external validity.

Following Bubonya et al. (2017), we exploit questions included in a large national survey and, as such, this paper is the first to estimate the extent of dysfunctional presenteeism across the UK workforce as a whole. We assess the extent to which physical and mental health affect people's ability to do their job effectively and seek to expose some of the 'hidden' costs of ill health on the UK economy. Unlike most previous studies in this field, we make use of a large nationally representative dataset and adopt a longitudinal framework to help establish causal relationships. We also explore the heterogeneity of health effects across a range of characteristics and investigate whether certain working conditions may mitigate the impact of health on dysfunctional presenteeism.

We find that both physical and mental health significantly predict the probability of dysfunctional presenteeism. This effect holds up in a longitudinal framework, such that a worsening of health over time increases the probability of dysfunctional presenteeism. Specifically, the onset of any physical health condition that impairs daily living increases the incidence of dysfunctional presenteeism by a magnitude of 7 percentage points while the estimated effect of the onset of clinically poor mental health is 12 percentage points. Given that only 9% of workers in the United Kingdom exhibit dysfunctional presenteeism in any given month, these are large effects. These results imply that investing in health (particularly mental health) is by far the most effective way of limiting the loss of work performance due to dysfunctional presenteeism across the UK economy.

We also find that two job characteristics appear to play a role in reducing the mental health effect: it is only 8 percentage points for people in part-time employment and 10 percentage points for people with autonomy over their work tasks. This implies that certain work accommodations can be effective at reducing the impact of health on dysfunctional presenteeism, and these accommodations should be adopted more widely to allow more people with mental health conditions to enter employment.

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<sup>1</sup>Output per hour in the UK is around 15% below the average for the rest of the G7 advanced economies (Office for National Statistics, 2017).

## 1.1 | Previous literature

The concept of presenteeism was first identified by Cooper (1996), who defined it as 'being at work when you should be at home either because you are ill or because you are working such long hours that you are no longer effective'. However, as Johns (2010) points out, various definitions are found in the literature, and it is important to disentangle these various understandings. A very common definition, and the one favoured by Johns (2010), is 'the act of going to work despite feeling unhealthy'. This is sometimes classified as the 'European' understanding of presenteeism (Karanika-Murray & Cooper, 2018) and essentially describes a behaviour or a choice.

Several empirical studies investigate the extent to which different aspects of work are associated with presenteeism, based on this definition. In general, people experiencing poor working conditions are more likely to attend work while sick. Conditions include stressful work (Hirsch et al., 2017), lack of support from colleagues (Arnold, 2016; Caverley et al., 2007), dissatisfaction with work environment (Leineweber et al., 2011) and workplace bullying (Conway et al., 2016). Presenteeism is also associated with indicators of responsibility and workload, such as work autonomy (Arnold, 2016), supervisory responsibilities (Arnold & de Pinto, 2015), being on a permanent full-time contract (Bockerman & Laukkanen, 2009) and long or irregular working hours (Arnold, 2016; Bockerman & Laukkanen, 2009; Hansen & Andersen, 2008). These findings suggest that time pressure or responsibility for completing work tasks can inhibit people from being absent from work. Lack of job security (Caverley et al., 2007; Hirsch et al., 2017) and lack of flexibility from employers to support sickness absence (Johansson & Lundberg, 2004) are also associated with higher presenteeism.

Where health is controlled for in the analysis, most studies simply measure this using general self-assessed health (e.g. where the respondent rates their health on a five-point scale between 'Excellent' and 'Very poor'), and confirm that poor health is predictive of presenteeism. In one of the few papers that explore the impact of health in more depth, Gosselin et al. (2013) find that some conditions (namely gastritis, insomnia and allergies) are associated with presenteeism but not absenteeism while other more serious conditions (back pain and emotional problems) predict both. Caverley et al. (2007) find that the presence of a chronic medical condition is more predictive of presenteeism than absenteeism.

Studies based on the 'European' definition of presenteeism are predicated on the assumption that attending work while not in full health is a negative outcome in itself. This assumption is justified if work attendance leads to further declines in health (although, as discussed below, in some cases work may contribute to recovery as part of so-called 'therapeutic presenteeism'). However, this definition ignores the potential impacts on broader economic outcomes, such as worker productivity.

For this reason, we prefer an alternative definition of presenteeism set out by Johns (2010): 'reduced productivity at work due to health problems'. This is very similar to the definition used by Schultz and Edington (2007), who reviewed more than 100 studies focusing on the links between health and on-the-job productivity. This is said to be the 'American' definition of presenteeism (Karanika-Murray & Cooper, 2018) and is a very different concept to the idea of coming to work while sick, as it describes an outcome rather than a behaviour. In this understanding, presenteeism is not a choice but a consequence of behaviours and other circumstances. The choice to forego sickness absence may be a primary reason for productivity loss due to health problems, but it should be noted that going to work while feeling unwell does not necessarily result in productivity loss. This important point is highlighted by Karanika-Murray and Biron (2019) who introduce the concept of 'functional presenteeism' where ill-health does not have a significant impact on job performance.

Conversely, it is possible for a person's health to affect their productivity even when they have not explicitly made a decision to attend work rather than take sick leave (Vingard et al., 2004). This may be particularly pertinent for long-term health conditions, where the presence of the condition is 'normal' for the individual and not a reason in itself to be absent from work. For clarity, it is convenient to name this American definition of presenteeism as 'dysfunctional presenteeism' following the typology set out in Karanika-Murray and Biron (2019).

Some studies seek to measure this dysfunctional presenteeism using indicators of lost productive time. For example, Stewart et al. (2003) find that depression leads to significant costs due to lost productive time and that most of these costs are 'invisible', in the sense that they are caused by hour-equivalent reduced performance at work rather than hours of work missed. Similarly, Kessler et al. (1999) find that depressed workers have significantly more 'work-disability days' than healthy workers and Kessler and Frank (1997) find that workers with psychiatric disorders are most likely to exhibit work impairment, and that 'work cutback' days (presenteeism) are much more prevalent than 'work loss' days (absenteeism).

Other studies make use of a number of survey tools that exist to identify reduced productivity due to disability and ill-health. As shown by Schultz and Edington (2007), there are a large number of such tools. In their review of the literature, they find that productivity loss at work is associated with a number of different health conditions, including diabetes, depression and arthritis. Moreover, individuals with multiple health conditions report greater (dysfunctional) presenteeism than those with few conditions, and the magnitude of work impairment increases with every additional chronic condition.

In a more recent study, Pedersen and Skagen (2014) find that poor health, low job satisfaction and not having managerial responsibility are all associated with lower work performance on the Stanford Presenteeism Scale (Koopman et al., 2002). Adler et al. (2006) find that depression has a negative impact on work performance, and to a much greater degree than rheumatoid arthritis, according to the Work Limitations Questionnaire (Lerner et al., 2001). Most recently, Brunner et al. (2019) find that job stressors (relating both to the task itself and relationships at work) have a negative effect and job resources (including job control, task significance, supportive behaviour from supervisors and appreciation at work) have a positive effect on health-related productivity (due to both absenteeism and presenteeism) as measured by the Work Productivity and Impairment-General Health questionnaire (Reilly et al., 1993).

These productivity instruments are rarely available in large-scale longitudinal surveys (hence most studies rely on bespoke datasets) and are therefore useful only for providing inference on small-selected populations and lack external validity. Moreover, these samples are largely based on a single cross-section so it is not possible to account for unobserved heterogeneity between individuals that may bias the estimated effect of health on dysfunctional presenteeism. To our knowledge, the only study that has attempted to investigate dysfunctional presenteeism using a national panel dataset is that of Bubonya et al. (2017). They use the Household Income and Labour Dynamics in Australia (HILDA) survey to assess the effects of mental health on absenteeism and presenteeism within the Australian workforce. To measure presenteeism, the authors consider responses to certain questions in the Short Form 36 (SF-36) Health Survey (Ware et al., 1993) that focus on the extent to which emotional problems affect the quality and quantity of work tasks and other activities accomplished. They find that the odds of presenteeism are six to seven times higher for people with poor mental health than people with good mental health. Moreover, the presenteeism of people with poor mental health is less sensitive to changes in employment conditions (namely job control, job security, job complexity and job stress) than people with good mental health.

