TITLE: Inequalities in time from stopping paid work to death: findings from the ONS Longitudinal Study, 2001 to 2011

Emily T Murray,[1*] Ewan Carr,[1,2] Paola Zaninotto,[1] Jenny Head,[1] Baowen Xue,[1] Stephen Stansfeld,[3] Brian Beach,[4] Nicola Shelton[1]

[1] Department of Epidemiology and Public Health, University College London, London, WC1E 7HB, UK

[2] Biostatistics and Health Informatics, Institute of Psychiatry, Psychology & Neuroscience, King's College London, London, SE5 8AF, UK

3 Queen Mary University of London, Wolfson Institute of Preventive Medicine, Centre for Psychiatry, London, EC1M 6BQ, UK

[4] International Longevity Centre – UK, SW1P 3QB, London, UK

* Corresponding author.
Department of Epidemiology & Population Health,
University College London, 1-19 Torrington Place, London WC1E 7HB.
Telephone: +44(0)20 3108 3339
Email: emily.murray@ucl.ac.uk

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ABSTRACT

Background: United Kingdom State pension eligibility ages are linked to average life expectancy, which ignores wide socioeconomic disparities in health, and overall, life expectancy.

Objectives: Investigate whether there are occupational social class differences in the amount of time older adults live after they stop work, and how much of these differences are due to health.

Methods: Participants were 76 485 members of the ONS Longitudinal Study (LS), who were 50-75y at the 2001 census and had stopped work by the 2011 census. Over 10 years of follow-up, we used censored linear regression to estimate mean differences in years between stopping work and death by occupational social class.

Results: After adjustment for age, both social class and health were independent predictors of post-work duration [Mean difference (95% CI): Unskilled class vs Professional 2.7yrs (2.4, 3.1); not good vs good health 2.4yrs (1.9; 2.9)], with LS members in the three manual classes experiencing ~1 additional year of post-work duration than professional workers (interaction p-values all <0.001). Further adjustment for gender and educational qualifications reduced, but did not eliminate social class and post-work duration associations. We estimate the difference in post-work years between professional classes in good health and unskilled workers not in good health as 5.1 years for women (21.0 vs 26.1) and 5.5 years for men (19.5 vs 25.0).

Conclusions: Lower social class groups are negatively affected by uniform state pension ages, because they are more likely to stop work at younger ages due to health reasons.

Key words: inequality; mortality; labour market; social class

What is already known:

- In most industrialised countries, eligibility ages for state pensions are being increased.
- The impetus for these ages increases have been based on increases in average life expectancy.
- There are wide inequalities in life expectancy and healthy life expectancy.

What this study adds:

- Lower occupational social classes tend to live more years after stopping work than professional classes.
- These associations were partially, but not entirely, explained by baseline health, age, gender and educational qualifications.
- Workers in manual social classes with poor health experienced an additional year of post-work duration compared to professionals not in good health.
- A uniform State Pension Age negatively affects lower occupational social classes, as greater proportion will be waiting longer periods between stopping work and qualifying for their state pension, potentially in poor health.

INTRODUCTION

In most industrialised countries, eligibility ages for state pensions are being increased. Between 2011 and 2018, the United Kingdom government raised the State Pension Age (SPA) for women from age 60 to 65, to match the SPA for men, with further increases to age 67 for both genders planned by 2028. Beyond 2028, both the Independent review of the State Pension[1] by the Department for Work and Pensions[2] and the Government Actuary Department[3] have recommended a further increase to age 68 by 2039.

The impetus for these rises in SPA is the current government policy that people should expect to spend, on average, "up to one third of their adult life in receipt of the State Pension".[3] Since 1970, there have been rapid increases in life expectancy,[4] resulting in an increasing ratio of pensioners per working age population.[5] However, use of average life expectancy to calculate SPA ignores the wide variations in life expectancy that occur across social class groups.[6] In the UK, mean differences in life expectancy between the lowest and highest occupational social groups are 4.3 years for men and 3.1 years for women aged 65 years.[7] Given the UK also has a uniform SPA, persons in lower class occupations may be experiencing a disproportionately shorter amount of time in receipt a state pension after exiting the workforce.

