Social Science & Medicine 312 (2022) 115383

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Examining the impact of different social class mechanisms on health inequalities: A cross-sectional analysis of an all-age UK household panel study

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A B S T R A C T

Background: Socioeconomic inequalities are well established across health, morbidity and mortality measures. Social class theory describes how social groups relate, interact and accrue advantages/disadvantages relative to one another, with different theorists emphasising different dimensions. In the context of health inequalities, different social class measures are used interchangeably to rank population groups in terms of health rather than directly exploring the role of social class in creating inequalities. We aim to better understand how four distinct social class mechanisms explain differences in a range of self-reported and biological health outcomes.
Methods: We use data from the UK Household Longitudinal Study, a representative population survey of UK adults, to identify measures pertaining to Early years, Bourdieusian, Marxist, and Weberian social class mechanisms. Using logistic and least-squares regression we consider the relative extent to which these mechanisms explain differences in health (Self-reported health, SF12 Physical (PCS) and Mental (MCS) Component Scores, General Health Questionnaire; N = 21,446) and allostatic load, a biomarker-based measure of cumulative stress (N = 5003).
Results: Respondents with higher social position according to all social class measures had better self-rated, physical and mental health, and lower allostatic load. Associations with Marxist social class were among the strongest (e.g. Relative Index of Inequality for very good/excellent self-rated health comparing highest versus lowest Marxist social class: 4.96 (4.45, 5.52), with the Weberian measure also strongly associated with self-rated (4.35 (3.90, 4.85)) and physical health (Slope Index of Inequality for SF12-PCS: 7.94 (7.39, 8.48)). Health outcome associations with Bourdieusian and Marxist measures were generally stronger for women and older respondents, and physical health associations with all measures were stronger among those aged 50+ years.
Conclusions: The impact of social class on health is multi-faceted. Policies to reduce health inequalities should focus more on unequal capital ownership, economic democracy and educational inequalities, reflecting Marxist and Weberian mechanisms.

1. Introduction

Health inequalities can be defined as the "systematic, avoidable and unfair differences in health outcomes that can be observed between populations, between social groups within the same population, or as a gradient across a population ranked by social position" (McCartney et al., 2019a). These inequalities are pervasive across most measures of health, illness and mortality, and represent some of the starkest injustices in modern societies (Marmot MA et al., 2020). Although there is a clear causal relationship between political economy and health inequalities, including inequalities in income, wealth and power, welfare state type and generosity, and specific economic and social policies (Beckfield and Krieger, 2009; McCartney et al., 2019b), there has been less written on how social class mechanisms link political economy and health inequalities (McCartney et al., 2019c). Indeed, it is more often the case that measures of social class are simply used as means of ranking population groups to measure health inequalities rather than to explain these inequalities (Mackenbach et al., 2008) and social class theorisation is therefore inadequate in this research (Muntaner and Lynch, 1999; Bartley et al., 1999).

Social class theory is well developed and describes the different ways in which social groups relate to one another, interact, and accrue advantages and disadvantages relative to one another, with different theorists emphasising different dimensions. Wright has previously sought to review and integrate a wide range of social class theories (Wright, 2015) and, in doing so, drew out, critiqued, and integrated the key mechanisms identified across theorists. The first of these theories was that of 'individual attributes'. This identifies social groups by shared

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https://doi.org/10.1016/j.socscimed.2022.115383
Received 9 February 2022; Received in revised form 24 August 2022; Accepted 16 September 2022
Available online 20 September 2022

economic and cultural characteristics and the social connections the individuals within these groups enjoy, rather than defining social class as a relational concept between social groups (Savage, 2015). The second, Bourdieu's theories of habitus and distinction, refer to the ways of living and being within social groups that are then used as a means of restricting or facilitating access to opportunities or resources (Bourdieu, 1984). Examples of this include accent, dress and the ability to refer to particular aspects of 'low' or 'high' culture in discussion. This leads to the third, Weber's theories of opportunity hoarding and social closure, wherein social groups find ways of blocking others from opportunities (often well-paid work or education) (Weber, 1978). Common means of achieving this have included marriage and colour bars, education credentials and nepotism. Fourth, Marx's theories of exploitation, domination and power relations are described, where the focus is on labour market relations where owners of capital are able to extract profits and control the activities of those who do not own capital (Marx, 1990). Finally, an early years mechanism is proposed in which people are exposed to all of the other social class processes through the proxy of their family, household and developmental context, thereby representing the intergenerational shaping of differential opportunities and outcomes.

