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**Working Paper**

## Longer Working Hours and Maternal Mental Health: A Comparison of Single vs. Partnered Mothers

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# Longer Working Hours and Maternal Mental Health: A Comparison of Single vs. Partnered Mothers

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MARCH 2024

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## ABSTRACT

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# Longer Working Hours and Maternal Mental Health: A Comparison of Single vs. Partnered Mothers

Single mothers have experienced increasing work requirements both in the UK and in other developed countries. Little is known how increasing working hours may have affected their mental health. We investigate the impact of increasing working hours on mental health of single mothers, and compare this relationship to that for partnered mothers. We used 13 waves of the UKHLS (2009-2023) to estimate the relationship between changing working hour categories (1-16 hour per week vs. 17-25; 26-35; 36-40; and 41+) and mental health using fixed-effects models. We also investigated the role of potential mechanisms linking higher working hours and mental health, including role strain and additional income. Our findings suggest that increasing working hours from low (1-16 hours per week) to higher categories has a negative and progressively worsening relationship with the mental health of single mothers. Increasing hours to 17-25, 26-35, 36-40, and 41+ is associated with lower GHQ-12 scores by -0.7, -0.5, -0.8, and -1.1 respectively. For partnered mothers, there is no significant relationship with mental health across any of the higher working hour categories. Further analyses suggest increased role strain for single mothers as a mechanism helping explain these differences. We have found that higher working hours relative to part-time may be contributing to the worsening mental health of single mothers, at least in part due to increased role strain of having to balance work and family responsibilities. Such effects should be considered when developing future welfare policies for single mothers, to ensure that greater work requirements do not undermine the mental health of the already vulnerable population group.

**JEL Classification:** J13, J16, J22

**Keywords:** mental health, working hours, single mothers, partnered mothers, inequalities

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# Introduction

## Background

Over the past two decades, there has been a marked rise in employment of single parents in the UK. Rising by more than twenty percentage points, the expansion of employment of single parents has been greater than that of their partnered counterparts (four percentage points), with over half of single parents currently employed in full-time work (Office for National Statistics, 2022).

Such increases in employment at least in part reflect the changing welfare policy landscape for single parents. Both internationally and in the UK, single parents have been faced with increasing pressure to either find work or to increase their working hours in order to remain eligible for benefits (Whitworth and Griggs, 2013). In the UK, one of the key such policies has been the Lone Parent Obligation (LPO). In 2008, work requirements were first introduced to single parents, previously unconditionally entitled to the Income Support benefit. In the following years, the age of the youngest child at which single parent is eligible for the benefit had been lowered successively, from 10 to 7 in 2010, to 5 in 2012, and to 3 in 2017 (Katikireddi *et al.*, 2018), with LPO directly contributing to increasing employment levels of single parents (Avram *et al.*, 2018; Codreanu, 2023).

Introduction of the Universal Credit (UC) in 2013 (currently the main working-age benefit in the UK) has been another important policy development for employment of single parents. By having a tapered, as opposed to sharp cut-off for benefits withdrawal, UC was designed to break the disincentive to work beyond the 16-hour limit existing under the legacy benefits system (DWP, 2010). Furthermore, both LPO and Universal Credit were implemented in the broader context of austerity and welfare reform in the UK, adding further pressure for single parents to increase their labour force participation (Bell and Gardiner, 2019).

## Literature review and evidence gaps

Employment is a crucial determinant of health and wellbeing, and its positive association with mental health has been established across numerous studies and population groups (Modini *et al.*, 2016). However, despite the significant rises in workforce participation, much less is known about the relationship between employment, and in particular working hours, and the mental health of working single mothers – a group with historically high prevalence of mental ill-health (Targosz *et al.*, 2003; Gingerbread, 2018).

There is a small body of evidence suggesting that being employed is associated with more benefits for mental health for partnered than for single mothers (Ali and Avison, 1997; Baker *et al.*, 1999; Afifi *et al.*, 2006). However, to the best of our knowledge, to date, there has been only one study investigating the effects of longer working hours on mental health of single (and partnered) mothers. A cross-sectional study by Robinson *et al.* (2014) investigated the role of working hours in explaining the differences in physical and mental health of single and partnered mothers in Australia. The study has found that working hours is an important determinant of the differences in physical health between the two groups but there was no significant relationship with mental health.

Related longitudinal research from the UK, on the other hand, suggests that working full-time is associated with increased biomarkers of chronic stress for mothers relative to women without children, concluding that reduced working hours or flexible working arrangements could enable working mothers to lower their levels of chronic stress (Chandola *et al.*, 2019). However, the study did not explicitly consider single and partnered mothers and was based on only two waves of data.

Recognising the lack of evidence in this area, a systematic review of quantitative studies on employed mothers by Robinson *et al.* (2018) has concluded that ‘there is remarkably little research on the work-family interface of sole mothers, [providing a case for] further research on sole employed mothers, in particular for more comparative studies with partnered mothers’ (p.280).

