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Brief Report

Examining if there is a differential association between smoking and chronic disease across socioeconomic groups: pooling of data from 15 prospective cohort studies

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Running Head: Socioeconomic position, smoking and mortality

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Statement of replication: The data sets are available to download upon approval via the UK Data Service. The codes to replicate analyses are available from corresponding author.

Abstract

Background: For the same quantity of cigarettes smoked, relative to the more affluent, socioeconomically disadvantaged people have higher levels of smoking biomarkers. This may be ascribed to inhaling cigarette smoke more deeply and more frequently, and/or choosing higher tar-containing brands. We investigated if this increased tobacco load, as captured using cotinine, is associated with a greater risk of mortality in lower social groups.

Methods: We used Cox proportional hazards models stratified by socioeconomic position to calculate hazard ratios in a pooled sample of 15 English and Scottish prospective cohort studies (N=81476).

Results: During a mean (SD) follow-up of 10.3 (4.4) years, 8234 deaths occurred. Risk of total mortality (Hazards Ratio; 95% confidence interval) for smokers relative to never-smokers in the high (2.5; 2.1, 3.1), intermediate (2.1; 1.8, 2.4), and low (2.0; 1.9, 2.2) educational groups did not differ markedly (*p for interaction=0.61*). Similar findings emerged when using cause-specific outcomes, and occupational social class and housing tenure as socioeconomic indices.

Conclusion: Contrary to our hypothesis, we found no indication that disadvantaged people were more vulnerable to the impact of smoking on chronic disease mortality.

Keywords: cotinine; smoking; socioeconomic position; cancer; cardiovascular disease; mortality

Introduction

It is well documented that cigarette smoking markedly increases the risk of developing chronic diseases, particularly several cancers and cardiovascular disease (CVD).[1] It is also well known that people in lower socioeconomic groups are much more likely to smoke than those from advantaged backgrounds[2]—in 2016, for instance, 21% of adults in England without formal qualifications smoked, compared with only 9% of those with a university degree.[3] This inequality has increased in recent years—between 2001 and 2012, smoking prevalence decreased among those with managerial or professional occupations (from 20% to 14%) while it remained unchanged among people in routine and manual occupations in the UK (33%).[4] Accordingly, the population impact of smoking is greater in the socioeconomically disadvantaged groups.[2,5] In addition to a greater population prevalence of smoking among people in lower socioeconomic groups, there is evidence that, for the same quantity of cigarettes smoked, less advantaged people have higher levels of the smoking biomarkers than more advantaged people.[2] This may be due to the manner in which individuals from lower socioeconomic groups smoke by inhaling more deeply and more frequently, and/or choosing higher tar-containing brands.[2] This increased tobacco load may lead to the greater risk of mortality—that is, higher smoking-related vulnerability—among disadvantaged groups. The few studies that have tested this hypothesis have revealed inconsistent findings. For instance, in a large Danish cohort, Nordahl *et al*. found that self-reported smoking carried a greater risk of stroke mortality among lower educated groups compared with higher educated groups.[6] However, in a large Belgian cohort, Charafeddine *et al*. found no evidence of differential vulnerability to self-reported smoking on all-cause mortality.[7] Crucially, studies have exclusively relied on self-reported smoking,[6-8] which is subject to reporting bias, particularly among people with lower education,[9] and this may

generate an inflated hazard in poorer individuals. Thus, we pooled a series of cohort studies with cause-specific mortality and measured cotinine data to test the hypothesis that smoking may exert a greater influence on health in disadvantaged populations.

Methods

Participants originated from the Health Survey for England (HSE), and the Scottish Health Survey (SHS), both of which have been described in detail elsewhere.[10,11] These are population-representative, cross-sectional health examination studies conducted in private households in England and Scotland. We pooled data from 12 HSE (1994 to 2008), and three SHS (1995, 1998, and 2003) studies in which response ranged from 68 to 77%.[10,12] Following participation in these surveys, consenting participants (88%) were linked to National Health Service mortality records up to December 2009 (SHS)[12] and mid-February 2011 (HSE).[10]

We created a baseline smoking variable by cross-referencing participants' self-reported smoking against their measured salivary or serum cotinine levels (the correlation between salivary and cotinine levels is very high)[13]: 1) never smokers were defined by self-reported "never smoker" *and* salivary cotinine below 12 ng/mL or serum cotinine below 9 ng/mL; 2) ex-smokers self-reported being an "ex-smoker" *and* had salivary cotinine below 12 ng/mL or serum cotinine below 9 ng/mL; and 3) current smokers comprised self-reported smokers and individuals with salivary cotinine ≥12 ng/mL, or serum cotinine ≥9 ng/mL. We selected endpoints that are known to have a relationship with cigarette smoking:[14] death from all causes, smoking-related cancers (lung, pancreas, esophagus, bladder, kidney, oral, liver, stomach, leukemia), all CVD, coronary heart disease (CHD), stroke, and chronic obstructive pulmonary disease (COPD). We used three socioeconomic position variables, including: age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or

below); occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations); and housing tenure (owner or renter). As covariates, we included sex, age at baseline (continuous), body mass index (weight in kilograms divided by height in meters squared), and dichotomized physical activity (any weekly moderate to vigorous exercise) and excessive alcohol intake (as ≥168 grams/week for men, and ≥112 grams/week for women).

Study members were included in the analytical sample if they had data on cotinine, self-reported smoking, socioeconomic variables, covariates (eFigure 1) and if they consented to mortality data linkage. For each socioeconomic and smoking group, we calculated age-standardized mortality rates per 10000 person-years (for 5-age groups) with the direct method using the 2015 European Standard Population as the standard. Subsequently, having ascertained via Schoenfeld residuals that the proportional hazards assumption was not violated, we calculated hazard ratios (HR) and associated 95% confidence intervals (95% CI) using Cox proportional hazard models. We stratified the analysis by socioeconomic position, adjusting the effect estimate first for age, sex, and cohort, then additionally for BMI, physical activity, and excessive alcohol intake. We imputed missing values for the last three variables using five imputations. Statistical significance for multiplicative interaction was assessed using the likelihood ratio test comparing the models with and without the product term of smoking and socioeconomic position. We also tested for additive interaction by calculating the Relative Excess Risk due to Interaction, the Proportion of Disease Attributable to Interaction, and the Synergy Index. In sensitivity analyses, we repeated the analysis focusing on premature all-cause and cause-specific mortality and three types of smoking exposure (number of cigarettes smoked

per day; cotinine level; and self-reported smoking). Analyses were conducted using Stata statistical software version 14 (StataCorp, College Station, TX).

Results

Our analytical sample comprised 81476 participants with complete data on cotinine, self-reported smoking, education, age, sex, and mortality (eFigure 1). The mean age of participants at baseline was 46 years (range: 16 to 97 years), and 53% were women (eTable 1). During a mean (SD) follow-up time of 10.3 (4.4) years, 8234 deaths occurred (1170 from smoking-related cancers, 4078 from CVD, 690 from stroke, 1412 from CHD, and 2568 from COPD). The age-standardized mortality rate was highest among smokers in lower socioeconomic groups. Thus, the rate (95% CI) per 10000 person-years for death from all causes was 243 (230, 256) among smokers with low education versus 182 (156, 208) among smokers with high education; for smoking-related cancer, the corresponding rates were 47 (42, 52) versus 28 (20, 36); and for CVD, 110 (102, 118) versus 95 (74, 116) (Figure). Both the basic and multivariable models yielded similar findings, thus we present results from the latter only. As anticipated, relative to non-smokers, cigarette smoking was related to an elevated risk of death from all causes in the high (HR; 95% CI: 2.5; 2.1, 3.1), intermediate (2.1; 1.8, 2.4), and low education group (2.0; 1.9, 2.2). Corresponding HRs (95% CI) for smoking-related cancers were 4.4 (3.0, 6.5), 4.4 (3.0, 6.6), and 4.3 (3.5, 5.2); and, for CVD, 3.8 (2.6, 5.5), 2.4 (1.8, 3.2), and 2.5 (2.2, 2.9) (Figure). There was, however, no indication that smoking in the more basic educational group yielded a greater impact on mortality in comparison to the higher educational categories as based on tests for interaction, multiplicative or additive (p-values for interaction $\geq$0.21). Similar patterns of association and mortality rates were observed for death from stroke, CHD, and COPD (eFigure 2). Results were also similar when substituting educational level for occupational social class

(eFigure 3) and housing tenure (eFigure 4) as the socioeconomic measure of interest. Our findings were robust under a range of sensitivity analyses, including three types of smoking exposure (eFigure 5-19). Finally, we found no strong evidence of heterogeneity in the association between mortality and smoking across the 15 included cohort studies.

Discussion

We found no support for the hypothesis of differential vulnerability to the effects of smoking on several chronic disease outcomes across different socioeconomic groups. Comparing our results to the literature is not straightforward due to differing methodological approaches, different smoking and socioeconomic indicators, and a range of mortality outcomes. However, Lewer *et al.*,[15] in a similar analysis to ours, also found no evidence of interaction between smoking and socioeconomic position on death from all causes and from COPD, while revealing higher absolute risk of smoking among more disadvantaged groups.

Some strengths of our study include the large and representative sample size which provided sufficient power to test for interaction, the use of an array of smoking-related chronic disease outcomes, and, for the first time to our knowledge, the utilization of an objective indicator of smoking exposure. Our work is of course not without its shortcomings. Smoking was only measured at baseline, and given the continuous decline of smoking prevalence in the population, it is likely that many participants decreased their intake or ceased completely during follow-up.

In conclusion, in a large and representative series of cohorts of the English and Scottish populations, we found no indication of differential vulnerability to the detrimental effect of smoking on death from a range of major chronic diseases known to be linked to tobacco smoking.

References

1. World Health Organization. WHO Global Report: Mortality Attributable to Tobacco. Geneva, Switzerland: World Health Organization, 2012.
2. Hiscock R, Bauld L, Amos A, Fidler JA, Munafò M. Socioeconomic status and smoking: a review. *Ann N Y Ac Sci* 2012;**1248**(1):107-123.
3. Office for National Statistics. Adult smoking habits in the UK: 2016. https://www.ons.gov.uk/releases/adultsmokinghabitsingreatbritain2016.
4. Cancer Research UK. Tobacco Statistics - Tobacco Statistics by Socio-economic Group. http://www.cancerresearchuk.org/health-professional/cancer-statistics/risk/tobacco#collapseFour.
5. Thun MJ, Carter BD, Feskanich D, Freedman ND, Prentice R, Lopez AD, Hartge P, Gapstur SM. 50-year trends in smoking-related mortality in the United States. *N Engl J Med* 2013;**368**(4):351-64.
6. Nordahl H, Osler M, Frederiksen BL, Andersen I, Prescott E, Overvad K, Diderichsen F, Rod NH. Combined effects of socioeconomic position, smoking, and hypertension on risk of ischemic and hemorrhagic stroke. *Stroke* 2014;**45**(9):2582-7.
7. Charafeddine R, Van Oyen H, Demarest S. Does the association between smoking and mortality differ by educational level? *Soc Sci Med* 2012;**74**(9):1402-6.
8. Rod NH, Lange T, Andersen I, Marott JL, Diderichsen F. Additive interaction in survival analysis: use of the additive hazards model. *Epidemiology* 2012;**23**(5):733-7.
9. Connor Gorber S, Schofield-Hurwitz S, Hardt J, Levasseur G, Tremblay M. The accuracy of self-reported smoking: a systematic review of the relationship between self-reported and cotinine-assessed smoking status. *Nicotine Tob Res* 2009;**11**(1):12-24.
10. Mindell J, Biddulph JP, Hirani V, Stamatakis E, Craig R, Nunn S, Shelton N. Cohort profile: the health survey for England. *Int J Epidemiol* 2012;**41**(6):1585-93.
11. Bell S, Russ TC, Kivimaki M, Stamatakis E, Batty GD. Dose-Response Association Between Psychological Distress and Risk of Completed Suicide in the General Population. *JAMA Psychiatry* 2015;**72**(12):1254-6.
12. Gray L, Batty GD, Craig P, Stewart C, Whyte B, Finlayson A, Leyland AH. Cohort profile: the Scottish health surveys cohort: linkage of study participants to routinely

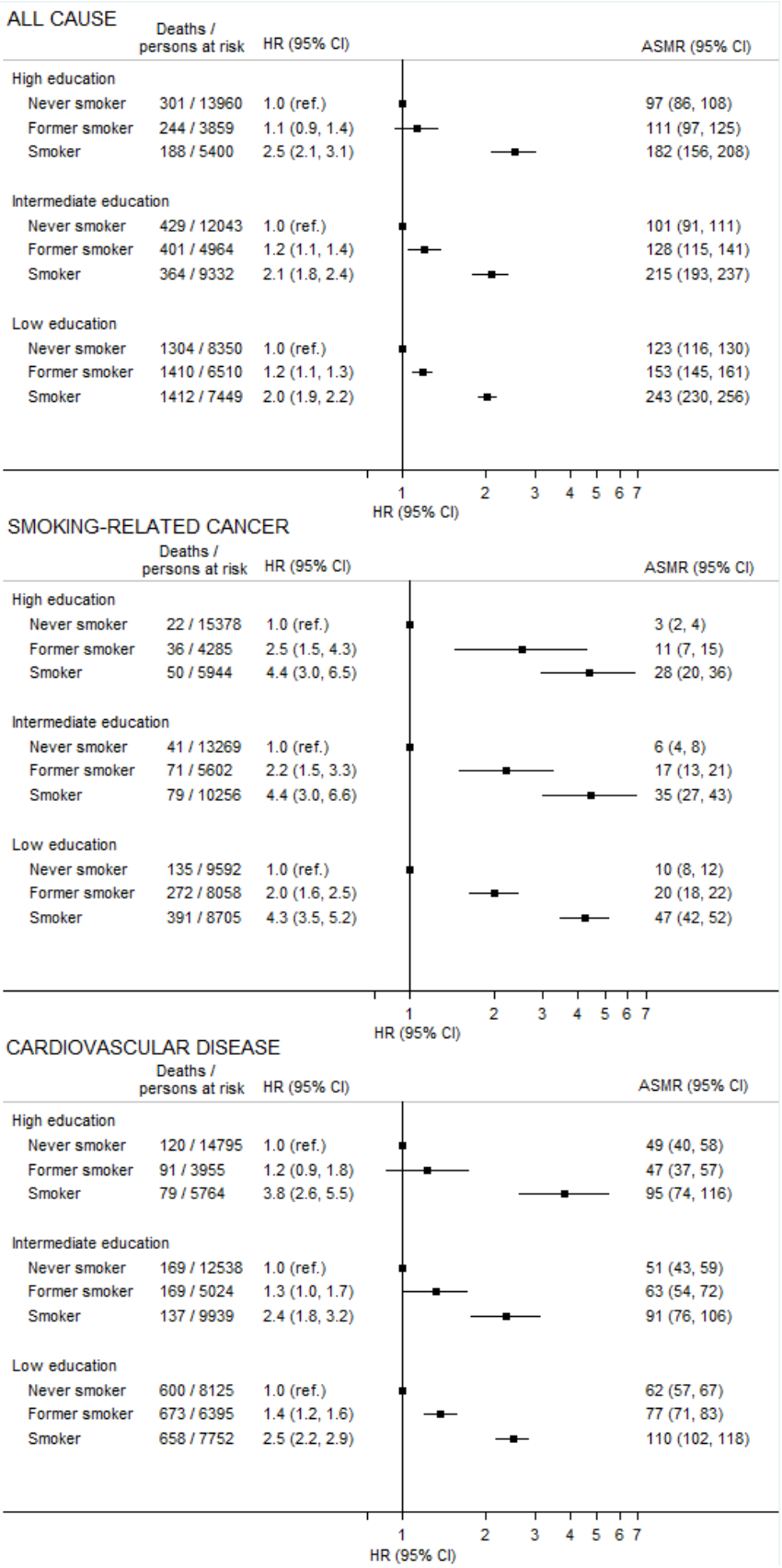
collected records for mortality, hospital discharge, cancer and offspring birth characteristics in three nationwide studies. *Int J Epidemiol* 2010;**39**(2):345-50.