More recently, these theorisations have been expanded slightly to incorporate consideration of intersectionality and discrimination and have been applied to the challenge of explaining health inequalities (McCartney et al., 2019a). However, applying and testing which theories can explain health outcomes is demanding of data across the life course and suffers from insufficiently sensitive measures of each of these theories (Wami et al., 2020). Some attempts have previously been made to understand the social class processes underlying inequalities in health rather than simply ranking by socioeconomic position. For example, Davey Smith (Davey Smith et al., 1998) used occupational social class and educational attainment data to explore whether material or cultural theories of social class explained more of the mortality differentials within the study population and found that the former was more important. Using international data, the importance of working-class power in contrast to measures of social capital, in explaining health outcomes has also been identified (Muntaner et al., 2002). In addition, different social class measures may mean different things to different groups. For example, some studies have reported that social class inequalities strengthen with age (cumulative disadvantage hypothesis) (Benzeval et al., 2011) while others suggest that they weaken (age as leveller hypothesis) (Dupre, 2007). Similarly, Muntaner (Muntaner et al., 2003) has reported that ownership and control of productive assets explain mental health outcomes in Barcelona for men but not women, alluding to the gendered and intersectional nature of the class relationships (Bartley, 1999; Borrell et al., 2004).

Despite these findings, there has not yet been a comprehensive test of the explanatory power of the full theorisation proposed by McCartney (McCartney et al., 2019a). Wami et al. (2020) used data from the National Child Development Study (NCDS) to explore the potential of existing longitudinal cohort data for measuring different social class theories. The authors were able to map NCDS variables to four of the five social class mechanisms described by McCartney (McCartney et al., 2019a) with different degrees of success, and also demonstrated associations between these variables and SF-36 physical, emotional and general health at age 50 years. However, they highlight a number of limitations to their study, for example restriction to self-reported health outcomes, variability in numbers and sizes of categories in derived social class variables, and the use of a relatively young cohort (all aged 50 years) in assessing the longer-term health effects of social class when research has shown that the extent of inequalities varies across the life course (Benzeval et al., 2011). The current study builds on and extends this work, using data from a representative population survey of UK adults of all ages. In particular, we map survey variables to social class measures using Indices of Inequality to allow direct comparison of the relative strength of associations between these measures and a wider range of health outcomes, including objective biomarker data, and we explore how associations vary according to gender and age. Our research aims are to: (i) consider the relative extent to which exposure to four of the five social class mechanisms proposed by McCartney (McCartney et al., 2019a) can explain differences in a range of self-reported and biological health outcomes and (ii) understand how associations between these mechanisms and health outcomes vary according to gender and age.

2. Methods

Analyses are based on data from *Understanding Society*, the UK Household Longitudinal Study (UKHLS) (Buck and McFall 2011; University of Essex, Institute for Social and Economic Research, 2021), details of which have been reported previously (Lynn, 2009). Briefly, the UKHLS, which began in 2009, is a longitudinal survey of 40,000 households in England, Scotland, Wales and Northern Ireland with data currently available from eleven collection waves. The main UKHLS combines three samples, the largest of which is the General Population Sample (GPS) and is based on households drawn randomly from a stratified clustered sample of postcode sectors in England, Wales and Scotland and a random sample of postcode sectors in Northern Ireland, ensuring that they are representative of the UK population. The second sample is the Ethnic Minority Boost Sample (EMBS), which is an oversampling of the five main ethnic minority groups in the UK (Indian, Pakistani, Bangladeshi, Black Caribbean and Black African) so that at least 1000 adults from each group were included at wave 1. The third sample, which joined UKHLS in wave 2, is a sample of households from the British Household Panel Survey (BHPS), which has been running since 1991. Individuals from households in all samples are contacted annually to collect information on changes to their household and individual circumstances. GPS respondents recruited in wave 1 have been shown to be representative of the corresponding census population at the neighbourhood level (Petersen, 2013). The impact of non-response and attrition has been examined in detail (Benzeval et al., 2020) and inverse probability weights have been developed to ensure that analyses based on the three samples (GPS, EMBS, BHPS) combined are representative of the UK population (Lynn, 2011; Lynn PK, 2010). The current analyses are based on interview data collected from adult (aged 16+ years) respondents from all three samples who took part in both waves 2 and 3, as data from both waves was used to derive social class measures. Biomarker data was also collected in follow up nurse interviews at waves 2 (GPS) and 3 (BHPS) on a subgroup of these samples.University of Essex, Institute for Social and Economic Research, 2010 The EMBS was not offered a nurse interview. Fieldwork for each wave is carried out over two years, and in year 2 of wave 2 only 81% of the GPS were invited in order to include the BHPS sample given field-force limitations at the time. Participants needed to have carried out the relevant main wave 2 or 3 interviews, have English as their first language, not be pregnant and not have moved or left the Study (McFall SLP et al., 2014; Benzeval et al., 2014). All results presented here are based on complete-case analyses.

