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A shorter working week for everyone: How much paid work is needed for mental health and well-being?

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ABSTRACT

There are predictions that in future rapid technological development could result in a significant shortage of paid work. A possible option currently debated by academics, policy makers, trade unions, employers and mass media, is a shorter working week for everyone. In this context, two important research questions that have not been asked so far are: what is the minimum amount of paid employment needed to deliver some or all of the well-being and mental health benefits that employment has been shown to bring? And what is the optimum number of working hours at which the mental health of workers is at its highest? To answer these questions, this study used the UK Household Longitudinal Study (2009–2018) data from individuals aged between 16 and 64. The analytical sample was 156,734 person-wave observations from 84,993 unique persons of whom 71,113 had two or more measurement times. Fixed effects regressions were applied to examine how changes in work hours were linked to changes in mental well-being within each individual over time. This study found that even a small number of working hours (between one and 8 h a week) generates significant mental health and well-being benefits for previously unemployed or economically inactive individuals. The findings suggest there is no single optimum number of working hours at which well-being and mental health are at their highest - for most groups of workers there was little variation in wellbeing between the lowest (1–8 h) through to the highest (44–48 h) category of working hours. These findings provide important and timely empirical evidence for future of work planning, shorter working week policies and have implications for theorising the future models of organising work in society.

1. Introduction

Recent advances in artificial intelligence and automation have revived fears of a jobless future. Current technological developments are affecting many industries simultaneously and potentially replacing skills thought to be uniquely human (Brynjolfsson and McAfee, 2014). This could cause significant job loss and mass unemployment (Mokyr et al., 2015). Studies suggest that anything between 9% and 47% of jobs in developed countries are at risk of automation (Arntz et al., 2016; Frey and Osborne, 2017). The assessments of how likely this scenario and what a government policy response should look like differ, but even most sceptical thinkers (e.g. McGaughey, 2018) are suggesting that contingency plans would be prudent. These debates had been accompanied by a growing polarisation in working hours, with some groups working longer and others working shorter hours, particularly in Anglo-Saxon countries (Eurofound, 2017).

Mass redundancy and high long-term unemployment levels are public health and social welfare concerns. Unemployment is associated with many negative individual and societal consequences, contributing to poverty and social inequality, and to a decline in mental, physical health and well-being of the unemployed people and their families (Catalano et al., 2011; McKee-Ryan, Song, Wanberg and Kinicki, 2005; WhatWorksWellbeing, 2017; Wood and Burchell, 2018). High unemployment increases government welfare and health expenditures (Coutts et al., 2014). Work-related mental ill-health costs the UK economy up to £70 billion per year (OECD, 2014). A rapid and permanent rise in unemployment could have devastating effects on public services, communities and individuals.

Several theorists have attempted to specify what it is about paid work that boosts well-being compared to worklessness (e.g. Fryer,

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1986; Jahoda, 1981, 1982; Warr, 1987). The beneficial job features have been referred to as the latent employment functions or psychosocial vitamins and include, for example: structured time (routine), social contact; shared goals; variety; enforced activity; and identity. Jahoda argues that these are inherent features of most jobs. During spells of unemployment these latent psychosocial features are reduced or absent (Gershuny, 1994). Numerous studies and meta-analyses have linked unemployment to negative health and well-being outcomes such as psychological distress, anxiety, happiness and life satisfaction (e.g. Coutts et al., 2014; McKee-Ryan et al., 2005; Paul and Moser, 2009).

This article addresses two important gaps in the literature. Firstly, how much paid employment is needed to get some or all of the mental health and well-being benefits? Neither academic researchers nor policy-makers have considered what is the least amount of paid work that will on average, provide health and well-being levels characteristic of employees rather than the unemployed? Secondly, what is the optimum amount of paid work at which an employee's mental health and well-being are at their highest levels? Previous debates and empirical studies, reviewed later in this paper, have focused on the differences in mental health and well-being between being unemployed or economically inactive and being employed or on the effects of having too much work (working overtime) or less work than desired by the individual (being underemployed). This is a vital academic and policy omission; for most other health and well-being outcomes a desirable or recommended dose is clearly indicated – for instance, medics suggest that adults need 8.5–10 μg of vitamin D a day (NHS, 2017).

This study addresses these two questions. It makes a contribution to theorising potential labour market scenarios and to developing policies and interventions aimed at minimising the negative effects of unemployment on mental health under a shortage of paid work. This paper also provides empirical evidence when ideas such as reducing the standard working time to a four-day week are discussed in media, think tanks and trialled in some workplaces (e.g. BBC, 2017; BBC, 2018; Booth, 2019; New Economic Foundation, 2010; Roy, 2018; Stronge and Harper, 2019).

The study uses data from the UK Household Longitudinal Study (2009–2018) to address this knowledge gap and contributes to evidence-based debates on an optimum working week length. This article first reviews the key arguments in three strands of the working hours and mental health literature. Then it describes the research methods, presents the findings and explores their theoretical, policy and practical implications.

2. Working hours and mental health

The number of working hours varies both within and between jobs and has the potential to affect workers' well-being and mental health. Three distinctive strands of debates on working hours and mental health can be identified: the unemployment versus employment debate; long working hours research and underemployment studies.

2.1. Unemployment vs. employment debate

This strand of thinking focuses on the divide between unemployment and employment. The key proposition is that in contemporary Western societies paid work is not only a source of income but also crucial for one's mental health and wellbeing. Therefore unemployment and economic inactivity are often associated with poorer health outcomes.