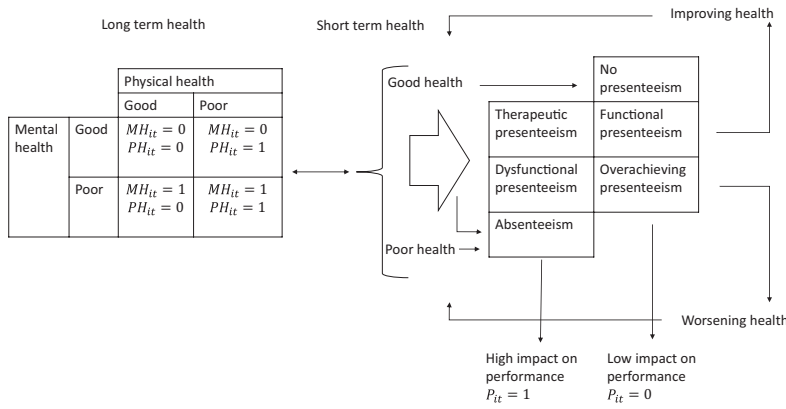


FIGURE 1 Theoretical framework (adapted from Karanika-Murray & Biron, 2019)

We measure dysfunctional presenteeism in a similar way, applying it to the UK workforce as a whole for the first time. We also expand on the contribution of Bubonya et al. (2017) by capturing the effects of physical health as well as mental health.

### 1.2 | Theory

Research into presenteeism has been criticised as being ‘markedly atheoretical’ (Johns, 2010; Karanika-Murray & Biron, 2019) and there is no prevailing theory of presenteeism to draw upon.

Standard economic theories of presenteeism focus on workers’ choice about whether or not to be absent from work conditional on health and other incentives (e.g. wages, sick pay, probability of dismissal), and have little to say about how this impacts on productivity. Chatterji and Tilley (2002) make the assumption that productivity is a function of health state, such that the theoretical firm would prefer all workers with low health to be absent. Similarly, Brown and Sessions (2004) specify a minimum acceptable level of sickness above which absence will always be preferred by the employer. While Hirsch et al. (2017) do include a productivity parameter in their model, for tractability purposes this is assumed to be exogenous and not related to the process by which health affects the worker’s presenteeism decision.

As we are primarily interested in the effects of health on work performance or productivity, we derive our theoretical model from the wider social science literature, in particular Karanika-Murray and Biron (2019), as this recognises the interplay between health, work performance and presenteeism behaviours and experiences.

Our empirical model estimates the reduced form relationship between long-term health and dysfunctional presenteeism but we do not ignore the ‘black box’ which connects these inputs and outputs. These connections are summarised in Figure 1. A given individual  $i$  at a given point in time  $t$  experiences long-term health in two dimensions, physical and mental health. For simplicity, we assume that the individual can have one of two health states on each dimension: good mental (physical) health denoted as  $MH_{it} = 0$  ( $PH_{it} = 0$ ) or poor mental (physical) health denoted as  $MH_{it} = 1$  ( $PH_{it} = 1$ ). These health states are derived from self-reported information on specific health problems that can be observed in the data.

Long-term health in turn affects the short-term health that the individual experiences on any given working day. We would expect long-term health to have a strong influence on short-term

health but this relationship is not deterministic. A person with no long-term health problems may still experience episodes of ill-health while someone with a long-term health problem may still have ‘good days’ when they are not ill or their health problem has no adverse effect on their work.

Given their short-term health, the individual subsequently makes a decision about whether or not to attend work. Where the individual is experiencing an episode of good health, they either attend work without presenteeism or absent from work dishonestly. In the literature, this behaviour is classified as ‘shirking’ and results from employers’ inability to observe the true health state of the worker (Brown & Sessions, 2004; Scoppa & Vuri, 2014). Either way, in such cases there would be no presenteeism.

Where short-term health is such that a reasonable case could be made for taking sick leave, any decision to continue working is deemed to be presenteeism. As discussed by Johns (2010), this decision may be influenced by a multitude of factors, including contextual factors (e.g. job demands, job security, rewards system, absence policy and work culture) and personal factors (e.g. work attitudes and personality).

Finally, the effect of this presenteeism is realised. As described by Karanika-Murray and Biron (2019), these effects depend on person-centred factors such as the nature of the illness or disability, the nature of the work and the supportiveness of the work environment. On the dimension of performance, presenteeism can be ‘functional’ if the individual can continue to work without experiencing a significant drop in work performance, or ‘dysfunctional’ if they are unable to continue working at the expected performance levels. For example, it may or may not be possible to adapt aspects of one’s work to ensure that performance can be maintained despite a deterioration in health. Thus, we have our dependent variable. This is denoted as  $P_{it}$  and takes the value of 0 if there is no, or limited, effect on performance and 1 if work performance is substantially diminished.

Although we describe  $P_{it}$  as an indicator for dysfunctional presenteeism, Figure 1 shows that  $P_{it} = 1$  also when presenteeism is ‘therapeutic’, according to the typology of Karanika-Murray and Biron (2019). In this case, presenteeism is hindering work performance but is at the same time aiding the individual’s recovery. For example engaging in productive activity can help to improve the self-worth of people struggling with mental health problems. In theory, our dysfunctional presenteeism variable could be capturing absenteeism as well but, as we explain in the Results section by use of certain robustness checks, it is unlikely that this is affecting our results.

It should also be noted that  $P_{it} = 0$  does not necessarily imply that presenteeism has no negative effects, as it also incorporates ‘overachieving’ presenteeism whereby workers manage to maintain performance but at the expense of worsening health or prolonged recovery time. We cannot observe the extent to which presenteeism is aiding or inhibiting recovery (the horizontal dimension in Figure 1) but this is also relevant to the empirical analysis as there is a clear feedback loop from presenteeism to health, raising the possibility of reverse causality.

### 1.3 | Data and descriptive analysis

The data we use come from Understanding Society: The UK Household Longitudinal Study (UKHLS) (University of Essex, 2019). This is a large national survey covering all four countries of the United Kingdom, in which households and individuals are interviewed on an annual basis, covering a wide range of topics. The UKHLS is sampled from all addresses in the United Kingdom through a process of randomisation and as such is representative of the UK population. It also

TABLE 1 Derivation of study sample

	Waves	Individuals	Observations
All UKHLS respondents	8	84,925	373,772
Prime age (21–55) only	8	54,397	215,495
Employees only	8	39,775	142,556
Waves 2, 4, 6 and 8 only	4	32,534	70,931
Excluding those not completing all five of the SF-12 questions used in the analysis (e.g. due to being a proxy respondent or refusing to do the self-completion questionnaire)	4	27,325	59,205
Excluding those with missing values on any other variable in the main model	4	25,179	53,103

contains a good measure of dysfunctional presenteeism (see below) and hence is considered a valuable dataset for this study. Survey weights have been applied for the descriptive statistics but not the multivariate regression analysis.