2.1. Social class theory measures

Four measures of social class were derived, each representing a different social class mechanism. Each measure was based on the sum of three variables, coded from 0 to 4, giving a social class score between 0 and 12. The first of these scales pertains to Early Years and is based on parental occupation, parental education and the age at which the respondent left school. Bourdieusian theory is represented by participation in mid/high-brow activities (including dancing, singing, playing a musical instrument, writing music, participating in drama or opera, painting, drawing or sculpting, reading for pleasure, writing prose or poetry, and membership of a book club), attendance at mid/high-brow events (including exhibition, play, opera, classical music performance,

ballet or contemporary dance), and volunteering or giving to charity. Marxist theory comprises housing tenure and car ownership, income from property or capital, and autonomy based on strength of agreement with the statement "What happens in life is beyond my control". Weberian theory is derived from respondents own educational qualifications, income and individual occupational social class. All measures are individually based, e.g. using own occupational class and income rather than household. We could not identify contemporaneous data to evaluate exposure to discrimination, and so this mechanism was not included.

2.2. Health outcomes

Outcome variables were selected to cover several different aspects of physical and mental health. The first, self-rated health, compared respondents with very good or excellent health with those rating their health as good, fair or poor. Physical health was assessed more objectively using the SF-12 Physical Component Summary (PCS) and mental health using the SF-12 Mental Component Summary (MCS) (Ware et al., 1998). The General Health Questionnaire-12 (GHQ-12) was also included as a measure of psychological distress (Goldberg DW, 1988). In addition, biomarker data were available for a subset of respondents who also took part in a Nurse Health Assessment at wave 2 (33) Biomarker data were used to derive allostatic load, a measure of cumulative stress (McEwen, 1998), based on 11 measures (Chandola et al., 2019) covering five physiological systems as presented in Table 1. For each biomarker the "worst" quartile was identified separately by gender and 10 year age group, given the different distributions for a number of biomarkers by age and sex, and accounting for medication use (Robertson et al., 2015). Allostatic load for each individual was then calculated as the number of worst quartiles, giving a score from 0 to 11 with higher scores indicating greater cumulative stress.

2.3. Statistical methods

Separate analyses for each health outcome were based on respondents with complete data for all social class measures and the health outcome of interest. The analytical sample for allostatic load, consisting of respondents with complete data for all social class measures and allostatic load, was markedly smaller than those for the questionnaire-based health outcomes as allostatic load was only available for respondents taking part in the Nurse Health Assessment. Analyses of self-rated health outcomes based on the reduced allostatic dataset were similar to those presented here.

Self-rated health was operationalised as a binary variable (excellent/very good versus good/fair/poor) while other questionnaire-based health outcomes (SF12-PCS, SF12-MCS, GHQ-12) and allostatic load were based on continuous (score) measures. There was variation in the magnitude of categories in the different social class variables making direct comparison between their respective associations with health outcomes difficult. We therefore derived an Index of Inequality for each measure, putting them all on the same scale and reducing the influence of extremes in the distribution of respondents in each category (Regidor, 2004). The Index of Inequality is based on the cumulative proportion ranking of the study population and produces a score between 0 and 1 (the lowest and highest possible respectively) based on the midpoint of the proportion of the population in each category. Analyses of self-rated health were based on logistic regression models, regressing the binary self-rated health outcome on each social class Index of Inequality, giving a Relative Index of Inequality (RII) for each, which represents the relative odds of excellent or very good self-rated health comparing the highest versus lowest social class. Similar analyses were carried out for each of the continuous questionnaire-based health outcomes and for allostatic load, this time based on least squares regression. In these models the resulting Slope Index of Inequality (SII) represents the difference in health outcome score again comparing the highest versus lowest social class for each measure. The use of RII/SII coefficients allows comparison of the respective impact on health outcomes of the different social class measures. Separate models were fitted for each social class measure with no additional adjustment made for other social class measures.

Preliminary analyses were based on all respondents in the analytical sample, adjusting for gender and age. Secondary stratified analyses compared differences in associations between (a) men and women (adjusted for age) and (b) younger (aged <50 years) and older (aged 50+ years) respondents (adjusted for gender). All models included inverse probability weights to take account of unequal selection probabilities into the study and differential non-response at each wave. These weights ensure the results are reliable estimates representative of the UK adult population living in private households (University of Essex, Institute for Social and Economic Research, 2021).

Table 1
Derivation of allostatic load.

System	Biomarker	Accounting for	Worst quartile
Endocrine	Dehydroepiandosterone Sulfate		Lowest
Inflammatory/ Immune	Insulin-like growth factor	Statins, HRT, contraception, anti-inflammatories	Lowest
	C-reactive protein	HRT, contraception, anti-fibrinolytic, haemostatics	Highest
	Fibrinogen		Highest
Metabolic	Haemoglobin A1c	Anti-inflammatories, aspirin Statins	Highest
	Total-HDL cholesterol ratio		Highest
	Triglycerides		Highest
Cardiovascular	Systolic blood pressure	Anti-hypertensives	Highest
	Diastolic blood pressure	Anti-hypertensives	Highest
	Waist-height ratio		Highest
Liver	Creatinine clearance rate		Lowest

3. Results

In total 40,742 GPS, EMBS and BHPS respondents were interviewed in both waves 2 and 3. Of these, 21,446 (53%) had complete data for all social class theory measures and were included in the analyses of self-rated, physical and mental health, while a subgroup of 5003 respondents also had allostatic load data. The characteristics of the analytical samples are presented in Table 2. On the basis of the overlapping data for respondents included and excluded from the analyses of health outcomes, there was little or no difference between our analytic sample and all panel respondents in the waves of interest, although those included in the allostatic load subgroup analyses were slightly older.

