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**Estimating population mental health effects of the rollout of Universal Credit: Difference-in-Differences analyses using the UK Household Longitudinal Study, 2009 - 2019**

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Difference-in-Differences analyses using the UK Household Longitudinal Study,  
2009 - 2019

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# Summary

## *Background*

Universal Credit (UC), introduced in 2013, has led to acute health harms among unemployed people, but the policy's impacts longer-term and on broader claimant groups remain unknown.

## *Methods*

We exploited the geographical variation in UC rollout to investigate impacts on population mental health (SF-12 Mental Component Summary) for up to four years following implementation for a larger cohort of claimants, including employed people. We linked 108,247 observations (29,528 individuals) from the UK Household Longitudinal Study between 2009-2019 to administrative Local Authority district data. We used standard and novel difference-in-differences approaches to estimate the average effect in the follow-up period and at different time points post-introduction, comparing a working age UC eligible population (treatment group) to an alternative benefits population (comparison group),

## *Findings*

UC was associated with mental health declining by 0.70 units (95% CI -1.24 to -0.15), a 1.5% relative reduction. Effects were larger during the first year of exposure (-1.01, 95% CI -1.93 to -0.10) without returning to baseline levels. Between 2013 and 2019, an estimated 111,954 (95% CI 35,497 to 182,948) additional people experienced depression and/or anxiety after UC's introduction, 27,115 of whom may have reached diagnostic threshold for common mental disorders.

## *Interpretation*

UC led to a sustained deterioration in population mental health, particularly marked in the first year of implementation. Reforms to UC are warranted to mitigate adverse mental health impacts.

## *Funding*

UK National Institute of Health and Care Research Public Health Research Programme (NIHR).

## Introduction

Globally, welfare programmes have been identified as important determinants of health and health inequalities.<sup>1</sup> Contractionary welfare reforms imposing restrictions on benefit access and reductions in benefit generosity have been found to worsen mental health.<sup>2</sup> Several studies have shown that tighter benefit eligibility, conditionality, and punitive sanctions are contributing to a growing public mental health crisis, disproportionately affecting the most vulnerable members of society.<sup>3-6</sup>

Introduced in the UK in 2013, Universal Credit (UC) has been described as one of the largest welfare changes enacted in a high-income country.<sup>7</sup> UC replaced six benefits and tax credits paid to people on low incomes or out of work, known as ‘legacy benefits’. The stated aims of UC were to simplify the benefits system, ‘make work pay’ and reduce system fraud and error.<sup>8</sup> To this end, UC introduced new features for social security provision in the UK, including benefit payments in monthly arrears, frequent income assessments and a fully digitalised service. The rollout of UC took place in three phases and at different points in time (see Appendix 1). Initially, only single working age individuals seeking employment (previously applying for Job Seekers Allowance) were eligible for UC. This was expanded gradually to include recipients of other legacy benefits.<sup>9</sup>

Although UC may increase income and improve employment outcomes for some groups of claimants, and therefore may have a positive impact on health, several studies have associated UC with various negative health related and other outcomes (see Appendix 2). Prior research focusing on the initial eligible group (i.e. unemployed individuals) has shown that unemployed people eligible for UC experience worse mental health compared to legacy groups, and that becoming unemployed under UC may have adverse effects on mental health particularly for single households with and without children compared to the legacy system.<sup>10,11</sup> In unemployed families, UC has been found to exacerbate socio-emotional behavioural difficulties for children up to the age of eight.<sup>12</sup> Such impacts might arise as a result of increased uncertainty around benefit payments and changes in benefit rates for specific populations, such as severely disabled people, harsher conditionality rules and stricter sanctions, which may contribute to financial

distress, particularly for vulnerable claimants, including lone parents, disabled people and low-income families and their children.<sup>4,13–15</sup>

By January 2024, 6.4 million people were on UC, 38% of whom were in employment (Appendix 3).<sup>16</sup> Considering that the policy's objective is to reduce welfare dependency not only by moving unemployed people into employment but also by helping employed people on low incomes to increase earnings and working hours, it is essential to understand the potential impact of UC on this wider claimant population. Prior to this study the impact on all groups eligible for UC (i.e. people in work) was unknown. Likewise, how the impacts vary over time has not been investigated in both employed and unemployed people. To address this knowledge gap, we used Difference-in-Differences (DiD) analysis to estimate the average mental health effect of the reform for all people likely exposed to UC during follow-up. We also implemented a novel DiD approach to address possible biases due to the staggered UC rollout and expose the longer-term impacts of the policy change, deriving by year effects at different time points post-rollout through an event study analysis.

## Methods

### *Data*

In this longitudinal study, we used data from the UK Household Longitudinal Study (UKHLS), a nationally representative sample of approximately 40,000 households, collected annually since 2009.<sup>17</sup> Data were gathered either through face-to-face interviews or self-completion questionnaires over 24 months for each time-period (wave). We used data from 2009/2011 to 2019/2021 (first 11 waves). We included respondents interviewed up to December 2019 to avoid the impact of population mental health deterioration caused by the COVID-19 pandemic. A special data license from the UK Data Service was obtained, providing the Local Authority (LA) district of residence for each respondent.

### *Participants*

We included working age persons (18-64) who reported receiving benefits at any point in time. We excluded full-time students, long-term sick and disabled persons, people in retirement and

persons living in Northern Ireland as information on UC rollout is not gathered by the UK Department for Work and Pensions (DWP).

### *Treatment and exposure*

We combined information about individual benefit receipt and the implementation of UC to define exposure. Individuals could report receiving up to ten different benefits in the same year. We assigned recipients to the treatment group if they reported receiving UC or any of the six legacy benefits – income-based Job Seekers Allowance (JSA), Working Tax Credit (WTC), Child Tax Credit (CTC), Housing Benefit (HB), Employment and Support Allowance (ESA), and Income Support (IS) – at each wave, reflecting those who were either directly claiming or at risk of claiming UC during the study time period. Individuals were assigned to the comparison group if they reported receiving state benefits other than UC or legacy benefits, such as Child Benefit or Council Tax Benefit (see Appendix 4). This ‘alternative benefits’ comparison group would have to go through the state benefits system for claiming benefits, but we assumed they should not be impacted by the implementation of UC directly.

To define UC rollout, we extracted data on people receiving UC at the LA district level from DWP’s Stat-Xplore statistics to construct a binary variable assigning 1 to the earliest time point UC had been recorded and, 0 if otherwise.<sup>18</sup> We linked each UKHLS participant to LA districts based on their residence and month and year of interview. We interacted the binary indicator at the LA level with the treatment group indicator to construct our ‘exposure’ measure; an individual is 'exposed' if they were in the treatment group *and* the LA district they lived in was UC active (i.e. post-introduction period).

### *Outcomes*

Our primary mental health measure was the self-reported mental health component score (MCS) of the 12-item Medical Outcomes Study Short Form Health Survey (SF-12). In our main analysis we used the continuous score ranging between 0-100 where higher values suggest better mental health, whilst in secondary analysis we used validated thresholds to dichotomise these scores to indicate clinical depression (cutoff  $\leq 45$ ) and common mental disorders (cutoff  $\leq 50$ ).<sup>19,20</sup>

## *Confounders and effect modifiers*

We controlled for individual-specific characteristics that may confound our estimates, including gender, age, age squared to account for nonlinear effects, country of residence, marital status (married, partnered, or cohabiting; single, separated, divorced, or widowed), highest educational qualification (degree; CGSE/ A-levels; lower/ other qualification; no qualification), whether the respondent was non-British, whether responsible for a dependent child ( $\leq 16$  years), and whether suffering from a long-standing illness. We also created a categorical variable indicating the number of years since UC started to be rolled out.

## *Statistical analysis*

We used DiD methods comparing changes in the average mental health between treatment and comparison groups before and after UC rollout.<sup>21</sup> We examined whether the trends in outcomes between the two groups remained stable in the pre-treatment period (parallel trends assumption), both visually and using regression analysis by testing whether the interaction term between treatment group indicator and pre-reform period was significant. We estimated linear and logistic regressions for continuous and binary outcome measures, respectively.

### *Difference-in-Differences using Multiple Imputation*

We used multiple imputation to account for bias due to missing data. We used chained equations to impute the outcome variable (8.42% of missing information). We included all variables present in the analysis model (and their past information), including the DiD interaction term, in the imputation model as predicting variables (see Appendix 5).<sup>22</sup> We iterated the process for 10 imputation cycles with a total of 1,190,717 observations. Finally, individual longitudinal weights were applied for correcting bias from over- or under-represented populations and adjusting for non-response bias.

### *Taking a Local-Projections Approach*

Since UC was rolled out across LA districts at different points in time, using early treated units as controls for later treated units may bias estimates by entering the DiD regression with negative weights.<sup>23</sup> To address potential biases, we took a novel local-projections DiD analysis (LP-DiD), combining ideas from the local projections approach in macroeconomics and the potential outcomes framework, to construct ‘clean’ controls that do not contain ‘units’ contaminated by

previous treatment status.<sup>24</sup> We implemented the method by regressing the differenced outcome in the pre- and post-treatment period on the differenced treatment indicator across a three-year horizon using a balanced panel of 7,710 observations, while restricting the comparison group to not-yet-treated units. We ran the baseline LP-DiD regression without covariates as this was expected to alter the variance-weighted scheme when treatment is staggered.<sup>24</sup> Effectively, we estimated a variance-weighted average mental health effect during follow-up with strictly positive weights, while also retrieving the estimates for different periods post-UC through an event study analysis. All analyses were conducted in Stata statistical software, release 17.0 (College Station, TX: StataCorp LLC).

### *Alternative measures and sensitivity analyses*

We tested whether the effects from the main analysis remained robust to different mental health measures. We used the General Health Questionnaire (GHQ-12) measuring the frequency of symptoms of psychological distress (i.e. concentration, decision making, sleep quality and feelings of strain, depression, and enjoyment).<sup>25</sup> Item responses range between 0-3. Scores across sub-areas can be measured as a continuous outcome (scored 0-36) and using a caseness scale (scored 0-12), where higher scores indicate higher psychological distress. We used four alternative measures: (1) change in continuous GHQ-12 score (0-36); (2) change in continuous GHQ-12 score (0-12); (3) percentage point change in prevalence of psychological distress to capture depressive disorders when the criterion is long-term depression (in the past 12 months) (values  $\geq 4$ ); and, (4) percentage point change in prevalence of psychological distress to capture depressive disorders when the criterion is short-term depression (in the past two weeks) (values  $\geq 3$ ).<sup>26</sup> To provide a more comprehensive account of the potential health effects of UC, we estimated impacts on physical health using the SF-12 Physical Component Summary (PCS), scored 0-100 with higher values indicating better physical health. We constructed a binary measure using PCS scores 50 or less to indicate the presence of physical conditions.<sup>19</sup>

We undertook several sensitivity analyses to explore whether results were robust to model specification. First, we employed a more conservative definition of our comparison group based on incomes to address possible biases due to differences in socioeconomic background between treatment and control groups; since individuals in the comparison group were potentially eligible for receiving alternative benefits regardless of their income in some cases (e.g. Child Benefit),



we restricted the comparison group on people with household incomes below the median based on the OECD modified income scale adjusted for inflation. Second, we performed complete case analyses as an alternative solution to dealing with missing information. Finally, we extended the baseline LP-DiD approach by including covariates into the model and using inverse probability weighting to ensure the variance-weighted scheme was preserved in the staggered setting.<sup>24</sup>

### *Role of the funding source*

The funders of the study (NIHR) had no role in study design, data collection, data analysis, data interpretation, the writing of the report, or the decision for submission for publication.

## Results

The sample consisted of 108,247 observations from 29,528 participants (see Appendix 6). We compared 64,363 person-year observations among individuals at risk of moving to UC (treatment group) and 43,884 person-year observations among respondents receiving alternative benefits (comparison group).

Table 1 provides descriptive information on baseline characteristics across the two groups in the year prior to UC rollout. Mental and physical health scores were lower in the treatment group compared to the comparison group in the pre-UC period. UC recipients were on average younger, more likely to be single, had non-British background, suffered from a longstanding illness, had lower educational qualifications and lower incomes relative to the comparison group. The parallel trends pre-intervention were consistent with the parallel trends assumption ( $p = 0.254$ ) (see Appendix 7).

Turning to our main results, UC rollout was associated with a deterioration in mental health by 0.70 units in the MCS score (95% CI -1.24 to -0.15) in the treatment relative to the comparison group (see Appendix 8 for full model), a 1.5% reduction (Table 2). There were also increases in the prevalence of depression (cutoff:  $MCS \leq 45$ ) by 3.0 percentage points (95% CI 0.4 to 5.5) (an 8.1% relative increase), and of common mental disorders (cutoff:  $MCS \leq 50$ ) by 4.1 percentage points (95% CI 1.3 to 6.7) (a 7.5% relative increase). Applied to the UK population, this means the introduction of UC, between 2013 and December 2019, led to approximately

81,917 additional individuals developing depression (95% CI 10,922 to 150,182) and 111,954 developing a common mental disorder (95% CI 35,497 to 182,948) (see Appendix 9).

We broadly found similar evidence using the GHQ-12 (see Appendix 10). Conversely, there were no clear effects of physical health harms based on the continuous (-0.24, 95% CI -0.66 to 0.18) and binary PCS measures (0.8, 95% CI -1.4 to 3.0) (see Appendix 10). Finally, both the complete case analysis (see Appendix 11) and a sensitivity test using a conservative comparison group based on relatively low incomes produced similar estimates (see Appendix 12).

	Treatment group	Comparison group	p value
Mental health, Mental Component Summary (MCS)	47.04 (10.36)	49.20 (8.88)	<0.0001
Prevalence depression (MCS≤45)	1,261 (36.9%)	767 (27.0%)	<0.0001
Prevalence common mental disorders (MCS≤50)	1,868 (54.7%)	1,281 (45.1%)	<0.0001
<i>Demographic characteristics</i>			
Age	39.26 (9.45)	42.04 (9.16)	<0.0001
<i>Gender</i>			
Male	921 (27.0%)	695 (24.57%)	..
Female	2,492 (73.0%)	2,147 (75.57%)	0.023
<i>Marital status</i>			
Married/Cohabiting	2,180 (63.9%)	2,449 (86.27%)	..
Single/Widowed/Divorced	1,233 (36.1%)	393 (13.87%)	<0.0001
<i>Responsible for dependent child</i>			
No	1,305 (38.2%)	1,099 (38.7%)	..
Yes	2,108 (61.8%)	1,743 (61.3%)	0.725
<i>Highest educational qualification</i>			
Degree	977 (28.6%)	1,553 (54.6%)	..
A levels/GCSE	1,788 (52.4%)	1,093 (38.5%)	..
Other qualification	311 (9.1%)	137 (4.8%)	..
No qualification	337 (9.9%)	59 (2.1%)	<0.0001
<i>Longstanding illness</i>			
No	2,416 (70.8%)	2,151 (75.7%)	..
Yes	997 (29.2%)	691 (24.3%)	<0.0001
<i>Country of residence</i>			
England	2,908 (85.2%)	2,324 (81.8%)	..
Wales	251 (7.4%)	220 (7.7%)	..

Scotland	254 (7.4%)	298 (10.5%)	<0.0001
<i>Ethnicity</i>			
British	2,464 (72.2%)	2,381 (83.8%)	..
Non-British	949 (27.8%)	461 (16.2%)	<0.0001
<i>Household income (median)</i>	13,035 (6,336)	20,283 (9,369)	<0.0001
Observations	3,413	2,842	

Baseline characteristics of treatment and comparison groups in the year prior to Universal Credit rollout. Mental and physical health scores show the average Mental Component Summary (MCS) and Physical Component Summary (PCS) scores with higher values indicating better (mental) health (standard deviations in parentheses). The categorical variables show the number of observations across categories (% in parentheses). Medians are shown for household incomes, measured with the OECD (Organization for Economic Cooperation and Development) modified scale and adjusted for inflation (interquartile range in parentheses). P-values are reported after conducting t-tests of independence of means for continuous variables and chi-square test for categorical variables.

Table 1: Baseline characteristics of treatment and comparison groups in the year prior to the introduction of Universal Credit, unweighted (n= 6,255)

	DiD estimate	95% CI	p value
Change in continuous Mental Component Summary (MCS) score	-0.70	-1.24 to -0.15	0.012
Percentage point change in prevalence of depression (<=45 cutoff)	3.0	0.4 to 5.5	0.022
Percentage point change in prevalence of common mental disorders (<=50 cutoff)	4.1	1.3 to 6.7	0.003

Difference-in-differences estimates with multiple imputation comparing those reported receiving Universal Credit or any of six legacy benefits (treatment group) and those reported receiving alternative benefits (comparison group) post Universal Credit introduction. Mental health is measured based on the continuous Mental Component Summary (MCS), ranging between 0-100 where higher values indicate better health. Total number of observations: 108,247.

Table 2: Difference-in-differences estimates

Table 3 presents the results from the LP-DiD analysis. On average, the introduction of UC was associated with a reduction in mental health by 0.71 units of the MCS score (95% CI -1.59 to 0.16) over four years of follow up, albeit not statistically significant. Examining, however, the results from the event study analysis, we found a larger and statistically significant negative

mental health impact one year after exposure to UC, estimated at -1.01 points (95% CI -1.93 to -0.10). This effect declined in the following periods (year 2: -0.69, 95% CI -1.67 to 0.28; year 3: -0.60, 95% CI -1.80 to 0.60), nevertheless without returning to baseline levels (Figure 1; see Appendix 13). Our sensitivity analysis including covariates into the baseline specification and using inverse probability weighting generated similar results (Appendix 14).

	LP-DiD estimate	95% CI	p value	observations
<i>Pooled estimates</i>				
Pre-reform period	-0.30	-0.95 to 0.35	0.364	4,299
Post-reform period	-0.71	-1.59 to 0.16	0.110	3,292
<i>Even study estimates</i> (before and after Universal Credit rollout)				
Three years prior	-0.25	-0.97 to 0.47	0.493	4,299
Two years prior	-0.35	-1.13 to 0.42	0.376	5,070
One year prior	0	..	..	..
Universal Credit rollout	-0.01	-0.80 to 0.77	0.972	5,841
One year after	-1.01	-1.93 to -0.10	0.029	4,942
Two years after	-0.69	-1.67 to 0.28	0.165	4,140
Three years after	-0.60	-1.80 to 0.60	0.325	3,292

Local projections difference-in-differences estimates using a balanced panel of 7,710 observations between 2009-2018 within a three-year post and pre-treatment horizon. Year 2019 was exempted due to few observations. Mental health is measured based on the continuous Mental Component Summary (MCS), ranging between 0-100 where higher values indicate better health.

Table 3: Local projections difference-in-differences estimates

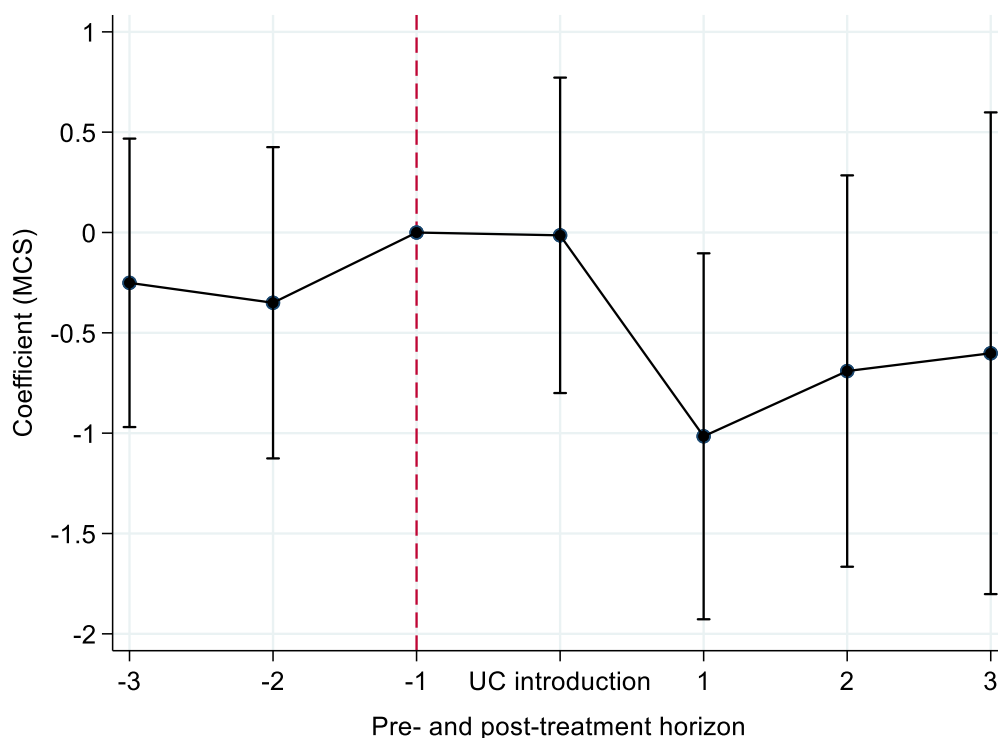


Figure 1: Event study analysis of the mental health impact of Universal Credit across a three-year horizon before and after the introduction of the reform.

Note: Local projections difference-in-differences estimates using a balanced panel of 7,710 observations between 2009-2018 within a three-year post and pre-treatment horizon. Given this is an event study analysis, the red dashed line indicates the *change* from the previous year (-1) to the year Universal Credit was introduced (0). Therefore, the figure depicts movements from one year to the next, where the first point of interest is *moving* from the year *prior* to Universal Credit introduction *to* the year Universal Credit was rolled out (and so forth). Mental health is measured based on the continuous Mental Component Summary (MCS), ranging between 0-100 where higher values indicate better health.