In the context of continuously increasing work requirements for single mothers, the lack of understanding about the relationship between working hours and mental health indicates an important and policy-relevant gap in the evidence base.

## Potential Mechanisms

The theory of ‘Role Strain’ (Marks, 1977; Spencer-Dawe, 2005; Michel *et al.*, 2011) can provide a useful framework to investigate the relationship between higher working hours and mental health of single vs. partnered mothers (Robinson *et al.*, 2014). According to this theory, individuals have finite resources (e.g., time, money and attention) available to balance roles, such as work and family obligations. Managing multiple competing roles can lead to exhaustion of available resources, generating role strain (Hargis *et al.*, 2011). Prolonged role strain can in turn impair health, resulting in depressive symptoms and burnout (Ahola *et al.*, 2006).

Time is a crucial finite resource for working mothers. It has been well established in the economics literature that individuals who dedicate more time (and effort) to work, will have, accordingly, to dedicate less time to fulfil family responsibilities (Becker, 1965). This trade-off or conflict arising from combining competing multiple responsibilities is likely to increase with the number of working hours and is also likely to be more pronounced for single than partnered mothers. This is because, unlike partnered mothers, single mothers are unable to pool their resources with their partner (e.g., they are not able to split childcare responsibilities) meaning that the demands on their time are far greater than those for partnered mothers.

However, despite the greater time constraints, research suggests that single mothers allocate no less time to childcare responsibilities than partnered mothers (Craig, 2005; Pepin *et al.*, 2018). Thus, longer hours are likely to generate much greater role strain for single as opposed to partnered mothers, leading to worse mental health.

On the other hand, longer working hours may generate additional income, leading to an increase in other available resources (e.g., money to pay for childcare) which may help facilitate managing the demands of work and family and reduce the role strain for both single and partnered mothers. Furthermore, income per se has been shown to be positively associated with mental health, particularly when it moves out individuals out of poverty (Thomson *et al.*, 2022). Thus, given that single mothers are more likely to be in poverty than

partnered mothers (Joseph Rowntree Foundation, 2023), they may be more likely to benefit from any increases in income from longer working hours. Finally, longer working hours may also lead to increased skill development and social support, which may also benefit mental health of both single and partnered mothers (Greenhaus and Powell, 2006).

It is a priori unclear which effect (role strain or income) will dominate and therefore the effect of longer working hours on mental health of single and partnered mothers should be investigated empirically.

The aim of this study is to investigate the effect of longer working hours (relative to part-time) on the mental health of working single mothers and to compare this relationship to that of partnered mothers, and to explore if longer working hours are contributing to the mental health inequalities between the two groups. Additionally, we aim to explore the effects of role strain and additional income in mediating this relationship.

Improved understanding of this relationship will help inform future welfare policies for single mothers, to help ensure that the rising employment and working hours help foster, or at least does not undermine, the already poor mental health of this population group.

## Methods

### Data

We used thirteen waves of data from the UK Understanding Society Survey (USS), covering the period between 2009-2023 (University of Essex, 2023). USS is a nationally representative, longitudinal panel survey based on a stratified clustered random sample of 40,000 households from the four UK countries. Sample selection for the survey is based upon postcodes which are then grouped into geographical strata to ensure a nationally representative selection of households. The survey asks respondents a range of questions related to their health, labour market experience, finances, opinions, family life, and well-being.

### Sample

In line with previous research on working hours (Robinson, Magee and Caputi, 2014; Mendolia, 2016), this study focused on employed mothers, defined as female respondents (aged 16-65) in paid work (full-time or part-time but not in self-employment<sup>1</sup>), and with parenting responsibilities of a child less than 16 years old. Eligible individuals were kept in the analyses as long as they met the above inclusion criteria.

We examined two marital status categories: single working mothers and partnered working mothers. The 'single' category included those separated, divorced and widowed; 'partnered' included those married or cohabiting. Our total sample included 9,427 mothers resulting in 41,110 observations across the 13 waves, with single mother observations accounting for 19% and partnered mother observations accounting for the remaining 81% of total observations. Sample flow diagram is illustrated in Figure 1.

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<sup>1</sup> Self-employed mothers (n=4,866 obs.) were not included in the analyses as they have much greater flexibility in choosing their working hours.

