

# ***Trajectories in mental health and socio-spatial conditions in a time of economic recovery and austerity: a longitudinal study in England 2011-17.***

## **Authors**

Sarah Curtis\*, University of Edinburgh and Durham University,  
[s.e.curtis@durham.ac.uk](mailto:s.e.curtis@durham.ac.uk)

Niall Cunningham, University of Newcastle, [niall.cunningham@newcastle.ac.uk](mailto:niall.cunningham@newcastle.ac.uk)

Jamie Pearce, University of Edinburgh, [jamie.pearce@ed.ac.uk](mailto:jamie.pearce@ed.ac.uk)

Peter Congdon, Queen Mary, University of London, [p.congdon@qmul.ac.uk](mailto:p.congdon@qmul.ac.uk)

Mark Cherrie, University of Edinburgh, [mark.cherrie@ed.ac.uk](mailto:mark.cherrie@ed.ac.uk)

Sarah Atkinson, Durham University, [s.j.atkinson@durham.ac.uk](mailto:s.j.atkinson@durham.ac.uk)

\*Corresponding Author

## **Abstract**

This paper examines trends in mental health among adults in England during the period of economic recovery and austerity following the 2008 'great recession'. We report analysis of data on 17,212 individuals living in England, from the longitudinal *Understanding Society Survey* (USS). We examined how individual's self-reported mental health over time (2011 -2017), related to their changing socio-geographical status.

Self-reported mental health is reported in the USS using version 2 of the SF12 Mental Component Summary. Trends in this score (across 5 observations per subject) were categorised into *Mental Health Trajectory Groups* (MHTGs) using Group Based Trajectory Modelling. We used maximum-likelihood **multinomial logit** models to estimate for individuals the relative likelihood of belonging to different Mental Health Trajectory categories as compared with a 'base' category, for whom mental health was good and stable throughout the period. We focus on likelihood of belonging to a group showing 'declining' mental health. Predictor variables included individuals' attributes and area conditions in their places of residence (including Office of National Statistics indicators of local employment deprivation and data on average income loss within districts due to welfare benefit reforms, published by the Centre of Regional Economic and Social Research at Sheffield Hallam University, UK).

Our results emphasise the multiple socio-geographical 'determinants' likely to be operating on individual mental health. Declining mental health was associated both with conditions at the start of the study period and with social and socio-geographical mobility by the end of the study period. Risks of declining mental health were significantly greater for more deprived individuals and also (controlling for individual attributes) among those living in English neighbourhoods that were already economically disadvantaged at the beginning of the 'great recession' and located in districts where average incomes were most severely impacted by the effects of governmental austerity programmes on welfare benefits.

## **Keywords**

mental-health

England

austerity

deprivation

geography

mobility

## **Acknowledgements**

This paper includes results from data released under ‘special license’ as output from the UK Data Service and the original data creators and copyright holders of data sets from the Understanding Society Survey, which have been used in the form specified in information accompanying the data set or notified to the user. Understanding Society is an initiative funded by the Economic and Social Research Council and various Government Departments, with scientific leadership by the Institute for Social and Economic Research, University of Essex, and survey delivery by the National Centre for Social Research and TNS BMRB. The research data are distributed by the UK Data Service.

We are grateful to the UK Data Service and the Institute for Social and Economic Research at the University of Essex for providing access to the *Understanding Society Survey* (USS) dataset, and for helpful advice from the USS team.

We are also grateful to the NOMIS Centre for access to data published by the Office of National Statistics, UK, and to Christina Beatty and Steve Fothergill of the Centre for Regional Economic and Social Research at Sheffield Hallam University for the data on welfare reform impacts at local authority level.

The authors are solely responsible for the findings and interpretations reported in this paper.

Some co-authors of this paper have collaborated while supported by funding by the Economic and Social Research Council, UK Grant no. ES/P008585/1.

## Introduction

This paper contributes to a growing body of research focussing on how health relates to changes over the life course of people and of the places where they live (e.g.: Pearce, 2018; van Lenthe and Mackenbach, 2004; Tunstall et al, 2014; Lund and Cois, 2018). We report below on a study in England of social and economic risk factors associated with change in individuals' mental health, during the period 2011-2017; a time of economic stress and austerity in public welfare expenditure following the 'great recession' that began in 2008.

We analysed data on 17,212 individuals living in England, drawn from the Understanding Society Survey (USS) (ISER, 2019a) (a national, longitudinal cohort study) and linked to indicators of conditions in the areas where they lived. Using data on self-reported mental health, we identified 5 groups of individuals with different mental health 'trajectories', recorded across five USS survey waves. We focussed especially on two of these groups; one reporting continuously stable, good mental health and another reporting initially good mental health which then deteriorated over time.

Drawing on the literature summarised below, we identified socio-economic risk factors which might theoretically be expected to show associations with these mental health trajectories. These included conditions in the places where sample members were living and individuals' own demographic, social and economic attributes. We focussed especially on how unemployment and impacts of welfare benefit reforms in places of residence were associated with mental health. We also included in the models indicators of social and geographical mobility. We tested these as predictors of the mental health trajectories identified in our study sample.

We report findings that contribute particularly to the important debates concerning the mental health impacts of gradual economic recovery and austerity following recession, and the psychological outcomes associated with ‘upward’ and ‘downward’ social and geographical mobility of individuals.

### **Background: the theoretically complex relationships between socio-geographical status, socio-spatial mobility and mental health**

Our study design was informed by published research, summarised below, which demonstrates links between mental health of individuals, and the socio-economic attributes of the places where they live, as well as their personal socio-economic status. Some of this research includes studies of how *changes* in mental health relate to socio-geographical mobility of individuals and to change in wider determinants of mental health in the areas where they live.

### **Conditions in places as factors associated with mental health**

A large body of research in health geography, reviewed in a series of geographical texts (Jones and Moon, 1987; Philo, 2005; Parr, 2008; Curtis 2010) has focussed on people’s mental health and how it is associated with the *places* where they live. The literature referenced below shows that at a particular point in time, we may expect an individual’s mental health to relate to various aspects of their local neighbourhood and the wider geographical area where they live.

Most studies in these geographical texts indicate that risk of mental illness is worse in more socio-economically disadvantaged neighbourhoods than in more advantaged areas. More recent studies, relating to local variation in mental illness and mental health care in England, in the period since 2010, also report positive associations between risk of mental illness, rates of mental health care use and area deprivation

(White et al, 2014; Remes et al, 2019, Keown et al, 2016). Anselmi et al. (2020) have suggested that small area indicators based on receipt of welfare benefits by people who are unemployed would be relevant for measuring geographical variation in need for care.

Within countries, differences are also observed in population health at the broader regional level, which may partly reflect variations in regional economic development, employment opportunities and impacts of policy interventions at this scale. In the English context, these are sometimes referred to in terms of the 'north/south divide', since populations in northern regions of England are more disadvantaged on a number of health indicators than populations in the south of the country (Wilkinson et al., 2008; Baker 2019). In addition, socio-economic systems at the national scale may affect mental health. The relationship between personal socio-economic position and physical and mental health is known to be variable internationally, depending on the welfare provisions made at the level of the state (Copeland et al, 2015) and the degree of socio-economic inequality at national scale (Wilkinson and Pickett, 2009).

Research also suggests that population mental health varies according to other area attributes, which may be distinct from socio-economic conditions. Notably some research points to differences between more urban versus more rural localities (Levin and Leyland, 2005; Paykel et al., 2000; Harriss and Hawton, 2011; Fontanella et al., 2015). Some population health indicators (such as suicide rates) suggest worse mental health in extremely isolated rural places in the UK, as well as more urban areas (Allan et al. 2017; Levin and Leyland, 2005). However, in general, rural settings may be more beneficial than urban environments for mental health and sense of wellbeing (Weich et al. 2006), partly because the highest levels of socio-economic disadvantage are concentrated in urban areas (Paykel et al., 2000).

## **Change over the lifecourse of places**

Research on population mental health inequalities viewed across time is also increasingly focussing on how *changes* in socio-economic determinants operating at the area level relate to health outcomes over time (Pearce, 2018; Pearce et al., 2018). This takes a lifecourse perspective on *places* as well as *people*.

Of particular relevance for this study is literature suggesting that mental health may be strongly impacted by changing socio-geographical factors during ‘critical periods’ in wider society, such as a downturn in economic conditions affecting whole communities as well as the economic fortunes of individuals. Research in Scotland (Curtis, Pearce et al, 2019) has shown that rates of deterioration in labour market conditions at district level during the ‘great recession’ and subsequent period of economic austerity varied geographically in ways that were statistically associated with worsening individual mental health, after allowing for a range of other risk factors. In England, economic impacts of the recession were also geographically variable and research suggests that deteriorating self-reported health (not specific to mental health) in the period 2001-11 was associated with changing labour market conditions 2007-11 (Curtis, Norman et al, 2019).

At regional level, the worst economic effects of recession were felt in northern regions where employment relies heavily on more traditional industries and public services (Martin et al, 2016). These include the West Midlands region, which saw the most rapid growth in unemployment (House of Commons, 2010; Bailey and Berkeley, 2014).

Also, subsequent to the ‘great recession’, reduced government spending on programmes that support socio-economically disadvantaged groups have particularly

affected more deprived areas and are theoretically likely to exacerbate socio-geographical health inequalities (Barr et al., 2015; Bambra et al., 2019). Beatty and Fothergill (2016) have published data showing how the impact of these reforms on incomes varied across Local Authority Districts in England.

### **Geographical mobility and mental health**

The associations between area level health determinants and changes in mental health are likely to operate in complex ways, partly because individuals may be mobile across space. Residential mobility from an area with lower risk to a place where the environment is more detrimental for mental health might give rise to a new case of mental illness. This pattern of migration also may be associated with other difficult life events for the individual, causing them to develop mental illness (Tunstall et al., 2015).

It is also important to consider that changes in mental health may give rise to residential mobility, due to processes of health selective migration and drift (Norman, 2018). Those already suffering from deteriorating mental health may be at greater risk of ‘downward’ residential mobility to more deprived areas (Maheswaran et al., 2018).

For example, Wilding et al (2018) used longitudinal population survey data from the *British Household Panel Survey* and its sequel, the *Understanding Society Survey* to analyse residential migration between survey waves and how this was predicted by various individual variables, including mental health. They concluded that those who were residentially mobile, but would have preferred not to move, were more likely to have poor mental health. Also, among those with poor mental health, the probability of moving between survey waves was greater if they had been living in areas where people in good mental health were more residentially stable between survey waves.

This supported the idea of 'health selective' migration, especially when migration may not be a positive choice for the individuals involved.

Other international research focuses on change in individual mental health over time as the outcome variable. This also demonstrates that health selective migration may help to explain associations between individual mental health and area level conditions (Dauncey et al., 1993; Moorin et al., 2006; Tunstall et al. 2014; Tunstall et al. 2015; van Lenthe and Mackenbach, 2004; Dartington-Pollock et al, 2018; Lund and Cois, 2018).

### **Individual attributes as socio-economic determinants of mental health**

We also considered the following literature showing how mental health may be associated with *individual risk factors* and *personal social mobility*. In addition to information about places, geographical studies of mental health variations in adult populations need to consider this wider literature on mental health differences associated with *individual* attributes. These include gender, age, ethnicity, marital status, housing tenure and socio-economic position (as measured by occupational class, income, and employment status). It is well established in the literature on inequalities in mental health that, at any particular point during a person's lifecourse, contemporaneous differences in socio-economic position are likely to be associated with differences in mental health. For example, Patel et al (2010) reported from an international review clear evidence that gender, household composition and disadvantage in terms of socio-economic position, and income are determinants of mental health. Daghlér et al. (2015) report gender differences in mental health of the population of the USA during and after the great recession, finding that women were



more likely than men to suffer anxiety in the post-recession period. An empirical study in England (Anselmi et al, 2020) reports that age group, living alone, and ethnic group were among the factors predicting medical treatment for mental illnesses. Public Health England (2018) also reports on inequalities in mental health between ethnic groups in the English population. A recent review showed that housing tenure and housing quality are also important for mental health (Singh et al.,2019).

### **Individual social mobility and mental health**

Many studies (especially in sociology and economics), have interpreted social mobility in terms of changes in individual, occupationally-defined, social class position and/or income (Goldthorpe et al., 1987). Research suggests that ‘downward’ mobility is likely to be related to worse mental health. In a study based on the British city of Newcastle, Tiffin et al. (2005) found that amongst men (but not women), risk of reporting a mental illness was associated with downward social mobility. Similar findings are reported in a study in Belgium (Daenekindt, 2017). While the *actual experience* of downward socio-economic mobility is likely to be linked to worsening health, it may also be the case that the *prospect* of downward mobility (e.g. the threat of redundancy or reduction in income) may cause stresses that are detrimental to mental health, even before such changes become a reality (Curtis, Pearce et al. 2019; Benach et al., 2014; De Moortel et al, 2017; Dirlam and Zheng, 2017).

It is also interesting to consider whether ‘upward’ mobility in terms of social class is beneficial for outcomes such as mental health. Some research suggests that this may be the case for some upwardly mobile individuals, but not for others. Some individuals who are upwardly socially mobile, especially from initially very disadvantaged levels, may find the process stressful as they confront barriers (‘class

ceilings') to social integration in their new social settings, and this may create stresses, at home, or in the workplace, which may be harmful to mental health (Friedman, 2014; Savage et al., 2015; Friedman et al., 2015; Friedman and Laurison, 2019). This may explain results from a Swedish cohort study of individuals born in the decade between 1949 and 1959 (Tikkaja et al., 2013) showing that although there was a significant association between upward social mobility and reduced risk of psychiatric disorder, this relationship was weaker for men starting in the most disadvantaged groups.

Other research suggests that individual upward socio-economic mobility can be promoted by residence in (generally more affluent) 'escalator regions' (Fielding, 1992) where individuals have the best opportunities of promotion up the socio-economic ladder. This might be expected to be beneficial for other outcomes such as mental health. However, a rich strand of work is emerging (Miles and Leguina, 2018; Toft, 2017), suggesting that migration to escalator regions may, in some cases, be coincident with other events in the lifecourse, undermining any psychological benefits of such socio-geographic mobility (e.g. family/relationship break-up, or problems of access to housing).

### **Aims of our research**

Given these complex potential links between changing socio-geographical conditions and mental health, there is considerable scope to extend research on geographies of mental health using a temporal, as well as socio-spatial perspective. In this paper we focus on the situation in England during the period 2011-2017, which was one of economic 'recovery' from the great recession, when employment rates had not

regained pre-recession levels and the UK government introduced a suite of austerity measures intended to reduce public spending.

Using longitudinal data from a large sample of the English population (extracted from the USS), we compared individuals with declining mental health with those in continuously good health, during the period of 'recovery and austerity' in England following the 'great recession'. Our research addressed the following specific research question:

- *Was the risk of declining mental health greater for people living in areas that were most deprived in terms of unemployment and also most impacted by austerity policies (after controlling for other individual and area risk factors indicated in the literature)?*

Given the debates reviewed above concerning health selective mobility and drift, a broader, secondary question of interest in our analyses was this:

- *Did aspects of geographical and social mobility of individuals during the study period relate to differences in their mental health trajectories?*

## **Methods**

Our study analysed data on a subset of individuals in the USS (ISER, 2019a), a large, long-established longitudinal annual panel survey of UK households. We studied 17,212 individuals aged over 16 at the start of the study period (2011) and living in England, with full data on the variables of interest, collected between 2011 and 2017, in survey waves 3 to 7 - see ISER (2019b) for details of the timing of the different survey waves. We note below, under 'limitations' of the study, proportions of the full USS sample excluded from our analysis due to attrition and missing variables across

the survey waves studied. As discussed below, the analytical sample is not exactly representative of the whole English population, but they do include residents from all regions of the country and from across the range of socio-economic conditions prevailing in more local areas.