## Discussion

Our study of nationally representative longitudinal UK data suggests that the rollout of UC was associated with a deterioration in mental health among an expanded cohort of people exposed to the policy change, including those in employment. Between 2013 and 2019, we estimate an additional 111,954 individuals experienced depression and/or anxiety due to this welfare change, 27,115 of whom may have reached the diagnostic threshold for clinical diagnosis. We found the adverse mental health effects to be more pronounced in the first year after exposure without

returning to baseline levels. Moreover, the relative increase for those meeting thresholds for depression and common mental disorders was greater than the relative change in the mean suggesting that the effects of the policy have been even more detrimental for those with pre-existing sub-clinical mental health problems.

Our findings are supported by international literature on the health effects of welfare reforms in high-income countries. This evidence suggests that contractionary social policy reforms – like UC - entailing harsher eligibility rules, reductions in benefit generosity for some groups and extended sanctioning, are contributing to poorer mental health and widening health inequalities through limiting the financial resources that are vital to health and by reinforcing negative societal perceptions around social welfare.<sup>2</sup> Our findings are also in line with previous studies identifying the adverse mental health effects of UC on unemployed individuals – the first group exposed to the reform – and on children in unemployed families claiming UC.<sup>10–12</sup> We add to this body of evidence by extending the exploration of mental health effects of UC to a wider cohort of recipients, on average and how these effects vary year by year in the post-exposure period.

Our study has several strengths. We employed DiD analysis, exploiting the phased implementation of UC, exposing the potential harms of the reform beyond the unemployed, and for people already in work claiming UC. We also conducted a novel local projections analysis to construct ‘clean’ controls and address possible biases due to variation in treatment timing<sup>23</sup>. We took this approach to assess the average and by year mental health effects post-UC introduction through an event study analysis within a three-year horizon. We used a large nationally representative sample that provided adequate statistical power to explore the effects of UC rollout over a longer time-period that previously has not been possible to explore. We replicated our analysis using well-validated mental health measures (e.g. SF-12, GHQ-12). We conducted several sensitivity tests confirming our main findings. Finally, we expanded the analysis of UC impacts on health by investigating possible harms on physical health.

This study has some limitations. First, we combined UC area level with individual level data for identifying persons who were most likely to be impacted by the policy change. We did so to account for transitions from legacy benefits to UC over time. However, benefit receipt levels are often underreported in survey data (or misreported in general). This may have affected our

results, for example if people are less likely to report UC receipt, compared to receipt of child benefit (which may be less stigmatising), this may mean our comparison group included some people who were affected by the policy. This may explain the (albeit smaller) deterioration in mental health we observed in our comparison group and would mean that our results are conservative. Second, given that benefit receipt for some alternative benefits was not means-tested, the comparison group may have included persons with relatively higher incomes. We conducted sensitivity analysis restricting the comparison group to individuals below the median household incomes, resulting in comparable findings. Third, there is a small level of uncertainty around the LP-DiD effect estimates, primarily because the method has only recently been implemented empirically. Despite this, the method yielded similar estimates to the standard DiD. Fourth, the UKHLS uses self-reported measures which may have introduced bias due to subjectivity and recall problems. To mitigate against this, we used well-validated, multidimensional mental health scales that combine several mental health aspects rated across different response categories. We additionally used cutoff scores based on literature to identify probable cases of depression and anxiety disorders. Fifth, we applied multiple imputation techniques to address potential bias due to missingness and used sample weighting to adjust for attrition so that sample composition best reflected the general population. Finally, problems may arise if time-varying factors were confounding the relationship between exposure and outcome, such as austerity effects. However, these effects are unlikely to have been differential in areas that introduced UC at an earlier point in time.

In summary, UC – a large reorganisation of the UK welfare system – appears to have adverse consequences for the mental health of claimants, many of whom are employed. The real-world impact may be substantial since an increasing proportion of the UK population are affected as implementation continues. This is noteworthy, considering one of the policy goals is moving people away from welfare support, namely through providing assistance to employed people on low incomes to increase their earnings and working hours, and supporting those evaluated as fit to work to find a job. Requirements to complete work-related activities as detailed in claimant commitments, and sanctioning if those are not met, may be a mechanism through which the mental health of claimants is undermined. Our findings also reveal a mental health ‘shock’ claimants may experience transitioning to UC for the first time. This effect is possibly related to the new elements introduced by UC, including the five-week waiting period, benefit deductions,

the intensified conditionality requirements and sanctions, and transitioning to a fully digitalised system.

The UC reform may have significant implications for rising healthcare (i.e. National Health Service (NHS) mental health provision), welfare needs and associated costs. It is possible that a reconsideration of the new UC elements as well as timely and preventative mental health provision, and tailored employment support especially during the first year of UC receipt, could be avenues for intervention to address both mental health and employment needs. However, by June 2022, 1.2 million people were in the waiting list for receiving mental health care in England, implying that mental health services cannot keep up with the rising demand.<sup>28</sup> It is imperative that governments around the world considering changes to their social welfare systems conduct health impact assessments before reforms are widely implemented. This could be supported by improving routine data linkage between health and social organisations (e.g. NHS and DWP).

Future research is needed to explore the mechanisms through which UC affects claimants' mental health, and particularly for vulnerable groups, including families with dependent children, lone parents, children in low-income households and people with disabilities. Some of this is forthcoming, within our wider evaluation collaboration.<sup>29</sup> Whilst we did not find evidence of physical health harms on the general population in our sample, investigating the experience of UC on both mental and physical health of those living with disabilities is needed. For example, emerging evidence has associated large welfare reforms with poorer physical health among unemployed persons.<sup>30</sup> Further, considering the wider socio-economic environment within which contemporary reforms are being implemented, it is of interest to investigate how UC may have aggravated or alleviated mental health problems during the COVID-19 pandemic and periods of austerity. Strong empirical evidence is required to inform policy makers seeking to improve and address the unintended consequences of welfare changes, both nationally and internationally.



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## Research in context

### *Evidence before this study*

We searched seven bibliographic databases (Medline OVID (number of hits=15), PubMed (18), APA PsycInfo (6), Scopus (30), Web of Science (44), EconLit (3), JSTOR (5)), and grey literature (e.g. Google Scholar, WorldCat, World Health Organisation) published in English between 2013 (introduction of reform) and September 2024 using the search terms “universal credit” AND (“health” OR “mental health” OR “mental disorder\*” OR “common mental disorder\*” OR “wellbeing” OR “well-being” OR “depression” OR “anxiety” OR “psychiatric disorder\*”).

We found six papers exploring the impact of Universal Credit (UC) on claimant mental health and 12 studies focusing on other effects (e.g. housing or food insecurity) or examining specific UC claimant groups (e.g. mothers’ experiences as lead carers, women in couples, young parents, and homeless welfare recipients). Two qualitative studies suggest that the transition to a fully digitalised service, the intensified conditionality and threat of sanctions may exacerbate depression and psychological distress for UC claimants with pre-existing mental health problems and undermine the mental wellbeing of those with no previous mental health disorders. Three empirical studies exploiting data up to 2018 with Difference-in-Differences analysis (DiD) show mental health harms associated with the introduction of UC for unemployed individuals and for young children in unemployed families claiming UC, whereas another study suggests that UC claimants experienced lower life satisfaction compared to persons on other or no benefits.

### *Added value of this study*

As UC was expanded to include more types of claimants, the potential negative impact may have now reached a large share of the UK population. Our study is the first to examine the impacts of UC on the whole eligible population, including employed people, while also exploring the longer-term effects of the policy change. We used natural experiment methods to estimate the average mental health effects of the reform in the follow-up period extending the period of analysis to December 2019. We employed a novel local-projections DiD analysis to account for possible biases due to heterogeneity in the timing of UC rollout and estimate the mental health impact at

different time points within a three-year horizon post-UC introduction. We conducted several robustness checks supporting our main analysis.

Our findings suggested the introduction of UC is associated with a deterioration in mental health by 0.7 points (95% CI -1.24 to -0.15) in the treatment relative to the comparison group. This effect was particularly pronounced one year after exposure to UC (-1.01, 95% CI -1.93 to -0.10) without returning to pre-reform levels after three years. We found the prevalence of common mental disorders to increase by 4.1 percentage points (95% CI 1.3 to 6.7). These estimates indicate that since the introduction of UC, an additional 111,954 individuals may have experienced depression and/or anxiety due to the reform, 27,115 of whom may have reached the diagnostic threshold for clinical diagnosis.

### *Implications of all the available evidence*

Mounting evidence suggests mental health harms of the introduction of UC, which are now affecting employed people. Considering that one of the policy's key goals is to reduce welfare dependency by moving more people into employment as well as by increasing the earnings and working hours of those in low-paid employment, it is important to understand the implications of the reform on the mental health of both unemployed people and people in work. To the extent to which the design of the new welfare system has unintended consequences on population mental health, contributing to rising mental health and welfare costs, policy makers should consider readjustments for mitigating such impacts, particularly early in the claiming process. Adjustments may include reforms of the five-week waiting period for receiving UC, benefit deductions, conditionality following transitions from other benefits to UC, and considering providing enhanced support during the transition to UC particularly for claimants facing digital exclusion. Finally, a greater understanding of the impact of work coach discretion in implementing UC rules for both those in employment and people evaluated as fit to work and of sanctions would be valuable for delineating the reform's mental health impacts.

## Contributions

PC and CB were joint lead applicants on the NIHR grant and conceived the overall study aim and methods. MM was the lead author and conducted the statistical analysis. MM and SW planned the analysis and methods with contributions by BB. SW conducted second checking of

the data, code and analysis. BB conducted second checking of the multiple imputation analysis. MM wrote the first draft with contributions by SW and BB. AB, SVK, DT-R, BB, and PC were additional members of the work package team and contributed to the selection of methods, critical reviewing and drafting of the manuscript, and interpretation of results. HB, MC, CB, SM, LM, MS, MR, and SH-J were members of the wider research team and contributed to the conception of research questions and to the writing of the final version of the manuscript. All authors approved the submitted manuscript.

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## Declaration of interests

We declare no conflict of interests. The funding bodies of this study were not involved in the study design, data analysis, interpretation of research findings, and writing of the manuscript.

## Data sharing

Individual-level data used in this study is available from the UK Data Service under special license agreements and cannot be shared by the authors. Area-level data is available from DWP's Stat-Xplore statistical tool. Statistical code related to this study will be made publicly available after publication at the study's OSF page where the study's protocol is also available:

<https://osf.io/9n82w/>

## Ethics

Ethics were not required. We applied for a special license to access local authority data within the UKHLS. The University of Essex Ethics Committee has approved all data collection of Understanding Society main study, including approval of consent from participants for health record linkages – see link to ethical statement:

<https://www.understandingsociety.ac.uk/documentation/mainstage/user-guides/main-survey-user-guide/ethics/>

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### Appendix 1: Timeline of implementation of Universal Credit, 2013-2024

Universal Credit was introduced in the UK to replace six means-tested benefits paid to people on low incomes or those out of work, known as ‘legacy benefits’ – income-based Job Seekers Allowance (JSA), Working Tax Credit (WTC), Child Tax Credit (CTC), Housing Benefit (HB), Employment and Support Allowance (ESA), and Income Support (IS).<sup>1</sup> Figure 1A describes the time periods and migration methods of the introduction of Universal Credit since 2013. It is noted that this depiction is a simplification of the various stages of Universal Credit implementation, for example, natural migration, although started in 2013 only became available to certain groups later, e.g. parents could claim from 2016 onwards.

Furthermore, it is noted that the main difference between natural and managed migration is that in the former, claimants who fulfilled all main criteria and experienced a change in their circumstances which required a new claim to a legacy benefit that was replaced by Universal Credit they had to make this claim under Universal Credit, whereas in the latter, the transition to Universal Credit of all remaining claimants who were not migrated either naturally or voluntarily was managed by the Department of Work and Pensions (DWP).

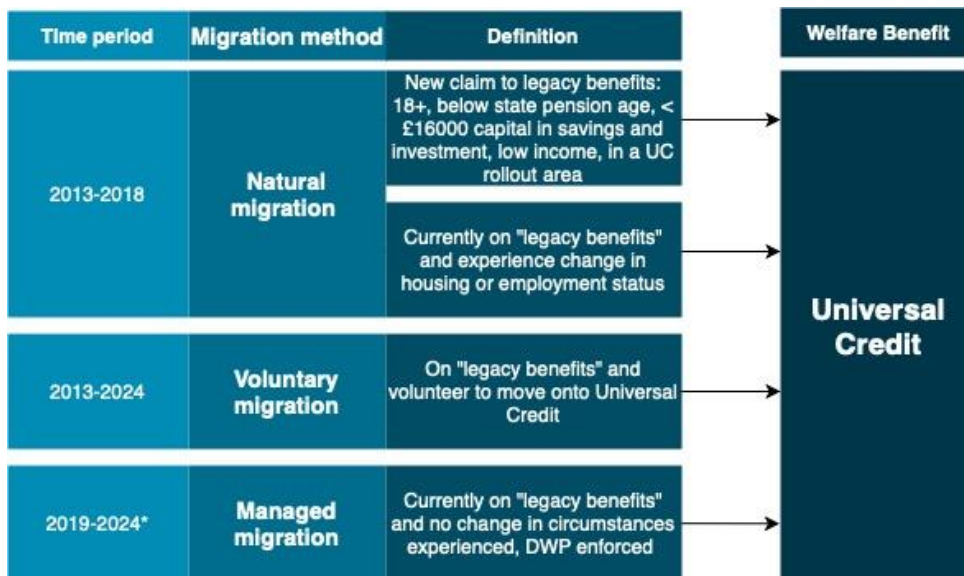


Figure 1A: Timeline of Implementation of Universal Credit between 2013 and 2024

Note: \*Paused in 2020 due to pandemic.

## Appendix 2: Summary of research on impacts of Universal Credit and social welfare

**Box 1: Summary of findings on impacts of Universal Credit, by type of effect and type of research design**

Category	Type of study	Targeted group	Outcome	UC/ Welfare element	Methods/ Data	Findings
<b>Health effects of Universal Credit (UC)</b>						
<i>Quantitative evidence</i>						
Brewer et al. (2024) <sup>2</sup>	Quantitative	Unemployed vs non-unemployed (e.g. everyone else incl. disabled, retired, students)	Mental health; GHQ-12	UC rollout	Quasi-experimental; Heterogeneous effects; UKHLS, 2009-2018	UC exacerbates mental health problems for unemployed individuals compared to legacy system – single adults and lone parents. A positive effect for coupled parents, through improvement in incomes.
Song et al. (2024) <sup>3</sup>	Quantitative	Children with unemployed parents vs children with non-unemployed parents; Year 2016 is identified as policy change	Child mental health: Strengths and Difficulties Questionnaire (SDQ)	UC	Before-after UC approach (in year 2016); Childcare utilization and household income as effects; Logistic regressions; UKHLS 2012-2018	Children in families eligible for UC face increased mental health difficulties compared to children in the comparison group; More pronounced for children in large families and children aged 8; No impact from increased childcare usage or reduced household income on child mental health.
Thornton & Iacoella (2024) <sup>4</sup>	Quantitative	Benefit recipients (UC / Legacy/ Other benefits/ No benefits)	Life satisfaction; GHQ-12 distress as a mediator	UC	Fixed effects regression; Robustness tests with DiD, IPW; mediation models; Heterogeneous effects (single parents, coupled parents, 35+ hours, employment status); UKHLS	Negative impact on life satisfaction; UC indirectly affects life satisfaction through increasing distress; UC has a less negative effect on single parents' life satisfaction compared to single non-parents; UC has a more negative effect on people not in paid work (other than unemployment) than those in paid work.
Wickham et al. (2020) <sup>5</sup>	Quantitative	Unemployed vs non-unemployed (excl. the disabled)	Mental health; GHQ-12, MCS	UC rollout	Quasi-experimental; UKHLS	Prevalence of psychological distress increased after the introduction of UC relative to the comparison group.
<i>Qualitative evidence</i>						
Cheetham et al. (2019) <sup>6</sup>	Qualitative	UC claimants/ Staff experiences	Physical and mental health; Social and family lives	UC claiming process; Digital service' Conditionality;	Semi-structured interviews with 33 UC claimants with disabilities and health conditions	UC has a negative impact on material wellbeing, physical and mental health, social and family

				Work Capability Assessments	and focus groups with 37 staff from local organisations, conducted in 2018 in two locations in North East England; Thematic analysis	lives of claimants; Digital services system is complicated and hostile; Threat of sanctions exacerbates distress
Wright et al. (2022) <sup>7</sup>	Qualitative	UC claimants/ Staff experiences	Mental health	UC conditionality; Work Capability Assessments	28 in-depth interviews with 19 claimants (nine interviewed twice); three focus groups with 23 Jobcentre Plus staff	UC 'full service' applies mainstream job search conditionality to people with mental health problems; Fear of sanctions, financial hardship, surveillance and social isolation relating to digital design has adverse effects, including those with no prior mental health problems
<b>Other impact of Universal Credit</b>						
<i>Quantitative evidence</i>						
Brewer & De Agostini (2015) <sup>8</sup>	Quantitative/ Euromod Working Paper series	UC claimants on National Minimum Wage (NMW)	Impact of UC on incomes and work incentives for families with NMW workers	UC reform	Tax and benefit microsimulation model; Synthetic dataset with information from Family Resources Survey and Labour Force Survey to identify those paid at or below the NMW; 2009-2010	No evidence that NMW families are more likely to win or lose from the UC reform than other families with the same weekly earnings; On average, mean incomes are slightly higher after UC; Both families with NMW jobs as main and secondary source of income are predicted to lose more
Brown et al. (2023) <sup>9</sup>	Quantitative	UC claimants	Analysis of socio-demographic characteristics and health profile of people claiming UC over time	UC; Digital service	Descriptive; Citizens Advice Newcastle and Citizens Advice Northumberland	A higher proportion of people with long-term disabilities were seeking advice with UC claiming process between 2017-2019 although the proportion of people with no disabilities increased in the following years.
Hardie (2022) <sup>10</sup>	Quantitative	UC claimants	Housing insecurity; Demand for Rent Arrears and Homelessness Advice	UC rollout	Quarterly LA UC data and 'advice trends' data from Citizens Advice in the UK (Q1/2014-Q1/2019); Fixed effects	UC is associated with increases in rent arrears advice issues (but not homelessness issues); Impact tends to be greater when UC has been rolled out for longer reaching more claimants, and greatest in the social rented sector where

						people are more vulnerable to arrears; Need to increase payments and address long wait periods and harsh sanctions
Hardie (2023) <sup>11</sup>	Quantitative	UC claimants	Housing insecurity; Homelessness assistance need	UC rollout	UC LA data; Monthly rates of Housing Options claims and statutory homelessness claims in Scotland; Fixed effects regression	UC 'full service' rollout up to March 2019 is associated with increases in Housing Options approaches rates, but there is no clear evidence of increases in rates of working-age statutory homelessness claims.
Sosenko et al. (2021) <sup>12</sup>	Quantitative	UC/ legacy claimants	Food bank use	UC rollout; Welfare policy	Quasi-experimental; LA data on volume of parcels and number of food banks in the Trussel Trust network, economy-related, welfare-system related, housing-related data for nine years (2011/2012-2019/2020)	UC rollout, the value of the main out-of-work benefit, benefit sanctions and the 'bedroom tax' in social housing are associated with increased food parcel uptake.
Williams et al. (2022) <sup>13</sup>	Quantitative	UC vs Housing benefit (HB)/ Jobseeker's Allowance (JSA) claimants	Housing insecurity	UC rollout	Quasi-experimental: Difference-in-differences fixed effects logistic regression; UKHLS (2009-2020)	UC has a significant effect on increasing housing insecurity in comparison to claiming HB or JSA; The effect is larger for people with disabilities and claimants moving from HB to UC.
<i>Qualitative evidence</i>						
Andersen (2023) <sup>14</sup>	Qualitative	Mothers' experiences of UC (as lead carers)	Gendered effects of UC	UC; Conditionality	Semi-structured interviews; Longitudinal study (2018-2019) on views and experiences of mothers subject to conditionality regime for lead carers within UC; Yorkshire	Conditionality regime exacerbates women's marginalized position in the dominant gendered citizenship framework.
De Oliveira (2022) <sup>15</sup>	Qualitative	Formally homeless people's experiences of UC	Impact of UC process on vulnerable groups	UC process; Conditionality; Digital service	Photoelicitation in-depth interviews with five formerly homeless people, aged 35-62 years, with experiences of UC in the UK	UC process leads vulnerable groups struggle and use food banks, contributing to destitution.
Parker & Veasey (2021) <sup>16</sup>	Qualitative	Women among couples on UC	Gender effects of UC; Impact of UC on vulnerable groups	UC; Joint applications for couples; Conditionality	Critical review of the literature; Semi-structured interviews with eight third sector and voluntary support workers for homeless people,	Current welfare system reinforces structural abuse of women; Entrapping women into abusive relationships; Exacerbated effects during the COVID-

