A data linkage study of the effects of the Great Recession and austerity on anti-depressant prescription usage

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Key points

- International evidence suggests that the Great Recession led to an increase in mental illness, particularly in countries that pursued austerity policies.
- This study is the first to assess how different regional economic trajectories, and inequalities in the impact of the Great Recession and austerity, affected regional inequalities in mental health.
- The study uses individual-level, data on new prescriptions of courses of antidepressants, linked to descriptors of individual and area characteristics, for a very large representative sample (n=86,500) of the Scottish population, comparing regional trends by economic trajectory, and assessing the contributory role of austerity
- Living in a region that did not recover promptly from the recession was associated with an increased risk of new antidepressant usage amongst employed adults, especially for regions that had lower employment rates pre-recession.

ABSTRACT

Background

International literature shows that the impacts of unemployment and loss of income (including reductions in state welfare expenditures) during the Great Recession (2007/2008) worsened population mental health. However, most research relies on self-reported health measures and ecological designs. This individual-level longitudinal study examines how regional economic trends and austerity related to depression using administrative prescription data for a very large and representative population sample.

Methods

Records from a sample of the Scottish Longitudinal Study (N=86,500) were linked to monthly primary care antidepressant prescriptions (2009-2015). Regional economic trends were characterised by annual full-time employment data (2004-2014). Economic impact of austerity was measured via annual income lost per working age adult due to welfare reforms (2010-2015). Sequence analysis identified new cases of anti-depressant use, and group-based trajectory modelling classified regions into similar economic trajectories. Multi-level logistic regression examined relationships between regional economic trends and new antidepressant prescriptions. Structural equation mediation analysis assessed the contributory role of welfare reforms.

Results

Employed individuals living in regions not recovering post-recession had the highest risk of beginning a new course of antidepressants (AOR 1.23; 95%CI 1.08-1.38). Individuals living in areas with better recovery trajectories had the lowest risk. Mediation analyses showed that

50% (95% CI 7-61%) of this association was explained by the impact of welfare benefit reforms on average incomes.

Conclusion

Following the Great Recession, local labour market decline and austerity measures were associated with growing antidepressant usage, increasing regional inequalities in mental health in Scotland. The study evidences the impact of austerity on health inequalities and suggests that economic conditions and welfare policies impact on population health. Reducing the burden of mental ill-health primarily requires action on the social determinants.

Keywords: Recession, labour market, austerity, welfare reform, mental health, prescription, antidepressants, administrative data, longitudinal analysis, health inequalities

INTRODUCTION

Depression is the leading cause of disability worldwide, with over 300 million people living with the illness [1]. Globally, between 2005 and 2015, there was an 18% rise in people living with depression. International evidence has found that the prevalence of mental ill health increases during economic recessions, including the 'Great Recession' commencing 2007/2008). [2-5]. Following the 2007/2008 crisis, worldwide an excess of 4,884 suicides were observed in 2009 [6], and over the next three years (2008-2010) an excess of 4,750 suicides occurred in the USA, 1,000 suicides in England, and 680 suicides in Spain. Self-harm and psychiatric morbidity also rose, including in England a 1.6% increase in poor mental health risk (GHQ12) between 2008-12 [7, 8].

However, the mental health effects of the Great Recessions varied by country and by area/region. There were more negative trends in mental health in those countries (e.g. Greece, Italy, Spain and the UK) that implemented austerity programmes, shortly following the Great Recession, aimed at increasing tax receipts and reducing spending, resulting in large scale cuts to central and local government budgets as well as reductions health services, welfare and benefits, which compounded the effect of the recession on population health [9, 10]. h [11]. In the UK, the austerity measures introduced by the UK Government resulted in reductions in welfare payments to the lowest income groups, the unemployed and people with disabilities. It also led to significant budgetary reductions to public sector services including public health and mental health services, and a slow-down in the growth of the NHS budget [12]. These macro-economic and policy decisions led to sharp increases in socioeconomic inequalities[13]. For example, Barr et al [14] suggest that geographical inequalities in mental health and wellbeing in the UK increased after austerity, and that

people living in more deprived areas experienced a larger increase in poor mental health [15] and self-harm [7].