Jahoda's Latent Deprivation Theory and Fryer's Agency Restriction argument best represent this line of thinking and explain why unemployment has such negative effects. Both theories emphasise that unemployment worsens an individual's well-being and mental health because of the centrality of paid work as a social institution. Jahoda (1982) argues employment is more than an income source (i.e. the manifest benefit); it also supplies latent psychosocial benefits including time structure, collective purpose and social contacts, identity and activity. The loss of these benefits due to unemployment damages well-being. In his response to Jahoda's theory, Fryer argued that the latent psychological benefit loss alone does not explain the negative effects of unemployment; the experience of unemployment damages well-being and mental health through the loss of agency – the ability to control one's life (Fryer, 1986, 1992).

Numerous studies based into this theoretical tradition have found that the unemployed, on average, have poorer well-being and mental health than those in paid work (e.g. Burchell, 1994; Jahoda, 1981; Jahoda, 1982; McKee-Ryan et al., 2005). Some of these differences can be explained by the selection effect: people with lower well-being are more likely to become unemployed. Unemployment itself also leads to a decline in mental health (Jefferis et al., 2011; McKee-Ryan et al., 2005; Paul and Moser, 2009; Wanberg, 2012).

Although the intensity varies from person to person, the link between unemployment and decline in well-being and mental health is consistent over time and across cultures (Artazcoz et al., 2004; Paul and Moser, 2009). Some studies suggests that the loss of income accounts for a significant proportion on the effect (Creed and Macintyre, 2001; Paul and Batinic, 2010; Weich and Lewis, 1998), although other studies have come to the opposite conclusion (Winkelmann and Winkelmann, 1998).

The unemployment versus employment literature provides explanations for why employment brings mental health and well-being benefits. It does not address the question of how much or how little paid work is needed to gain these benefits. The other two perspectives address this limitation, but only to a degree.

2.2. Long working hours' research

The key argument of another longstanding research strand is that working long hours damages worker's well-being and mental health. According to the European Working Time Directive workers, with few exceptions, should not work more than 48 h a week on average. This to some extent aligns with the empirical evidence, although many of these studies focus on employees working shifts or unsocial hours, not long weekly working hours per se. Large-scale longitudinal panel studies including objective mental health measures, suggest that working long hours has negative consequences for health, well-being,leisure and families (Kivimäki et al., 2015). They impede an ability to care for oneself, leads to exhaustion, burnout, occupational stress, depression, anxiety and other mental health disorders (Bannai and Tamakoshi, 2014; Ng and Feldman, 2008; Theorell et al., 2015; Virtanen et al., 2018). In some studies the effects start at a lower working hours threshold for women than for men (Dinh et al., 2017; Virtanen et al., 2011).

2.3. Underemployment studies

Another research strand focuses on the effect of subjectively defined underemployment - working fewer hours than one would prefer - on workers' mental health and well-being. The main theoretical proposition, supported by several studies, of this strand is that involuntary part-time working has negative implications for workers' mental health and well-being (e.g. Angrave and Charlwood, 2015; Bell and Blanchflower, 2018; Heyes et al., 2016; Kamerāde and Richardson, 2018; Wilkins, 2007; Wooden et al., 2009).

This debate does not objectively define or identify the smallest number of working hours at which somebody could be considered being underemployed. Instead it relies on people's subjective working hour's preferences. The assumption is that if workers were able to work the hours they prefer to work, they would be happier and healthier.

This assumption is problematic for two reasons. Firstly, there might be a gap between what people think might be good for them and their mental health and well-being and what is actually good. Secondly, this assumption is rather hypothetical for policy purposes as most workers

have a limited control over the number of working hours they work. Changes in the economy, employers' business models, family demands all shape worker's limited control over and their working hours (Gerstel and Clawson, 2018). The less power an individual has – which is likely to be linked to their gender, class and ethnicity -the less choice they have in their working hours (Lambert, 2008). Few employees use the employee flexibility programmes available in the UK; many fear negative career implications (Williams et al., 2013).

2.4. Current study: minimum and optimum number of working hours

These debates reveal two important gaps. Firstly, they have not asked and empirically investigated what is the smallest amount of paid work that will provide, on average, health and well-being levels characteristic of employees rather than of the unemployed (or economically inactive). Secondly, what is the optimum number of working hours at which the workers' mental health and well-being is at its peak? This article addresses these two gaps and examines the minimum and optimum number of working hours for well-being and mental health. Based on the reviewed literature we propose that:

- As being employed is shown to give a well-being and mental health boost, the mental health and well-being levels of the employed will be higher than when they were unemployed or economically inactive. We aim to identify what is the minimum number of working hours beyond which a person is no longer disadvantaged in terms of their mental health and well-being.
- As involuntary part-time work is associated with lower well-being levels, a higher number of working hours will be associated with better well-being and mental health, till the optimum number of working hours, which we aim to identify, – at which well-being and mental health are at their highest, is reached.

3. Methods

3.1. Data and sample

This study used longitudinal panel data on employment and health outcomes from eight waves (2009–2018) of the UK Household Longitudinal Study (UKHLS) (University of Essex, ISER, NatCen Social Research and Kantar Public, 2018). The UKHLS comprises a stratified and clustered General Population Sample of around 40,000 households in the first wave and complementary samples.