					conducted in early 2020 before lockdowns in three locations in the South West and South East of England; Thematic analysis	19 pandemic lockdowns; A wider recognition of gender power relations within the welfare system is required.
Veasey & Parker (2021) <sup>17</sup>	Qualitative	Homeless welfare recipients	Impact of UC on vulnerable groups; Gender implications	UC; Welfare system; Welfare reform; Conditionality; Sanctions; Digital service	Semi-structured interviews with eight third sector and voluntary support workers for homeless people, conducted in early 2020 before lockdowns in three locations in the South West and South East of England; Interpretative phenomenological analysis	Welfare reforms, including increased conditionality and sanctions, reinforce inequality and social marginalisation especially for the most vulnerable groups.
Wood (2023) <sup>18</sup>	Qualitative	Young parents on UC	Discrimination of UC against young people/ young parents; Poverty	UC; Lower levels of support for young people (below the age of 25)	Two waves of in-depth interviews with 90 young parents under the age of 25 claiming UC (and couples where one partner is below the age of 25 and the other partner is above the age of 25), conducted between 2018-2020 in four areas of England and Scotland; Thematic analysis	Young parents on UC face extreme financial disadvantage, housing difficulties; Problematic interactions with DWP staff contributing to lower awareness and access to social benefits.
Wood & Bennett (2023) <sup>19</sup>	Qualitative	Single and coupled low-income parents with and without dependent children on UC	Impact of UC on low-income families during the COVID-19 pandemic; Financial adversity; Mental health & family relationships	UC; Childcare costs; Monthly assessments; UC uplift during the pandemic	Two-wave in-depth interviews with 90 (single and coupled) parents with and without dependent children claiming UC, conducted in 2018 and 2020 in four areas in England and Scotland; Thematic analysis	Inadequate benefit rates, childcare costs, and erratic payments and administrative burden due to monthly assessments led to financial adversity; Increased caring responsibilities and worries about childcare primarily impacted women, contributing to worse family relationships and mental health problems; Positive impact of the uplift but its worth was disproportionate for families with more children.  Positive experiences for a minority of parents who were furloughed and saved money on

						work-related costs, and because of temporarily reduced work-related conditionality; Positive aspects in family relationships for male partners because of more family time.
<b>Effects of welfare reform and social welfare elements (not restricted to Universal Credit)</b>						
Day & Shaw (2022) <sup>20</sup>	Qualitative	Disabled; Chronically ill on ESA that have been through the Work Capability Assessment process (WCA)		Conditionality; Work Capability Assessments	Semi-structured interviews with five participants with chronic conditions to explore the impact of UK welfare reform and perceptions of WCA process; Interpretative Phenomenological Analysis	The WCA process undermines/ignores participants' understanding of their condition; the focus on 'capability' ignores the qualitative aspects of medical conditions leading to feelings of dehumanisation; the process leads to feelings of lack of autonomy through lengthy battles for diagnosis; DWP decisions perceived as inescapable leading to feelings of uncertainty and stigmatisation.
Mehta et al. (2021) <sup>21</sup>	Qualitative	Disabled peoples' experiences with ESA	Labour market outcomes	Conditionality; Sanctions; Work Related Activity Group	In-depth, semi-structured interviews with 15 participants; Thematic analysis	Negative impact of conditionality and sanctions on disabled claimants; Lack of equality; Impact of issues of compliance within a regime that imposes sanctions; Alternative ways of experiences and responses to this policy regime.
Williams (2021a) <sup>22</sup>	Quantitative	Unemployed claiming JSA	Anxiety; Depression	Sanctions of unemployment benefits prior to introduction of UC; Welfare reform Act 2012 increasing the minimum sanction period from one to four weeks and the maximum from 26 to 156 weeks	Quarterly LA data on JSA rate sanctions in England from Stat-Xplore (Q3/2010-Q4/2014); Anxiety and depression from QLFS; Fixed effects models (area level)	JSA sanctions lead to increased self-reported anxiety and depression, especially after the increase in the length of sanctions in October 2012.
Williams (2021b) <sup>23</sup>	Quantitative	Unemployed claiming JSA	Antidepressant prescribing	Sanctions of unemployment benefits	Quarterly LA data on JSA rate sanctions in England from Stat-Xplore (Q3/2010-Q4/2014); Antidepressant prescribing items from NHS Digital; Fixed effects models (area level)	Higher sanctions rate at the LA level are associated with both adverse mental health (increased antidepressant prescribing) and wider public expenditure implications.

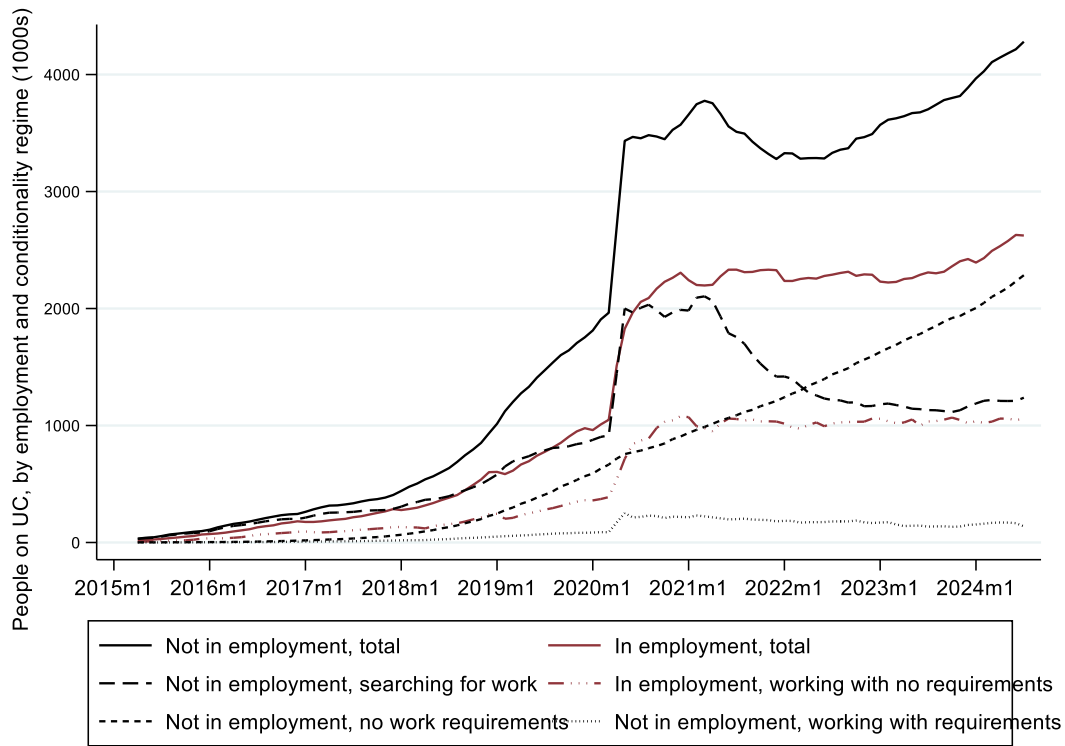
Yau et al. (2021) <sup>24</sup>	Multi-method		Food insecurity	Poverty	Analysis of 132 newspaper articles about food insecurity in the UK; 2016-2019; Thematic analysis	Food insecurity is defined by food bank use or hunger (and other consequences for individuals). Government, especially in relation to UC rollout is identified as a driver of food insecurity. Existing solutions focused on food banking and redistribution of 'food waste'.
<b>Reports/ Other evidence</b>						
Fei (2021) <sup>25</sup>	Qualitative/ PhD thesis	UC and benefit claimants	Responses to welfare behavioural conditionality	UC; Social benefits	In-depth, semi-structured interviews with 32 persons with experiences claiming working-age benefits and UC and 18 stakeholders in South London	Stakeholders make explicit/implicit interpretations of behavioural change of UC claimants based on their individual, institutional and social backgrounds and in relation to their role and experience; UC claimants experience changes in seeking information and advice for UC; lower time costs because of digital service; some participants encounter digital/ literacy barriers that hinder benefit-related behavioural change; UC conditionality causes temporary financial destitute; Sanctions and childcare are less relevant to encourage those out of work to move off benefit and into work and enable in work recipients to make work progress
Thompson et al. (2020) <sup>26</sup>	Qualitative	Homeless people's experiences and access to UC	Health impact	UC	Six in-depth interviews with homeless people; Six in-depth interviews with third sector stakeholders supporting people who are homeless; Focus groups with 14 people with personal experiences of homelessness; Thematic analysis	UC assumes capacity which is not consistent with homelessness; leads to complications around payments, sanctions and delays, IT access and communication and problems demonstrating ill-health; Potential for severe health consequences, especially stress and anxiety.



Reviews						
Bidmead et al. (2023) <sup>27</sup>	Qualitative	Children and young people	Poverty; Health; Wellbeing	UC	Rapid review of 16 qualitative/ mixed methods studies on children and young people's experiences with welfare support in the UK; Narrative synthesis	Children growing up in poverty has significant negative impacts on health and wellbeing, contributing to feelings of exclusion and unfairness.
Carey & Bell (2023) <sup>28</sup>	Qualitative	Lone mothers on UC; Children	Poverty; Mental health	UC; Conditionality; Digital service;	Critical evaluation of qualitative evidence on UC; Exploration of ethics of the welfare system	Conditionality policies for lone parents may lead to increased risks for poverty, a deterioration in mental health and destitution posed by sanctions and precarious low-paid employment undermining parenting capacities and children's wellbeing.
McKay et al. (2023) <sup>29</sup>	Systematic review		Health; Wellbeing; Crime; Quality of life; Employment; Subjective wellbeing; Tuberculosis; Hospitalisation	Basic income	Systematic review of ten studies on evidence on the health and wellbeing effects of basic income policies	Basic income interventions may reduce health inequalities and act upon the determinants of health and wellbeing; A small number of trials suggests a positive impact
Dwyer et al. (2023) <sup>30</sup>	Qualitative/ Book	Welfare recipients subject to various degrees of conditionality	Impact, effectiveness, and ethicality of welfare conditionality (employment effects, cessation of antisocial behaviour, behavioural change)	Welfare conditionality; Sanctions	WelCond Project: Semi-structured interviews with 52 policy stakeholders; 27 focus groups with frontline welfare practitioners supporting welfare service users subject to conditionality; Qualitative longitudinal study to a diversity of welfare service users subject to varying types and degrees of conditionality; Nine groups of recipients (jobseekers, lone parents, disabled people, UC recipients in and out of work, homeless people, social tenants, individuals and families subject to ASB orders, offenders, migrants); Period 2014-2017 in 11	Benefit sanctions contribute to poverty and profound harms; Conditionality generates negative behavioural changes such as the adoption of ' <i>counterproductive compliance</i> ' (e.g. welfare conditionality inhibits effective attempts to secure employment because the role of coaches has changed from assisting people into work to policing the conditions attached to individuals claims through the threat of sanctions) which provokes anxiety and depression and <i>disengagement from the social security system</i> because people are either unable or unwilling to meet the mandatory

					locations in England and Scotland	requirements to retain benefit eligibility.
Machin (2017) <sup>31</sup>	Discursive	Impact on low-income families	Impact on vulnerable groups	Ethics: Two-child limit; Child Tax Credit; UC	Discussion of ethical considerations of limiting financial support based on family size	
Machin & Reynolds (2024) <sup>32</sup>	Qualitative/ Review	Claimants with mental health problems	Impact on vulnerable groups	Commodification: Medical assessments determining benefit eligibility; Personal Independence Payment (PIP); Employment and Support Allowance (ESA); UC	Practitioners' experiences and reflections of the process of medical assessments for welfare eligibility	Current system of commodified medical assessments in the UK has had a regressive impact on vulnerable and disabled claimants, and services fail in meeting most basic customer service standards; Scottish system alternative approach of not using private sector companies in assessment process and assessments are used only as a last resort in absence of other formal or informal evidence; Vulnerable claimants should be supported
Stewart et al. (2023) <sup>33</sup>	Review		Child & maternal health	Interventions tackling the social determinants of health	Policy-mapping review across the UK (1981-2021) using open keyword and category searches of UK and devolved Government websites, and hand searched policy reviews; 336 policies and 306 strategy documents identified	Three policy priority areas in child and maternal health (welfare grants in pregnancy and early childhood, early years education and childcare, Universal Credit and welfare policies).

**Appendix 3: Composition of people on Universal Credit by employment and major conditionality regime**



**Figure 3A: People on Universal Credit by employment and major conditionality regime, April 2015 to July 2024**

Note: Data extracted from Stat-Xplore. Data prior to 2015 were not available.

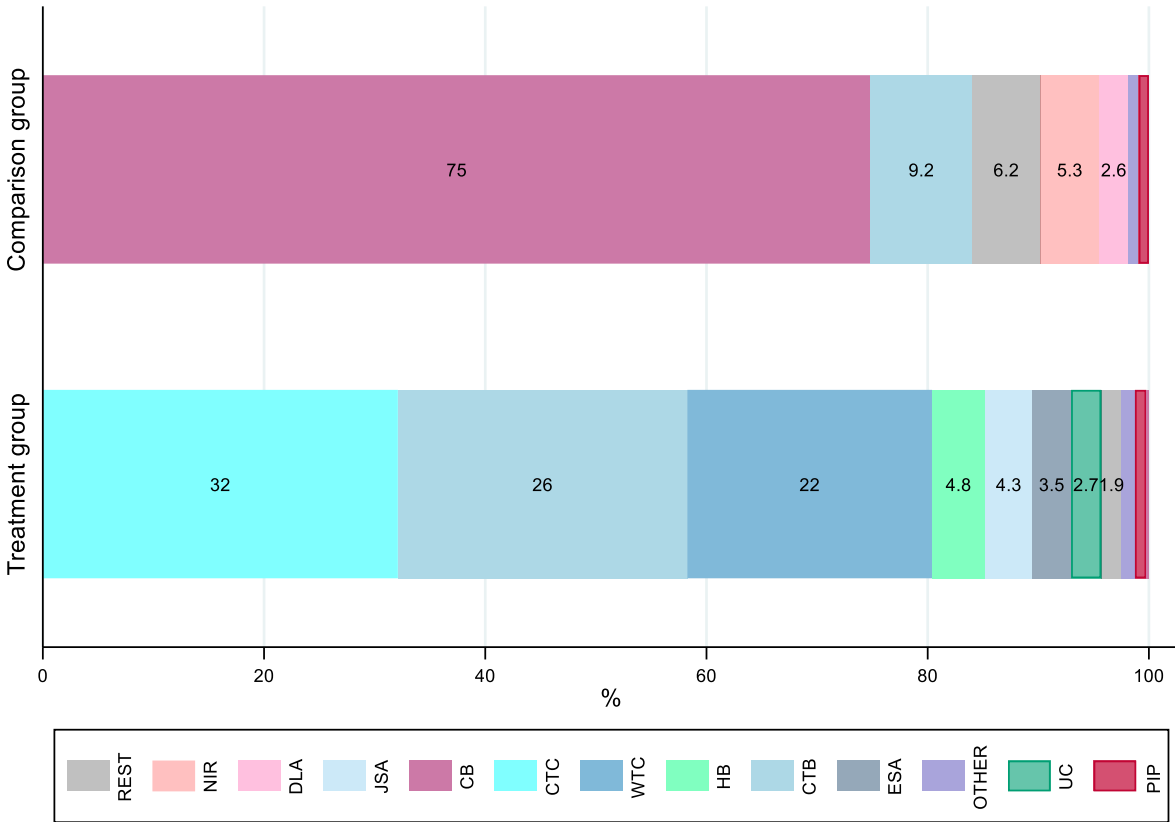
#### **Appendix 4: Analysis of benefits received by treatment and comparison group**

Individuals were assigned to the treatment group if they had reported receiving either Universal Credit or any of the six legacy benefits at any point in time. People could report receiving up to 10 different state benefits in the same year, therefore, they were assigned to the treatment group if at least one of those benefits was Universal Credit or legacy benefits for that year. Respondents were assigned to the comparison group if they had reported receiving other/ alternative state benefits.

Figure 4A depicts the overall distribution of benefits reported in the treatment and comparison groups. Overall, the most reported benefit among the treated was the Child Tax Credit (32%), followed by Council Tax Benefit (26%), Working Tax Credit (22%), Housing Benefit (4.8%), Jobseeker's Allowance (4.3%) and Employment and Support Allowance (3.5%), and Universal Credit (2.7%). The rest of the distribution includes other types of state benefits.

Although we have excluded the long-term disabled who are not employed and the retired from our analysis, some people may still report receiving benefits connected to disability or retirement. These may include individuals who are still in employment and receive other types of benefits. Figure 4B depicts the types of benefits received in the treatment and comparison groups by economic status of benefit recipients. As shown, the two groups receive distinctly different types of benefits by economic status. Two thirds of people in employment in the treatment group reported receiving Working Tax Credit and/or Child Tax Credit, whereas three quarters of employed individuals in the comparison group received Child Benefit.

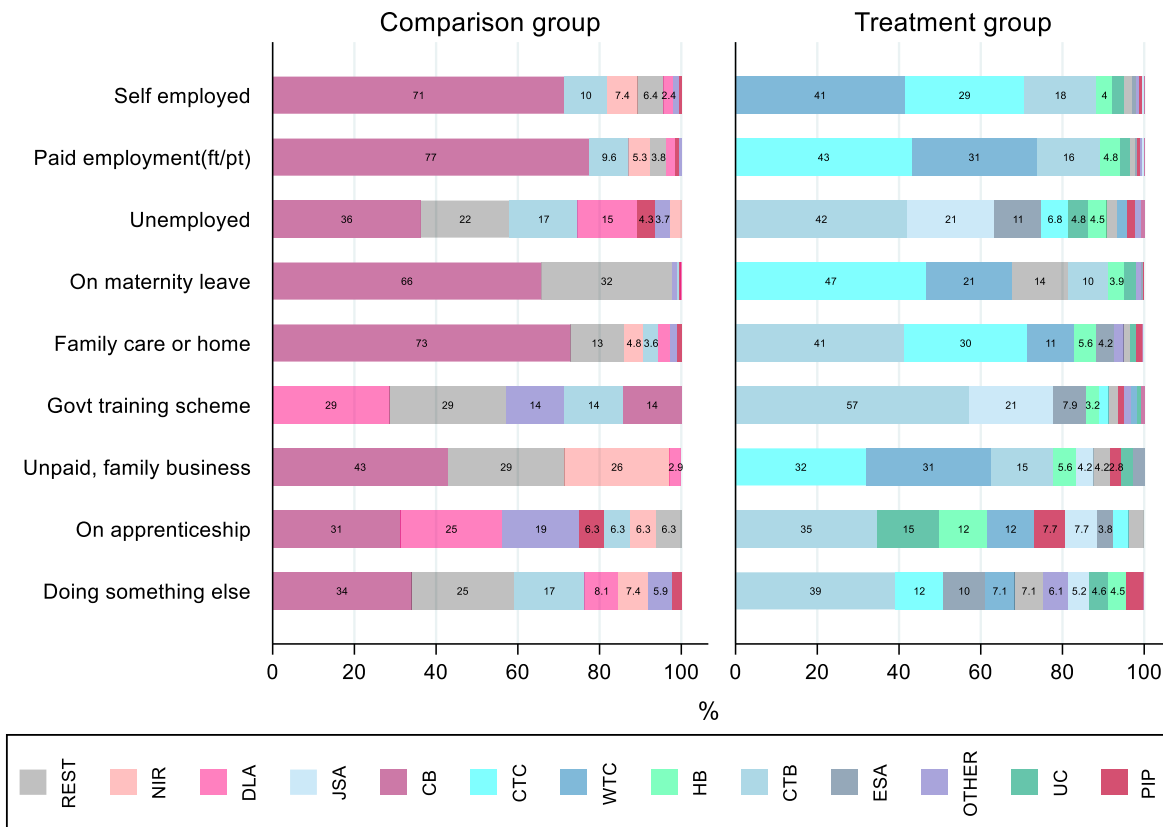
Tables 4.1 and 4.2 further disaggregate the distribution of benefits received by the number of reported benefits in the treatment and comparison groups, respectively.



**Figure 4A: Main benefits received (%), treatment and comparison group**

Note: **Legacy benefits & Universal Credit:** *WTC*: Working Tax Credit; *JSA*: Job Seeker's Allowance; *CTC*: Child Tax Credit; *HB*: Housing Benefit; *ESA*: Employment and Support Allowance; *IS*: Income Support; *UC*: Universal Credit. **Other benefits:** *CTB*: Council Tax Benefit; *CB*: Child Benefit; *DLA*: Disability Living Allowance; *NIR*: NI Retirement/ State retirement; *PIP*: Personal Independence Payment; *OTHER*: Other state benefit; *REST*: Rest of benefits which have been aggregated into one category for simplifying the presentation (Carer's Allowance - 0.62%, Maternity Allowance - 0.65%; Foster/Guardian Allowance - 0.31%; Return-to-Work Credit - 0.13%; In-Work Credit for Lone Parents - 0.09%; A Widow's or War Widow's Pension - 0.20%; A Widowed Mother's Allowance - 0.04%; Pension Credit (includes Guarantee Cred) - 0.04%; Severe Disablement Allowance - 0.01%; Industrial Injury Disablement Allowance - 0.24%; Attendance Allowance - 0.05%; War Disablement Pension - 0.19%; Incapacity Benefit - 0.27%; Other Disability Related Benefit or Pay - 0.27%).

**Number of observations across benefits reported in the treatment group:** 64,363 total number of observations. *WTC*: 14,238; *JSA*: 2,758; *CTC*: 20,659; *HB*: 3,091; *ESA*: 2,240; *UC*: 1,756; *IS*: 1,198; Other state benefits (*CTB*: 16,848; *CB*: 151; *PIP*: 664; *REST*: 760). **Number of observations across benefits reported in the comparison group:** 43,884 total number of observations. *CTB*: 4,029; *CB*: 32,846; *DLA*: 1,157; *NIR*: 2,338; *PIP*: 404; *OTHER*: 405; *REST*: 2,705.



**Figure 4B: Main benefits received (%) by economic status, treatment and comparison group**

**Legacy benefits & Universal Credit:** WTC: Working Tax Credit; JSA: Job Seeker's Allowance; CTC: Child Tax Credit; HB: Housing Benefit; ESA: Employment and Support Allowance; IS: Income Support; UC: Universal Credit. **Other benefits:** CTB: Council Tax Benefit; CB: Child Benefit; DLA: Disability Living Allowance; NIR: NI Retirement/ State retirement; PIP: Personal Independence Payment; OTHER: Other state benefit; REST: Rest of benefits which have been aggregated into one category for simplifying the presentation (Carer's Allowance, Maternity Allowance; Foster/Guardian Allowance; Return-to-Work Credit; In-Work Credit for Lone Parents -; A Widow's or War Widow's Pension; A Widowed Mother's Allowance; Pension Credit (includes Guarantee Cred) -; Severe Disablement Allowance; Industrial Injury Disablement Allowance; Attendance Allowance; War Disablement Pension; Incapacity Benefit; Other Disability Related Benefit or Pay). 64,363 total number of observations in the treatment group. 43,884 total number of observations in the comparison group.

