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Association between home working and mental health by key worker status during the Covid-19 pandemic. Evidence from four British longitudinal studies

Bożena WIELGOSZEWSKA¹, Charlotte BOOTH¹, Michael J GREEN²,
Olivia KL HAMILTON² and Jacques WELS^{3*}

¹Centre for Longitudinal Studies (CLS), University College London, United Kingdom

²MRC/CSO Social & Public Health Sciences Unit, University of Glasgow, United Kingdom

³MRC unit for lifelong health and ageing, University College London, United Kingdom

Email: jcqwels@gmail.com ; w.jacques@ucl.ac.uk

Tel: +44 (0) 20 7670 5700

Fax: +44 (0) 20 7580 1501

*Corresponding author

Abstract

Little is known about the relationship between homeworking and mental health during the Covid-19 pandemic and how it might differ by keyworker status. To understand this relationship, we use longitudinal data collected over three time points during the pandemic from three British cohort studies born in 1958 (National Child Development Study), 1970 (British Cohort Study) and 1989–90 (Next Step) as well as from a population-based study stratified by four age groups (Understanding Society). We estimate the association between life satisfaction, anxiety, depression, and psychological distress and homeworking by key

worker status using mixed effects models with maximum likelihood estimation to account for repeated measurements across the pandemic, allowing intercepts to vary across individuals after controlling for a set of covariates including pre-pandemic home working propensities and loneliness. Results show that key workers working from home showed the greatest decline in mental health outcomes relative to other groups. Pre-pandemic homeworking did not significantly change the nature of such a relationship and loneliness slightly attenuated some of the effects. Finally, mental health outcomes varied across age-groups and time points. The discussion emphasises the need to pay attention to key workers when assessing the relationship between mental health and homeworking.

Introduction

During the Covid-19 pandemic, many workers began working from home due to national virus suppression measures. According to the International Labour Organisation, 557 million employees worked from home worldwide during the second quarter of 2020, accounting for 17.4 percent of the global workforce¹⁾. In the UK, the share of the workforce working at home during the pandemic was higher than pre-pandemic; following government guidance to work from home where possible, an average 37 percent of the workforce worked from home in 2020, compared with 27 percent in 2019^{2, 3)}. Whereas the occurrence of home working was increasing prior to the pandemic⁴⁾, there are several reasons why widespread uptake of home working, specifically in the context of the Covid-19 pandemic, could have implications for workers' mental health and wellbeing⁵⁾. Firstly, in the UK homeworking was largely unanticipated and was introduced with immediate effect, meaning that some workers might have lacked the physical or digital resources that they needed to work effectively from home. Secondly, due to the closure of schools and childcare facilities to the children of non-essential workers, many workers took on additional childcare and schooling responsibilities alongside their paid workload. Additionally, physical separation from friends and colleagues might have led to feelings of loneliness or social isolation⁵⁾. In particular, the switch to (potentially prolonged periods of) homeworking, might have implications for essential (or key) workers, whose work duties remained ongoing due to their essential role in the pandemic response, but this remains largely unknown.

There is a well-established relationship between individual employment status and mental health and wellbeing⁶⁻⁹⁾. Most of the pre-pandemic literature has focused on employment transitions, including transitions to and from unemployment, but little is known about changes related to home working and findings are mixed. A pre-pandemic experimental study found that homeworking was associated with higher objective and self-measured employee productivity as it contributed to saving commuting time, a quieter work environment, increased work satisfaction, and lower sick leave¹⁰⁾. Other studies have demonstrated that pre-pandemic home working can lead to higher job satisfaction and a better perceived work-life balance¹¹⁻¹³⁾. Similarly, there is a positive relationship between scheduling control and work-life balance policies and job satisfaction and mental wellbeing¹⁴⁾. However, other evidence has indicated that home working also appears to be associated with social isolation and loneliness, which can increase stress and decrease perceived productivity and work satisfaction¹⁵⁾. Recent evidence in the Covid-19 pandemic context suggests that adults who were constantly working from home

had the highest odds of common mental disorders, suggesting there may be stressors associated with home working^{16, 17}). At the same time, the restructuring of work patterns, including balancing remote work with caring and home-schooling responsibilities, combined with worry over the virus itself, translated into many people feeling ‘overwhelmed’ or ‘scared’¹⁸). Descriptive statistics during the Covid-19 pandemic have shown that home working was associated with positive experiences in terms of housework and childcare responsibilities, both for men and women, but the flip side of it was that homeworking was perceived as blurring the boundaries between work and family life³). In line with this, it was shown that homeworking arrangements had a positive relationship with the older workforce’s self-reported health in the early stage of the pandemic, but that men’s health benefited more from those arrangements than women¹⁹). Prevalence of depression, anxiety, and stress among remote workers is indeed affected by sex, and a higher increase in both housework and working hours during the COVID-19 pandemic has been observed among women compared with men²⁰), as well as a greater decline in mental health amongst women.

One specific dimension of homeworking during the pandemic that has been overlooked is the differential effects of homeworking by key worker status. During the pandemic, the UK, the USA²¹) and the European commission published a list of occupations that were considered ‘key’ or ‘essential’ in maintaining basic economic and public health functioning²²), although, there is no single definition of a key worker and the types of occupations that were considered ‘key’ tended to change throughout the pandemic²²). In May 2020, the Office for National Statistics²³) predicted that 33 percent of the total UK workforce were in key worker occupations. The health and social care sector had the largest proportion of key workers (31 percent), of which 14 percent were working from home at least one day a week. Socio-economic differences have been observed in key versus non-key workers²⁴). For example, key workers are more likely to be female (60 percent versus 43 percent of regular workers)²⁴). Additionally, 80 percent of the key workers in professional services have a degree versus less than 20 percent in social care, and less than 10 percent in food and transport sectors²⁴). Many key worker occupations were considered as low skilled and low paid in pre-pandemic times, often taken by migrant workers²²), although public demonstrations of appreciation for key workers became more pervasive as the pandemic progressed²⁵). Workers in essential services were at increased risk of Covid-19 infection^{26, 27}), especially frontline key workers, who often experienced lack of resources (including personal protective equipment), clear guidance, or training during this time²⁸). Of key workers, those who were required to work from home (for example, those who

have administrative roles within the health or social care sector), might have experienced additional stressors due to the need to continue providing essential services without the full range of resources that were typically available at their employers' premises. In contrast, key workers might have experienced fewer conflicts with childcare responsibilities than non-key workers during the lockdown phases associated with school closure, because children with a parent or carer identified as a key worker were able to remain at school.

It is anticipated that homeworking will last beyond the Covid-19 pandemic for a larger share of workers than in the past²⁹). As such, the potential relationship between homeworking and mental health must be better understood. The potential impact of homeworking on the mental health and wellbeing of key workers, whose roles were instrumental in maintaining essential services across a range of sectors, is of particular importance for future pandemic planning and to highlight areas for additional support. Enforced shifts to homeworking might also differentially affect people at different life-stages. Older age workers might have greater difficulty in adapting to new technologies and ways of working, while younger workers may have been more likely to experience conflicts with childcare responsibilities. In this study we examine the relationship between homeworking and key worker status and mental health and wellbeing outcomes, specifically life satisfaction, anxiety, depression, and psychological distress, across three pandemic time points. To do this, we will analyse data from four UK population-based longitudinal cohort studies, testing the relationship between homeworking and key worker status and mental health and wellbeing outcomes across different age groups. In addition, we consider loneliness and pre-pandemic homeworking propensities as potential mechanisms by which homeworking and mental health and wellbeing might be associated. Considering the significant shift in the population to working from home during the pandemic and a growing interest in whether and how this could be continued going forward, this study will provide evidence on the potential impact of homeworking on population mental health, while considering different groups (both key worker and non-key worker, as well as different age cohorts), and potential mechanisms, such as preparedness to work from home and loneliness.

Subject and Method

Data and sample

Data were from four UK-based population studies. Three studies – the CLS cohorts – are age homogenous birth cohorts hosted at the Centre for Longitudinal Studies (CLS), each

experiencing the pandemic at a different life-stage: Next Steps (NS, formerly the Longitudinal Study of Young People in England that includes respondents born in 1989–1990, aged 30–32); the 1970 British Cohort Study (BCS, that includes respondents born in 1970, aged 50–51); and the National Child Development Study (NCDS, that includes respondents born in 1958, now aged 62–63). These studies used the same questionnaire at three specific time points during the Covid-19 pandemic. The first survey (T1) was collected in April-May 2020 during the initial surge of infections and the first national lockdown. The second survey (T2) was collected in September-October 2020 during a period that saw initial restrictions eased. The final survey (T3) was collected in February–March 2021 during another period of high infection rates and national lockdown.

The fourth study was Understanding Society (Usoc; also known as the UK Household Longitudinal Study), which reflects a nationally representative and age-heterogeneous sample. Data were taken from eight pandemic questionnaires, which were allocated into three time periods representing different stages of the pandemic (T1=April, May, and June 2020; T2=July and September 2020; T3=November 2020, January 2021 and March 2021). Pre-pandemic data was from annual questionnaires carried out in 2015–2019. In order to see how homeworking affected people at different ages, we separated data from Usoc into four 10-year age bands: 26–35, 36–45, 46–55, 56–65. Each of the CLS cohorts corresponds with one of these age groups, with an extra middle-aged group (36–45) that is not covered by the CLS cohorts.

Analytical samples were restricted to those who were employed before the pandemic, economically active (i.e., not furloughed) during any pandemic survey, and those who had a complete set of covariates.

[Please, insert table 1]

Table 1 exhibits the sample sizes for each CLS cohort and for the four Usoc age-groups for each pandemic time point, with a total of 26,786 observations within the three CLS cohorts and 32,382 observations in Usoc.

Outcomes

Three main outcome variables were used in the CLS cohorts: life satisfaction, anxiety, and depression. Two main outcomes were used in Usoc: life satisfaction, and the 12-item General Health Questionnaire (GHQ) that contains information about psychological distress, related to

anxiety and depression. These were assessed at each pandemic survey (in Usoc life satisfaction was not ascertained in April or June 2020).