To complicate this picture, social class differences in healthy life expectancy are even starker than those seen for general life expectancy. For example, men aged 50 in professional occupations are expected to live a further 25 years in good health, while men in manual occupations can only expect 18 years: a seven-year difference.[8] This can be seen in the higher rate of disability pension uptake for lower social class groups.[9-14] With the tightening of eligibility rules for disability benefits,[15] a rising SPA could therefore have a disproportionate impact on

people in lower social class groups, who are more likely to leave employment early due to health and unemployment reasons,[16;17] but are not eligible for incapacity benefit and must wait until increasingly older ages to qualify for a state pension.[18]However, no studies that have examined whether lower social class groups tend to have shorter or longer amounts of time between stopping work and death, compared to higher social class groups, or whether these social class differences exist for people in good and poor health.

METHODS

Study population

The Office for National Statistics (ONS) Longitudinal Study (LS) is a 1% representative sample of the English and Welsh censuses 1971-2011. For each census year, all persons who completed a postal questionnaire (or an online questionnaire in 2011), were selected for the LS if they had one of four selected birth dates. Immigrants and new births were subsequently added to the sample if their birthday fell on one of the selected birth dates. If an LS member responded to a subsequent census, the new census data was added to their record. Further information on the LS's structure, methodology and quality of data (e.g. 94% response rate for the 2011 census) can be found elsewhere.[19] For our analysis, we included respondents to the 2001 census (29th April 2001) that were aged 50-75 and had stopped work by the 2011 census (27th March 2011). This sample was chosen for its representativeness to individuals being targeted by the Extending Working Life Sector Initiative, a government programme aimed at extending employment rates for individuals aged 50+ years.[20] The sample was born in 1951 or earlier, so men would have been eligible for SPA at age 65 and women at age 60 years.

Outcome

Time from stopping work until death was calculated as age at death (or age of right-censoring for those still alive at the end of follow -up in 2011) minus the age they stopped work.

Age of death was calculated from year and month of death data from annual matches of ONS LS members with death certificate data.[21] At the time of analysis, all-cause mortality data were available up to 31st December 2013. For this analysis, we censored follow-up at 27th March 2011, to match the census data collection completion day.[22] Age of stopping work was calculated from responses to the 2001[23] and 2011[24] censuses. LS members self-reported if they were doing any paid work in the week preceding the census. If the respondent answered 'no' to paid work in the last week, they were then asked in subsequent questions if they had ever worked and the year they had last worked. Specific calculations of age stopped work are located in Supplementary file 1.

Sensitivity analyses was conducted where, rather than using the midpoint, the age of stopping work was imputed using either (ii) 1/10 or (ii) 9/10 of the distance between age in 2001 and age at death.

Exposure

Occupational social class is based on the Registrar-General's social class schema (RGSC) that was used in British official statistics on births and deaths from 1951-2001. The RGSC produces six homogenous groups of people with similar levels of occupational skills,[25] and may be more strongly related to mortality than other UK occupational social measures.[26]

For the 2001 English and Welsh censuses, LS members were asked the full title of their main job, whether they were self-employed with or without employees, and whether they were an employee or a supervisor/foreman. If the respondent was not in employment in the last week, they were asked for the same information for their last main job. Based on this information, LS members were assigned to one of six occupational social classes – professional I, Managerial/technical II, skilled non-manual IIINM, skilled manual IIIM, partly skilled IV, and un-skilled V – from a pre-designated occupational skill level of the listed occupations,[27] which were collapsed according to the Occupation Classification scheme SOC90.[28]

Covariates

Health and demographic indicators measured at the 2001 census were investigated as potential confounders, including: (i) *self-rated health*—'over the last 12 months would you say, your health has on the whole been: good, fairly good or not good?', (ii) *age*, (iii) *gender* and (iv) *educational qualifications* [four categories of degree and above, A-level or O-level, no qualifications or other qualifications (e.g. City and Guilds, RSA/OCR, BTEC/Edexcel)].

Statistical analyses

Tests for trend across 2001 occupational social class categories were tested for all demographic, work and mortality predictors using linear regression for continuous variables and a non-parametric test of increasing or decreasing ranks across ordered groups (provided by the 'nptrend' command in Stata) for categorical variables. Censored linear regression was used to investigate whether there were occupational social class differences in years between stopping work and death (n=76,485). To account for unknown death dates for those still alive at the end of follow-up in 2011, the outcome was treated as right-censored (tobit). As each respondent would

be censored at a different age, we used the cnreg command in Stata to allow the censoring value allowed to vary by survey member. This model supposes that there is a latent variable that linearly depends on x via a parameter β, which determines the relationship between the independent variable x and the latent variable y.[29]