Fig. 1 presents associations between health outcomes and social class theory measures. Graphs for GHQ-12 and allostatic load, for which lower scores represent better outcomes, are reverse coded so that higher scores represent better outcomes for comparison with self-rated health and SF-12. All social class measures were strongly associated with all health outcomes, with respondents with the highest social position according to each scale having higher odds of excellent or very good self-rated health, higher SF-12 PCS and MCS scores, and lower GHQ-12 scores and allostatic load (i.e. better health based on all measures). The strongest associations for self-rated and physical health (SF12-PCS) were those with Marxist and Weberian measures (e.g. RII (95% CI) for self-rated health comparing highest versus lowest Marxist social class: 4.96 (4.45, 5.52)) and the strongest associations with mental health

Table 2
Characteristics of survey respondents and analytical samples.

	All survey respondents (N = 40,742)	Main analytical sample (N = 21,446)	Allostatic load analytical sample (N = 5003)
Gender (%)			
Male	43.3	43.4	44.0
Female	56.7	56.6	56.0
Age (%)			
<50 years	53.8	50.5	41.2
50+ years	46.2	49.5	58.8
Self-rated health (%)			
Excellent/ Very good	50.1	51.4	52.9
Good/Fair/ Poor	49.9	48.6	47.1
Mean (SD) GHQ-12	11.1 (5.5)	11.1 (5.4)	10.9 (5.2)
Mean (SD) SF12-PCS	49.5 (11.3)	49.7 (11.2)	50.1 (10.5)
Mean (SD) SF12-MCS	49.9 (9.6)	50.2 (9.4)	50.8 (9.0)
Mean (SD) Allostatic load	3.1 (2.0)	3.0 (2.0)	3.0 (2.0)
Mean (SD) Early years score	9.0 (2.9)	9.1 (2.9)	9.0 (2.9)
Mean (SD) Bourdieu score	5.6 (2.6)	5.9 (2.6)	6.3 (2.6)
Mean (SD) Marxist score	8.2 (2.4)	8.3 (2.4)	8.7 (2.3)
Mean (SD) Weberian score	9.2 (3.6)	9.5 (3.6)	9.6 (3.5)

(GHQ-12 and MCS) were those with the Marxist measure (e.g. SII for GHQ-12 comparing highest versus lowest Marxist social class: 3.71 (−3.99, −3.42)). Associations with allostatic load were more consistent with just a suggestion of stronger associations with Marxist and Weberian theories.

Results stratified by gender are presented in Fig. 2. Associations with the Early years mechanism were generally fairly similar for men and women. Bourdieusian and Marxist measure associations were consistently stronger for women than for men and this was particularly true for self-rated health and mental health (e.g. RII/SII (95% CI) for self-rated health, SF12-MCS, and GHQ-12 according to Bourdieusian social class in women versus men: 3.64 (3.15, 4.20) versus 2.66 (2.26, 3.12), *p for interaction=0.01*; 2.55 (1.80, 3.29) versus 0.63 (−0.14, 1.40), $p < 0.001$; and −1.56 (−1.98, −1.15) versus −0.97 (−1.40, −0.55), *p=0.01* respectively). There was no consistent gender-difference in associations with Weberian social class, with just SF12-PCS associations stronger for men versus women (8.64 (7.85, 9.44) versus 7.11 (6.37, 7.84), $p < 0.001$).

Fig. 3 presents results stratified by age. Associations with the Early years mechanism were broadly similar across age groups with the exception of SF12-PCS for which associations were stronger in older respondents (6.64 (5.75, 7.53) versus 4.10 (3.38, 4.82) in older versus younger respondents, *p for interaction* < 0.001). In contrast, there was a consistent pattern of markedly stronger associations with Bourdieusian social class among those aged 50+ years across all health outcomes (e.g. RII for better self-rated health for older versus younger respondents: 4.53 (3.91, 5.26) versus 2.19 (1.88, 2.56), $p < 0.001$). Associations with Marxist social class were also stronger for older respondents, particularly in analyses of SF12-PCS (11.27 (10.34, 12.20) versus 5.67 (4.98, 6.35) for older versus younger respondents, $p < 0.001$), although other differences were less marked than those for Bourdieusian social class. Associations with Weberian social class were more consistent across age groups although there was some evidence of a stronger association with SF12-PCS among older versus younger respondents (8.66 (7.77, 9.55) versus 6.18 (5.47, 6.89), $p < 0.001$).