We used information on individual's self-reported mental health and other personal and family attributes, collected in successive survey waves over the period 2011 - 2017. These were linked with geographical information about the economic conditions prevailing in the places where they lived over the period studied.

### **The outcome variable: trends in mental health**

Information on self-reported mental health has been collected at each wave of the USS and scored, using version 2 of the SF12 Mental Component Summary (MCS) functioning score (Ware et al 2001; ISER, 2020). The self-completed responses to survey questions were converted to a 'normalised' score ranging from 0 (low functioning; very poor mental health) to 100 (high functioning; very good mental health) (ISER, 2020).

Across the individuals studied, trends in this score between waves 3 and 7 of the survey (5 observations for each subject) were categorised into *Mental Health Trajectory Groups* (MHTGs) using Group Based Trajectory Modelling (GBTM) software designed for use in Stata programming (Jones and Nagin, 2013, Nagin et al, 2018; Franklyn et al., 2013). GBTM is a finite mixture modelling technique using trajectory groups to represent latent trajectories across subjects in longitudinal studies.

We selected the GBTM model specification used for our analysis based on the Bayesian Information Criterion (BIC) which was compared between trajectory models with varying numbers of categories. (The BIC is here defined as the maximum

likelihood value minus half the parameter total, multiplied by the logarithm of the sample size, so that higher BIC values indicate better model fit.) We found that a model with six groups has a higher (less negative) BIC than for a smaller number of groups. The choice of GBTM model specification aims also at parsimony and interpretability, considering the extent to which the classification distinguished clearly differing trends in reported mental health. Based on these criteria, the results reported here are derived from a GBTM model which classifies trends in mental health into the six categories shown in Figure 1, which also contains group membership shares (posterior classification probabilities times 100).

In this paper we focus particularly on individuals in two of these mental health trajectory groups (MHTGs):

- MHTG 6 – those who reported *consistently high* levels of mental health functioning across all waves, treated as the reference group and accounting for about 47% the entire sample; and
- MHTG 3 – those who initially reported relatively good mental health, but from wave 4 onward reported *declining mental health* across the waves – just under 8% of the sample.

The outcome variable in our analysis is the risk of being in MHTG 3 compared with MHTG 6.

The other four MHTGs shown in Figure 1 comprised those with mental health that was either: consistently improving (MHTG 4); continuously poor (MHTG 1); or stable at intermediate levels (MHTGs 2 and 5). These are less clearly relevant to the research question of interest here regarding the risk of *worsening mental health* in the period of

‘economic recovery’ following the ‘great recession’. However, we make brief reference below to the results of models comparing MHTGs 1,2,4 and 5 with group 6.

### **Predictor variables**

The predictor variables in our analyses included indicators categorising the person’s geographical area of residence and their individual or family status. (Table A [Electronic Appendix] lists the categorisation and derivation of these variables).

Geographical variables in the models categorise socio-geographic aspects of the place of residence for each individual at wave 4. These variables were selected in light of our review of the literature (summarised above) and also based on preparatory analyses which tested the significance of their associations with the MHTG outcomes of interest. The indicators were chosen to capture the socio-economic impact of local unemployment levels at the start of the recession and the impacts of district level austerity measures during the subsequent recovery period, while controlling for local urban-rural differences and broad regional variations that might not be fully captured at the more local scale.

The geographical predictors are indicators for areas defined at various geographical scales. Lower-Level Super Output Areas (LSOAs), which, in England as a whole, total 32,844 small areas, ranging from 1,000-3,000 in total population size, are used to organize and publish data from the population census and other sources. They are taken here to indicate ‘neighbourhood’ conditions. We also included information relating to Local Authority District (LAD) areas in England, which are larger geographical units corresponding to administrative areas of local government at which service provision is organized and welfare benefit reforms are implemented. Our sample relates to 317 LADs in total, with resident populations in 2011 ranging from

approximately 35,000 to 1,000,000. At a broader geographical scale, information on Government Region of residence was also used since some political and economic processes operate at a larger scale and some published literature has used these units to study geographical inequalities. We identified the person's place of residence within one of 9 Government Regions across England.

At the scale of the LSOA where each sample member was resident at USS wave 4, we used as an indicator of area socio-economic deprivation the Employment domain of the Index of Multiple Deprivation 2010 (Ministry of Housing Communities and Local Government, 2011). The Employment Domain is based on data on receipt of welfare benefits for unemployed residents in 2008 coincident with the start of the economic recession (published on behalf of the Office of National Statistics by NOMIS (NOMIS ONS, 2011). This indicator was selected to capture the level of disadvantage in the labour market at the onset of the 'great recession'. The individual's LSOA of residence at USS wave 4 was categorised according to national quintile ranking of the Employment Domain score. Most disadvantaged areas were ranked 5 and least disadvantaged ranked 1. Our ranking is based on disadvantage scores published by ONS, although readers may wish to note that some rankings published by ONS use the reverse order, with most disadvantaged areas ranked 1.

We classified the LAD of residence for sample members in quintiles using an indicator developed by Beatty and Fothergill (2016), which classifies LADs by average income loss per person of working age due to government 'Welfare Reforms' up to 2015. This is relevant to our research because it captures statistically the 'population level' *economic* impacts of welfare reform. However, we note that it probably does not capture all the wider social manifestations of austerity impacts.

Since differences in population mental health between urban and rural areas have been reported in the literature (as explained in the background section above), area of residence at the scale of LSOAs was also categorised according to the 2011 rural-urban classification (ONS, 2019). In our preliminary analysis, these were summarised to distinguish between: conurbations, urban areas in cities and towns, settlements in and around smaller 'rural towns' and rural villages and dispersed settlements. We found that living in or near smaller towns in rural areas, compared with all other areas, showed the clearest association with the outcome, so our final model used a binary indicator of residence in this type of area vs other types of area.

In addition to differences at the scale of LSOA and LAD, we found that risks of the mental health outcome of interest varied regionally, especially between individuals living in the West Midlands (which includes the city of Birmingham, one of the major conurbations in England and its surrounding area) and other regions. Research conducted at the University of Warwick (Institute for Employment Research, 2009) shows that this region was particularly badly affected by the recession. This relationship was independent of the other geographical and individual variables tested in our analysis, so we have used an indicator which distinguishes between the West Midlands and other regions.

For each geographical variable, we also generated an additional indicator showing whether the person had moved to a location in a different category during the period between wave 4 (data collected at a date between 2012 and 2014) and wave 7 (2015-17). We compared those who, at both waves, were living in areas classed in the same category with 'movers' migrating to an area in a different category. For 'movers', we distinguished between those undergoing 'upward' residential mobility (to an area



where conditions were theoretically likely to be more beneficial for mental health) and those with ‘downward’ mobility (to areas where conditions might be more detrimental).

Individual and family attributes considered in the analysis were the variables listed below. These were selected as likely to be relevant, based on our review of the background literature above, and showed significant associations with the mental health outcomes considered here. (The categories are summarised in Table 1 and details of the variable definitions are shown in [Table A: supplementary material]:

- sex;
- age group (in 10 year categories);
- self-identified ethnic group (in broad categories);
- whether the person lived with a partner;
- occupational social class;
- income in the month prior to interview;
- employment status;
- housing tenure at wave 4, distinguishing between outright home owners and those who were renting or paying mortgages on their homes
- being in receipt of welfare benefits at wave 4 (other than child benefits and state pensions, which are rather ‘universal’ benefits for parents or older people and are not related to socio-economic disadvantage).

To capture socio-economic mobility, we also included in the models information on *changes* in socio-economic position between survey wave 4 and wave 7 (See Table A). These relate to change in the individual’s social class, income, employment, tenure, and receipt of welfare benefits. For each of these attributes, we compare those for whom there was no change with others experiencing changes that might

theoretically be likely to alter the risks of declining mental health. We distinguished between changes suggesting ‘deteriorating’ social conditions, likely to increase the risk of being in MHTG 3, and ‘improving’ socio-economic conditions that might theoretically be expected to reduce the risk of membership of MHTG 3. Table A also includes information on the percentage of the analytical sample in the different variable categories. (To protect the confidentiality of respondents, avoiding any risks of disclosure, these data are summarised as whole percentage figures and some details relating to small percentages are withheld.)

### Method of analysis

Our analysis used the ‘mlogit’ command in Stata to fit maximum-likelihood multinomial logit models, estimating for individuals the relative likelihood of belonging to one of the Mental Health Trajectory Groups (MHTG) 1 – 5 shown in Figure 1, as compared with MHTG 6, the ‘base’ category.

Our preliminary analyses showed that area-level indicators based on employment deprivation and average income loss per person of working age due to government ‘Welfare Reforms ‘ both showed significant positive associations with relative risk of the mental health outcome (MHTG 3) when included separately in the analytical model. However, these indicators are intercorrelated and did not show an independently significant association with the mental health outcome of interest when both were included.

We therefore generated a composite indicator of ‘area economic disadvantage’ for the study sample by summing the quintile ranks of area of residence on ‘employment deprivation’ and ‘average loss of income due to welfare reforms’, and producing a composite economic disadvantage score ranging from 2-10. This was summarized

into two categories: those scoring 2-5 (lower disadvantage; 44% of the total) and those scoring 6-10 (greater disadvantage; 56%). These categories were chosen because, as shown in Figures 2 and 3, they distinguish between those in areas more affected by both employment deprivation at the start of the time of post-recession recovery and austerity impact during the period studied (predominantly ranking in quintiles 3 to 5 on both of the components), and other areas which were less disadvantaged on both components (mainly ranking in quintiles 1-2).

Below we report on our findings that show how the likelihood of being in MHTG 3, compared with MHTG 6, varied in relation to individual and area predictor variables. Results are reported as adjusted odds ratio (AOR) coefficients and 95% confidence intervals. Statistical significance was defined as 'P' values lower than 0.05 (shown in bold text in Table 1).

## **Results**

The results in Table 1 (part 1) show how the probability of membership of MHTG 3 vs. MHTG 6 relates to attributes of area of residence at waves 4 and 7 (controlling for relationships with personal characteristics, discussed below). Those living at wave 4 in localities with a higher economic disadvantage score (indicating greater disadvantage) had significantly higher relative risk of being in MHTG 3 vs MHTG 6 than those in areas with a lower economic disadvantage score.

Also, living in a small town within a rural region at wave 4 was negatively associated with risk of being in MHTG 3 vs. MHTG 6. Those living in the West Midlands, as compared with other parts of England, were more likely to be in MHTG 3, relative to MHTG 6.

Considering residential mobility, those who, between wave 4 and 7, moved to an area of higher employment deprivation, measured on the IMD2010, and those moving to an area where loss of income due to welfare reforms was greater were significantly more likely to be in MHTG 3 than MHTG 6, compared with 'non-movers'. Also, those moving to an area where average loss of income due to welfare reforms was lower were comparatively less likely to be in MHTG 3. Movements between areas in different categories in terms of rurality or Government Region were not significant predictors of the MHTG 3 outcome.

The general impression from these results is that those in MHTG 3, with declining mental health, were particularly likely to be living in disadvantaged areas at the beginning of the period and/or to have been downwardly mobile to more deprived areas subsequently. The associations with area economic disadvantage are independent of other geographical and individual variables in the model.

Table 1 (part 2) shows that most individual variables included in the model were also associated with statistically significant differences in the probability of having declining mental health (MHTG 3) compared with constantly good mental health (MHTG 6).

Individual attributes raising the probability of *declining mental health* (MHTG 3) were:

- being female (compared with males);
- being in younger age groups (under 30 years) at wave 4 (as compared with those aged 30-39 years);
- not living with a partner at both wave 4 and 7, as compared with those who lived with a partner at both survey waves);

- being in receipt of welfare benefits (other than child benefits or state pensions) at wave 4 (compared with not receiving benefits in these categories);

People were less likely to be in MHTG 3, compared with MHTG 6, if they had the following attributes:

- being among older age groups, over 50 years at wave 4 (compared with those aged 30-39 years);
- (with borderline significance) being in social class 3 (small employers and own account workers) or Class 5 (semi-routine and routine workers) at wave 4 (compared with class 1 managerial and professional);
- being outright owners of their homes at wave 4 (compared with other tenures);
- having higher income at wave 4.

There were also significant associations with some indicators of *change* in individual socio-economic status. The relative probability of being in MHTG 3 vs MHTG 6 was positively associated with:

- living with a partner at wave 4 but not wave 7, (compared with those who lived with a partner at both survey waves);
- becoming unemployed between waves 4 and 7 (compared with being employed at both waves);
- moving onto welfare benefits between wave 4 and 7;
- (less significantly) being upwardly mobile between social class groups.

The probability of being in MHTG3 was also negatively associated with moving off welfare benefits from wave 4 to 7.

Supplementary Table B [Electronic Appendix] reports the complete results from the model, showing the results for other parts of the model which predict probability of being in MHTG 1, 2, 4 or 5, as compared with MHTG 6). This shows, for example, that people in MHTG 2 (a group with relatively low, slightly declining mental health throughout the period studied) were also more likely to have been living in an area of higher economic disadvantage. However, membership of MHTG 2 was not significantly associated with mobility between areas in different categories of employment deprivation and loss of income due to welfare benefits. MHTG 4 represents those whose mental health improved from a relatively low level in wave 4 to a higher level. These may include individuals in recovery from a period of mental illness. Compared with MHTG 6, those in MHTG 4 are more likely to be women, in 'Asian' ethnic groups, not in a long-term partnership, who were on lower incomes and receiving welfare benefits at some point during the study period. They were less likely to be in the older age groups, identifying in 'Black' ethnic groups or outright homeowners. The indicators describing place of residence were not significantly associated with membership of MHTG 4. Table B shows that individual variables relating to ethnic group and change in income from wave 4 to 7 were not significantly associated with membership of MHTG 3 but were significantly associated with membership of other MHTGs, so they were retained in the model.

## **Limitations**

We acknowledge some limitations to these analyses, some of which might be interesting to address in future research.

The analysis is not intended to be exactly representative of the English population. We have not applied any weightings in respect of under- or over-representation of some groups in the original sample. (We note that some authors (e.g. Solon et al, 2015) raise doubts over whether such weighting is appropriate in studies such as this one). Although the USS data includes some methods for weighting to make the total survey sample more representative of Britain as a whole, these do not apply to the English sub-sample we have used. To provide an approximate indication of how our study sample compares with the population of England as a whole, we include in [Table C supplementary material] some summary information on how attributes of the sample recorded at wave 4 compare with similar indicators for the population of England as a whole, recorded in the 2011 census. This suggests, for example, that in the analytical sample, as compared with the census population, there may be some ‘over-representation’ of women, those in older age groups, and people living with a partner. Those in social classes III, IV and V may be somewhat ‘under-represented’ relative to the census population.