13. Jarvis MJ, Primatesta P, Erens B, Feyerabend C, Bryant A. Measuring nicotine intake in population surveys: comparability of saliva cotinine and plasma cotinine estimates. *Nicotine Tob Res* 2003;**5**(3):349-55.
14. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. *Jama* 2004;**291**(10):1238-45.
15. Lewer D, McKee M, Gasparrini A, Reeves A, de Oliveira C. Socioeconomic position and mortality risk of smoking: evidence from the English Longitudinal Study of Ageing (ELSA). *Eur J Public Health* 2017;**27**(6):1068-1073.

Figure footnote

Association between cigarette smoking and death from all causes, smoking-related cancer, and CVD, according to educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Survey studies conducted between 1994 and 2008 (N = 81476). Educational level derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. ASMR: Age-standardized mortality rates calculated using the 2015 European Standard Population as the standard.

Figure


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 301 / 13960 1.0 (ref.) 97 (86, 108)
Former smoker 244 / 3859 1.1 (0.9, 1.4) 111 (97, 125)
Smoker 188 / 5400 2.5 (2.1, 3.1) 182 (156, 208)
Intermediate education
Never smoker 429 / 12043 1.0 (ref.) 101 (91, 111)
Former smoker 401 / 4964 1.2 (1.1, 1.4) 128 (115, 141)
Smoker 364 / 9332 2.1 (1.8, 2.4) 215 (193, 237)
Low education
Never smoker 1304 / 8350 1.0 (ref.) 123 (116, 130)
Former smoker 1410 / 6510 1.2 (1.1, 1.3) 153 (145, 161)
Smoker 1412 / 7449 2.0 (1.9, 2.2) 243 (230, 256)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 22 / 15378 1.0 (ref.) 3 (2, 4)
Former smoker 36 / 4285 2.5 (1.5, 4.3) 11 (7, 15)
Smoker 50 / 5944 4.4 (3.0, 6.5) 28 (20, 36)
Intermediate education
Never smoker 41 / 13269 1.0 (ref.) 6 (4, 8)
Former smoker 71 / 5602 2.2 (1.5, 3.3) 17 (13, 21)
Smoker 79 / 10256 4.4 (3.0, 6.6) 35 (27, 43)
Low education
Never smoker 135 / 9592 1.0 (ref.) 10 (8, 12)
Former smoker 272 / 8058 2.0 (1.6, 2.5) 20 (18, 22)
Smoker 391 / 8705 4.3 (3.5, 5.2) 47 (42, 52)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 120 / 14795 1.0 (ref.) 49 (40, 58)
Former smoker 91 / 3955 1.2 (0.9, 1.8) 47 (37, 57)
Smoker 79 / 5764 3.8 (2.6, 5.5) 95 (74, 116)
Intermediate education
Never smoker 169 / 12538 1.0 (ref.) 51 (43, 59)
Former smoker 169 / 5024 1.3 (1.0, 1.7) 63 (54, 72)
Smoker 137 / 9939 2.4 (1.8, 3.2) 91 (76, 106)
Low education
Never smoker 600 / 8125 1.0 (ref.) 62 (57, 67)
Former smoker 673 / 6395 1.4 (1.2, 1.6) 77 (71, 83)
Smoker 658 / 7752 2.5 (2.2, 2.9) 110 (102, 118)
1 2 3 4 5 6 7
HR (95% CI)

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eTable 1. Characteristics of participants in analytical sample at baseline, pooled data from 15 Health Survey for England and 3 Scottish Health Survey samples (N = 81 476)

	Smoking category [a]				
	Total N = 81 476	Never smoker	Ex-smoker	Smoker	*p-value* [b]
N (% of total)		38 333 (47.0)	18 228 (22.4)	24 915 (30.6)	
Women (N, %)	43 219 (53.0)	22 692 (59.2)	8 319 (45.6)	12 208 (49.0)	*<0.001*
Age (mean, SD)	45.8 (17.3)	45.4 (17.3)	55.7 (16.1)	42.1 (15.9)	*<0.001*
BMI (mean, SD)	26.6 (3.7)	26.6 (4.8)	27.7 (4.5)	25.8 (4.7)	*<0.001*
Occupational position [c]					*<0.001*
High	25 505 (32.7)	13 585 (37.4)	6 218 (34.7)	5 702 (24.0)	
Intermediate	18 848 (24.1)	9 947 (27.4)	3 942 (22.0)	4 959 (20.8)	
Low	33 725 (43.2)	12 824 (35.3)	7 756 (43.3)	13 145 (55.2)	
Educational level [d]					*<0.001*
High	25 435 (31.2)	15 257 (39.8)	4 304 (23.6)	5 874 (23.6)	
Intermediate	29 191 (35.8)	13 309 (34.7)	5 650 (31.0)	10 232 (41.1)	
Low	26 855 (33.0)	9 772 (25.5)	8 274 (45.4)	8 809 (35.4)	
Housing tenure					
Owner	59 278 (72.9)	30 371 (79.3)	14 442 (79.4)	14 465 (58.1)	*<0.001*
Renter	22 085 (27.1)	7 908 (20.7)	3 753 (20.6)	10 424 (41.9)	
Excessive alcohol [e]	27 510 (21.4)	4 333 (16.8)	3 115 (24.5)	5 451 (31.9)	*<0.001*
Physically active [f]	31 169 (59.7)	15 298 (65.5)	6 313 (59.0)	9 480 (61.8)	*<0.001*

[a] Cotinine-checked smoking categories were as follows: 1) never smoker from self-reported "never smoker" and salivary cotinine below 12 ng/mL or serum cotinine below 9 ng/mL; 2) ex-smoker from self-reported "ex-smoker" and salivary cotinine below 12 ng/mL or serum cotinine below 9 ng/mL; 3) current smoker, irrespective of self-reported smoking behavior, salivary cotinine ≥12 ng/mL or serum cotinine ≥9 ng/mL.

[b] Statistical significance for difference across smoking groups from Chi-square test for categorical variables, and from Student t-test for continuous variables.

[c] Occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations).

[d] Educational level categories were as follows: high corresponds to leaving full-time education at age 18 or older; intermediate to 16 to 17 years of age; low to 15 years of age or younger.

[e] Physical activity dichotomized as any weekly moderate to vigorous physical activity.

[f] Excessive alcohol consumption dichotomized as ≥21 units/week for men, and ≥14 units/week for women.

eTable 2. Characteristics of participants included in analytic sample and those excluded

	Included	Excluded
N	81476	8428
Age (mean, SD)	46.4 (17.5)	39.5 (19.9)
Women (%)	53.1	54.2
Occupational social class [a] (%)		
High	32.3	32.3
Middle	24.3	24.1
Low	43.4	43.6
Educational level [b] (%)		
High	31.2	37.3
Middle	35.8	32.6
Low	33.0	30.1
Housing tenure		
Owner	73.1	67.8
Renter	26.9	32.2
Body mass index (kg/m2; mean, SD)	26.5 (4.7)	25.5 (4.9)
Systolic blood pressure (mmHg; mean, SD)	132.1 (19)	127.8 (18.2)
Physical activity [c] (%)	63.0	62.5
Self-reported smoking status		
Never	49.1	59.8
Former	24.8	18
Current	26	22.2
Excessive alcohol [d] (%)	23.2	20.6
Diabetes (%)	2.8	2.6

[a] Occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations).

[b] Educational level categories were as follows: high corresponds to leaving full-time education at age 18 or older; intermediate to 16 to 17 years of age; low to 15 years of age or younger.

[c] Physical activity dichotomized as any weekly moderate to vigorous physical activity.

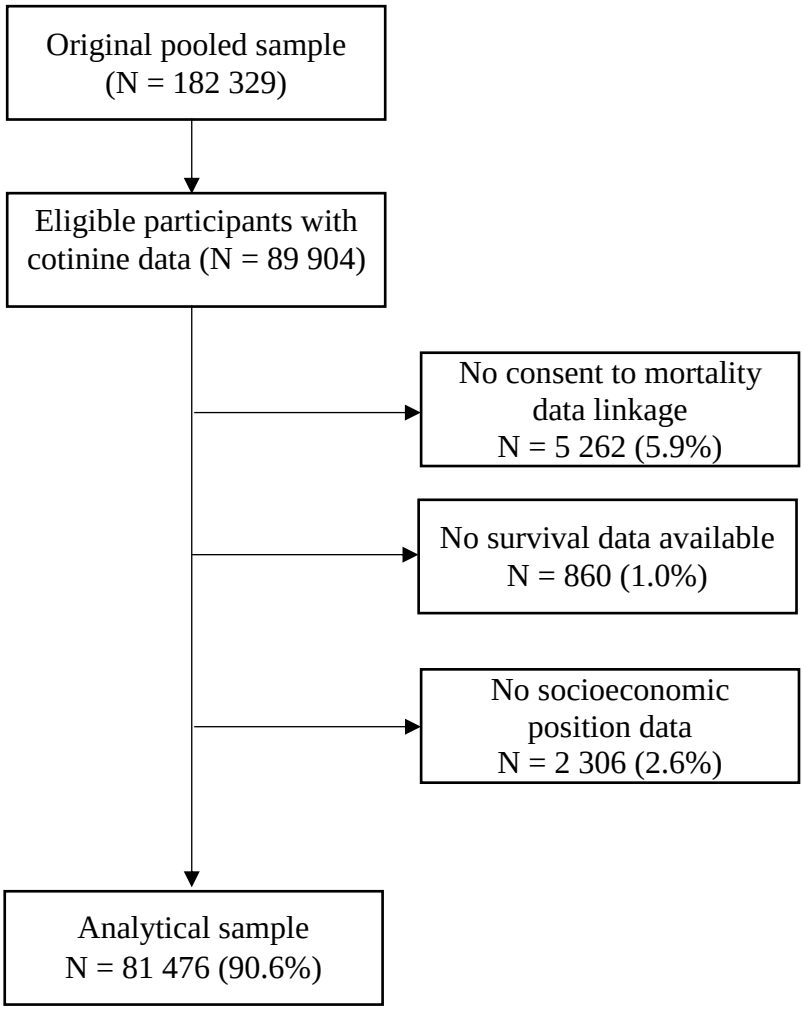
[d] Excessive alcohol dichotomized as ≥21 units/week for men, and ≥14 units/week for women

eTable 3. Concordance between self-reported smoking and cotinine-verified smoking classification.

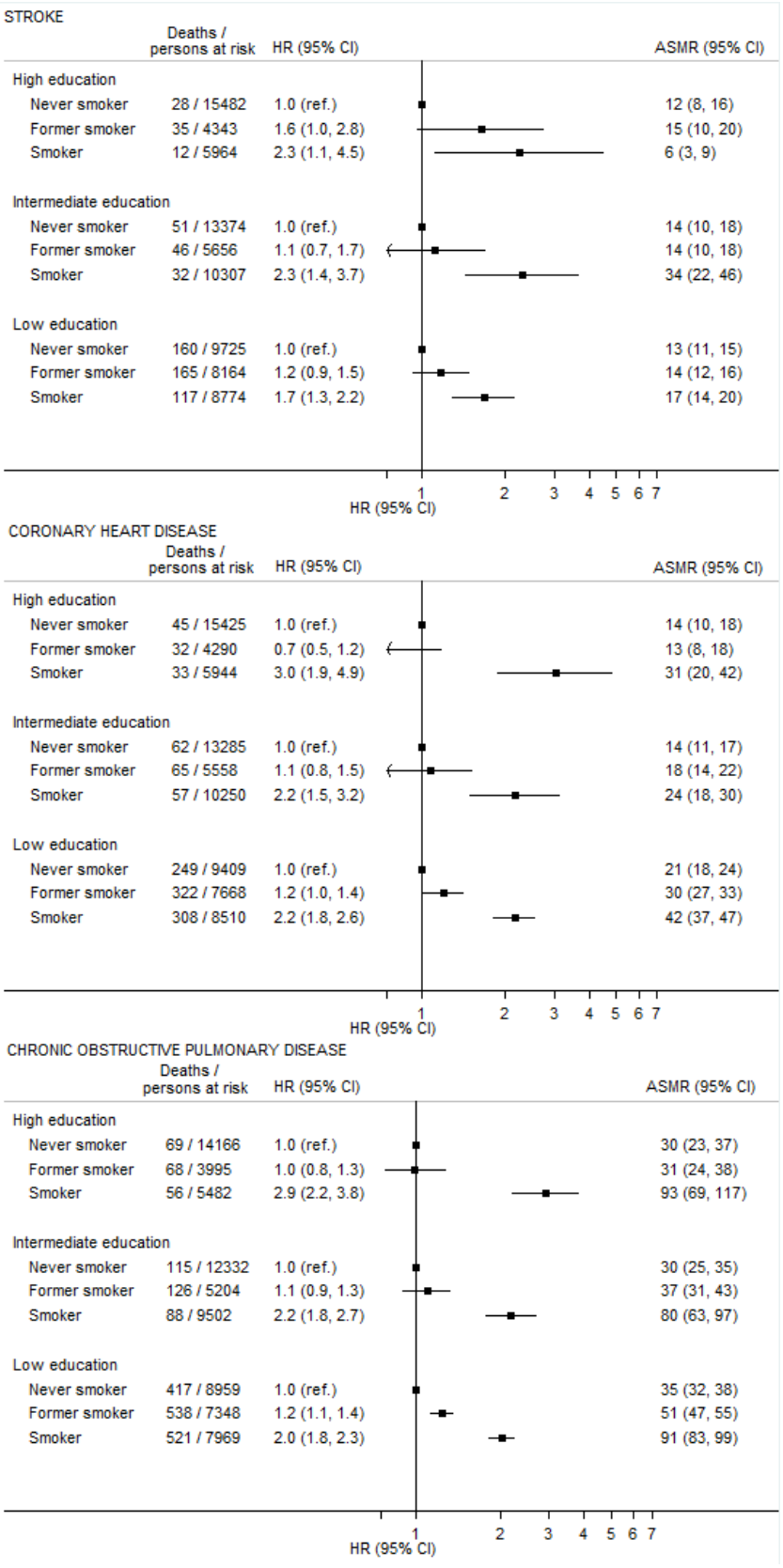
Self-reported smoking status	Cotinine-checked smoking status			% Reassigned
	Never	Ex-smoker	Current smoker	
Never	43 060	0	1 681	3.8%
Ex-smoker	0	19 396	2 344	10.8%
Current smoker	0	0	23 036	0.0%

[a] Cotinine-based smoking categories were as follows: 1) never smoker from self-reported "never smoker" *and* salivary cotinine below 12 ng/mL or serum cotinine below 9 ng/mL; 2) ex-smoker from self-reported "ex-smoker" *and* salivary cotinine below 12 ng/mL or serum cotinine below 9 ng/mL; 3) current smoker, irrespective of self-reported smoking behaviour, salivary cotinine ≥12 ng/mL or serum cotinine ≥9 ng/mL.