Life satisfaction (time-varying): A single item question was asked: “Overall how satisfied are you with your life nowadays?” Participants were asked to rate their answer using a 0-10 scale (CLS cohorts), 10 indicating the highest level of life satisfaction, or a 1-7 scale (Usoc), 7 indicating the highest level of life satisfaction.

Anxiety (time-varying): Two questions from the GAD-7³⁰⁾ were asked in relation to how often respondents had been feeling a certain way over the past 2 weeks: “nervous anxious or on edge”, “not being able to stop or control worrying”, rated on a 4-point scale (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). Responses were summed resulting in 0-6 scale, 6 indicating the highest level of anxiety.

Depression (time-varying): Two questions from the PHQ-9³¹⁾ were asked in relation to how often respondents had been feeling a certain way over the past two weeks: “down depressed or hopeless”, “little interest or pleasure in doing things”, rated on the same 4-point scale (as above), summed resulting in 0-6 scale, 6 indicating the highest level of depression.

General Health Questionnaire (time-varying): a 12-item questionnaire, assessing common symptoms of both anxiety and depression, with scores ranging from 0 (least distressed) to 36 (most distressed)³²⁾.

Exposures

The study combines two variables: homeworking and key worker status.

The variable used to capture homeworking in this study was harmonised using two modalities: 1 = working from home at least some of the time; 0 = working at employer’s premises or other location.

In the UK, key workers (or critical / essential workers) are defined as public or private-sector employees who provide essential services. They are defined based on their sector of activity: e.g., health and social care; education and childcare; key public services; local and national government; food and other necessary goods; public safety and national security; transport; and utilities, communication, and financial services²⁴⁾. Key worker status was assessed in two different ways in this study. First, we used self-reported key worker status during the pandemic (yes/no), time-varying in the CLS cohorts, but assessed only once in Usoc at T1. This is the

categorisation we use for our main analyses. Second, for CLS cohorts, we calculated a more objective measure of key worker status using the Institute for Fiscal Studies (IFS)³³ classification that distinguishes key worker status based on the Standard Occupation Classification (SOC-2010). This was based on participants pre-pandemic SOC classification, and findings for the CLS cohorts were similar when this categorisation was used instead. This was not possible in Usoc, as their information about occupation combined SOC-2000 and SOC-2010 nomenclature that were not fully compatible.

At each survey, we then combined the two exposure variables into four modalities: (i) working at employer's premises / non key worker; (ii) working at employer's premises / key worker; (iii) homeworking / non key workers; (iv) homeworking / key workers.

Covariates

The study controls for a set of fixed and time-varying covariates that are described below:

Age (time-varying): only in Usoc, where we adjusted for age within analyses for each 10-year age-band. CLS cohorts are age homogeneous.

Country (fixed): England (including crown dependencies), Scotland, Wales, Northern Ireland or Other in Usoc.

Sex (fixed): coded as "Male=1" and "Female=2".

Ethnicity (fixed): self-reported and recoded into "White=1" and "non-White=0". This data was not available in BCS and NCDS.

Education (fixed): based on self-reported highest qualifications and recoded into "degree=1" (reflecting professional degrees or NVQ level 4 and 5) and "no degree=0" (NVQ levels 3 and lower).

Pre-pandemic socio-economic classification / occupational class (SEC) (fixed) is assessed through NS-SEC in all studies and recoded into the following three categories: "1 = 1.1-2 (Managers)"; "2 = 3-4 (Intermediate)"; "3 = 5-9 (Lower/technical)".

Pre-pandemic occupation (fixed) (1-digit SOC, 2010): data on occupational status was assessed in all studies containing the following categories: 1) Managers, Directors And Senior Officials; 2) Professional Occupations; 3) Associate Professional And Technical Occupations; 4) Administrative And Secretarial Occupations; 5) Skilled Trades Occupations; 6) Caring, Leisure And Other Service Occupations; 7) Sales And Customer Service Occupations; 8)

Process, Plant And Machine Operatives; 9) Elementary Occupations. Usoc combined information from SOC2010 and SOC2000, using SOC2000 in a minority of cases where no recent change in job had occurred.

Housing tenure (fixed): was assessed pre-pandemic and coded into “owned/mortgaged=1” and “other=0”.

Household composition (fixed): was assessed in all studies by asking participants who they currently live with. A variable was created with the following categories: “0=alone”; “1=partner & children (if female)”; “2=partner and children (if male)”; “3=partner no children (if female)”; “4=partner no children (if male)”; “5=lone parent”; “6=others (i.e., other relatives or non-relatives)”; “7=alone”.

Household overcrowding (fixed): during the pandemic was estimated by number of people per room in a household.

Pre-pandemic weekly working hours (fixed): data on weekly working hours prior to the pandemic were included on a continuous scale.

Pre-pandemic mental health (fixed): was assessed using the General Health Questionnaire-12 with a cut-off score of >3 (using 0-12 scoring; Usoc, NS), and the Malaise Inventory 9-item scale, with a cut-off score of >4 (BCS, NCDS).

Pre-pandemic variables come from the last available wave of each dataset, i.e., 2013 for NCDS, 2016 for BCS, 2015 for NS and 2019 for Usoc.

Mechanisms

Pre-pandemic home working (fixed): we control for pre-pandemic propensities to work fully or partially from home based on SOC2010 (2-digits), sex and age-group (16–29, 30–49 and 50–66) prior to the start of the pandemic, derived from the Annual Population Survey (APS). A binary logit regression calculating the propensities (in logit) to work fully or partially from home versus not working from home (reference category) was fitted in APS. Data were weighted using a standardized population weight variable (PWTA20). The model included three interaction terms: between SOC2010 and sex, between SOC2010 and age group and between sex and age group. Predicted probabilities were derived from the logits and then merged with the different datasets of each study based on recorded SOC2010.

Loneliness (time-varying): was assessed in all studies using a single item question “how often do you feel lonely” and has three modalities: ‘hardly ever’, ‘some of the time’ and ‘often’.

Data analysis

Mixed effects models with maximum likelihood estimation were used to account for repeated measurements across the pandemic, allowing intercepts to vary across individuals. A time variable (T1, T2, T3), a group variable (four modalities of home working by key worker status), and their interaction were included in the model. The model was replicated across five levels of adjustment. (I) The *non-adjusted model* only looks at the relationship between the exposure and outcomes (but was adjusted for age in Usoc). (II) The *adjusted model* includes age, country, sex, ethnicity, education, SEC, SOC, housing tenure, household composition, household overcrowding, pre-pandemic working hours and pre-pandemic mental health. (III) The *adjusted model plus loneliness* controls for the full set of covariates in the adjusted model plus loneliness. (IV) The *adjusted model plus pre-pandemic home working propensities* includes all the variables that are controlled for in the adjusted model plus pre-pandemic home working propensities. (V) The *fully adjusted model* controls for the full set of covariates plus pre-pandemic loneliness and home working propensities.

Studies were weighted to be representative of their target populations and to account for differential attrition and non-response^{34–38}.

Results

Occupation categories by key worker and homeworking status

Using pooled data from the CLS cohorts, we compared the total number and percentage of workers across occupation categories (1-digit SOC) by work location (employers/work from home) and key worker status (both self-reported and SOC-defined) (Table 2). Firstly, we found discrepancies between the self-reported and SOC-defined key worker status, e.g., for those working at employer’s premises, a larger proportion reported being a key worker (39.6%), compared to when the SOC-defined classification was used (24.1%). This was similar for those working from home, as the proportion of self-reported key workers (17.8%) was greater than the SOC-defined proportion of key workers (9.8%), which may have been due to the changing definition of key workers across the pandemic. Second, the number of key workers varied across occupation categories. For key workers working at employer’s premises, the largest

proportion were in caring, leisure, and service occupations, e.g., childcare (20.6% self-reported, 33.5% SOC defined), and professional occupations, e.g., teaching and nursing (19.1% self-reported, 27.4% SOC-defined). For key workers working from home, the largest proportion were in professional occupations, e.g., teaching and law (37.8% self-reported, 61.3% SOC defined), and associate professional occupations, e.g., welfare (22.7% self-reported, 12.1% SOC defined). Finally, there was a general trend for those working from home to be in a higher SOC classification, which was true for key workers and non-key workers.

Using pooled data across Usoc age bands, we also assessed the distribution of occupations by work location and key worker status (only self-reported available) (Table 2). A slightly different distribution was observed compared to the CLS cohorts, as key workers working at employer's premises mostly worked in caring, leisure, and service occupations (16.7%), and elementary occupations, e.g., cleaning and storage (16.4%). The distribution of key workers working from home was more similar to CLS with the highest proportion in professional (35.6%) and associate professional occupations (23.4%). Finally, the same trend for those working from home to be in higher SOC classifications was observed.

[Please insert table 2]

Associations between key worker and homeworking status and life satisfaction, anxiety, and depression

Analyses used mixed effect models containing an interaction between the three pandemic time-points and the home working / keyworker exposure variable, so we have calculated and plotted the predicted margins from the three outcome variables. Fig. 1, 2 and 3 respectively show the predictive margins of life satisfaction, anxiety, and depression by home working / key worker status for each time point after controlling for the full set of covariates (fully adjusted model) in the CLS cohorts, while similarly, Fig. 4 and 5 respectively show predictive margins of life satisfaction, and psychiatric distress for each age group in Usoc (fully adjusted models). Full estimates, including confidence intervals, flowing from the fully adjusted models can be found in the [online appendix 1](#).