The analytical sample was 156,734 person-wave observations, on average 19,555 unemployed, economically inactive (long-term and temporarily sick or disabled, on maternity leave, looking after family) and employed respondents aged between 18 and the retirement age (65 for men and 60 for women) per wave. Full-time students, the retired and those on governmental training schemes in each wave were excluded because their working hours might be restricted. Because of the wealth of literature on overwork this study focused on workers whose weekly work hours did not exceed 48 h. The UKHLS longitudinal weights were used to adjust for the complex survey design, non-response rate, unequal selection probabilities and attrition over waves.

4. Variables

4.1. Dependent variables

4.1.1. Mental health and well-being

This study used three variables to measure well-being and mental health. However, as the results for two of these variables (General Health Questionnaire (GHQ) and Short Form Mental Component Summary (SF-12 MCS)) were very similar, and they were highly correlated ($r = 0.73$) for the sake of brevity only the results from the GHQ will be presented in detail in this paper. The SF-12 MCS results are available in the online supplement as a robustness check and to allow comparisons with other datasets.

1) The 12-item (GHQ) - a widely used reliable psychiatric illness and distress measurement (Goldberg and Williams, 1988). The answers to GHQ-12 twelve questions were used to calculate a scale ranging from 0 (the least distressed) to 36 (the most distressed). In this study, the scale was reversed with a higher score indicating better mental health.
   The GHQ-12 primarily focuses on various symptoms of mental illness such as depression, anxiety, sleep problems, concentration etc., whereas SF-12 MCS focuses on performance of mental function in daily life and whether mental health problems interfere with social life.
2) A life satisfaction indicator captured subjective well-being - a person's cognitive evaluation of his or her life (Diener et al., 2005, p.63). The respondents were asked to rate their overall life satisfaction on a 7-point scale ranging from 1 (completely dissatisfied) to 7 (completely satisfied).

4.2. Independent and control variables

The key independent variable was the self-reported number of hours expected to work in a normal week, including overtime and second job. We expected a non-linearity in the transitions between unemployment/inactivity and paid work and mental well-being and therefore categorised working hours: 0 (unemployed/economically inactive); $> 0\& < =8$; $> 8\& < =16$; $> 16\& < =20$; $> 20\& < =24$; $> 24\& < =28$; $> 28\& < =32$; $> 32\& < =36$; $> 36\& < =40$; $> 40\& < =44$; $> 44\& < =48$.

In all models individual and household characteristics that influence employment status, work hours and mental well-being (Dinh et al., 2017) were controlled for. They included age (grand mean centered), age squared to capture the potential curvilinear relationship, marital status, presence of children, number of children, whether respondents have caring responsibilities, whether have longstanding illness, logged household income. To take into account health selection into work, the extent to which health limits work, ranging from 1 (all the time) to 5 (none of the time) was controlled for. Wave dummies were controlled to capture any individual-level idiosyncratic disturbances over time.

Considering the confounding effects of job quality on relationship between work hours and mental health, the models focused on the optimum number of working hours for the employed included the job and occupation characteristics available in the dataset: logged hourly pay, whether have a permanent contract, occupational group and job satisfaction.For descriptive statistics see Table A1 in online supplementary material. The models did not include variables with no or little within-person variation (e.g. gender, education levels) because fixed effects regression models described below only use within-person variation.

4.3. Design and analytic strategy

This study used fixed effects (FE) regression models to examine how *changes* in work hours are linked to *changes* in mental well-being *within* each individual *over time*, while eliminating unobserved heterogeneity – confounding effects from time-constant variables (Halaby, 2004). This estimated the causal relationship between work and mental well-being more accurately than would be possible using a pooled cross-sectional design.

The first set of the analyses examined the transitions between unemployment/inactivity and paid work to identify the minimum number of work hours; the second set of the analyses, based on the sample of employed individuals only, focused on the transitions between working in the standard full-time job (36–40 h per week) and working fewer or more hours to identify the optimal number of hours. Both sets of

analyses controlled for individual and household characteristics. Only the second set controlled for income and other job charateristics measured only for the employed people.

To establish whether the effect size of the minimum number of working hours remains the same after job charateristics are controlled for, we calculated and compared predicted values (a prediction of the mean response value when all the predictors in the model are controlled for) for working 0 < & < =8 h in all models (see Table A4 in online supplementary materials).

All FE models were fitted separately by gender and unemployed/inactive status. Women work fewer hours that men do because of care responsibilities but many non-retirement age men work part-time due to health reasons or underemployment (Dinh et al., 2017; Eurofound, 2013; Thompson and Wheatley, 2019), therefore we expected gendered mental health effects. In search for potential optimum number of work hours, we have further conducted a series of Wald tests to compare each work hour category against each of all other categories, controlling for other variables in the model.

5. Results

5.1. Minimum number of work hours

Tables 1 and 2 report FE models exploring the minimum number of work hours required for increased mental wellbeing for previously employed or inactive people, while controlling for other variables in the model.

5.2. GHQ-12 mental health

Table 1 reports the four models predicting effects of changes in work hours on changes in mental health. The results suggest that even working for a small number of hours (> 0& < =8 h per week) was associated with significantly higher reversed GHQ-12 score, that is, a significantly lower likelihood of psychiatric symptoms, for men in periods of unemployment (Model 1), and women who were unemployed or inactive (Models 2 and 4). Although working a small number of hours was also related to better mental health for previously inactive men (Model 3), the effect was statistically non-significant until working more than 32 h. The effect size of moving from unemployment to paid work was similar for men and women: initial eight or less working hours per week was associated with a 1.11 and 0.93 points, respectively, increase in the reversed GHQ-12 score, resulting in the predicted values (PV) of GHQ-12 of 25.18 and 24.39. For previously inactive women, the initial mental health boost was 0.83 points (PV = 24.36).