4. Discussion

The present study extends previous work by considering the relative strength of associations of four of the five social class mechanisms proposed by McCartney (McCartney et al., 2019a) with a range of self-reported and biological health outcomes, and, moreover, how these vary according to age and gender. Respondents with higher social position according to the Early years mechanism, and Bourdieusian, Marxist, and Weberian measures had better self-rated, physical and mental health, and lower allostatic load, a biomarker-based measure of cumulative stress. Associations with Marxist social class were generally among the strongest, with the Weberian measure also particularly strongly associated with self-rated and physical health. Health outcome associations with Bourdieusian and Marxist measures were generally stronger for women and older respondents, and physical health associations with all social class measures were stronger among those aged 50+ years.

The current analyses have a number of strengths and limitations. The results are based on analyses from a large representative longitudinal survey of UK adults and analytical weights were used throughout to increase the representativeness of the sample with the UK general population. Analyses of questionnaire-based health outcomes were based on a larger analytical sample than analyses of allostatic load. However, results from sensitivity analyses of questionnaire-based outcomes based on the smaller allostatic load sample were very similar to those presented here, suggesting that any differences in associations were not due to differences in the analytical sample. The outcome measures included subjective self-rated health as well as measures of mental and physical health based on validated instruments, and a biomarker-based measure of cumulative stress. The social class measures were derived from detailed longitudinal data covering the whole life course but were driven, to some extent, by data availability and the success of each in representing the social class theory in question may therefore be variable; for example car ownership as a marker of capital is limited by urban-rural differences, with people overinvesting in cars relative to capital position in rural areas due to lack of public transport and vice-versa. The Early years mechanism was based on retrospective questions and, as a result, may be more susceptible to recall bias, which may partially explain the weaker associations with health outcomes. In addition, Bourdieusian social class was based on responses to a list of specific activities and events, which covered a wide range of interests but tended more towards mid/high culture and does not account for changes in culture over time (for example the rising popularity of football among higher social class, and decreased affordability for lower social class individuals over time). In general, the differences in associations that were observed between different mechanisms may to a degree reflect the ability of the available data to capture the essence of each.

Where other studies have considered the contribution of different social class mechanisms in generating inequalities in health, the findings have been broadly similar to those identified here (Muntaner et al., 2015). For example, Muntaner and colleagues identified that economic inequality and working-class power was more strongly associated with a range of health outcomes compared to more Bourdieusian social capital measures (Muntaner et al., 2002), while several autobiographical (Eribon, 2019; Barr, 2014; Charlesworth, 1999; McGarvey, 2018), ethnographic (McKenzie, 2015) and qualitative accounts (Mackenzie et al., 2017) of social class mechanisms also speak to the interlinked nature of social class mechanisms and structural discrimination. Also in common with previous work (Whitley et al., 2018), our results demonstrate that social class across the full life-course has a marked impact on health inequalities and, although the weakest associations were generally with the most distal Early years mechanism, there were still clear inequalities