Some of these disparities may be due to exclusion from our analytical sample of individuals in the USS missing data on relevant variables. Some individuals also left the relevant USS cohorts during the study period, which might be due to failure of follow up, migration to a location outside England, or death during the study period (which may include mental health related mortality such as suicide). Such omissions are indicated, for example, by the observation that our analytical sample includes 17,212 of the 36,221 individuals who responded, at least partially, to the USS in wave 4, at the start of the period studied. Also, the technical report on USS wave 4 published by the USS managers indicates that of households included in the wave 4

sample, 82% responded fully or partially, and 84% of eligible adults in these households completed an individual interview (Jessop & Oskala 2014, p28).

More generally, in terms of methodological limitations, we note that cautions regarding latent growth models may be considered. A latent growth model may not be appropriate to all growth processes – such as when homogeneous pattern of change, albeit with variation around the central trend, is expected (Connell and Frye, 2006). Moreover, drawing causal inferences from latent growth models may need to be circumspect (Von Stumm and Plomin, 2015). From a technical viewpoint, the classification of individuals to particular latent trajectories are subject to uncertainty. On the other hand, confidence in inferences from the model in the present application is strengthened by the large sample size and by the interpretability of the findings against wider research evidence.

There may also be scope for further analysis to explore interaction effects between the predictor variables, which might further illuminate the complex ways that different area and individual variables may operate in their association with mental health.

## **Discussion**

Our results suggest a complex pattern of risk factors associated with individuals' mental health trajectories during a period of slow economic recovery immediately following the 'great recession', at a time when a range of austerity measures were taking effect in the UK. Several different attributes of places as well as individuals show independent associations with decline in mental health in this large sample from England

Of particular interest in this paper is association with our composite indicator of area economic disadvantage (combining neighbourhood level employment deprivation at



the start of the recession and District level impact of subsequent welfare reforms), This suggests that relative risks of having declining mental health (MHTG 3 compared with MHTG6) were higher in areas where employment deprivation was greater, and governmental austerity measures on welfare benefits also impacted most severely on the District population. This result is evident after a number of individual risk factors are controlled for, including individuals' employment status and receipt of welfare support such as unemployment benefits. Thus, the association with the composite indicator of area economic disadvantage is apparently reflecting a 'contextual' mental health risk factor, which is, to a significant degree, independent of personal characteristics.

The finding that there was also higher risk of declining mental health for those in the West Midlands region seems likely to reflect the especially severe economic impacts of the 2008 onset of recession in this region (reviewed above). This seems to reinforce the conclusion that the impacts of economic recession and related austerity policy implementations aimed at fiscal recovery (affecting local neighbourhoods and wider districts) were significant for individual mental health.

Our models also allow for urban-rural and regional differences in risk and show that these attributes of areas may also relate to declining mental health. Those in small towns in rural settings have a lower relative risk of declining mental health. This result seems broadly consistent with other research on rural/urban differences in self-reported mental health outcomes reviewed above.

We also found that those who were 'downwardly mobile' between survey waves 4 and 7, moving to more economically disadvantaged areas, where unemployment deprivation had been greater at the start of the 'great recession' in 2008, or to areas

where average loss of income due to welfare reforms was relatively high, were more likely to experience declining mental health during this period. A corollary of this observation is that those who moved to areas where average incomes were *less* severely impacted by welfare benefit reforms had a lower risk of being in MHTG 3 relative to MHTG 6, so this aspect of ‘upward’ socio-geographic mobility may have been protective for mental health.

The results also indicate significant associations between individual attributes and declining mental health. We have noted that, independently of other variables in the model, individuals on lower incomes and those who, between survey waves 4 and 7, became unemployed or moved onto welfare benefits had a greater risk of declining mental health (MHTG 3), while those who moved off welfare benefits were less likely to be in MHTG 3 relative to MHTG 6. This finding supports other research, summarised above, reporting links between mental health and change in personal employment status, income and welfare dependency.

For the most part, the associations between mental health trajectories and other individual risk factors are to be expected, based on other literature. Exceptions include our findings for social class groups, suggesting that those who, at wave 4 were in Social Class 1 (professional and managerial social classes, generally considered to be most advantaged in terms of health) did *not* show any advantage in terms of risk of declining mental health (MHTG 3). At a weak ( $p \leq 0.10$ ) level of statistical significance, those in Classes 3 and 5 were *less* likely to have declining health than those in Class 1. Also, risk was *greater* for those who were upwardly mobile in terms of social class between survey waves 4 and 7. This could be interpreted as part of the socially ‘dislocating’ or isolating impact of social mobility identified in sociological research. Class origins early in life may be associated with different attitudes towards social

mobility (Manstead, 2018). The Bourdieusian idea of ‘cultural capital’ (Bourdieu, 1985) suggests that confidence and knowledge regarding expected patterns of behaviour within one’s social group are important social assets. Those who have always lived in more privileged communities will have acquired these assets through early life experiences, such as education in more elite institutions, from which those who are upwardly mobile may have been excluded (SMC, 2019). The socially uneven potential to benefit from upward mobility in class position between and within generations is therefore recognised as being a key driver and indicator of inequalities between individuals and groups, which in turn, is likely to have mental health implications.

It is also possible that measures of social status based on occupational group may be less relevant as indicators of risk for mental health than indicators such as income, which, in our results, shows a strong negative association with the risk of being in MHTG 3 *versus* MHTG 6. It may be that the relationships between class and mental illness risks reported in some other studies do not control fully for income variation, and that class disparities can be largely explained by differences in income between social class categories. Our findings also lead us to speculate that (despite better prospects in terms of income) moving to a higher professional status causes stressful challenges, especially during an economic recession, which may damage mental health.

## **Conclusions**

We conclude that individuals were significantly more likely to suffer declining mental health if they were living in neighbourhoods with high levels of employment deprivation at the start of the 2008 recession, and where impacts of subsequent welfare benefit reforms at the scale of Local Authority Districts were greatest. This association is

independent of the individual risk factors for mental health in our models. It is also independent of urban rural disparities or broader regional variations. The introduction of welfare reforms during the economic recovery period, affecting a range of benefits that are especially important for disadvantaged communities, seems to have compounded the mental health impacts of unemployment in local labour markets.

Trends in mental health show significant associations both with conditions at the start of the study period and with subsequent social and socio-geographical mobility by the end of the period. Health selective socio-geographical mobility and effects of 'drift' probably explain some, but not all, of the mental health inequalities observed. Thus, our study also underlines the importance of considering mobility as a factor associated with varying risk of declining mental health. However, individuals' socio-geographical 'starting point' in the early stages of post-recession recovery is significantly associated with subsequent changes in their mental health. Our findings are consistent with the idea that area disadvantage may have a causal effect in triggering decline in mental health.

Our findings regarding the complex nature of risk factors for declining mental health in our study seem consistent with arguments that risk factors for individual mental health outcomes are 'multi-scalar' and 'relational' (Macintyre et al, 2002; Cummins et al, 2007; Dahlgren and Whitehead, 1991), involving area processes linked to inequality, mobility, health selective migration and drift, operating at local, district and regional scales, in combination with individual attributes. These are very important during critical periods such as economic recessions and, given continuing instability in global economies, these topics would be interesting to examine further in future international research.

From an international perspective, this research also emphasises that studies of mental health during the 'recovery and austerity' period, following on from the 'great recession' of 2008-2009 should consider the locally variable impacts of government welfare programmes, as well as impacts of changes in labour markets. Our findings invite further international comparative research on mental health variation in relation to changing individual and community conditions over time, as recommended, for example, by Pearce (2018).

## References

- Allan, R., P. Williamson & H. Kulu (2017) Unravelling urban-rural health disparities in England. *Population Space and Place*, 23.
- Anselmi, L., Everton, A., Shaw, R., Suzuki, W., Burrows, J., Weir, R., Tatrek-Gintowt, R., Sutton, M., Lorimer, S. (2020) Estimating local need for mental health care to inform fair resource allocation in the NHS in England: cross-sectional analysis of national administrative data linked at person level. *British Journal of Psychiatry*, 216, p338-344.
- Anselmi, L., A. Everton, R. Shaw, W. Suzuki, J. Burrows, R. Weir, R. Tatarek-Gintowt, M. Sutton & S. Lorrimer (2020) Estimating local need for mental healthcare to inform fair resource allocation in the NHS in England: cross-sectional analysis of national administrative data linked at person level. *British Journal of Psychiatry*, 216, 338-344.
- Bailey, D. & N. Berkeley (2014) Regional responses to recession: the role of the West Midlands Regional Taskforce. *Regional Studies*, 48, 1797-1812.
- Baker, C. (2019) Health inequalities: Income deprivation and north/south divides. House of Commons Library, <https://commonslibrary.parliament.uk/insights/health-inequalities-income-deprivation-and-north-south-divides/>
- Bambra, C., K. E. Smith, J. Pearce (2019) Scaling up: The politics of health and place. *Social Science & Medicine*, 232, 36-42.
- Barr, B., P. Kinderman & M. Whitehead (2015) Trends in mental health inequalities in England during a period of recession, austerity and welfare reform 2004 to 2013. *Social Science and Medicine*, 147, 334-441.

Beatty, C. & S. Fothergill. (2016) The Uneven Impact of Welfare Reform: The financial losses to places and people. Sheffield, UK.: Centre for Regional Economic and Social Research, Sheffield Hallam University, UK.

<http://www.shu.ac.uk/research/cresr/sites/shu.ac.uk/files/welfare-reform-2016.xlsx>

Beatty, C. & S. Fothergill (2020) Recovery or stagnation? Britain's older industrial towns since the recession. *Regional Studies*, 54, 1238-1249.

Benach, J., A. Vives, M. Amable, C. Vanroelen, G. Tarafa & C. Muntaner. 2014. Precarious employment: understanding an emerging social determinants of health In *Annual Review of Public Health*, 35, ed. J. E. Fielding, 229-253.

Bourdieu, P. 1985. The forms of capital. In *Handbook of theory and research for the sociology of education* ed. J. G. Richardson, 241 - 258. New York Greenwood Press.

Copeland, A., C. Bambra, L. Nylen, A. Kasim, M. Riva, S. Curtis, B. Burstrom (2015) All in it together? The effects of recession on population health and health inequalities in England and Sweden, 1991-2010. *International Journal of Health Services*, 45, 3-24.

Connell, A, Frye, A (2006) Growth mixture modelling in developmental psychology: Overview and demonstration of heterogeneity in developmental trajectories of adolescent antisocial behaviour. *Infant and Child Development: An International Journal of Research and Practice*, 15(6), 609-621.

Cummins, S., S. Curtis, A. V. Diez-Roux & S. Macintyre (2007) Understanding and representing 'place' in health research: A relational approach. *Social Science & Medicine*, 65, 1825-1838.

Curtis, S. 2010. *Space, Place and Mental Health*. Farnham, UK.: Ashgate.

Curtis, S., J. Pearce, M. Cherrie, C. Dibben, N. Cunningham, C. Bambra, (2019) Changing labour market conditions during the 'great recession' and mental health in Scotland 2007-2011: an example using the Scottish Longitudinal Study and data for local areas in Scotland. *Social Science & Medicine*, 227, 1-9.

Curtis, S., P. Norman, R. Cookson, M. Cherrie & J. Pearce (2019) Recession, local employment trends and change in self-reported health of individuals: A longitudinal study in England and Wales during the 'great recession'. *Health and Place*, 59, Published online.

Daghlér, K., J. Chen & S. B. Thomas (2015) Gender differences in Mental Health Outcomes before, during, and after the Great Recession. *Plos One*, May 13 2015. [doi.org/10.1371/journal.pone.0124103](https://doi.org/10.1371/journal.pone.0124103)

Dahlgren, G. and M. Whitehead (1991) European strategies for tackling social inequalities in health: Levelling up part 2. Geneva. World Health Organization.

Dartington-Pollock, R., P. Norman & N. Shackleton (2018) Migration, Mobility and Health. In *Routledge handbook of health geography*, eds. V. A. Crooks, G. Andrews & J. Pearce. Abingdon: Routledge.

Dauncey, K., J. Giggs, K. Baker & G. Harrison (1993) Schizophrenia in Nottingham - Lifelong Residential Mobility of a Cohort. *British Journal of Psychiatry*, 163, 613-619.

Daenekindt, S. (2017) The experience of social mobility: Social isolation, utilitarian individualism, and social disorientation. *Social Indicators Research*, 133(1), 15-30

De Moortel, D., O. Thevenon, H. De Witte & C. Vanroeln (2017) Working hours mismatch, macroeconomic change, and mental well-being in Europe. *Journal of Health and Social Behaviour*, 58. 217-231.



Dirlam, J., H. Zheng (2017) Job satisfaction developmental trajectories and health: a lifecourse perspective, *Social Science and Medicine*, 178, 95-103.

Fielding, A. J. (1992) Migration and social mobility: South East England as an escalator region. *Regional Studies* 26, 1–15.

Fontanella, C. A., D. L. Hiance-Steelesmith, G. S. Phillips, J. A. Bridge, N. Lester, H. A. Sweeney, J. V. Campo (2015) Widening Rural-Urban Disparities in Youth Suicides, United States, 1996-2010. *JAMA Pediatrics*, 169, 466-473.

Franklyn, J., Shranks, W., Pakes, J., SanFelix-Gimeno, G., Matlin, O., Brennan, T., Choudry, N. (2013) Group based trajectory models: a new approach to classifying and interpreting long-term medication adherence, *Medical Care*, 51, 9, 789-796.

Friedman, S. (2014) 'The Price of the Ticket: Rethinking the Experience of Social Mobility', *Sociology*, 48(2): 352–68.

Friedman, S., D. Laurison & A. Miles (2015) Breaking the "class' ceiling? Social mobility into Britain's elite occupations. *Sociological Review*, 63, 259-289.

Friedman, S. & D. Laurison. (2019) *Class ceilings: Why It Pays to Be Privileged*. Bristol, UK: Policy Press.

Goldthorpe, J., C. Llewellyn, C. Payne (1987) *Social Mobility and the Class Structure in Modern Britain: 2<sup>nd</sup> Edition* (Oxford: Clarendon Press).

Harriss, L., K. Hawton (2011) Deliberate self-harm in rural and urban regions: A comparative study of prevalence and patient characteristics. *Social Science & Medicine*, 73, 274-281..

House of Commons (2010) *The Effect of the Economic Downturn on the People in the West Midlands*. London: House of Commons West Midlands Regional Committee.

<https://publications.parliament.uk/pa/cm200910/cmselect/cmwestmid/258/258.pdf#:~:text=West%20Midlands%20Regional%20Committee%20The%20effect%20of%20the,of%20Commons%20to%20be%20printed%2011%20January%202010>

Institute for Employment research (2009) Impact of Recession and the Longer Term Demand for Skills IER Bulletin no 91 , University of Warwick, Warwick, UK.

<https://warwick.ac.uk/fac/soc/ier/publications/bulletins/ier91.pdf>

ISER (2019a). Understanding Society. The UK Household Longitudinal Study: Essex University and UK Data Service. University of Essex Institute for Social and Economic Research and National Centre for Social Research.

<https://www.understandingsociety.ac.uk/>

ISER (2019b). Understanding Society, the UK Household Longitudinal Survey: survey timeline. University of Essex Institute for Social and Economic Research and National Centre for Social Research.