eFigure 1. Flowchart of participant inclusion into main analytical sample

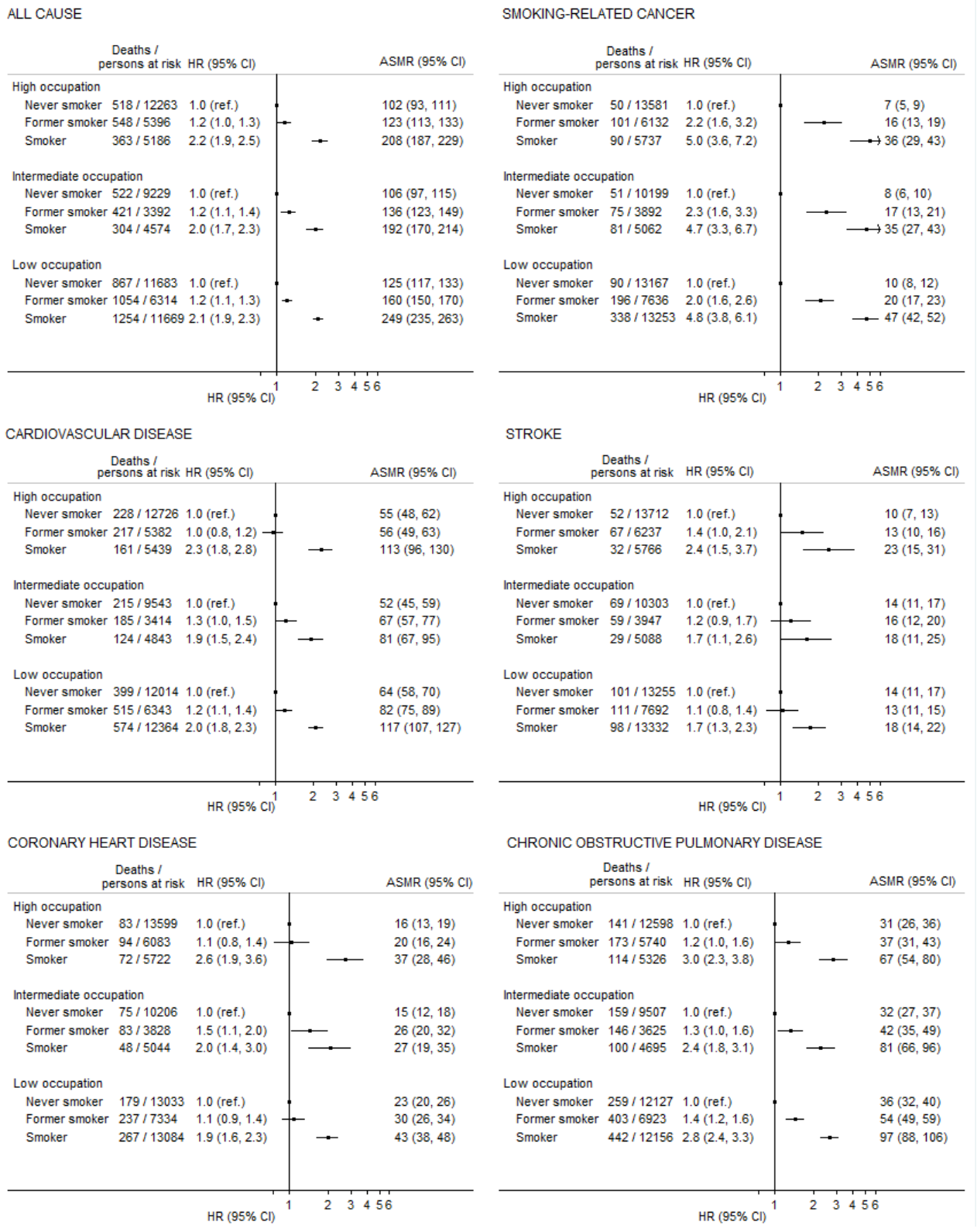


eFigure 2



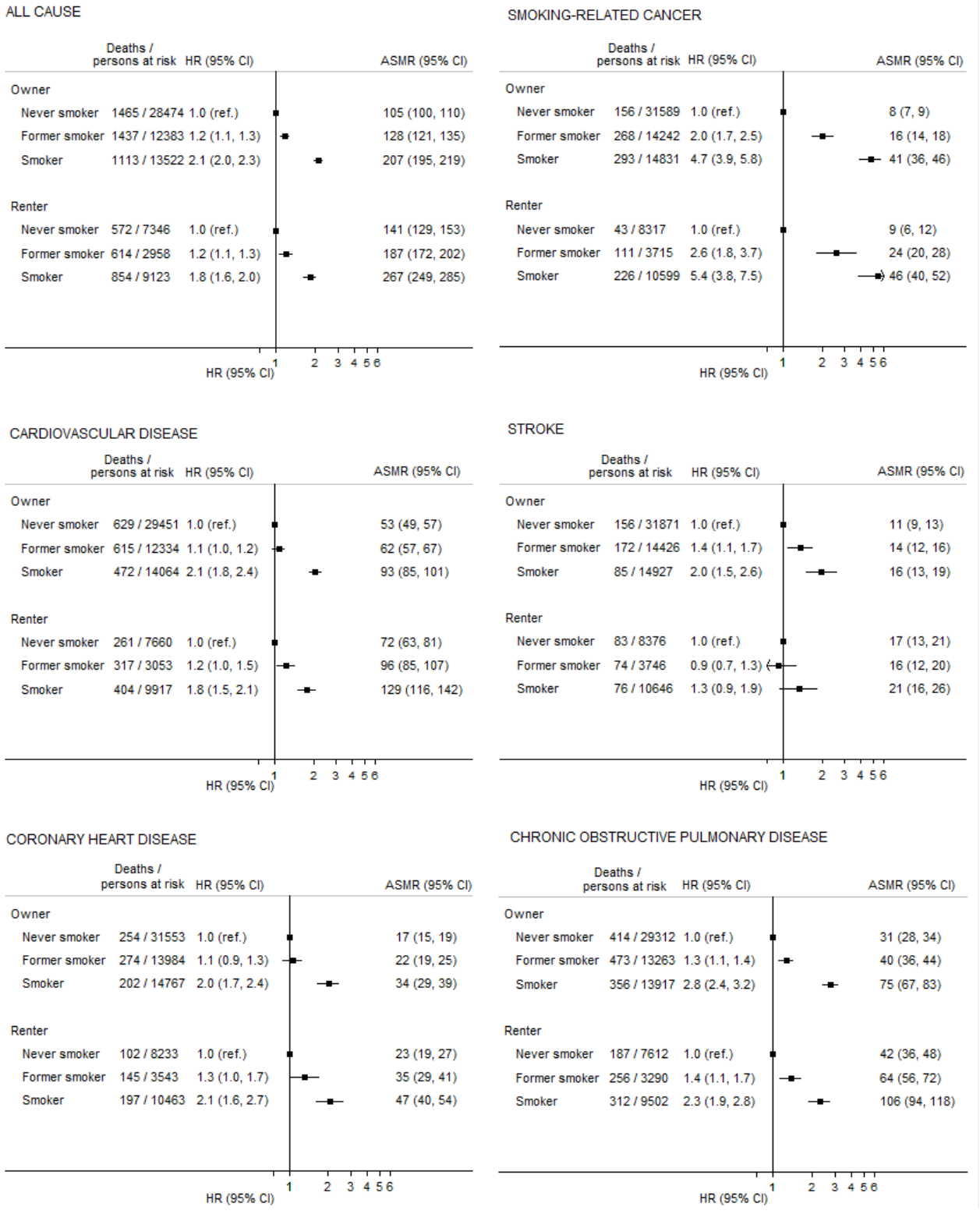
Association between cigarette smoking and death from stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Educational level derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population as the standard.

eFigure 3


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 518 / 12263 1.0 (ref.) 102 (93, 111)
Former smoker 548 / 5396 1.2 (1.0, 1.3) 123 (113, 133)
Smoker 363 / 5186 2.2 (1.9, 2.5) 208 (187, 229)
Intermediate occupation
Never smoker 522 / 9229 1.0 (ref.) 106 (97, 115)
Former smoker 421 / 3392 1.2 (1.1, 1.4) 136 (123, 149)
Smoker 304 / 4574 2.0 (1.7, 2.3) 192 (170, 214)
Low occupation
Never smoker 867 / 11683 1.0 (ref.) 125 (117, 133)
Former smoker 1054 / 6314 1.2 (1.1, 1.3) 160 (150, 170)
Smoker 1254 / 11669 2.1 (1.9, 2.3) 249 (235, 263)
1 2 3 4 5 6
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 50 / 13581 1.0 (ref.) 7 (5, 9)
Former smoker 101 / 6132 2.2 (1.6, 3.2) 16 (13, 19)
Smoker 90 / 5737 5.0 (3.6, 7.2) 36 (29, 43)
Intermediate occupation
Never smoker 51 / 10199 1.0 (ref.) 8 (6, 10)
Former smoker 75 / 3892 2.3 (1.6, 3.3) 17 (13, 21)
Smoker 81 / 5062 4.7 (3.3, 6.7) 35 (27, 43)
Low occupation
Never smoker 90 / 13167 1.0 (ref.) 10 (8, 12)
Former smoker 196 / 7636 2.0 (1.6, 2.6) 20 (17, 23)
Smoker 338 / 13253 4.8 (3.8, 6.1) 47 (42, 52)
1 2 3 4 5 6
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 228 / 12726 1.0 (ref.) 55 (48, 62)
Former smoker 217 / 5382 1.0 (0.8, 1.2) 56 (49, 63)
Smoker 161 / 5439 2.3 (1.8, 2.8) 113 (96, 130)
Intermediate occupation
Never smoker 215 / 9543 1.0 (ref.) 52 (45, 59)
Former smoker 185 / 3414 1.3 (1.0, 1.5) 67 (57, 77)
Smoker 124 / 4843 1.9 (1.5, 2.4) 81 (67, 95)
Low occupation
Never smoker 399 / 12014 1.0 (ref.) 64 (58, 70)
Former smoker 515 / 6343 1.2 (1.1, 1.4) 82 (75, 89)
Smoker 574 / 12364 2.0 (1.8, 2.3) 117 (107, 127)
1 2 3 4 5 6
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 52 / 13712 1.0 (ref.) 10 (7, 13)
Former smoker 67 / 6237 1.4 (1.0, 2.1) 13 (10, 16)
Smoker 32 / 5766 2.4 (1.5, 3.7) 23 (15, 31)
Intermediate occupation
Never smoker 69 / 10303 1.0 (ref.) 14 (11, 17)
Former smoker 59 / 3947 1.2 (0.9, 1.7) 16 (12, 20)
Smoker 29 / 5088 1.7 (1.1, 2.6) 18 (11, 25)
Low occupation
Never smoker 101 / 13255 1.0 (ref.) 14 (11, 17)
Former smoker 111 / 7692 1.1 (0.8, 1.4) 13 (11, 15)
Smoker 98 / 13332 1.7 (1.3, 2.3) 18 (14, 22)
1 2 3 4 5 6
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 83 / 13599 1.0 (ref.) 16 (13, 19)
Former smoker 94 / 6083 1.1 (0.8, 1.4) 20 (16, 24)
Smoker 72 / 5722 2.6 (1.9, 3.6) 37 (28, 46)
Intermediate occupation
Never smoker 75 / 10206 1.0 (ref.) 15 (12, 18)
Former smoker 83 / 3828 1.5 (1.1, 2.0) 26 (20, 32)
Smoker 48 / 5044 2.0 (1.4, 3.0) 27 (19, 35)
Low occupation
Never smoker 179 / 13033 1.0 (ref.) 23 (20, 26)
Former smoker 237 / 7334 1.1 (0.9, 1.4) 30 (26, 34)
Smoker 267 / 13084 1.9 (1.6, 2.3) 43 (38, 48)
1 2 3 4 5 6
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 141 / 12598 1.0 (ref.) 31 (26, 36)
Former smoker 173 / 5740 1.2 (1.0, 1.6) 37 (31, 43)
Smoker 114 / 5326 3.0 (2.3, 3.8) 67 (54, 80)
Intermediate occupation
Never smoker 159 / 9507 1.0 (ref.) 32 (27, 37)
Former smoker 146 / 3625 1.3 (1.0, 1.6) 42 (35, 49)
Smoker 100 / 4695 2.4 (1.8, 3.1) 81 (66, 96)
Low occupation
Never smoker 259 / 12127 1.0 (ref.) 36 (32, 40)
Former smoker 403 / 6923 1.4 (1.2, 1.6) 54 (49, 59)
Smoker 442 / 12156 2.8 (2.4, 3.3) 97 (88, 106)
1 2 3 4 5 6
HR (95% CI)

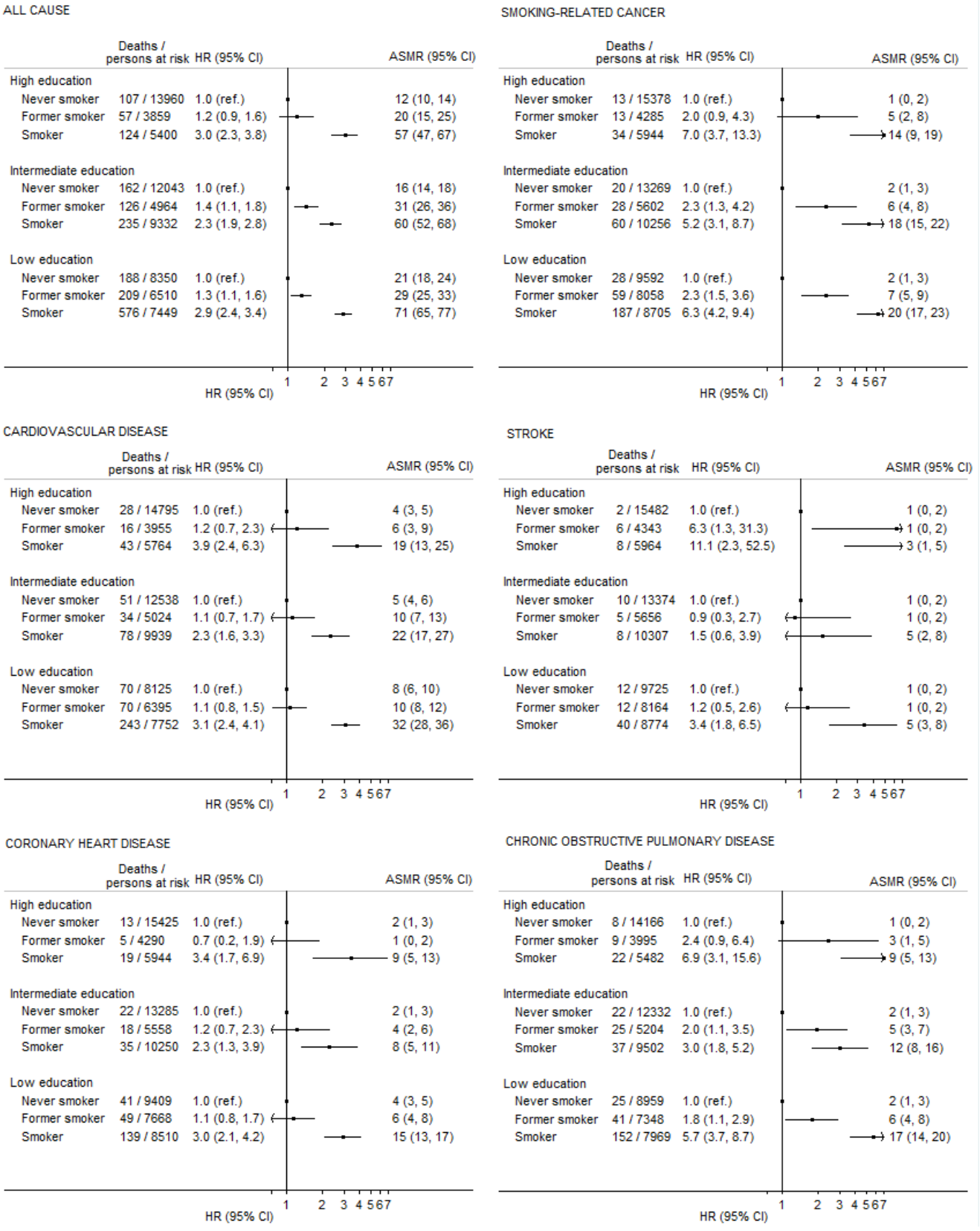
Association between cigarette smoking and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by occupational social class, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 4