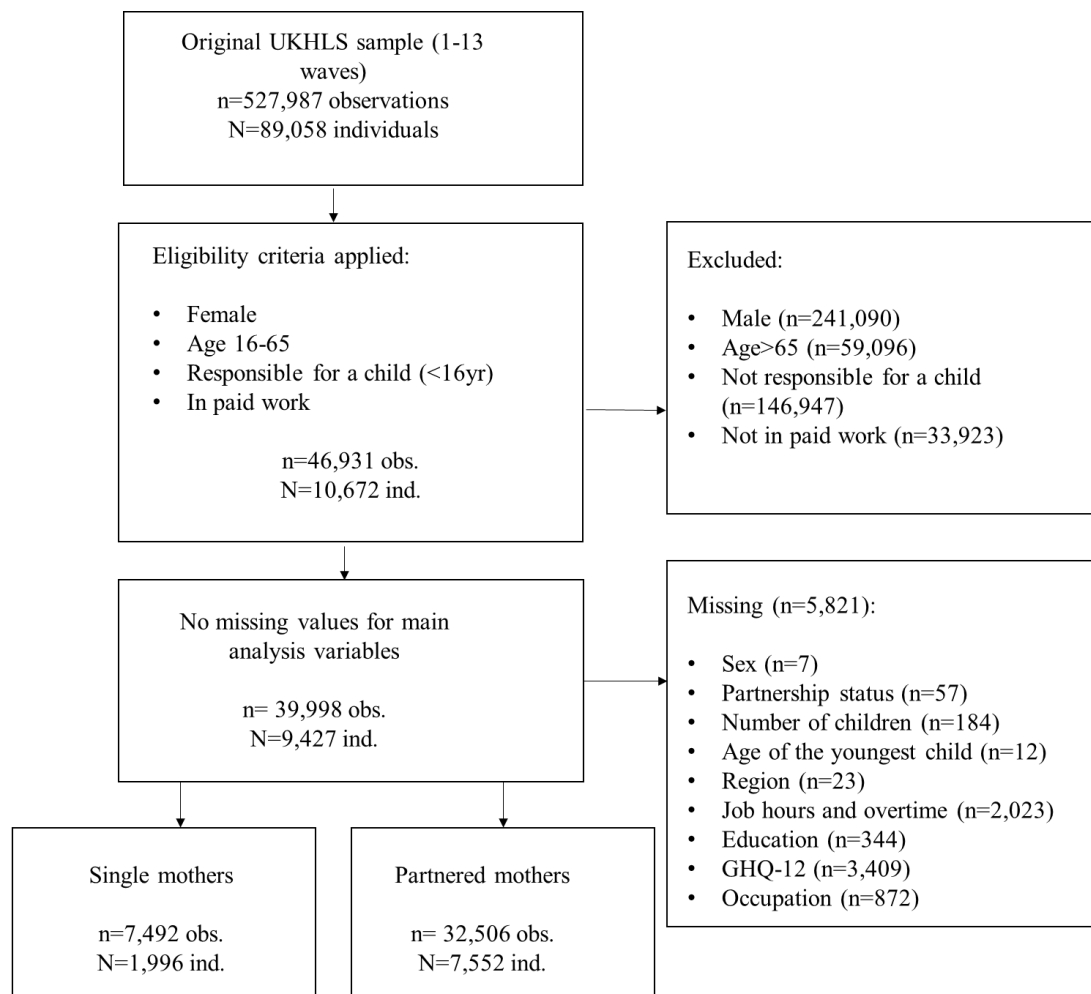


Figure 1. Sample flow

## Outcome

The key outcome of interest in this study was mental health, as measured with GHQ-12 (the twelve-item General Health Questionnaire). This measure has been well validated to identify poor psychological health in the general population and has been widely used in longitudinal studies (Goldberg and Hillier, 1979; Goldberg *et al.*, 1997). The total score ranges from 0 to 36, with higher scores indicating worse mental health. In this study, the GHQ-12 was reverse coded, with higher scores indicating better mental health, for easier interpretation of results (see, e.g., Aksoy *et al.* (2021); Bambra *et al.* (2022)).

## Key explanatory variable

Our main explanatory variable is working hours, indicating the number of hours typically worked in a week, including hours from overtime. Given that working hours are likely to have a non-linear relationship with mental health (e.g., it is well-established that working very long hours has detrimental effects on mental health relative to working full-time (Weston *et al.*, 2019)), this variable was split into categories. However, defining variables to describe maternal employment is complicated, with an infinite number to formulate the needed categories (Harvey, 1999). Therefore, the choice of categories was primarily based on



job hour requirements for single mothers in receipt of social security benefits in the UK (DWP, 2023).

The categories were as follows:

- Low Working Hours: 1-16 hours per week (reference category) – it is the current requirement for mothers with children 3-4 years old under the Universal Credit. Working up to 16 hours has also historically been considered ‘part-time’ work in the UK as it denoted the threshold after which single parents would become eligible for in-work benefits under the legacy system (HM Government, 2023).
- Medium-Low Working Hours: 17-25 hours per week – the required number of hours for mothers with children aged 5-12 under the Universal Credit is up to 25.
- Medium-High Working Hours: 26-35 – the required number of hours for mothers with children aged 13-16 under the Universal Credit is up to 35.
- Full-time Working Hours: 36-40 hours.
- High Working Hours: 41+ hours per week– working longer than full-time hours; expected to have a different effect on mental health than working full-time or less.

## Other Covariates

We included several socio-demographic controls that have been associated with both labour force participation and mental health: age, age squared, education, change of partnership status; number of children, age of the youngest child, and region (Jaumotte, 2004; Lund *et al.*, 2018).