<https://www.understandingsociety.ac.uk/documentation/mainstage/survey-timeline>

ISER (2020). Understanding Society, the UK Household Longitudinal Survey: survey: Data and documentation SF-12 Mental Component Summary

[https://www.understandingsociety.ac.uk/documentation/mainstage/dataset-documentation/variable/sf12mcs\\_dv](https://www.understandingsociety.ac.uk/documentation/mainstage/dataset-documentation/variable/sf12mcs_dv)

Jessop, C & A. Oskala (2014) UK Household Longitudinal Study. Prepared for: The Institute for Social and Economic Research, University of Essex

Accessed December 2020

Jones, K., G. Moon. (1987). *Health, Disease and Society: An Introduction to Medical Geography*. London: Routledge & Kegan Paul.

Jones, B. L. & D. S. Nagin (2013) A Note on a Stata Plugin for Estimating Group-based Trajectory Models. *Sociological Methods & Research*, 42, 608-613.

Keown, P., O. McBride, L. Twigg, D. Crepaz-Keay, E. Cyhlarova, H. Parsons, J.

Scott, K. Bhui & S. Weich (2016) Rates of voluntary and compulsory psychiatric in-patient treatment in England: an ecological study investigating associations with deprivation and demographics. *British Journal of Psychiatry*, 209, 157-161.

Levin, K. A., A. H. Leyland (2005) Urban/rural inequalities in suicide in Scotland, 1981-1999. *Social Science & Medicine*, 60, 2877-2890.

Lund, C. & A. Cois (2018) Simultaneous social causation and social drift: Longitudinal analysis of depression and poverty in South Africa. *Journal of Affective Disorders*, 229, 396-402.

Macintyre, S., A. Ellaway & S. Cummins (2002) Place effects on health: how can we conceptualise, operationalise and measure them? *Social Science & Medicine*, 55, 125-139.

Maheswaran, R., M. Strong, P. Clifford & L. Brewins (2018) Socioeconomic deprivation, mortality and health of within-city migrants: a population cohort study. *Journal of Epidemiology and Community Health* 72, 525-519.

Manstead, A.S.R (2018). 'The psychology of social class: How socioeconomic status impacts thought, feelings, and behaviour', *British Journal of Social Psychology* 57: 267-291.

Martin, R., P. Sunley, B. Gardiner & P. Tyler (2016) How regions react to recessions: resilience and the role of economic structure *Regional Studies*, 50, 561-585.

Miles, A. & A. Leguina (2018) 'Socio-spatial mobilities and narratives of class identity in Britain', *British Journal of Sociology* 69(4): 1063-1095.

Ministry of Housing Communities and Local Government (2011) *The English Indices of Deprivation 2010*. London: UK Government.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/6320/1870718.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6320/1870718.pdf) (accessed August 2020)

Moorin, R. E., C. D. J. Holman, C. Garfield & K. J. Brameld (2006) Health related migration: evidence of reduced "urban-drift". *Health & Place*, 12, 131-140.

Nagin, D., B. Jones, V. Lima-Pasos, R. Tremblay (2018) Group based trajectory modelling. *Statistical Methods in Medical Research*, 27, 2015-2023.

Norman, P. D. (2018) Clarity in research frameworks for studying "health selective migration". *Journal of Epidemiology and Community Health*, 72, 449-450.

NOMIS ONS (2011) Index of Multiple Deprivation. Durham, UK: NOMIS.

<https://www.nomisweb.co.uk/articles/587.aspx>

ONS (2019) 2011 rural/urban classification, UK Office of National Statistics  
<https://www.ons.gov.uk/methodology/geography/geographicalproducts/ruralurbanclassifications/2011ruralurbanclassification>

Parr, H. (2008). *Mental Health and Social Space: Towards Inclusionary Geographies?* Oxford: Blackwell Publishing.

Patel, V., C. Lund, S. Hatheril, S. Plagerson, J. Corrigall, M. Funk & A. Flisher. (2010) Mental disorders: equity and social determinants. In *Equity, social determinants and public health programmes.*, eds. Blas E & A. S. Kurup, 115-34. Geneva: World Health Organization.

Paykel, E., R. Abbott, R. Jenkins, T. Brugha, H. Meltzer (2000) Urban-rural mental health differences in Great Britain: findings from the National Morbidity Survey. *Psychological Medicine*, vol 30, 269-280.

Philo, C. (2005) The geography of mental health: an established field? *Current Opinion in Psychiatry*, 18, 585-59..

Pearce, J. (2018) Complexity and uncertainty in geography of health research: incorporating life-course perspectives. *Annals of the American Association of Geographers*, 108, 1491-1498.

Pearce, J., M. Cherrie, N. Shortt, I. Deary, C. Ward-Thompson (2018) Life course of place: a longitudinal study of mental health and place. *Transactions of the Institute of British Geographers* 43.

Public Health England (2018) *Local action on health inequalities Understanding and reducing ethnic inequalities in health*. London: Public Health England.

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/730917/local\\_action\\_on\\_health\\_inequalities.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730917/local_action_on_health_inequalities.pdf)

Remes, O., L. Lafortune, N. Wainwright, P. Surtees, K. T. Khaw & C. Brayne (2019) Association between area deprivation and major depressive disorder in British men and women: a cohort study. *Bmj Open*, 9.

Savage, M., N. Cunningham, F. Devine, S. Friedman, D. Laurison, L. McKenzie, A. Miles, H. Snee & P. Wakeling (2015) *Social Class in the 21st Century* London: Penguin.

Singh, A., L. Daniel, E. Baker & R. Bentley (2019) Housing Disadvantage and Poor Mental Health: A Systematic Review. *American Journal of Preventive Medicine*, 57, 262-272.

SMC (2019) *Elitist Britain 2019: The Educational Backgrounds of Britain's Leading People*. London: Sutton Trust/Social Mobility Commission.

Solon, G., S. J. Haider & J. M. Wooldridge (2015) What Are We Weighting For? *Journal of Human Resources*, 50, 301-316.

Tiffin, P.A., M.S. Pearce, L. Parker (2005) Social mobility over the lifecourse and self-reported mental health at age 50: prospective cohort study, *Journal of Epidemiology and Community Health* 59: 870-872.

Tikkaja, S., S. Sandin, N. Malki, B. Modin, P. Sparén, C.M. Hultman (2013) Social Class, Social Mobility and Risk of Psychiatric Disorder – A Population-Based Longitudinal Study, *PLoS ONE* 8(11): e77975.

Toft, M. (2017) Enduring contexts: Segregation by affluence throughout the life course, *Sociological Review* 66(3): 645-664.

Tunstall, H., R. Mitchell, J. Pearce & N. Shortt (2014) The general and mental health of movers to more- and less-disadvantaged socio-economic and physical environments within the UK. *Social Science & Medicine*, 118, 97-107.

Tunstall, H., N. K. Shortt, J. R. Pearce, R. J. Mitchell, (2015), Difficult Life Events, Selective Migration and Spatial Inequalities in Mental Health in the UK. *Plos One*, 10.

van Lenthe, F. J., J. P. Mackenbach (2004) Neighbourhood inequalities in health and health-related behaviour: a role for selective migration? *European Journal of Public Health*, 14, 64-64.

Von Stumm, S., Plomin, R (2015) Socioeconomic status and the growth of intelligence from infancy through adolescence. *Intelligence*, 48, 30-36.

Ware, J. E., M. Kosinski, D. M. Turner-Bowker & B. Gandek (2001), How to Score Version 2 of the SF-12® Health Survey (With a Supplement Documenting Version 1), Lincoln, RI, Quality Metric Incorporated. <https://www.worldcat.org/title/how-to-score-version-2-of-the-sf-12-health-survey-with-a-supplement-documenting-version-1/oclc/60577051>

Weich, S., L. Twigg & G. Lewis (2006) Rural/non-rural differences in rates of common mental disorders in Britain - Prospective multilevel cohort study. *British Journal of Psychiatry*, 188, 51-57.

White, J., N. Gutacker, R. Jacobs & A. Mason (2014) Hospital admissions for severe mental illness in England: Changes in equity of utilisation at the small area level between 2006 and 2010. *Social Science & Medicine*, 120, 243-251.

Wilding, S., D. Martin, D., G. Moon (2018) Place and preference effects on the association between mental health and internal migration within Great Britain. *Health and Place*, 52, 180-187.

Wilkinson, J., J. Bywaters, S. Simms, D. Chappel, G. Glover (2008) Developing mental health indicators in England. *Public Health*, 122, 897-905.

Wilkinson, R. & K. Pickett. 2009. *The Spirit Level: Why More Equal Societies Almost Always Do Better*. London: Allen Lane.



Figure 1  
Graph showing SF12 Mental Health Score trends for USS members during waves 3 to 7, in 6 trajectory groups

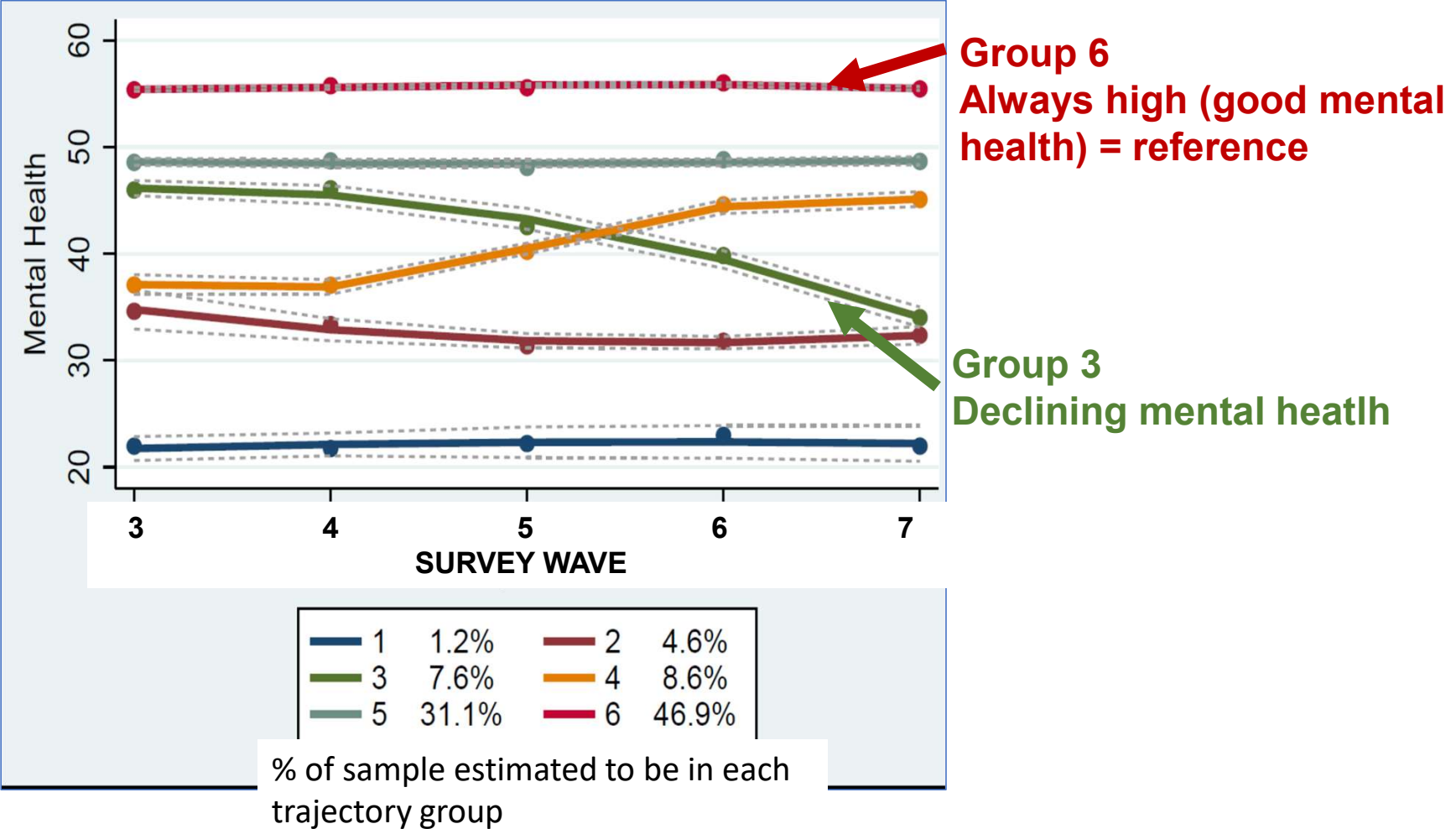


Figure 2 Distribution of sample by economic disadvantage score for place of residence and quintile group of LSOA of residence on IMD2010 employment domain

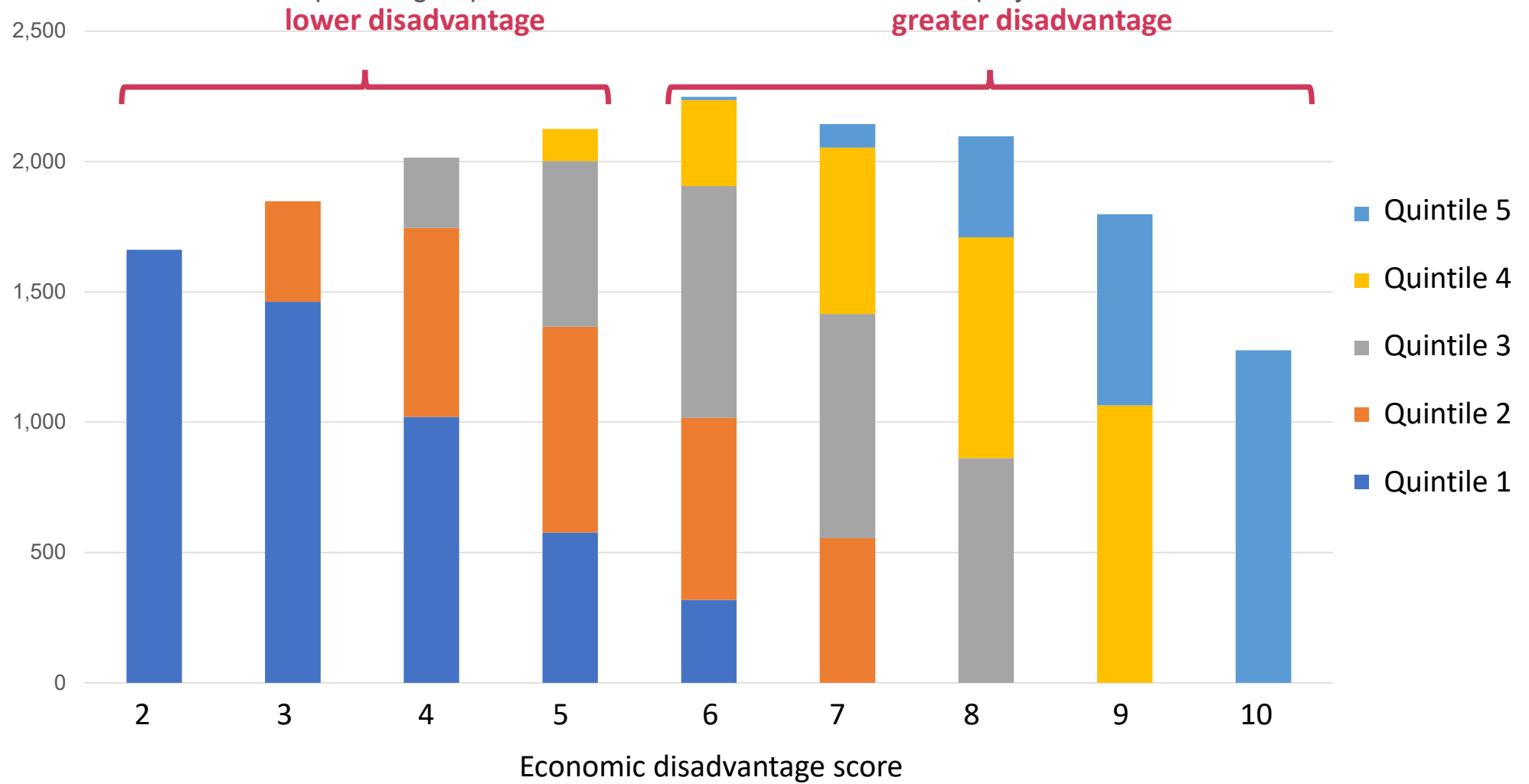


Figure 3 Distribution of sample by economic disadvantage score for place of residence and quintile group of LAD of residence on average loss of income due to welfare reforms