Initially, unadjusted models were fitted that estimated mean years between stopping work and death for each occupational social class (represented using dummy variables), compared to the reference class of professional (I) occupational class. As prior research has indicated that associations between social class and age of stopping work might vary by health, age, gender and education, we then tested whether an interaction existed by including interaction terms between each of the five social class dummy variables and each covariate. Each covariate was tested separately (e.g. the gender interaction model would include only the class, gender, and class*gender variables). We present results for interactions where p-values were <0.05 for any of the tested interaction terms within a covariate. Third, if all covariate interaction p-values were >= 0.05, the covariate was included in the model as a confounder. As health was the main covariate of interest, it was the first adjustment. As health, age, gender and education display complex relationships with each other, and with age of stopping work and age of death, we decided to display adjusted results in a step-wise manner.To check for linearity of the association between social class and post-work duration, all models were re-run with social class as an ordered categorical variable and F-tests were assessed for p-values < 0.05. All analyses were performed using Stata 14 (StataCorp, 2015).

RESULTS

Of the 148 606 original participants aged 50-75 in 2001, there were 110 918 with data on age of stopping work (including 3 903 imputed) (see Supplementary file 2). An additional 38 226 LS members were missing data on occupational social class, resulting in a final sample size of 76 485.

Table 1 shows that in 2001, 59.5% of women and 52.4% of men aged 50-75 were not working, with a greater percentage not working in lower social classes, compared to higher (p-value for trend<0.001). LS members from lower social classes were more likely to report ill health at baseline, be older and not have an educational qualification (all <0.001). The non-right-censored mean (SD) age of stopping work was 58.0 (6.5) years for women and 60.2 (6.3) for men, with lower occupational classes stopping work at younger ages (average years difference between Professional and Unskilled classes: women 2.1, men 3.2, test for trend both genders <0.001). Over the 10-year follow-up, in both genders, the lower the social class the higher the percentage of deaths (both <0.001). For LS members who had died (14.6% of women and 25.1% of men), within social class categories, the non-right-censored mean age stopped work was consistently lower for those who had died than the total sample mean.

Table 2 shows mean differences in years from stopping work to death for LS members who had stopped work by the 2011 census. In the unadjusted analysis (model 1), the lower the social class, the more time LS members lived between stopping work and death (p-value for trend <0.001). For example, an LS member who had worked in an unskilled occupation lived on average 3.9 years [95% confidence interval (CI): 3.6; 4.2)] longer between stopping work and dying than those LS members who had worked in a professional occupation. Health was a strong predictor

of post-work duration [Not good vs good: mean difference 4.1yrs (3.5; 4.8)], reducing mean differences for all social classes (model 2). Interactions between social class*health were not significant in model 2, but after adjustment for age (model 3) individuals who had worked in the bottom three social classes and reported not good health experienced an additional year of post work duration than if they reported the same health status but had worked in a professional occupation. The basic interaction results of social class, gender and class*gender showed that gender modified associations between social class and post-work duration (data not shown), but these interaction terms were eliminated when health status was added to the model (model 4). Further adjustment for educational qualifications (model 5) also reduced, but did not eliminate the effect of class on post-work duration. Interaction p-values for age and educational qualifications were all >=0.05 (data not shown). All p-values for social class trend tests remained <0.001 for all models.

The sensitivity analysis – replacing average imputed values of age of stopped work between age at the 2001 census and age at death with one-tenth and nine-tenths distance – did not substantially change results (data not shown).

Figure 1 uses data from Table 2, model 4 to show estimated mean time from stopping work to death by social class, gender and health, for LS members who were aged 65 in 2001. We estimate that if two women were age 65 in 2001, the woman who had worked in an unskilled occupation and reported not good health in 2001 would have lived a further 26.1 years (24.6; 25.9) years after they had stopped work, while the professional woman would have lived 21.0 years (95% CI: 20.2; 21.4) after they had stopped work; a difference of 5.1 years. Two men in the same circumstances would live on average 25.0 and 19.5 years from stopping work to death, respectively.

Discussion

In this nationally-representative sample of older individuals in England and Wales, we have shown for the first time that there are occupational social class inequalities in the number of years lived after stopping work. LS members who had worked in lower social classes lived a greater number of years after they stopped work, with more time per decreasing social class.