Our dataset contains responses from all even-numbered waves of UKHLS to date, namely wave 2 (2010–2011), wave 4 (2012–2013), wave 6 (2014–2015) and wave 8 (2016–2017).<sup>2</sup> The sample retains all observations where the respondent was employed (self-employed individuals are excluded) and between the ages of 21 and 55; this is to retain a focus on the prime age workforce, and abstract as far as possible from the issue of health and retirement. After also excluding any observations with missing values on any variables included in the full model, we are left with a sample of 53,103 observations across 25,179 unique individuals. This is an unbalanced panel where each individual is observed an average of 2.1 times. Table 1 shows the observations lost due to restricting the sample.

To construct an indicator for dysfunctional presenteeism, we broadly follow the approach of Bubonya et al. (2017) by utilising specific questions in the Short Form 12 (SF-12) Health Survey (Ware et al., 1995).<sup>3</sup> These questions form part of the self-completion questionnaire that all adult participants in UKHLS are asked to complete every year. The full SF-12 questionnaire is shown in Appendix A4. We use five out of the 12 questions, selecting only those questions that specifically ask about how health has affected work: extent to which physical health limits amount of work (Q3a); extent to which physical health limits kind of work (Q3b); extent to which mental health meant accomplished less (Q4a); extent to which mental health meant worked less carefully (Q4b); and extent to which pain interfered with work (Q5). For all questions, the respondent was asked to consider the past four weeks and could give one of five possible responses.

<sup>2</sup>The odd-numbered waves are dropped because they do not include some questions on working conditions that we use in our models, namely use of formal flexible working, access to informal flexible working, autonomy over job tasks, autonomy over work pace, autonomy over work manner, autonomy over task order, autonomy over work hours and job security.

<sup>3</sup>The SF-12 is a shorter general health instrument derived from the SF-36. The HILDA survey used by Bubonya et al. (2017) contains the SF-36, while our UKHLS data contains the SF-12. Bubonya et al. (2017), focusing on presenteeism due to mental health, use three questions from the SF-36 all of which are answered either 'yes' or 'no': whether they have, as a result of any emotional problems, experienced during the last four weeks 'cutting down the amount of time you spent on work or other activities', 'accomplished less than you would like' and 'didn't do work or other activities as carefully as usual'. Respondents were deemed to be experiencing presenteeism if they answered 'yes' to any of these three questions.



We define person  $i$  as experiencing dysfunctional presenteeism in wave  $t$  if they gave one of the top two responses to one or more of the five questions ('all the time' or 'most of the time' for Q3a, 3b, 4a or 4b, or 'extremely' or 'quite a bit' for Q5). We also explore different definitions, to check that our results and conclusions are not sensitive to the particular definition of dysfunctional presenteeism. This is discussed further below.

As shown in Appendix A4, the wording of the questions is such that they may capture more than dysfunctional presenteeism at work. Reference to 'other regular daily activities' or 'housework' suggests that respondents are thinking about the effect of health on their non-work activities as well. Moreover, some respondents to the SF-12 may consider absence from work as an impact of health on work and as such may not necessarily be experiencing presenteeism. We address these issues in our robustness checks, described below.

As our main explanatory variables of interest, we construct two dichotomous variables for physical health and mental health respectively. Our physical health variable is derived from a question in the main interview stage of the survey in which respondents are asked to report whether, as a result of health problems or disabilities, they experience substantial difficulties with particular functions, often classified as the activities of daily living; for example mobility, lifting and manual dexterity.<sup>4</sup> If they do not report any impairment then we deem them to be in good physical health, but if they report one or more impairments they are defined as being in poor physical health. The mental health variable is derived from the General Health Questionnaire (GHQ) (Goldberg & Williams, 1988). This is a 12-question instrument completed as part of the self-completion questionnaire in UKHLS. The GHQ is a clinically validated psychological tool which can be used to quantify a person's mental well-being. We use this information to create a dichotomous mental health variable, where people exceeding a diagnostic threshold are deemed to have poor mental health.<sup>5</sup> The questions used to compute the physical health and mental health variables are described in Appendices A2 and A3 respectively.

We also control for a number of other sociodemographic and work-related covariates, namely: gender, age group, marital status, whether has children, highest qualification, ethnicity, own income, other household income, whether works in the public sector, whether job is temporary, whether job is part time, occupation classification, workplace size, whether individual uses formal or informal flexible working arrangements, extent to which individual has autonomy at work across different dimensions and whether the individual deems their job to be secure. Detailed definitions for all variables are provided in Appendix A1.

Table 2 presents descriptive statistics for all variables in the model. It shows that, by our definition, about 9% of the prime age working population experiences dysfunctional presenteeism in a given month, but these rates are considerably higher among people with health problems. Dysfunctional presenteeism is experienced by about a third (32%) of people with

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<sup>4</sup>While most of the functions included in this variable (as listed in Appendix A2) are physical in nature, it could be argued that people reporting difficulties with 'memory or ability to concentrate, learn or understand' are experiencing mental health rather than physical health problems. As a robustness check, we treat people reporting this impairment only as not having a physical health problem, and our results are almost identical.

<sup>5</sup>This measure is derived from the GHQ-12 caseness score. The original GHQ permits responses of 0 to 3 for each of the 12 questions. The caseness score recodes values of 0 and 1 on individual questions to 0, and values of 2 and 3 to 1; giving a scale from 0 (least distressed) to 12 (the most distressed). A person is assumed to have poor mental health if their caseness score is 4 or above. This cut-off is used by the NHS to define being in poor mental health for monitoring purposes. See Health and Social Care Information Centre (2013).

TABLE 2 Descriptive statistics

	% dysfunctional presenteeism	Unweighted N	% of total sample
Total sample	9.4	53,103	100.0
No physical impairments/disabilities	6.8	47,272	89.0
Any physical impairment/disability	32.1	5831	11.0
<i>Type of physical impairment/disability</i>			
Mobility	46.9	2014	3.8
Lifting/carrying	42.6	2498	4.7
Manual dexterity	51.2	716	1.3
Continence	37.2	426	0.8
Hearing	22.4	422	0.8
Sight	29.6	371	0.7
Communication or speech	38.9	167	0.3
Memory, concentration	44.3	811	1.5
Recognising physical danger	59.1	64	0.1
Physical coordination	50.6	612	1.2
Difficulties with personal care	65.8	322	0.6
Other health problem	29.2	1647	3.1
<i>Mental health state</i>			
Good mental health	6.2	44,426	83.7
Poor mental health	26.3	8677	16.3
<i>Other characteristics</i>			
Male	8.2	23,862	44.9
Female	10.6	29,240	55.1
Age 21–24	8.8	3942	7.4
Age 25–34	9.1	13,196	24.8
Age 35–44	8.9	16,887	31.8
Age 45–55	10.3	19,078	35.9
Married	8.8	38,655	72.8
Not married	10.8	14,448	27.2
Children	8.9	23,908	45.0
No children	9.8	29,195	55.0
White British	9.0	42,771	80.5
Other white	9.4	2718	5.1
Mixed race	8.9	893	1.7
Asian/Chinese	14.6	4183	7.9
Black Caribbean/African	15.0	1852	3.5
Other ethnicity	17.3	310	0.6
Highest qual: degree	7.2	19,125	36.0
Highest qual: other higher ed	10.3	7385	13.9

(Continues)

TABLE 2 (Continued)