[Please, insert Fig. 1]

[Please, insert Fig. 2]

[Please, insert Fig. 3]

[Please, insert Fig. 4]

[Please, insert Fig. 5]

Before looking at each age group separately, two main observations flow from the figures. First, we observe differences across cohorts when looking at the distribution of each predicted margins that are independent of homeworking and key worker status. The younger CLS cohort (NS) reports lower life satisfaction levels compared with the older cohorts (BCS, NCDS). The same is true for anxiety and depression as older cohorts report lower anxiety and depression levels compared with younger cohorts. There was a similar trend towards greater distress in younger age groups in Usoc. This finding is consistent with other studies that have shown that younger cohorts were more likely to report poorer mental health during the Covid-19 pandemic³⁶). Second, it can be seen that life satisfaction tends to decrease over time and depression tends to increase. This is particularly marked for the older cohorts but does not apply to anxiety, which did not significantly change over time. Such a negative change in life satisfaction and depression levels might be related to lockdown fatigue and the social measures implemented in the UK at T3.

Next Steps (age 30–32) and Usoc ages 26–35: Both studies showed patterns with low life satisfaction for non-key workers at employer’s premises in the initial months of the pandemic, with improvements later in the pandemic. In NS there was some deterioration in life satisfaction over time for the other three groups, while life satisfaction was fairly stable for these groups in Usoc. Anxiety and depression symptoms were fairly stable over the pandemic in NS, with two exceptions. Non-key workers at employer’s premises had high anxiety initially and then improved, while homeworking key workers experienced a rise in depression in early 2021. In Usoc, most groups saw an improvement in psychiatric distress when restrictions eased during the summer of 2020, with increases when lockdowns were re-instated in late 2020 and early 2021. This pattern was least prominent for homeworking key workers who experienced more stable high levels of distress.

Usoc ages 36–45: This age group had a similar pattern to above, with low life satisfaction for non-key workers at employer’s premises early on, with this improving at later time points, though in this case it did not quite catch up with the other groups. Similarly, non-key workers

at employer's premises also experienced high levels of psychiatric distress early on, but this improved to match other groups at later time points.

BCS (age 50–51) and Usoc ages 46–55: In BCS, life satisfaction deteriorated across time for all groups, particularly key workers working from home, while Usoc had contrasting results whereby life satisfaction was relatively stable but tended to be higher among those working from home, especially non-key workers. Findings from BCS also showed that compared to earlier in the pandemic, anxiety improved at later time points for non-key workers at employer's premises, but got worse for key workers working from home. Depression worsened in early 2021 for all groups, particularly both groups working from home. The psychiatric distress measures from Usoc showed some slight improvements when restrictions eased, and non-key workers working from home were doing slightly better at all time points, but there was not much variation over time or between key worker and homeworking groups.

NCDS (age 62–63) and Usoc ages 56–65: In the NCDS cohort, who were approaching retirement age, life satisfaction got worse in early 2021 for all groups but non-key workers at employer's premises were least affected. In Usoc, life satisfaction was relatively stable or even slightly increased over time for all groups. Anxiety was relatively stable over time in this cohort, while depression symptoms rose over time, particularly for key workers working from home (who had the lowest levels of depression early on). In Usoc, there was a pattern whereby key workers working from home had the highest levels of distress, while key workers at employers' premises had the lowest, and this pattern was stable over time.

Across all the studies, outcomes, and age groups, two patterns were observed consistently. First, outcomes were particularly poor for non-key workers at employers' premises in the early stages of the pandemic, but this improved as the pandemic progressed. This pattern was especially prominent in the younger age groups. Second, outcomes were poor or getting worse over the course of the pandemic for key workers working from home. This pattern was clear across multiple outcomes in the CLS cohorts, but could only be seen in the oldest age group in Usoc.

Mechanisms

The estimates shown above are based on the fully adjusted models that control for a series of socio-demographic variables and employment characteristics. We hypothesise that the effects of key worker and working from home on employee's mental health could be attenuated by two mechanisms: (1) loneliness, given working from home was likely related to higher social

isolation especially in the essential occupations that are traditionally highly dependent on face-to-face contact; (2) pre-pandemic homeworking propensities, given some employees would have likely worked from home before the outbreak of the virus, which could have resulted in them and their employer being better prepared for the changes. If the hypothesised mechanisms are at play, once they are included in the models, we would expect the effects of key workers and working from home to no longer be statistically significant, or largely attenuated.

Once loneliness is accounted for in our models, the effects of being a key worker and working from home and their interaction with time, change somewhat, indicating that loneliness may have been contributing to adverse mental health outcomes of employees. For example, in terms of life satisfaction, the effect of key workers working from home is only statistically significant at 5% level in NCDS at T3 and this significance disappears once we control for loneliness. In terms of anxiety, we only observe a change in the significance of the coefficients in BCS. In this case the significance of the interaction effect of non-key workers who work from home at T3, as well as the main effect for this groups disappears. In terms of depression, the significance disappears in NCDS for key workers who work from home at T2. We can also see that those who were lonely some of the time or often, as compared to those who were hardly ever lonely were significantly less satisfied with their lives, more anxious and more depressed. While the effects of loneliness on life satisfaction are larger in the younger cohorts, we do not observe much difference in the two older cohorts for anxiety and depression, but in this case the effect is also substantially larger for younger cohorts.

However, accounting for the pre-pandemic propensities to work from home, the expected levels of life satisfaction, anxiety and depression do not change much. This implies that having worked in occupations that were better prepared to work from home had a negligible impact on employee's mental health during the pandemic.

Finally, it must be mentioned that the analyses in the CLS cohorts have been replicated using a SOC-based definition of key worker status instead of a self-reported variable. Estimates did not vary significantly, but broader confidence intervals, particularly due to the reduced number of key workers in the SOC-based variable, were observed.

Discussion

This study has a few limitations that mainly relate to the comparability of the datasets that were used. First, the definition of homeworking is slightly different across studies. In the CLS

cohorts, information about homeworking was collected on a binary basis (home working versus working at employer's premises) in T1, whilst T2 and T3 allowed respondents to answer that they were working some days at home and some days at their employer's premises. To be able to use the three sweeps, we have combined these modalities, distinguishing those working fully or partially from home, from those working fully at their employer's premises. Further analyses have been made separately and the association of the combination of homeworking and working at employer's premises with mental health occupies an intermediary position between full homeworking and no homeworking. Second, the Standard Occupational Classification (SOC) is not homogeneous across studies. In the CLS cohorts, we used pre-pandemic information based on the SOC2010 classification whilst, in Usoc, the SOC variable combines the SOC2010 and the SOC2000 nomenclatures depending on when the respondents started their current job. A third limitation is about the self-reported definition of being a key worker. Both Usoc and the CLS cohorts show very high propensities of declaring being a key worker, respectively 49.1 in CLS and 55.7 in Usoc (this is comparable with what observed in other studies using a self-reported definition³⁹). By comparison, government reports estimated this figure to reflect 33 percent of the workforce before the start of the pandemic²³). However, using the IFS SOC-defined key worker variable (instead of the self-reported variable) we find no significant difference in the association with mental health. Finally, broad confidence intervals can be observed for the predictive margins among non-key workers at employer's premises, particularly among the youngest cohorts (in Usoc 26–35 and 36–45, as well as in NS) at T1 (May 2020 in the CLS cohorts and in April-June 2020 in Usoc). This could be explained by the period when data were collected that was characterised by a very strict lockdown, and that very few young respondents among the sectors were in this configuration (i.e., associate professional and technical occupations, administrative and secretarial occupations, and skilled trades occupations).

Despite these limitations, several findings flow from this study that are of interest both in terms of public policy and further research on homeworking and mental health.

Firstly, a main finding is that key workers working from home are those who have reported the worst mental health outcomes relative to other groups. It is also consistent across studies and age groups that this group's relative position has deteriorated over the pandemic, with effects being slightly worse in older cohorts. It can be hypothesized that some specific key workers – who have had a strong societal role – might have been forced to work fully or partially from home, which might have generated a feeling of frustration regarding their work leading to

poorer mental health outcomes. This assumption is supported when looking at the sectors of activity where key workers working from home are employed as there is a high prevalence of teaching and educational professions and, to a lesser extent, governmental administrative occupations within this category. These are less represented when looking at key workers working from their employer's premises. Considering teaching professionals as an example, increasing psychological distress may have been related to chaotic school re-opening policy during this period, which saw repeated social isolations for large groups of students in response to cases of Covid-19 within schools, meaning that teachers were constantly reverting between in-person and home-based teaching.

Whilst the shift towards homeworking patterns during the pandemic is associated with greater physical and mental health issues¹⁷⁾, particularly for those with no prior home working experience⁴⁰⁾, this study confirms those findings but nuances them by pointing out the detrimental role of being a key worker in explaining such a relationship. A substantial contribution of this study is to demonstrate that the societal role associated with some critical jobs might be an explanation of worse mental health across key workers. Although the critical nature of one's job is highly subjective (a higher proportion of workers declare being a key worker compared with the actual figures), the self-reported sense of occupying a critical position as well as the actual key worker classification play a part in explaining how home working might have generated lower mental health outcomes. Further studies should focus on such a neglected aspect and the experience of home working for those who consider their job as critical.

Second, non-key workers working at employer's premises started off with very poor mental health (particularly in young age groups), but their mental health improved at subsequent time points. Three explanations could be speculated. First, there might have been a lag within some companies in implementing home working policies or using the Covid-19 job retention scheme (furlough) to allow workers to be temporally unemployed. Second, there might be some endogeneity in the relationship as respondents with poor mental health might have been allowed to keep working from their employers' premises. Third, the overall population in our study might be different from one time point to another since we restricted the sample to those working only, omitting the unemployed and furloughed^{35, 36)} (although a study in the US has shown that changes in employment status were not associated with pre-pandemic homeworking possibilities⁴¹⁾).

Most pre-pandemic studies have considered the relationship between home working and mental health as consistent over time, but recent studies have pointed out that the effect of working from home on mental health may be different during the pandemic, and may even differ over time as the pandemic progresses^{42, 43}). Our study confirms that within a pandemic context, that the relationship between mental health and home working has changed over time and might be partially affected by the social measures (e.g., lockdowns) implemented at different stages of the pandemic. Further studies could investigate the extent to which associations changing over time is attributable to differences in the background propensity to remain fully working from home and whether and for whom some exposure to on-site working could mitigate or exacerbate mental health disadvantages.