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 1465 / 28474 1.0 (ref.) 105 (100, 110)
Former smoker 1437 / 12383 1.2 (1.1, 1.3) 128 (121, 135)
Smoker 1113 / 13522 2.1 (2.0, 2.3) 207 (195, 219)
Renter
Never smoker 572 / 7346 1.0 (ref.) 141 (129, 153)
Former smoker 614 / 2958 1.2 (1.1, 1.3) 187 (172, 202)
Smoker 854 / 9123 1.8 (1.6, 2.0) 267 (249, 285)
1 2 3 4 5 6
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 156 / 31589 1.0 (ref.) 8 (7, 9)
Former smoker 268 / 14242 2.0 (1.7, 2.5) 16 (14, 18)
Smoker 293 / 14831 4.7 (3.9, 5.8) 41 (36, 46)
Renter
Never smoker 43 / 8317 1.0 (ref.) 9 (6, 12)
Former smoker 111 / 3715 2.6 (1.8, 3.7) 24 (20, 28)
Smoker 226 / 10599 5.4 (3.8, 7.5) 46 (40, 52)
1 2 3 4 5 6
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 629 / 29451 1.0 (ref.) 53 (49, 57)
Former smoker 615 / 12334 1.1 (1.0, 1.2) 62 (57, 67)
Smoker 472 / 14064 2.1 (1.8, 2.4) 93 (85, 101)
Renter
Never smoker 261 / 7660 1.0 (ref.) 72 (63, 81)
Former smoker 317 / 3053 1.2 (1.0, 1.5) 96 (85, 107)
Smoker 404 / 9917 1.8 (1.5, 2.1) 129 (116, 142)
1 2 3 4 5 6
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 156 / 31871 1.0 (ref.) 11 (9, 13)
Former smoker 172 / 14426 1.4 (1.1, 1.7) 14 (12, 16)
Smoker 85 / 14927 2.0 (1.5, 2.6) 16 (13, 19)
Renter
Never smoker 83 / 8376 1.0 (ref.) 17 (13, 21)
Former smoker 74 / 3746 0.9 (0.7, 1.3) 16 (12, 20)
Smoker 76 / 10646 1.3 (0.9, 1.9) 21 (16, 26)
1 2 3 4 5 6
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 254 / 31553 1.0 (ref.) 17 (15, 19)
Former smoker 274 / 13984 1.1 (0.9, 1.3) 22 (19, 25)
Smoker 202 / 14767 2.0 (1.7, 2.4) 34 (29, 39)
Renter
Never smoker 102 / 8233 1.0 (ref.) 23 (19, 27)
Former smoker 145 / 3543 1.3 (1.0, 1.7) 35 (29, 41)
Smoker 197 / 10463 2.1 (1.6, 2.7) 47 (40, 54)
1 2 3 4 5 6
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 414 / 29312 1.0 (ref.) 31 (28, 34)
Former smoker 473 / 13263 1.3 (1.1, 1.4) 40 (36, 44)
Smoker 356 / 13917 2.8 (2.4, 3.2) 75 (67, 83)
Renter
Never smoker 187 / 7612 1.0 (ref.) 42 (36, 48)
Former smoker 256 / 3290 1.4 (1.1, 1.7) 64 (56, 72)
Smoker 312 / 9502 2.3 (1.9, 2.8) 106 (94, 118)
1 2 3 4 5 6
HR (95% CI)

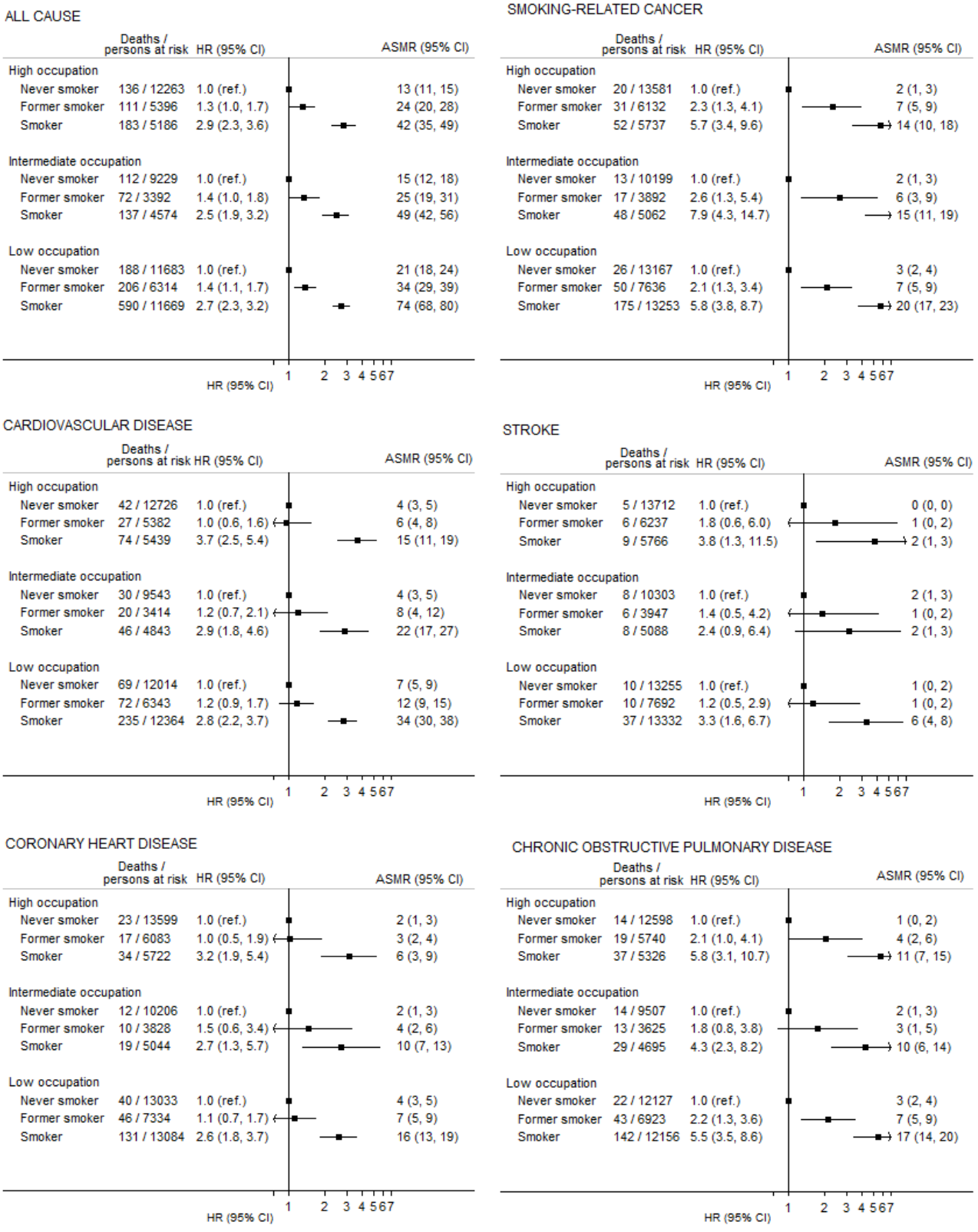
Association between cigarette smoking and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by housing tenure, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Housing tenure was divided into 1) Owner and 2) Renter. Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 5


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 107 / 13960 1.0 (ref.) 12 (10, 14)
Former smoker 57 / 3859 1.2 (0.9, 1.6) 20 (15, 25)
Smoker 124 / 5400 3.0 (2.3, 3.8) 57 (47, 67)
Intermediate education
Never smoker 162 / 12043 1.0 (ref.) 16 (14, 18)
Former smoker 126 / 4964 1.4 (1.1, 1.8) 31 (26, 36)
Smoker 235 / 9332 2.3 (1.9, 2.8) 60 (52, 68)
Low education
Never smoker 188 / 8350 1.0 (ref.) 21 (18, 24)
Former smoker 209 / 6510 1.3 (1.1, 1.6) 29 (25, 33)
Smoker 576 / 7449 2.9 (2.4, 3.4) 71 (65, 77)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 13 / 15378 1.0 (ref.) 1 (0, 2)
Former smoker 13 / 4285 2.0 (0.9, 4.3) 5 (2, 8)
Smoker 34 / 5944 7.0 (3.7, 13.3) 14 (9, 19)
Intermediate education
Never smoker 20 / 13269 1.0 (ref.) 2 (1, 3)
Former smoker 28 / 5602 2.3 (1.3, 4.2) 6 (4, 8)
Smoker 60 / 10256 5.2 (3.1, 8.7) 18 (15, 22)
Low education
Never smoker 28 / 9592 1.0 (ref.) 2 (1, 3)
Former smoker 59 / 8058 2.3 (1.5, 3.6) 7 (5, 9)
Smoker 187 / 8705 6.3 (4.2, 9.4) 20 (17, 23)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 28 / 14795 1.0 (ref.) 4 (3, 5)
Former smoker 16 / 3955 1.2 (0.7, 2.3) 6 (3, 9)
Smoker 43 / 5764 3.9 (2.4, 6.3) 19 (13, 25)
Intermediate education
Never smoker 51 / 12538 1.0 (ref.) 5 (4, 6)
Former smoker 34 / 5024 1.1 (0.7, 1.7) 10 (7, 13)
Smoker 78 / 9939 2.3 (1.6, 3.3) 22 (17, 27)
Low education
Never smoker 70 / 8125 1.0 (ref.) 8 (6, 10)
Former smoker 70 / 6395 1.1 (0.8, 1.5) 10 (8, 12)
Smoker 243 / 7752 3.1 (2.4, 4.1) 32 (28, 36)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 2 / 15482 1.0 (ref.) 1 (0, 2)
Former smoker 6 / 4343 6.3 (1.3, 31.3) 1 (0, 2)
Smoker 8 / 5964 11.1 (2.3, 52.5) 3 (1, 5)
Intermediate education
Never smoker 10 / 13374 1.0 (ref.) 1 (0, 2)
Former smoker 5 / 5656 0.9 (0.3, 2.7) 1 (0, 2)
Smoker 8 / 10307 1.5 (0.6, 3.9) 5 (2, 8)
Low education
Never smoker 12 / 9725 1.0 (ref.) 1 (0, 2)
Former smoker 12 / 8164 1.2 (0.5, 2.6) 1 (0, 2)
Smoker 40 / 8774 3.4 (1.8, 6.5) 5 (3, 8)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 13 / 15425 1.0 (ref.) 2 (1, 3)
Former smoker 5 / 4290 0.7 (0.2, 1.9) 1 (0, 2)
Smoker 19 / 5944 3.4 (1.7, 6.9) 9 (5, 13)
Intermediate education
Never smoker 22 / 13285 1.0 (ref.) 2 (1, 3)
Former smoker 18 / 5558 1.2 (0.7, 2.3) 4 (2, 6)
Smoker 35 / 10250 2.3 (1.3, 3.9) 8 (5, 11)
Low education
Never smoker 41 / 9409 1.0 (ref.) 4 (3, 5)
Former smoker 49 / 7668 1.1 (0.8, 1.7) 6 (4, 8)
Smoker 139 / 8510 3.0 (2.1, 4.2) 15 (13, 17)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 8 / 14166 1.0 (ref.) 1 (0, 2)
Former smoker 9 / 3995 2.4 (0.9, 6.4) 3 (1, 5)
Smoker 22 / 5482 6.9 (3.1, 15.6) 9 (5, 13)
Intermediate education
Never smoker 22 / 12332 1.0 (ref.) 2 (1, 3)
Former smoker 25 / 5204 2.0 (1.1, 3.5) 5 (3, 7)
Smoker 37 / 9502 3.0 (1.8, 5.2) 12 (8, 16)
Low education
Never smoker 25 / 8959 1.0 (ref.) 2 (1, 3)
Former smoker 41 / 7348 1.8 (1.1, 2.9) 6 (4, 8)
Smoker 152 / 7969 5.7 (3.7, 8.7) 17 (14, 20)
1 2 3 4 5 6 7
HR (95% CI)

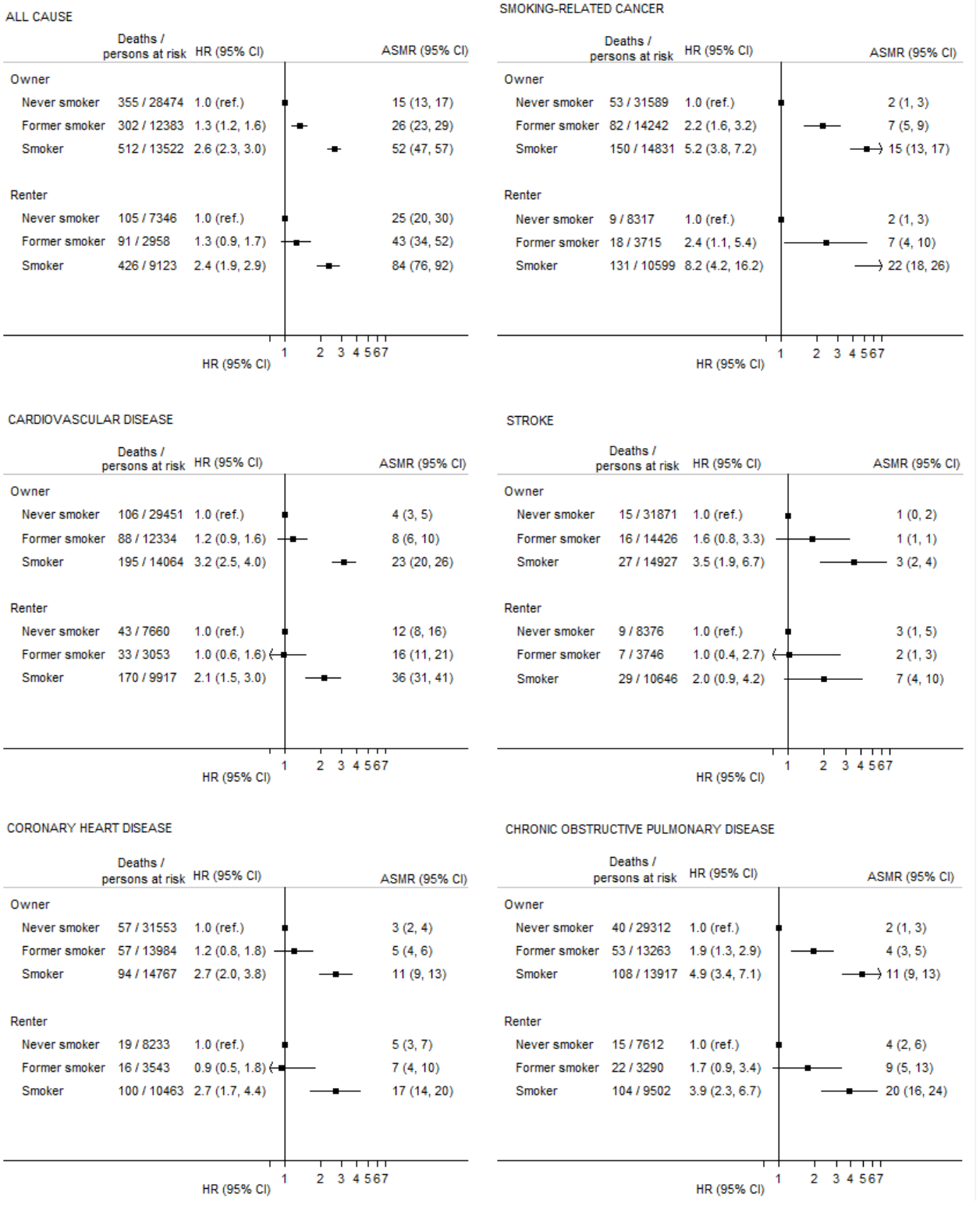
Association between cigarette smoking and premature death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 6