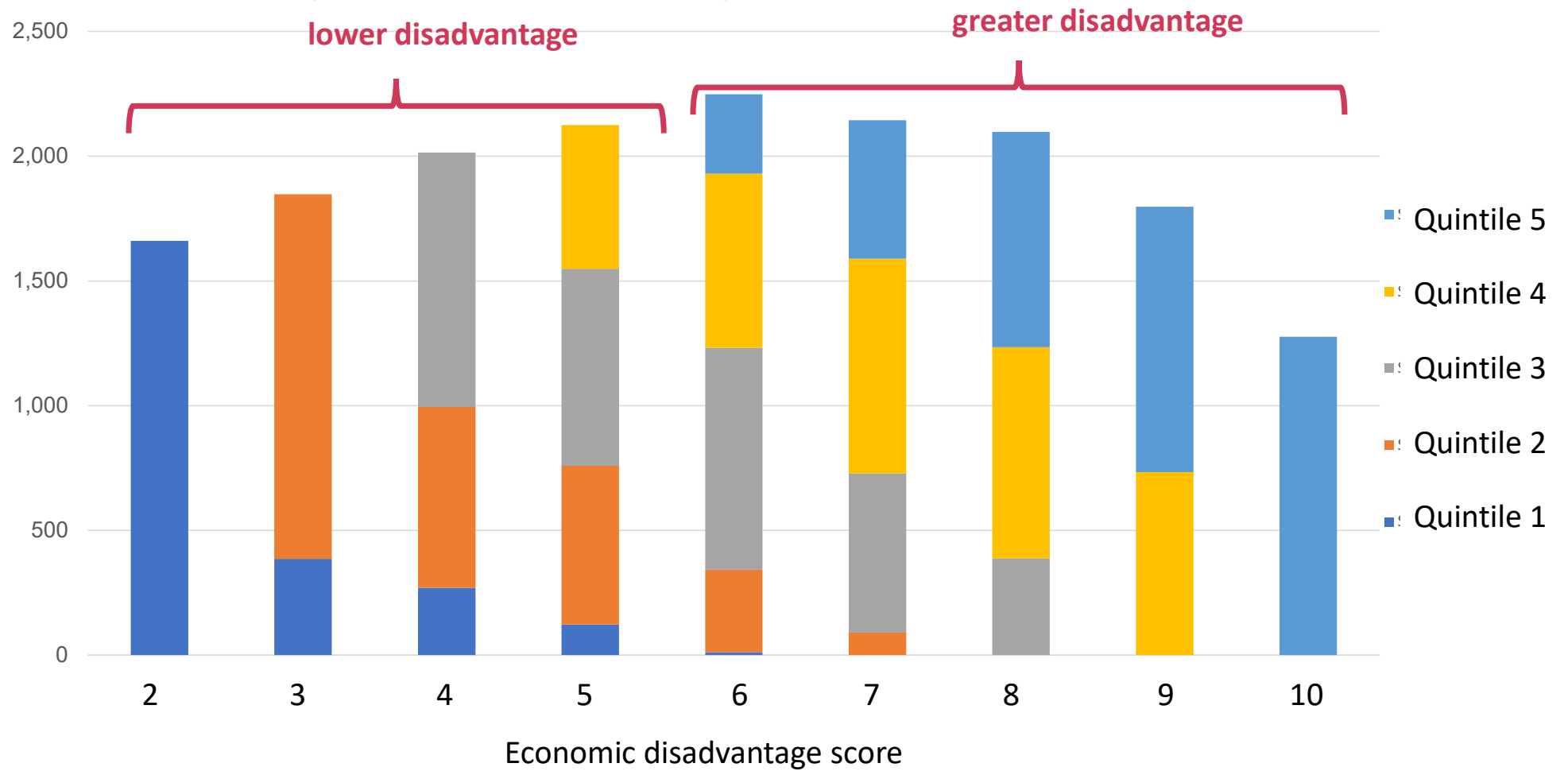


Table 1 Model of individual and area variables predicting membership of mental health trajectory group 3 compared with group 6 \*

(P&gt;|z| marked in bold text for significant associations)

\* part of a multinomial logistic regression model (full model shown in Supplementary Table B)

| Predictors (reference category):   | categories of predictors   | Coeff  | Std. error | z      | P> z             | 95% confidence interval |
|--|--|--------|------------|--------|------------------|-------------------------|
| Part 1: Area variables   |  |        |            |        |                  |                         |
| Rural Urban classification of place of residence at wave 4 (not in small towns and rural fringe)                   | town in rural area   | -0.261 | 0.116      | -2.250 | <b>0.024</b>     | -0.488 -0.034           |
| Moved to area in different urban/rural category wave 4 to 7 (no change)  | moved into less urbanised/more rural area                          | -0.111 | 0.214      | -0.520 | 0.604            | -0.530 0.308            |
|  | moved into more urbanised/less rural area                          | 0.239  | 0.214      | 1.110  | 0.265            | -0.181 0.658            |
| Government Region of residence at wave 4 (region other than West Midlands)   | West Midlands  | 0.354  | 0.100      | 3.540  | <b>&lt;0.001</b> | 0.158 0.549             |
| moved in or out of W. Midlands (no change wave 4 to 7)   | moved into W. Midlands   | 0.081  | 0.554      | 0.150  | 0.884            | -1.004 1.166            |
|  | moved out of W. Midlands   | 0.207  | 0.532      | 0.390  | 0.698            | -0.836 1.249            |
| area economic disadvantage category** wave 4 (1= lower disadvantage)   | 2 = greater disadvantage   | 0.172  | 0.070      | 2.450  | <b>0.014</b>     | 0.035 0.309             |
| residential mobility wave 4 to 7 between LSOA quintiles ranked by employment domain (no change)                    | moved to less deprived quintile                                    | 0.159  | 0.150      | 1.060  | 0.289            | -0.135 0.452            |
|  | moved to more deprived quintile                                    | 0.300  | 0.146      | 2.050  | <b>0.040</b>     | 0.013 0.587             |
| residential mobility wave 4 to 7 between LAD quintiles ranked by loss of income due to welfare reforms (no change) | moved to less disadvantaged quintile                               | -0.595 | 0.263      | -2.260 | <b>0.024</b>     | -1.111 -0.079           |
|  | moved to more disadvantaged quintile                               | 0.341  | 0.159      | 2.140  | <b>0.032</b>     | 0.029 0.652             |
| Part 2 Individual variables  |  |        |            |        |                  |                         |
| Sex (male)   | female   | 0.551  | 0.068      | 8.070  | <b>&lt;0.001</b> | 0.417 0.685             |
| Age group at wave 4 in 10 year groups (30-49 years)  | under 20   | 0.621  | 0.193      | 3.220  | <b>0.001</b>     | 0.243 0.999             |
|  | 20-29  | 0.235  | 0.117      | 2.000  | <b>0.045</b>     | 0.005 0.465             |
|  | 40-49  | -0.178 | 0.101      | -1.770 | 0.077            | -0.375 0.019            |
|  | 50-59  | -0.391 | 0.110      | -3.550 | <b>&lt;0.001</b> | -0.607 -0.175           |
|  | 60-69  | -1.100 | 0.248      | -4.430 | <b>&lt;0.001</b> | -1.587 -0.613           |
|  | 70 +   | -1.335 | 0.283      | -4.720 | <b>&lt;0.001</b> | -1.889 -0.780           |
| Partnership status wave 4 to 7 (living with a partner at wave 4 and 7)   | not living living with a partner wave 4 or 7                       | 0.233  | 0.081      | 2.870  | <b>0.004</b>     | 0.074 0.392             |
|  | not with partner wave 4, with partner wave 7                       | -0.004 | 0.175      | -0.030 | 0.980            | -0.347 0.338            |
|  | lived with partner wave 4, not at wave 7                           | 1.218  | 0.158      | 7.700  | <b>&lt;0.001</b> | 0.908 1.528             |
| Occupational Social class in wave 4 (Class I: Management & Professional)   | Class II :Intermediate   | -0.165 | 0.128      | -1.290 | 0.198            | -0.416 0.086            |
|  | Class III: small employers and own account                         | -0.306 | 0.157      | -1.950 | 0.052            | -0.615 0.002            |
|  | Class IV: lower supervisory & technical                            | -0.239 | 0.173      | -1.380 | 0.167            | -0.578 0.100            |
|  | Class V (semi-routine & routine)                                   | -0.218 | 0.112      | -1.950 | 0.052            | -0.437 0.001            |
|  | Unclassified: Inapplicable   | -0.119 | 0.184      | -0.650 | 0.518            | -0.480 0.242            |
| change in social class wave 4 to 7 (no change)   | upwardly mobile  | 0.265  | 0.143      | 1.840  | 0.065            | -0.017 0.546            |
|  | downwardly mobile  | -0.018 | 0.182      | -0.100 | 0.920            | -0.374 0.338            |
|  | inapplicable   | 0.058  | 0.194      | 0.300  | 0.767            | -0.324 0.439            |
| Income in £K wave 4  | [continuous variable]  | -0.053 | 0.016      | -3.400 | <b>0.001</b>     | -0.084 -0.023           |
| change in income £K wave 4 to 7  | [continuous variable]  | -0.014 | 0.015      | -0.920 | 0.356            | -0.043 0.016            |
| Employment status waves 4 and 7 (employed at waves 4 and 7)  | not in paid employment at waves 4 or 7 and aged < 60 years 2011    | 0.179  | 0.205      | 0.870  | 0.384            | -0.224 0.581            |
|  | became unemployed between wave 4 and 7 and aged <60 2011           | 0.597  | 0.208      | 2.860  | <b>0.004</b>     | 0.188 1.005             |
|  | not employed wave 4 employed wave 7                                | -0.107 | 0.200      | -0.530 | 0.593            | -0.499 0.285            |
|  | aged 60 years + in wave 4 and not employed in wave 4 and/or wave 7 | 0.044  | 0.292      | 0.150  | 0.881            | -0.529 0.616            |

|  |  |        |       |         |                  |        |        |
|--|--|--------|-------|---------|------------------|--------|--------|
| ethnic group recorded wave 4<br><br>('White British/Irish')                                | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | 0.165  | 0.128 | 1.290   | 0.198            | -0.086 | 0.416  |
|  | 'Black'; ( Black African, Caribbean, Black other'                        | -0.226 | 0.176 | -1.290  | 0.198            | -0.571 | 0.118  |
|  | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other')              | 0.177  | 0.208 | 0.850   | 0.395            | -0.231 | 0.586  |
| Tenure status (whether outright ownership) at wave 4<br>(not outright owner)               | outright owner   | -0.376 | 0.093 | -4.060  | <b>&lt;0.001</b> | -0.557 | -0.194 |
| Whether became an outright home owner<br>(Did not become an outright owner)                | became outright owner wave 4-7   | -0.122 | 0.135 | -0.900  | 0.368            | -0.386 | 0.143  |
| Whether reported receiving welfare or disability benefits in wave 4<br>(0 = none reported) | reported receipt of benefit(s)   | 1.474  | 0.125 | 11.820  | <b>&lt;0.001</b> | 1.230  | 1.719  |
| Change in reported receipt of benefits wave 4 to wave 7<br>(no change)                     | came off benefits : benefits received in wave 4 but not wave 7           | -0.911 | 0.152 | -6.010  | <b>&lt;0.001</b> | -1.208 | -0.614 |
|  | came onto benefits (benefits not received wave 4 but received wave 7)    | 0.917  | 0.170 | 5.400   | <b>&lt;0.001</b> | 0.584  | 1.249  |
| Constant   |  | -1.951 | 0.144 | -13.550 | <b>&lt;0.001</b> | -2.233 | -1.669 |

\*\*Combined indicator of economic disadvantage (based on quintile on IMD2010 employment domain for LSOA and quintile on average loss due to welfare reform for LAD)

Number of obs = 17,212  
Wald chi2(215) = 2816.33  
Prob > chi2 = 0.0000  
Log pseudolikelihood = -20718.383  
Pseudo R2 = 0.0739

**Table A details of predictor variables using in modelling and the reason for definition of categories**

**i) Variables categorising areas of residence**

| Predictor Variable label   | Categories of predictors<br>(reference category in parentheses)                                   | % of analytical<br>sample (nearest<br>whole %) (*= exact<br>% withheld) | Basis for classification   |
|--|---|---|--|
| Rural Urban classification<br>of place of residence at wave 4  | (not in small towns in rural fringe)<br>small town in rural area                                  | 89<br>11  | Urban/rural classification of place of residence based on<br>ONS (2019) 2011 rural/urban classification, UK Office of<br>National Statistics   |
| Moved to area in different urban/rural<br>category wave 4 to 7   | (no change)<br>moved into more rural/less urbanised area<br>moved into more urban/less rural area | 95<br>3<br>2  | Urban rural classification of place of residence based on<br>ONS (2019) 2011 rural/urban classification,<br>UK Office of National Statistics   |
| Government Region of residence at wave 4   | (region other than West Midlands)<br>West Midlands  | 90<br>10  | Place of residence at USS wave 4, classified on the basis of the<br>9 Government regions in England.   |
| moved in or out of W. Midlands   | (no change wave 4 to 7)<br>moved into W. Midlands<br>moved out of W. Midlands                     | >95*<br><5*<br><5*  | Place of residence at USS waves 4 & 7, classified on the basis of<br>the<br>9 Government regions in England.   |
| area economic disadvantage category wave 4   | (lower disadvantage)<br>greater disadvantage  | 44<br>56  | Indicator of higher vs lower economic advantage. Derived by the<br>authors from:<br>Index of Multiple Deprivation (2010) Employment Domain and<br>index of average loss of income due to welfare reform (Beatty, C. &<br>S. Fothergill. (2016). See main text for details of derivation) |
| residential mobility wave 4 to 7 between LSOA<br>quintiles ranked by employment domain                       | (no change)<br>moved to less deprived quintile<br>moved to more deprived quintile                 | 90<br>5<br>5  | Categorised according to quintile categories on the Index of<br>Multiple Deprivation (2010) Employment Domain<br>of LSOA of residence at USS waves 4 and 7   |
| residential mobility wave 4 to 7 between LAD<br>quintiles ranked by loss of income due to welfare<br>reforms | (no change)<br>moved to less disadvantaged quintile<br>moved to more disadvantaged quintile       | 93<br>2<br>4  | Categorised according to quintile categories on the index of<br>average loss of income due to welfare reform (Beatty, C. & S.<br>Fothergill. (2016) for Local Authority District of residence<br>at USS waves 4 & 7  |