Both age and age squared were included to account for the nonlinear relationship of age with mental health and employment. The education variable was split into three categories: degree or higher (=1), A-levels or equivalent (=2), GCSE or below (=3). To account for any partnership changes, we included a dummy variable indicating 1=changed partnership status, 0=did not. The region variable contained eight categories: London (=1); North East and West (=2); Midlands (=3); East (=4); South (=5); Wales (=6); Scotland (=7); and Northern Ireland (=8). Finally, we also included year fixed effects (dummies for each interview year) – to account for trends over time that affect both comparison groups.

Finally, in some specifications we also controlled for occupation to account for potential impacts on health from different work characteristics across occupations. We used the three-category version of the National Statistics Socio-economic Classification (NS-SEC) (Weston *et al.*, 2019). This classified people according to their main job: managerial/professional (=1), intermediate (=2), and routine (=3). Unlike job characteristic such as wages, occupation is unlikely to be a downstream effect of higher working hours and therefore should not be considered as a ‘bad control’ (Angrist and Pischke, 2009).

## Potential mechanisms

In our analysis of mechanisms, we investigated two variables as potential mediators between higher working hours and mental health: one relating to the ‘role strain’ theory and one related to the additional income mechanism.

The variable chosen to investigate the ‘role strain’ mechanism was an indicator if an individual made alternative working arrangements due to childcare. Originally, the variable contained four categories (1=children are looked after partner; 2=old enough to look after themselves; 3=parent only works during school hours; 4=parent works at home; 5=‘other’ arrangement). We dichotomised these categories into 0=No alternative arrangements (categories 1 and 2); 1=With alternative arrangements (categories 3, 4, 5).

The effect of additional income was investigated using the variable denoting if an individual was paid for working overtime or not (0=No; 1=Yes).

## Empirical strategy

### Fixed effects models

For our main analysis, we estimated fixed effects models, separately for single and partnered mothers. We chose fixed effects because this method allows us to control for time invariant unobserved individual effects that are likely to be correlated with both working hours and mental health (such as motivation, enthusiasm, and genetic characteristics), rendering methods such as random effects less appropriate. The choice of fixed vs random effects was further confirmed by Hausman test.

The fixed effects models were estimated in the following form:

$$MH_{it} = \beta_1 Job\ hours + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

where  $i = 1, 2, \dots, n$ ,  $T = 1, \dots$

$MH_{it}$  is mental health of an individual  $i$  at period  $t$ ; *Job hours* is categorical job hours variable;  $\alpha_i$  is individual fixed effect;  $X_{it}$  is a vector of individual characteristics associated with mental health, including: age, age squared, whether mother changed partnership status, education, number of children, age of the youngest child, region; year; and occupation. We added these control variables sequentially such that Model 1 has no control variables, Model 2 controls for all of the above except occupation, and Model 3 includes all controls. Model 3 is our preferred specification and its results will be prioritised in the interpretation of results.

We used robust standard errors in all models to allow for serial correlation and heteroskedasticity. All models were estimated using Stata v.18 (StataCorp, 2023), using the *xtreg, fe* command.

For our comparative analysis – i.e., to investigate if there were statistically differences in effects based on marital status (single vs. partnered), we re-ran the analysis with the full sample and included an interaction term (marital status X job hours).

The model with the interaction was as follows:

$$MH_{it} = \beta_1 Job\ hours * Single + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

where  $i = 1, 2, \dots, n, T = 1, \dots$

Where ‘Single’ denotes whether single or partnered.

### Investigation of potential mechanisms

As discussed in the Introduction, there are two potential competing mechanisms in the relationship between higher working hours and mental health: role strain and additional income. We assessed the effects of role strain by investigating if mothers, who have to make arrangements to work due to childcare, experience different effects of working hours on mental health than those who do not need alternative arrangements. Due to potential endogeneity issues (whereby changing care arrangements might influence working hours) we only included observations in which there were no changes to care arrangements.

To investigate the income mechanism, we also examined if additional income from longer hours has an effect on maternal mental health. We did this by comparing the effects of higher working hours on mental health for individuals with paid overtime and without.

### Robustness checks

We performed a number of sensitivity analyses to investigate the robustness of our main results to alternative estimation methods and model specification, described in detail in the following sub-sections.

#### Continuous job hours measure

To assess if our results are affected by categorisation of job hours, we also estimated the effects of job hours as continuous variable. We estimated a linear fixed effects model of the following form:

$$MH_{it} = \beta_1 Job\ hours + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \quad (3)$$

Where  $MH_{it}$  is mental health outcome; Job hours is continuous job hours measure;  $X_{it}$  is a vector of control variables as specified in Eq. (X);  $\alpha_i$  relates to time-invariant individual fixed effect and  $\varepsilon_{it}$  is random error term.

#### Testing for reverse causality

To rule out that reverse causality might be driving our results (whereby mothers with poorer mental health are increasing their working hours), we included long-term disability as a covariate to our main specification. Previous research suggests that controlling for this variable could to some extent exclude the reversed causal effects of work on health (Kamerāde *et al.*, 2019).