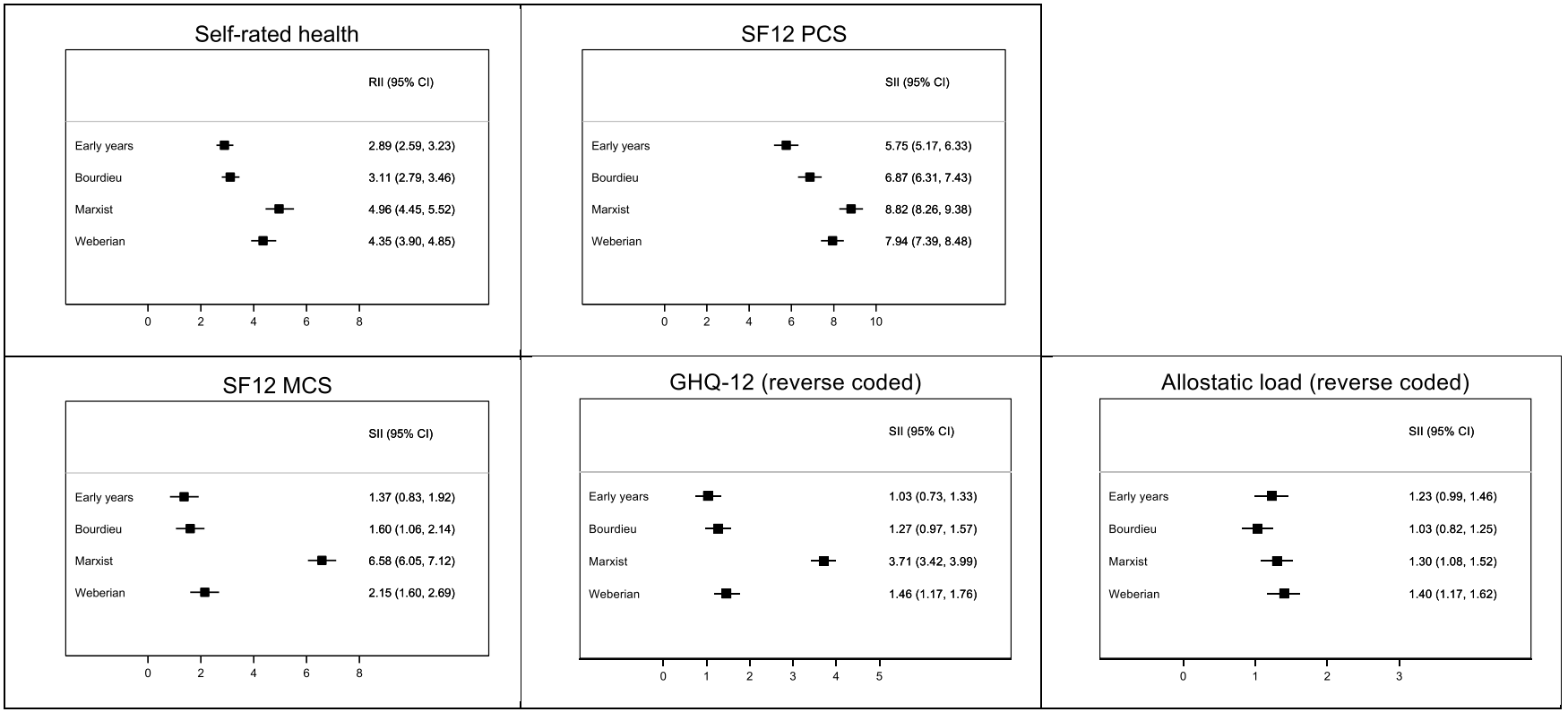

Fig. 1. RII (95% CI) for excellent or very good self-rated health and SII (95% CI) for SF12 PCS, SF12 MCS, GHQ-12 (reverse coded) and allostatic load (reverse coded) according to overall social class theory score (highest versus lowest) adjusted for gender and age. In all graphs moving from left to right along the x-axis indicates increasing inequality.