**ii) Variables categorising individual attributes**

| Predictor Variable label   | Categories of predictors<br>(reference category in parentheses)   | % of analytical<br>sample (nearest<br>whole %) | Basis for classification  |
|--|---|--|---|
| Sex  | (male)<br>female  | 43<br>57                                       | self reported gender  |
| Age group at wave 4 in 10 year groups                                  | 16-19<br>20-29<br>30-39<br>40-49<br>50-59<br>60-69<br>70 +  | 3<br>10<br>17<br>21<br>19<br>18<br>12          | age (in 10 year categories) at survey wave 4  |
| Partnership status wave 4 to 7   | (living with a partner at wave 4 and 7)<br>not living living with a partner wave 4 or 7<br>not with partner wave 4, with partner wave 7<br>lived with partner wave 4, not at wave 7   | 65<br>28<br>4<br>3                             | whether the person lived with a partner at waves 4 and/or 7   |
| Occupational Social class in wave 4                                    | (Class I: Management & Professional)<br>Class II :Intermediate<br>Class III: small employers and own account<br>Class IV: lower supervisory & technical<br>Class V (semi-routine & routine)<br>Unclassified: Inapplicable including retired                               | 28<br>9<br>6<br>4<br>15<br>38                  | Occupational Social Class in wave 4 using National Statistics Socio-<br>economic Classification UK classification   |
| change in social class wave 4 to 7                                     | (no change)<br>upwardly mobile<br>downwardly mobile<br>inapplicable (including retired)   | 45<br>6<br>4<br>46                             | For those in social classes I - V at waves 4 or 7, whether the<br>person was 'upwardly mobile (towards class I) or downwardly<br>mobile (towards class V)                   |
| Income in EK wave 4  | continuous variable; mean £K3.8k;s.d. £K2.8   |  | Income reported in the month preceeding interview   |
| change in income EK wave 4 to 7  | continuous variable; mean £K0.25;s.d. £K0.25  |  | relative difference (between wave 4 and wave 7) in previous<br>month's income   |
| Employment status waves 4 and 7  | (employed at waves 4 and 7)<br>not in paid employment at waves 4 or 7 and<br>aged < 60 2011<br>became unemployed between wave 4 and 7<br>and aged <60 2011<br>not employed wave 4 employed wave 7<br>aged 60years + in wave 4 and not employed<br>in wave 4 and/or wave 7 | 54<br>10<br>4<br>6<br>26                       | reported employment (distinguishing between those above and<br>below 60, who may have been over the age of retirement)  |
| self identified ethnic group recorded wave 1                           | ('White British/Irish')<br>'Asian' ('Indian', 'Pakistani', 'Bangladeshi',<br>'Chinese', 'other Asian')<br>Black'; ('Black African', 'Caribbean', 'Black<br>other')<br>'mixed/other' ('white' & 'black' or 'Asian'<br>'Arab' 'other')                                      | 88<br>6<br>3<br>2                              | self-identified ethnic group (in broad categories)  |
| Tenure status : whether outright owner wave<br>4                       | (not outright owner)<br>outright owner  | 66<br>34                                       | Whether the person was an outright owner of their home at<br>wave 4   |
| Whether became an outright home owner by<br>wave 7                     | (Already an outright owner/ did not become an<br>outright owner)<br>became outright owner wave 4-7  | 93<br>7  | Whether the person became an outrightowner by wave 7, having<br>been in another tenure categories at wave 4   |
| Whether reported receiving welfare or<br>disability benefits in wave 4 | (none reported)<br>reported receipt of benefit(s)   | 85<br>15                                       | Whether the person reported receipt of benefits (other than<br>'universal benefits to parents with young children and state<br>pension)                                     |
| Change in reported receipt of benefits wave<br>4 to wave 7             | (no change)<br>came off benefits : benefits received in wave<br>4 but not wave 7<br>came onto benefits (benefits not received<br>wave 4 but received wave 7)  | 90<br>7<br>3                                   | Whether the person's reported receipt of benefits (other than<br>'universal benefits to parents with young children and state<br>pension) changed between wave 4 and wave 7 |

**Table B Complete results from Multinomial Regression model predicting relative risk of all Mental Health Trajectory Categories (compared with being in Category 6, the 'base' category). Predictors including individual and area variables**

| Mental Health Trajectory Group<br>predictor variables (reference category) | categories of predictors  | Coef.  | Robust<br>Std. Err. | z     | P> z   | [95% Conf. Interval] |
|--|---|--------|---------------------|-------|--------|----------------------|
| <b>Mental Health Trajectory Group 1</b>                                    |   |        |                     |       |        |                      |
| sex<br>(male)  | female  | 0.898  | 0.175               | 5.14  | <0.001 | 0.556 1.241          |
| Age in years at wave 4<br>(30-39 yrs)                                      | under 20  | 0.462  | 0.464               | 1.00  | 0.319  | -0.447 1.371         |
|  | 20-29   | 0.313  | 0.273               | 1.15  | 0.252  | -0.222 0.848         |
|  | 40-49   | 0.428  | 0.234               | 1.83  | 0.067  | -0.030 0.887         |
|  | 50-59   | 0.052  | 0.248               | 0.21  | 0.834  | -0.435 0.539         |
|  | 60-69   | -1.272 | 1.034               | -1.23 | 0.219  | -3.298 0.754         |
|  | 70 +  | -2.632 | 1.165               | -2.26 | 0.024  | -4.915 -0.349        |
| partnership status wave 4 to 7<br>(living with a partner at wave 4 and 7)  | not living living with a partner wave 4 or 7                      | 0.641  | 0.193               | 3.32  | 0.001  | 0.263 1.019          |
|  | not with partner wave 4 with partner wave 7                       | 0.018  | 0.452               | 0.04  | 0.969  | -0.869 0.905         |
|  | lived with partner wave 4, not at wave 7                          | 1.304  | 0.364               | 3.58  | <0.001 | 0.591 2.018          |
| occupational social class wave 4<br>(Class I: Management & Professional)   | Class II :Intermediate  | -0.780 | 0.446               | -1.75 | 0.080  | -1.654 0.093         |
|  | Class III: small employers and own account                        | -2.179 | 1.021               | -2.14 | 0.033  | -4.180 -0.179        |
|  | Class IV: lower supervisory & technical                           | -0.786 | 0.649               | -1.21 | 0.226  | -2.058 0.486         |
|  | Class V (semi-routine & routine)                                  | -0.567 | 0.332               | -1.71 | 0.087  | -1.218 0.083         |
|  | Unclassified: Inapplicable  | -0.021 | 0.660               | -0.03 | 0.974  | -1.315 1.272         |
| change in social class wave 4 to 7<br>(no change)                          | upwardly mobile   | 0.267  | 0.513               | 0.52  | 0.603  | -0.739 1.273         |
|  | downwardly mobile   | 0.961  | 0.421               | 2.28  | 0.022  | 0.137 1.786          |
|  | inapplicable  | 0.524  | 0.510               | 1.03  | 0.303  | -0.474 1.523         |
| Income in £K wave 4 (continuous variable)                                  |   | -0.159 | 0.057               | -2.78 | 0.005  | -0.272 -0.047        |
| change in income £K wave 4 to 7 (continous variable)                       |   | -0.037 | 0.049               | -0.75 | 0.450  | -0.134 0.059         |
| Employment status waves 4 and 7<br>(employed at waves 4 and 7)             | aged < 60 2011 and not in paid employment at waves 4 or 7         | 0.531  | 0.529               | 1.00  | 0.316  | -0.507 1.568         |
|  | became unemployed between wave 4 and 7; aged <60 years 2011       | 0.315  | 0.507               | 0.62  | 0.534  | -0.678 1.309         |
|  | not employed wave 4   | -0.254 | 0.567               | -0.45 | 0.655  | -1.366 0.858         |
|  | employed wave 7   |        |                     |       |        |                      |
|  | aged 60+ years in wave 4 and not employed in wave 4 and/or wave 7 | -0.151 | 1.153               | -0.13 | 0.896  | -2.410 2.108         |
| ethnic group recorded wave 4   |   |        |                     |       |        |                      |

|  |  |        |       |        |        |        |        |
|--|--|--------|-------|--------|--------|--------|--------|
| ('White British/Irish')  | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | -0.234 | 0.315 | -0.74  | 0.457  | -0.852 | 0.384  |
|  | 'Black'; ( Black African, Caribbean, Black other'                        | -0.626 | 0.379 | -1.65  | 0.099  | -1.368 | 0.117  |
|  | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other'))'            | 0.025  | 0.405 | 0.06   | 0.950  | -0.768 | 0.818  |
| Whether outright home owner wave 4 (not outright owner)  | outright owner   | -0.620 | 0.229 | -2.71  | 0.007  | -1.068 | -0.172 |
| Whether became an outright home owner (Did not become an outright owner)   | became outright owner wave 4-7   | -0.611 | 0.415 | -1.47  | 0.141  | -1.424 | 0.202  |
| Whether reported receiving welfare or disability benefits in wave 4 (none reported)                                | reported receipt of benefit(s)   | 2.369  | 0.235 | 10.10  | <0.001 | 1.909  | 2.829  |
| Change in reported receipt of benefits wave 4 to wave 7 (no change)  | came off benefits : benefits received in wave 4 but not wave 7           | -1.987 | 0.324 | -6.14  | <0.001 | -2.621 | -1.353 |
|  | came onto benefits (benefits not received wave 4 but received wave 7)    | 1.015  | 0.404 | 2.51   | 0.012  | 0.224  | 1.807  |
| Whether in small town at wave 4 (not in small towns/rural fringe)  | small town in rural area   | -0.811 | 0.342 | -2.37  | 0.018  | -1.482 | -0.141 |
| Moved to area in different urban/rural category wave 4 to 7  | moved to less urban /more rural area                                     | -0.717 | 0.524 | -1.37  | 0.171  | -1.744 | 0.309  |
| (no change)  | moved to less rural /more urban area                                     | 0.643  | 0.510 | 1.26   | 0.208  | -0.357 | 1.643  |
| Whether living in West Midlands wave 4 (not in West Midlands)  | West Midlands  | 0.570  | 0.214 | 2.66   | 0.008  | 0.150  | 0.990  |
| Whether moved in or out of W. Midlands   | moved into W. Midlands   | 0.280  | 1.169 | 0.24   | 0.810  | -2.011 | 2.571  |
| (no change wave 4 to 7)  | moved out of W. Midlands   | 0.088  | 1.032 | 0.09   | 0.932  | -1.935 | 2.111  |
| area economic disadvantage category** wave 4 (lower disadvantage)  | 2 = greater disadvantage   | 0.355  | 0.192 | 1.85   | 0.064  | -0.021 | 0.730  |
| residential mobility wave 4 to 7 between LSOA quintiles ranked by employment domain (no change)                    | moved to less deprived quintile  | -0.036 | 0.335 | -0.11  | 0.913  | -0.693 | 0.620  |
|  | moved to more deprived quintile  | -0.110 | 0.419 | -0.26  | 0.793  | -0.931 | 0.711  |
| residential mobility wave 4 to 7 between LAD quintiles ranked by loss of income due to welfare reforms (no change) | moved to less disadvantaged quintile                                     | 0.394  | 0.527 | 0.75   | 0.455  | -0.640 | 1.428  |
|  | moved to more disadvantaged quintile                                     | 0.743  | 0.339 | 2.19   | 0.029  | 0.078  | 1.408  |
| Constant   |  | -4.609 | 0.442 | -10.43 | <0.001 | -5.475 | -3.743 |



| Mental Health Trajectory Group  |  |        |                  |       |        |                      |        |
|---|--|--------|------------------|-------|--------|----------------------|--------|
| predictor variables (reference category)                                  | categories of predictors   | Coef.  | Robust Std. Err. | z     | P> z   | [95% Conf. Interval] |        |
| Mental Health Trajectory Group 2  |  |        |                  |       |        |                      |        |
| sex<br>(male)   | female   | 0.503  | 0.084            | 5.97  | <0.001 | 0.338                | 0.667  |
| Age in years at wave 4<br>(30-39 yrs)                                     | under 20   | 0.297  | 0.238            | 1.25  | 0.212  | -0.169               | 0.764  |
|   | 20-29  | 0.050  | 0.145            | 0.35  | 0.729  | -0.234               | 0.334  |
|   | 40-49  | -0.156 | 0.121            | -1.29 | 0.199  | -0.393               | 0.082  |
|   | 50-59  | -0.461 | 0.130            | -3.55 | <0.001 | -0.716               | -0.206 |
|   | 60-69  | -1.515 | 0.399            | -3.80 | <0.001 | -2.296               | -0.733 |
|   | 70 +   | -2.352 | 0.437            | -5.38 | <0.001 | -3.208               | -1.496 |
| partnership status wave 4 to 7<br>(living with a partner at wave 4 and 7) | not living living with a partner wave 4 or 7                             | 0.593  | 0.097            | 6.09  | <0.001 | 0.402                | 0.784  |
|   | not with partner wave 4 with partner wave 7                              | 0.369  | 0.202            | 1.83  | 0.067  | -0.026               | 0.765  |
|   | lived with partner wave 4, not at wave 7                                 | 0.986  | 0.205            | 4.82  | <0.001 | 0.585                | 1.388  |
| occupational social class wave 4<br>(Class I: Management & Professional)  | Class II :Intermediate   | -0.209 | 0.170            | -1.23 | 0.219  | -0.542               | 0.124  |
|   | Class III: small employers and own account                               | -0.499 | 0.223            | -2.24 | 0.025  | -0.935               | -0.063 |
|   | Class IV: lower supervisory & technical                                  | -0.468 | 0.245            | -1.91 | 0.056  | -0.949               | 0.013  |
|   | Class V (semi-routine & routine)   | -0.311 | 0.144            | -2.16 | 0.030  | -0.593               | -0.029 |
|   | Unclassified: Inapplicable   | -0.153 | 0.253            | -0.61 | 0.544  | -0.650               | 0.343  |
| change in social class wave 4 to 7<br>(no change)                         | upwardly mobile  | 0.151  | 0.196            | 0.77  | 0.442  | -0.234               | 0.536  |
|   | downwardly mobile  | 0.467  | 0.203            | 2.30  | 0.022  | 0.069                | 0.866  |
|   | inapplicable   | 0.050  | 0.259            | 0.19  | 0.846  | -0.458               | 0.558  |
| Income in £K wave 4 (continuous variable)                                 |  | -0.101 | 0.024            | -4.16 | <0.001 | -0.148               | -0.053 |
| change in income £K wave 4 to 7 (continous variable)                      |  | -0.073 | 0.025            | -2.86 | 0.004  | -0.122               | -0.023 |
| Employment status waves 4 and 7<br>(employed at waves 4 and 7)            | aged < 60 2011 and not in paid employment at waves 4 or 7                | 0.693  | 0.270            | 2.57  | 0.010  | 0.164                | 1.222  |
|   | became unemployed between wave 4 and 7; aged <60 years 2011              | 0.511  | 0.271            | 1.89  | 0.059  | -0.020               | 1.041  |
|   | not employed wave 4  | -0.136 | 0.268            | -0.51 | 0.611  | -0.661               | 0.389  |
|   | employed wave 7  |        |                  |       |        |                      |        |
|   | aged 60+ years in wave 4 and not employed in wave 4 and/or wave 7        | 0.566  | 0.459            | 1.23  | 0.217  | -0.333               | 1.464  |
| ethnic group recorded wave 4<br>( 'White British/Irish')                  | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | 0.203  | 0.153            | 1.32  | 0.186  | -0.098               | 0.503  |