#### Testing for attrition bias

Panel data analyses are susceptible to problems of attrition bias. This can occur when individuals systematically drop out of the sample and when the drop out is associated with the outcome of interest. To test whether our results are likely to be impacted by attrition bias, we implemented the Verbeek and Nijman (1992) test. Specifically, we added three different

variables to our main specification regression equations (Eq. 1) to test if they have a significant relationship with mental health.

The following three variables (one at a time) added to main specification, to test for attrition bias: the number of waves individual is present in; a dummy if present at the next wave; a dummy if present in all waves. We have found that mental health-related attrition bias is unlikely to affect our results.

## Results

### Descriptive characteristics

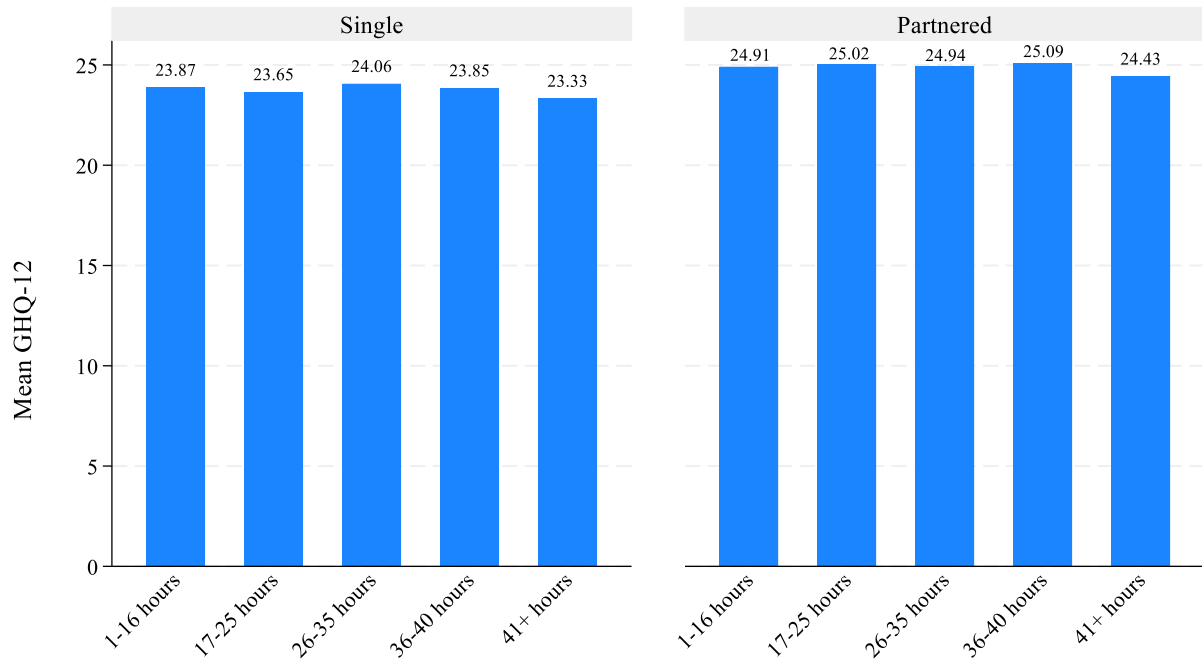
Table 1 illustrates the descriptive statistics of the two comparison groups pooled across all waves. Consistent with existing literature, there are significant differences between single and partnered mothers. For example, single mothers have poorer mental health, are less likely to have higher education degree, and are more likely to be working in Routine occupations. In terms of job hours, single mothers are more likely to work lower hours (1-16 and 17-25 hours) and are less likely to work long hours (41+) than partnered mothers.

Table 1 Descriptive characteristics of the analysis sample across all available waves (1-13)

	Partnership status		Test
	Single	Partnered	
GHQ-12	23.73 (5.96)	24.90 (5.07)	<0.001
Age	38.89 (7.85)	39.49 (6.92)	<0.001
Working hours			
1-16 hours	1,331 (17.7%)	4,759 (14.6%)	<0.001
17-25 hours	2,028 (26.9%)	8,203 (25.1%)	
26-35 hours	1,724 (22.9%)	8,167 (25.0%)	
36-40 hours	1,454 (19.3%)	6,252 (19.1%)	
41+ hours	997 (13.2%)	5,321 (16.3%)	
Education			
Degree or higher	3,145 (41.7%)	18,301 (56.0%)	<0.001
GCSE, A-levels or equivalent	4,114 (54.6%)	13,859 (42.4%)	
Below GCSE or other	275 (3.7%)	542 (1.7%)	
Occupation			
Professional	2,702 (35.9%)	16,202 (49.5%)	<0.001
Intermediate	1,442 (19.1%)	6,517 (19.9%)	
Routine	3,390 (45.0%)	9,983 (30.5%)	
Changed partnership status			
No	6,970 (92.5%)	32,263 (98.7%)	<0.001
Yes	564 (7.5%)	439 (1.3%)	
Number of children			
One	4,676 (62.1%)	14,423 (44.1%)	<0.001
Two	2,337 (31.0%)	14,510 (44.4%)	
Three or more	521 (6.9%)	3,769 (11.5%)	
Age of youngest child			
0-2 years old	768 (10.2%)	7,273 (22.2%)	<0.001
3-11 years old	4,353 (57.8%)	18,270 (55.9%)	
12-15 years old	2,413 (32.0%)	7,159 (21.9%)	
Region			
London	1,124 (14.9%)	3,299 (10.1%)	<0.001
North East and West	1,034 (13.7%)	4,655 (14.2%)	
Midlands	1,946 (25.8%)	7,749 (23.7%)	
East	568 (7.5%)	3,033 (9.3%)	
South	1,221 (16.2%)	6,717 (20.5%)	
Wales	477 (6.3%)	2,099 (6.4%)	
Scotland	676 (9.0%)	2,941 (9.0%)	
Northern Ireland	488 (6.5%)	2,209 (6.8%)	
Observations	7,492 (18.7%)	32,506 (81.3%)	