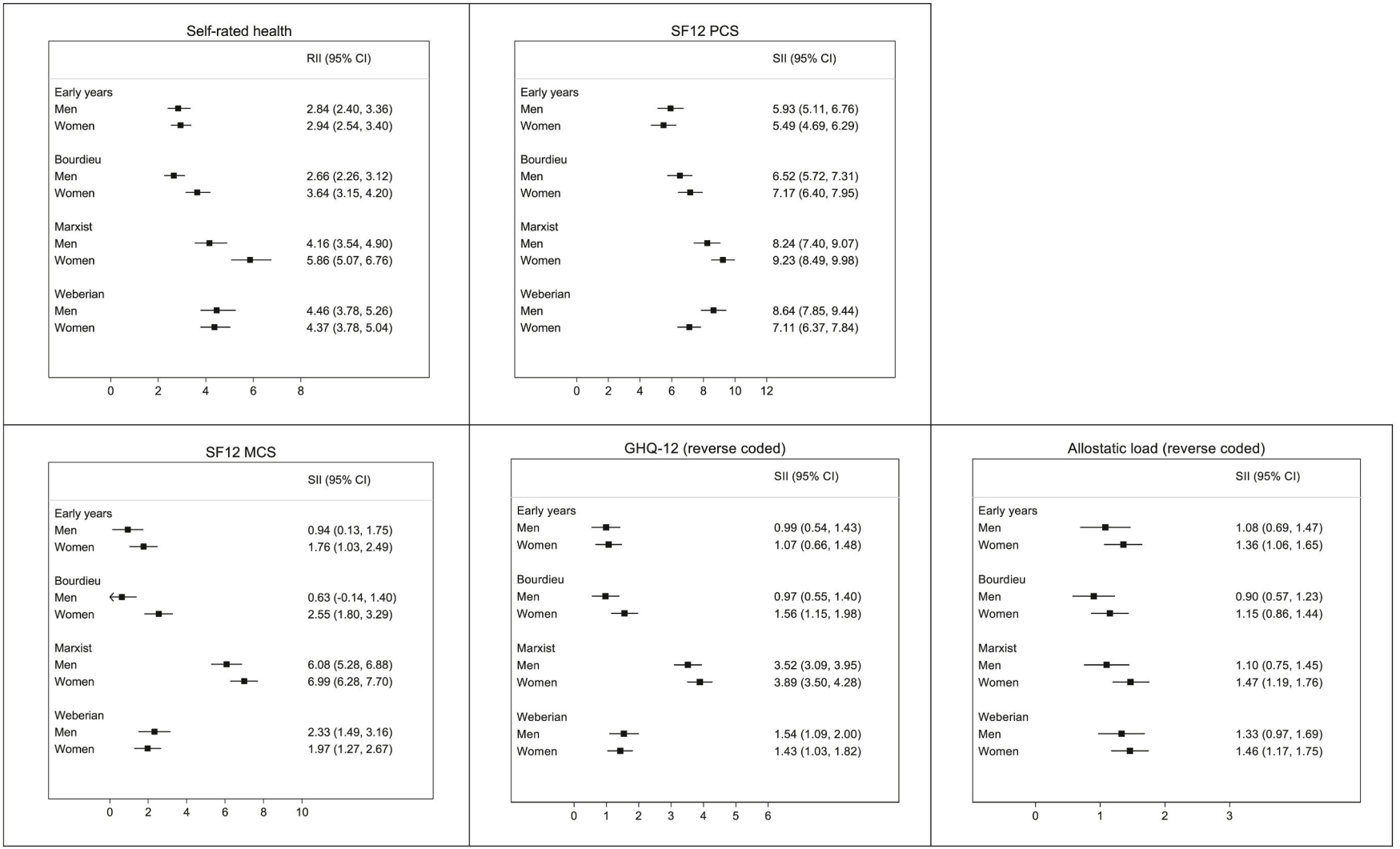

Fig. 2. RII (95% CI) for excellent or very good self-rated health and SII (95% CI) for SF12 PCS, SF12 MCS, GHQ-12 (reverse coded) and allostatic load (reverse coded) according to overall social class theory score (highest versus lowest) in men versus women (adjusted for age). In all graphs moving from left to right along the x-axis indicates increasing inequality.