Finally, it must be mentioned that both time and age/cohort play a role when looking at the association between homeworking and key worker status and mental health. The study finds that working from home was associated with worsening of mental health across the pandemic, particularly for key workers and older adults. Usoc findings suggest that working from home was somewhat better for younger people, and worse for older people. This should be accounted for if further lockdowns were to be imposed in the future. However, given the changes that are observed over the time points, one should remain cautious and not generalize these observations to post-pandemic times as the distinction between key workers and non-key workers might not be as marked.

Mental health differences by age and sex have been constantly observed⁴⁴) and both differences have widened during the pandemic⁴⁵) but independently of labour market positions or the type of employment arrangement^{19, 46}). We find that younger cohorts or age groups have been reporting lower life satisfaction (except in Usoc), higher anxiety, higher depression and higher psychiatric distress compared with older cohorts or age groups throughout the pandemic. Whilst our study does not directly test for age differences, accounting for age group discrepancies when looking mental health by homeworking and key worker status is of interest and specific attention should be given to the younger populations who report overall worse mental health. Younger age groups would have been most likely to have school-aged children at home, and their experience of home working during the pandemic may have been further complicated by school closures - understanding the impact of this is an important avenue for further research to inform future school closure policy.

Funding

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Table 1. Study sample sizes over the three pandemic time periods

	Period 1	Period 2	Period 3	Total
CLS Cohorts	May 2020	Sep–Oct 2020	Feb–Mar 2021	
1958 National Child Development Study (NCDS)	2,224	2,764	3,003	8,016
1970 British Cohort Study (BCS)	3,101	3,874	4,175	11,150
1989–90 Next Steps (NS)	1,504	2,851	3,265	7,620
Total	6,849	9,494	10,443	26,786
Understanding Society (UsoC)^a	Apr–Jun 2020	Jul–Sep 2020	Nov 2020– Mar 2021	
Ages 26–35	1,999	1,149	1,481	4,629
Ages 36–45	3,315	1,985	2,564	7,864
Ages 46–55	4,509	2,732	3,723	10,964
Ages 56–65	3,470	2,290	3,165	8,925
Total	13,293	8,156	10,933	32,382

^aAs UsoC had taken multiple surveys within each period, figures represent the total number of distinct measures taken during each period.

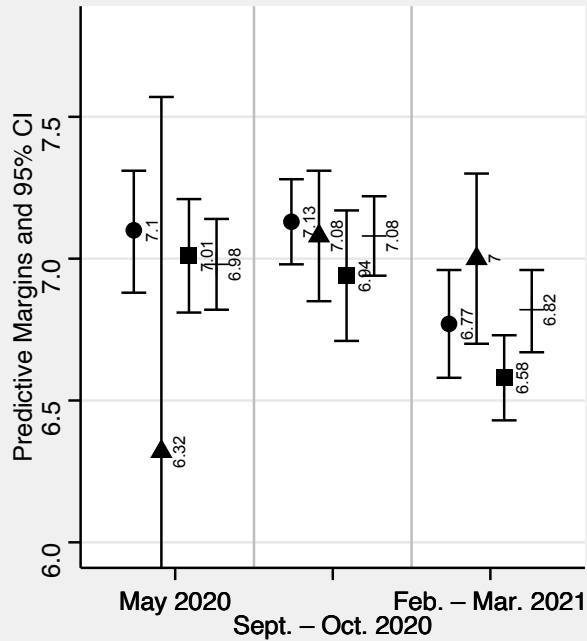
Table 2. Self-reported and SOC-based key worker status by 1-digit Standard Occupational Classification (SOC2010) (Pooled data)

Standard Occupational Classification (SOC 2010)	Self-reported key worker status (Pooled CLS data)							
	Employer's premises / Non key worker		Employer's premises / Key worker		Homeworking / Non key worker		Homeworking / Key worker	
	N	Percent	N	Percent	N	Percent	N	Percent
1) Managers, directors, and senior officials	311	8.6	428	4.0	937	12.0	316	6.6
2) Professional occupations	309	8.6	2,023	19.1	2,591	33.2	1,807	37.8
3) Associate professional and technical occupations	449	12.4	947	8.9	2,173	27.8	1,084	22.7
4) Administrative and secretarial occupations	601	16.7	1,395	13.1	1,592	20.4	899	18.8
5) Skilled trades occupations	676	18.7	817	7.7	129	1.6	179	3.7
6) Caring, leisure and other service occupations	234	6.5	2,184	20.6	118	1.5	294	6.1
7) Sales and customer service occupations	333	9.2	861	8.1	202	2.6	148	3.1
8) Process, plant, and machine operatives	339	9.4	1,049	9.9	25	0.3	32	0.7
9) Elementary occupations	357	9.9	909	8.6	37	0.5	26	0.5
Total	3,609	100	10,613	100	7,804	99.9	4,785	100
Percent	13.5		39.6		29.1		17.8	
	Pre-pandemic SOC-based key worker status (Pooled CLS data)							
1) Managers, directors, and senior officials	549	7.06	194	2.99	1,093	10.96	164	6.2
2) Professional occupations	571	7.34	1,776	27.37	2,783	27.91	1,621	61.29
3) Associate professional and technical occupations	826	10.62	575	8.86	2,948	29.56	320	12.1
4) Administrative and secretarial occupations	1,769	22.74	230	3.55	2,395	24.01	102	3.86
5) Skilled trades occupations	1,355	17.42	143	2.2	277	2.78	31	1.17
6) Caring, leisure and other service occupations	248	3.19	2,176	33.54	51	0.51	361	13.65
7) Sales and customer service occupations	896	11.52	300	4.62	344	3.45	6	0.23
8) Process, plant, and machine operatives	556	7.15	835	12.87	33	0.33	24	0.91
9) Elementary occupations	1,009	12.97	259	3.99	49	0.49	16	0.6
Total	7,779	100.0	6,488	100.0	9,973	100.0	2,645	100.0
Percent	28.9		24.1		37.1		9.8	
	Self-reported key worker status (Pooled Usoc data)							
1) Managers, directors, and senior officials	439	9.7	641	7.1	1,954	17.0	878	12.0
2) Professional occupations	258	5.7	1,247	13.8	3,368	29.3	2,607	35.6

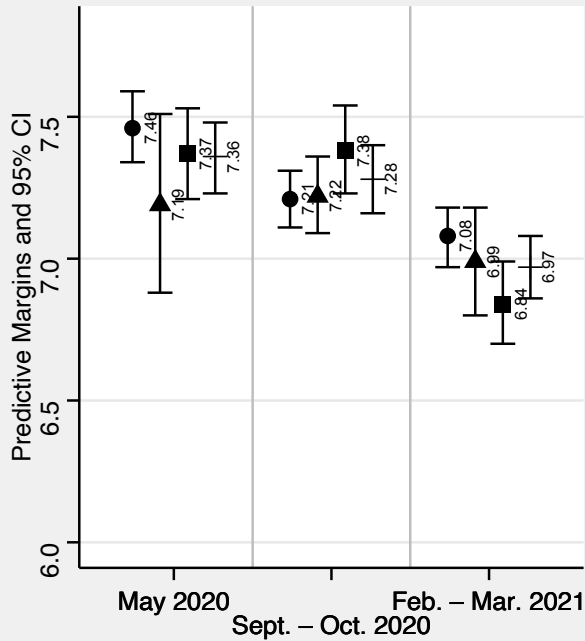
3) Associate professional and technical occupations	470	10.4	994	11.0	3,284	28.6	1,716	23.4
4) Administrative and secretarial occupations	393	8.7	723	8.0	1,621	14.1	732	10.0
5) Skilled trades occupations	1,027	22.7	723	8.0	436	3.8	146	2.0
6) Caring, leisure and other service occupations	344	7.6	1,509	16.7	263	2.3	759	10.4
7) Sales and customer service occupations	353	7.8	1,012	11.2	296	2.6	259	3.5
8) Process, plant, and machine operatives	511	11.3	705	7.8	126	1.1	119	1.6
9) Elementary occupations	728	16.1	1,482	16.4	149	1.3	110	1.5
Total	4,523	100.0	9,036	100.0	11,497	100.0	7,326	100.0
Percent	14.0		27.9		35.5		22.6	

Note: CLS refers to the Centre for Longitudinal cohorts (i.e., the 1958 National Child Development Study (NCDS), the 1970 British Cohort Study (BCS) and the 1989-90 Next Steps (NS)). Usoc refers to Understanding Society.