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 136 / 12263 1.0 (ref.) 13 (11, 15)
Former smoker 111 / 5396 1.3 (1.0, 1.7) 24 (20, 28)
Smoker 183 / 5186 2.9 (2.3, 3.6) 42 (35, 49)
Intermediate occupation
Never smoker 112 / 9229 1.0 (ref.) 15 (12, 18)
Former smoker 72 / 3392 1.4 (1.0, 1.8) 25 (19, 31)
Smoker 137 / 4574 2.5 (1.9, 3.2) 49 (42, 56)
Low occupation
Never smoker 188 / 11683 1.0 (ref.) 21 (18, 24)
Former smoker 206 / 6314 1.4 (1.1, 1.7) 34 (29, 39)
Smoker 590 / 11669 2.7 (2.3, 3.2) 74 (68, 80)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 20 / 13581 1.0 (ref.) 2 (1, 3)
Former smoker 31 / 6132 2.3 (1.3, 4.1) 7 (5, 9)
Smoker 52 / 5737 5.7 (3.4, 9.6) 14 (10, 18)
Intermediate occupation
Never smoker 13 / 10199 1.0 (ref.) 2 (1, 3)
Former smoker 17 / 3892 2.6 (1.3, 5.4) 6 (3, 9)
Smoker 48 / 5062 7.9 (4.3, 14.7) 15 (11, 19)
Low occupation
Never smoker 26 / 13167 1.0 (ref.) 3 (2, 4)
Former smoker 50 / 7636 2.1 (1.3, 3.4) 7 (5, 9)
Smoker 175 / 13253 5.8 (3.8, 8.7) 20 (17, 23)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 42 / 12726 1.0 (ref.) 4 (3, 5)
Former smoker 27 / 5382 1.0 (0.6, 1.6) 6 (4, 8)
Smoker 74 / 5439 3.7 (2.5, 5.4) 15 (11, 19)
Intermediate occupation
Never smoker 30 / 9543 1.0 (ref.) 4 (3, 5)
Former smoker 20 / 3414 1.2 (0.7, 2.1) 8 (4, 12)
Smoker 46 / 4843 2.9 (1.8, 4.6) 22 (17, 27)
Low occupation
Never smoker 69 / 12014 1.0 (ref.) 7 (5, 9)
Former smoker 72 / 6343 1.2 (0.9, 1.7) 12 (9, 15)
Smoker 235 / 12364 2.8 (2.2, 3.7) 34 (30, 38)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 5 / 13712 1.0 (ref.) 0 (0, 0)
Former smoker 6 / 6237 1.8 (0.6, 6.0) 1 (0, 2)
Smoker 9 / 5766 3.8 (1.3, 11.5) 2 (1, 3)
Intermediate occupation
Never smoker 8 / 10303 1.0 (ref.) 2 (1, 3)
Former smoker 6 / 3947 1.4 (0.5, 4.2) 1 (0, 2)
Smoker 8 / 5088 2.4 (0.9, 6.4) 2 (1, 3)
Low occupation
Never smoker 10 / 13255 1.0 (ref.) 1 (0, 2)
Former smoker 10 / 7692 1.2 (0.5, 2.9) 1 (0, 2)
Smoker 37 / 13332 3.3 (1.6, 6.7) 6 (4, 8)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 23 / 13599 1.0 (ref.) 2 (1, 3)
Former smoker 17 / 6083 1.0 (0.5, 1.9) 3 (2, 4)
Smoker 34 / 5722 3.2 (1.9, 5.4) 6 (3, 9)
Intermediate occupation
Never smoker 12 / 10206 1.0 (ref.) 2 (1, 3)
Former smoker 10 / 3828 1.5 (0.6, 3.4) 4 (2, 6)
Smoker 19 / 5044 2.7 (1.3, 5.7) 10 (7, 13)
Low occupation
Never smoker 40 / 13033 1.0 (ref.) 4 (3, 5)
Former smoker 46 / 7334 1.1 (0.7, 1.7) 7 (5, 9)
Smoker 131 / 13084 2.6 (1.8, 3.7) 16 (13, 19)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 14 / 12598 1.0 (ref.) 1 (0, 2)
Former smoker 19 / 5740 2.1 (1.0, 4.1) 4 (2, 6)
Smoker 37 / 5326 5.8 (3.1, 10.7) 11 (7, 15)
Intermediate occupation
Never smoker 14 / 9507 1.0 (ref.) 2 (1, 3)
Former smoker 13 / 3625 1.8 (0.8, 3.8) 3 (1, 5)
Smoker 29 / 4695 4.3 (2.3, 8.2) 10 (6, 14)
Low occupation
Never smoker 22 / 12127 1.0 (ref.) 3 (2, 4)
Former smoker 43 / 6923 2.2 (1.3, 3.6) 7 (5, 9)
Smoker 142 / 12156 5.5 (3.5, 8.6) 17 (14, 20)
1 2 3 4 5 6 7
HR (95% CI)

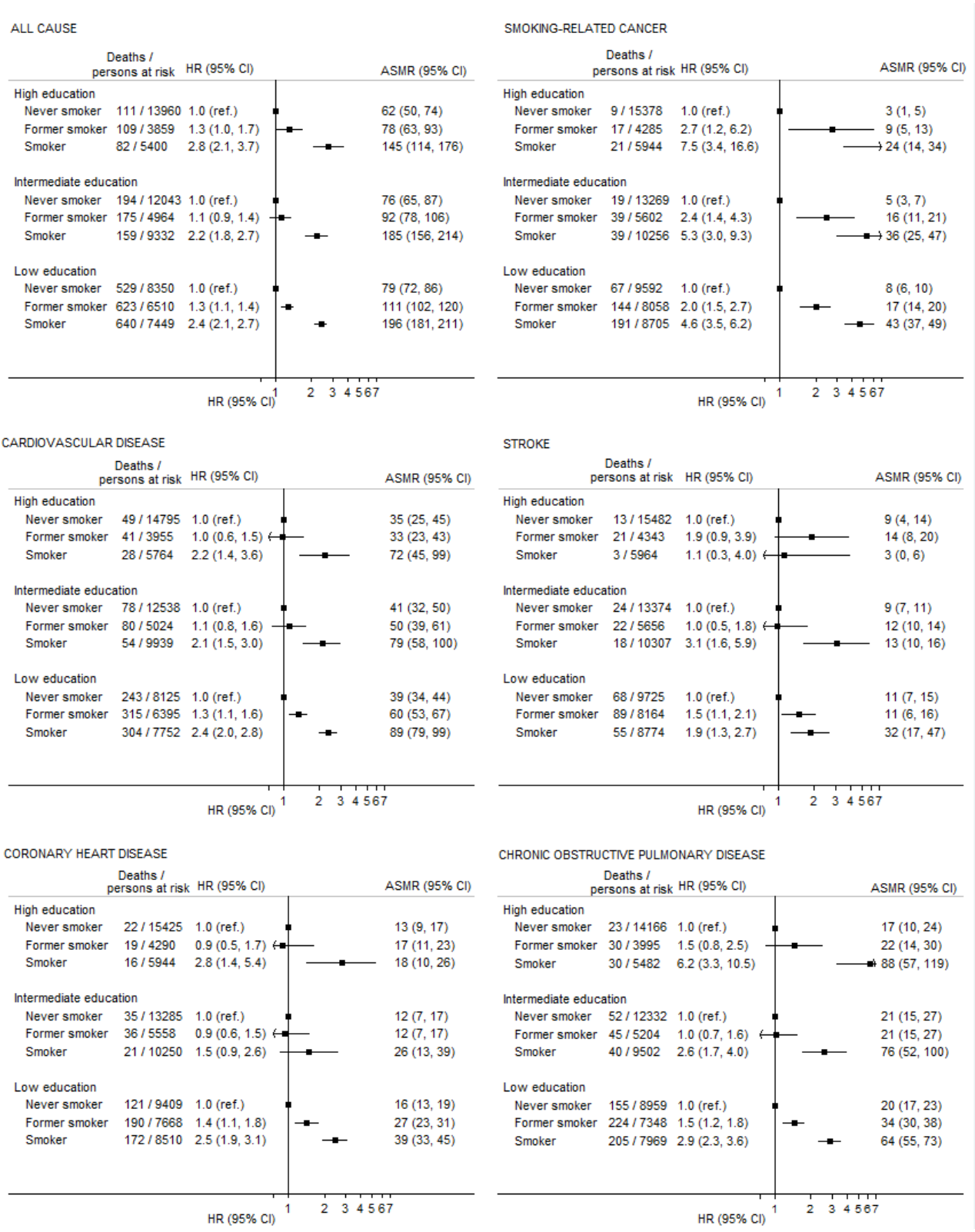
Association between cigarette smoking and premature death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by occupational social class, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 7


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 355 / 28474 1.0 (ref.) 15 (13, 17)
Former smoker 302 / 12383 1.3 (1.2, 1.6) 26 (23, 29)
Smoker 512 / 13522 2.6 (2.3, 3.0) 52 (47, 57)
Renter
Never smoker 105 / 7346 1.0 (ref.) 25 (20, 30)
Former smoker 91 / 2958 1.3 (0.9, 1.7) 43 (34, 52)
Smoker 426 / 9123 2.4 (1.9, 2.9) 84 (76, 92)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 53 / 31589 1.0 (ref.) 2 (1, 3)
Former smoker 82 / 14242 2.2 (1.6, 3.2) 7 (5, 9)
Smoker 150 / 14831 5.2 (3.8, 7.2) 15 (13, 17)
Renter
Never smoker 9 / 8317 1.0 (ref.) 2 (1, 3)
Former smoker 18 / 3715 2.4 (1.1, 5.4) 7 (4, 10)
Smoker 131 / 10599 8.2 (4.2, 16.2) 22 (18, 26)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 106 / 29451 1.0 (ref.) 4 (3, 5)
Former smoker 88 / 12334 1.2 (0.9, 1.6) 8 (6, 10)
Smoker 195 / 14064 3.2 (2.5, 4.0) 23 (20, 26)
Renter
Never smoker 43 / 7660 1.0 (ref.) 12 (8, 16)
Former smoker 33 / 3053 1.0 (0.6, 1.6) 16 (11, 21)
Smoker 170 / 9917 2.1 (1.5, 3.0) 36 (31, 41)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 15 / 31871 1.0 (ref.) 1 (0, 2)
Former smoker 16 / 14426 1.6 (0.8, 3.3) 1 (1, 1)
Smoker 27 / 14927 3.5 (1.9, 6.7) 3 (2, 4)
Renter
Never smoker 9 / 8376 1.0 (ref.) 3 (1, 5)
Former smoker 7 / 3746 1.0 (0.4, 2.7) 2 (1, 3)
Smoker 29 / 10646 2.0 (0.9, 4.2) 7 (4, 10)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 57 / 31553 1.0 (ref.) 3 (2, 4)
Former smoker 57 / 13984 1.2 (0.8, 1.8) 5 (4, 6)
Smoker 94 / 14767 2.7 (2.0, 3.8) 11 (9, 13)
Renter
Never smoker 19 / 8233 1.0 (ref.) 5 (3, 7)
Former smoker 16 / 3543 0.9 (0.5, 1.8) 7 (4, 10)
Smoker 100 / 10463 2.7 (1.7, 4.4) 17 (14, 20)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 40 / 29312 1.0 (ref.) 2 (1, 3)
Former smoker 53 / 13263 1.9 (1.3, 2.9) 4 (3, 5)
Smoker 108 / 13917 4.9 (3.4, 7.1) 11 (9, 13)
Renter
Never smoker 15 / 7612 1.0 (ref.) 4 (2, 6)
Former smoker 22 / 3290 1.7 (0.9, 3.4) 9 (5, 13)
Smoker 104 / 9502 3.9 (2.3, 6.7) 20 (16, 24)
1 2 3 4 5 6 7
HR (95% CI)

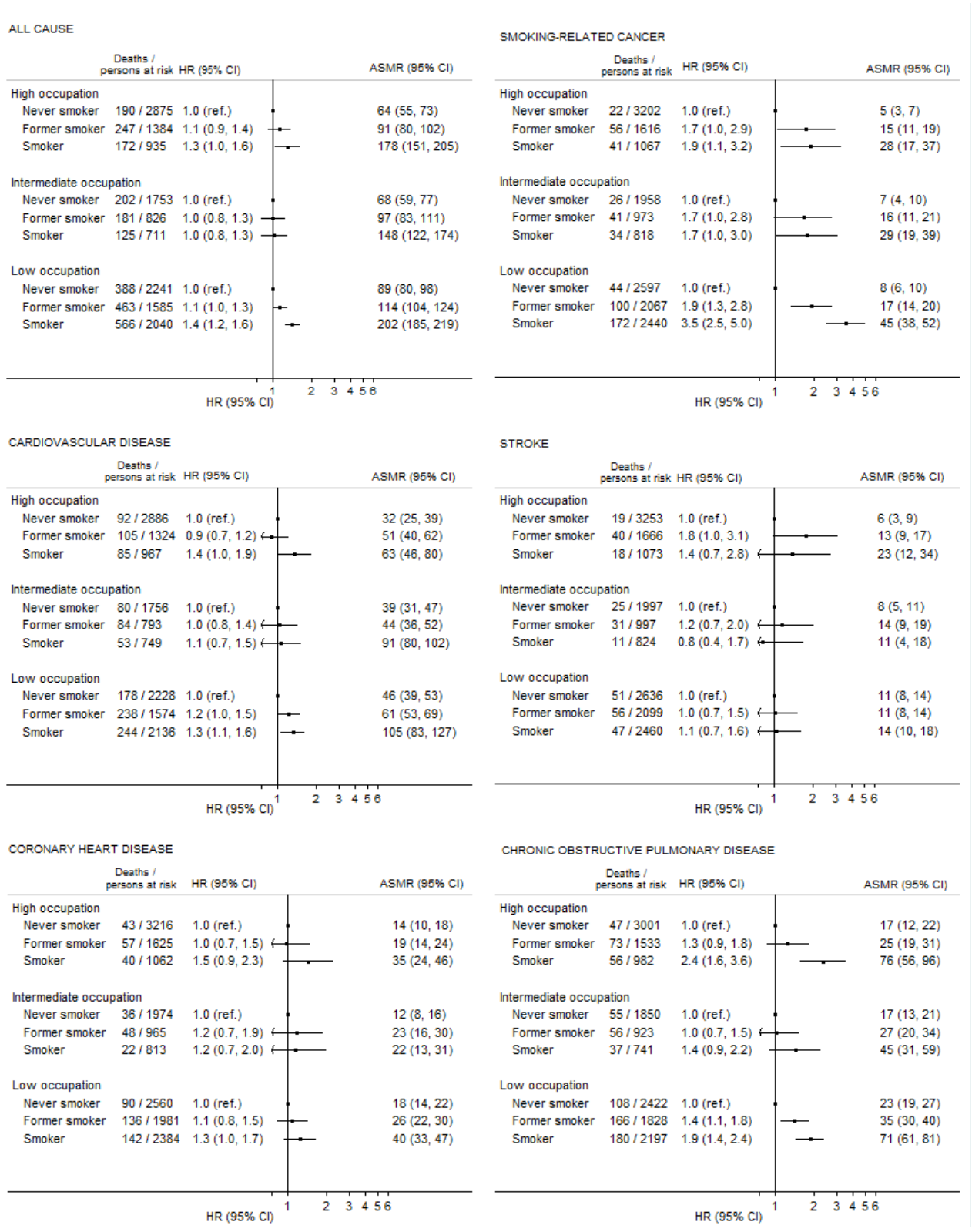
Association between cigarette smoking and premature death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by housing tenure, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Housing tenure was divided into 1) Owner and 2) Renter. Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 8