	<b>% dysfunctional presenteeism</b>	<b>Unweighted N</b>	<b>% of total sample</b>
Highest qual: A-level	9.9	11,787	22.2
Highest qual: GCSE	10.9	10,504	19.8
Highest qual: Other qual	12.2	2979	5.6
Highest qual: No quals	14.7	1323	2.5
Public sector	9.3	20,034	37.7
Private sector	9.5	33,069	62.3
Temporary job	10.8	2562	4.8
Permanent job	9.3	50,541	95.2
Full time	8.8	42,101	79.3
Part time	11.9	11,002	20.7
SOC1: Managers	6.9	7245	13.6
SOC2: Professional	6.5	9481	17.9
SOC3: Associate professional	9.2	9323	17.6
SOC4: Administrative	9.3	6766	12.7
SOC5: Skilled trades	7.3	3246	6.1
SOC6: Personal services	13.2	5507	10.4
SOC7: Sales/customer service	12.1	3948	7.4
SOC8: Process operatives	9.9	2936	5.5
SOC9: Elementary occupations	14.4	4651	8.8
Under 25 employees	10.5	15,967	30.1
25–99 employees	9.2	13,742	25.9
100–499 employees	8.6	12,139	22.9
500 or more employees	9.0	11,255	21.2
Uses formal flexible working	9.7	23,403	44.1
Does not use formal flexible working	9.2	29,700	55.9
Access to informal flexible working	8.7	34,301	64.6
No access to informal flexible working	10.9	18,802	35.4
Autonomy over job tasks	8.6	39,042	73.5
No autonomy over job tasks	11.8	14,061	26.5
Autonomy over work pace	8.8	39,845	75.0
No autonomy over work pace	11.2	13,258	25.0
Autonomy over work manner	8.8	44,483	83.8
No autonomy over work manner	12.9	8620	16.2
Autonomy over task order	8.8	44,013	82.9
No autonomy over task order	12.6	9090	17.1
Autonomy over work hours	8.4	24,404	46.0
No autonomy over work hours	10.3	28,699	54.0
Job security	8.8	48,562	91.4

TABLE 2 (Continued)

	% dysfunctional presenteeism	Unweighted N	% of total sample
No job security	15.5	4541	8.6
Own income less than or equal to median	11.3	19,658	37.0
Own income greater than median	8.3	33,445	63.0
Other household income less than or equal to median	10.2	25,931	48.8
Other household income greater than median	8.6	27,172	51.2

Note: Weighted by UKHLS person-level weights (adult main and proxy interview). An individual is deemed to have experienced dysfunctional presenteeism if they respond either 'all of the time' or 'most of the time' to any of the SF-12 questions 3a, 3b, 4a or 4b, or they respond either 'extremely' or 'quite a bit' to question 5.

at least one physical impairment and over a quarter (26%) of people with poor mental health. Women are more likely to experience dysfunctional presenteeism than men and it is also more common among older workers, and single people without children. Dysfunctional presenteeism tends to be higher among people with lower qualifications and in lower-skilled occupations. People in smaller workplaces and those in part time and temporary jobs are also more likely than average to experience dysfunctional presenteeism but there is very little difference between the public and private sectors. Workers who feel that they have autonomy over their work life are less likely to experience dysfunctional presenteeism, as well as people who feel that their job is secure.

## 1.4 | Statistical analysis

Our research question is addressed using two econometric models. First, we use a probit model on the pooled data to estimate the association between dysfunctional presenteeism and health. In other words, to what extent does health explain differences in the incidence of dysfunctional presenteeism across the population? Second, we use a correlated random effects (CRE) probit model to explain the extent to which changes in dysfunctional presenteeism over time are explained by changes in health over time. This latter model provides the most robust results as, unlike the pooled probit, the CRE probit controls for systematic time-invariant differences in the unobserved characteristics between people with and without health problems that may be explaining differences in dysfunctional presenteeism. For example people with poor health may experience higher levels of deprivation (not directly caused by their condition) or have poorer quality jobs or relationships at work, thus explaining why they may be at more risk of dysfunctional presenteeism regardless of their health condition. To the extent that these, or related, factors are not observed in the data, they will bias the estimates from the pooled model.

We assume that the probability that a given individual  $i$  experiences dysfunctional presenteeism in wave  $t$  conditional on her observed health status and other characteristics can be expressed by a probit equation.

$$\Pr(P_{it}|MH_{it}, PH_{it}, X_{it}) = \Phi(MH_{it}\beta_1 + PH_{it}\gamma_1 + X_{it}\theta_1) \quad (1)$$

Here,  $P_{it}$  is a binary indicator equal to 1 if individual  $i$  experiences dysfunctional presenteeism in wave  $t$  and 0 otherwise. The health variables  $MH_{it}$  and  $PH_{it}$  describe the mental and physical health state, respectively, of individual  $i$  at time  $t$  where each can take the value of either 0 (good health) or 1 (poor health),  $X_{it}$  contains all other observable variables assumed to influence dysfunctional presenteeism and  $\Phi$  denotes the normal cumulative distribution function. We estimate Equation (1) using the pooled waves of data to derive the association of health with dysfunctional presenteeism after allowing for  $X_{it}$ . If  $X_{it}$  captured all the relevant characteristics affecting dysfunctional presenteeism, these associations could be interpreted causally. However, they will be biased as causal effects if, as suggested above, there is unobserved heterogeneity which influences  $P_{it}$  and is also correlated with  $MH_{it}$ ,  $PH_{it}$  and  $X_{it}$ . To deal with this, we define  $v_i$  as the unobserved characteristics common to an individual but invariant over time. Following Wooldridge (2010), we assume that  $v_i$  is linearly related to the individual-specific means of the explanatory variables such that:

$$v_i = \psi + \overline{MH}_i \eta + \overline{PH}_i \varphi + \overline{X}_i \xi + a_i \quad (2)$$

Here,  $\overline{MH}_i = \frac{1}{T} \sum_{t=1}^T MH_{it}$ ,  $\overline{PH}_i = \frac{1}{T} \sum_{t=1}^T PH_{it}$  and  $\overline{X}_i = \frac{1}{T} \sum_{t=1}^T X_{it}$ . The error term  $a_i$  is assumed to be uncorrelated with the group means and normally distributed. We can now add the unobserved heterogeneity into the equation and specify a CRE probit that can be estimated consistently using maximum likelihood:

$$\Pr(P_{it} | MH_{it}, PH_{it}, X_{it}, v_i) = \Phi(\psi + MH_{it} \beta_2 + PH_{it} \gamma_2 + X_{it} \theta_2 + \overline{MH}_i \eta + \overline{PH}_i \varphi + \overline{X}_i \xi + a_i) \quad (3)$$

Since we now condition on the individual-specific means of health (and of the other characteristics), the coefficients  $\beta_2$  and  $\gamma_2$  in Equation (3) can essentially be interpreted as the effect on dysfunctional presenteeism associated with a change in mental and physical health status respectively. For both the pooled probit in Equation (1) and the CRE probit in Equation (3), we report the estimated average marginal effects (AME). The AME measures the effect of a 1-unit change of the explanatory variable on the probability of dysfunctional presenteeism, averaged over all individuals in the sample.

## 2 | RESULTS

The main results are shown in Table 3, where the first column shows the results from the pooled probit model in Equation (1) and the second column shows the results of the CRE probit model in Equation (3).

It is clear that both physical and mental health have a large and significant effect on dysfunctional presenteeism controlling for other characteristics. The pooled probit result shows that an individual with any kind of physical impairment is 13 percentage points more likely to experience dysfunctional presenteeism than a person with no impairments. However, this is only half of the raw difference between people with and without physical impairments (25 percentage points) as shown in Table 2. In other words, about half of the raw difference is explained by other personal and job characteristics which are associated with poor health. The effect halves again when we account for unobserved differences between people, as shown by the AME in the CRE probit model. This implies that developing a physical impairment leads to a 7 percentage point increase in the probability of dysfunctional presenteeism.