**Number of observations across benefits reported in the treatment group:** 64,363 total number of observations. Number of observations by economic status (self-employed: 6,074; paid employment: 31,532; unemployed: 11,737; on maternity leave: 844; family care: 13,236; government training scheme: 126; unpaid, family business: 72; on apprenticeship: 26; something else: 716). **Number of observations across benefits reported in the comparison group:** 43,884 total number of observations. Number of observations by economic status (self-employed: 4,320; paid employment: 33,342; unemployed: 1,062; on maternity leave: 1,112; family care: 3,712; government training scheme: 14; unpaid, family business: 35; on apprenticeship: 16; something else: 271).

**Table 4.1: Main benefits by number of benefits received in a particular year (%), Treatment group**

Number of benefits	Obs.	Main benefits by number of benefits received in a particular year (%), Treatment group						
		WTC	JSA	CTC	UC	HB	ESA	IS
1	8,576	36.4%	30.5%	14.2%	6.1%	4.9%	4.4%	3.5%
2	23,204	CB 83.7%	CTC 80%	WTC 9.2%	CTB 6.9%	HB 6.2%	JSA 3.2%	UC 3%
3	15,428	CB 77%	CTC 74.5%	WTC 60.4%	CTB 26.5%	HB 24.4%	JSA 10.6%	IS 6.6%
4	6,971	CB 80.6%	CTC 74.9%	CTB 64.4%	HB 60.6%	WTC 42.1%	IS 20.7%	DLA 14.6%
5	7,909	CB 95.6%	CTB 94.8%	CTC 94.3%	HB 92.8%	WTC 38.5%	IS 37.3%	JSA 14.2%
6	1,545	CTB 95.6%	CB 94.4%	HB 92.1%	CTC 89%	IS 55.5%	CA 39.7%	DLA 38.2%
7	598	CTB 98.8%	CB 97%	HB 96.3%	CTC 95.3%	IS 79.9%	DLA 79.3%	CA 77.4%
8	112	CTB 99.1%	HB 96.4%	CTC 95.5%	CB 95.5%	DLA 92.9%	CA 84.8%	IS 75%
9	15	CB 100%	HB 100%	CA 100%	DLA 100%	CTB 100%	CTC 93.3%	IS 66.7%
10	5	CTC 100%	HB 100%	CA 100%	CB 100%	CTB 100%	DLA 80%	IB 80%
Total obs.	64,363							

WTC: Working Tax Credit; JSA: Job Seeker's Allowance; CTC: Child Tax Credit; UC: Universal Credit; HB: Housing Benefit; ESA: Employment and Support Allowance; IS: Income Support; CTB: Council Tax Benefit; CB: Child Benefit; IB: Incapacity Benefit; CA: Carer's Allowance; DLA: Disability Living Allowance

**Table 4.2: Main benefits by number of benefits received in a particular year (%), Comparison group**

Number of benefits	Obs.	Main benefits by number of benefits received in a particular year (%), Comparison group				
		CB	CTB	NIR	DLA	CA
1	41,256	77.9%	8.1%	5.7%	2.5%	1.4%
2	2,288	CB 64.3%	DLA 31.1%	CTB 27.4%	MA 16%	CA 13.2%
3	292	CB 72.3%	DLA 62.7%	CA 54.1%	CTB 31.8%	IB 10.3%
4	41	DLA 82.9%	CTB 61%	CB 56.1%	CA 51.2%	IB 24.4%
5	5	CB 100%	DLA 80%	CA 80%	CTB 80%	WMA 40%
6	2	PC 100%	DLA 100%	AA 100%	CA 100%	CTB 100%
Total obs.	43,884					

CB: Child Benefit; CTB: Council Tax Benefit; NIR: NI Retirement/ State retirement; DLA: Disability Living Allowance; CA: Carer's Allowance; MA: Maternity Allowance; IB: Incapacity Benefit; PC: Pension Credits; AA: Attendance Allowance; WMA: A Widowed Mother's Allowance

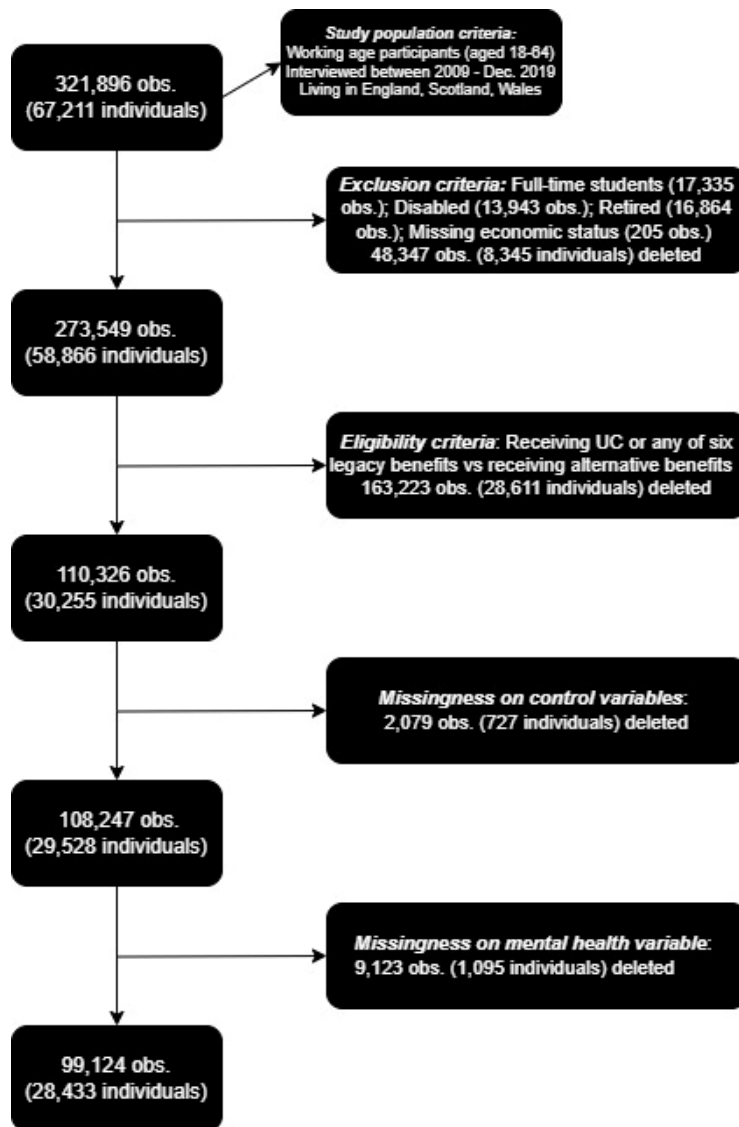
## Appendix 5: Multiple imputation procedures

Due to the hierarchical structure of the data, we used past information of the dependent and independent variables to impute the outcome variables according to the following process:

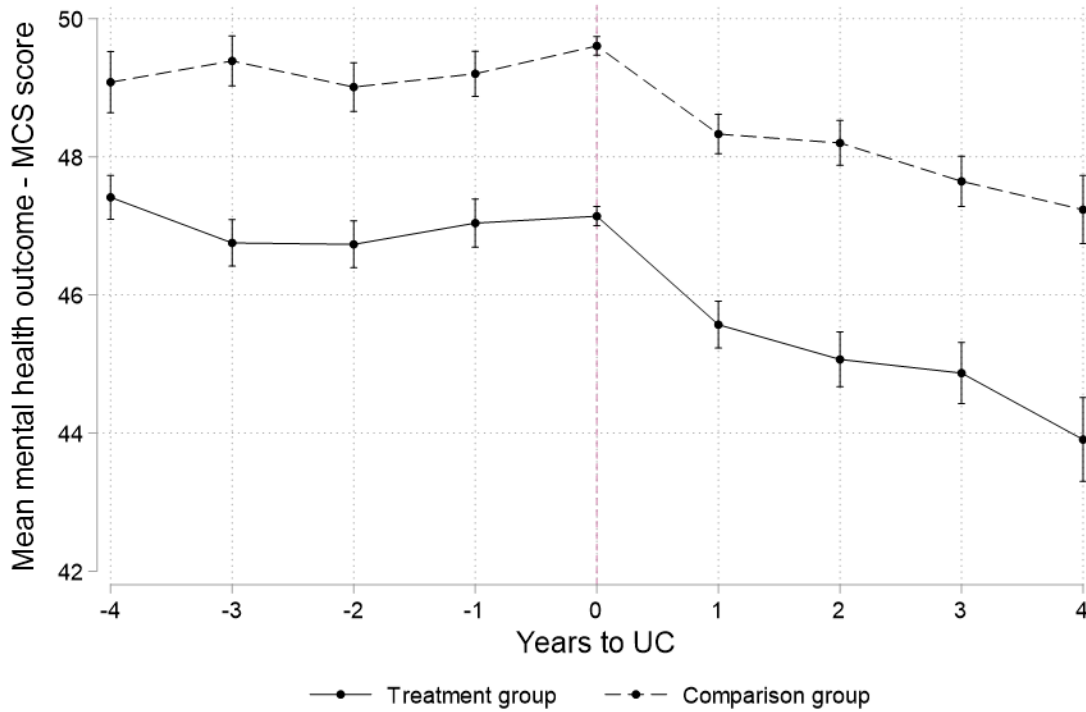
1. All missing waves were filled in to create a balanced panel with 11 waves and 29,528 for each year resulting in a total of 324,808 observations.
2. The missing information of control variables for these years was filled in: the values of constant variables, such as gender and ethnicity, were completed for missing waves, whereas variables with known time-varying values, such as age, age squared were filled in accordingly. The values of variables with little variation, such as marital status, having a dependent child (no missing), longstanding illness (0.09% missing values), marital status (0.15% missing values), educational level (1.6% missing values), were completed by assuming that the values in the year before the year with non-missing information would have remained steady.
3. Data were declared as missing and reformatted in a wide format so that each of the 29,528 observations would have information across 11 waves.
4. The dependent variable was registered as a variable to be imputed whereas the rest of variables that were to be included in the imputation model (and their past values across the 11 waves) (e.g. gender, ethnicity, country of residence, age, age squared, having a dependent child, marital status, having a longstanding illness, educational level, DiD interaction term, years before and after UC introduction) were registered as regular variables.
5. We used a truncated regression imputation method for imputing 225,684 missing observations (31%, based on the balanced panel dataset we have created) for the continuous MCS score to make sure imputed values were within the possible range of scores and no negative values would be produced through the process of imputation (e.g. as in the case of a simple regression model). We set the lower limit at 0 and the upper limit at 76.53 because this was the highest observed value in the original dataset. We iterated the procedure for 10 cycles, therefore producing 10 multiply imputed datasets.
6. After the imputation was conducted, the dataset was reformatted into the long (panel) format.
7. Then, only observations in the original dataset were kept, meaning that the final dataset would be the same as the initial dataset with imputed MCS values (across 10 imputed datasets). Therefore, the total observations were 1,190,717 (108,247 \* 11).
8. We finally conducted the analysis using the 10 multiply imputed datasets as normally.



## Appendix 6: Flowchart of study population and sample size



**Appendix 7: Parallel trends assumption examination (visually and through regression analysis)**



**Figure 7A: Mean mental health scores (MCS) in the treatment and comparison groups before and after the introduction of Universal Credit (indicated by the red dashed line)**

**Table 7.1: Parallel trends assumption using regression analysis, multiple imputation model**

Multiple-imputation estimates	Imputations	10
Survey: Linear regression	Number of obs	108,182
Number of strata = 361	Population size	74,918.052
Number of PSUs = 85,558	Subpop. Size	27,102.788
	Total	1,190,717

Multiple imputation by chains using truncated regression and 10 imputation cycles.

<b>MCS</b>	<b>Coefficient</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Age	-0.169	0.072	-2.35	0.019	-0.311	-0.0278
Age squared	0.003	0.000	3.79	0.000	0.001	0.005
Gender (ref. male)						
Female	-3.161	0.304	-10.37	0.000	-3.758	-2.563
Dependent child (ref. no)						
Yes	1.863	0.298	6.25	0.000	1.278	2.448
Longstanding illness (ref. no)						
Yes	-3.892	0.206	-18.82	0.000	-4.297	-3.486
Marital status (ref. married/cohab.)						
Single	-2.123	0.243	-8.73	0.000	-2.599	-1.646
Country (ref. England)						
Wales	-0.557	0.483	-1.15	0.249	-1.505	0.391
Scotland	-0.771	0.328	-2.34	0.019	-1.416	-0.126
Ethnicity (ref. British)						
Non-British	-0.427	0.244	-1.75	0.081	-0.907	0.052
Educational level (ref. degree)						
A Levels/ GCSE	-0.036	0.186	-0.19	0.847	-0.402	0.330
Other	-0.082	0.308	-0.27	0.789	-0.686	0.522
No qualification	-0.591	0.364	-1.62	0.105	-1.306	0.123
Treatment	-1.411	0.388	-3.63	0.000	-2.173	-0.649
Years to UC	-0.101	0.077	-1.32	0.188	-0.252	0.049
Treatment#Period prior to policy intervention						
	-0.109	0.095	-1.14	0.254	-0.297	0.078
Constant	52.62	1.446	36.38	0	49.79	55.46

## Appendix 8: Main results with multiple imputation – full model

The MCS score ranges between 0-100, where higher values suggest better mental health.

Multiple-imputation estimates	Imputations	10
Survey: Linear regression	Number of obs.	108,247
Number of strata = 361	Population size	74,924.36
Number of PSUs = 85,558	Total	1,190,717

MCS	Coefficient	std. err.	t	P>t	[95% CI]	
Age	-0.193	0.040	-4.78	0.000	-0.272	-0.113
Age squared	0.003	0.000	7.68	0.000	0.002	0.004
Gender (ref. male)						
Female	-2.395	0.168	-14.24	0.000	-2.725	-2.065
Dependent child (ref. no)						
Yes	1.067	0.166	6.41	0.000	0.741	1.393
Longstanding illness (ref. no)						
Yes	-4.441	0.137	-32.24	0.000	-4.711	-4.171
Marital status (ref. married/cohab.)						
Single	-2.210	0.153	-14.41	0.000	-2.510	-1.909
Country (ref. England)						
Wales	-0.775	0.289	-2.68	0.007	-1.342	-0.207
Scotland	-0.261	0.227	-1.15	0.25	-0.707	0.184
Ethnicity (ref. British)						
Non-British	-0.346	0.168	-2.05	0.04	-0.677	-0.015
Educational level (ref. degree)						
A Levels/ GCSE	0.008	0.126	0.07	0.947	-0.239	0.256
Other	-0.496	0.242	-2.05	0.041	-0.971	-0.020
No qualification	-0.982	0.244	-4.02	0.000	-1.462	-0.503
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.502	1.495	0.34	0.737	-2.427	3.433
-9	0.566	1.034	0.55	0.584	-1.462	2.594
-8	-0.867	0.782	-1.11	0.267	-2.400	0.665
-7	0.587	0.398	1.47	0.141	-0.193	1.368
-6	0.488	0.290	1.68	0.093	-0.080	1.057
-5	0.285	0.224	1.27	0.204	-0.155	0.725
-4	-0.410	0.219	-1.87	0.062	-0.841	0.019
-3	-0.576	0.227	-2.53	0.011	-1.022	-0.130
-2	-0.538	0.240	-2.24	0.025	-1.009	-0.067
-1	-0.548	0.232	-2.36	0.018	-1.004	-0.093
+1	-0.283	0.330	-0.86	0.391	-0.932	0.364
+2	-0.628	0.358	-1.75	0.079	-1.331	0.073
+3	-0.835	0.387	-2.16	0.031	-1.595	-0.075
+4	-1.567	0.516	-3.03	0.002	-2.580	-0.555
+5	-0.764	0.708	-1.08	0.281	-2.153	0.624
+6	0.692	2.019	0.34	0.732	-3.266	4.652
Treatment						
Post intervention	-1.134	0.264	-4.29	0.000	-1.651	-0.616
	-1.077	0.139	-7.73	0.000	-1.350	-0.804
Treatment##Post intervention						
UC/legacy#1	-0.698	0.278	-2.51	0.012	-1.243	-0.153
Constant	53.92	0.855	63.06	0.000	52.24	55.59

## Appendix 9: Contextualisation of findings

This section provides details regarding the selection of cutoff values for the construction of binary mental health indicators, the calculation of the number of people who may have developed mental health disorders due to the introduction of Universal Credit, and the number of people that may have reached the diagnostic thresholds for depression/ common mental disorders due to the policy reform.

### 9.1. Selecting cut-offs for the MCS-12

Scores were selected based on Gill et al. (2007).<sup>34</sup> A score of  $\leq 45$  was chosen as the best screening cut-off for depression (sensitivity, 0.87; specificity, 0.83; PPP, 0.18; NPP, 0.99), and  $\leq 50$  for any anxiety disorder (sensitivity, 0.81; specificity, 0.73; PPP, 0.19; NPP, 0.98). A cut-off of  $\leq 50$  was also chosen for any common mental disorder (sensitivity, 0.84; specificity, 0.74; PPP, 0.24; NPP, 0.98).

### 9.2 Calculating the number of people between 2013-2019 that may have experienced depression and/ or anxiety due to the introduction of Universal Credit

Based on data derived from Stat-Xplore, by December 2019, there were 2,730,575 people on Universal Credit. Using a binary measure with a cut-off  $\leq 50$  in the continuous mental health scale, our findings suggested there was an increase in common mental disorders by 4.1 percentage points among individuals eligible for moving onto Universal Credit compared to the comparison group. Based on this estimate, we found that approximately 111,954 (95% CI 35,497 to 182,948) additional individuals may have developed a common mental disorder due to exposure to Universal Credit compared to the non-eligible population. Based on a more conservative cut-off capturing prevalence in depression ( $\leq 45$ ) and our estimate of 3.0 percentage points, we find that by December 2019 approximately 81,917 (95% CI 10,922 to 150,182) additional persons may have developed depression due to the introduction of Universal Credit.

### 9.3 Calculating the number of people reaching the diagnostic threshold for a common mental disorder

- $\leq 45$  cutoff for depression (sensitivity SN 0.87, specificity SP 0.83, prevalence 4%): PPV=17.58%
- $\leq 50$  cutoff for any mental disorder (incl. anxiety disorders and depression) (SN 0.84, SP 0.74, prevalence 9%): PPV=24.22%

We calculated that out of 111,954 additional individuals on Universal Credit who might have developed a common mental disorder due to the policy introduction, approximately 27,115 individuals may have reached the diagnostic threshold for any common mental disorder, including depression and anxiety disorders (111,954 \*24.22%).

## Appendix 10: Findings from alternative outcome variables with multiple imputation

**Table 10.1: Summary of findings for alternative outcome measures, multiple imputation models**

	<b>Estimate</b>	<b>95% CI</b>	<b>P&gt;t</b>
Change in continuous MCS score	-0.70	-1.24 to -0.15	0.012
Percentage point change in prevalence of depression (<=45 cutoff)	3.0	0.4 to 5.5	0.022
Percentage point change in prevalence of common mental disorders (<=50 cutoff)	4.1	1.3 to 6.7	0.003
Change in continuous GHQ-12 score (0-36)	0.31	0.01 to 0.61	0.041
Change in continuous GHQ-12 score (0-12)	0.20	0.03 to 0.37	0.022
Percentage point change in prevalence of psychological distress (cutoff ≥4)	2.4	0.2 to 4.5	0.032
Percentage point change in prevalence of psychological distress (cutoff ≥3)	3.0	0.7 to 5.4	0.012
Change in continuous PCS score	-0.24	-0.66 to 0.18	0.269
Percentage point change in prevalence of physical conditions (<=50)	0.8	-1.4 to 3.0	0.468

**Table 10.2. Binary MCS measure ( $\leq 45$  cutoff) screening for depression)**

The binary MCS variable is constructed such that an odds ratio above 1 implies an increase in depression.

Multiple-imputation estimates  
 Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations = 10  
 Number of obs. = 108,247  
 Total obs. = 1,190,717

<b>MCS Binary (<math>\leq 45</math>)</b>	<b>Odds ratio</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Age	1.033	0.009	3.59	0.000	1.015	1.052
Age squared	0.999	0.000	-5.61	0.000	0.999	1
Gender (ref. male)						
Female	1.537	0.061	10.80	0.000	1.421	1.661
Dependent child (ref. no)						
Yes	0.821	0.032	-5.09	0.000	0.761	0.886
Longstanding illness (ref. no)						
Yes	2.3	0.064	29.71	0.000	2.177	2.430
Marital status (ref. married/cohab.)						
Single	1.529	0.051	12.84	0.000	1.433	1.631
Country (ref. England)						
Wales	1.126	0.07	1.90	0.058	0.996	1.273
Scotland	1.056	0.054	1.06	0.289	0.955	1.167
Ethnicity (ref. British)						
Non-British	1.168	0.046	3.93	0.000	1.081	1.262
Educational level (ref. degree)						
A Levels/ GCSE	1.042	0.032	1.35	0.178	0.982	1.106
Other	1.223	0.068	3.62	0.000	1.097	1.363
No qualification	1.349	0.075	5.35	0.000	1.208	1.506
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	1.095	0.527	0.19	0.850	0.426	2.814
-9	0.840	0.227	-0.64	0.520	0.495	1.427
-8	1.234	0.221	1.17	0.241	0.868	1.753
-7	0.875	0.088	-1.33	0.183	0.719	1.065
-6	0.926	0.062	-1.15	0.251	0.811	1.056
-5	0.949	0.053	-0.94	0.348	0.850	1.059
-4	1.070	0.058	1.24	0.215	0.961	1.191
-3	1.131	0.062	2.23	0.026	1.015	1.260
-2	1.186	0.066	3.07	0.002	1.064	1.323
-1	1.158	0.066	2.58	0.010	1.036	1.295
+1	1.070	0.077	0.94	0.348	0.929	1.231
+2	1.153	0.086	1.92	0.055	0.997	1.333
+3	1.199	0.100	2.18	0.029	1.018	1.412
+4	1.290	0.133	2.47	0.013	1.054	1.578
+5	1.132	0.226	0.62	0.534	0.766	1.675
+6	0.580	0.309	-1.02	0.308	0.203	1.656
Treatment						
Post intervention	1.288	0.079	4.12	0.000	1.142	1.453
	1.282	0.044	7.17	0.000	1.198	1.372
Treatment#Post intervention						
UC/legacy#1	1.122	0.07	1.85	0.064	0.993	1.268
Constant	0.138	0.026	-10.47	0.000	0.095	0.200
<b>Marginal test</b>						
<b>MCS Binary (<math>\leq 45</math>)</b>	<b>Coefficient</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Treatment#Post intervention						
UC/legacy#1	0.03	0.013	2.30	0.022	0.004	0.055

**Table 10.3. Binary MCS measure ( $\leq 50$  cutoff) screening for anxiety disorders/ common mental disorder**

The binary MCS measure is constructed such that an odds ratio above 1 implies an increase in distress.