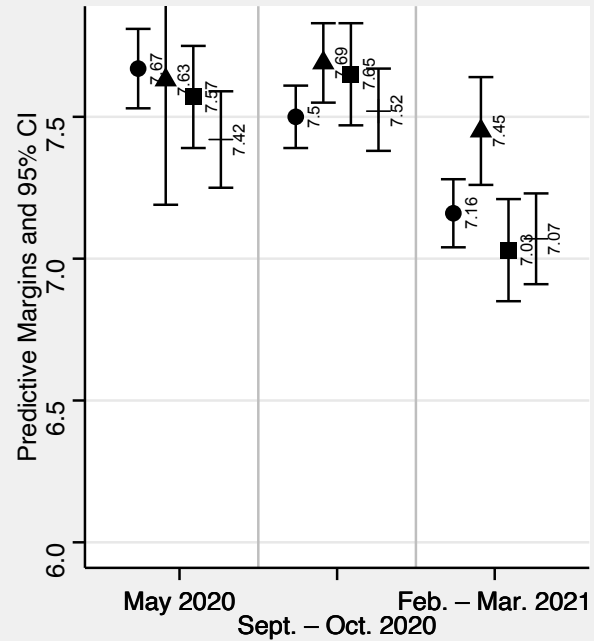
1989-90 Next Steps
(NS)



1970 British Cohort
Study (BCS)

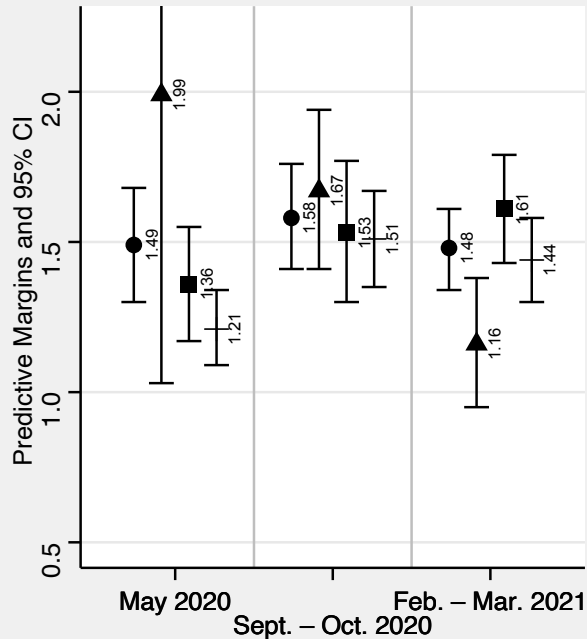


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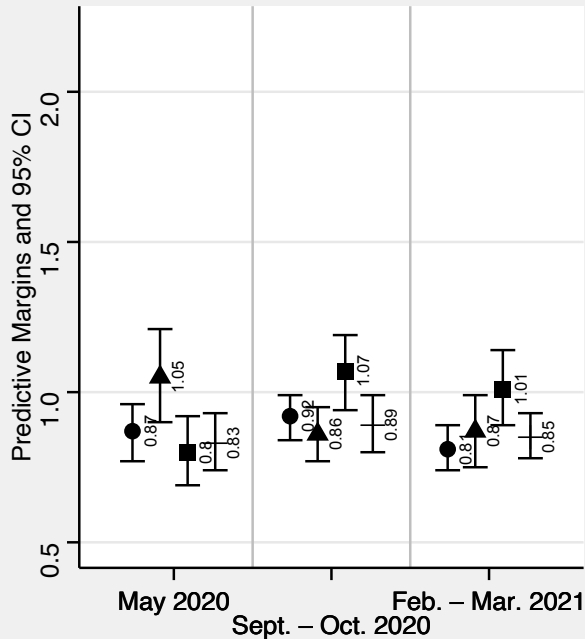


● Employer's premises / Key worker ▲ Employer's premises / Non key worker ■ Home working / Key worker + Home working / Non key worker

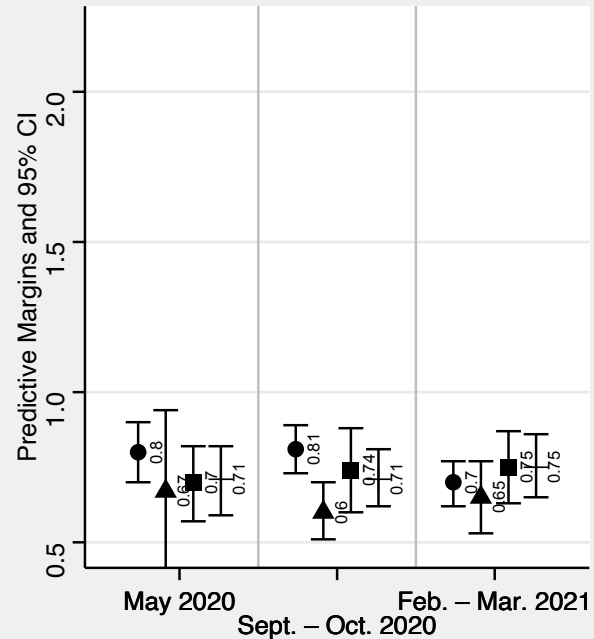
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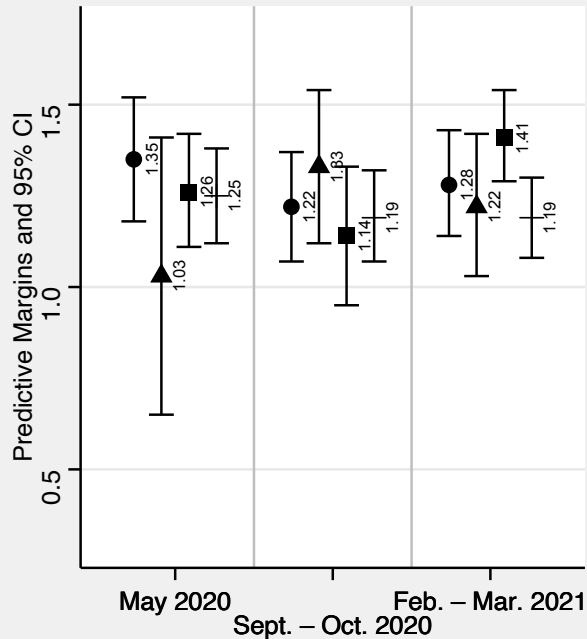


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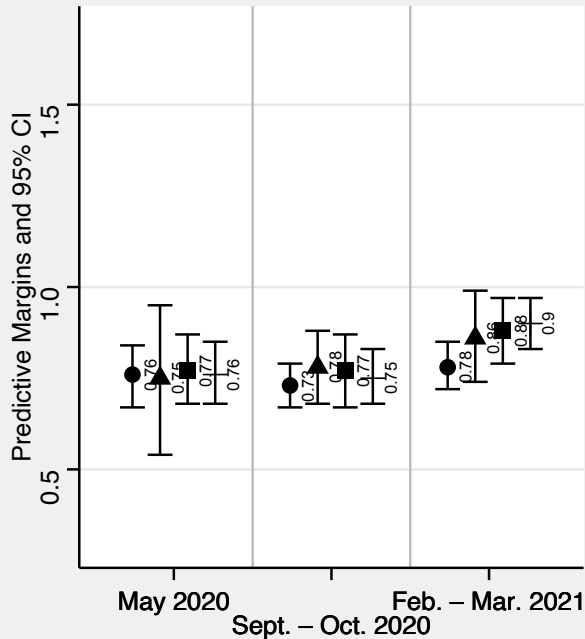


● Employer's premises / Key worker ▲ Employer's premises / Non key worker ■ Home working / Key worker + Home working / Non key worker

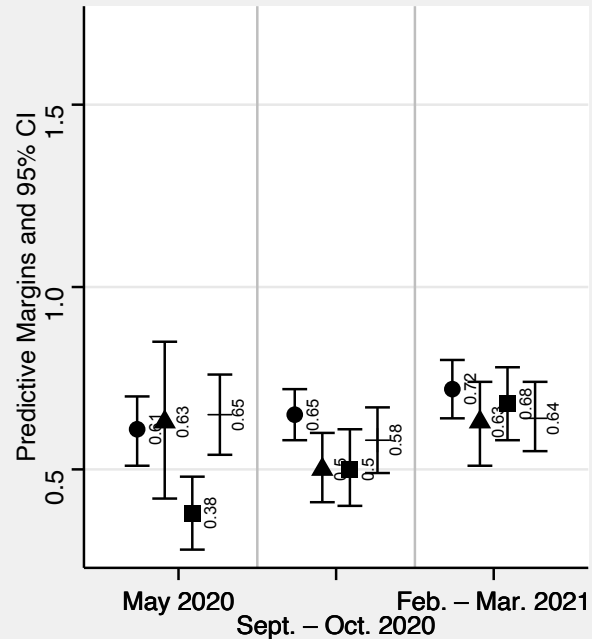
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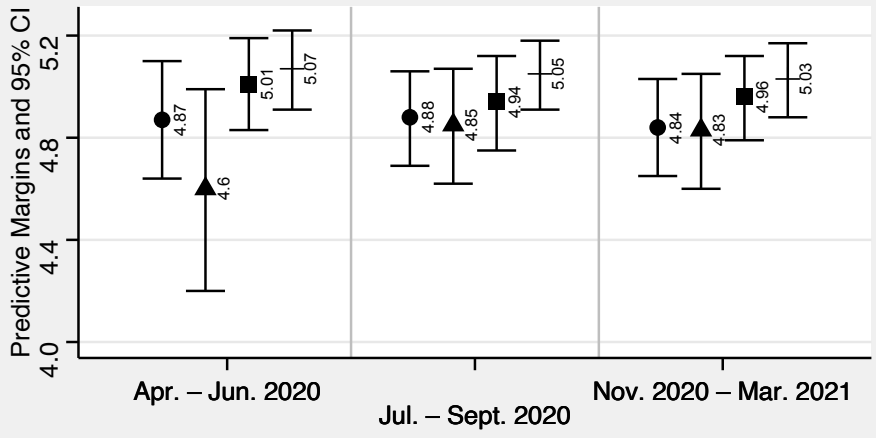


1958 National Child
Development Study (NCDS)

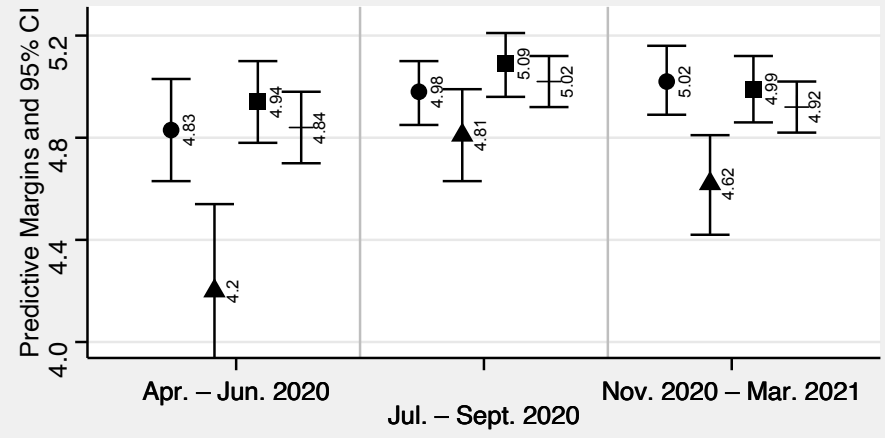


● Employer's premises / Key worker ▲ Employer's premises / Non key worker ■ Home working / Key worker + Home working / Non key worker