We have repeated the above analyses for SF-12 MSC and found that the results remain generally similar (see Table A2 in online supplementary material): even working for a small number of hours was associated with significantly better mental health for previously unemployed (> 0& < =8), inactive (> 0& < =8) men and unemployed (> 20& < =24), inactive (> 0& < =8) women.

5.3. Life satisfaction

Table 2 reports the four models predicting effects of changes in work hours on changes in life satisfaction. For men who were either previously unemployed (Model 1, effect size 0.52, predicted score 5.24) or inactive (Model 3, effect size 0.34, PV = 5.12) a small number of work hours (> 0& < =16) was associated with a significant increase in their life satisfaction. The initial life satisfaction boost disappeared or became less significant at > 16& < =24 work hours, but appeared again

Table 1
Fixed effects (FE) models predicting the effects of work hours on mental health (reversed GHQ-12).

Work hours	Model 1		Model 2		Model 3		Model 4	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
	Men		Women		Men		Women	
	(ref = Unemp.)		(ref = Unemp.)		(ref = Inactive)		(ref = Inactive)	
> 0& < =8	1.11*	(0.47)	0.93**	(0.33)	0.38	(0.40)	0.83***	(0.25)
> 8& < =16	0.93*	(0.36)	1.09***	(0.27)	0.07	(0.42)	0.72***	(0.21)
> 16& < =20	1.45**	(0.46)	1.06***	(0.24)	0.56	(0.49)	0.71***	(0.20)
> 20& < =24	0.91+	(0.49)	1.05***	(0.25)	0.08	(0.52)	0.59**	(0.20)
> 24& < =28	2.02***	(0.53)	1.14***	(0.25)	0.99+	(0.54)	0.65**	(0.20)
> 28& < =32	1.73***	(0.34)	1.21***	(0.24)	0.65	(0.42)	0.70***	(0.20)
> 32& < =36	1.86***	(0.29)	1.35***	(0.26)	0.74*	(0.35)	0.91***	(0.21)
> 36& < =40	1.78***	(0.24)	1.16***	(0.26)	0.64+	(0.33)	0.73***	(0.19)
> 40& < =44	1.80***	(0.24)	0.86**	(0.27)	0.65+	(0.33)	0.45*	(0.21)
> 44& < =48	1.86***	(0.25)	0.94**	(0.31)	0.69*	(0.34)	0.73**	(0.23)
Age	0.41**	(0.16)	0.04	(0.09)	0.34*	(0.16)	−0.02	(0.09)
Age^2	0.00***	(0.00)	0.00**	(0.00)	0.00**	(0.00)	0.00*	(0.00)
Marital status (ref = Never married)								
Married/cohabited	0.33	(0.24)	0.34	(0.22)	0.44+	(0.23)	0.32	(0.20)
Separated/widowed	−0.29	(0.38)	−0.06	(0.26)	−0.22	(0.36)	−0.27	(0.25)
Children (ref = No children)								
Children aged 0–4	0.26	(0.30)	0.32	(0.26)	0.30	(0.29)	0.52*	(0.23)
Children aged 5–11	−0.02	(0.28)	0.36	(0.25)	−0.07	(0.29)	0.36	(0.23)
Children aged 12–15	0.29	(0.24)	0.25	(0.21)	0.24	(0.24)	0.20	(0.19)
Number of children	−0.11	(0.16)	−0.05	(0.13)	−0.19	(0.16)	−0.06	(0.13)
Logged household income	0.29**	(0.10)	0.24+	(0.13)	0.24+	(0.14)	0.24*	(0.09)
Have caring responsibilities (ref = Yes)	0.33	(0.23)	0.10	(0.34)	0.01	(0.27)	0.24	(0.22)
Have longstanding illness (ref = Yes)	0.47***	(0.12)	0.53***	(0.12)	0.34**	(0.12)	0.70***	(0.11)
Extent to which health limits work	0.74***	(0.07)	0.85***	(0.06)	0.70***	(0.07)	0.88***	(0.05)
Wave dummies	YES		YES		YES		YES	
Constant	18.03***	(1.23)	16.30***	(1.25)	19.81***	(1.33)	15.79***	(0.95)
Person-wave observations	57,519		73,366		55,128		87,853	
Within R^2	0.03		0.02		0.02		0.02	

Note. Robust standard errors were in parentheses. Wave dummies were controlled in all models. ***p < 0.001, **p < 0.01, *p < 0.05, + p < 0.1.

Table 2
Fixed effects (FE) models predicting the effects of work hours on life satisfaction.