The processes leading more disadvantaged social classes to live a greater number of years after work exit are complex. Previous research using data from other Western European countries with similar retirement policies to the UK suggests that individuals at both ends of the class hierarchy are more likely to exit the labour market at later ages, but for different reasons. This literature has shown that workers in lower occupational grades need to stay in the workforce longer due to financial constraints (e.g. lower pension contributions and reduced access to private and occupational pension schemes), while more advantaged classes tend to stay later because they had better health, stronger work attachment and were less likely to be made redundant.[30] Our work, however, shows a clear gradient between lower class and earlier age of work exit. This suggests that, at least in the UK, factors pushing lower occupational grades out of the labour market are stronger than pull factors (e.g. financial constraints).

While we do not have information on why LS members exited the labour market, what we were able to show, and is supported by findings from four other British longitudinal studies, [31] is that health is one of the main drivers of why lower social class individuals tend to experience more time between stopping work and death. Our data is in in keeping with many other studies that have shown that lower social class men and women will experience fewer years in good health than professional workers.[8,32]

What our work additionally shows is that even for those individuals who develop poor health, individuals classified into one of the three lower social classes will live an additional year more after they stop work than professional workers. Given the large body of research showing that individuals in poor health and lower occupational classes tend to die at earlier ages,[32] the most likely explanation is that poor health has a greater impact on the ability of manual workers to stay in the labour market to later ages than non-manual workers. It is however important to consider that associations between social class and post-work years were not entirely explained by health. We recommend further studies to explore specific mechanisms more fully.

Strengths and weaknesses of this study

The ONS Longitudinal Study is a large nationally-representative dataset that includes individual data on occupational class, age of stopping work and health, linked to historical death records. Use of such a large study also allowed us to investigate the complex relationships between social class, age of stopping work, gender, health and mortality. A weakness of the study is that individual data are only collected every decade. Consequently, there is some imprecision concerning the timing of work exit for individuals who were working at the 2001 census but who died before the 2011 census (5% of sample). We attempted to correct for potential non-random missing work exit data by imputing an estimated age of stopping work. It would have also been preferable to have more frequent assessments of health, given the importance of health 'shocks' in predicting work exit behaviour. A more specific measure of health would have also been more informative, but overall subjective rather than objective health measures have been shown to be better predictors of retirement.[33] In addition, given that selection into occupations can be gender specific, some caution should be taken in assuming similar strengths in associations between social class and post-work duration by gender are directly comparable.

Conclusions

Our results illustrate that a uniform SPA disproportionately affects disadvantaged occupational social classes, as a greater proportion are waiting longer periods between stopping work and qualifying for their state pension, potentially in poor health, than more advantaged social classes. Given that manual occupations also tend to start full-time work earlier than non-manual occupations,[34] manual social class workers are likely paying into the pension system for a similar amount of time as higher social classes.

The solution to this inequality is not straightforward. The preferred strategy for UK policymakers is to support individuals to stay in work up to SPA. There is evidence that the average age of work exit is increasing in the UK.[35] However, over half of women and two-fifths of men still fall out of the labour market before SPA.[35-36] There is also no evidence that these rises in average age of work exit are occurring among all social classes. With a quarter of individuals retiring before SPA for negative reasons (e.g. own health, caring or redundancy),[37] activities to help maintain good health and facilitate re-employment will be crucial. However, some individuals will have to leave work early (i.e. for health), who we have shown here are more likely to be of a lower social class, so this strategy alone will be insufficient to address the unequal outcomes we have identified.

Yet even if all social classes left work at the same age, class differences in life expectancy means that lower classes will live fewer years after stopping work than professional classes. Some researchers have suggested that SPA should directly reflect life expectancy differences,[38] where retirement eligibility age is determined by the type of job.[39] Alternatively, the eligibility age requirement could be dropped, so that State Pension eligibility is solely determined by

accumulation of years of full-time equivalent work.[38] The recent Independent Review of the State Pension argued for keeping a uniform SPA out of the principle of universality for the pension benefit, but to mitigate disadvantage through a means-tested one year early SPA for those who are unable to work through ill health or caring responsibilities.[1] We believe a two-year early SPA may be more appropriate for individuals who work in manual occupations, given that they leave work a year earlier than professional workers not in good health. With rises in SPA already legislated,[2] and evidence of stalling life expectancy,[40] it is vital that researchers and policy-makers assess how these rises will influence financial security and health for the most vulnerable in society.

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Conflict of interest:

The authors have no conflicts of interest to declare.