TABLE 3 Average marginal effects on probability of dysfunctional presenteeism

	Pooled probit	CRE probit
Poor physical health	0.133 <sup>***</sup> (0.003)	0.075 <sup>***</sup> (0.006)
Poor mental health	0.126 <sup>***</sup> (0.003)	0.119 <sup>***</sup> (0.005)
Female	-0.001 (0.003)	
Married	-0.007 <sup>*</sup> (0.004)	-0.009 (0.008)
Age 21-24	0.004 (0.005)	-0.013 (0.011)
Age 25-34	0.004 (0.003)	-0.013 (0.008)
Age 35-44	0.007 <sup>**</sup> (0.003)	-0.010 <sup>*</sup> (0.006)
Children	-0.002 (0.003)	-0.003 (0.006)
Degree	-0.035 <sup>***</sup> (0.008)	0.063 (0.040)
Other higher education	-0.020 <sup>***</sup> (0.008)	0.069 (0.045)
A-level	-0.023 <sup>***</sup> (0.007)	0.079 <sup>*</sup> (0.041)
GCSE	-0.025 <sup>***</sup> (0.007)	0.075 <sup>*</sup> (0.040)
Other qualification	-0.008 (0.008)	0.015 (0.031)
Public sector	-0.001 (0.003)	-0.008 (0.006)
Temporary job	-0.011 <sup>*</sup> (0.006)	-0.012 <sup>*</sup> (0.007)
Part time	0.001 (0.004)	0.003 (0.006)
SOC2: Professional	-0.002 (0.005)	-0.007 (0.010)
SOC3: Associate professional	0.004 (0.005)	-0.004 (0.009)
SOC4: Administrative	0.010 <sup>**</sup> (0.005)	-0.003 (0.011)

(Continues)

TABLE 3 (Continued)

	Pooled probit	CRE probit
SOC5: Skilled trades	0.012 <sup>**</sup> (0.006)	-0.011 (0.014)
SOC6: Personal services	0.033 <sup>***</sup> (0.005)	0.002 (0.013)
SOC7: Sales/customer service	0.025 <sup>***</sup> (0.006)	-0.005 (0.012)
SOC8: Process operatives	0.026 <sup>***</sup> (0.006)	-0.012 (0.014)
SOC9: Elementary occupations	0.037 <sup>***</sup> (0.006)	-0.019 <sup>*</sup> (0.011)
Log of own net weekly income	-0.010 <sup>***</sup> (0.003)	0.001 (0.004)
Log of other household net weekly income	-0.001 (0.001)	0.000 (0.001)
25-99 employees	-0.004 (0.003)	0.002 (0.007)
100-499 employees	-0.003 (0.003)	0.014 <sup>*</sup> (0.008)
500 or more employees	0.003 (0.004)	0.012 (0.009)
Uses formal flexible working	-0.001 (0.003)	0.005 (0.004)
Access to informal flexible working	-0.010 <sup>***</sup> (0.003)	0.003 (0.004)
Autonomy over job tasks	0.000 (0.003)	-0.008 <sup>*</sup> (0.005)
Autonomy over work pace	0.002 (0.003)	-0.001 (0.005)
Autonomy over work manner	-0.013 <sup>***</sup> (0.004)	-0.002 (0.006)
Autonomy over task order	-0.002 (0.004)	0.003 (0.005)
Autonomy over work hours	0.011 <sup>***</sup> (0.003)	-0.005 (0.004)
Job security	-0.028 <sup>***</sup> (0.004)	-0.021 <sup>***</sup> (0.006)
<i>N</i>	53,102	53,103

Note: Standard errors in brackets. Pooled probit regression includes wave dummies (not shown). CRE probit regression includes the mean of all time-variant variables (not shown).

\*\*\* $p < .01$ ; \*\* $p < .05$ ; \* $p < .1$ .

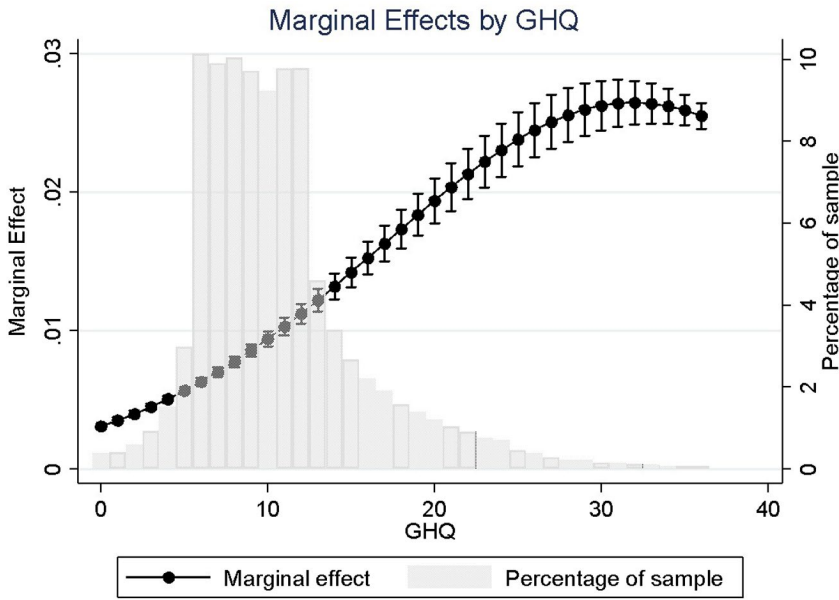


FIGURE 2 Marginal effect of GHQ on dysfunctional presenteeism at different levels of GHQ in CRE probit model

In the pooled probit model, having poor mental health is also associated with a 13 percentage point higher probability of dysfunctional presenteeism. This compares to a raw difference of 20 percentage points, implied in Table 2. Hence, about two-thirds of the raw difference is accounted for by the effect of mental health itself. The AME is only slightly smaller (12 percentage points) in the CRE probit, suggesting that unobservable differences between people have only a very modest confounding effect on the relationship between mental health and dysfunctional presenteeism. This also suggests that the effect of mental health on dysfunctional presenteeism is stronger than the effect of physical health, similar to the findings of Adler et al. (2006) for primary care patients in the United States. Figure 2 shows the relationship between the level of mental health (measured with the continuous GHQ score) and the marginal effect on dysfunctional presenteeism. The graph shows that marginal effects are much higher than average for people with particularly poor mental health (higher GHQ scores). For the minority of people reporting GHQ scores of around 20 or above, the effect of a 1-point increase in GHQ score (measured on a scale of 0 to 36) is to increase the probability of dysfunctional presenteeism by at least two percentage points, compared to less than one percentage point for people with good mental health (GHQ scores less than 10). By the same reasoning, a small improvement in mental health is predicted to have a much stronger effect on reducing dysfunctional presenteeism among people with poor mental health compared to people with average or good mental health.<sup>6</sup>

<sup>6</sup>We also looked at whether there are any delayed effects of health on dysfunctional presenteeism, by including a 1-year lag of the physical and mental health variables. This is an indicator of whether or not the individual was in poor health in the intermediate waves of UKHLS (i.e. waves 1, 3, 5 and 7 that are excluded from the main models). In the CRE specification with lags, we find that these delayed effects are positive but not significant when also controlling for contemporaneous health. This suggests that dysfunctional presenteeism is affected only by current health problems, not by health problems that occurred in the past (and which did not persist).



The extent to which presenteeism can be dysfunctional is not only determined by health but also by personal characteristics and the work environment (Karanika-Murray & Biron, 2019). With this in mind, our results also shed light on how dysfunctional presenteeism is affected by factors unrelated to health.