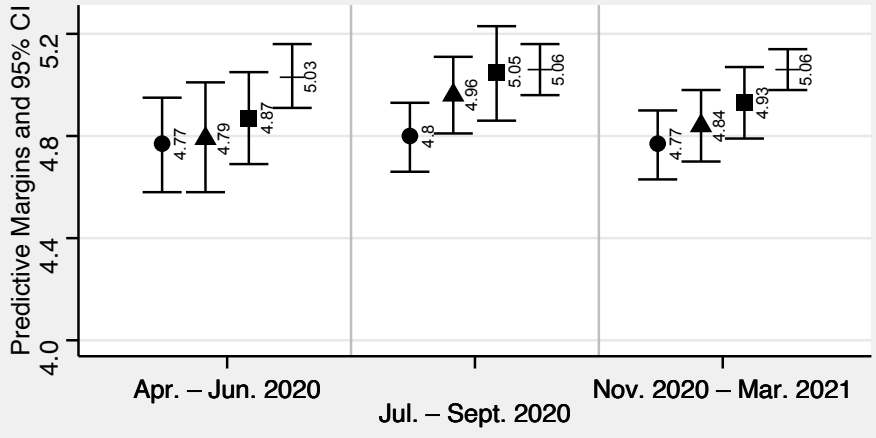
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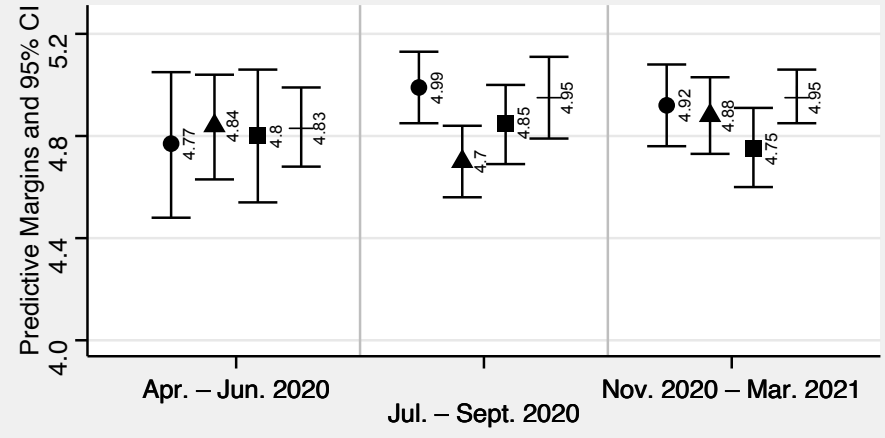
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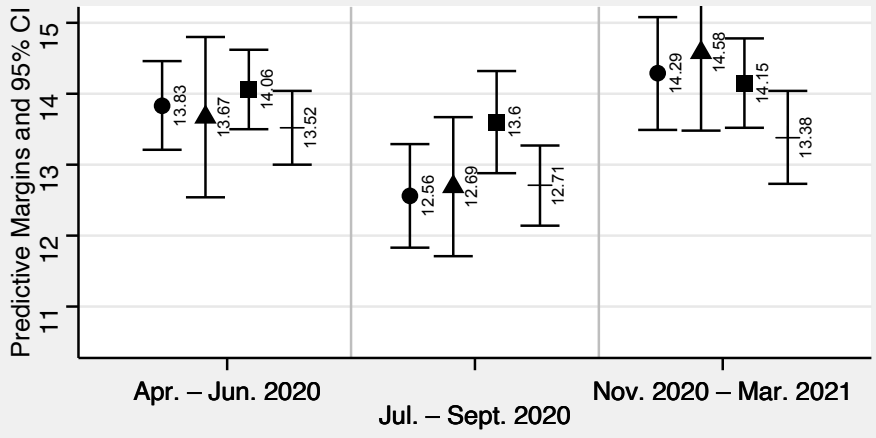


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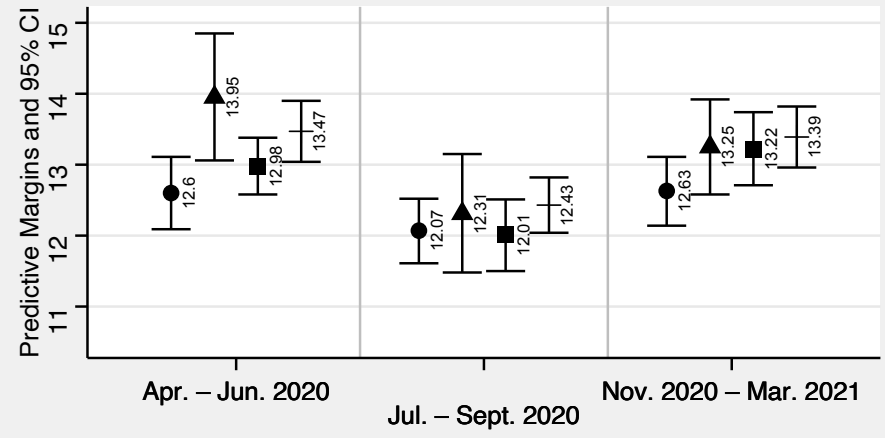


● Employer's premises / Key worker ▲ Employer's premises / Non key worker ■ Home working / Key worker + Home working / Non key worker

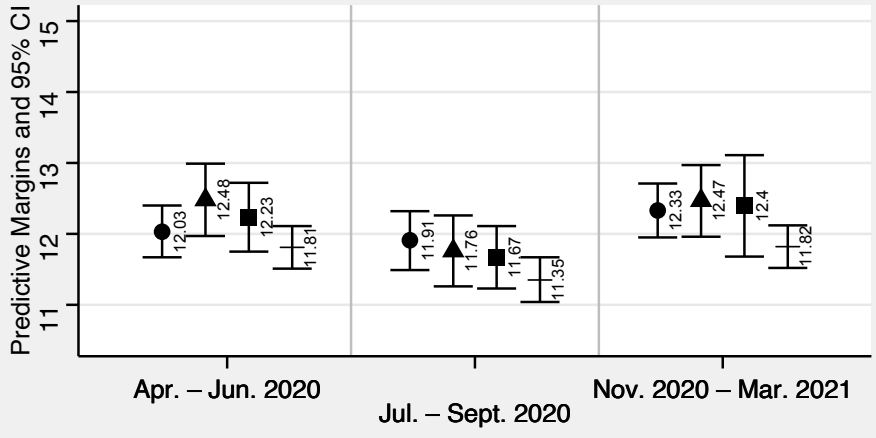
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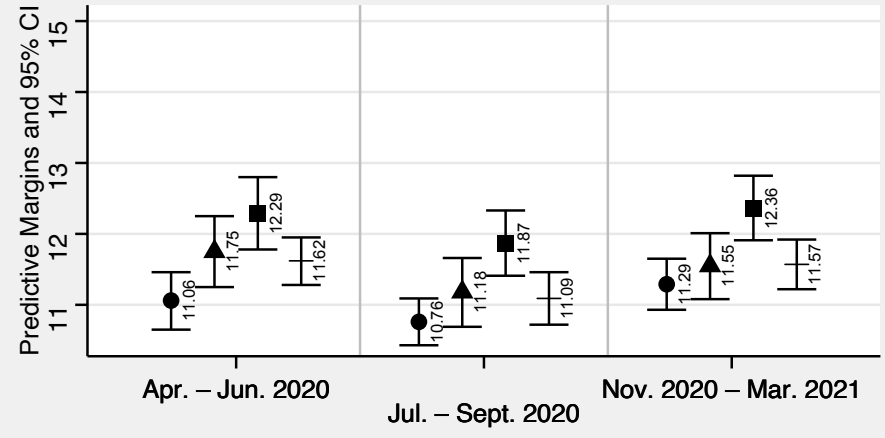
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● Employer's premises / Key worker ▲ Employer's premises / Non key worker ■ Home working / Key worker + Home working / Non key worker

Appendix 1

Predictive margins and 95% CI of life satisfaction by home working and key worker status (fully adjusted model)

Wave	Exposure	Self-reported key worker status			SOC-based key worker status		
		Margins	lower ci	upper ci	Probability	lower ci	upper ci
1989-90 Next Steps (NS)							
May 2020	Employer's premises / Non key worker	6.32	5.08	7.57	7.36	7.19	7.52
Sept. – Oct. 2020	Employer's premises / Non key worker	7.08	6.85	7.31	7.19	7.08	7.3
Feb. – Mar. 2021	Employer's premises / Non key worker	7	6.7	7.3	7.05	6.93	7.17
May 2020	Employer's premises / Key worker	7.1	6.88	7.31	7.49	7.34	7.65
Sept. – Oct. 2020	Employer's premises / Key worker	7.13	6.98	7.28	7.25	7.14	7.37
Feb. – Mar. 2021	Employer's premises / Key worker	6.77	6.58	6.96	7.07	6.94	7.21
May 2020	Home working / Non key worker	6.98	6.82	7.14	7.33	7.22	7.44
Sept. – Oct. 2020	Home working / Non key worker	7.08	6.94	7.22	7.31	7.21	7.41
Feb. – Mar. 2021	Home working / Non key worker	6.82	6.67	6.96	6.94	6.85	7.04
May 2020	Home working / Key worker	7.01	6.81	7.21	7.47	7.29	7.66
Sept. – Oct. 2020	Home working / Key worker	6.94	6.71	7.17	7.29	7.06	7.53
Feb. – Mar. 2021	Home working / Key worker	6.58	6.43	6.73	6.79	6.61	6.97
1970 British Cohort Study (BCS)							
May 2020	Employer's premises / Non key worker	7.19	6.88	7.51	7.36	7.19	7.52
Sept. – Oct. 2020	Employer's premises / Non key worker	7.22	7.09	7.36	7.19	7.08	7.3
Feb. – Mar. 2021	Employer's premises / Non key worker	6.99	6.8	7.18	7.05	6.93	7.17
May 2020	Employer's premises / Key worker	7.46	7.34	7.59	7.49	7.34	7.65
Sept. – Oct. 2020	Employer's premises / Key worker	7.21	7.11	7.31	7.25	7.14	7.37
Feb. – Mar. 2021	Employer's premises / Key worker	7.08	6.97	7.18	7.07	6.94	7.21
May 2020	Home working / Non key worker	7.36	7.23	7.48	7.33	7.22	7.44
Sept. – Oct. 2020	Home working / Non key worker	7.28	7.16	7.4	7.31	7.21	7.41
Feb. – Mar. 2021	Home working / Non key worker	6.97	6.86	7.08	6.94	6.85	7.04
May 2020	Home working / Key worker	7.37	7.21	7.53	7.47	7.29	7.66
Sept. – Oct. 2020	Home working / Key worker	7.38	7.23	7.54	7.29	7.06	7.53
Feb. – Mar. 2021	Home working / Key worker	6.84	6.7	6.99	6.79	6.61	6.97