Contributorship:

ETM conceptualised and designed the study, constructed the data set, performed the analytical analyses, and drafted/revised the initial manuscript. NS conceptualised the study, reviewed the results and reviewed the manuscript. EC, PZ, JH, BX, SS and BB reviewed the statistical results and manuscript.

Licence for Publication:

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Table 1. Distribution of work, health & death indicators by occupational social class, ONS Longitudinal Study 2001 to 2011 (total n=76 485; observed=72 692, imputed=3 793).*

	TOTAL	I Professional	II Managerial/ technical	IIIN Skilled Non-Manual	IIIM Skilled Manual	IV Partly Skilled	V Unskilled	p-value Test for trend
Women, N (% total)	38,183	473 (1.2)	9,751 (25.5)	13,338 (34.9)	3,486 (9.1)	7,126 (18.7)	4,009 (10.5)	
Work status in 2001, %								
Working	40.5	59.9	47.8	42.0	34.5	35.0	30.5	
Not working	59.5	40.1	52.2	58.0	65.5	65.0	69.5	<0.001
Status in 2011, %								
Not working	85.4	89.0	87.4	86.1	84.2	83.8	81.8	
Died	14.6	11.0	12.6	13.9	15.8	16.2	18.2	<0.001
Not good health in 2001, %	52.1	34.5	44.0	48.3	59.0	60.9	63.6	<0.001
Mean age in 2001 (SD)	60.9	59.2	60.0	61.0	61.4	60.9	62.2	<0.001
Highest Qualification, %								
None	53.6	9.1	25.4	49.6	68.7	75.7	87.9	
O-level/A-level	23.2	16.7	25.3	33.4	16.2	14.6	6.3	
Degree	14.8	71.7	42.6	4.7	4.8	3.8	2.0	
Other	8.5	2.5	6.7	12.3	10.3	5.9	3.8	<0.001
Mean age stopped work (SD)	58.0 (6.5)	59.7 (6.1)	58.5 (6.2)	58.2 (6.4)	57.8 (6.7)	57.4 (6.8)	57.6 (7.1)	<0.001
For those who died:	(n=5,580)	(n=52)	(n=1,230)	(n=1,858)	(n=552)	(n=1,157)	(n=731)	
Mean age stopped work (SD)	56.8 (6.9)	58.3 (7.5)	57.3 (6.6)	56.8 (6.7)	56.4 (6.6)	56.5 (6.9)	56.7 (7.7)	0.026
Mean age death (SD)	70.6 (7.4)	68.8 (8.2)	70.0 (7.8)	70.7 (7.5)	70.7 (7.0)	70.7 (7.2)	71.4 (7.2)	<0.001
Mean time stopped work -> death (>0)	13.8 (8.7)	10.5 (7.3)	12.7 (8.5)	13.9 (8.8)	14.3 (8.5)	14.1 (8.7)	14.7 (8.9)	<0.001
Men, N (%)	38,302	2,603 (6.8)	10,502 (27.4)	3,716 (9.7)	13,165 (34.4)	5,806 (15.2)	2,510 (6.6)	
Work status in 2001, %								
Working	47.6	58.8	52.9	47.4	43.8	45.8	37.4	
Not working	52.4	41.2	47.1	52.6	56.2	54.1	62.7	<0.001
Status in 2001, %								
Not working	74.9	79.3	77.8	73.6	73.6	72.8	71.9	
Died	25.1	20.7	22.2	26.4	26.4	27.2	28.1	<0.001
Not good health in 2001, %	52.3	36.9	43.1	50.3	57.6	59.4	64.7	<0.001
Mean age in 2001 (SD)	61.6	61.3	61.1	62.0	61.9	61.5	61.8	<0.001
Highest Qualification, %								
None	48.9	6.1	25.4	39.0	62.2	71.9	83.0	
O-level/A-level	21.4	22.7	33.0	36.6	13.5	13.3	8.3	
Degree	14.9	63.0	28.9	10.3	3.1	3.8	2.3	
Other	14.9	8.2	13.1	14.1	21.2	11.0	6.4	<0.001
Mean age stopped work (SD)	60.2 (6.3)	62.0 (5.9)	60.8 (5.9)	60.5 (6.2)	60.2 (6.3)	60.0 (6.6)	58.8 (7.2)	<0.001
For those who died:	(n=9,608)	(n=538)	(n=2,329)	(n=981)	(n=3,478)	(n=1,578)	(n=704)	
Mean age stopped work (SD)	59.2 (6.6)	59.8 (5.8)	58.8 (5.8)	58.3 (6.1)	57.9 (6.4)	57.0 (6.7)	56.3 (7.0)	<0.001
Mean age death (SD)	70.4 (7.2)	70.9 (7.2)	70.3 (7.5)	71.1 (7.3)	70.5 (7.0)	69.9 (7.1)	70.0 (6.8)	0.001
Mean time stopped work -> death (>0)	11.2 (7.4)	9.7 (6.8)	10.3 (7.2)	11.8 (7.5)	11.6 (7.4)	11.4 (7.7)	12.2 (7.8)	<0.001