It is therefore plausible that austerity may mediate the effects of economic recession on mental health [16]. Differing local labour market contexts and the uneven socio-spatial impact of austerity may have contributed to these patterns [17, 18]. Changes in the wider regional economy may directly affect individual mental health outcomes whilst also potentially operating 'indirectly' by influencing an individual's perception and experience of a recession, raising stress and anxiety [19]. However, the existing literature is small, uses ecological designs based on data aggregated at area level and self-reported measures, and no studies have examined the impacts of changes in labour markets and austerity measures in combination to assess their relative importance for trends in mental health inequalities..

Scotland had a relatively shallow recession, with a 4.8% peak-to-trough reduction in GDP per head (compared to 6% UK-wide), but experienced a particularly slow recovery to growth [20]. Following the recession, self-reported general health [21] and mental health [22] tended to be worse in regions of Scotland with persistently low employment rates, even for those who remained employed [22]. Variations across the 32 Local Authority Districts in Scotland indicated that there were distinct regional differences in the more general economic impacts of (and recovery from) the Great Recession and subsequent austerity-related measures. Scotland is therefore an important setting in which to examine the effects of the Great Recession and austerity on regional inequalities in mental health.

Antidepressant use has risen steadily in Scotland since the Great Recession and there are clear socioeconomic inequalities in this trend [23]. Here we make an original contribution to knowledge by examining how 'new' cases of prescription use relates to different regional labour market

trajectories, and the uneven regional effects of the Great Recession and austerity. This longitudinal study uses a large, linked individual-level dataset to examine: (a) how the upward trend in 'new' anti-depressant prescription rates observed during the Great Recession varied by regional economic conditions (measured using labour market trajectories); (b) the extent to which this relationship was mediated by regional inequalities in the effects of austerity.

METHODS

Study sample

We used the Scottish Longitudinal Study (SLS), a population representative sample (5.3%) of individuals living in Scotland, drawn from the population census. The SLS sample are selected using 20 semi-random birth dates and enter the study at one of the 1991, 2001 or 2011 censuses, or through being a new birth or immigrant. The participants were linked to data on NHS service use and prescriptions for mental health conditions in the period 2009-2014. The SLS and NHS data extracts were provided in anonymised format and analyses undertaken in a secure and regulated setting. Results were assessed by SLS staff prior to publication to ensure the anonymity of the individuals.

The analytical sample used the following inclusion criteria: a) SLS member supplied information in 2001 and 2011 censuses, prior to, and subsequent to the onset of the recession, (N≈151,400; number rounded to nearest 100); b) the person was aged between 16 and 60 in 2011 (i.e. at working age or about to enter the labour market) (N≈124,000); c) the person was economically active and employed in the labour market in 2011. After selection, the working sample size comprised ≈86,500 people distributed across all parts of Scotland.

Antidepressant Prescriptions

The outcome measure was 'new' cases of depression which we base on our earlier work, using sequence analysis to identify groups of individuals with similar patterns of change in mental health (based on changes in prescription use) [24]. The current study focused on individuals for whom the frequency of monthly prescriptions for antidepressants (British National Formulary (BNF): 4.3) was initially (in the first six months of the study period) very low (or zero), but subsequently increased to a level indicative of diagnosed mental illness, for extended periods of time (six months or more) [24]. This pattern was likely to indicate the onset of a 'newly diagnosed' case of depression requiring medication, reflecting incidence of 'new' cases of depression among our sample.

Labour market conditions: classification of trend in local employment rates 2004-2014

Variables relating to annual trends in full-time (FT) employment (derived by and sourced from the NOMIS Official Labour Market Statistics, Office for National Statistics) were measured for Local Authorities (N=32) in Scotland over the period 2004-14 (covering the period prior to and during the economic recession, and the aftermath period, when in some areas local economies began to recover). We applied group-based trajectory modelling [25], using the 'lcmm' package in R, to classify local authorities by changes in labour market conditions. We ran the model specifying 2 to 8 groups stipulating the inclusion of at least three local authorities; we then reflected on the group membership alongside fit assessment criteria plots [26], to decide the optimal number of groups. We assigned labour market trend groups to each SLS member based on local authority of residence in 2011; residential location is recorded in the SLS at decennial census dates, of which 2011 is closest to the beginning of our study period.