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 111 / 13960 1.0 (ref.) 62 (50, 74)
Former smoker 109 / 3859 1.3 (1.0, 1.7) 78 (63, 93)
Smoker 82 / 5400 2.8 (2.1, 3.7) 145 (114, 176)
Intermediate education
Never smoker 194 / 12043 1.0 (ref.) 76 (65, 87)
Former smoker 175 / 4964 1.1 (0.9, 1.4) 92 (78, 106)
Smoker 159 / 9332 2.2 (1.8, 2.7) 185 (156, 214)
Low education
Never smoker 529 / 8350 1.0 (ref.) 79 (72, 86)
Former smoker 623 / 6510 1.3 (1.1, 1.4) 111 (102, 120)
Smoker 640 / 7449 2.4 (2.1, 2.7) 196 (181, 211)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 9 / 15378 1.0 (ref.) 3 (1, 5)
Former smoker 17 / 4285 2.7 (1.2, 6.2) 9 (5, 13)
Smoker 21 / 5944 7.5 (3.4, 16.6) 24 (14, 34)
Intermediate education
Never smoker 19 / 13269 1.0 (ref.) 5 (3, 7)
Former smoker 39 / 5602 2.4 (1.4, 4.3) 16 (11, 21)
Smoker 39 / 10256 5.3 (3.0, 9.3) 36 (25, 47)
Low education
Never smoker 67 / 9592 1.0 (ref.) 8 (6, 10)
Former smoker 144 / 8058 2.0 (1.5, 2.7) 17 (14, 20)
Smoker 191 / 8705 4.6 (3.5, 6.2) 43 (37, 49)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 49 / 14795 1.0 (ref.) 35 (25, 45)
Former smoker 41 / 3955 1.0 (0.6, 1.5) 33 (23, 43)
Smoker 28 / 5764 2.2 (1.4, 3.6) 72 (45, 99)
Intermediate education
Never smoker 78 / 12538 1.0 (ref.) 41 (32, 50)
Former smoker 80 / 5024 1.1 (0.8, 1.6) 50 (39, 61)
Smoker 54 / 9939 2.1 (1.5, 3.0) 79 (58, 100)
Low education
Never smoker 243 / 8125 1.0 (ref.) 39 (34, 44)
Former smoker 315 / 6395 1.3 (1.1, 1.6) 60 (53, 67)
Smoker 304 / 7752 2.4 (2.0, 2.8) 89 (79, 99)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 13 / 15482 1.0 (ref.) 9 (4, 14)
Former smoker 21 / 4343 1.9 (0.9, 3.9) 14 (8, 20)
Smoker 3 / 5964 1.1 (0.3, 4.0) 3 (0, 6)
Intermediate education
Never smoker 24 / 13374 1.0 (ref.) 9 (7, 11)
Former smoker 22 / 5656 1.0 (0.5, 1.8) 12 (10, 14)
Smoker 18 / 10307 3.1 (1.6, 5.9) 13 (10, 16)
Low education
Never smoker 68 / 9725 1.0 (ref.) 11 (7, 15)
Former smoker 89 / 8164 1.5 (1.1, 2.1) 11 (6, 16)
Smoker 55 / 8774 1.9 (1.3, 2.7) 32 (17, 47)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 22 / 15425 1.0 (ref.) 13 (9, 17)
Former smoker 19 / 4290 0.9 (0.5, 1.7) 17 (11, 23)
Smoker 16 / 5944 2.8 (1.4, 5.4) 18 (10, 26)
Intermediate education
Never smoker 35 / 13285 1.0 (ref.) 12 (7, 17)
Former smoker 36 / 5558 0.9 (0.6, 1.5) 12 (7, 17)
Smoker 21 / 10250 1.5 (0.9, 2.6) 26 (13, 39)
Low education
Never smoker 121 / 9409 1.0 (ref.) 16 (13, 19)
Former smoker 190 / 7668 1.4 (1.1, 1.8) 27 (23, 31)
Smoker 172 / 8510 2.5 (1.9, 3.1) 39 (33, 45)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 23 / 14166 1.0 (ref.) 17 (10, 24)
Former smoker 30 / 3995 1.5 (0.8, 2.5) 22 (14, 30)
Smoker 30 / 5482 6.2 (3.3, 10.5) 88 (57, 119)
Intermediate education
Never smoker 52 / 12332 1.0 (ref.) 21 (15, 27)
Former smoker 45 / 5204 1.0 (0.7, 1.6) 21 (15, 27)
Smoker 40 / 9502 2.6 (1.7, 4.0) 76 (52, 100)
Low education
Never smoker 155 / 8959 1.0 (ref.) 20 (17, 23)
Former smoker 224 / 7348 1.5 (1.2, 1.8) 34 (30, 38)
Smoker 205 / 7969 2.9 (2.3, 3.6) 64 (55, 73)
1 2 3 4 5 6 7
HR (95% CI)

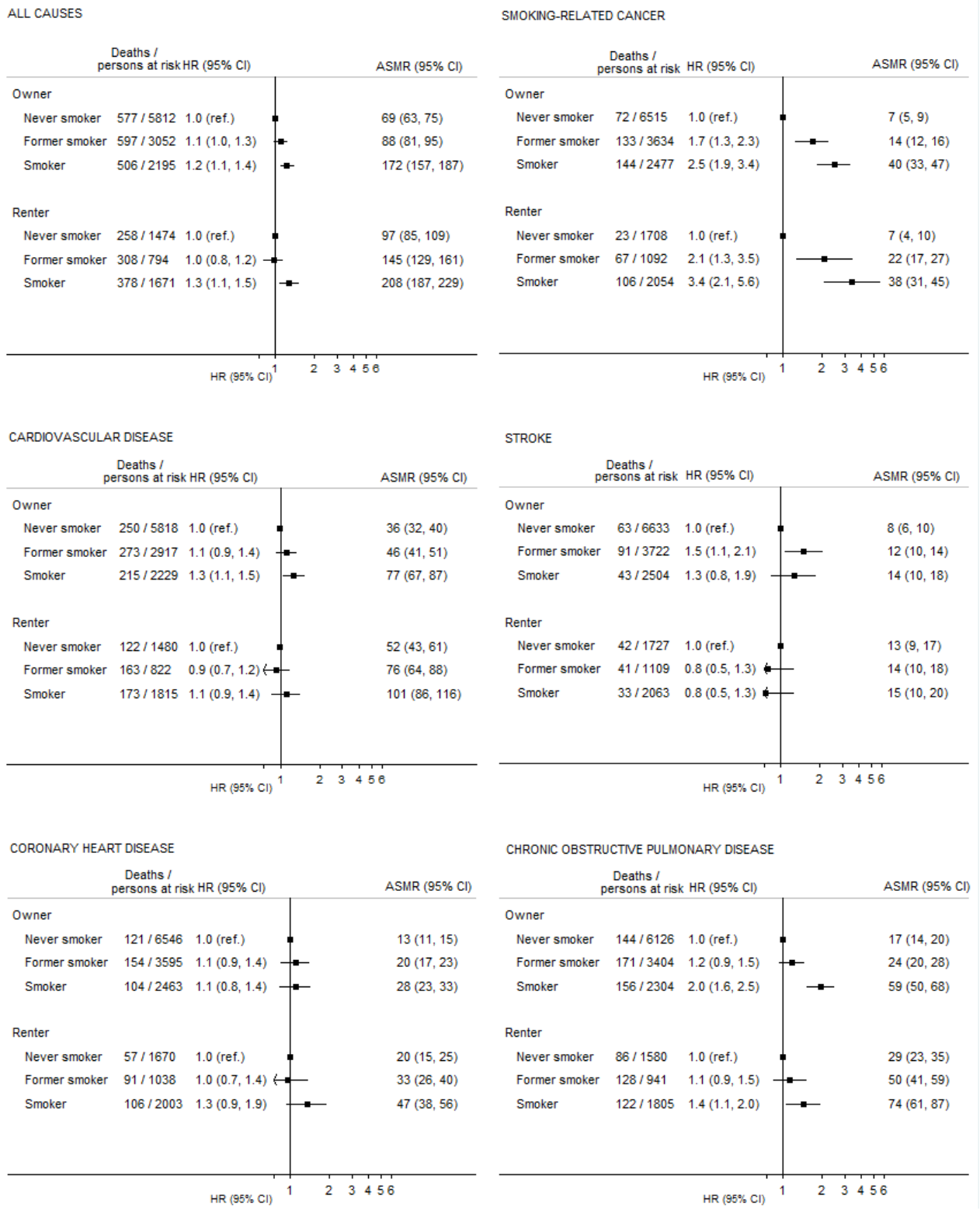
Association between cigarette smoking and death from all causes (limited to 6-y follow-up), smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 9


ALL CAUSE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 190 / 2875 1.0 (ref.) 64 (55, 73)
Former smoker 247 / 1384 1.1 (0.9, 1.4) 91 (80, 102)
Smoker 172 / 935 1.3 (1.0, 1.6) 178 (151, 205)
Intermediate occupation
Never smoker 202 / 1753 1.0 (ref.) 68 (59, 77)
Former smoker 181 / 826 1.0 (0.8, 1.3) 97 (83, 111)
Smoker 125 / 711 1.0 (0.8, 1.3) 148 (122, 174)
Low occupation
Never smoker 388 / 2241 1.0 (ref.) 89 (80, 98)
Former smoker 463 / 1585 1.1 (1.0, 1.3) 114 (104, 124)
Smoker 566 / 2040 1.4 (1.2, 1.6) 202 (185, 219)
1 2 3 4 5 6
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 22 / 3202 1.0 (ref.) 5 (3, 7)
Former smoker 56 / 1616 1.7 (1.0, 2.9) 15 (11, 19)
Smoker 41 / 1067 1.9 (1.1, 3.2) 28 (17, 37)
Intermediate occupation
Never smoker 26 / 1958 1.0 (ref.) 7 (4, 10)
Former smoker 41 / 973 1.7 (1.0, 2.8) 16 (11, 21)
Smoker 34 / 818 1.7 (1.0, 3.0) 29 (19, 39)
Low occupation
Never smoker 44 / 2597 1.0 (ref.) 8 (6, 10)
Former smoker 100 / 2067 1.9 (1.3, 2.8) 17 (14, 20)
Smoker 172 / 2440 3.5 (2.5, 5.0) 45 (38, 52)
1 2 3 4 5 6
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 92 / 2886 1.0 (ref.) 32 (25, 39)
Former smoker 105 / 1324 0.9 (0.7, 1.2) 51 (40, 62)
Smoker 85 / 967 1.4 (1.0, 1.9) 63 (46, 80)
Intermediate occupation
Never smoker 80 / 1756 1.0 (ref.) 39 (31, 47)
Former smoker 84 / 793 1.0 (0.8, 1.4) 44 (36, 52)
Smoker 53 / 749 1.1 (0.7, 1.5) 91 (80, 102)
Low occupation
Never smoker 178 / 2228 1.0 (ref.) 46 (39, 53)
Former smoker 238 / 1574 1.2 (1.0, 1.5) 61 (53, 69)
Smoker 244 / 2136 1.3 (1.1, 1.6) 105 (83, 127)
1 2 3 4 5 6
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 19 / 3253 1.0 (ref.) 6 (3, 9)
Former smoker 40 / 1666 1.8 (1.0, 3.1) 13 (9, 17)
Smoker 18 / 1073 1.4 (0.7, 2.8) 23 (12, 34)
Intermediate occupation
Never smoker 25 / 1997 1.0 (ref.) 8 (5, 11)
Former smoker 31 / 997 1.2 (0.7, 2.0) 14 (9, 19)
Smoker 11 / 824 0.8 (0.4, 1.7) 11 (4, 18)
Low occupation
Never smoker 51 / 2636 1.0 (ref.) 11 (8, 14)
Former smoker 56 / 2099 1.0 (0.7, 1.5) 11 (8, 14)
Smoker 47 / 2460 1.1 (0.7, 1.6) 14 (10, 18)
1 2 3 4 5 6
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 43 / 3216 1.0 (ref.) 14 (10, 18)
Former smoker 57 / 1625 1.0 (0.7, 1.5) 19 (14, 24)
Smoker 40 / 1062 1.5 (0.9, 2.3) 35 (24, 46)
Intermediate occupation
Never smoker 36 / 1974 1.0 (ref.) 12 (8, 16)
Former smoker 48 / 965 1.2 (0.7, 1.9) 23 (16, 30)
Smoker 22 / 813 1.2 (0.7, 2.0) 22 (13, 31)
Low occupation
Never smoker 90 / 2560 1.0 (ref.) 18 (14, 22)
Former smoker 136 / 1981 1.1 (0.8, 1.5) 26 (22, 30)
Smoker 142 / 2384 1.3 (1.0, 1.7) 40 (33, 47)
1 2 3 4 5 6
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 47 / 3001 1.0 (ref.) 17 (12, 22)
Former smoker 73 / 1533 1.3 (0.9, 1.8) 25 (19, 31)
Smoker 56 / 982 2.4 (1.6, 3.6) 76 (56, 96)
Intermediate occupation
Never smoker 55 / 1850 1.0 (ref.) 17 (13, 21)
Former smoker 56 / 923 1.0 (0.7, 1.5) 27 (20, 34)
Smoker 37 / 741 1.4 (0.9, 2.2) 45 (31, 59)
Low occupation
Never smoker 108 / 2422 1.0 (ref.) 23 (19, 27)
Former smoker 166 / 1828 1.4 (1.1, 1.8) 35 (30, 40)
Smoker 180 / 2197 1.9 (1.4, 2.4) 71 (61, 81)
1 2 3 4 5 6
HR (95% CI)

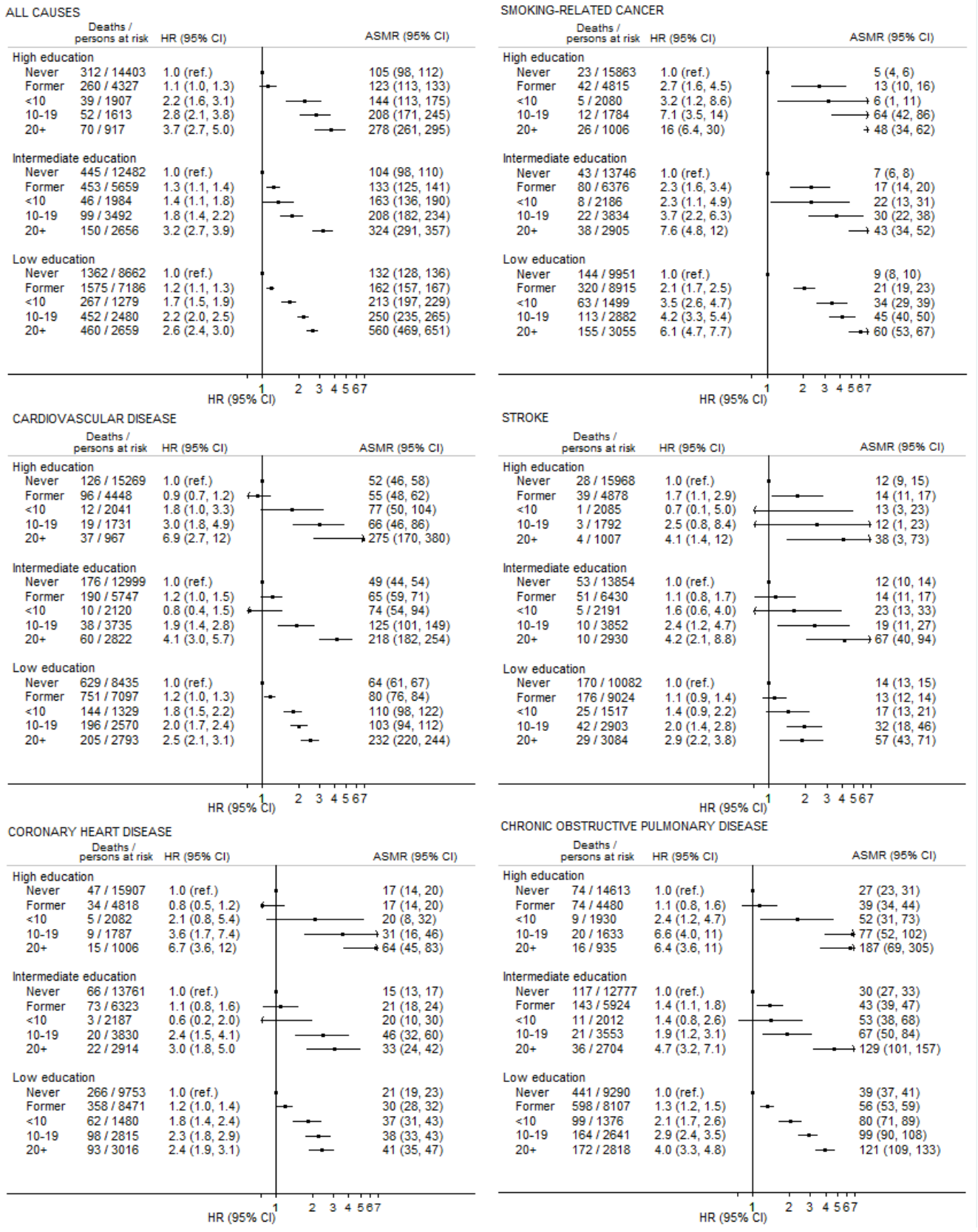
Association between cigarette smoking and death from all causes (limited to 6-y follow-up), smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by occupational social class, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 10