Work hours	Model 1		Model 2		Model 3		Model 4	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
	Men		Women		Men		Women	
	(ref = Unemp.)		(ref = Unemp.)		(ref = Inactive)		(ref = Inactive)	
> 0& < =8	0.52***	(0.13)	0.06	(0.09)	0.34**	(0.13)	−0.03	(0.07)
> 8& < =16	0.32**	(0.11)	0.10	(0.06)	0.28*	(0.12)	0.08	(0.05)
> 16& < =20	0.19	(0.12)	0.10	(0.06)	0.10	(0.14)	0.07	(0.05)
> 20& < =24	0.25+	(0.13)	0.13*	(0.06)	0.17	(0.14)	0.11*	(0.05)
> 24& < =28	0.40***	(0.11)	0.08	(0.06)	0.26*	(0.12)	0.07	(0.06)
> 28& < =32	0.42***	(0.09)	0.05	(0.06)	0.30**	(0.11)	0.05	(0.05)
> 32& < =36	0.51***	(0.07)	0.06	(0.06)	0.39***	(0.09)	0.06	(0.06)
> 36& < =40	0.40***	(0.06)	0.05	(0.06)	0.30***	(0.09)	0.06	(0.05)
> 40& < =44	0.43***	(0.07)	−0.03	(0.07)	0.33***	(0.09)	−0.03	(0.06)
> 44& < =48	0.45***	(0.06)	0.05	(0.07)	0.35***	(0.09)	0.06	(0.06)
Age	0.00	(0.04)	0.01	(0.02)	−0.02	(0.04)	−0.01	(0.02)
Age^2	0.00**	(0.00)	0.00	(0.00)	0.00**	(0.00)	−0.00	(0.00)
Marital status (ref = Never married)								
Married/cohabited	0.09	(0.06)	0.04	(0.05)	0.08	(0.06)	−0.02	(0.05)
Separated/widowed	−0.13	(0.10)	−0.14*	(0.07)	−0.06	(0.10)	−0.15*	(0.07)
Children (ref = No children)								
Children aged 0–4	−0.01	(0.09)	0.07	(0.06)	0.00	(0.08)	0.09	(0.06)
Children aged 5–11	−0.04	(0.08)	0.01	(0.07)	−0.04	(0.08)	0.03	(0.06)
Children aged 12–15	0.01	(0.07)	0.05	(0.05)	−0.03	(0.07)	0.04	(0.05)
Number of children	0.04	(0.04)	−0.07*	(0.03)	0.05	(0.04)	−0.02	(0.03)
Logged household income	0.02	(0.02)	0.06*	(0.03)	0.11**	(0.04)	0.07**	(0.02)
Have caring responsibilities (ref = Yes)	0.10	(0.07)	0.10	(0.08)	0.02	(0.07)	0.14*	(0.06)
Have longstanding illness (ref = Yes)	0.05	(0.03)	0.12***	(0.03)	0.07*	(0.03)	0.12***	(0.03)
Extent to which health limits work	0.11***	(0.02)	0.12***	(0.01)	0.12***	(0.02)	0.12***	(0.01)
Wave dummies	YES		YES		YES		YES	
Constant	3.70***	(0.32)	3.90***	(0.27)	3.10***	(0.37)	3.56***	(0.24)
Person-wave observations	57,519		73,366		55,128		87,853	
Within R^2	0.02		0.02		0.02		0.02	

Note. Robust standard errors were in parentheses. Wave dummies were controlled in all models. ***p < 0.001, **p < 0.01, *p < 0.05, + p < 0.1.

at working more than 24 h. In contrast, for women who were previously unemployed (Model 2, effect size 0.13, PV = 5.10) or economically inactive (Model 4, effect size 0.11, PV = 4.97), the only working hours category that made a significant difference to life satisfaction in comparison to being unemployed or inactive was working > 20& < =24 h.

5.4. Optimum number of work hours for mental wellbeing among employed

Table 3 reports FE models which explored the optimum number of work hours for mental wellbeing among the employed controlling for various job characteristics. The reference group is > 36& < =40 h - the standard number of work hours. The results show that among the employed, working less than standard hours was not associated with significantly poorer mental health and life satisfaction. The exception were men working for > 8& < =16 h: they had significantly poorer GHQ-12 mental health compared to working for standard > 36& < =40 h. Working > 40& < =44 h significantly reduced mental health and life satisfaction for women. Most job characteristics including hourly pay, type of contract and occupational class were statistically non-significant. The exception was job satisfaction – it was significant across all models. The robustness check using SF-12 MSC showed similar results with the exception that for men working > 0& < =8 h means significantly better SF-12 score than working full-time (see Table A3 in online supplementary material).

Further analyses using a series of Wald tests to compare each work hour category against each of all other categories, suggested that for both men and women there was no optimum work hours category, that is a category with significantly better mental health than all other working hours categories (all Wald test p-values were > 0.05).

Predicted values for working > 0& < =8 h based on Table 3 estimates were: GHQ-12: 25.30 for men and 24.98 for women; life satisfaction 5.15 and 5.14 respectively. These values were not substantively different from the predicted values from Table 1&2 reported above, suggesting that the size effect of mental wellbeing boost remains the same after job characteristics are controlled for.

We further explored the interaction effects between hourly pay and work hours on mental wellbeing, controlling for all other demographic and job characteristics (see Table 4). Most interaction terms were not statistically significant, with exception of women working > 32& < =36 and > 40& < =44 h –the positive impact on logged hourly pay on mental health was lower for women working these hours than it was when they worked > 0& < =8 h. For robustness check, we have repeated the above analyses for SF-12 MSC in Table A5 (in online supplementary material) and found that the results remain generally similar.

5.5. Further robustness checks

Two analyses were used to examine the robustness of the results. First, the Hausman tests that compared coefficients of FE and Random effects (RE) were significant in all models (p < 0.001), suggesting that the RE results were biased and confirming our choice of FE models. Second, Vaisey and Miles(2017, p52-56) method was used to test for the endogenous selection (aka reversed causality) by using the following equation: $Work\_hours_t = a + b*Mental\_well - being_{t-1} + c*(\sum_{t-1=1}^{n=7} Mental\_well - being_{t-1})$. This tested whether mental well-being (t-1) could significantly predict work hours (t) while controlling for the time constant fixed effects of mental well-being over time. OLS regression was used to conduct this test for the ease of interpretation; further analysis using ordered logistic regression suggests that results were similar. The results (see online supplementary material Table A6) show that in most cases all three mental well-being indicators were not

Table 3
Fixed effects (FE) models predicting the effects of work hours on GHQ-12 mental health and life satisfaction among employed respondents.