Welfare Reforms data

Over the period 2010 to 2015, the UK Government introduced reforms to welfare payments. Details are provided elsewhere [27] but, in brief, they included changes to: housing benefits (entitlement to assistance with the cost of housing and rules affecting the size of properties supported by payments); non-dependant deductions (increased deductions in benefits to reflect anticipated contributions from non-dependent household members); benefits cap (a ceiling on total benefit payments per household); council tax support (reduced entitlement of working age claimants); personal independence payment (more stringent medical tests for those receiving benefits due to disabilities); employment and support allowance (more stringent medical tests and greater conditionality), child benefit (a three-year freeze and withdrawal for higher income households); tax credits (reduction in eligibility and payment rates affecting lower and middle income households); and 1% up-rating (limit in annual up-rating of value across most benefits). For many recipients, these reforms reduced eligibility and welfare payments received. We used published data [28]on average regional income lost per working age adult per annum due to these austerity measures at Local Authority level (Local Authorities in Scotland have responsibility for the delivery of local health and social services), and they are also broadly equivalent to 'labour market areas' which are geographical units so used to assess employment data [13].

Covariates

Age, sex, ethnicity (white/non-white/missing), marital status (single, married, separated, divorced, widowed), living alone (yes/no), social grade (1 high, 5 low) and Carstairs [29] neighbourhood deprivation (1-low, 10-high) were selected as covariates because they were associated with risk of mental illness [22]. Data on each individual's Local Authority of

residence in 2001 and 2011 was used to control for possible effects of health selective migration, prior to the main study period, between regions studied in our analysis. 'Labour market migration' was defined in terms of individual residential migration, between the 2001 and 2011 censuses. We identified those who moved between LAs which had been differently classified according to trends in employment 2004-2014 (see above). However, we were not able to control for subsequent residential migration. This indicator was used to adjust for participants' movement between regions of the country experiencing different labour market trajectories over the period studied. to adjust for participants' movement between regions of the country experiencing different labour market trajectories over the period studied.

Analysis

We undertook a two-stage analysis using multi-level logistic regression and structural equation mediation. All analyses were undertaken in R 3.5.1.

Stage 1: Multi-level logistic regression analysis

Generalised multi-level models with a logit link were developed using the 'lme4' package [30]. We defined a binary outcome variable, coded 1 for those individuals starting a 'new' course of prescribed antidepressants. This was coded 0 for the 'reference group' comprising all other individuals (i.e. including those who had no prescriptions, occasional prescriptions, declining prescriptions or 'chronic' prescriptions that were ongoing throughout the study period). We defined the Local Authority of residence in 2011 as the random effect, to account for similarities in prescription pattern among people living in the same region. We had extremely low missing data (<20 individuals), which was considered as occurring at random, therefore we present the results in a case-complete analysis. We determined the

association between the likelihood of starting a new course of antidepressants and labour market trend group (after controlling for covariates explained above) as the relationship of particular interest. Results are reported as adjusted odds ratios (AOR) and 95% confidence intervals are presented. A sensitivity analysis was undertaken using auxiliary measures of the economy in the person's place of residence.

Stage 2: Mediation analysis

We then designed a structural equation model using the 'Lavaan' package, to estimate the degree to which relative loss of income in the population due to different types of welfare reform mediated the relationship between regional FT employment trend and likelihood of starting prescriptions. Given the outcome was binary, we used the weighted least square mean and variance adjusted estimator, with diagonally weighted least squares to estimate model parameters. We built a parsimonious model with a minimal sufficient adjustment set of covariates including age, sex, ethnicity and social grade; the key output was the percentage of the association mediated.

RESULTS

Classifying local authority labour market trend groups

We found six groups with a quadratic term to be the optimal model for categorising local authority FT employment trends [19]. Six groups provided the best model fit in terms of lowest BIC (4521) and AIC (4486). The average posterior probability and odds of correct classification exceeded recommended thresholds of 70% and 5 respectively. The standard deviation of group membership probabilities, lower standard deviation indicating a better 'fit', for six groups was lower than four groups but higher than two or three groups. In deciding between two, three and six groups, we plotted the trajectories with the different

group memberships. For these six employment trend groups (Figures 1 and 2), mean FT employment rate from 2004-2014 and % change since 2011-2014 were: *High-Recovered* (38.3% of people in FT employment from 2004-2014; +0.89% change in people in FT employment from 2011-2014), *High-Declined* (36.5%; -0.39%), *Moderate-Recovered* (35.2%; +0.70%), Moderate-Declined (33.9%; -0.89%), *Low-Recovered* (32.7%; +1.08%) and *Low-Declined* (31.4%; -0.53%). Optimal groupings for the other economic indicators are presented in Supplementary Material S1.