Around 23% of either single or partnered mothers increased their job hours by at least one category during the period of the study, with 15% and 61% decreasing and maintaining their

hours respectively. Looking at mental health scores across the different job hour categories displayed in Figure 2 we can see some, albeit little, variation in mental health across the categories. For example, working long hours (41+) has the lowest mental health scores for both single and partnered mothers.



Graphs by Partnership status

## Econometric analysis results

### Fixed effects models

The results of our unadjusted (Model 1) fixed effects analysis show that, relative to low working hours (1-16 hours per week), all of the higher working categories have a negative association with the mental health of single mothers (although the 26-35 hour category is only marginally statistically significant ( $p < 0.1$ ); the negative effect appears to be increasing with hours worked. We observe very similar patterns once we adjust for potential confounders in Model 2 and Model 3 (preferred specification).

Specifically, higher working hours have a negative association with the mental health of single mothers, and the effect is worsening with higher working hour categories: i.e., relative to low-working hours, increasing hours to 36-40 or 41+ hours has a greater negative effect on mental health (equal to -0.8 and -1.1 GHQ-12 points respectively,  $p < 0.01$ ) than increasing hours to 17-25 (with effect equal to -0.7,  $p < 0.01$ ). For partnered mothers, we observe no significant associations across the majority of the working hour categories. One exception is the negative association between 41+ hours and GHQ-12 in Model 1 (with effect of -0.7,  $p < 0.01$ ) and -0.3 ( $p < 0.1$ ) in Models 2 and 3 respectively.

Table 2 Association between job hours and mental health (GHQ-12) for single and partnered mothers: Fixed effects model results

	Model 1		Model 2		Model 3 <sup>+</sup>	
	Single	Partnered	Single	Partnered	Single	Partnered
Job hours						
17-25 hours	-0.802*** [-1.305,-0.298]	-0.131 [-0.353,0.090]	-0.705*** [-1.209,-0.202]	-0.049 [-0.268,0.169]	-0.698*** [-1.201,-0.194]	-0.041 [-0.260,0.178]
26-35 hours	-0.739** [-1.331,-0.147]	-0.197 [-0.451,0.056]	-0.558* [-1.148,0.033]	0.037 [-0.215,0.290]	-0.531* [-1.120,0.058]	0.052 [-0.201,0.306]
36-40 hours	-1.122*** [-1.830,-0.415]	-0.147 [-0.424,0.131]	-0.853** [-1.556,-0.151]	0.175 [-0.103,0.453]	-0.797** [-1.504,-0.091]	0.201 [-0.079,0.480]
41+ hours	-1.498*** [-2.235,-0.760]	-0.697*** [-0.998,-0.395]	-1.190*** [-1.932,-0.448]	-0.291* [-0.593,0.012]	-1.127*** [-1.876,-0.378]	-0.258* [-0.564,0.047]
Observations	7492	32506	7492	32506	7492	32506

95% confidence intervals in brackets.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

+Preferred specification.

Models 1 includes no controls; Model 2 controls for: age, age sq, number of children, age of the youngest child, whether changed partnership status, education, region, year; Model 3 includes Model 2 controls + occupation.

To test if the difference in results between single and partnered mothers is statistically significant, we also estimated associations for pooled sample with an interaction term for job hours and partnership status. Results displayed in Table 3 below broadly confirm the findings of the stratified analysis: we can see that the effect of higher working hours has a greater negative effect for single mothers at higher job hour categories (17-25, 36-40, and 41+ hours).