Multiple-imputation estimates  
 Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations =10  
 Number of obs. = 108,247  
 Total obs. = 1,190,717

MCS Binary ( $\leq 50$ )	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.044	0.009	5.11	0.000	1.027	1.061
Age squared	0.999	0.000	-7.21	0.000	0.999	0.999
Gender (ref. male)						
Female	1.484	0.053	11.11	0.000	1.384	1.591
Dependent child (ref. no)						
Yes	0.852	0.03	-4.56	0.000	0.795	0.913
Longstanding illness (ref. no)						
Yes	1.981	0.054	25.20	0.000	1.878	2.089
Marital status (ref. married/cohab.)						
Single	1.41	0.045	10.88	0.000	1.326	1.500
Country (ref. England)						
Wales	1.102	0.062	1.72	0.085	0.987	1.231
Scotland	0.969	0.045	-0.67	0.502	0.884	1.062
Ethnicity (ref. British)						
Non-British	1.089	0.039	2.37	0.018	1.015	1.169
Educational level (ref. degree)						
A Levels/ GCSE	0.982	0.027	-0.65	0.516	0.930	1.037
Other	1.044	0.052	0.86	0.388	0.947	1.151
No qualification	1.197	0.063	3.44	0.001	1.080	1.327
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	1.078	0.509	0.16	0.873	0.427	2.719
-9	0.860	0.209	-0.62	0.535	0.534	1.385
-8	1.294	0.203	1.64	0.100	0.952	1.760
-7	0.950	0.083	-0.59	0.557	0.800	1.128
-6	0.900	0.053	-1.79	0.074	0.802	1.010
-5	0.980	0.049	-0.40	0.686	0.888	1.081
-4	1.202	0.058	3.80	0.000	1.093	1.322
-3	1.087	0.054	1.68	0.094	0.986	1.199
-2	1.150	0.060	2.69	0.007	1.039	1.274
-1	1.103	0.058	1.88	0.061	0.996	1.223
+1	1.077	0.072	1.11	0.266	0.945	1.229
+2	1.142	0.082	1.85	0.064	0.992	1.316
+3	1.294	0.104	3.20	0.001	1.105	1.514
+4	1.427	0.151	3.35	0.001	1.159	1.757
+5	1.400	0.270	1.75	0.081	0.960	2.043
+6	0.951	0.480	-0.10	0.921	0.351	2.572
Treatment						
Post intervention	1.158	0.063	2.69	0.007	1.041	1.289
Treatment#Post intervention						
UC/legacy#1	1.176	0.036	5.30	0.000	1.108	1.249
Treatment#Post intervention						
UC/legacy#1	1.186	.069	2.93	0.003	1.058	1.329
Constant	0.298	0.053	-6.84	0.000	0.210	0.421
<b>Marginal test</b>						
<b>MCS binary</b>	<b>Coefficient</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Treatment#Post intervention						
UC/legacy#1	0.41	0.014	2.94	0.003	0.013	0.067



**Table 10.4. Continuous GHQ-12 (0-36 Scale)**

The score ranges between 0-36, where higher values suggest greater psychological distress.

Multiple-imputation estimates  
 Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations =10  
 Number of obs = 108,247  
 Total obs. = 1,190,717

<b>GHQ-12 (0-36)</b>	<b>Coefficient</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Age	0.110	0.022	4.89	0.000	0.066	0.154
Age squared	-0.002	0.000	-5.94	0.000	-0.002	-0.001
Gender (ref. male)						
Female	1.321	0.106	12.49	0.000	1.113	1.528
Dependent child (ref. no)						
Yes	-0.740	0.104	-7.09	0.000	-0.944	-0.535
Longstanding illness (ref. no)						
Yes	2.889	0.081	35.77	0.000	2.73	3.047
Marital status (ref. married/cohab.)						
Single	0.994	0.090	11.05	0.000	0.818	1.17
Country (ref. England)						
Wales	0.411	0.168	2.45	0.015	0.082	0.741
Scotland	0.089	0.129	0.69	0.490	-0.164	0.342
Ethnicity (ref. British)						
Non-British	0.076	0.096	0.79	0.428	-0.112	0.265
Educational level (ref. degree)						
A Levels/ GCSE	0.044	0.070	0.62	0.534	-0.094	0.181
Other	0.187	0.147	1.28	0.202	-0.100	0.474
No qualification	0.295	0.139	2.11	0.035	0.021	0.568
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	-0.280	0.688	-0.41	0.684	-1.63	1.070
-9	0.262	0.726	0.36	0.719	-1.163	1.686
-8	0.828	0.548	1.51	0.131	-0.247	1.903
-7	-0.077	0.254	-0.30	0.760	-0.575	0.420
-6	-0.103	0.156	-0.66	0.511	-0.408	0.203
-5	-0.129	0.128	-1.01	0.314	-0.381	0.123
-4	-0.078	0.125	-0.62	0.535	-0.323	0.168
-3	0.134	0.135	1.00	0.319	-0.130	0.399
-2	-0.130	0.133	-0.98	0.327	-0.390	0.130
-1	-0.191	0.134	-1.42	0.156	-0.454	0.073
+1	0.095	0.177	0.54	0.591	-0.251	0.441
+2	0.249	0.188	1.32	0.187	-0.121	0.618
+3	0.298	0.211	1.41	0.159	-0.117	0.712
+4	0.620	0.280	2.21	0.027	0.070	1.169
+5	0.394	0.372	1.06	0.289	-0.335	1.124
+6	-0.663	1.217	-0.54	0.586	-3.048	1.722
Treatment						
Post intervention	-0.085	0.138	-0.62	0.535	-0.355	0.184
Treatment#Post intervention	0.732	0.082	8.97	0.000	0.572	0.893
Treatment#Post intervention						
UC/legacy#1	0.312	0.153	2.04	0.041	0.012	0.611
Constant	7.78	0.481	16.18	0.000	6.837	8.723

**Table 10.5. Continuous GHQ-12 (0-12 Scale)**

The score ranges between 0-12, where higher values suggest greater psychological distress.

Multiple-imputation estimates  
 Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations =10  
 Number of obs = 108,247  
 Total obs. = 1,190,717

<b>GHQ-12 (0-36)</b>	<b>Coefficient</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Age	0.027	0.013	2.15	0.032	0.002	0.051
Age squared	-0.001	0.000	-3.58	0.000	-0.001	0.000
Gender (ref. male)						
Female	0.659	0.059	11.20	0.000	0.543	0.774
Dependent child (ref. no)						
Yes	-0.417	0.060	-7.01	0.000	-0.534	-0.301
Longstanding illness (ref. no)						
Yes	1.532	0.047	32.58	0.000	1.439	1.624
Marital status (ref. married/cohab.)						
Single	.548	.052	10.60	0.000	0.447	0.650
Country (ref. England)						
Wales	0.104	0.087	1.19	0.235	-0.067	0.274
Scotland	0.050	0.076	0.66	0.510	-0.099	0.200
Ethnicity (ref. British)						
Non-British	0.163	0.056	2.94	0.003	0.054	0.272
Educational level (ref. degree)						
A Levels/ GCSE	-0.071	0.040	-1.78	0.075	-0.148	0.007
Other	0.054	0.083	0.65	0.516	-0.109	0.217
No qualification	0.160	0.084	1.89	0.060	-0.007	0.326
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.150	0.463	0.32	0.747	-0.764	1.063
-9	0.130	0.395	0.33	0.742	-0.643	0.904
-8	0.380	0.301	1.26	0.207	-0.210	0.969
-7	0.028	0.132	0.21	0.833	-0.231	0.286
-6	-0.038	0.089	-0.42	0.671	-0.213	0.137
-5	-0.048	0.070	-0.68	0.496	-0.185	0.090
-4	-0.063	0.073	-0.86	0.392	-0.207	0.081
-3	0.114	0.075	1.51	0.131	-0.034	0.261
-2	-0.003	0.076	-0.04	0.969	-0.152	0.146
-1	-0.100	0.073	-1.37	0.172	-0.243	0.043
+1	0.041	0.102	0.41	0.685	-0.158	0.241
+2	0.046	0.106	0.44	0.663	-0.162	0.255
+3	0.136	0.123	1.11	0.269	-0.105	0.376
+4	0.246	0.160	1.54	0.124	-0.068	0.560
+5	0.035	0.231	0.15	0.878	-0.418	0.489
+6	0.113	0.729	0.16	0.877	-1.317	1.544
Treatment						
Post intervention	-0.053	0.079	-0.68	0.5	-0.207	0.101
	0.345	0.045	7.75	0.000	0.258	0.432
Treatment#Post intervention						
UC/legacy#1	0.197	0.086	2.28	0.022	0.028	0.367
Constant	0.781	0.266	2.94	0.003	0.26	1.302

**Table 10.6. Binary GHQ-12 measure (cutoff  $\geq 4$ )**

The binary GHQ-12 is constructed such that an odds ratio above 1 suggests an increase in psychological distress.

Multiple-imputation estimates  
 Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations = 10  
 Number of obs = 108,247  
 Total obs. = 1,190,717

Binary GHQ-12 ( $\geq 4$ cutoff)	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.009	0.01	0.94	0.345	0.990	1.029
Age squared	1	0.000	-2.09	0.037	1	1
Gender (ref. male)						
Female	1.546	0.069	9.80	0.000	1.417	1.687
Dependent child (ref. no)						
Yes	0.775	0.033	-5.91	0.000	0.712	0.843
Longstanding illness (ref. no)						
Yes	2.627	0.085	29.87	0.000	2.466	2.799
Marital status (ref. married/cohab.)						
Single	1.436	0.055	9.53	0.000	1.333	1.547
Country (ref. England)						
Wales	1.035	0.069	0.53	0.600	0.909	1.179
Scotland	0.989	0.059	-0.19	0.853	0.879	1.113
Ethnicity (ref. British)						
Non-British	1.088	0.050	1.84	0.066	0.994	1.191
Educational level (ref. degree)						
A Levels/ GCSE	0.935	0.033	-1.94	0.052	0.873	1.001
Other	0.983	0.064	-0.26	0.794	0.865	1.117
No qualification	1.065	0.068	0.98	0.326	0.939	1.208
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.661	0.387	-0.71	0.481	0.208	2.099
-9	1.079	0.316	0.26	0.797	0.607	1.916
-8	1.180	0.242	0.81	0.420	0.789	1.765
-7	1.019	0.112	0.17	0.866	0.821	1.264
-6	0.961	0.074	-0.52	0.605	0.826	1.118
-5	1.014	0.063	0.23	0.818	0.898	1.145
-4	0.955	0.060	-0.74	0.460	0.844	1.08
-3	1.068	0.066	1.06	0.288	0.946	1.206
-2	1.002	0.065	0.02	0.980	0.882	1.137
-1	0.913	0.061	-1.37	0.170	0.801	1.040
+1	1.034	0.088	0.39	0.696	0.876	1.221
+2	1.014	0.086	0.16	0.874	0.858	1.198
+3	1.096	0.102	0.98	0.328	0.913	1.315
+4	1.277	0.150	2.09	0.037	1.015	1.608
+5	1.003	0.249	0.01	0.989	0.617	1.631
+6	1.145	0.677	0.23	0.819	0.357	3.671
Treatment						
Post intervention	1.32	0.054	6.74	0.000	1.217	1.431
Treatment#Post intervention						
UC/legacy#1	1.159	0.083	2.06	0.039	1.007	1.333
Constant	0.13	0.027	-9.88	0.000	0.087	0.195

**Marginal test**

Binary GHQ-12 ( $\geq 4$ )	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment#Post intervention						
UC/legacy#1	0.024	0.011	2.15	0.032	0.002	0.045

**Table 10.7. Binary GHQ-12 measure (cutoff  $\geq 3$ )**

The binary GHQ-12 is constructed such that an odds ratio above 1 suggests an increase in psychological distress.

Multiple-imputation estimates  
 Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations = 10  
 Number of obs = 108,247  
 Total obs. = 1,190,717

GHQ-12 Binary ( $\geq 3$ cutoff)	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.005	0.009	0.52	0.601	0.987	1.023
Age squared	1	0.000	-1.99	0.047	1	1
Gender (ref. male)						
Female	1.519	0.063	10.01	0.000	1.4	1.649
Dependent child (ref. no)						
Yes	0.766	0.031	-6.59	0.000	0.707	0.829
Longstanding illness (ref. no)						
Yes	2.509	0.075	30.59	0.000	2.365	2.662
Marital status (ref. married/cohab.)						
Single	1.433	0.05	10.22	0.000	1.337	1.535
Country (ref. England)						
Wales	1.006	0.063	0.10	0.921	0.89	1.138
Scotland	1.025	0.058	0.44	0.658	0.918	1.146
Ethnicity (ref. British)						
Non-British	1.07	0.045	1.61	0.107	0.985	1.161
Educational level (ref. degree)						
A Levels/ GCSE	0.907	0.029	-3.03	0.002	0.851	0.966
Other	0.984	0.058	-0.27	0.79	0.877	1.105
No qualification	1.071	0.062	1.19	0.237	0.956	1.2
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	1.261	0.729	0.40	0.689	0.405	3.929
-9	1.160	0.323	0.53	0.594	0.672	2.001
-8	1.343	0.259	1.53	0.126	0.920	1.960
-7	1.102	0.109	0.98	0.329	0.907	1.338
-6	0.993	0.069	-0.11	0.916	0.867	1.137
-5	1.002	0.057	0.04	0.966	0.897	1.120
-4	0.945	0.055	-0.97	0.333	0.842	1.060
-3	1.021	0.059	0.36	0.722	0.912	1.142
-2	0.946	0.057	-0.93	0.353	0.841	1.064
-1	0.919	0.056	-1.37	0.170	0.815	1.037
+1	1.088	0.086	1.06	0.289	0.931	1.270
+2	1.048	0.087	0.57	0.570	0.891	1.234
+3	1.137	0.101	1.44	0.151	0.955	1.353
+4	1.207	0.133	1.71	0.088	0.972	1.498
+5	1.298	0.308	1.10	0.273	0.815	2.067
+6	1.14	0.636	0.24	0.814	0.381	3.411
Treatment						
Post intervention	1.278	0.048	6.50	0.000	1.187	1.376
Treatment#Post intervention UC/legacy#1						
UC/legacy#1	1.19	0.08	2.59	0.010	1.043	1.358
Constant						
Constant	0.216	0.041	-7.99	0.000	0.148	0.314
<b>Marginal test</b>						
GHQ-12 Binary ( $\geq 3$ cutoff)	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment#Post intervention UC/legacy#1	0.030	0.012	2.51	0.012	0.007	0.054

**Table 10.8. Physical health (continuous PCS score 0-100)**

The PCS score ranges between 0-100, where higher values indicate better physical health.

Multiple imputation by chains using truncated regression and 10 imputation cycles

Multiple-imputation estimates  
 Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 86,558

Imputations =10  
 Number of obs. = 108,247  
 Total obs. = 1,190,717

PCS	Coefficient	std. err.	t	P>t	[95% CI]	
Age	0.159	0.033	4.79	0.000	0.094	0.224
Age squared	-0.003	0.000	-7.47	0.000	-0.004	-0.002
Gender (ref. male)						
Female	-1.315	0.152	-8.67	0.000	-1.612	-1.017
Dependent child (ref. no)						
Yes	1.273	0.15	8.46	0.000	0.978	1.568
Longstanding illness (ref. no)						
Yes	-8.257	0.124	-66.49	0.000	-8.5	-8.013
Marital status (ref. married/cohab.)						
Single	0.376	0.12	3.13	0.002	0.141	.612
Country (ref. England)						
Wales	-0.319	0.201	-1.59	0.112	-0.713	0.074
Scotland	0.235	0.180	1.30	0.192	-0.118	0.587
Ethnicity (ref. British)						
Non-British	-1.945	.133	-14.61	0.000	-2.206	-1.684
Educational level (ref. degree)						
A Levels/ GCSE	-1.138	0.102	-11.17	0.000	-1.338	-0.938
Other	-2.618	0.200	-13.12	0.000	-3.009	-2.227
No qualification	-3.023	0.210	-14.40	0.000	-3.435	-2.611
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.691	1.587	0.44	0.663	-2.42	3.802
-9	0.140	0.916	0.15	0.879	-1.655	1.935
-8	0.187	0.589	0.32	0.751	-0.967	1.341
-7	-0.986	0.381	-2.59	0.010	-1.732	-0.239
-6	0.063	0.232	0.27	0.787	-0.392	0.517
-5	0.036	0.197	0.18	0.855	-0.349	0.421
-4	-0.319	0.186	-1.72	0.086	-0.684	0.046
-3	-0.774	0.200	-3.88	0.000	-1.166	-0.383
-2	-0.834	0.203	-4.10	0.000	-1.232	-0.436
-1	-0.684	0.197	-3.47	0.001	-1.070	-0.297
+1	0.118	0.234	0.50	0.616	-0.341	0.577
+2	0.161	0.275	0.58	0.559	-0.379	0.700
+3	-0.31	0.278	-1.12	0.263	-0.855	0.234
+4	-0.09	0.344	-0.26	0.794	-0.765	0.585
+5	-0.767	0.686	-1.12	0.263	-2.112	0.577
+6	-0.036	1.297	-0.03	0.978	-2.580	2.508
Treatment						
Post intervention	-0.595	0.192	-3.10	0.002	-0.972	-0.218
Treatment#Post intervention						
UC/legacy#1	-1.147	0.117	-9.78	0.000	-1.377	-0.917
Treatment#Post intervention						
UC/legacy#1	-0.236	0.214	-1.10	0.269	-0.656	0.183
Constant	55.416	.682	81.25	0.000	54.079	56.753

**Table 10.9. Binary PCS score ( $\leq 50$  cutoff) screening for physical conditions**

The PCS binary score is constructed such that an odds ratio above 1 implies worse physical health.