Relationship between FT employment trend groups and likelihood of beginning a new course of antidepressants

Residents who, in 2011, lived in regions showing a 'High-Recovered' FT employment trend were used as the reference category in the multilevel models as it was one of the larger groups and at one extreme of the comparison (i.e. assumed the most beneficial labour market conditions). We found that in comparison to this group, there was a linear increase in odds of beginning a new course of antidepressants if the participant resided in areas with FT employment trajectories typified by 'High - Declined' to 'Low-Declined' (AOR 1.23; 95%CI 1.08-1.38) (Figure 3; full model: Supplementary Material S2). The difference between living in the 'Low-Declined' and 'Low-Recovered' local authorities was markedly higher compared to the other FT employment level pairs (e.g. 'Moderate-Recovered' and 'Moderate-Declined'). We carried out some sensitivity tests, using similar modelling to examine the association between receipt of 'new' antidepressant prescriptions and other indicators of local economic conditions available from the NOMIS archive (Supplementary Material 2). Some of the economic indicators tested had weaker associations with antidepressant prescriptions (active

employment and FT earnings)whilst others displayed no association (hours worked or Gross Value Added (GVA) per head) (Supplementary Material S3).

Mediation by welfare reforms

The effect of population income loss due to the welfare reforms explained 50% of the FT employment trend effect (95% CI 7% to 61%) (Figure 4). The association between FT employment trend group and new course of antidepressants remained significant after inclusion of the impact on population income of different welfare reforms as a covariate (Supplementary Material S4). The association was virtually unchanged with inclusion of average loss of income due to cuts in housing benefit, child benefit and the overall benefit cap, was weakly mediated with changes in non-dependent deductions and employment and support allowance, and moderately mediated with loss of income due to changes in tax credits, 1% up-rating and personal independence payments.

DISCUSSION

We found that living in a region characterised by low and declining FT employment following the Great Recession was associated with increased likelihood of antidepressant use. These findings suggest that, in Scotland, the impact of the Great Recession on mental health was particularly detrimental in less resilient labour markets. Half of this association was mediated by the 2010-2015 regional impact of austerity-related welfare reforms.

Our findings are in keeping with previous research in the UK and internationally into the health impacts of recession and austerity. They support the argument that during the recession inequality in mental health and wellbeing increased [14] and that in more disadvantaged areas, worst hit by the recession and austerity, the increase in poor mental health and self-harm was significantly higher than elsewhere [17, 31].Similarly, qualitative research with people with existing mental

health conditions also found that austerity exacerbated their situation [32]. Our research enforces international literature showing that weakened social protection systems adversely affected mental health in Europe, particularly amongst the most disadvantaged areas and social groups [9, 33]. Our multi-level study, using health data on individuals combined with area data, extends previous analysis by including as possible risk factors indicators of economic conditions including impacts of austerity, in contrast to most other studies that focus on employment rates' [14]. Our study - because it relates to adults in employment in 2011, close to the beginning of the study period,– suggests that the association between recession and poor mental health might also be to do with other pathways such as increased job insecurity, precarity at work, wage reductions, reduction in public services, or the impact of specific welfare reforms (e.g. reductions in tax credits) on those in employment [34, 35]. The mental health implications of macroeconomic changes can therefore extend beyond the impacts on those who are out of work.

Previous studies suffer shortcomings due to the: application of cross-sectional or ecological designs; use of non-representative populations; exclusion of important confounders; lack of temporal coverage; or limitations in measuring the economy (e.g. measures taken at a single time point) or health outcomes [36]. In particular, self-reported health status is limited by differences in propensity to report existing health problems by age, sex, ethnicity and socioeconomic status [37]. Administrative data can address some of these limitations. Two other studies have linked administrative antidepressant data in a similar way to the current study [22, 38]. The first linked antidepressant prescriptions from 2011-15 to the full Northern Irish 2011 Census but did not consider macroeconomic factors, only individual level employment, which had a protective effect against antidepressant use. We found that area employment conditions are also important. The second study classified Scottish regions

by active employment aged 16+ with self-reported mental illness in 2011 [22]. The work highlighted nine Scottish local authorities (including Glasgow) where individuals had elevated risk of self-reported mental illness. By using longitudinal measures of regional labour markets over a longer period of time, we had more information available to classify regions on baseline level and recovery since 2008/2009, for example, showing that people living in Glasgow had lower risk than those in Dundee, which did not recover as promptly.