The results from the pooled probit model show that the probability of dysfunctional presenteeism is higher for those with no qualifications and reduces as own income increases. Dysfunctional presenteeism is significantly higher among people in lower-skilled occupations, confirming a cross-sectional result for Danish workers from Pedersen and Skagen (2014), but lower among those who have access to informal flexibility at work, have autonomy over the manner in which they do their work and perceive their job to be secure. Perhaps surprisingly, having autonomy over one's working hours is associated with a significantly higher probability of dysfunctional presenteeism. However, in the CRE probit specification (closer to a causal prediction), the effects of most other variables aside from health become insignificant (at the 95% significance threshold), suggesting that an individual would not be expected to experience a change in dysfunctional presenteeism in response to a change in their personal or work circumstances. This contrasts to the results of Brunner et al. (2019) for Swiss workers, where some work characteristics continue to be predictive of dysfunctional presenteeism even after controlling for fixed effects. The one exception in our results is perceived job security. Experiencing a change from feeling that one's job is not secure to feeling that one's job is secure is associated with a 2 percentage point reduction in the probability of dysfunctional presenteeism.

While a change in work characteristics generally does not lead to a change in dysfunctional presenteeism keeping health constant, in some cases work characteristics may affect the extent to which a change in health impacts on dysfunctional presenteeism. We test for this by interacting various work characteristics with the health variables in the CRE probit regression and then estimating AMEs separately for different types of work characteristics, and show the results in Table 4. We find that the effect on dysfunctional presenteeism from crossing the threshold into poor mental health is much stronger for full-time workers (13 percentage points) than part-time workers (8 percentage points) and for people who have limited autonomy over their job tasks (14 percentage points) compared to those who do have autonomy (10 percentage points). This suggests that part-time work and autonomy over one's work may be more conducive for people experiencing an onset of poor mental health, in terms of lowering the impact of their health on their productivity. This supports the finding from Jones (2007) that part-time employment provides an important way of accommodating work-limiting disability. There is also some relationship between occupation and mental health. Poor mental health seems to lead to dysfunctional presenteeism to a greater extent in associate professional and administrative occupations (14 percentage points) relative to managerial occupations (9 percentage points). However, the marginal effects in lower-skilled occupations do not differ from the managerial group.

Perhaps, the most surprising result is that the marginal effect of physical health on dysfunctional presenteeism is stronger among those who have access to informal flexible working (8 percentage points) than those who do not have this access (6 percentage points).

## 2.1 | Robustness checks

Our first robustness check assesses the sensitivity of our results to our specific definition of dysfunctional presenteeism by repeating the analysis based on different definitions. First, we

TABLE 4 Average marginal effects on probability of dysfunctional presenteeism across subgroups

Health variable	Effect of mental health		Effect of physical health	
	AME	Chi-square test of difference	AME	Chi-square test of difference
Full-time work	0.1285 <sup>***</sup> (0.0062)		0.0703 <sup>***</sup> (0.0067)	
Part-time work	0.0836 <sup>***</sup> (0.0102)	14.77 <sup>***</sup>	0.0901 <sup>***</sup> (0.0126)	2.11
Permanent work	0.1197 <sup>***</sup> (0.0056)		0.0734 <sup>***</sup> (0.0062)	
Temporary work	0.0965 <sup>***</sup> (0.0186)	1.50	0.1040 <sup>***</sup> (0.0237)	1.65
Private sector	0.1203 <sup>***</sup> (0.0072)		0.0748 <sup>***</sup> (0.0077)	
Public sector	0.1155 <sup>***</sup> (0.0085)	0.18	0.0730 <sup>***</sup> (0.0093)	0.02
SOC1: Managers	0.0950 <sup>***</sup> (0.0135)		0.0926 <sup>***</sup> (0.0178)	
SOC2: Professional	0.1099 <sup>***</sup> (0.0135)	0.61	0.0546 <sup>***</sup> (0.0149)	2.72 <sup>*</sup>
SOC3: Associate professional	0.1353 <sup>***</sup> (0.0133)	4.65 <sup>**</sup>	0.0658 <sup>***</sup> (0.0139)	1.45
SOC4: Administrative	0.1388 <sup>***</sup> (0.0166)	4.22 <sup>**</sup>	0.0726 <sup>***</sup> (0.0168)	0.68
SOC5: Skilled trades	0.1320 <sup>***</sup> (0.0267)	1.52	0.0696 <sup>***</sup> (0.0230)	0.62
SOC6: Personal services	0.1202 <sup>***</sup> (0.0164)	1.40	0.0846 <sup>***</sup> (0.0177)	0.10
SOC7: Sales/customer service	0.1258 <sup>***</sup> (0.0194)	1.72	0.0735 <sup>***</sup> (0.0203)	0.51
SOC8: Process operatives	0.1088 <sup>***</sup> (0.0247)	0.24	0.0963 <sup>***</sup> (0.0238)	0.02
SOC9: Elementary occupations	0.0977 <sup>***</sup> (0.0160)	0.02	0.0778 <sup>***</sup> (0.0169)	0.37
Less than 25 employees	0.1077 <sup>***</sup> (0.0095)		0.0761 <sup>***</sup> (0.0106)	
25–99 employees	0.1080 <sup>***</sup> (0.0102)	0.00	0.0679 <sup>***</sup> (0.0111)	0.31
100–499 employees	0.1265 <sup>***</sup> (0.0121)	1.51	0.0666 <sup>***</sup> (0.0122)	0.35

(Continues)

TABLE 4 (Continued)

Health variable	Effect of mental health		Effect of physical health	
	AME	Chi-square test of difference	AME	Chi-square test of difference
500 or more employees	0.1322 <sup>***</sup> (0.0118)	2.55	0.0880 <sup>***</sup> (0.0131)	0.50
Does not use formal flexible working	0.1178 <sup>***</sup> (0.0068)		0.0776 <sup>***</sup> (0.0074)	
Uses formal flexible working	0.1134 <sup>***</sup> (0.0089)	0.17	0.0662 <sup>***</sup> (0.0095)	1.04
Does not have access to informal flexible working	0.1249 <sup>***</sup> (0.0078)		0.0619 <sup>***</sup> (0.0079)	
Has access to informal flexible working	0.1157 <sup>***</sup> (0.0077)	0.76	0.0835 <sup>***</sup> (0.0087)	3.97 <sup>**</sup>
No autonomy over job tasks	0.1390 <sup>***</sup> (0.0090)		0.0806 <sup>***</sup> (0.0094)	
Autonomy over job tasks	0.1043 <sup>***</sup> (0.0070)	10.08 <sup>***</sup>	0.0715 <sup>***</sup> (0.0078)	0.65
No autonomy over work pace	0.1250 <sup>***</sup> (0.0088)		0.0758 <sup>***</sup> (0.0092)	
Autonomy over work pace	0.1097 <sup>***</sup> (0.0071)	2.01	0.0742 <sup>***</sup> (0.0078)	0.02
No autonomy over work manner	0.1302 <sup>***</sup> (0.0105)		0.0751 <sup>***</sup> (0.0107)	
Autonomy over work manner	0.1106 <sup>***</sup> (0.0067)	2.67	0.0733 <sup>***</sup> (0.0075)	0.02
No autonomy over task order	0.1310 <sup>***</sup> (0.0103)		0.0798 <sup>***</sup> (0.0105)	
Autonomy over task order	0.1146 <sup>***</sup> (0.0068)	1.90	0.0713 <sup>***</sup> (0.0075)	0.50
No autonomy over work hours	0.1269 <sup>***</sup> (0.0069)		0.0742 <sup>***</sup> (0.0073)	
Autonomy over work hours	0.1090 <sup>***</sup> (0.0087)	2.77 <sup>*</sup>	0.0759 <sup>***</sup> (0.0097)	0.03
No job security	0.1339 <sup>***</sup> (0.0130)		0.0647 <sup>***</sup> (0.0139)	
Job security	0.1119 <sup>***</sup> (0.0066)	2.45	0.0766 <sup>***</sup> (0.0073)	0.63

Note: Standard errors in brackets. Estimated from CRE probit regressions with interactions with AMEs estimated separately for each sub-group. Chi-square tests whether the AME from the sub-group in question is significantly different to the baseline sub-group.