1958 National Child Development Study (NCDS)							
May 2020	Employer's premises / Non key worker	7.63	7.19	8.07	7.66	7.47	7.85
Sept. – Oct. 2020	Employer's premises / Non key worker	7.69	7.55	7.83	7.62	7.51	7.73
Feb. – Mar. 2021	Employer's premises / Non key worker	7.45	7.26	7.64	7.3	7.16	7.44
May 2020	Employer's premises / Key worker	7.67	7.53	7.81	7.69	7.5	7.89
Sept. – Oct. 2020	Employer's premises / Key worker	7.5	7.39	7.61	7.44	7.3	7.57
Feb. – Mar. 2021	Employer's premises / Key worker	7.16	7.04	7.28	7.13	6.97	7.28
May 2020	Home working / Non key worker	7.42	7.25	7.59	7.49	7.34	7.64
Sept. – Oct. 2020	Home working / Non key worker	7.52	7.38	7.67	7.59	7.46	7.72
Feb. – Mar. 2021	Home working / Non key worker	7.07	6.91	7.23	7.08	6.94	7.22
May 2020	Home working / Key worker	7.57	7.39	7.75	7.46	7.24	7.68
Sept. – Oct. 2020	Home working / Key worker	7.65	7.47	7.83	7.49	7.23	7.75
Feb. – Mar. 2021	Home working / Key worker	7.03	6.85	7.21	6.96	6.74	7.18

Understanding Society (26–35)

May 2020	Employer's premises / Non key worker	4.6	4.2	4.99
Sept. – Oct. 2020	Employer's premises / Non key worker	4.85	4.62	5.07
Feb. – Mar. 2021	Employer's premises / Non key worker	4.83	4.6	5.05
May 2020	Employer's premises / Key worker	4.87	4.64	5.1
Sept. – Oct. 2020	Employer's premises / Key worker	4.88	4.69	5.06
Feb. – Mar. 2021	Employer's premises / Key worker	4.84	4.65	5.03
May 2020	Home working / Non key worker	5.07	4.91	5.22
Sept. – Oct. 2020	Home working / Non key worker	5.05	4.91	5.18
Feb. – Mar. 2021	Home working / Non key worker	5.03	4.88	5.17
May 2020	Home working / Key worker	5.01	4.83	5.19
Sept. – Oct. 2020	Home working / Key worker	4.94	4.75	5.12
Feb. – Mar. 2021	Home working / Key worker	4.96	4.79	5.12

Understanding Society (36–45)

May 2020	Employer's premises / Non key worker	4.2	3.86	4.54
Sept. – Oct. 2020	Employer's premises / Non key worker	4.81	4.63	4.99
Feb. – Mar. 2021	Employer's premises / Non key worker	4.62	4.42	4.81
May 2020	Employer's premises / Key worker	4.83	4.63	5.03
Sept. – Oct. 2020	Employer's premises / Key worker	4.98	4.85	5.1
Feb. – Mar. 2021	Employer's premises / Key worker	5.02	4.89	5.16

May 2020	Home working / Non key worker	4.84	4.7	4.98
Sept. – Oct. 2020	Home working / Non key worker	5.02	4.92	5.12
Feb. – Mar. 2021	Home working / Non key worker	4.92	4.82	5.02
May 2020	Home working / Key worker	4.94	4.78	5.1
Sept. – Oct. 2020	Home working / Key worker	5.09	4.96	5.21
Feb. – Mar. 2021	Home working / Key worker	4.99	4.86	5.12

Understanding Society (46–55)

May 2020	Employer's premises / Non key worker	4.79	4.58	5.01
Sept. – Oct. 2020	Employer's premises / Non key worker	4.96	4.81	5.11
Feb. – Mar. 2021	Employer's premises / Non key worker	4.84	4.7	4.98
May 2020	Employer's premises / Key worker	4.77	4.58	4.95
Sept. – Oct. 2020	Employer's premises / Key worker	4.8	4.66	4.93
Feb. – Mar. 2021	Employer's premises / Key worker	4.77	4.63	4.9
May 2020	Home working / Non key worker	5.03	4.91	5.16
Sept. – Oct. 2020	Home working / Non key worker	5.06	4.96	5.16
Feb. – Mar. 2021	Home working / Non key worker	5.06	4.98	5.14
May 2020	Home working / Key worker	4.87	4.69	5.05
Sept. – Oct. 2020	Home working / Key worker	5.05	4.86	5.23
Feb. – Mar. 2021	Home working / Key worker	4.93	4.79	5.07

Understanding Society (56–65)

May 2020	Employer's premises / Non key worker	4.84	4.63	5.04
Sept. – Oct. 2020	Employer's premises / Non key worker	4.7	4.56	4.84
Feb. – Mar. 2021	Employer's premises / Non key worker	4.88	4.73	5.03
May 2020	Employer's premises / Key worker	4.77	4.48	5.05
Sept. – Oct. 2020	Employer's premises / Key worker	4.99	4.85	5.13
Feb. – Mar. 2021	Employer's premises / Key worker	4.92	4.76	5.08
May 2020	Home working / Non key worker	4.83	4.68	4.99
Sept. – Oct. 2020	Home working / Non key worker	4.95	4.79	5.11
Feb. – Mar. 2021	Home working / Non key worker	4.95	4.85	5.06
May 2020	Home working / Key worker	4.8	4.54	5.06
Sept. – Oct. 2020	Home working / Key worker	4.85	4.69	5
Feb. – Mar. 2021	Home working / Key worker	4.75	4.6	4.91

Predictive margins and 95% CI of anxiety by home working and key worker status (fully adjusted model)

Wave	Exposure	Self-reported key worker status			SOC-based key worker status		
		Margins	lower ci	upper ci	Probability	lower ci	upper ci
1989-90 Next Steps (NS)							
May 2020	Employer's premises / Non key worker	1.99	1.03	2.95	0.91	0.79	1.03
Sept. – Oct. 2020	Employer's premises / Non key worker	1.67	1.41	1.94	0.86	0.78	0.93
Feb. – Mar. 2021	Employer's premises / Non key worker	1.16	0.95	1.38	0.79	0.71	0.87
May 2020	Employer's premises / Key worker	1.49	1.3	1.68	0.88	0.75	1
Sept. – Oct. 2020	Employer's premises / Key worker	1.58	1.41	1.76	0.95	0.85	1.05
Feb. – Mar. 2021	Employer's premises / Key worker	1.48	1.34	1.61	0.87	0.77	0.97
May 2020	Home working / Non key worker	1.21	1.09	1.34	0.82	0.74	0.9
Sept. – Oct. 2020	Home working / Non key worker	1.51	1.35	1.67	0.93	0.86	1.01
Feb. – Mar. 2021	Home working / Non key worker	1.44	1.3	1.58	0.9	0.83	0.97
May 2020	Home working / Key worker	1.36	1.17	1.55	0.82	0.65	0.99
Sept. – Oct. 2020	Home working / Key worker	1.53	1.3	1.77	1.05	0.8	1.29
Feb. – Mar. 2021	Home working / Key worker	1.61	1.43	1.79	1	0.85	1.16
1970 British Cohort Study (BCS)							
May 2020	Employer's premises / Non key worker	1.05	0.9	1.21	0.91	0.79	1.03
Sept. – Oct. 2020	Employer's premises / Non key worker	0.86	0.77	0.95	0.86	0.78	0.93
Feb. – Mar. 2021	Employer's premises / Non key worker	0.87	0.75	0.99	0.79	0.71	0.87
May 2020	Employer's premises / Key worker	0.87	0.77	0.96	0.88	0.75	1
Sept. – Oct. 2020	Employer's premises / Key worker	0.92	0.84	0.99	0.95	0.85	1.05
Feb. – Mar. 2021	Employer's premises / Key worker	0.81	0.74	0.89	0.87	0.77	0.97
May 2020	Home working / Non key worker	0.83	0.74	0.93	0.82	0.74	0.9
Sept. – Oct. 2020	Home working / Non key worker	0.89	0.8	0.99	0.93	0.86	1.01
Feb. – Mar. 2021	Home working / Non key worker	0.85	0.78	0.93	0.9	0.83	0.97
May 2020	Home working / Key worker	0.8	0.69	0.92	0.82	0.65	0.99
Sept. – Oct. 2020	Home working / Key worker	1.07	0.94	1.19	1.05	0.8	1.29
Feb. – Mar. 2021	Home working / Key worker	1.01	0.89	1.14	1	0.85	1.16
1958 National Child Development Study (NCDS)							
May 2020	Employer's premises / Non key worker	0.67	0.41	0.94	0.77	0.63	0.9
Sept. – Oct. 2020	Employer's premises / Non key worker	0.6	0.51	0.7	0.72	0.64	0.81
Feb. – Mar. 2021	Employer's premises / Non key worker	0.65	0.53	0.77	0.66	0.58	0.74