Our findings have policy implications particularly given the focus in the Scottish Government's Mental Health Strategy 2017-2027 [39], which prioritises prevention and early detection. We demonstrate the importance of recognising the wider societal impacts – including for mental health – of macroeconomic change, and the need for mental health strategies to focus on economic conditions and the social determinants of health, especially welfare. Our study also shows that it is important to recognise the regionally uneven impacts of macroeconomic change and the implications for geographical inequalities in health. Thus targeting resources (including mental health provision and increasing the provision of secure, FT employment opportunities) into areas that are more vulnerable to these structural changes may help to alleviate some of the health consequences.

Strengths

We used a population representative sample of the Scottish working population. Our study is novel in the breadth (e.g. several measures of labour market and welfare reform) and depth (e.g. 10 years of data) of our characterisation of the political-economy. In the current study, longitudinal information on post-recession monthly prescription status determined a group of individuals who had started a new and sustained course of antidepressants, excluding those being temporarily prescribed, possibly for other conditions. We also made

exclusions based on prescribed dose to remove cases likely to be due to conditions other than clinical depression. By using a multi-level model, we were able to account for prescription patterns that are associated with the local authority of residence in 2011. The study also benefited from the quality of the prescription data which are routinely collected across the country and the quality checked by NHS Scotland. GPs account for over 95% of prescriptions in primary care, and prescriptions must be submitted by dispensers for reimbursement which helps ensure a very high level of completeness and enables longitudinal data linkage [40].

Limitations

We did not have data on diagnosis for depression so we acknowledge that some of the prescriptions may not be mental illness [41]. Although we adjusted for potential variations in prescribing regimes between local authorities, we were unable to account for differences between general practitioners in the propensity to treat depression with antidepressants [42]. When interpreting our findings, we assumed that the causal pathway is unidirectional, with areas most effected by recession being also most impacted by austerity, and both processes contributing to higher mental health risk, however, the literature of health selective mobility e [43] indicates that there is bi-directionality. Future work could usefully examine the longer-term impacts of the Great Recession and austerity using longer follow-ups and repeated measures. We could not control for possible effects of health selective migration after 2011, the last date for which residential location of sample members was available. Further, by not accounting for the historical distribution of welfare in Scotland there is likely some overestimation in the percentage mediated estimate. Finally, the unexplained variance in the mediation models could be related to other individual and regional changes that occurred during study period, such as wage stagnation and cuts

to local authority funding. Future analysis could integrate multiple individual and regional variables to address these issues.

CONCLUSION

Our study makes an important contribution to the international evidence base about the effects of the Great Recession and austerity on mental health. Using a linked, individual-level, longitudinal data set, we provide some of the strongest evidence to date suggesting that during the recent period of recession and austerity, antidepressant use has increased particularly for those living in regions of the country that did not recover promptly from the Great Recession and which were most negatively impacted by welfare reforms. Our study also shows that it is important to recognise the regionally uneven impacts of long term macroeconomic change and the adverse implications for geographical inequalities in health. The study therefore provides detailed empirical evidence to support assertions that social levels of welfare benefit provisions matter for mental health in times of economic upheaval. Future work should examine the effects on regional inequalities in health of the Great Recession in other countries – those that did and did not pursue austerity.