|  |   | Coef.        | Std. Err.        | z        | P> z            | [95% Conf. Interval]        |
|--|---|--------------|------------------|----------|-----------------|-----------------------------|
|  | 'Black'; ( Black African, Caribbean, Black other'                     | -1.022       | 0.273            | -3.74    | <0.001          | -1.556 -0.487               |
|  | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other'))'         | 0.377        | 0.214            | 1.76     | 0.078           | -0.042 0.796                |
| Whether outright home owner wave 4 (not outright owner)  | outright owner  | -0.390       | 0.110            | -3.56    | <0.001          | -0.605 -0.176               |
| Whether became an outright home owner (Did not become an outright owner)   | became outright owner wave 4-7  | -0.477       | 0.191            | -2.50    | 0.012           | -0.851 -0.104               |
| Whether reported receiving welfare or disability benefits in wave 4 (0 = none reported)                            | reported receipt of benefit(s)  | 1.909        | 0.136            | 14.05    | <0.001          | 1.643 2.176                 |
| Change in reported receipt of benefits wave 4 to wave 7 (0= no change)   | came off benefits : benefits received in wave 4 but not wave 7        | -0.981       | 0.158            | -6.23    | <0.001          | -1.290 -0.672               |
|  | came onto benefits (benefits not received wave 4 but received wave 7) | 1.171        | 0.190            | 6.17     | <0.001          | 0.799 1.543                 |
| Whether in small town at wave 4 (not in small towns/rural fringe)  | small town in rural area  | -0.210       | 0.145            | -1.45    | 0.146           | -0.494 0.073                |
| Moved to area in different urban/rural category wave 4 to 7  | moved to less urban /more rural area                                  | 0.110        | 0.247            | 0.44     | 0.657           | -0.375 0.594                |
| (no change)  | moved to less rural /more urban area                                  | -0.013       | 0.293            | -0.04    | 0.965           | -0.588 0.561                |
| Whether living in West Midlands wave 4 (not in West Midlands)  | West Midlands   | 0.297        | 0.125            | 2.38     | 0.017           | 0.052 0.541                 |
| Whether moved in or out of W. Midlands (no change wave 4 to 7)   | moved into W. Midlands  | -0.053       | 0.664            | -0.08    | 0.937           | -1.353 1.248                |
|  | moved out of W. Midlands  | -0.514       | 0.838            | -0.61    | 0.540           | -2.157 1.129                |
| area economic disadvantage category** wave 4 (1= lower disadvantage)   | 2 = greater disadvantage  | 0.220        | 0.090            | 2.45     | 0.014           | 0.044 0.397                 |
| residential mobility wave 4 to 7 between LSOA quintiles ranked by employment domain (no change)                    | moved to less deprived quintile                                       | -0.025       | 0.194            | -0.13    | 0.899           | -0.406 0.357                |
|  | moved to more deprived quintile                                       | 0.253        | 0.181            | 1.40     | 0.162           | -0.102 0.607                |
| residential mobility wave 4 to 7 between LAD quintiles ranked by loss of income due to welfare reforms (no change) | moved to less disadvantaged quintile                                  | 0.226        | 0.260            | 0.87     | 0.386           | -0.284 0.735                |
|  | moved to more disadvantaged quintile                                  | 0.149        | 0.204            | 0.73     | 0.464           | -0.250 0.548                |
| Constant   |   | -2.442       | 0.195            | -12.50   | <0.001          | -2.824 -2.059               |
| -----  | -----   | -----        | -----            | -----    | -----           | -----                       |
| -----  | -----   | -----        | -----            | -----    | -----           | -----                       |
| <b>Mental Health Trajectory Group</b>  |   |              | <b>Robust</b>    |          |                 |                             |
| <b>predictor variables (reference category)</b>  | <b>categories of predictors</b>                                       | <b>Coef.</b> | <b>Std. Err.</b> | <b>z</b> | <b>P&gt; z </b> | <b>[95% Conf. Interval]</b> |

| Mental Health Trajectory Group 3                     |  |        |       |       |        |        |        |
|--|--|--------|-------|-------|--------|--------|--------|
| sex  |  |        |       |       |        |        |        |
| (male)   | female   | 0.551  | 0.068 | 8.07  | <0.001 | 0.417  | 0.685  |
| Age in years at wave 4                               |  |        |       |       |        |        |        |
| (30-39 yrs)  | under 20   | 0.621  | 0.193 | 3.22  | 0.001  | 0.243  | 0.999  |
|  | 20-29  | 0.235  | 0.117 | 2.00  | 0.045  | 0.005  | 0.465  |
|  | 40-49  | -0.178 | 0.101 | -1.77 | 0.077  | -0.375 | 0.019  |
|  | 50-59  | -0.391 | 0.110 | -3.55 | <0.001 | -0.607 | -0.175 |
|  | 60-69  | -1.100 | 0.248 | -4.43 | <0.001 | -1.587 | -0.613 |
|  | 70 +   | -1.335 | 0.283 | -4.72 | <0.001 | -1.889 | -0.780 |
| partnership status wave 4 to 7                       |  |        |       |       |        |        |        |
| (living with a partner at wave 4 and 7)              | not living living with a partner wave 4 or 7                             | 0.233  | 0.081 | 2.87  | 0.004  | 0.074  | 0.392  |
|  | not with partner wave 4 with partner wave 7                              | -0.004 | 0.175 | -0.03 | 0.980  | -0.347 | 0.338  |
|  | lived with partner wave 4, not at wave 7                                 | 1.218  | 0.158 | 7.70  | <0.001 | 0.908  | 1.528  |
| occupational social class wave 4                     |  |        |       |       |        |        |        |
| (Class I: Management & Professional)                 | Class II :Intermediate   | -0.165 | 0.128 | -1.29 | 0.198  | -0.416 | 0.086  |
|  | Class III: small employers and own account                               | -0.306 | 0.157 | -1.95 | 0.052  | -0.615 | 0.002  |
|  | Class IV: lower supervisory & technical                                  | -0.239 | 0.173 | -1.38 | 0.167  | -0.578 | 0.100  |
|  | Class V (semi-routine & routine)   | -0.218 | 0.112 | -1.95 | 0.052  | -0.437 | 0.001  |
|  | Unclassified: Inapplicable   | -0.119 | 0.184 | -0.65 | 0.518  | -0.480 | 0.242  |
| change in social class wave 4 to 7                   |  |        |       |       |        |        |        |
| (no change)  | upwardly mobile  | 0.265  | 0.143 | 1.84  | 0.065  | -0.017 | 0.546  |
|  | downwardly mobile  | -0.018 | 0.182 | -0.10 | 0.920  | -0.374 | 0.338  |
|  | inapplicable   | 0.058  | 0.194 | 0.30  | 0.767  | -0.324 | 0.439  |
| Income in £K wave 4 (continuous variable)            |  | -0.053 | 0.016 | -3.40 | 0.001  | -0.084 | -0.023 |
| change in income £K wave 4 to 7 (continous variable) |  | -0.014 | 0.015 | -0.92 | 0.356  | -0.043 | 0.016  |
| Employment status waves 4 and 7                      |  |        |       |       |        |        |        |
| (employed at waves 4 and 7)                          | aged < 60 2011 and not in paid employment at waves 4 or 7                | 0.179  | 0.205 | 0.87  | 0.384  | -0.224 | 0.581  |
|  | became unemployed between wave 4 and 7; aged <60 years 2011              | 0.597  | 0.208 | 2.86  | 0.004  | 0.188  | 1.005  |
|  | not employed wave 4  | -0.107 | 0.200 | -0.53 | 0.593  | -0.499 | 0.285  |
|  | employed wave 7  |        |       |       |        |        |        |
|  | aged 60+ years in wave 4 and not employed in wave 4 and/or wave 7        | 0.044  | 0.292 | 0.15  | 0.881  | -0.529 | 0.616  |
| ethnic group recorded wave 4                         |  |        |       |       |        |        |        |
| ('White British/Irish')                              | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | 0.165  | 0.128 | 1.29  | 0.198  | -0.086 | 0.416  |
|  | 'Black'; ( Black African, Caribbean, Black other'                        | -0.226 | 0.176 | -1.29 | 0.198  | -0.571 | 0.118  |
|  | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other')'             | 0.177  | 0.208 | 0.85  | 0.395  | -0.231 | 0.586  |

|   |  |        |           |        |        |            |           |
|---|--|--------|-----------|--------|--------|------------|-----------|
| Whether outright home owner wave 4<br>(not outright owner)  | outright owner   | -0.376 | 0.093     | -4.06  | <0.001 | -0.557     | -0.194    |
| Whether became an outright home owner<br>(Did not become an outright owner)   | became outright owner<br>wave 4-7  | -0.122 | 0.135     | -0.90  | 0.368  | -0.386     | 0.143     |
| Whether reported receiving welfare or<br>disability benefits in wave 4<br>(0 = none reported)                               | reported receipt of<br>benefit(s)  | 1.474  | 0.125     | 11.82  | <0.001 | 1.230      | 1.719     |
| Change in reported receipt of benefits wave<br>4 to wave 7<br>(no change)   | came off benefits :<br>benefits received in<br>wave 4 but not wave 7           | -0.911 | 0.152     | -6.01  | <0.001 | -1.208     | -0.614    |
|   | came onto benefits<br>(benefits not received<br>wave 4 but received<br>wave 7) | 0.917  | 0.170     | 5.40   | <0.001 | 0.584      | 1.249     |
| Whether in small town at wave 4<br>(not in small towns/rural fringe)  | small town in rural area   | -0.261 | 0.116     | -2.25  | 0.024  | -0.488     | -0.034    |
| Moved to area in different urban/rural<br>category wave 4 to 7  |  |        |           |        |        |            |           |
| (no change)   | moved to less urban<br>/more rural area  | -0.111 | 0.214     | -0.52  | 0.604  | -0.530     | 0.308     |
|   | moved to less rural<br>/more urban area  | 0.239  | 0.214     | 1.11   | 0.265  | -0.181     | 0.658     |
| Whether living in West Midlands wave 4<br>(not in West Midlands)  | West Midlands  | 0.354  | 0.100     | 3.54   | <0.001 | 0.158      | 0.549     |
| Whether moved in or out of W. Midlands<br>(no change wave 4 to 7)   | moved into W. Midlands   | 0.081  | 0.554     | 0.15   | 0.884  | -1.004     | 1.166     |
|   | moved out of W.<br>Midlands  | 0.207  | 0.532     | 0.39   | 0.698  | -0.836     | 1.249     |
| area economic disadvantage category**<br>wave 4<br>(1= lower disadvantage)  | 2 = greater disadvantage   | 0.172  | 0.070     | 2.45   | 0.014  | 0.035      | 0.309     |
| residential mobility wave 4 to 7 between<br>LSOA quintiles ranked by employment<br>domain<br>(no change)                    | moved to less deprived<br>quintile   | 0.159  | 0.150     | 1.06   | 0.289  | -0.135     | 0.452     |
|   | moved to more deprived<br>quintile   | 0.300  | 0.146     | 2.05   | 0.040  | 0.013      | 0.587     |
| residential mobility wave 4 to 7 between<br>LAD quintiles ranked by loss of income due<br>to welfare reforms<br>(no change) | moved to less<br>disadvantaged quintile  | -0.595 | 0.263     | -2.26  | 0.024  | -1.111     | -0.079    |
|   | moved to more<br>disadvantaged quintile  | 0.341  | 0.159     | 2.14   | 0.032  | 0.029      | 0.652     |
| Constant  |  | -1.951 | 0.144     | -13.55 | 0.000  | -2.233     | -1.669    |
| -----   | -----  | -----  | -----     | -----  | -----  | -----      | -----     |
| -----   | -----  | -----  | -----     | -----  | -----  | -----      | -----     |
| Mental Health Trajectory Group  |  |        | Robust    |        |        |            |           |
| predictor variables (reference category)  | categories of predictors   | Coef.  | Std. Err. | z      | P> z   | [95% Conf. | Interval] |
| -----   | -----  | -----  | -----     | -----  | -----  | -----      | -----     |
| Mental Health Trajectory Group 4  |  |        |           |        |        |            |           |
| sex<br>(male)   | female   | 0.522  | 0.063     | 8.31   | <0.001 | 0.399      | 0.646     |
| Age in years at wave 4  |  |        |           |        |        |            |           |

|  |  |        |       |       |        |        |        |
|--|--|--------|-------|-------|--------|--------|--------|
| (30-39 yrs)  | under 20   | 0.006  | 0.196 | 0.03  | 0.977  | -0.378 | 0.389  |
|  | 20-29  | -0.115 | 0.115 | -1.00 | 0.318  | -0.340 | 0.111  |
|  | 40-49  | -0.007 | 0.090 | -0.08 | 0.934  | -0.183 | 0.168  |
|  | 50-59  | -0.328 | 0.099 | -3.30 | 0.001  | -0.522 | -0.133 |
|  | 60-69  | -1.205 | 0.229 | -5.26 | <0.001 | -1.654 | -0.755 |
|  | 70 +   | -1.622 | 0.257 | -6.32 | <0.001 | -2.126 | -1.119 |
| partnership status wave 4 to 7                       |  |        |       |       |        |        |        |
| (living with a partner at wave 4 and 7)              | not living living with a partner wave 4 or 7                             | 0.453  | 0.074 | 6.08  | <0.001 | 0.307  | 0.599  |
|  | not with partner wave 4 with partner wave 7                              | 0.427  | 0.148 | 2.88  | 0.004  | 0.136  | 0.718  |
|  | lived with partner wave 4, not at wave 7                                 | 0.957  | 0.158 | 6.06  | <0.001 | 0.648  | 1.267  |
| occupational social class wave 4                     |  |        |       |       |        |        |        |
| (Class I: Management & Professional)                 | Class II :Intermediate   | -0.049 | 0.118 | -0.42 | 0.676  | -0.280 | 0.181  |
|  | Class III: small employers and own account                               | -0.184 | 0.142 | -1.30 | 0.194  | -0.462 | 0.094  |
|  | Class IV: lower supervisory & technical                                  | -0.141 | 0.160 | -0.88 | 0.377  | -0.454 | 0.172  |
|  | Class V (semi-routine & routine)   | -0.021 | 0.104 | -0.20 | 0.843  | -0.225 | 0.183  |
|  | Unclassified: Inapplicable   | 0.346  | 0.200 | 1.74  | 0.083  | -0.045 | 0.738  |
| change in social class wave 4 to 7                   |  |        |       |       |        |        |        |
| (no change)  | upwardly mobile  | 0.098  | 0.137 | 0.72  | 0.474  | -0.171 | 0.367  |
|  | downwardly mobile  | 0.340  | 0.147 | 2.32  | 0.021  | 0.052  | 0.628  |
|  | inapplicable   | -0.325 | 0.204 | -1.59 | 0.111  | -0.724 | 0.075  |
| Income in £K wave 4 (continuous variable)            |  | -0.056 | 0.015 | -3.72 | <0.001 | -0.086 | -0.026 |
| change in income £K wave 4 to 7 (continous variable) |  | -0.041 | 0.015 | -2.76 | 0.006  | -0.070 | -0.012 |
| Employment status waves 4 and 7                      |  |        |       |       |        |        |        |
| (employed at waves 4 and 7)                          | aged < 60 2011 and not in paid employment at waves 4 or 7                | 0.321  | 0.195 | 1.65  | 0.100  | -0.061 | 0.703  |
|  | became unemployed between wave 4 and 7; aged <60 years 2011              | 0.272  | 0.220 | 1.23  | 0.217  | -0.160 | 0.704  |
|  | not employed wave 4  | 0.172  | 0.182 | 0.94  | 0.346  | -0.185 | 0.528  |
|  | employed wave 7  | 0.156  | 0.280 | 0.56  | 0.577  | -0.393 | 0.706  |
|  | aged 60+ years in wave 4 and not employed in wave 4 and/or wave 7        |        |       |       |        |        |        |
| ethnic group recorded wave 4                         |  |        |       |       |        |        |        |
| ('White British/Irish')                              | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | 0.347  | 0.114 | 3.03  | 0.002  | 0.123  | 0.571  |
|  | 'Black'; ( Black African, Caribbean, Black other'                        | -0.364 | 0.164 | -2.22 | 0.027  | -0.685 | -0.042 |
|  | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other'))'            | 0.149  | 0.194 | 0.77  | 0.441  | -0.231 | 0.530  |
| Whether outright home owner wave 4                   |  |        |       |       |        |        |        |
| (not outright owner)                                 | outright owner   | -0.406 | 0.085 | -4.75 | <0.001 | -0.573 | -0.238 |
| Whether became an outright home owner                |  |        |       |       |        |        |        |
| (Did not become an outright owner)                   | became outright owner wave 4-7   | -0.040 | 0.120 | -0.33 | 0.741  | -0.275 | 0.195  |