*** Sample descriptive only. Right-censoring not taken into account.**

Table 2. Adjusted mean differences in years between stopping work and death by occupational social class, health, class*health, age, gender, class*gender and educational qualifications, ONS Longitudinal Study (n=76 485).*

	Model 1: Unadjusted	Model 2: + Health	Model 3: + Age	Model 4: + Gender	Model 5: + Education
Occupational social class 2001:					
I Professional (reference)	-	-	-	-	-
II Managerial/technical	1.8 (1.5, 2.0)	1.2 (0.8, 1.6)	1.6 (1.3, 1.9)	1.1 (0.5, 1.7)	1.0 (0.4, 1.7)
IIIN Skilled Non-Manual	2.9 (2.6, 3.2)	2.7 (2.3, 3.1)	2.6 (2.3, 2.9)	1.6 (1.0, 2.2)	1.5 (0.8, 2.1)
IIIM Skilled Manual	2.2 (1.9, 2.5)	1.7 (1.2, 2.1)	1.2 (0.8, 1.5)	1.3 (0.7, 2.0)	1.0 (0.3, 1.6)
IV Partly Skilled	3.3 (3.0, 3.6)	2.3 (1.9, 2.8)	2.2 (1.9, 2.5)	1.7 (1.1, 2.4)	1.3 (0.7, 2.0)
V Unskilled	3.9 (3.6, 4.2)	3.5 (3.0, 4.0)	2.7 (2.4, 3.1)	1.8 (1.2, 2.5)	1.3 (0.6, 1.9)
Not good self-reported health in 2001	-	4.1 (3.5, 4.8)	2.4 (1.9, 2.9)	2.4 (1.9, 2.9)	2.4 (1.9, 2.9)
Not good health * class I	-	-	-	-	-
Not good health * class II	-	-0.1 (-0.8, 0.5)	0.0 (-0.5, 0.5)	0.0 (-0.6, 0.5)	-0.1 (-0.6, 0.4)
Not good health * class IIIN	-	-0.2 (-0.9, 0.5)	0.1 (-0.5, 0.6)	0.1 (-0.5, 0.6)	0.0 (-0.6, 0.5)
Not good health * class IIIM	-	0.6 (-0.04, 1.3)	1.0 (0.4, 1.5)	0.9 (0.4, 1.4)	0.9 (0.3, 1.4)
Not good health * class IV	-	0.4 (-0.3, 1.1)	0.9 (0.4, 1.4)	0.8 (0.3, 1.4)	0.8 (0.2, 1.3)
Not good health * class V	-	0.2 (-0.6, 0.9)	0.8 (0.2, 1.4)	0.8 (0.2, 1.4)	0.8 (0.2, 1.3)
Age in 2001 (baseline=50yrs)	-	-	0.76 (0.75, 0.77)	0.76 (0.76, 0.77)	0.8 (0.2, 1.4)
Gender (Women)				-1.6 (-2.2, -0.9)	-1.5 (-2.1, -0.9)
Women * class I	-	-	-	-	-
Women * class II	-	-	-	0.0 (-0.7, 0.6)	0.0 (-0.7, 0.6)
Women * class IIIN	-	-	-	-0.2 (-0.9, 0.5)	-0.2 (-0.8, 0.5)
Women * class IIIM	-	-	-	-0.3 (-1.0, 0.3)	-0.3 (-1.0, 0.4)
Women * class IV	-	-	-	-0.3 (-1.0, 0.3)	-0.4 (-1.0, 0.3)
Women * class V	-	-	-	0.5 (-0.2, 1.2)	0.4 (-0.3, 1.1)
Educational qualifications					
Degree or higher	-	-	-	-	-
A-level/O-level					-0.1 (-0.3, 0.02)
No qualifications					0.7 (0.6, 0.9)
Other qualifications/unknown level					-0.4 (-0.6, -0.2)

* Tests for trend across social class groups: all models <0.001.