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 577 / 5812 1.0 (ref.) 69 (63, 75)
Former smoker 597 / 3052 1.1 (1.0, 1.3) 88 (81, 95)
Smoker 506 / 2195 1.2 (1.1, 1.4) 172 (157, 187)
Renter
Never smoker 258 / 1474 1.0 (ref.) 97 (85, 109)
Former smoker 308 / 794 1.0 (0.8, 1.2) 145 (129, 161)
Smoker 378 / 1671 1.3 (1.1, 1.5) 208 (187, 229)
HR (95% CI) 1 2 3 4 5 6
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 72 / 6515 1.0 (ref.) 7 (5, 9)
Former smoker 133 / 3634 1.7 (1.3, 2.3) 14 (12, 16)
Smoker 144 / 2477 2.5 (1.9, 3.4) 40 (33, 47)
Renter
Never smoker 23 / 1708 1.0 (ref.) 7 (4, 10)
Former smoker 67 / 1092 2.1 (1.3, 3.5) 22 (17, 27)
Smoker 106 / 2054 3.4 (2.1, 5.6) 38 (31, 45)
HR (95% CI) 1 2 3 4 5 6
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 250 / 5818 1.0 (ref.) 36 (32, 40)
Former smoker 273 / 2917 1.1 (0.9, 1.4) 46 (41, 51)
Smoker 215 / 2229 1.3 (1.1, 1.5) 77 (67, 87)
Renter
Never smoker 122 / 1480 1.0 (ref.) 52 (43, 61)
Former smoker 163 / 822 0.9 (0.7, 1.2) 76 (64, 88)
Smoker 173 / 1815 1.1 (0.9, 1.4) 101 (86, 116)
HR (95% CI) 1 2 3 4 5 6
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 63 / 6633 1.0 (ref.) 8 (6, 10)
Former smoker 91 / 3722 1.5 (1.1, 2.1) 12 (10, 14)
Smoker 43 / 2504 1.3 (0.8, 1.9) 14 (10, 18)
Renter
Never smoker 42 / 1727 1.0 (ref.) 13 (9, 17)
Former smoker 41 / 1109 0.8 (0.5, 1.3) 14 (10, 18)
Smoker 33 / 2063 0.8 (0.5, 1.3) 15 (10, 20)
HR (95% CI) 1 2 3 4 5 6
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 121 / 6546 1.0 (ref.) 13 (11, 15)
Former smoker 154 / 3595 1.1 (0.9, 1.4) 20 (17, 23)
Smoker 104 / 2463 1.1 (0.8, 1.4) 28 (23, 33)
Renter
Never smoker 57 / 1670 1.0 (ref.) 20 (15, 25)
Former smoker 91 / 1038 1.0 (0.7, 1.4) 33 (26, 40)
Smoker 106 / 2003 1.3 (0.9, 1.9) 47 (38, 56)
HR (95% CI) 1 2 3 4 5 6
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 144 / 6126 1.0 (ref.) 17 (14, 20)
Former smoker 171 / 3404 1.2 (0.9, 1.5) 24 (20, 28)
Smoker 156 / 2304 2.0 (1.6, 2.5) 59 (50, 68)
Renter
Never smoker 86 / 1580 1.0 (ref.) 29 (23, 35)
Former smoker 128 / 941 1.1 (0.9, 1.5) 50 (41, 59)
Smoker 122 / 1805 1.4 (1.1, 2.0) 74 (61, 87)
HR (95% CI) 1 2 3 4 5 6

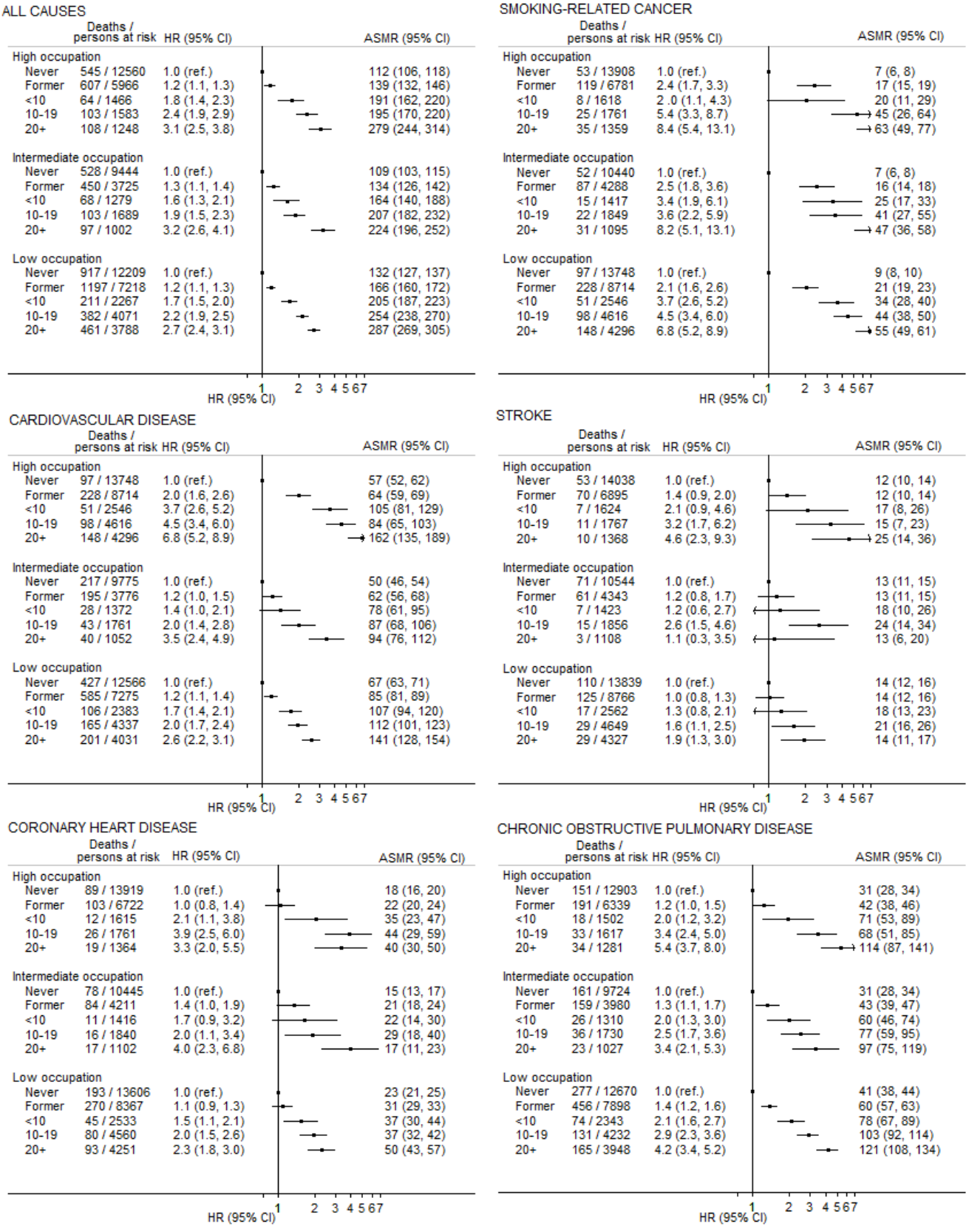
Association between cigarette smoking and death from all causes (limited to 6-y follow-up), smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by housing tenure, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Housing tenure was divided into 1) Owner and 2) Renter. Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 11


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never 312 / 14403 1.0 (ref.) 105 (98, 112)
Former 260 / 4327 1.1 (1.0, 1.3) 123 (113, 133)
<10 39 / 1907 2.2 (1.6, 3.1) 144 (113, 175)
10-19 52 / 1613 2.8 (2.1, 3.8) 208 (171, 245)
20+ 70 / 917 3.7 (2.7, 5.0) 278 (261, 295)
Intermediate education
Never 445 / 12482 1.0 (ref.) 104 (98, 110)
Former 453 / 5659 1.3 (1.1, 1.4) 133 (125, 141)
<10 46 / 1984 1.4 (1.1, 1.8) 163 (136, 190)
10-19 99 / 3492 1.8 (1.4, 2.2) 208 (182, 234)
20+ 150 / 2656 3.2 (2.7, 3.9) 324 (291, 357)
Low education
Never 1362 / 8662 1.0 (ref.) 132 (128, 136)
Former 1575 / 7186 1.2 (1.1, 1.3) 162 (157, 167)
<10 267 / 1279 1.7 (1.5, 1.9) 213 (197, 229)
10-19 452 / 2480 2.2 (2.0, 2.5) 250 (235, 265)
20+ 460 / 2659 2.6 (2.4, 3.0) 560 (469, 651)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never 23 / 15863 1.0 (ref.) 5 (4, 6)
Former 42 / 4815 2.7 (1.6, 4.5) 13 (10, 16)
<10 5 / 2080 3.2 (1.2, 8.6) 6 (1, 11)
10-19 12 / 1784 7.1 (3.5, 14) 64 (42, 86)
20+ 26 / 1006 16 (6.4, 30) 48 (34, 62)
Intermediate education
Never 43 / 13746 1.0 (ref.) 7 (6, 8)
Former 80 / 6376 2.3 (1.6, 3.4) 17 (14, 20)
<10 8 / 2186 2.3 (1.1, 4.9) 22 (13, 31)
10-19 22 / 3834 3.7 (2.2, 6.3) 30 (22, 38)
20+ 38 / 2905 7.6 (4.8, 12) 43 (34, 52)
Low education
Never 144 / 9951 1.0 (ref.) 9 (8, 10)
Former 320 / 8915 2.1 (1.7, 2.5) 21 (19, 23)
<10 63 / 1499 3.5 (2.6, 4.7) 34 (29, 39)
10-19 113 / 2882 4.2 (3.3, 5.4) 45 (40, 50)
20+ 155 / 3055 6.1 (4.7, 7.7) 60 (53, 67)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never 126 / 15269 1.0 (ref.) 52 (46, 58)
Former 96 / 4448 0.9 (0.7, 1.2) 55 (48, 62)
<10 12 / 2041 1.8 (1.0, 3.3) 77 (50, 104)
10-19 19 / 1731 3.0 (1.8, 4.9) 66 (46, 86)
20+ 37 / 967 6.9 (2.7, 12) 275 (170, 380)
Intermediate education
Never 176 / 12999 1.0 (ref.) 49 (44, 54)
Former 190 / 5747 1.2 (1.0, 1.5) 65 (59, 71)
<10 10 / 2120 0.8 (0.4, 1.5) 74 (54, 94)
10-19 38 / 3735 1.9 (1.4, 2.8) 125 (101, 149)
20+ 60 / 2822 4.1 (3.0, 5.7) 218 (182, 254)
Low education
Never 629 / 8435 1.0 (ref.) 64 (61, 67)
Former 751 / 7097 1.2 (1.0, 1.3) 80 (76, 84)
<10 144 / 1329 1.8 (1.5, 2.2) 110 (98, 122)
10-19 196 / 2570 2.0 (1.7, 2.4) 103 (94, 112)
20+ 205 / 2793 2.5 (2.1, 3.1) 232 (220, 244)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never 28 / 15968 1.0 (ref.) 12 (9, 15)
Former 39 / 4878 1.7 (1.1, 2.9) 14 (11, 17)
<10 1 / 2085 0.7 (0.1, 5.0) 13 (3, 23)
10-19 3 / 1792 2.5 (0.8, 8.4) 12 (1, 23)
20+ 4 / 1007 4.1 (1.4, 12) 38 (3, 73)
Intermediate education
Never 53 / 13854 1.0 (ref.) 12 (10, 14)
Former 51 / 6430 1.1 (0.8, 1.7) 14 (11, 17)
<10 5 / 2191 1.6 (0.6, 4.0) 23 (13, 33)
10-19 10 / 3852 2.4 (1.2, 4.7) 19 (11, 27)
20+ 10 / 2930 4.2 (2.1, 8.8) 67 (40, 94)
Low education
Never 170 / 10082 1.0 (ref.) 14 (13, 15)
Former 176 / 9024 1.1 (0.9, 1.4) 13 (12, 14)
<10 25 / 1517 1.4 (0.9, 2.2) 17 (13, 21)
10-19 42 / 2903 2.0 (1.4, 2.8) 32 (18, 46)
20+ 29 / 3084 2.9 (2.2, 3.8) 57 (43, 71)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never 47 / 15907 1.0 (ref.) 17 (14, 20)
Former 34 / 4818 0.8 (0.5, 1.2) 17 (14, 20)
<10 5 / 2082 2.1 (0.8, 5.4) 20 (8, 32)
10-19 9 / 1787 3.6 (1.7, 7.4) 31 (16, 46)
20+ 15 / 1006 6.7 (3.6, 12) 64 (45, 83)
Intermediate education
Never 66 / 13761 1.0 (ref.) 15 (13, 17)
Former 73 / 6323 1.1 (0.8, 1.6) 21 (18, 24)
<10 3 / 2187 0.6 (0.2, 2.0) 20 (10, 30)
10-19 20 / 3830 2.4 (1.5, 4.1) 46 (32, 60)
20+ 22 / 2914 3.0 (1.8, 5.0 33 (24, 42)
Low education
Never 266 / 9753 1.0 (ref.) 21 (19, 23)
Former 358 / 8471 1.2 (1.0, 1.4) 30 (28, 32)
<10 62 / 1480 1.8 (1.4, 2.4) 37 (31, 43)
10-19 98 / 2815 2.3 (1.8, 2.9) 38 (33, 43)
20+ 93 / 3016 2.4 (1.9, 3.1) 41 (35, 47)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never 74 / 14613 1.0 (ref.) 27 (23, 31)
Former 74 / 4480 1.1 (0.8, 1.6) 39 (34, 44)
<10 9 / 1930 2.4 (1.2, 4.7) 52 (31, 73)
10-19 20 / 1633 6.6 (4.0, 11) 77 (52, 102)
20+ 16 / 935 6.4 (3.6, 11) 187 (69, 305)
Intermediate education
Never 117 / 12777 1.0 (ref.) 30 (27, 33)
Former 143 / 5924 1.4 (1.1, 1.8) 43 (39, 47)
<10 11 / 2012 1.4 (0.8, 2.6) 53 (38, 68)
10-19 21 / 3553 1.9 (1.2, 3.1) 67 (50, 84)
20+ 36 / 2704 4.7 (3.2, 7.1) 129 (101, 157)
Low education
Never 441 / 9290 1.0 (ref.) 39 (37, 41)
Former 598 / 8107 1.3 (1.2, 1.5) 56 (53, 59)
<10 99 / 1376 2.1 (1.7, 2.6) 80 (71, 89)
10-19 164 / 2641 2.9 (2.4, 3.5) 99 (90, 108)
20+ 172 / 2818 4.0 (3.3, 4.8) 121 (109, 133)
1 2 3 4 5 6 7
HR (95% CI)