\*\*\* $p < .01$ ; \*\* $p < .05$ ; \* $p < .1$ .

broaden the scope of dysfunctional presenteeism by classifying anyone giving one of the top three (rather than top two) responses to at least one of the five SF-12 questions described above as experiencing dysfunctional presenteeism. This implies that a person experiences dysfunctional presenteeism if they respond 'some of the time', 'most of the time' or 'all of the time' to any one of the four questions referring to the impact of physical health or emotional problems or respond 'moderately', 'quite a bit' or 'extremely' to the fifth question about the impact of pain.

We also construct a tighter definition of dysfunctional presenteeism by insisting that the individual experiences problems in at least two (rather than one) of the five areas. Again, we vary whether we require them to have responded with a top two or top three response on the Likert scale.

The AMEs pertaining to physical and mental health for each definition of dysfunctional presenteeism are presented in Table 5. The absolute sizes of the effects are very different, commensurate with the differences in the average probability of dysfunctional presenteeism according to each definition. The AMEs in both models are highest for the broadest definition (top three responses for at least one problem) and lowest for the narrowest definition (top two responses for at least two problems), but continue to be highly significant in all models. Also, in all CRE probit models, the effect of mental health on dysfunctional presenteeism is stronger than the effect of physical health (with a ratio of between about half and two-thirds).

Our second robustness check accounts for the possibility that not all survey respondents reporting dysfunctional presenteeism are attending work. We are not able to control fully for absenteeism as this is not precisely identified in UKHLS. However, we can identify whether the respondent has a paid job but did no work in the previous week and whether the reason for this was sickness or injury. We have replicated our analysis removing the 4% of the sample not at work in the previous week, and found very similar results.<sup>7</sup>

Our third robustness check addresses the issue of the SF-12 questions incorporating impacts of health on activities outside of paid work. Although all respondents in our sample are in paid employment, it is possible that many people are also considering their non-work activities (e.g. housework, volunteering) when answering the questions. To account for this, we repeat our analysis excluding the 21% of observations where the respondent worked part-time (and hence were likely to be spending a significant proportion of the week on non-work activities). Again, we find very similar results.

### 3 | DISCUSSION

The evidence is clear that both developing a physical impairment and experiencing worsening of mental health have a significant effect on the productivity of workers in the United Kingdom. Bearing in mind that only 9% of the workforce is estimated to experience dysfunctional presenteeism in a given month, the effects of health are large, raising this probability by 7 percentage points from developing any physical impairment and by 12 percentage points from developing poor mental health. No other observed changes in personal or work characteristics have comparable effects on dysfunctional presenteeism.

<sup>7</sup>UKHLS does not identify respondents who did *some* work in the previous week but also had *some* sickness absence, nor does it identify any sickness absence taken over the previous four weeks, which is the time period covered by our presenteeism proxy measures.

**TABLE 5** Average marginal effects on probability of dysfunctional presenteeism, by varying the definition of dysfunctional presenteeism

		Top two responses			Top three responses		
		Unweighted mean of dependent variable	Pooled probit	CRE probit	Unweighted mean of dependent variable	Pooled probit	CRE probit
At least one problem area	Physical health	0.102	0.133 <sup>***</sup> (0.003)	0.075 <sup>***</sup> (0.006)	0.270	0.262 <sup>***</sup> (0.005)	0.133 <sup>***</sup> (0.008)
	Mental health		0.126 <sup>***</sup> (0.003)	0.119 <sup>***</sup> (0.005)		0.310 <sup>***</sup> (0.004)	0.270 <sup>***</sup> (0.007)
At least two problem areas	Physical health	0.043	0.063 <sup>***</sup> (0.002)	0.040 <sup>***</sup> (0.004)	0.170	0.196 <sup>***</sup> (0.004)	0.110 <sup>***</sup> (0.007)
	Mental health		0.065 <sup>***</sup> (0.002)	0.066 <sup>***</sup> (0.004)		0.223 <sup>***</sup> (0.003)	0.212 <sup>***</sup> (0.007)
<i>N</i>			53,102	53,103		53,102	53,103

*Note:* Standard errors in brackets. Pooled probit regressions include wave dummies and all other covariates in [Table 3](#) (not shown). CRE probit regressions include all other covariates in [Table 3](#) and the mean of all time-variant variables (not shown).

<sup>\*\*\*</sup> $p < .01$ ; <sup>\*\*</sup> $p < .05$ ; <sup>\*</sup> $p < .1$ .

One limitation of our analysis is that there is a possibility that our results may be confounded by reverse causality. As shown in [Figure 1](#), a person's experience at work can in turn affect their short-term and subsequently long-term health. Specifically, dysfunctional presenteeism is expected to worsen health while therapeutic presenteeism (which also reduces work performance) is expected to improve health. Therefore, we cannot be completely certain that the observed relationship between health and dysfunctional presenteeism is caused by health alone.

Although we cannot quantify them, the potential economic effects of health-related productivity loss are substantial. For employers, the effect is reduced output, leading ultimately to the erosion of profit margins or failure to meet performance targets. There may be implications for employees as well, at least in the long term, as continued dysfunctional presenteeism is likely to contribute to reduced earnings growth or even job loss.

In theory, reduced productivity should be reflected in reduced wages but in practice, wages can be 'sticky' in the sense that they do not always change in response to exogenous changes in productivity. To explore this further, we estimate a simple Mincerian wage model regressing hourly wages on dysfunctional presenteeism, controlling for age and education (Mincer, 1974). The results suggest that people experiencing dysfunctional presenteeism have 9.5% lower earnings on average. When we also control for fixed effects, the effect of dysfunctional presenteeism is a fall in real wages of approximately 0.85% on average. Although small in magnitude, this effect is statistically significant and also comparable to average real wage growth in recent years, estimated to be 1.4% in real terms between 2017/2018 and 2018/2019 in Great Britain (Office for National Statistics, 2019).

These findings may go some way, therefore, to explaining the gap in earnings between disabled and non-disabled people. As discussed by Kruse et al. (2018), discrimination against disabled people and those with health problems may still be driving much of the earnings gap, but the effects of health on productivity is also an important explanation.

The appropriate response to these findings depends somewhat on whether one subscribes to the 'biomedical' or 'social' perspectives on disability and employment (Berthoud, 2008; Williams-Whitt & Taras, 2010). The biomedical model essentially takes a supply-side approach, making the assumption that it is the health problem itself that leads to deficiencies in productivity. Our findings provide some support for this perspective as health is clearly the biggest determinant of dysfunctional presenteeism relative to other factors such as work characteristics. Investments in improving the mental health and physical functioning of the workforce should be expected to yield high returns in terms of reducing health-related productivity loss. This may go some way to reducing the problem of low productivity in the UK economy.

To some extent, our findings are also consistent with the social model, in which the adverse employment prospects of disabled people are assumed to be caused by the failure of employers, or the labour market in general, to make jobs accessible to people with health problems. We find some evidence that the interaction between health and work characteristics is a significant determinant of dysfunctional presenteeism. Although a deterioration in mental health reduces productivity significantly for all groups, the effects are much reduced when working part time or when one has autonomy over one's work tasks, suggesting that certain types of employment are more accommodating for people experiencing worsening health, in terms of minimising dysfunctional presenteeism.

## 4 | CONCLUSION

Health is the most important driver of dysfunctional presenteeism in the United Kingdom. On average, developing any kind of physical impairment is estimated to lead to a doubling (e.g. from 7% to

14%) in the probability of reduced productivity at work. Moving from good to poor mental health has an even greater effect, predicting a threefold increase in the probability of dysfunctional presenteeism on average (e.g. from 6% to 18%). Furthermore, the marginal effects of an incremental worsening of mental health are particularly high among people with mental health already worse than average. These effects are relatively consistent across all demographic groups, job types and working arrangements, suggesting that policies aimed at improving physical and mental health among working people should reduce the dysfunctional presenteeism of everyone and deliver substantial benefits to the economy. However, there are a few cases where the effects of health on dysfunctional presenteeism are significantly reduced depending on work characteristics, suggesting that it may also be possible to design work in such a way that health problems have a reduced impact.