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Figure Captions

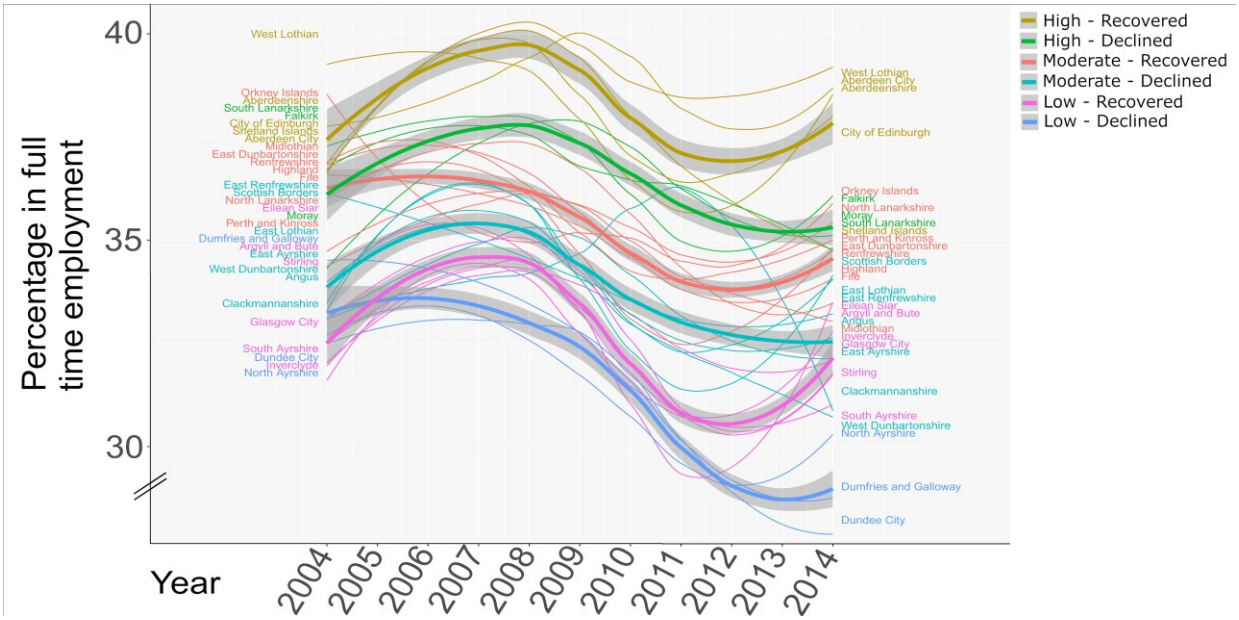

Figure 1: Full-time Employment Trajectory Groups for Scottish Local Authorities (2004-2014)