*Table 3 Association between higher working hours and mental health: Fixed effects models including interaction between job hours and partnership status*

	Coefficient <sup>+</sup>
Job hours	
17-25 hours	-0.054 [-0.273,0.165]
26-35 hours	0.007 [-0.245,0.259]
36-40 hours	0.168 [-0.110,0.446]
41+ hours	-0.301* [-0.604,0.001]
Single	0.060 [-0.480,0.599]
Interactions	
17-25 hours X Single	-0.494* [-1.007,0.020]
26-35 hours X Single	-0.399 [-0.980,0.181]
36-40 hours X Single	-0.803** [-1.442,-0.164]
41+ hours X Single	-0.783** [-1.483,-0.083]
Observations	39,998

95% confidence intervals in brackets.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

<sup>+</sup>Same control variables as in models displayed in Table 2 (Model 3).

## Mechanisms

Two potential mechanisms, role strain and additional income, could be mediating the relationship between increased job hours and mental health and the differences between single vs partnered mothers. We investigated the ‘role strain’ mechanism by examining if there are differences in associations between those who make alternative working arrangements due to childcare vs those who do not (whose children are either old enough to look after themselves or are looked after one’s partner). As shown in Table 4, among those



with alternative working arrangements, the relationship between higher working hours (36-40 and 41+ hours vs working 1-16 hours) is negative for single mothers, with coefficients on GHQ-12 equal to -2.1 ( $p<0.1$ ) and -2.7 ( $p<0.01$ ) respectively; and there is no relationship for partnered mothers, providing support to the ‘Role Strain’ theory.

Among those without alternative arrangements, there is again no association between job hours and mental health for partnered mothers, but there is a marginally significant (coefficient = -6.5,  $p<0.1$ ) negative association for single mothers who change their hours to 17-25 hours per week. However, only 138 observations were available to estimate the association for this subgroup, suggesting that these estimates should be interpreted with caution.

*Table 4 Association between higher working hours between those with alternative work arrangements and those without*

	With alternative arrangements		Without alternative arrangements	
	Single	Partnered	Single	Partnered
17-25 hours	-0.593 [-1.724,0.538]	0.110 [-0.568,0.787]	-6.519* [-13.115,0.076]	0.165 [-0.506,0.836]
26-35 hours	-1.126 [-2.556,0.305]	0.249 [-0.601,1.098]	-3.340 [-11.037,4.358]	-0.025 [-0.798,0.749]
36-40 hours	-2.096* [-4.313,0.120]	0.134 [-0.949,1.217]	-2.847 [-17.072,11.379]	0.013 [-0.838,0.864]
41+ hours	-2.702** [-5.002,-0.403]	-0.174 [-1.583,1.236]	0.000 [0.000,0.000]	-0.351 [-1.217,0.515]
Observations	1255	3222	138	6451

95% confidence intervals in brackets.

\*  $p<0.1$ , \*\*  $p<0.05$ , \*\*\*  $p<0.01$

+Same control variables as in models displayed in Table 2 (Model 3).

In terms of the income mechanism (Table 5), there is no significant relationship between higher working hours and mental health for those with paid overtime or not for single mothers. For partnered mothers, however, there is a marginally significant positive association with high-working hours (36-40 and 41+ hours) among those with paid overtime, suggesting that additional income might be compensating for any negative effects of higher working hours for partnered mothers.

*Table 5 Association between higher working hours between those with paid overtime and those without*

	With paid overtime		Without	
	Single	Partnered	Single	Partnered
17-25 hours	0.451 [-2.015,2.917]	0.154 [-0.595,0.903]	-0.471 [-5.249,4.306]	-0.025 [-0.923,0.872]
26-35 hours	1.823 [-0.889,4.536]	0.619 [-0.221,1.458]	-0.621 [-4.904,3.662]	-0.017 [-0.932,0.898]
36-40 hours	-0.074 [-3.262,3.114]	0.889* [-0.056,1.834]	-0.229 [-4.630,4.171]	0.133 [-0.827,1.094]
41+ hours	0.989 [-2.062,4.040]	0.951* [-0.067,1.969]	-0.796 [-5.150,3.559]	-0.728 [-1.665,0.209]
Observations	1196	4578	1274	8373

95% confidence intervals in brackets.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

+Same control variables as in models displayed in Table 2 (Model 3).

## Robustness checks

### Job hours as a continuous variable

Given the difficulties in determining appropriate job hour categories, we also explored our main variable of interest (job hours) as a continuous variable. The results of a fixed effects regression model suggest that a one hour per-week increase in job hours is associated with a decrease of GHQ-12 by -0.02 (p<0.05) for single mothers, and by -0.01 (p<0.1) for partnered mothers, thus corroborating the findings of the main analysis.

### Reverse causality: including long-term disability as covariate

Including long-term disability has not made a material difference to our main results, as illustrated in Table 5. This suggests that reverse causality (whereby mental health influences job hours) is unlikely to impact our results.

*Table 6 Investigation of reverse causality: association between higher job hours and mental health when long-term disability is added as a covariate; Fixed effects models*

	Single	Partnered
Job hours		
17-25 hours	-0.693*** [-1.194,-0.193]	-0.059 [-0.278,0.160]
26-35 hours	-0.559* [-1.145,0.026]	0.033 [-0.220,0.286]
36-40 hours	-0.861** [-1.558,-0.164]	0.161 [-0.116,0.439]
41+ hours	-1.207***	-0.297*

	[-1.944,-0.471]	[-0.599,0.006]
With disability	-1.264*** [-1.735,-0.793]	-0.737*** [-0.934,-0.540]
Observations	7486	32491

95% confidence intervals in brackets.