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## APPENDIX A1

### VARIABLE DEFINITIONS

Variable	Definition
Physical health (functional impairment)	See Appendix A2
Mental health (GHQ)	See Appendix A3
Female	Whether female
Married	Whether either married, in a registered same-sex civil partnership or living as a couple
Age	Age at time of interview
Children	Whether has one or more own children in the household, including natural children, adopted children and step children, under age of 16
Highest qualification	Highest educational or vocational qualification
Public sector	Whether works for some other type of organisation, not a private firm or business or other limited company
Temporary job	Whether current job is in some way not permanent
Part time	Whether employed part time (defined as 30 or fewer hours per week)
Occupation	Standard Occupational Classification 2010 of current job, at 1-digit level
Log of own net monthly income	Natural log of total net personal income—no deductions
Log of other household net monthly income	Natural log of the difference between total household net income and total net personal income
Workplace size	Number of people employed at current workplace
Uses formal flexible working	Whether flexible working is available at respondent's place of work and they currently work in any of the following ways: part-time working; working term-time only; job sharing; flexi-time; working a compressed week; working annualised hours; working from home on a regular basis; other flexible working arrangements
Access to informal flexible working	Whether is able to vary working hours on an informal basis, for example by re-arranging start or finish times if needed

Variable	Definition
Autonomy over job tasks	Whether has some or a lot of influence over the tasks one does in one's job <sup>a</sup>
Autonomy over work pace	Whether has some or a lot of influence over the pace at which one works <sup>a</sup>
Autonomy over work manner	Whether has some or a lot of influence over how one does one's work <sup>a</sup>
Autonomy over task order	Whether has some or a lot of influence over the order in which one carries out tasks <sup>a</sup>
Autonomy over work hours	Whether has some or a lot of influence over the time one starts or finishes one's working day <sup>a</sup>
Job security	Whether respondent thinks it is unlikely or very unlikely that they will lose their job during the next 12 months, due to being sacked, laid off, made redundant or not having their contract renewed

<sup>a</sup> All work autonomy questions in UKHLS have four possible responses: 'a lot', 'some', 'a little' and 'none'. This is converted into a binary variable by coding 'a lot' and 'some' as having autonomy and 'a little' and 'none' as not having autonomy.

## APPENDIX A2

### THE ACTIVITIES FOR DAILY LIVING (ADL) QUESTIONNAIRE

The physical health variable is based on the Activities for Daily Living (ADL) questionnaire which forms part of the UKHLS interview. The question is as follows:

Do you have any health problems or disabilities that mean you have substantial difficulties with any of the following areas of your life?

1. Mobility (moving around at home and walking)
2. Lifting, carrying or moving objects
3. Manual dexterity (using your hands to carry out everyday tasks)
4. Continence (bladder and bowel control)
5. Hearing (apart from using a standard hearing aid)
6. Sight (apart from wearing standard glasses)
7. Communication or speech problems
8. Memory or ability to concentrate, learn or understand
9. Recognising when you are in physical danger
10. Your physical co-ordination (e.g. balance)
11. Difficulties with own personal care (e.g. getting dressed, taking a bath or shower)
12. Other health problem or disability
13. None of these

Respondents are deemed to be in good physical health if they respond with option 13 (none of these) and in poor physical health if they give one or more of the other responses.

**APPENDIX A3****THE GENERAL HEALTH QUESTIONNAIRE (GHQ)**

The mental health variable is based on the General Health Questionnaire (GHQ), which consists of the 12 questions below. For the dichotomous mental health variable, the respondent is deemed to be in poor mental health if they give response 3 or 4 to at least four of the 12 questions, and in good mental health otherwise. To compute the continuous GHQ score, the 1–4 scale is converted to a 0–3 to scale by subtracting 1 from each numerical response, and then the scores from all 12 questions are summed to provide a composite score in the range 0–36. Hence a score of 0 indicates very good mental health and 36 indicates very poor mental health. Further details about the GHQ and its use is available from Goldberg and Williams (1988).

- a. The next questions are about how you have been feeling recently. Have you recently been able to concentrate on whatever you're doing?
  1. Better than usual
  2. Same as usual
  3. Less than usual
  4. Much less than usual
- b. Have you recently lost much sleep over worry?
  1. Not at all
  2. No more than usual
  3. Rather more than usual
  4. Much more than usual
- c. Have you recently felt that you were playing a useful part in things?
  1. More than usual
  2. Same as usual
  3. Less than usual
  4. Much less than usual
- d. Have you recently felt capable of making decisions about things?
  1. More so than usual
  2. Same as usual
  3. Less so than usual
  4. Much less capable
- e. Have you recently felt constantly under strain?
  1. Not at all
  2. No more than usual
  3. Rather more than usual
  4. Much more than usual

- f. Have you recently felt you couldn't overcome your difficulties?
  - 1. Not at all
  - 2. No more than usual
  - 3. Rather more than usual
  - 4. Much more than usual
  
- g. Have you recently been able to enjoy your normal day-to-day activities?
  - 1. More than usual
  - 2. Same as usual
  - 3. Less so than [sic] usual
  - 4. Much less than usual
  
- h. Have you recently been able to face up to problems?
  - 1. More so than usual
  - 2. Same as usual
  - 3. Less able than usual
  - 4. Much less able
  
- i. Have you recently been feeling unhappy or depressed?
  - 1. Not at all
  - 2. No more than usual
  - 3. Rather more than usual
  - 4. Much more than usual
  
- j. Have you recently been losing confidence in yourself?
  - 1. Not at all
  - 2. No more than usual
  - 3. Rather more than usual
  - 4. Much more than usual
  
- k. Have you recently been thinking of yourself as a worthless person?
  - 1. Not at all
  - 2. No more than usual
  - 3. Rather more than usual
  - 4. Much more than usual
  
- l. Have you recently been feeling reasonably happy, all things considered?
  - 1. More so than usual
  - 2. About the same as usual
  - 3. Less so than usual
  - 4. Much less than usual

**APPENDIX A4****THE SF12 MODULE**

This appendix includes all questions that make up the SF12 assessment in the UKHLS questionnaire. The questions that are used in this paper are 3a, 3b, 4a, 4b and 5.

Q1. In general, would you say your health is ...

1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

Q2. The following questions are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

a. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling or playing golf

1. Yes, limited a lot
2. Yes, limited a little
3. No, not limited at all

b. Climbing **several** flights of stairs

1. Yes, limited a lot
2. Yes, limited a little
3. No, not limited at all

Q3. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of your physical health?**

a. **Accomplished less** than you would like

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

b. Were limited in the **kind** of work or other activities

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Q4. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

a. **Accomplished less** than you would like

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

b. Did work or other activities **less carefully than usual**

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Q5. During the **past 4 weeks**, how much did pain interfere with your normal work (including both work outside the home and housework)?

1. Not at all
2. A little bit
3. Moderately
4. Quite a bit
5. Extremely

Q6. These questions are about how you feel and how things have been with you **during the past 4 weeks**. for each question, please give the one answer that comes closest to the way you have been feeling. how much of the time during the **past 4 weeks**...

a. Have you felt calm and peaceful?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

b. Did you have a lot of energy?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

c. Have you felt downhearted and depressed?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time

Q7. During the **past 4 weeks**, how much of the time have your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives)?

1. All of the time
2. Most of the time
3. Some of the time
4. A little of the time
5. None of the time