	GHQ-12		GHQ-12		Life satisfaction		Life satisfaction	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
	Men		Women		Men		Women	
Work hours (ref = > 36& < =40)								
> 0& < =8	−0.67	(0.44)	0.27	(0.29)	−0.02	(0.14)	−0.02	(0.08)
> 8& < =16	−0.70*	(0.35)	0.16	(0.21)	−0.01	(0.10)	0.06	(0.06)
> 16& < =20	−0.10	(0.44)	0.04	(0.18)	−0.20	(0.14)	0.03	(0.05)
> 20& < =24	−0.50	(0.44)	0.01	(0.18)	−0.14	(0.12)	0.09+	(0.05)
> 24& < =28	0.24	(0.50)	0.11	(0.17)	−0.03	(0.10)	0.05	(0.05)
> 28& < =32	−0.09	(0.30)	0.12	(0.15)	0.01	(0.09)	0.03	(0.04)
> 32& < =36	0.07	(0.18)	0.23	(0.15)	0.10*	(0.05)	0.02	(0.04)
> 40& < =44	−0.04	(0.11)	−0.31*	(0.13)	0.02	(0.04)	−0.08*	(0.04)
> 44& < =48	−0.00	(0.13)	−0.11	(0.15)	0.04	(0.04)	0.01	(0.04)
Age	0.38*	(0.16)	0.07	(0.09)	0.00	(0.05)	0.01	(0.02)
Age^2	0.00**	(0.00)	0.00*	(0.00)	0.00**	(0.00)	−0.00	(0.00)
Marital status (ref = Never married)								
Married/cohabited	0.44+	(0.23)	0.31	(0.19)	0.07	(0.06)	−0.01	(0.06)
Separated/widowed	−0.09	(0.36)	−0.25	(0.26)	−0.07	(0.10)	−0.17*	(0.07)
Children (ref = No children)								
Children aged 0–4	0.22	(0.30)	0.41+	(0.23)	0.01	(0.08)	0.10	(0.06)
Children aged 5–11	−0.14	(0.29)	0.37	(0.23)	−0.02	(0.08)	0.01	(0.06)
Children aged 12–15	0.11	(0.24)	0.32+	(0.19)	0.00	(0.07)	0.04	(0.05)
Number of children	−0.13	(0.17)	−0.21+	(0.12)	0.05	(0.04)	−0.06+	(0.03)
Logged household income	0.24	(0.17)	0.19+	(0.11)	0.08+	(0.04)	0.11**	(0.03)
Have caring responsibilities (ref = Yes)	0.35	(0.25)	0.58*	(0.25)	0.06	(0.08)	0.10	(0.08)
Have longstanding illness (ref = Yes)	0.25*	(0.12)	0.43***	(0.11)	0.06+	(0.03)	0.09**	(0.03)
Extent to which health limits work	0.65***	(0.07)	0.80***	(0.05)	0.09***	(0.02)	0.11***	(0.01)
Logged hourly pay	−0.03	(0.09)	−0.12+	(0.07)	0.01	(0.03)	0.02	(0.02)
Permanent contract (ref. = Yes)	−0.00	(0.25)	−0.06	(0.17)	−0.11	(0.07)	−0.04	(0.05)
Occupational class (ref. = Managerial & Professional)								
Intermediate	−0.26	(0.29)	−0.00	(0.19)	0.02	(0.07)	0.05	(0.05)
Semi-routine & Routine	−0.04	(0.24)	−0.05	(0.21)	0.03	(0.06)	0.01	(0.05)
Job satisfaction	0.72***	(0.04)	0.79***	(0.04)	0.12***	(0.01)	0.10***	(0.01)
Wave dummies	YES		YES		YES		YES	
Constant	16.64***	(1.57)	14.21***	(1.16)	3.12***	(0.46)	3.07***	(0.33)
Person-wave observations	48,095		66,684		48,095		66,684	
Within R^2	0.08		0.08		0.03		0.03	

Note. Robust standard errors were in parentheses. Wave dummies were controlled in all models. ***p < 0.001, **p < 0.01, *p < 0.05, + p < 0.1.

significantly associated with work hours at the subsequent waves, suggesting that reversed causality was not a serious problem.

6. Discussion and conclusion

This study addressed two important gaps in the knowledge: what is the minimum number of working hours for mental health to be better than during unemployment or economically inactive periods, and what is the optimum number of working hours for the best mental health and well-being? Overall, the findings are clear: the significant difference in mental health and well-being is between those with paid work and those with none; the variability between those with different number of hours of work is non-significant.

This study found that for most previously unemployed or inactive men and women the minimum number of working hours required to psychologically benefit from paid work is one to eight working hours a week. These are some variations in the results between genders but the similarities between the previously inactive and unemployed, men and women are far more pronounced. There are a few exceptions, most likely related to the complexities of the UK in-work benefit system and in how working more than 16 working hours can affect access to other benefits. For previously inactive men the first boost in their GHQ-12 score appears only at working over 32 h. For previously unemployed and inactive men there is a first boost in their life satisfaction at working up to 16 h, then there is no significant difference until they start working 24 + hours. Another exception are previously unemployed women who experience a significant raise in SF-12 MSC score and life satisfaction only when working over 20hrs and unemployed and inactive women for whom the only working hours category that makes a significant difference in their life satisfaction is 20–24 h. A possible explanation for these variations is that people on income support lose access to the benefit if they work more than 16 h a week unless they have children in which case they gain access to other benefits. This may explain why there is a dip at working 16 h for men but not women as women are more likely to care for children (Dinh et al., 2017). For those on a low hourly wage, especially men, working 16–20 h a week can be problematic as the wages earned are less than benefits previously received, therefore we see some variations in the effects of working hours on mental health and wellbeing around working 16 h a week. A more detailed exploration of the effects of the benefits on mental health was beyond the scope of this study.