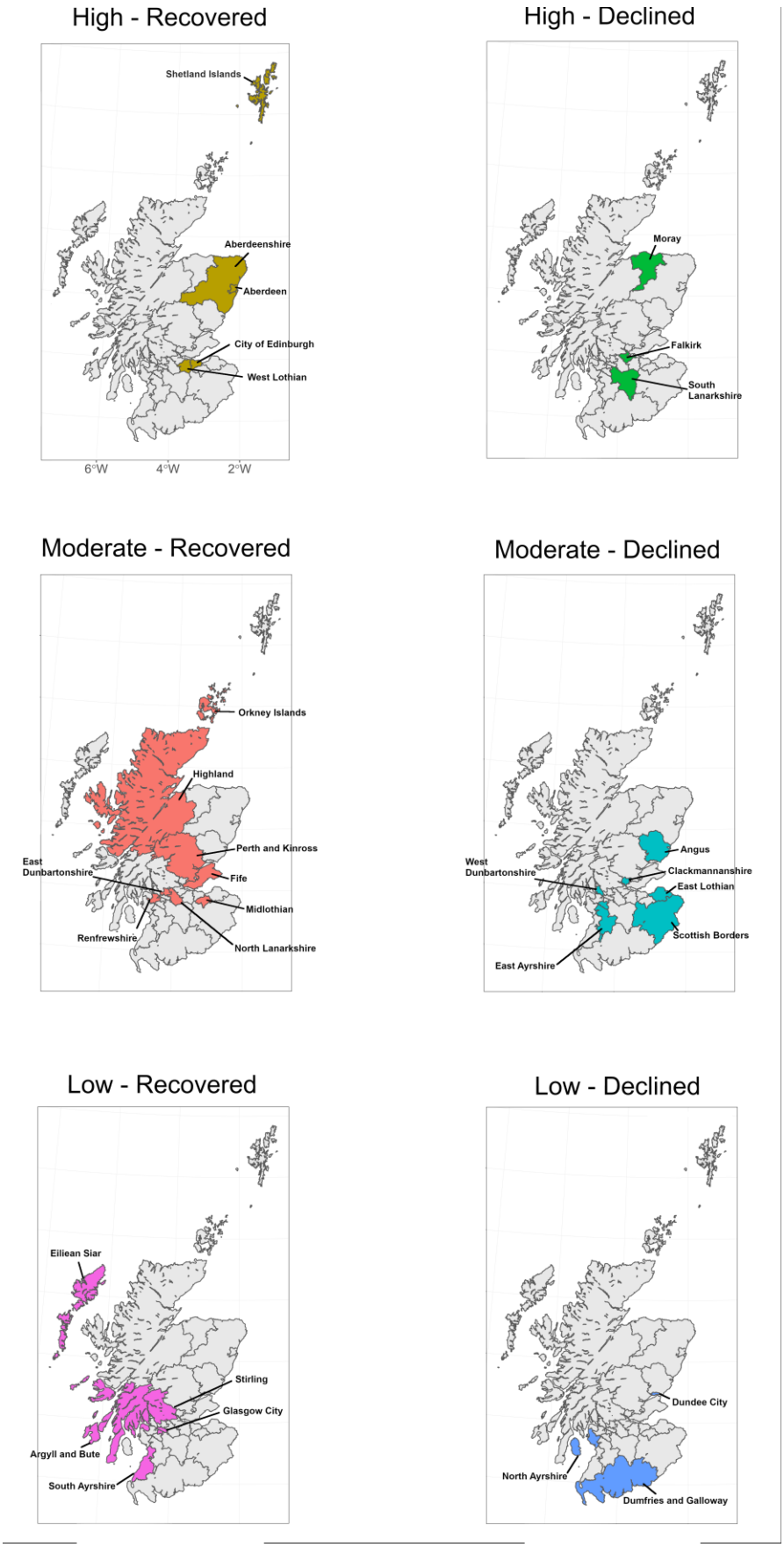

Figure 2: Full-time Employment Trend Groups for Scottish Local Authorities (2004-2014)