|   |  |              |                  |          |                 |                             |        |
|---|--|--------------|------------------|----------|-----------------|-----------------------------|--------|
| Whether reported receiving welfare or disability benefits in wave 4<br>(0 = none reported)  | reported receipt of benefit(s)   | 1.169        | 0.122            | 9.59     | <0.001          | 0.930                       | 1.407  |
| Change in reported receipt of benefits wave 4 to wave 7<br>(0= no change)   | came off benefits :<br>benefits received in wave 4 but not wave 7        | -0.454       | 0.141            | -3.23    | 0.001           | -0.730                      | -0.178 |
|   | came onto benefits<br>(benefits not received wave 4 but received wave 7) | 0.799        | 0.169            | 4.72     | <0.001          | 0.467                       | 1.130  |
| Whether in small town at wave 4<br>(not in small towns/rural fringe)<br>Moved to area in different urban/rural category wave 4 to 7 | small town in rural area   | -0.164       | 0.103            | -1.59    | 0.112           | -0.365                      | 0.038  |
| (no change)   | moved to less urban /more rural area                                     | -0.048       | 0.202            | -0.24    | 0.813           | -0.444                      | 0.348  |
|   | moved to less rural /more urban area                                     | -0.132       | 0.228            | -0.58    | 0.564           | -0.579                      | 0.315  |
| Whether living in West Midlands wave 4<br>(not in West Midlands)  | West Midlands  | 0.096        | 0.099            | 0.97     | 0.334           | -0.099                      | 0.291  |
| Whether moved in or out of W. Midlands<br>(no change wave 4 to 7)   | moved into W. Midlands   | 0.084        | 0.533            | 0.16     | 0.875           | -0.960                      | 1.128  |
|   | moved out of W. Midlands   | -0.244       | 0.681            | -0.36    | 0.720           | -1.579                      | 1.090  |
| area economic disadvantage category**<br>wave 4<br>(1= lower disadvantage)  | 2 = greater disadvantage   | 0.055        | 0.065            | 0.84     | 0.403           | -0.074                      | 0.183  |
| residential mobility wave 4 to 7 between LSOA quintiles ranked by employment domain<br>(no change)                                  | moved to less deprived quintile  | 0.192        | 0.142            | 1.35     | 0.176           | -0.086                      | 0.469  |
|   | moved to more deprived quintile  | 0.250        | 0.141            | 1.77     | 0.077           | -0.027                      | 0.526  |
| residential mobility wave 4 to 7 between LAD quintiles ranked by loss of income due to welfare reforms<br>(no change)               | moved to less disadvantaged quintile                                     | 0.011        | 0.212            | 0.05     | 0.960           | -0.405                      | 0.426  |
|   | moved to more disadvantaged quintile                                     | 0.026        | 0.169            | 0.15     | 0.878           | -0.305                      | 0.357  |
| Constant  |  | -1.740       | 0.135            | -12.85   | <0.001          | -2.005                      | -1.475 |
| -----   | -----  | -----        | -----            | -----    | -----           | -----                       | -----  |
| -----   | -----  | -----        | -----            | -----    | -----           | -----                       | -----  |
| <b>Mental Health Trajectory Group</b>   |  |              | <b>Robust</b>    |          |                 |                             |        |
| <b>predictor variables (reference category)</b>   | <b>categories of predictors</b>  | <b>Coef.</b> | <b>Std. Err.</b> | <b>z</b> | <b>P&gt; z </b> | <b>[95% Conf. Interval]</b> |        |
| -----   | -----  | -----        | -----            | -----    | -----           | -----                       | -----  |
| <b>Mental Health Trajectory Group 5</b>   |  |              |                  |          |                 |                             |        |
| sex<br>(male)   | female   | 0.326        | 0.037            | 8.76     | <0.001          | 0.253                       | 0.398  |
| Age in years at wave 4<br>(30-39 yrs)   | under 20   | 0.139        | 0.133            | 1.04     | 0.298           | -0.123                      | 0.400  |
|   | 20-29  | 0.064        | 0.075            | 0.85     | 0.396           | -0.084                      | 0.211  |
|   | 40-49  | -0.143       | 0.059            | -2.43    | 0.015           | -0.259                      | -0.028 |
|   | 50-59  | -0.299       | 0.063            | -4.77    | <0.001          | -0.422                      | -0.176 |
|   | 60-69  | -0.785       | 0.109            | -7.19    | <0.001          | -0.999                      | -0.571 |

|   |  |        |       |       |        |        |        |
|---|--|--------|-------|-------|--------|--------|--------|
|   | 70 +   | -0.893 | 0.127 | -7.06 | <0.001 | -1.141 | -0.645 |
| partnership status wave 4 to 7<br>(living with a partner at wave 4 and 7)                 | not living with a partner wave 4 or 7                                    | 0.212  | 0.047 | 4.54  | <0.001 | 0.120  | 0.303  |
|   | not with partner wave 4 with partner wave 7                              | 0.216  | 0.100 | 2.16  | 0.031  | 0.020  | 0.413  |
|   | lived with partner wave 4, not at wave 7                                 | 0.591  | 0.115 | 5.13  | <0.001 | 0.366  | 0.817  |
| occupational social class wave 4<br>(Class I: Management & Professional)                  | Class II :Intermediate   | 0.006  | 0.070 | 0.08  | 0.933  | -0.132 | 0.143  |
|   | Class III: small employers and own account                               | -0.221 | 0.082 | -2.69 | 0.007  | -0.382 | -0.060 |
|   | Class IV: lower supervisory & technical                                  | -0.194 | 0.094 | -2.08 | 0.038  | -0.378 | -0.011 |
|   | Class V (semi-routine & routine)   | -0.120 | 0.063 | -1.91 | 0.056  | -0.243 | 0.003  |
|   | Unclassified: Inapplicable   | 0.013  | 0.103 | 0.13  | 0.898  | -0.189 | 0.216  |
| change in social class wave 4 to 7<br>(no change)   | upwardly mobile  | 0.102  | 0.084 | 1.22  | 0.224  | -0.062 | 0.267  |
|   | downwardly mobile  | 0.160  | 0.095 | 1.67  | 0.094  | -0.027 | 0.347  |
|   | inapplicable   | -0.003 | 0.110 | -0.03 | 0.980  | -0.219 | 0.213  |
| Income in £K wave 4 (continuous variable)   |  | -0.024 | 0.008 | -3.18 | 0.001  | -0.039 | -0.009 |
| change in income £K wave 4 to 7 (continous variable)                                      |  | -0.010 | 0.008 | -1.26 | 0.207  | -0.026 | 0.006  |
| Employment status waves 4 and 7<br>(employed at waves 4 and 7)                            | aged < 60 2011 and not in paid employment at waves 4 or 7                | -0.097 | 0.126 | -0.77 | 0.443  | -0.344 | 0.150  |
|   | became unemployed between wave 4 and 7; aged <60 years 2011              | 0.156  | 0.128 | 1.22  | 0.221  | -0.094 | 0.406  |
|   | not employed wave 4 employed wave 7                                      | -0.011 | 0.115 | -0.10 | 0.924  | -0.237 | 0.215  |
|   | aged 60+ years in wave 4 and not employed in wave 4 and/or wave 7        | -0.078 | 0.143 | -0.55 | 0.585  | -0.359 | 0.203  |
| ethnic group recorded wave 4<br>( 'White British/Irish' )                                 | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | 0.253  | 0.078 | 3.26  | 0.001  | 0.101  | 0.405  |
|   | 'Black'; ( Black African, Caribbean, Black other'                        | -0.173 | 0.106 | -1.64 | 0.101  | -0.381 | 0.034  |
|   | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other'))'            | 0.241  | 0.129 | 1.86  | 0.063  | -0.013 | 0.495  |
| Whether outright home owner wave 4<br>(not outright owner)                                | outright owner   | -0.276 | 0.049 | -5.63 | <0.001 | -0.372 | -0.180 |
| Whether became an outright home owner<br>(Did not become an outright owner)               | became outright owner wave 4-7   | -0.090 | 0.074 | -1.22 | 0.224  | -0.234 | 0.055  |
| Whether reported receiving welfare or<br>disability benefits in wave 4<br>(none reported) | reported receipt of benefit(s)   | 0.559  | 0.090 | 6.20  | <0.001 | 0.382  | 0.736  |
| Change in reported receipt of benefits wave<br>4 to wave 7                                |  |        |       |       |        |        |        |

|  |  |              |       |       |        |        |        |
|--|--|--------------|-------|-------|--------|--------|--------|
| (no change)  | came off benefits :<br>benefits received in<br>wave 4 but not wave 7           | -0.421       | 0.110 | -3.83 | <0.001 | -0.637 | -0.206 |
|  | came onto benefits<br>(benefits not received<br>wave 4 but received<br>wave 7) | 0.463        | 0.116 | 4.00  | <0.001 | 0.236  | 0.691  |
| Whether in small town at wave 4<br>(not in small towns/rural fringe)<br>Moved to area in different urban/rural<br>category wave 4 to 7 | small town in rural area   | -0.151       | 0.060 | -2.53 | 0.011  | -0.268 | -0.034 |
| (no change)  | moved to less urban<br>/more rural area  | 0.083        | 0.120 | 0.69  | 0.489  | -0.152 | 0.317  |
|  | moved to less rural<br>/more urban area  | -0.178       | 0.140 | -1.27 | 0.202  | -0.451 | 0.096  |
| Whether living in West Midlands wave 4<br>(not in West Midlands)   | West Midlands  | 0.092        | 0.061 | 1.51  | 0.132  | -0.028 | 0.212  |
| Whether moved in or out of W. Midlands<br>(no change wave 4 to 7)  | moved into W. Midlands   | 0.188        | 0.335 | 0.56  | 0.575  | -0.469 | 0.845  |
|  | moved out of W.<br>Midlands  | -0.289       | 0.423 | -0.68 | 0.495  | -1.118 | 0.540  |
| area economic disadvantage category**<br>wave 4<br>(1= lower disadvantage)   | 2 = greater disadvantage   | 0.023        | 0.039 | 0.60  | 0.551  | -0.053 | 0.099  |
| residential mobility wave 4 to 7 between<br>LSOA quintiles ranked by employment<br>domain<br>( no change)                              | moved to less deprived<br>quintile   | 0.197        | 0.090 | 2.18  | 0.029  | 0.020  | 0.373  |
|  | moved to more deprived<br>quintile   | 0.148        | 0.093 | 1.59  | 0.111  | -0.034 | 0.330  |
| residential mobility wave 4 to 7 between<br>LAD quintiles ranked by loss of income due<br>to welfare reforms<br>(no change)            | moved to less<br>disadvantaged quintile  | -0.132       | 0.131 | -1.01 | 0.310  | -0.388 | 0.123  |
|  | moved to more<br>disadvantaged quintile  | 0.186        | 0.100 | 1.87  | 0.062  | -0.009 | 0.382  |
| Constant   |  | -0.178       | 0.076 | -2.33 | 0.020  | -0.327 | -0.028 |
| Mental Health Trajectory Group 6   |  | Base Outcome |       |       |        |        |        |

|                                  |                        |   |        |
|----------------------------------|------------------------|---|--------|
| *Multinomial logistic regression | Number of observations | = | 17212  |
|                                  | Wald chi2 (215)        | = | 2816   |
|                                  | Probability of chi2    | = | 0.000  |
|                                  | Log pseudolikelihood   | = | -20718 |
|                                  | Pseudo R2              | = | 0.0739 |

\*\*Combined indicator of economic disadvantage (based on quintile on IMD2010 employment domain for LSOA and quintile on average loss of income due to welfare reforms for LAD)



**Table C Comparison of relative frequencies of selected variables from the analytical sample with corresponding information on comparable data from the population census 2011**

| Predictor Variable label                             | Categories   | % of analytical sample as reported in wave 4 (nearest whole %) | % of English population reported in population Census 2011 * |
|--|--|--|--|
| Sex  | (male)   | 43   | 49.2   |
|  | female   | 57   | 50.8   |
| Age group at wave 4 in 10 year groups                | 16-19  | 3  | 5.1  |
|  | 20-29  | 10   | 13.7   |
|  | 30-39  | 17   | 13.3   |
|  | 40-49  | 21   | 14.6   |
|  | 50-59  | 19   | 12.1   |
|  | 60-69  | 18   | 10.7   |
|  | 70 +   | 12   | 11.6   |
| Partnership status                                   | (living with a partner at wave 4   | 65   | 57.8   |
|  | not living living with a partner wave 4                                  | 28   | 42.2   |
| Occupational Social class in wave 4                  | 1 (Class I: Management & Professional)                                   | 28   | 30.7   |
|  | 2 Class II :Intermediate   | 9  | 13.1   |
|  | 3 Class III: small employers and own account                             | 6  | 9.3  |
|  | 4 Class IV: lower supervisory & technical                                | 4  | 7.1  |
|  | 5 Class V (semi-routine & routine)                                       | 15   | 25.8   |
|  | 6 Unclassified: Inapplicable including retired                           | 38   | 14.0   |
| self identified ethnic group recorded wave 1         | ('White British/Irish')  | 88   | 85.4   |
|  | 'Asian' ('Indian', 'Pakistani', 'Bangladeshi', 'Chinese', 'other Asian') | 6  | 7.8  |
|  | Black'; ( 'Black African', 'Caribbean', 'Black other')                   | 3  | 3.5  |
|  | 'mixed/other' ('white' & 'black' or 'Asian' 'Arab' 'other')              | 2  | 3.3  |
| quintile category of LSOAemployment quintile IMD2010 | 1  | 29   | 27.2   |
|  | 2  | 18   | 17.6   |
|  | 3  | 20   | 19.3   |
|  | 4  | 17   | 18.3   |
|  | 5  | 15   | 17.7   |

\* source: NOMIS

[Nomis - Official Labour Market Statistics \(nomisweb.co.uk\)](http://nomisweb.co.uk)

Derived from reported in tables published by NOMIS