In contrast to expectations, we also found that there is no optimum number of working hours at which well-being and mental health are significantly at their highest. This study finds no evidence that the current full-time standard of working 36–40 h a week is the optimal for mental health and well-being, when job characteristics, such as hourly pay, occupational group and contract permanency are controlled. The results suggest that working full-time is better for mental health than working > 8& < =16 h (for men) and > 40& < =44 h (for women and their life satisfaction too), possibly because of the difficulties of combining longer working hours with child care (Dinh et al., 2017). However, full-time work was not the optimum category as it was not significantly different from any other working hours' category in terms of mental health and wellbeing.

These findings are consistent with the theoretical argument and evidence base that securing paid employment or being reemployed in

Table 4
Interaction effects between hourly pay and work hours on GHQ-12 mental health and life satisfaction among employed respondents.

	GHQ-12		GHQ-12		Life satisfaction		Life satisfaction	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
	Men		Women		Men		Women	
Work hours (ref = > 0& < =8)								
> 8& < =16	−1.35	(1.14)	0.35	(0.67)	0.20	(0.34)	0.04	(0.19)
> 16& < =20	0.60	(1.51)	−0.14	(0.70)	0.18	(0.45)	0.01	(0.20)
> 20& < =24	−1.73	(1.45)	0.83	(0.69)	0.38	(0.46)	0.26	(0.20)
> 24& < =28	1.37	(1.43)	0.88	(0.73)	0.14	(0.38)	0.08	(0.22)
> 28& < =32	0.22	(1.26)	1.10	(0.70)	−0.13	(0.38)	0.20	(0.20)
> 32& < =36	0.65	(1.16)	1.83*	(0.72)	0.26	(0.32)	0.26	(0.22)
> 36& < =40	0.16	(1.00)	0.96	(0.69)	0.18	(0.28)	−0.13	(0.20)
> 40& < =44	0.79	(1.04)	0.94	(0.77)	0.13	(0.29)	−0.04	(0.22)
> 44& < =48	2.15*	(1.05)	0.82	(0.86)	0.52+	(0.30)	−0.08	(0.25)
Logged hourly pay	0.06	(0.20)	0.14	(0.17)	0.06	(0.05)	0.02	(0.04)
> 8& < =16 × LHP	0.43	(0.28)	−0.11	(0.20)	−0.05	(0.08)	0.01	(0.05)
> 16& < =20 × LHP	−0.04	(0.41)	0.02	(0.20)	−0.11	(0.12)	0.02	(0.05)
> 20& < =24 × LHP	0.62+	(0.35)	−0.32	(0.20)	−0.15	(0.14)	−0.05	(0.05)
> 24& < =28 × LHP	−0.17	(0.33)	−0.31	(0.21)	−0.03	(0.09)	−0.00	(0.06)
> 28& < =32 × LHP	0.11	(0.34)	−0.38+	(0.20)	0.07	(0.09)	−0.05	(0.05)
> 32& < =36 × LHP	0.01	(0.26)	−0.56**	(0.21)	−0.03	(0.07)	−0.06	(0.06)
> 36& < =40 × LHP	0.13	(0.22)	−0.37+	(0.19)	−0.04	(0.06)	0.04	(0.05)
> 40& < =44 × LHP	−0.06	(0.23)	−0.45*	(0.22)	−0.02	(0.06)	−0.00	(0.06)
> 44& < =48 × LHP	−0.42+	(0.23)	−0.37	(0.24)	−0.12+	(0.06)	0.03	(0.06)
Wave dummies	YES		YES		YES		YES	
Constant	16.80***	(1.79)	13.28***	(1.28)	2.95***	(0.51)	3.09***	(0.36)
Person-wave observations	48,095		66,684		48,095		66,684	
Within R2	0.08		0.08		0.03		0.03	

Note. All models controlled for age, age squared, marital status, presence of children, number of children, household income, whether have caring responsibilities, whether have longstanding illness, extent to which health limits work, whether have a permanent contract, occupational class and job satisfaction. Robust standard errors were in parentheses. Wave dummies were controlled in all models. ***p < 0.001, **p < 0.01, *p < 0.05, + p < 0.1.

good quality employment is beneficial for one's mental health and well-being (Jahoda, 1981, 1982) but go beyond them in one important and somewhat surprising respect - the average effective dose of employment for mental health and well-being is only about the equivalent of one day per week.

The findings suggest that the effect sizes of the minimum number of working hours on well-being and mental health are in line with other studies on working hours and mental health (Ganster et al., 2018). The effects sizes tended to be slightly larger for men than women, possibly because paid work is still more central to men's than women's lives and because women are more likely to combine paid work with caring responsibilities (Dinh et al., 2017; M. A. Smith et al., 2013). Effect sizes of work on mental health are relatively small because of multiple causality (with genetics, relationship status and social support effects all playing an important part) and because only the short-term effects were examined.

We did not find that hourly income made a difference to the effects of working hours on mental health and wellbeing, possibly because we controlled for the household income that could offset the negative effect of low working hours and low income.