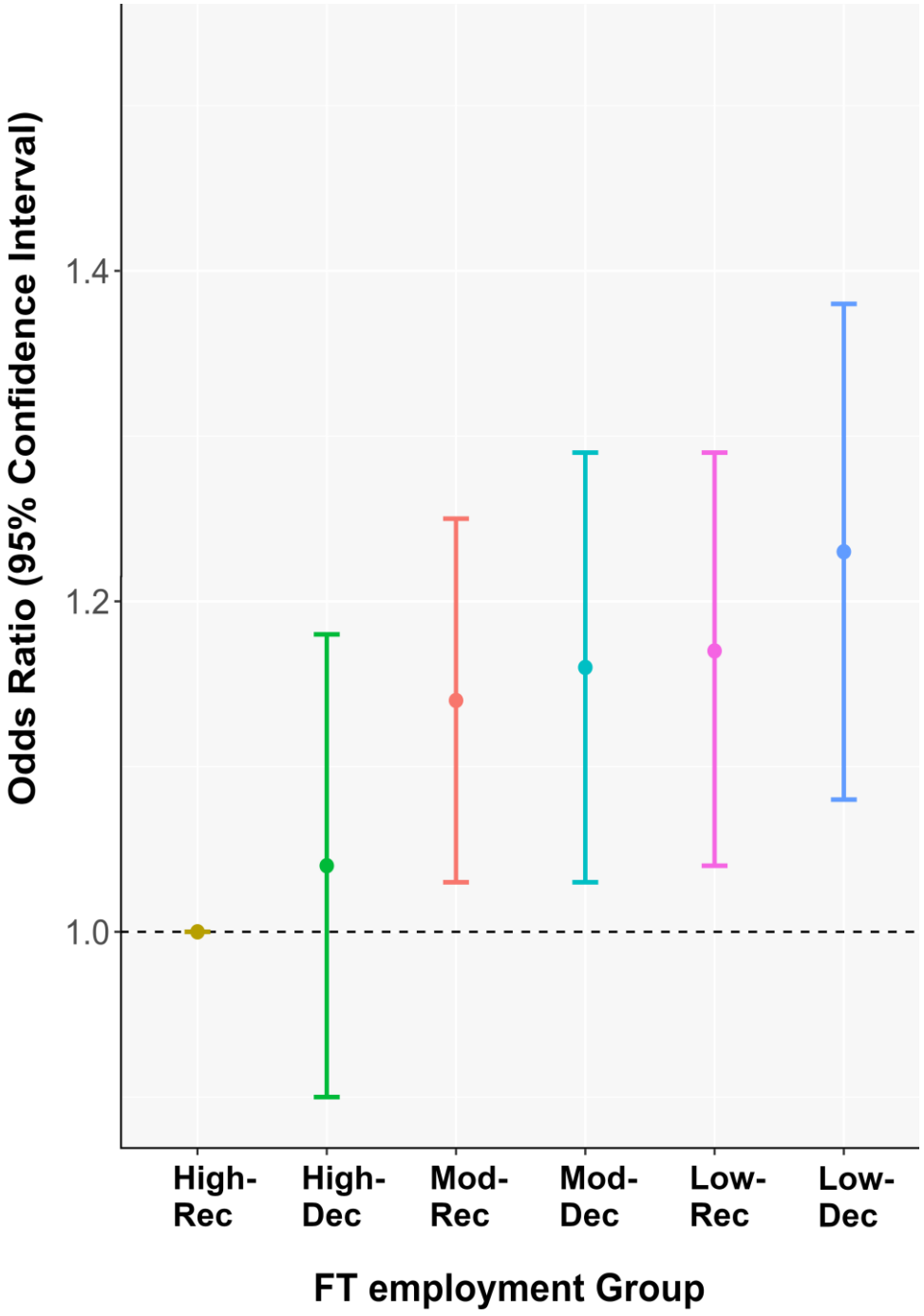

Figure 3: Adjusted Odds Ratios for risk of starting a new course of antidepressants during the study period, in relation to place of residence classified by full-time Employment Trend Groups for Scottish Local Authorities (2004-2014). (Model controlling for individual covariates.) Source: SLS.

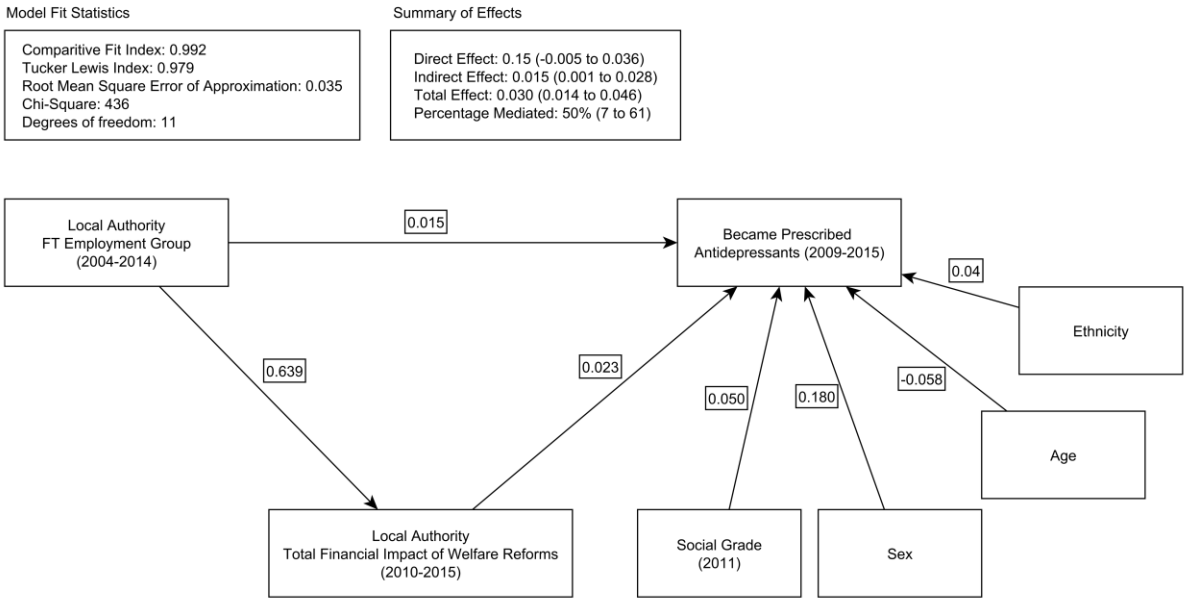

Figure 4: Local authority full-time employment and new antidepressant prescription, mediated by local authority total financial impact of welfare reforms N.b. Standardised coefficients

Declarations

Ethics approval and consent to participate

Permission to use the SLS and other data sources has been approved by the data controllers of the SLS and by the Public Benefit and Privacy Panel, responsible for governance of use of NHS eDRIS statistics, held securely in the ESRC Administrative Data Research Centre in Edinburgh. The analysis was undertaken in the National Records of Scotland SLS secure data centre. Ethical approval was issued by the University of Durham.

Consent for publication

The SLS Data Custodian approved the manuscript for publication.

Competing Interests

The authors declare that they have no competing interests.

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Authors' contributions

SC, CD, NC, CB, MC and JP conceived and designed the analysis. SC, GB and MC collected the data. MC, SC and GB contributed to the analysis. MC performed the analysis. MC and JP drafted the manuscript. All authors made substantial contributions to the final text in the manuscript.

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