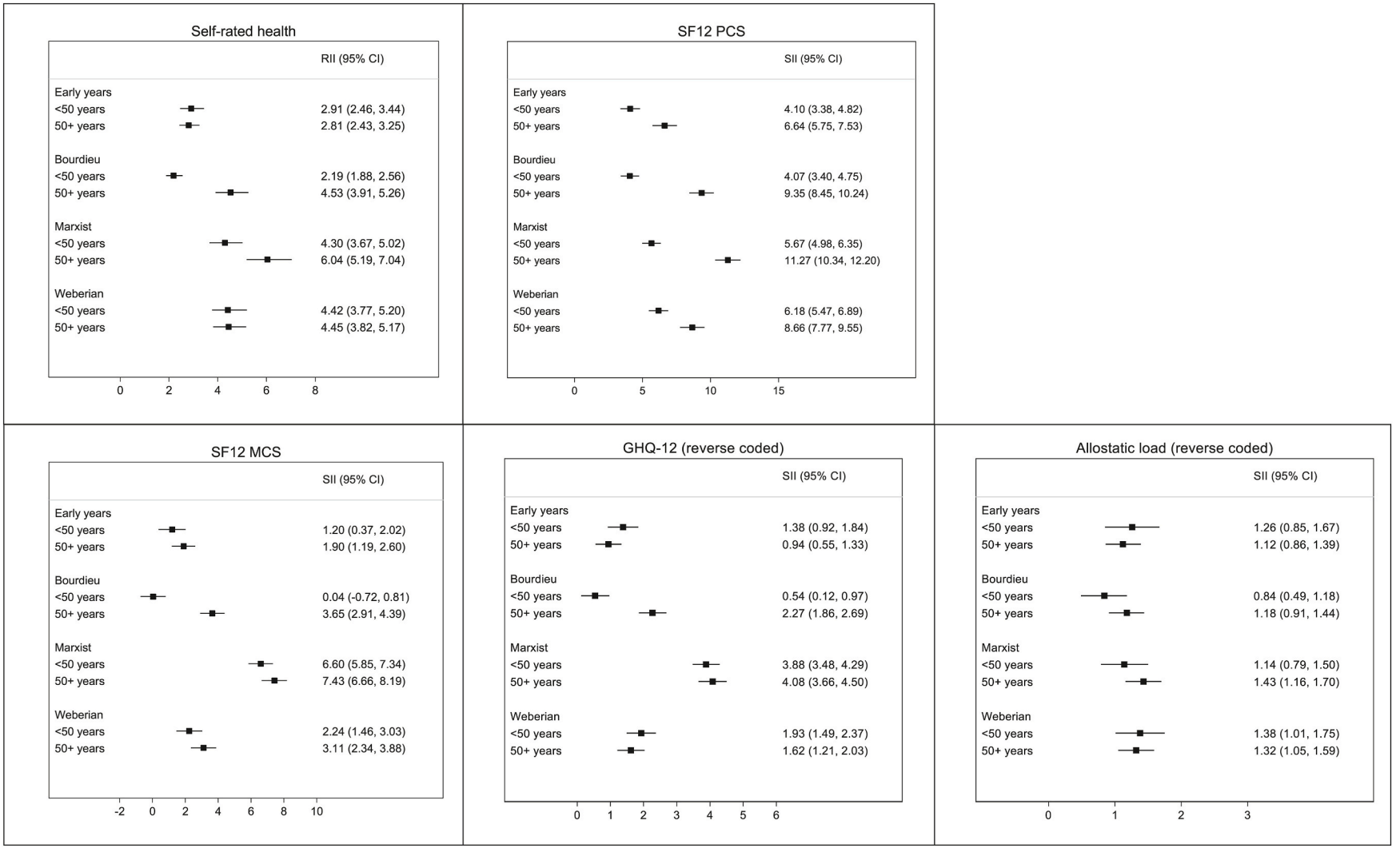

Fig. 3. RII (95% CI) for excellent or very good self-rated health and SII (95% CI) for SF12 PCS, SF12 MCS, GHQ-12 (reverse coded) and allostatic load (reverse coded) according to overall social class theory score (highest versus lowest) in respondents aged <50 versus 50+ years (adjusted for gender). In all graphs moving from left to right along the x-axis indicates increasing inequality.

even in the oldest groups. The current work also highlights the importance of recognising the differential impact of different social class mechanisms to different groups, for example those defined by gender and age.

The implications of this study are multiple. For researchers, there is scope for further work to deepen the theorisation and measurement of social class mechanisms, and to test their causal relationships to subsequent health (and social and economic) outcomes. In particular, there is a gap examining the relationship with mortality outcomes because of the relatively young nature of most of the longitudinal studies that contain sufficient data across social class mechanisms. For policymakers interested in reducing inequalities in health (and social) inequalities, the finding that the Marxist mechanisms of exploitation and domination have the largest impact suggests that policy development should be mindful of the structure of the economy, including ownership of capital, inequalities in power (Reynolds, 2021; McCartney et al., 2021a; Friel et al., 2021; Topp et al., 2021), and the control different social class groups have over their economic life (Whitehead et al., 2016). For example the rise in rent extraction by privileged groups has been identified as an issue of concern (Sayer and McCartney, 2021), leading to discussion of potential responses that reflect the need for better economic democracy (Cumbers et al., 2020), community wealth building, and inclusive or wellbeing economies (Shipton et al., 2021). Policy to address the Weberian mechanisms which generate social closure is also important. The inequalities in experience of the education system, for example the advantages experienced by those attending fee-paying schools, is a potentially important source of health inequalities (Zajacova and Lawrence, 2018; Parker et al., 2020; Wu et al., 2020). Although intersectional and discriminatory social class mechanisms were not measured in this study it is important that these also be recognised by policymakers, for example addressing issues of misogyny, racism and all forms of structural discrimination. As countries consider the range of challenges they face as they emerge from the initial waves of the COVID-19 pandemic, there is an opportunity to enact policies that can simultaneously address these health, equity, ecological and social crises (McCartney et al., 2020, 2021b).

5. Conclusion

This study finds strong associations between four social class mechanism and a wide range of health outcomes across all age groups. The Marxist and Weberian measures which encapsulate the experiences of exploitation and domination in the economy, and the processes of social closure (in particular relating to the impacts of inequalities in education) are particularly powerful explanations for the observed health inequalities. Policymakers interested in reducing health (and other forms of) inequality should consider issues of unequal capital ownership, economic democracy and educational inequalities as approaches to reducing the operation of the Marxist and Weberian mechanisms underlying health inequalities.

Funding

Understanding Society is an initiative funded by the Economic and Social Research Council (ESRC ES/M008592/1) and various Government Departments, with scientific leadership by the Institute for Social and Economic Research, University of Essex, and survey delivery by NatCen Social Research and Kantar Public. EW is funded by the Medical Research Council (MC_UU_00022/2) and Scottish Government Chief Scientist Office (SPHSU17). MBe is funded by ESRC (ES/S007253/1). The funders had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Authors' contributions

All authors designed the study and collectively drafted the paper. EW carried out the statistical analyses. All authors critically revised the article, contributed to data interpretation and finalised and approved the manuscript.

Ethics approval and consent to participate

The University of Essex Ethics Committee has approved all data collection on Understanding Society main study. Approval for the collection of biosocial data by trained nurses in Waves 2 and 3 of the main survey was obtained from the National Research Ethics Service (Understanding Society - UK Household Longitudinal Study: A Biosocial Component, Oxfordshire A REC, Reference: 10/H0604/2).

Declaration of competing interestCOI

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Availability of data and materials materials-methods

Data from the Understanding Society are available for download from the UK Data Service: Understanding Society: Waves 1–11, 2009–2020 and Harmonised BHPS: Waves 1–18, 1991–2009. SN: 6614, http://doi.org/10.5255/UKDA-SN-6614-15 and Understanding Society: Waves 2 and 3 Nurse Health Assessment, 2010–2012. SN:7251. http://doi.org/10.5255/UKDA-SN-7251-3.

Data availability

Data will be made available on request.

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