The findings have important theoretical implications. They contribute to the current debates about the future of work and to creating an alternative theoretical vision of how paid work could be organised. Most policy options for addressing a potential rise in unemployment levels have focused on measures such as a universal basic income (UBI) to provide economic support to those without employment. Our findings support an alternative, more radical, theoretical perspective – a redistribution of working hours in society. In this alternative full employment is retained, but a typical working week is reduced (even to Keynes' prophesied 15 h) (Keynes, 1930/1963) so that work is redistributed to everybody who wants paid work, allowing the well-being benefits that working (even a small number of hours) brings to be distributed amongst workers. In health and well-being terms this seems to be a much better option for individuals as the well-being of working-age part-time workers is close to or better than the well-being of full-time workers, both of whom have far fewer symptoms of anxiety and depression than the unemployed or economically inactive (Kamerāde and Richardson, 2018; V. Smith, 2013). Not only would such redistribution reduce unemployment and associated public health costs, it could increase productivity, reduce CO2 emissions from commuting, production and consumption and improve work-life balance.

The findings provide evidence on current policy and media debates about whether a shorter working week is possible and desirable. They suggest that the 'normal' full-time working week could be shortened without a detrimental effect on the workers' mental health and well-being. The policy challenge would be to find ways to reduce and distribute working hours so that the beneficial effects of paid work are retained for the majority of workers and current inequalities are not increased. Widespread, or universal reduced hour working has distinctly gendered implications as part time work is currently associated with lower quality jobs and severely limited upward career mobility and pension accumulation (M. A. Smith et al., 2013). The redistribution could involve working five shorter days or reducing the length of a "normal" working week. Other, more creative solutions could be to dramatically increase annual holidays from a few weeks to a few months, perhaps allowing several two-month breaks each year. It is an empirical question as to which of these (or other) working patterns would be most effective at retaining high levels of productivity and well-being and whilst an important avenue for further enquiries are beyond the scope of this paper.

The findings also contribute vital empirical evidence to academic and policy debates on active labour market programmes (ALMPs) and mental health and wellbeing (Coutts et al., 2014). The results indicate that any ALMPs should be designed on a certain number of employment hours in order to achieve optimal health and well-being outcomes as the latent benefits or active intervention elements which ALMPs are theorised to replicate might have a time/dosage dimension to them. Current employability courses and welfare/job seekers allowance

regulations require hours of job search (36 per week in the UK) and weeks or months of full-time attendance on employability provision which are expensive to implement and deliver. It may be assumed that a reduction in mental health issues among the unemployed could lead to improvements in individual quality of life, their employability, job readiness and subsequently a reduction in the usage of health services that in many OECD countries are overstretched.

One important objection to these policy implications is that for many in the labour market their income is directly linked to their hours of work, and a reduction in hours of paid work would push them below the poverty line. This paper emphasises that to avoid increasing the risk of poverty and social inequality, the policy proposal emerging from our findings would be to reduce the working hours for everyone, not just for some selected groups. Over time developed countries have become more productive due to better technology, a more highly educated workforce and more efficient organisation of work, this productivity growth averages about 2.5% per annum, over the long term which means that a country doubles its output per hour worked every 28 years (Gordon, 2010). In the last few decades most of this 'bonus' has been taken through an increase in spending power, but if it were to be taken in reduced hours of work, the median working week could see a reduction to a 4 day week in just nine years, and continue with steady progress to a halving of working time in the year 2047, with no loss of spending power.

6.1. Limitations and future directions

This study has important shortcomings that are a source for further enquiries. Firstly, we focused on the population-averaged effects of working hours on mental well-being, while controlling for a set of individual, household and a limited number of job-related factors. Therefore the minimum and optimum numbers of working hours identified in this study apply to an 'average' UK worker. However, because of the pervasive inequalities in the labour market that affects how much and what quality work is available and to whom, and how much different groups can control and manage their working time (Gerstel and Clawson, 2018), the effects of working hours might vary considerably, especially for workers on the periphery of the labour market. For example, while this study found that two dimensions of precarious work (Benach et al., 2016) - low hourly pay and temporary contracts - had no significant effect on the relationship between working hours and mental health, other important job quality dimensions remained unexplored due to lack of suitable variables in the dataset. Some studies indicate that insecure or poor quality jobs might not be better than unemployment (Butterworth et al., 2011; Kim & von dem Knesebeck, 2015). Future studies need to explore whether the effect of minimum number of working hours on mental health still remains significant in such jobs.

This study has estimated relatively short-term effects of changes in working hours i.e. the effect between two consecutive waves (approximately 12 months). The longer term impact of changes in working on well-being and mental health needs to be investigated, as workers potentially either adapt to or grow tired of their working time patterns. This study also focused on expected (contracted) hours which might be different from actual working hours.

The fixed effects (FE) models applied in this study use only within-respondent variation to estimate parameters. Respondents without any variability in working hours from wave to wave contributed nothing to estimating the effect of working hours on mental health. Many scholars have argued that this is a small limitation compared to the advantages of FE models (Halaby, 2004, p. 527).

Despite these limitations, this study makes an important contribution to debates on how to offset possible mental health crisis in future labour markets. Better knowledge of the relationship between work, health and well-being can give a powerful steer to public policies aimed at improving the quality of life of those experiencing unemployment and labour market disadvantage. This paper opens up an evidence-based theoretical debate about how work and unemployment may be experienced in the future.

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Appendix A. Supplementary data

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