Multiple-imputation estimates  
Survey: Logistic regression  
Number of strata = 361  
Number of PSUs = 86,558

Imputations =10  
Number of obs. = 108,247  
Total obs. = 1,190,717

PCS Binary ( $\leq 50$ )	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	0.962	0.009	-4.08	0.000	.944	0.98
Age squared	1.001	0.000	6.07	0.000	1	1.001
Gender (ref. male)						
Female	1.314	0.055	6.49	0.000	1.21	1.426
Dependent child (ref. no)						
Yes	0.804	0.033	-5.31	0.000	.742	0.872
Longstanding illness (ref. no)						
Yes	5.6	0.166	58.10	0.000	5.283	5.935
Marital status (ref. married/cohab.)						
Single	0.996	0.036	-0.11	0.911	.928	1.069
Country (ref. England)						
Wales	1.091	0.071	1.33	0.183	0.96	1.241
Scotland	0.901	0.049	-1.92	0.054	0.811	1.002
Ethnicity (ref. British)						
Non-British	1.753	0.072	13.70	0.000	1.617	1.899
Educational level (ref. degree)						
A Levels/ GCSE	1.368	0.045	9.57	0.000	1.283	1.459
Other	1.843	0.107	10.56	0.000	1.645	2.065
No qualification	2.135	0.119	13.59	0.000	1.913	2.383
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.908	0.436	-0.20	0.841	0.354	2.326
-9	0.998	0.273	-0.01	0.994	0.583	1.708
-8	1.001	0.191	0.00	0.996	0.688	1.457
-7	1.276	0.135	2.31	0.021	1.038	1.569
-6	0.953	0.068	-0.67	0.504	0.829	1.097
-5	0.983	0.061	-0.27	0.784	0.871	1.110
-4	1.033	0.06	0.56	0.578	0.922	1.157
-3	1.228	0.075	3.38	0.001	1.090	1.383
-2	1.302	0.083	4.15	0.000	1.150	1.476
-1	1.171	0.073	2.54	0.011	1.037	1.323
+1	1.071	0.081	0.91	0.364	0.924	1.241
+2	0.991	0.082	-0.11	0.914	0.843	1.165
+3	1.191	0.105	1.97	0.049	1.001	1.416
+4	1.056	0.121	0.48	0.632	0.844	1.322
+5	1.367	0.307	1.39	0.163	0.881	2.122
+6	1.497	0.922	0.66	0.513	0.445	5.039
Treatment						
Post intervention	1.043	0.066	0.67	0.500	0.922	1.180
	1.373	0.050	8.64	0.000	1.278	1.475
Treatment#Post intervention						
UC/legacy#1	1.043	0.069	0.63	0.528	0.916	1.188
Constant	0.175	0.035	-8.71	0.000	0.118	0.259
<b>Marginal test</b>						
PCS Binary ( $\leq 50$ )	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment#Post intervention						
UC/legacy#1	0.008	0.011	0.73	0.468	-0.014	0.030

## Appendix 11: Complete case analysis

**Table 11.1. Summary of findings based on alternative outcome measures, complete case analysis**

	<b>Estimate</b>	<b>95% CI</b>	<b>P&gt;t</b>
Change in continuous MCS score	-0.68	-1.23 to -0.13	0.016
Percentage point change in prevalence of depression ( $\leq 45$ cutoff)	2.9	0.5 to 5.4	0.025
Percentage point change in prevalence of Common mental disorders ( $\leq 50$ cutoff)	4.1	1.4 to 6.9	0.003
Change in continuous GHQ-12 score (0-36)	0.26	-0.04 to 0.56	0.085
Change in continuous GHQ-12 score (0-12)	0.18	0.01 to 0.35	0.036
Percentage point change in prevalence of psychological distress ( $\geq 4$ cutoff)	2.2	-0.0 to 4.4	0.052
Percentage point change in prevalence of psychological distress ( $\geq 3$ cutoff)	2.8	0.5 to 5.2	0.019
Change in continuous PCS score	-0.24	-0.66 to 0.18	0.259
Percentage point change in prevalence of physical conditions ( $\leq 50$ )	0.8	-1.5 to 3.0	0.503

**Table 11.2: MCS - parallel trends assumption, complete case analysis**

Survey: Linear regression  
 Number of strata = 360  
 Number of PSUs = 79,947

Number of obs = 99,065  
 Population size = 70,933.18  
 Subpop. no. obs = 23,899  
 Subpop. size = 25,418.298  
 Design df = 79,587  
 F(15, 79573) = 57.05  
 Prob > F = 0.0000  
 R-squared = 0.0663

MCS	Coef.	std. err.	t	P>t	[95% CI]	
Age	-0.170	0.072	-2.350	0.019	-0.312	-0.028
Age squared	0.003	0.001	3.760	0.000	0.002	0.005
Gender (ref. male)						
Female	-3.224	0.307	-10.500	0.000	-3.826	-2.622
Dependent child (ref. no)						
Yes	1.906	0.297	6.420	0.000	1.324	2.488
Longstanding illness (ref. no)						
Yes	-3.872	0.207	-18.720	0.000	-4.278	-3.467
Marital status (ref. married/cohab.)						
Single	-2.114	0.250	-8.470	0.000	-2.603	-1.625
Country (ref. England)						
Wales	-0.301	0.503	-0.600	0.549	-1.288	0.685
Scotland	-0.743	0.327	-2.270	0.023	-1.384	-0.101
Ethnicity (ref. British)						
Non-British	-0.398	0.251	-1.580	0.114	-0.891	0.095
Educational level (ref. degree)						
A Levels/ GCSE	0.031	0.185	0.170	0.869	-0.332	0.393
Other	-0.060	0.316	-0.190	0.851	-0.679	0.560
No qualification	-0.513	0.372	-1.380	0.168	-1.242	0.216
Treatment						
Years to UC	-1.346	0.388	-3.470	0.001	-2.107	-0.586
	-0.105	0.077	-1.360	0.174	-0.256	0.046
Treatment#Years before policy intervention	-0.101	0.096	-1.050	0.294	-0.290	0.088
Constant	52.684	1.457	36.160	0.000	49.828	55.540

Note: 1 stratum omitted because it contains no subpopulation members.



**Table 11.3: MCS – full model results, complete case analysis**

Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 79,999

Number of obs = 99,124  
 Population size = 70,939,485  
 Design df = 79,638  
 F(32, 79607) = 77.28  
 Prob > F = 0.0000  
 R-squared = 0.0851

MCS	Coef.	std. err.	t	P>t	[95% CI]	
Age	-0.201	0.041	-4.930	0.000	-0.281	-0.121
Age squared	0.004	0.000	7.840	0.000	0.003	0.005
Gender (ref. male)						
Female	-2.424	0.172	-14.120	0.000	-2.761	-2.088
Dependent child (ref. no)						
Yes	1.101	0.171	6.440	0.000	0.766	1.436
Longstanding illness (ref. no)						
Yes	-4.425	0.139	-31.850	0.000	-4.697	-4.153
Marital status (ref. married/cohab.)						
Single	-2.218	0.158	-14.080	0.000	-2.526	-1.909
Country (ref. England)						
Wales	-0.729	0.304	-2.400	0.016	-1.324	-0.133
Scotland	-0.240	0.229	-1.050	0.296	-0.689	0.210
Ethnicity (ref. British)						
Non-British	-0.337	0.173	-1.950	0.052	-0.677	0.002
Educational level (ref. degree)						
A Levels/ GCSE	0.061	0.128	0.480	0.633	-0.190	0.312
Other	-0.533	0.249	-2.140	0.033	-1.022	-0.044
No qualification	-0.874	0.246	-3.560	0.000	-1.355	-0.393
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.471	1.493	0.320	0.753	-2.456	3.397
-9	0.621	1.044	0.590	0.552	-1.425	2.667
-8	-0.951	0.795	-1.200	0.231	-2.508	0.607
-7	0.667	0.400	1.670	0.096	-0.118	1.451
-6	0.599	0.301	1.990	0.046	0.010	1.189
-5	0.415	0.236	1.760	0.078	-0.047	0.877
-4	-0.415	0.233	-1.780	0.075	-0.872	0.042
-3	-0.458	0.236	-1.940	0.052	-0.921	0.005
-2	-0.449	0.251	-1.790	0.074	-0.941	0.043
-1	-0.463	0.249	-1.860	0.062	-0.951	0.024
+1	-0.271	0.336	-0.810	0.420	-0.931	0.388
+2	-0.668	0.366	-1.830	0.068	-1.385	0.049
+3	-0.823	0.391	-2.110	0.035	-1.589	-0.057
+4	-1.513	0.527	-2.870	0.004	-2.545	-0.481
+5	-0.865	0.688	-1.260	0.208	-2.214	0.483
+6	0.612	2.189	0.280	0.780	-3.679	4.902
Treatment						
Post intervention	-1.094	0.142	-7.720	0.000	-1.372	-0.816
	-1.076	0.276	-3.900	0.000	-1.616	-0.535
Treatment#Post intervention						
UC/legacy#1	-0.678	0.280	-2.420	0.016	-1.228	-0.129
Constant	54.088	0.866	62.420	0.000	52.390	55.786

**Table 11.4: Binary MCS ( $\leq 45$  cutoff screening for depression)– full model results, complete case**

The binary outcome is constructed such that those with scores  $\leq 45$  are assigned 1, and 0 if otherwise.

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 79,999

Number of obs = 99,124  
 Population size = 70,939,485  
 Design df = 79,638  
 F(31, 79608) = 58.96  
 Prob > F = 0.0000

MCS Binary ( $\leq 45$ )	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.035	0.009	3.830	0.000	1.017	1.054
Age squared	0.999	0.000	-5.880	0.000	0.999	1.000
Gender (ref. male)						
Female	1.543	0.061	10.930	0.000	1.428	1.668
Dependent child (ref. no)						
Yes	0.819	0.032	-5.130	0.000	0.758	0.884
Longstanding illness (ref. no)						
Yes	2.307	0.066	29.310	0.000	2.182	2.440
Marital status (ref. married/cohab.)						
Single	1.533	0.052	12.710	0.000	1.436	1.638
Country (ref. England)						
Wales	1.127	0.071	1.900	0.057	0.997	1.275
Scotland	1.051	0.054	0.970	0.333	0.950	1.163
Ethnicity (ref. British)						
Non-British	1.161	0.046	3.760	0.000	1.074	1.255
Educational level (ref. degree)						
A Levels/ GCSE	1.030	0.032	0.980	0.328	0.970	1.094
Other	1.238	0.069	3.820	0.000	1.109	1.381
No qualification	1.324	0.069	5.380	0.000	1.195	1.466
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	1.121	0.540	0.240	0.812	0.436	2.883
-9	0.844	0.228	-0.630	0.531	0.497	1.433
-8	1.268	0.230	1.310	0.190	0.889	1.809
-7	0.875	0.087	-1.350	0.178	0.721	1.063
-6	0.916	0.063	-1.280	0.199	0.801	1.047
-5	0.925	0.052	-1.380	0.169	0.828	1.034
-4	1.073	0.059	1.280	0.199	0.963	1.196
-3	1.116	0.061	2.030	0.043	1.004	1.242
-2	1.189	0.066	3.130	0.002	1.067	1.325
-1	1.162	0.067	2.620	0.009	1.038	1.300
+1	1.074	0.077	0.990	0.324	0.932	1.237
+2	1.172	0.088	2.110	0.035	1.011	1.357
+3	1.208	0.101	2.260	0.024	1.025	1.422
+4	1.293	0.135	2.470	0.014	1.054	1.585
+5	1.167	0.231	0.780	0.436	0.791	1.721
+6	0.613	0.307	-0.980	0.328	0.230	1.636
Treatment						
Post intervention	1.289	0.046	7.080	0.000	1.202	1.383
Treatment##Post intervention						
UC/legacy#1	1.116	0.070	1.760	0.078	0.988	1.261
Constant	0.130	0.025	-10.760	0.000	0.090	0.189
<b>Marginal test</b>						
MCS Binary ( $\leq 45$ )	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment##Post intervention						
UC/legacy#1	0.029	0.013	2.240	0.025	0.004	0.054

**Table 11.5: Binary MCS ( $\leq 50$  cutoff screening for depression)– full model results, complete case**

The binary outcome is constructed such that those with scores  $\leq 45$  are assigned 1, and 0 if otherwise.

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 79,999

Number of obs = 99,124  
 Population size = 0,939.485  
 Design df = 79,638  
 F(31, 79608) = 46.21  
 Prob > F = 0.0000

MCS Binary ( $\leq 50$ )	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.047	0.009	5.430	0.000	1.030	1.064
Age squared	0.999	0.000	-7.520	0.000	0.999	0.999
Gender (ref. male)						
Female	1.492	0.054	11.120	0.000	1.390	1.600
Dependent child (ref. no)						
Yes	0.849	0.030	-4.560	0.000	0.791	0.911
Longstanding illness (ref. no)						
Yes	1.974	0.054	25.010	0.000	1.872	2.083
Marital status (ref. married/cohab.)						
Single	1.408	0.045	10.670	0.000	1.322	1.499
Country (ref. England)						
Wales	1.097	0.064	1.590	0.112	0.979	1.229
Scotland	0.963	0.045	-0.800	0.426	0.879	1.056
Ethnicity (ref. British)						
Non-British	1.073	0.039	1.940	0.052	0.999	1.153
Educational level (ref. degree)						
A Levels/ GCSE	0.970	0.027	-1.090	0.275	0.918	1.025
Other	1.039	0.052	0.760	0.449	0.942	1.146
No qualification	1.151	0.058	2.800	0.005	1.043	1.269
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	1.108	0.523	0.220	0.828	0.439	2.796
-9	0.857	0.209	-0.630	0.527	0.532	1.381
-8	1.329	0.214	1.770	0.077	0.970	1.822
-7	0.955	0.083	-0.530	0.593	0.805	1.132
-6	0.894	0.053	-1.900	0.058	0.797	1.004
-5	0.959	0.049	-0.830	0.406	0.868	1.059
-4	1.221	0.060	4.030	0.000	1.108	1.345
-3	1.077	0.054	1.490	0.135	0.977	1.187
-2	1.152	0.060	2.730	0.006	1.041	1.276
-1	1.113	0.059	2.020	0.044	1.003	1.234
+1	1.080	0.073	1.140	0.253	0.946	1.234
+2	1.157	0.084	2.020	0.043	1.004	1.334
+3	1.302	0.104	3.290	0.001	1.112	1.523
+4	1.433	0.154	3.360	0.001	1.162	1.768
+5	1.450	0.268	2.010	0.044	1.010	2.082
+6	0.927	0.429	-0.160	0.871	0.374	2.298
Treatment	1.177	0.037	5.200	0.000	1.107	1.252
Post intervention	1.177	0.065	2.970	0.003	1.057	1.310
Treatment#Post intervention						
UC/legacy#1	1.188	0.070	2.950	0.003	1.059	1.333
Constant	0.278	0.049	-7.230	0.000	0.196	0.393
<b>Marginal test</b>						
GHQ-12 Binary	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment#Post intervention						
UC/legacy#1	0.041	0.014	2.970	0.003	0.014	0.069

**Table 11.6. Continuous GHQ-12 score: 0-36 Scale**

The score ranges between 0-36, where higher values suggest greater psychological distress.

Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 79,421

Number of obs = 98,494  
 Population size = 69,868.66  
 Design df = 79,060  
 F(31, 79030) = 68.46  
 Prob > F = 0.0000  
 R-squared = 0.0823

GHQ-12 (0-36)	Coefficient	std. err.	t	P>t	[95% CI]	
Age	0.107	0.023	4.660	0.000	0.062	0.152
Age squared	-0.002	0.000	-5.680	0.000	-0.002	-0.001
Gender (ref. male)						
Female	1.348	0.106	12.760	0.000	1.141	1.555
Dependent child (ref. no)						
Yes	-0.750	0.106	-7.050	0.000	-0.958	-0.541
Longstanding illness (ref. no)						
Yes	2.889	0.081	35.640	0.000	2.730	3.048
Marital status (ref. married/cohab.)						
Single	0.961	0.092	10.490	0.000	0.781	1.140
Country (ref. England)						
Wales	0.439	0.172	2.560	0.010	0.103	0.775
Scotland	0.111	0.131	0.840	0.399	-0.147	0.368
Ethnicity (ref. British)						
Non-British	0.103	0.100	1.030	0.302	-0.093	0.300
Educational level (ref. degree)						
A Levels/ GCSE	0.041	0.071	0.580	0.562	-0.098	0.180
Other	0.180	0.150	1.190	0.232	-0.115	0.474
No qualification	0.277	0.144	1.930	0.054	-0.005	0.559
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	-0.381	0.684	-0.560	0.577	-1.721	0.959
-9	0.359	0.766	0.470	0.640	-1.143	1.860
-8	0.879	0.580	1.510	0.130	-0.258	2.016
-7	-0.090	0.258	-0.350	0.726	-0.595	0.415
-6	-0.100	0.163	-0.610	0.540	-0.419	0.219
-5	-0.136	0.132	-1.030	0.305	-0.395	0.124
-4	-0.099	0.127	-0.780	0.435	-0.349	0.150
-3	0.103	0.135	0.760	0.445	-0.162	0.368
-2	-0.157	0.133	-1.180	0.238	-0.417	0.104
-1	-0.217	0.129	-1.680	0.093	-0.469	0.036
+1	0.125	0.176	0.710	0.478	-0.220	0.470
+2	0.283	0.189	1.500	0.135	-0.088	0.653
+3	0.316	0.209	1.520	0.129	-0.093	0.725
+4	0.643	0.282	2.280	0.022	0.091	1.195
+5	0.513	0.357	1.440	0.151	-0.187	1.212
+6	-0.552	1.317	-0.420	0.675	-3.133	2.029
Treatment						
Post intervention	0.787	0.080	9.840	0.000	0.631	0.944
	-0.072	0.137	-0.530	0.596	-0.340	0.195
Treatment#Post intervention						
UC/legacy#1	0.263	0.152	1.730	0.085	-0.036	0.561
Constant	7.794	0.488	15.950	0.000	6.836	8.751

**Table 11.7. Continuous GHQ-12 score: 0-12 Scale**

The score ranges between 0-36, where higher values suggest greater psychological distress.

Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 79,421

Number of obs = 98,494  
 Population size = 69,868.66  
 Design df = 79,060  
 F(31, 79030) = 59.76  
 Prob > F = 0.0000  
 R-squared = 0.0738

GHQ-12 (0-12)	Coefficient	std. err.	t	P>t	[95% CI]	
Age	0.026	0.012	2.130	0.033	0.002	0.051
Age squared	-0.001	0.000	-3.610	0.000	-0.001	-0.000
Gender (ref. male)						
Female	0.677	0.060	11.280	0.000	0.560	0.795
Dependent child (ref. no)						
Yes	-0.427	0.061	-6.960	0.000	-0.548	-0.307
Longstanding illness (ref. no)						
Yes	1.534	0.046	33.380	0.000	1.444	1.624
Marital status (ref. married/cohab.)						
Single	0.528	0.051	10.390	0.000	0.429	0.628
Country (ref. England)						
Wales	0.133	0.092	1.450	0.148	-0.047	0.313
Scotland	0.045	0.077	0.590	0.556	-0.106	0.197
Ethnicity (ref. British)						
Non-British	0.175	0.055	3.170	0.002	0.067	0.284
Educational level (ref. degree)						
A Levels/ GCSE	-0.077	0.040	-1.920	0.054	-0.156	0.001
Other	0.035	0.081	0.430	0.666	-0.124	0.194
No qualification	0.163	0.079	2.070	0.038	0.009	0.317
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.122	0.432	0.280	0.778	-0.724	0.968
-9	0.161	0.419	0.380	0.701	-0.660	0.981
-8	0.381	0.315	1.210	0.227	-0.236	0.997
-7	-0.007	0.135	-0.050	0.961	-0.271	0.257
-6	-0.038	0.093	-0.410	0.680	-0.220	0.144
-5	-0.045	0.072	-0.620	0.533	-0.185	0.096
-4	-0.072	0.071	-1.020	0.307	-0.211	0.066
-3	0.106	0.075	1.410	0.158	-0.041	0.253
-2	-0.002	0.075	-0.020	0.980	-0.149	0.146
-1	-0.113	0.073	-1.560	0.119	-0.255	0.029
+1	0.047	0.101	0.460	0.643	-0.151	0.245
+2	0.055	0.106	0.510	0.607	-0.154	0.263
+3	0.152	0.119	1.280	0.202	-0.081	0.386
+4	0.253	0.160	1.580	0.113	-0.060	0.566
+5	0.103	0.226	0.450	0.650	-0.340	0.545
+6	-0.082	0.705	-0.120	0.907	-1.464	1.300
Treatment	0.365	0.045	8.150	0.000	0.277	0.453
Post intervention	-0.044	0.079	-0.550	0.579	-0.199	0.111
Treatment#Post intervention						
UC/legacy#1	0.182	0.087	2.100	0.036	0.012	0.352
Constant	0.784	0.261	3.000	0.003	0.272	1.297

**Table 11.8. Binary GHQ-12 measure ( $\geq 4$  cutoff)**

The binary GHQ-12 is constructed such that an odds ratio above 1 suggests an increase in psychological distress.

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 79,421

Number of obs = 98,494  
 Population size = 69,868.66  
 Design df = 79,060  
 F(31, 79030) = 47.03  
 Prob > F = 0.0000

Binary GHQ-12 ( $\geq 4$ )	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.009	0.010	0.860	0.392	0.989	1.028
Age squared	1.000	0.000	-2.020	0.043	1.000	1.000
Gender (ref. male)						
Female	1.561	0.071	9.780	0.000	1.428	1.707
Dependent child (ref. no)						
Yes	0.772	0.034	-5.800	0.000	0.707	0.843
Longstanding illness (ref. no)						
Yes	2.637	0.085	30.130	0.000	2.476	2.809
Marital status (ref. married/cohab.)						
Single	1.422	0.054	9.240	0.000	1.320	1.533
Country (ref. England)						
Wales	1.048	0.072	0.690	0.492	0.916	1.200
Scotland	0.977	0.059	-0.390	0.694	0.868	1.099
Ethnicity (ref. British)						
Non-British	1.095	0.050	1.960	0.050	1.000	1.198
Educational level (ref. degree)						
A Levels/ GCSE	0.928	0.033	-2.120	0.034	0.866	0.995
Other	0.969	0.063	-0.490	0.627	0.853	1.101
No qualification	1.068	0.064	1.080	0.279	0.948	1.202
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.602	0.305	-1.000	0.317	0.223	1.627
-9	1.098	0.335	0.310	0.760	0.603	1.997
-8	1.161	0.248	0.700	0.485	0.764	1.764
-7	0.987	0.111	-0.120	0.908	0.791	1.231
-6	0.956	0.077	-0.560	0.578	0.816	1.120
-5	1.016	0.065	0.240	0.807	0.896	1.151
-4	0.945	0.060	-0.890	0.373	0.834	1.071
-3	1.057	0.068	0.870	0.383	0.933	1.199
-2	0.997	0.066	-0.040	0.967	0.876	1.135
-1	0.901	0.061	-1.560	0.119	0.789	1.027
+1	1.038	0.088	0.440	0.663	0.879	1.225
+2	1.021	0.087	0.250	0.805	0.864	1.208
+3	1.113	0.103	1.150	0.249	0.928	1.334
+4	1.285	0.151	2.130	0.033	1.020	1.619
+5	1.058	0.258	0.230	0.818	0.656	1.707
+6	0.889	0.507	-0.210	0.836	0.291	2.718
Treatment	1.346	0.056	7.130	0.000	1.241	1.461
Post intervention	0.967	0.071	-0.450	0.649	0.838	1.117
Treatment#Post intervention						
UC/legacy#1	1.143	0.083	1.850	0.064	0.992	1.317
Constant	0.132	0.027	-9.750	0.000	0.088	0.198
<b>Marginal test</b>						
<b>Binary GHQ-12 (<math>\geq 4</math>)</b>	<b>Coefficient</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% CI]</b>	
Treatment#Post intervention						
UC/legacy#1	0.022	0.011	1.940	0.052	-0.000	0.044

**Table 11.9. Binary GHQ-12 measure ( $\geq 3$  cutoff)**

The binary GHQ-12 is constructed such that an odds ratio above 1 suggests an increase in psychological distress.