May 2020	Employer's premises / Key worker	0.8	0.7	0.9	0.81	0.68	0.95
Sept. – Oct. 2020	Employer's premises / Key worker	0.81	0.73	0.89	0.79	0.7	0.89
Feb. – Mar. 2021	Employer's premises / Key worker	0.7	0.62	0.77	0.72	0.62	0.83
May 2020	Home working / Non key worker	0.71	0.59	0.82	0.66	0.56	0.76
Sept. – Oct. 2020	Home working / Non key worker	0.71	0.62	0.81	0.68	0.59	0.76
Feb. – Mar. 2021	Home working / Non key worker	0.75	0.65	0.86	0.7	0.61	0.79
May 2020	Home working / Key worker	0.7	0.57	0.82	0.81	0.64	0.99
Sept. – Oct. 2020	Home working / Key worker	0.74	0.6	0.88	0.85	0.67	1.04
Feb. – Mar. 2021	Home working / Key worker	0.75	0.63	0.87	0.89	0.72	1.05

Predictive margins and 95% CI of depression by home working and key worker status (fully adjusted model)

Wave	Exposure	Self-reported key worker status			SOC-based key worker status		
		Margins	lower ci	upper ci	Probability	lower ci	upper ci
1989–90 Next Steps (NS)							
May 2020	Employer’s premises / Non key worker	1.03	0.65	1.41	0.72	0.61	0.83
Sept. – Oct. 2020	Employer’s premises / Non key worker	1.33	1.12	1.54	0.79	0.72	0.87
Feb. – Mar. 2021	Employer’s premises / Non key worker	1.22	1.03	1.42	0.86	0.78	0.94
May 2020	Employer’s premises / Key worker	1.35	1.18	1.52	0.8	0.69	0.9
Sept. – Oct. 2020	Employer’s premises / Key worker	1.22	1.07	1.37	0.68	0.6	0.75
Feb. – Mar. 2021	Employer’s premises / Key worker	1.28	1.14	1.43	0.73	0.65	0.82
May 2020	Home working / Non key worker	1.25	1.12	1.38	0.79	0.72	0.86
Sept. – Oct. 2020	Home working / Non key worker	1.19	1.07	1.32	0.77	0.7	0.84
Feb. – Mar. 2021	Home working / Non key worker	1.19	1.08	1.3	0.92	0.86	0.98
May 2020	Home working / Key worker	1.26	1.11	1.42	0.69	0.55	0.82
Sept. – Oct. 2020	Home working / Key worker	1.14	0.95	1.33	0.73	0.56	0.9
Feb. – Mar. 2021	Home working / Key worker	1.41	1.29	1.54	0.78	0.66	0.89
1970 British Cohort Study (BCS)							
May 2020	Employer’s premises / Non key worker	7.19	6.88	7.51	0.72	0.61	0.83
Sept. – Oct. 2020	Employer’s premises / Non key worker	7.22	7.09	7.36	0.79	0.72	0.87
Feb. – Mar. 2021	Employer’s premises / Non key worker	6.99	6.8	7.18	0.86	0.78	0.94
May 2020	Employer’s premises / Key worker	7.46	7.34	7.59	0.8	0.69	0.9
Sept. – Oct. 2020	Employer’s premises / Key worker	7.21	7.11	7.31	0.68	0.6	0.75
Feb. – Mar. 2021	Employer’s premises / Key worker	7.08	6.97	7.18	0.73	0.65	0.82
May 2020	Home working / Non key worker	7.36	7.23	7.48	0.79	0.72	0.86
Sept. – Oct. 2020	Home working / Non key worker	7.28	7.16	7.4	0.77	0.7	0.84
Feb. – Mar. 2021	Home working / Non key worker	6.97	6.86	7.08	0.92	0.86	0.98
May 2020	Home working / Key worker	7.37	7.21	7.53	0.69	0.55	0.82
Sept. – Oct. 2020	Home working / Key worker	7.38	7.23	7.54	0.73	0.56	0.9
Feb. – Mar. 2021	Home working / Key worker	6.84	6.7	6.99	0.78	0.66	0.89
1958 National Child Development Study (NCDS)							
May 2020	Employer’s premises / Non key worker	0.63	0.42	0.85	0.58	0.47	0.7
Sept. – Oct. 2020	Employer’s premises / Non key worker	0.5	0.41	0.6	0.58	0.51	0.65

Feb. – Mar. 2021	Employer’s premises / Non key worker	0.63	0.51	0.74	0.67	0.59	0.75
May 2020	Employer’s premises / Key worker	0.61	0.51	0.7	0.63	0.51	0.75
Sept. – Oct. 2020	Employer’s premises / Key worker	0.65	0.58	0.72	0.66	0.58	0.75
Feb. – Mar. 2021	Employer’s premises / Key worker	0.72	0.64	0.8	0.75	0.64	0.85
May 2020	Home working / Non key worker	0.65	0.54	0.76	0.55	0.47	0.64
Sept. – Oct. 2020	Home working / Non key worker	0.58	0.49	0.67	0.54	0.47	0.62
Feb. – Mar. 2021	Home working / Non key worker	0.64	0.55	0.74	0.66	0.57	0.74
May 2020	Home working / Key worker	0.38	0.28	0.48	0.51	0.35	0.66
Sept. – Oct. 2020	Home working / Key worker	0.5	0.4	0.61	0.59	0.4	0.78
Feb. – Mar. 2021	Home working / Key worker	0.68	0.58	0.78	0.67	0.53	0.8

Predictive margins and 95% CI of GHQ (General Health Questionnaire) by home working and key worker status (fully adjusted model)

Wave	Exposure	Self-reported key worker status		
		Margins	lower ci	upper ci
Understanding Society (26–35)				
May 2020	Employer’s premises / Non key worker	13.67	12.54	14.8
Sept. – Oct. 2020	Employer’s premises / Non key worker	12.69	11.71	13.67
Feb. – Mar. 2021	Employer’s premises / Non key worker	14.58	13.48	15.69
May 2020	Employer’s premises / Key worker	13.83	13.21	14.46
Sept. – Oct. 2020	Employer’s premises / Key worker	12.56	11.83	13.29
Feb. – Mar. 2021	Employer’s premises / Key worker	14.29	13.49	15.08
May 2020	Home working / Non key worker	13.52	13	14.04
Sept. – Oct. 2020	Home working / Non key worker	12.71	12.14	13.27
Feb. – Mar. 2021	Home working / Non key worker	13.38	12.73	14.04
May 2020	Home working / Key worker	14.06	13.5	14.62
Sept. – Oct. 2020	Home working / Key worker	13.6	12.88	14.32
Feb. – Mar. 2021	Home working / Key worker	14.15	13.52	14.78
Understanding Society (36–45)				
May 2020	Employer’s premises / Non key worker	13.95	13.06	14.85
Sept. – Oct. 2020	Employer’s premises / Non key worker	12.31	11.48	13.15
Feb. – Mar. 2021	Employer’s premises / Non key worker	13.25	12.58	13.92
May 2020	Employer’s premises / Key worker	12.6	12.09	13.11
Sept. – Oct. 2020	Employer’s premises / Key worker	12.07	11.61	12.52
Feb. – Mar. 2021	Employer’s premises / Key worker	12.63	12.14	13.11
May 2020	Home working / Non key worker	13.47	13.04	13.9
Sept. – Oct. 2020	Home working / Non key worker	12.43	12.04	12.82
Feb. – Mar. 2021	Home working / Non key worker	13.39	12.96	13.82
May 2020	Home working / Key worker	12.98	12.58	13.38
Sept. – Oct. 2020	Home working / Key worker	12.01	11.5	12.51
Feb. – Mar. 2021	Home working / Key worker	13.22	12.71	13.74
Understanding Society (46–55)				

May 2020	Employer's premises / Non key worker	12.48	11.97	12.99
Sept. – Oct. 2020	Employer's premises / Non key worker	11.76	11.26	12.26
Feb. – Mar. 2021	Employer's premises / Non key worker	12.47	11.96	12.97
May 2020	Employer's premises / Key worker	12.03	11.67	12.4
Sept. – Oct. 2020	Employer's premises / Key worker	11.91	11.49	12.32
Feb. – Mar. 2021	Employer's premises / Key worker	12.33	11.95	12.71
May 2020	Home working / Non key worker	11.81	11.51	12.11
Sept. – Oct. 2020	Home working / Non key worker	11.35	11.04	11.67
Feb. – Mar. 2021	Home working / Non key worker	11.82	11.52	12.12
May 2020	Home working / Key worker	12.23	11.75	12.72
Sept. – Oct. 2020	Home working / Key worker	11.67	11.23	12.11
Feb. – Mar. 2021	Home working / Key worker	12.4	11.68	13.11
Understanding Society (56–65)				
May 2020	Employer's premises / Non key worker	11.75	11.25	12.25
Sept. – Oct. 2020	Employer's premises / Non key worker	11.18	10.69	11.66
Feb. – Mar. 2021	Employer's premises / Non key worker	11.55	11.08	12.01
May 2020	Employer's premises / Key worker	11.06	10.65	11.46
Sept. – Oct. 2020	Employer's premises / Key worker	10.76	10.43	11.09
Feb. – Mar. 2021	Employer's premises / Key worker	11.29	10.93	11.65
May 2020	Home working / Non key worker	11.62	11.28	11.95
Sept. – Oct. 2020	Home working / Non key worker	11.09	10.72	11.46
Feb. – Mar. 2021	Home working / Non key worker	11.57	11.22	11.92
May 2020	Home working / Key worker	12.29	11.78	12.8
Sept. – Oct. 2020	Home working / Key worker	11.87	11.41	12.33
Feb. – Mar. 2021	Home working / Key worker	12.36	11.91	12.82