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

+Same control variables as in models displayed in Table 2.

## Discussion

### Summary and contextualisation of key findings

We aimed to examine the impact of longer working hours on maternal mental health and to investigate if this impact was different for single vs. partnered mothers. We have found that, relative to working low hours (1-16 hours per week), increasing working hours to 17-25, 26-35, 36-40, and to 41+ hours per week has negative effects on the mental health of single mothers, with the effect getting progressively worse with each category (except 26-35 hours). For partnered mothers, on the other hand, we have found no significant relationship, except for a marginally statistically significant negative relationship with working 41+ hours. The differences in associations between the two comparison groups were statistically significant for all but 26-35 hour categories, suggesting that higher working hours may be contributing to widening mental health inequalities between single and partnered mothers.

We explored potential competing mechanisms relating to higher working hours and mental health and have found that increased role strain (as indicated by making alternative working arrangements) is a likely factor contributing to the worsening mental health of single but not partnered mothers. Additional income (as indicated by working with paid overtime), on the other hand, only appeared to have a (positive) influence on the mental health of partnered mothers, suggesting that additional income is unlikely to compensate for increased role strain for single mothers.

Our findings are broadly in agreement wider literature on employment and mental health of single and partnered mothers. Previous literature has generally concluded that employment has better impacts on mental health of partnered than single mothers (Ali and Avison, 1997; Baker, North and Team, 1999). Prior research into effects of working hours on single vs. partnered mothers is very limited, however. To the best of our knowledge, only one study to date has examined working hours as a factor explaining mental health differences between the two groups and has found no significant effect (Robinson, Magee and Caputi, 2014). However, the study was cross-sectional and based on data from Australia from over ten years ago, thus of limited internal and external validity to the current context.

There have been significant increases work requirements for single mothers during the period of our study. Both welfare benefit cuts and increasing conditionality have contributed to their rising employment rates. Our study contributes to the findings of previous research on rising work requirements which has found that it has negatively affected the mental health of single mothers (Katikireddi *et al.*, 2018; Codreanu, 2023). In the context of continuously increasing work requirements for single parents, such findings highlight the importance of considering

the potential negative effects of such policies on the mental health of the already vulnerable population group.

Additionally, our investigation of potential mechanisms provides further policy-relevant evidence on the effects of role strain in mediating the negative effects of higher job hours on mental health of single mothers. While role strain itself has been shown to have negative effects on maternal mental health (Chandola *et al.*, 2004), it may also be limiting mothers from increasing their working hours when they desire to, thus undermining their future employment opportunities as well as their mental health (Gingerbread, 2023). Such findings highlight the importance of providing adequate childcare support and flexible working arrangements to support the employment of single mothers as well as their mental health.

## Strengths and limitations

To the best of our knowledge, this has been the first longitudinal study exploring the effects of longer working hours on the mental health of single and partnered mothers to date. Given the rising work hour requirements and maternal employment rates, our key finding that working longer hours may undermine the mental health of single mothers and widen inequalities represents a timely and policy-relevant contribution to the existing evidence base. The robustness of our results has been checked using numerous sensitivity analyses, thus strengthening the confidence in our conclusions.

Nevertheless, our study has several limitations. First, our results should be interpreted as associational evidence only. Despite our attempts to control for reverse causality and time-invariant confounding, we could not account for time-varying influences affecting both working hours and mental health, meaning that we were unable to attribute cause and effect. Nevertheless, by utilising longitudinal data and panel data models, our study arguably presents higher level evidence than the cross-sectional studies that have so far dominated this research area.

Secondly, our marital status variable consisted of only two categories: single mothers, including divorced, separated, never married and widowed mothers; and partnered mothers; including mothers in de-facto and marriage and those cohabiting. By grouping all these women into two categories, we thus assumed experiences and relationships were similar regardless of how or why mothers were single or partnered which is unlikely to be realistic (Afifi, Cox and Enns, 2006). Future studies in this area should ideally take into account the different routes into single parenthood.

Finally, given the focus on UK population and different labour market contexts in other countries, the external generalisability of our results may be limited. Future studies in other countries, or using multi-country data, may help further elucidate the relationship between higher working hours and mental health of single mothers.

## Conclusion

Our study has shown that, relative to working 1-16 hours per week, working longer hours has a negative association with the mental health of single but not partnered mothers, suggesting that increasing working hours may be widening the mental health inequalities between the two groups. Given the ongoing emphasis on work activation policies both in the UK and in other developed countries, it is important to ensure that future policy evaluations take into

account the potential health effects of such policies, to ensure that increased working hours do not undermine the mental health of the most vulnerable groups of our society.

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