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 79,421

Number of obs = 98,494  
 Population size = 69,868.66  
 Design df = 79,060  
 F(31, 79030) = 49.36  
 Prob > F = 0.0000

Binary GHQ-12 ( $\geq 3$ )	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	1.003	0.009	0.360	0.719	0.985	1.022
Age squared	1.000	0.000	-1.880	0.060	1.000	1.000
Gender (ref. male)						
Female	1.534	0.065	10.150	0.000	1.413	1.667
Dependent child (ref. no)						
Yes	0.761	0.032	-6.550	0.000	0.701	0.826
Longstanding illness (ref. no)						
Yes	2.524	0.076	30.770	0.000	2.379	2.677
Marital status (ref. married/cohab.)						
Single	1.419	0.051	9.830	0.000	1.324	1.522
Country (ref. England)						
Wales	1.025	0.066	0.390	0.696	0.904	1.163
Scotland	1.014	0.058	0.240	0.808	0.906	1.134
Ethnicity (ref. British)						
Non-British	1.071	0.045	1.630	0.104	0.986	1.164
Educational level (ref. degree)						
A Levels/ GCSE	0.899	0.030	-3.220	0.001	0.843	0.959
Other	0.969	0.057	-0.530	0.596	0.863	1.088
No qualification	1.071	0.060	1.210	0.225	0.959	1.195
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	1.268	0.716	0.420	0.674	0.419	3.837
-9	1.168	0.341	0.530	0.595	0.659	2.069
-8	1.349	0.268	1.500	0.133	0.913	1.992
-7	1.083	0.110	0.790	0.431	0.888	1.322
-6	0.989	0.071	-0.160	0.873	0.859	1.138
-5	1.006	0.059	0.110	0.915	0.896	1.130
-4	0.934	0.055	-1.170	0.243	0.832	1.048
-3	1.012	0.059	0.210	0.833	0.902	1.136
-2	0.945	0.057	-0.930	0.353	0.839	1.065
-1	0.908	0.056	-1.560	0.118	0.805	1.025
+1	1.095	0.087	1.140	0.254	0.937	1.279
+2	1.054	0.088	0.630	0.528	0.895	1.242
+3	1.151	0.101	1.600	0.109	0.969	1.368
+4	1.214	0.135	1.750	0.080	0.977	1.509
+5	1.376	0.321	1.370	0.171	0.871	2.173
+6	0.887	0.483	-0.220	0.825	0.305	2.581
Treatment						
Post intervention	1.299	0.050	6.850	0.000	1.205	1.399
	0.888	0.060	-1.770	0.077	0.778	1.013
Treatment#Post intervention						
UC/legacy#1	1.179	0.080	2.430	0.015	1.032	1.346
Constant						
	0.222	0.043	-7.770	0.000	0.152	0.324

**Marginal test**

Binary GHQ-12 ( $\geq 3$ )	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment#Post intervention						
UC/legacy#1	0.028	0.012	2.350	0.019	0.005	0.052

**Table 11.10. Physical health (continuous PCS score)**

The PCS score ranges between 0-100, where higher values indicate better physical health.

Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 79,999

Number of obs = 99,124  
 Population size = 0,939,485  
 Design df = 79,638  
 F(31, 79608) = 241.60  
 Prob > F = 0.0000  
 R-squared = 0.227

PCS	Coefficient	std. err.	t	P>t	[95% CI]	
Age	0.162	0.033	4.860	0.000	0.097	0.228
Age squared	-0.003	0.000	-7.550	0.000	-0.004	-0.002
Gender (ref. male)						
Female	-1.274	0.154	-8.300	0.000	-1.575	-0.973
Dependent child (ref. no)						
Yes	1.244	0.153	8.140	0.000	0.944	1.543
Longstanding illness (ref. no)						
Yes	-8.270	0.126	-65.650	0.000	-8.517	-8.023
Marital status (ref. married/cohab.)						
Single	0.370	0.122	3.030	0.002	0.130	0.610
Country (ref. England)						
Wales	-0.409	0.201	-2.040	0.041	-0.803	-0.016
Scotland	0.275	0.179	1.530	0.125	-0.076	0.626
Ethnicity (ref. British)						
Non-British	-1.780	0.134	-13.330	0.000	-2.041	-1.518
Educational level (ref. degree)						
A Levels/ GCSE	-1.118	0.103	-10.900	0.000	-1.319	-0.917
Other	-2.549	0.203	-12.560	0.000	-2.947	-2.151
No qualification	-2.920	0.211	-13.820	0.000	-3.335	-2.506
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.644	1.586	0.410	0.684	-2.463	3.752
-9	0.235	0.911	0.260	0.796	-1.550	2.020
-8	0.147	0.591	0.250	0.804	-1.012	1.305
-7	-1.042	0.385	-2.710	0.007	-1.795	-0.288
-6	0.096	0.233	0.410	0.681	-0.361	0.553
-5	0.040	0.198	0.200	0.839	-0.348	0.428
-4	-0.313	0.186	-1.690	0.092	-0.677	0.051
-3	-0.799	0.199	-4.010	0.000	-1.190	-0.408
-2	-0.872	0.205	-4.260	0.000	-1.273	-0.470
-1	-0.652	0.193	-3.370	0.001	-1.031	-0.273
+1	0.094	0.236	0.400	0.691	-0.368	0.556
+2	0.166	0.278	0.600	0.551	-0.379	0.710
+3	-0.325	0.275	-1.180	0.238	-0.865	0.215
+4	-0.126	0.347	-0.360	0.716	-0.807	0.555
+5	-0.840	0.687	-1.220	0.221	-2.186	0.506
+6	0.064	1.357	0.050	0.962	-2.595	2.723
Treatment						
Post intervention	-1.137	0.118	-9.610	0.000	-1.369	-0.905
	-0.596	0.191	-3.110	0.002	-0.971	-0.221
Treatment#Post intervention						
UC/legacy#1	-0.243	0.215	-1.130	0.259	-0.665	0.179
Constant	55.363	0.688	80.420	0.000	54.013	56.712



**Table 11.11. Binary PCS score (≤50 screening for physical conditions)**

The PCS binary score is constructed such that an odds ratio above 1 implies worse physical health.

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 79,999

Number of obs = 99,124  
 Population size = 70,939,485  
 Design df = 79,638  
 F(31, 79608) = 159.96  
 Prob > F = 0.0000

PCS Binary (≤50)	Odds ratio	std. err.	t	P>t	[95% CI]	
Age	0.961	0.009	-4.060	0.000	0.943	0.980
Age squared	1.001	0.000	6.090	0.000	1.000	1.001
Gender (ref. male)						
Female	1.306	0.055	6.360	0.000	1.203	1.418
Dependent child (ref. no)						
Yes	0.811	0.034	-5.030	0.000	0.747	0.880
Longstanding illness (ref. no)						
Yes	5.702	0.168	59.090	0.000	5.382	6.041
Marital status (ref. single)						
Married/cohab	0.997	0.037	-0.090	0.927	0.927	1.071
Country (ref. England)						
Wales	1.120	0.074	1.730	0.084	0.985	1.275
Scotland	0.887	0.048	-2.210	0.027	0.797	0.986
Ethnicity (ref. British)						
Non-British	1.655	0.069	12.090	0.000	1.525	1.796
Educational level (ref. degree)						
A Levels/ GCSE	1.358	0.045	9.280	0.000	1.273	1.448
Other	1.794	0.106	9.910	0.000	1.598	2.014
No qualification	2.030	0.111	12.890	0.000	1.823	2.260
Number of years before and after the introduction of UC (ref. year 0 introduction of UC)						
-10	0.950	0.456	-0.110	0.915	0.370	2.435
-9	0.996	0.273	-0.020	0.987	0.582	1.703
-8	1.006	0.191	0.030	0.974	0.693	1.461
-7	1.331	0.143	2.650	0.008	1.078	1.643
-6	0.958	0.070	-0.600	0.551	0.830	1.104
-5	0.966	0.058	-0.570	0.569	0.858	1.088
-4	1.020	0.059	0.340	0.737	0.910	1.143
-3	1.242	0.073	3.670	0.000	1.106	1.395
-2	1.337	0.085	4.560	0.000	1.180	1.515
-1	1.183	0.073	2.730	0.006	1.048	1.335
+1	1.084	0.082	1.060	0.290	0.934	1.257
+2	0.994	0.083	-0.070	0.943	0.844	1.171
+3	1.200	0.103	2.110	0.035	1.013	1.420
+4	1.070	0.124	0.590	0.557	0.853	1.343
+5	1.408	0.313	1.540	0.123	0.911	2.176
+6	1.432	0.825	0.620	0.534	0.463	4.432
Treatment	1.376	0.051	8.670	0.000	1.280	1.479
Post intervention	1.069	0.066	1.070	0.283	0.947	1.206
Treatment#Post intervention						
UC/legacy#1	1.037	0.069	0.540	0.590	0.910	1.181
Constant	0.168	0.034	-8.710	0.000	0.112	0.251

**Marginal test**

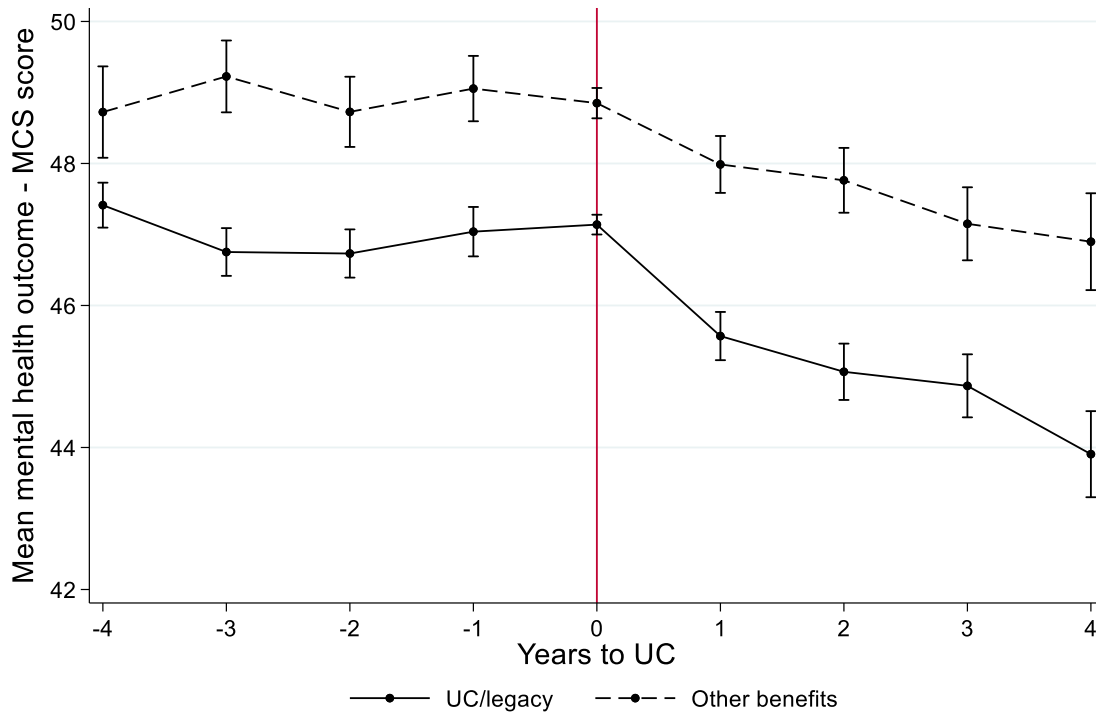
PCS Binary (≤50)	Coefficient	std. err.	t	P>t	[95% CI]	
Treatment#Post intervention						
UC/legacy#1	0.008	0.011	0.670	0.503	-0.015	0.030

## Appendix 12: Sensitivity analysis using an alternative comparison group restricted on (lower) incomes

The comparison group in our main analysis primarily consisted of people receiving Child Benefit (e.g. approximately 75%), which is not an income-tested benefit, implying that treatment and comparison groups differed in their socio-economic background. The baseline median household incomes – based on the OECD modified scale adjusted for inflation – of treatment and comparison groups were £13,035.54 (IQR: 6,336.111) and £20,283.36 (IQR: 9,369.467), respectively. We conducted a sensitivity analysis that restricted the comparison group to people on relatively low incomes to ensure treatment and control groups were more comparable with respect to socio-economic status. To achieve that, we retained people with household incomes below the median and not on legacy benefits in the comparison group, generating more comparable groups (treatment group: £13,093.36, IQR 6,227.962; comparison group: £16,325.22, IQR 4,859.545). The final sample size included 78,220 person-year observations in the complete case analysis (treatment group: 57,611; comparison group: 20,609). Findings were consistent with the main analysis, as shown in the following tables and figures.

**Table 12.1: Descriptive statistics, treatment and alternative comparison group based on incomes, year prior to UC introduction**

	Treatment group		Comparison group	
	Mean	Std. Dev.	Mean	Std. Dev.
MCS	47.04	10.364	49.055	9.104
MCS ( $\leq 45$ )	0.369	0.483	0.274	0.446
MCS ( $\leq 50$ )	0.547	0.498	0.463	0.499
PCS	50.54	9.765	52.658	8.623
PCS ( $\leq 50$ )	0.369	0.482	0.26	0.439
Age	39.264	9.453	41.288	9.01
Age squared	1630.997	762.121	1785.791	769.195
Gender				
Male	0.27	0.444	0.255	0.436
Female	0.73	0.444	0.745	0.436
Marital status				
Married	0.639	0.48	0.871	0.335
Single	0.361	0.48	0.129	0.335
Dependent child				
No	0.382	0.486	0.371	0.483
Yes	0.618	0.486	0.629	0.483
Educational level				
Degree	0.286	0.452	0.448	0.497
A levels/GCSE	0.524	0.5	0.463	0.499
Other	0.091	0.288	0.06	0.238
No qual	0.099	0.298	0.029	0.167
Longstanding illness				
No	0.708	0.455	0.755	0.43
Yes	0.292	0.455	0.245	0.43
Country	..	..	..	..
England	0.852	0.355	0.818	0.386
Wales	0.074	0.261	0.084	0.277
Scotland	0.074	0.262	0.098	0.298
Ethnicity				
British	0.722	0.448	0.832	0.374
Non-British	0.278	0.448	0.168	0.374
Number of children in the household	1.609	1.185	1.402	0.938
Income (OECD modified scale adj. for inflation), median	13,093.36 (IQR: 6,227.962)		16,325.22 (IQR: 4,859.545)	
Obs. (year prior to UC introduction)	3,413		1,506	



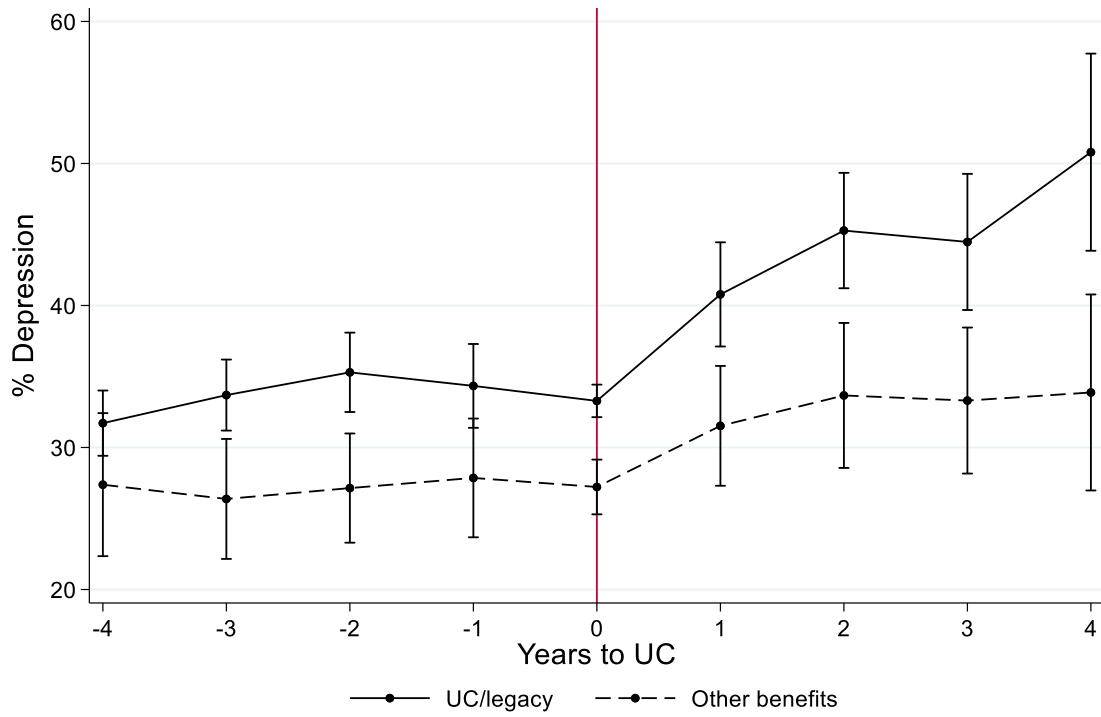
**Figure 12A: Mean mental health scores, treatment and comparison group in the years before the introduction of Universal Credit. Comparison group is restricted to those with incomes below the median household incomes based on OECD modified scale adjusted for inflation.**

**Table 12.2: MCS – Sensitivity analysis restricting the comparison group to people on low incomes**

Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 63,042

Number of obs = 78,220  
 Population size = 56,242.26  
 Design df = 62,681  
 F(31, 62651) = 64.86  
 Prob > F = 0.0000  
 R-squared = 0.0868

MCS	Coefficient	std.	err.	t	P>t	95%
Country (ref. England)						
Wales	-0.968	0.328	-2.950	0.003	-1.611	-0.325
Scotland	-0.482	0.267	-1.810	0.071	-1.004	0.040
Age						
Age squared	-0.185	0.047	-3.980	0.000	-0.277	-0.094
	0.004	0.001	6.400	0.000	0.003	0.005
Gender (ref. male)						
Female	-2.251	0.195	-11.540	0.000	-2.633	-1.869
Educational level (ref. degree)						
A levels/GCSE	0.000	0.148	0.000	0.999	-0.291	0.291
Other	-0.611	0.262	-2.330	0.020	-1.125	-0.098
No qualification	-0.893	0.262	-3.400	0.001	-1.408	-0.379
Marital status (ref. married/cohab.)						
Single	-2.244	0.168	-13.370	0.000	-2.573	-1.915
Longstanding illness (ref. no)						
Yes	-4.917	0.158	-31.180	0.000	-5.226	-4.608
Ethnicity (ref. British)						
Non-British	-0.439	0.198	-2.210	0.027	-0.827	-0.050
Dependent child (ref. no)						
Yes	1.029	0.194	5.300	0.000	0.649	1.409
Number of years before and after the introduction of UC (ref. year 0)						
-10	-0.276	1.718	-0.160	0.872	-3.643	3.090
-9	0.922	1.140	0.810	0.419	-1.313	3.156
-8	-1.267	0.894	-1.420	0.156	-3.019	0.485
-7	0.552	0.444	1.240	0.214	-0.319	1.422
-6	0.650	0.310	2.090	0.036	0.042	1.259
-5	0.507	0.246	2.070	0.039	0.026	0.989
-4	-0.339	0.237	-1.430	0.153	-0.805	0.126
-3	-0.569	0.256	-2.220	0.026	-1.072	-0.066
-2	-0.509	0.277	-1.840	0.066	-1.053	0.034
-1	-0.472	0.275	-1.720	0.086	-1.012	0.067
+1	-0.342	0.400	-0.850	0.393	-1.126	0.443
+2	-0.903	0.421	-2.140	0.032	-1.728	-0.077
+3	-0.857	0.457	-1.880	0.061	-1.753	0.038
+4	-1.710	0.582	-2.940	0.003	-2.851	-0.569
+5	-1.280	0.773	-1.660	0.098	-2.795	0.235
+6	-1.118	2.444	-0.460	0.647	-5.908	3.672
Treatment (low income)						
Post intervention	-0.794	0.175	-4.530	0.000	-1.137	-0.451
	-0.982	0.349	-2.820	0.005	-1.665	-0.298
Treatment#Post intervention						
1 1	-0.725	0.342	-2.120	0.034	-1.396	-0.054
Constant	53.568	0.964	55.580	0.000	51.679	55.457



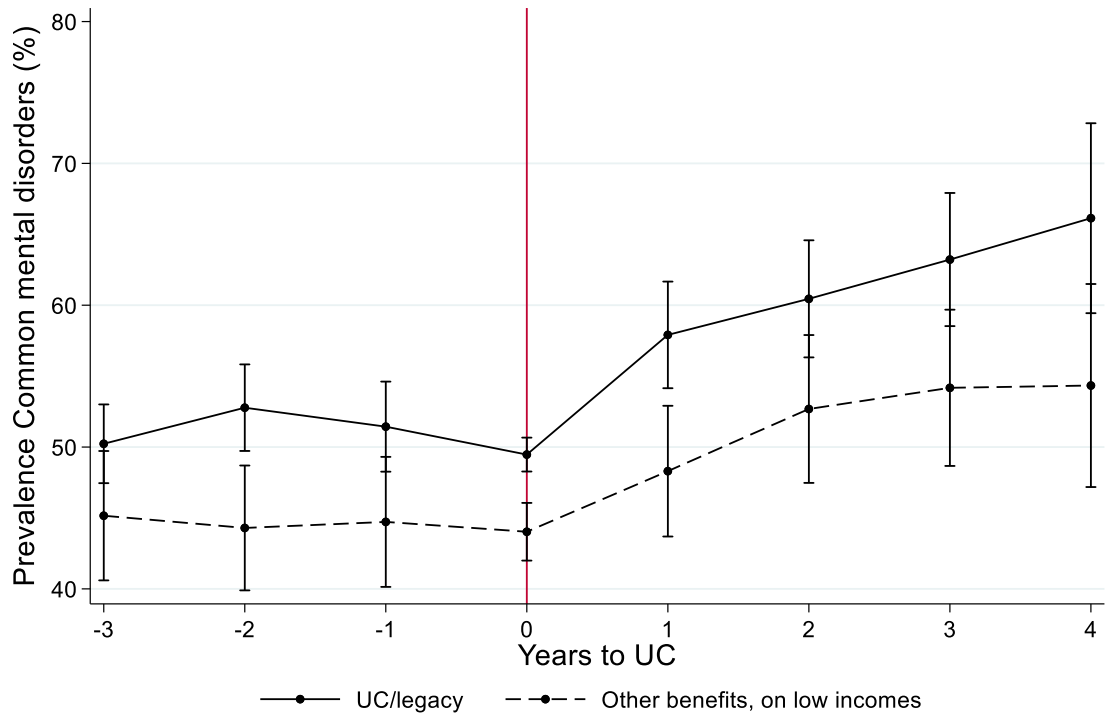
**Figure 12B: Prevalence of depression (%) in treatment and comparison groups in the years before the introduction of Universal Credit. Comparison group is restricted to those with incomes below the median household incomes.**

**Table 12.3: Binary MCS ( $\leq 45$  cutoff) – Sensitivity analysis restricting the comparison group to people on low incomes**

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 63,042

Number of obs = 78,220  
 Population size = 56,242.26  
 Design df = 62,681  
 F(31, 62651) = 46.56  
 Prob > F = 0.0000

MCS Binary ( $\leq 45$ cutoff)	Odds ratio	Std. err.	t	P>t	95% conf. interval	
Country (ref. England)						
Wales	1.170	0.079	2.330	0.020	1.025	1.334
Scotland	1.081	0.063	1.350	0.178	0.965	1.211
Age						
Age squared	1.030	0.010	2.910	0.004	1.010	1.051
	0.999	0.000	-4.540	0.000	0.999	1.000
Gender (ref. male)						
Female	1.456	0.063	8.620	0.000	1.337	1.586
Educational level (ref. degree)						
A levels/GCSE	1.045	0.037	1.260	0.209	0.976	1.119
other	1.239	0.074	3.560	0.000	1.101	1.394
no qual	1.315	0.073	4.950	0.000	1.180	1.466
Marital status (ref. married/cohab.)						
Single	1.527	0.054	11.930	0.000	1.424	1.637
Longstanding illness (ref. no)						
Yes	2.401	0.076	27.630	0.000	2.257	2.555
Ethnicity (ref. British)						
Non-British	1.187	0.053	3.880	0.000	1.089	1.295
Dependent child (ref. no)						
Yes	0.852	0.036	-3.760	0.000	0.784	0.926
Years prior and after the introduction of UC						
-10	1.381	0.711	0.630	0.530	0.504	3.789
-9	0.778	0.227	-0.860	0.390	0.440	1.378
-8	1.320	0.259	1.420	0.157	0.899	1.939
-7	0.875	0.092	-1.260	0.207	0.712	1.076
-6	0.868	0.062	-1.980	0.047	0.755	0.998
-5	0.872	0.052	-2.290	0.022	0.776	0.981
-4	1.006	0.059	0.100	0.924	0.896	1.128
-3	1.080	0.063	1.310	0.189	0.963	1.212
-2	1.140	0.070	2.130	0.033	1.011	1.285
-1	1.127	0.073	1.850	0.064	0.993	1.279
+1	1.048	0.088	0.560	0.574	0.889	1.236
+2	1.211	0.105	2.210	0.027	1.022	1.434
+3	1.183	0.116	1.710	0.087	0.976	1.433
+4	1.365	0.160	2.660	0.008	1.086	1.717
+5	1.376	0.318	1.380	0.167	0.875	2.163
+6	0.777	0.400	-0.490	0.623	0.284	2.129
Treatment based on incomes						
Post intervention	1.190	0.051	4.040	0.000	1.094	1.295
	1.251	0.102	2.740	0.006	1.066	1.468
Treatment#Post intervention						
1 1	1.133	0.087	1.630	0.103	0.975	1.316
Constant	0.155	0.032	-9.020	0.000	0.103	0.232
<b>Marginal test</b>						
	<b>Contrast</b>	<b>std. error</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% conf. interval]</b>	
Treatment#post-period	0.030	0.016	1.890	0.058	-0.001	0.061



**Figure 12C: Prevalence of common mental disorders (%) in treatment and comparison groups in years before the introduction of Universal Credit. Comparison group is restricted to those with incomes below the median household incomes based on OECD modified scale adjusted for inflation.**

**Table 12.4: Binary MCS ( $\leq 50$  cutoff) – Sensitivity analysis restricting the comparison group to people on low incomes**

Survey: Logistic regression  
 Number of strata = 361  
 Number of PSUs = 63,042

Number of obs = 78,220  
 Population size = 56,242.26  
 Design df = 62,681  
 F(31, 62651) = 36.36  
 Prob > F = 0.0000

MCS Binary ( $\leq 50$ cutoff)	Odds	ratio	std.	err.	t	P>t
Country (ref. England)						
Wales	1.166	0.071	2.500	0.012	1.034	1.314
Scotland	1.015	0.055	0.270	0.783	0.913	1.128
Age						
Age squared	1.039	0.010	3.990	0.000	1.020	1.058
	0.999	0.000	-5.650	0.000	0.999	1.000
Gender (ref. male)						
Female	1.422	0.058	8.620	0.000	1.313	1.541
Educational level (ref. degree)						
A levels/GCSE	0.993	0.032	-0.210	0.832	0.932	1.058
other	1.066	0.058	1.170	0.243	0.958	1.187
No qualification	1.143	0.061	2.510	0.012	1.030	1.269
Marital status (ref. married/cohab.)						
Single	1.401	0.048	9.860	0.000	1.310	1.498
Longstanding illness (ref. no)						
Yes	2.092	0.064	23.950	0.000	1.969	2.222
Ethnicity (ref. British)						
Non-British	1.095	0.045	2.220	0.026	1.011	1.187
Dependent child (ref. no)						
Yes	0.867	0.035	-3.520	0.000	0.800	0.939
Years before and after the introduction of UC (ref. year 0)						
-10	1.579	0.836	0.860	0.388	0.559	4.458
-9	0.746	0.198	-1.100	0.270	0.442	1.256
-8	1.450	0.258	2.090	0.037	1.024	2.055
-7	0.977	0.093	-0.250	0.804	0.810	1.177
-6	0.887	0.055	-1.920	0.055	0.785	1.002
-5	0.945	0.052	-1.030	0.301	0.849	1.052
-4	1.215	0.065	3.630	0.000	1.094	1.350
-3	1.072	0.059	1.260	0.207	0.962	1.196
-2	1.138	0.066	2.220	0.027	1.015	1.276
-1	1.108	0.067	1.700	0.089	0.985	1.248
+1	1.072	0.086	0.870	0.386	0.916	1.255
+2	1.214	0.103	2.280	0.023	1.027	1.434
+3	1.344	0.129	3.090	0.002	1.114	1.622
+4	1.420	0.167	2.990	0.003	1.128	1.788
+5	1.590	0.341	2.160	0.031	1.044	2.421
+6	1.481	0.712	0.820	0.414	0.577	3.800
Treatment (based on incomes)						
Post intervention	1.086	0.043	2.110	0.035	1.006	1.173
	1.113	0.082	1.460	0.145	0.964	1.285
Treatment#post intervention						
1 1	1.236	0.088	2.970	0.003	1.075	1.422
_cons	0.340	0.067	-5.500	0.000	0.232	0.500
<b>Marginal test</b>	<b>Contrast</b>	<b>std. err.</b>	<b>t</b>	<b>P&gt;t</b>	<b>[95% conf. interval]</b>	
Treatment#post intervention						



0.050

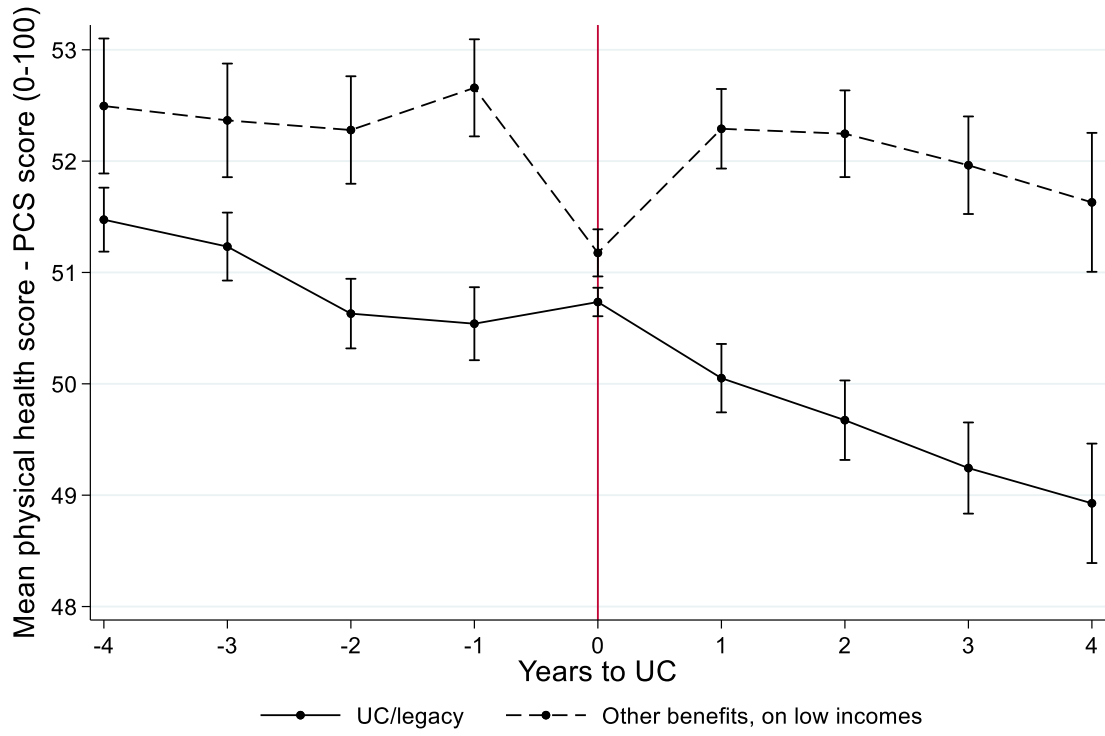
0.017

2.970

0.003

0.017

0.084



**Figure 12D: Mean physical health scores, treatment and comparison group in the years before the introduction of Universal Credit. Comparison group is restricted to those with incomes below the median household incomes based on OECD modified scale adjusted for inflation.**

**Table 12.5: PCS – Sensitivity analysis restricting the comparison group to people on low incomes**

Survey: Linear regression  
 Number of strata = 361  
 Number of PSUs = 63,042

Number of obs = 78,220  
 Population size = 56,242.26  
 Design df = 62,681  
 F(31, 62651) = 186.75  
 Prob > F = 0.0000  
 R-squared = 0.2225

PCS	Coefficient	std.	err.	t	P>t	[95% CI]
country						
Wales	-0.285	0.226	-1.260	0.206	-0.728	0.157
Scotland	0.633	0.190	3.330	0.001	0.260	1.006
age_dv	0.212	0.038	5.510	0.000	0.136	0.287
age_dv2	-0.004	0.000	-8.050	0.000	-0.005	-0.003
gender						
Female	-1.249	0.168	-7.430	0.000	-1.579	-0.920
edugroup_new						
A levels/GCSE	-1.119	0.121	-9.250	0.000	-1.357	-0.882
other	-2.344	0.222	-10.570	0.000	-2.778	-1.909
no qual	-2.850	0.225	-12.660	0.000	-3.291	-2.408
married						
Single	0.409	0.133	3.080	0.002	0.149	0.670
illness						
Yes	-8.270	0.143	-57.930	0.000	-8.550	-7.991
ethnicity						
Non-British	-1.862	0.153	-12.130	0.000	-2.162	-1.561
child16						
Yes	1.081	0.163	6.620	0.000	0.761	1.401
yearstoUC						
-10	0.553	1.875	0.290	0.768	-3.121	4.227
-9	0.227	0.978	0.230	0.817	-1.690	2.144
-8	0.291	0.636	0.460	0.647	-0.956	1.538
-7	-0.887	0.423	-2.100	0.036	-1.716	-0.058
-6	0.248	0.258	0.960	0.337	-0.258	0.754
-5	0.225	0.205	1.100	0.273	-0.178	0.628
-4	-0.029	0.199	-0.140	0.885	-0.419	0.362
-3	-0.633	0.223	-2.840	0.004	-1.069	-0.196
-2	-0.705	0.230	-3.060	0.002	-1.157	-0.254
-1	-0.534	0.226	-2.360	0.018	-0.977	-0.090
+1	0.347	0.286	1.210	0.225	-0.213	0.907
+2	0.448	0.327	1.370	0.170	-0.192	1.088
+3	-0.081	0.341	-0.240	0.812	-0.749	0.587
+4	-0.291	0.410	-0.710	0.478	-1.095	0.513
+5	-0.473	0.820	-0.580	0.564	-2.080	1.134
+6	-0.585	1.427	-0.410	0.682	-3.382	2.211
Treatment	-0.775	0.155	-4.990	0.000	-1.080	-0.470
Post intervention	-0.427	0.267	-1.600	0.109	-0.950	0.095

Treatment#post intervention

1 1	-0.428	0.264	-1.620	0.105	-0.946	0.090
_cons	54.234	0.773	70.130	0.000	52.718	55.749

### Appendix 13: Local-Projections DiD

The Local-Projections DiD (LP-DiD) approach is a novel method that merges local projections ideas from macroeconomics to the potential outcomes framework to take care of possible biases that may arise in standard DiD when there is variation in treatment timing.<sup>35</sup> According to recent econometric literature, if earlier treated units are used as comparisons for later treated units, the estimated ATET will be a weighted average of all possible 2x2 DiD estimators where weights may also be negative.<sup>36</sup> Considering that Local Authority districts introduced UC at different points in time (staggered design), then dynamic treatment effects may be present which may result in biased estimates. The LP-DiD addresses the problem of negative weighting by constructing ‘clean’ controls that do not contain units contaminated by previous treatment status to estimate cohort-specific effects. Effectively, comparisons only occur between newly treated groups and groups that do not include either previously treated observations or observations that have been treated in-between periods. Then, the LP-DiD provides a ‘weighted average of all treatment-cohort effects with positive weights that depend on treatment variance and subsample sizes’.<sup>35(p14)</sup>

We performed the LP-DiD approach by constructing a balanced panel of individuals followed across waves 2009-2008 (7,710 observations) to derive the on average effect across the follow-up period and at different points in time post-introduction through an event study analysis. We regressed the differenced outcome variable on the differenced indicator over a three-year horizon pre-and post-UC introduction:

$$Y_{i,t+h} - Y_{i,t-h} = \beta_n^{LP-DiD} \Delta D_{it} + \lambda_t^h + \varepsilon_{it}^h$$

where  $\lambda_t^h$  are common time effects and  $\varepsilon_{it}^h$  is the error term within a horizon  $h = [1,3]$  restricting the sample only to newly treated  $\Delta D_{it} = 1$  or not-yet-treated units  $D_{i,t+h} = 0$  in the analysis (‘clean control’ condition).

Tables 13.1 summarises findings from the LP-DiD model.

**Table 13.1. Local-Projections difference-in-differences estimates, dynamic and pooled effects across a three-year horizon**

LP-DiD	Coefficient	std. err.	t	P>t	[95% CI]	Obs.
Dynamic effects						
Three periods prior to UC	-0.251	0.366	-0.690	0.493	-0.970 0.468	4299
Two periods prior to UC	-0.350	0.395	-0.890	0.376	-1.126 0.425	5070
One period prior to UC	0	..	..	..	.. ..	..
UC introduction	-0.014	0.400	-0.040	0.972	-0.800 0.772	5841
One period after UC	-1.015	0.465	-2.190	0.029	-1.927 -0.104	4942
Two periods after UC	-0.690	0.497	-1.390	0.165	-1.666 0.285	4140
Three periods after UC	-0.602	0.611	-0.980	0.325	-1.802 0.599	3292
LP-DiD Pooled Estimates						
Pre-UC period	-0.300	0.331	-0.910	0.364	-0.950 0.349	4299
Post-UC period	-0.714	0.446	-1.600	0.110	-1.590 0.162	3292

#### Appendix 14: Sensitivity analysis LP-DiD using inverse probability weighting

We replicated the main local-projections difference-in-differences (LP-DiD) including covariates into the baseline model. Generally, the inclusion of covariates is expected to alter the variance-weighting scheme.<sup>35</sup> We ran a sensitivity analysis using propensity score methods to ensure weights remained non-negative and the variance-weighting scheme was still held in the LP-DiD setting. We predicted propensity scores using a probit model and constructed inverse probability weights based on the following equation:<sup>37</sup>

$$IPW = \frac{treatment}{propensity\ score} + \frac{(1 - treatment)}{(1 - propensity\ score)}$$

This procedure ensured that the baseline characteristics between treatment and control group were balanced. Lastly, the weights were included in the LP-DiD specification.

Results are summarised in Tables 14.1-14.3.

**Table 14.1. Checking balance in baseline characteristics between treatment and control groups, t-test statistics, control group is the reference**

	<b>t-test</b>	<b>Difference</b>
Gender	0.05*	-0.02
Country - England	0.01	-0.02
Country - Wales	-0.01	-0.01
Country - Scotland	0.00	-0.02
Age	1.40**	-0.52
Age squared	98.26*	-42.86
Education - degree	0.22***	-0.04
Education - A levels	-0.17***	-0.04
Education - other	0.00	-0.02
Education - no qualification	-0.04***	-0.01
Single	-0.29***	-0.03
Long-standing illness	-0.04	-0.03
Non-British	-0.03	-0.03
Whether responsible for dependent child	0.07**	-0.02
Observations	771.00	

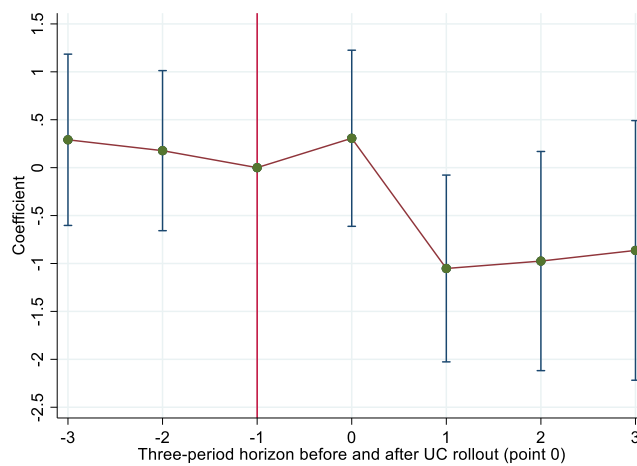
**Table 14.2: Checking balance between treatment and control groups in baseline characteristics after applying inverse probability weighting**

	<b>Coefficient</b>	<b>p-value</b>
c.gender@0.UCvsoth~w	0.9052974	
c.gender@1.UCvsoth~w	0.908269	0.9165
c.COUI@0.UCvsot~w	0.9066494	
c.COUI@1.UCvsot~w	0.8954534	0.6448
c.COUI2@0.UCvsot~w	0.0393925	
c.COUI2@1.UCvsot~w	0.038556	0.9618
c.COUI3@0.UCvsot~w	0.0539581	
c.COUI3@1.UCvsot~w	0.0659906	0.4932
c.age_dv@0.UCvsot~w	40.75743	
c.age_dv@1.UCvsot~w	40.79032	0.961
c.age_dv2@0.UCvsot~w	1712.35	
c.age_dv2@1.UCvsot~w	1717.543	0.9261
c.EDUI@0.UCvsot~w	0.4427267	
c.EDUI@1.UCvsot~w	0.4339923	0.8455
c.EDUI2@0.UCvsot~w	0.4765323	
c.EDUI2@1.UCvsot~w	0.479527	0.9479
c.EDUI3@0.UCvsot~w	0.0601571	
c.EDUI3@1.UCvsot~w	0.0593857	0.9697
c.EDUI4@0.UCvsot~w	0.0205839	
c.EDUI4@1.UCvsot~w	0.0270949	0.6961

c.married@0.UCvsot~w	0.2107512	
c.married@1.UCvsot~w	0.2176678	0.8883
c.illness@0.UCvsot~w	0.259299	
c.illness@1.UCvsot~w	0.2556394	0.928
c.ethnicity@0.UCvs~w	0.1818154	
c.ethnicity@1.UCvs~w	0.1721087	0.7945
c.child16@0.UCvsot~w	0.8309313	
c.child16@1.UCvsot~w	0.8540224	0.5472
Observations	771	

**Table 14.3. LP-DID event study and pooled estimates with inverse probability weighting**

	Coeffic~t	SE	t	P>t	[95% CI]		Obs
Three years prior to UC rollout	0.291	0.455	.64	0.523	-0.603	1.184	4299
Two years prior to UC rollout	0.177	0.425	.42	0.677	-0.658	1.012	5070
One year prior to UC rollout	0	..	..	..	..	..	..
UC introduction	0.307	0.468	.66	0.513	-0.612	1.226	5841
One year after UC rollout	-1.052	0.496	-2.120	0.034	-2.027	-0.078	4942
Two years after UC rollout	-0.975	0.582	-1.670	0.095	-2.118	0.169	4140
Three years after UC rollout	-0.864	0.690	-1.250	0.211	-2.218	0.491	3292
LP-DiD Pooled Estimates							
Pre-UC period	0.238	0.349	.68	0.497	-0.448	0.923	4299
Post-UC period	-0.969	0.465	-2.080	0.038	-1.881	-0.056	3292



**Figure 14.A: LP- DiD event study estimates with inverse probability weighting**

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