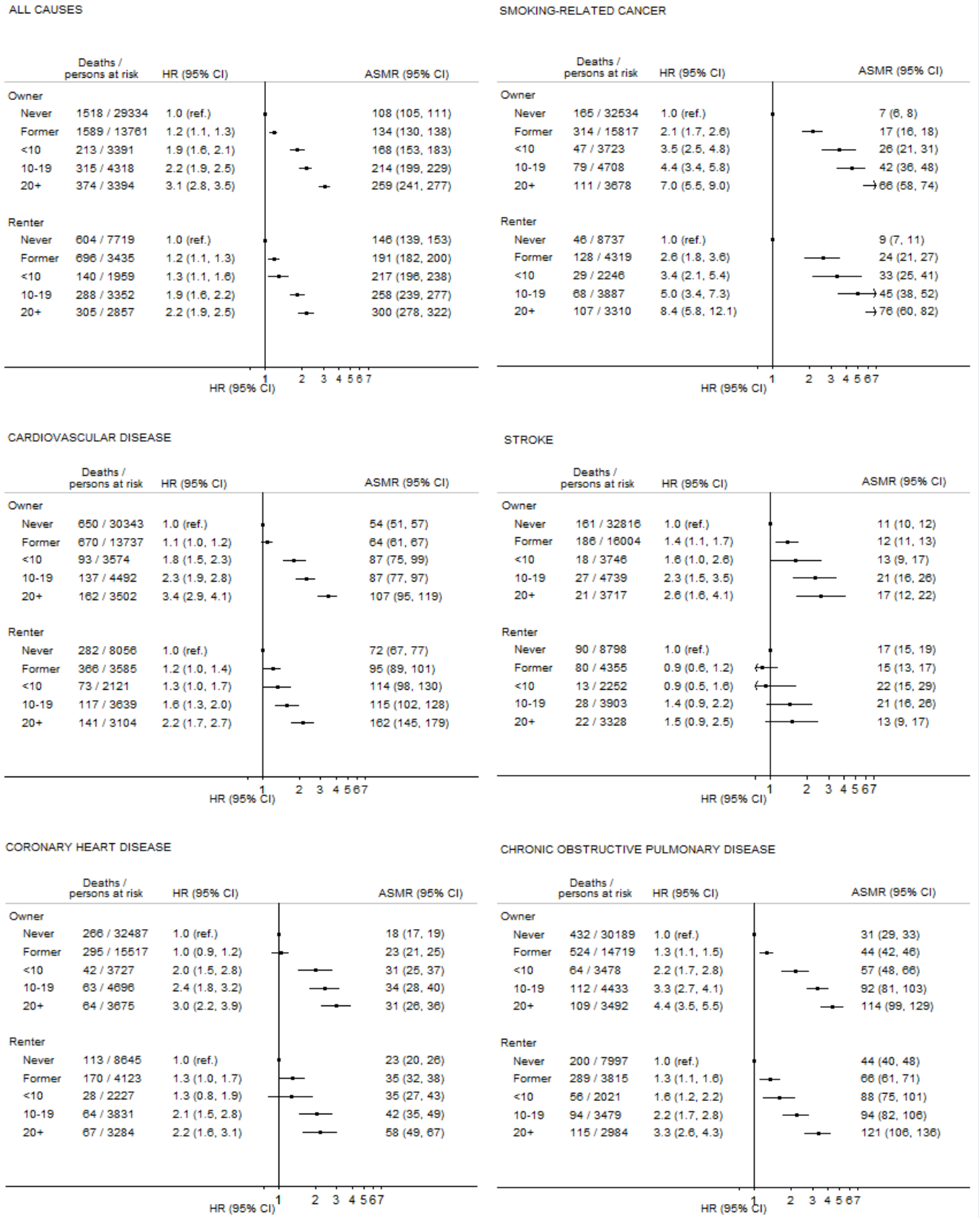
Association between cigarette smoking (number of cigarettes smoked per day) and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 12


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never 545 / 12560 1.0 (ref.) 112 (106, 118)
Former 607 / 5966 1.2 (1.1, 1.3) 139 (132, 146)
<10 64 / 1466 1.8 (1.4, 2.3) 191 (162, 220)
10-19 103 / 1583 2.4 (1.9, 2.9) 195 (170, 220)
20+ 108 / 1248 3.1 (2.5, 3.8) 279 (244, 314)
Intermediate occupation
Never 528 / 9444 1.0 (ref.) 109 (103, 115)
Former 450 / 3725 1.3 (1.1, 1.4) 134 (126, 142)
<10 68 / 1279 1.6 (1.3, 2.1) 164 (140, 188)
10-19 103 / 1689 1.9 (1.5, 2.3) 207 (182, 232)
20+ 97 / 1002 3.2 (2.6, 4.1) 224 (196, 252)
Low occupation
Never 917 / 12209 1.0 (ref.) 132 (127, 137)
Former 1197 / 7218 1.2 (1.1, 1.3) 166 (160, 172)
<10 211 / 2267 1.7 (1.5, 2.0) 205 (187, 223)
10-19 382 / 4071 2.2 (1.9, 2.5) 254 (238, 270)
20+ 461 / 3788 2.7 (2.4, 3.1) 287 (269, 305)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never 53 / 13908 1.0 (ref.) 7 (6, 8)
Former 119 / 6781 2.4 (1.7, 3.3) 17 (15, 19)
<10 8 / 1618 2 .0 (1.1, 4.3) 20 (11, 29)
10-19 25 / 1761 5.4 (3.3, 8.7) 45 (26, 64)
20+ 35 / 1359 8.4 (5.4, 13.1) 63 (49, 77)
Intermediate occupation
Never 52 / 10440 1.0 (ref.) 7 (6, 8)
Former 87 / 4288 2.5 (1.8, 3.6) 16 (14, 18)
<10 15 / 1417 3.4 (1.9, 6.1) 25 (17, 33)
10-19 22 / 1849 3.6 (2.2, 5.9) 41 (27, 55)
20+ 31 / 1095 8.2 (5.1, 13.1) 47 (36, 58)
Low occupation
Never 97 / 13748 1.0 (ref.) 9 (8, 10)
Former 228 / 8714 2.1 (1.6, 2.6) 21 (19, 23)
<10 51 / 2546 3.7 (2.6, 5.2) 34 (28, 40)
10-19 98 / 4616 4.5 (3.4, 6.0) 44 (38, 50)
20+ 148 / 4296 6.8 (5.2, 8.9) 55 (49, 61)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never 97 / 13748 1.0 (ref.) 57 (52, 62)
Former 228 / 8714 2.0 (1.6, 2.6) 64 (59, 69)
<10 51 / 2546 3.7 (2.6, 5.2) 105 (81, 129)
10-19 98 / 4616 4.5 (3.4, 6.0) 84 (65, 103)
20+ 148 / 4296 6.8 (5.2, 8.9) 162 (135, 189)
Intermediate occupation
Never 217 / 9775 1.0 (ref.) 50 (46, 54)
Former 195 / 3776 1.2 (1.0, 1.5) 62 (56, 68)
<10 28 / 1372 1.4 (1.0, 2.1) 78 (61, 95)
10-19 43 / 1761 2.0 (1.4, 2.8) 87 (68, 106)
20+ 40 / 1052 3.5 (2.4, 4.9) 94 (76, 112)
Low occupation
Never 427 / 12566 1.0 (ref.) 67 (63, 71)
Former 585 / 7275 1.2 (1.1, 1.4) 85 (81, 89)
<10 106 / 2383 1.7 (1.4, 2.1) 107 (94, 120)
10-19 165 / 4337 2.0 (1.7, 2.4) 112 (101, 123)
20+ 201 / 4031 2.6 (2.2, 3.1) 141 (128, 154)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never 53 / 14038 1.0 (ref.) 12 (10, 14)
Former 70 / 6895 1.4 (0.9, 2.0) 12 (10, 14)
<10 7 / 1624 2.1 (0.9, 4.6) 17 (8, 26)
10-19 11 / 1767 3.2 (1.7, 6.2) 15 (7, 23)
20+ 10 / 1368 4.6 (2.3, 9.3) 25 (14, 36)
Intermediate occupation
Never 71 / 10544 1.0 (ref.) 13 (11, 15)
Former 61 / 4343 1.2 (0.8, 1.7) 13 (11, 15)
<10 7 / 1423 1.2 (0.6, 2.7) 18 (10, 26)
10-19 15 / 1856 2.6 (1.5, 4.6) 24 (14, 34)
20+ 3 / 1108 1.1 (0.3, 3.5) 13 (6, 20)
Low occupation
Never 110 / 13839 1.0 (ref.) 14 (12, 16)
Former 125 / 8766 1.0 (0.8, 1.3) 14 (12, 16)
<10 17 / 2562 1.3 (0.8, 2.1) 18 (13, 23)
10-19 29 / 4649 1.6 (1.1, 2.5) 21 (16, 26)
20+ 29 / 4327 1.9 (1.3, 3.0) 14 (11, 17)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never 89 / 13919 1.0 (ref.) 18 (16, 20)
Former 103 / 6722 1.0 (0.8, 1.4) 22 (20, 24)
<10 12 / 1615 2.1 (1.1, 3.8) 35 (23, 47)
10-19 26 / 1761 3.9 (2.5, 6.0) 44 (29, 59)
20+ 19 / 1364 3.3 (2.0, 5.5) 40 (30, 50)
Intermediate occupation
Never 78 / 10445 1.0 (ref.) 15 (13, 17)
Former 84 / 4211 1.4 (1.0, 1.9) 21 (18, 24)
<10 11 / 1416 1.7 (0.9, 3.2) 22 (14, 30)
10-19 16 / 1840 2.0 (1.1, 3.4) 29 (18, 40)
20+ 17 / 1102 4.0 (2.3, 6.8) 17 (11, 23)
Low occupation
Never 193 / 13606 1.0 (ref.) 23 (21, 25)
Former 270 / 8367 1.1 (0.9, 1.3) 31 (29, 33)
<10 45 / 2533 1.5 (1.1, 2.1) 37 (30, 44)
10-19 80 / 4560 2.0 (1.5, 2.6) 37 (32, 42)
20+ 93 / 4251 2.3 (1.8, 3.0) 50 (43, 57)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never 151 / 12903 1.0 (ref.) 31 (28, 34)
Former 191 / 6339 1.2 (1.0, 1.5) 42 (38, 46)
<10 18 / 1502 2.0 (1.2, 3.2) 71 (53, 89)
10-19 33 / 1617 3.4 (2.4, 5.0) 68 (51, 85)
20+ 34 / 1281 5.4 (3.7, 8.0) 114 (87, 141)
Intermediate occupation
Never 161 / 9724 1.0 (ref.) 31 (28, 34)
Former 159 / 3980 1.3 (1.1, 1.7) 43 (39, 47)
<10 26 / 1310 2.0 (1.3, 3.0) 60 (46, 74)
10-19 36 / 1730 2.5 (1.7, 3.6) 77 (59, 95)
20+ 23 / 1027 3.4 (2.1, 5.3) 97 (75, 119)
Low occupation
Never 277 / 12670 1.0 (ref.) 41 (38, 44)
Former 456 / 7898 1.4 (1.2, 1.6) 60 (57, 63)
<10 74 / 2343 2.1 (1.6, 2.7) 78 (67, 89)
10-19 131 / 4232 2.9 (2.3, 3.6) 103 (92, 114)
20+ 165 / 3948 4.2 (3.4, 5.2) 121 (108, 134)
1 2 3 4 5 6 7
HR (95% CI)

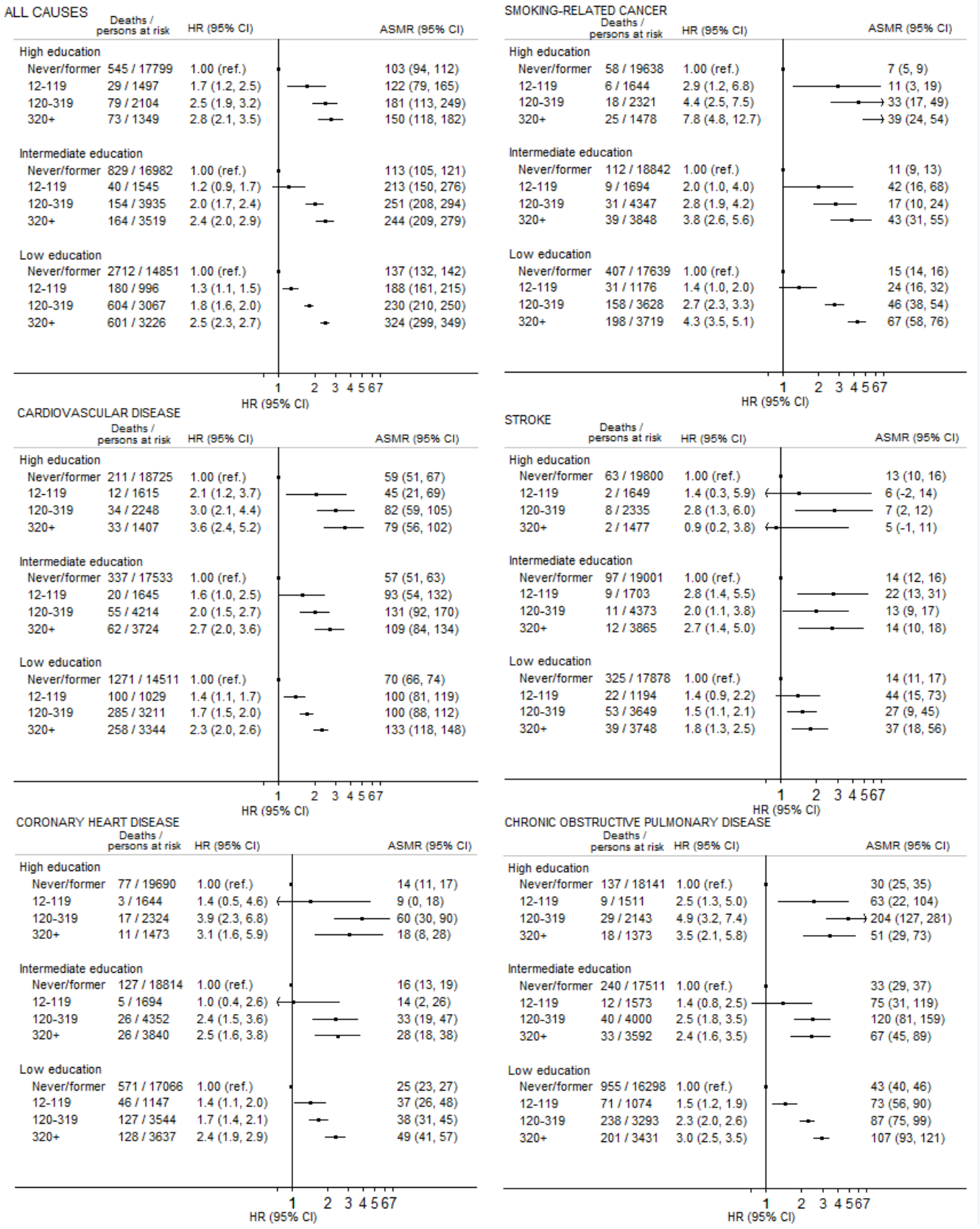
Association between cigarette smoking (number of cigarettes smoked per day) and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by occupational social class, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 13


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never 1518 / 29334 1.0 (ref.) 108 (105, 111)
Former 1589 / 13761 1.2 (1.1, 1.3) 134 (130, 138)
<10 213 / 3391 1.9 (1.6, 2.1) 168 (153, 183)
10-19 315 / 4318 2.2 (1.9, 2.5) 214 (199, 229)
20+ 374 / 3394 3.1 (2.8, 3.5) 259 (241, 277)
Renter
Never 604 / 7719 1.0 (ref.) 146 (139, 153)
Former 696 / 3435 1.2 (1.1, 1.3) 191 (182, 200)
<10 140 / 1959 1.3 (1.1, 1.6) 217 (196, 238)
10-19 288 / 3352 1.9 (1.6, 2.2) 258 (239, 277)
20+ 305 / 2857 2.2 (1.9, 2.5) 300 (278, 322)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never 165 / 32534 1.0 (ref.) 7 (6, 8)
Former 314 / 15817 2.1 (1.7, 2.6) 17 (16, 18)
<10 47 / 3723 3.5 (2.5, 4.8) 26 (21, 31)
10-19 79 / 4708 4.4 (3.4, 5.8) 42 (36, 48)
20+ 111 / 3678 7.0 (5.5, 9.0) 66 (58, 74)
Renter
Never 46 / 8737 1.0 (ref.) 9 (7, 11)
Former 128 / 4319 2.6 (1.8, 3.6) 24 (21, 27)
<10 29 / 2246 3.4 (2.1, 5.4) 33 (25, 41)
10-19 68 / 3887 5.0 (3.4, 7.3) 45 (38, 52)
20+ 107 / 3310 8.4 (5.8, 12.1) 76 (60, 82)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never 650 / 30343 1.0 (ref.) 54 (51, 57)
Former 670 / 13737 1.1 (1.0, 1.2) 64 (61, 67)
<10 93 / 3574 1.8 (1.5, 2.3) 87 (75, 99)
10-19 137 / 4492 2.3 (1.9, 2.8) 87 (77, 97)
20+ 162 / 3502 3.4 (2.9, 4.1) 107 (95, 119)
Renter
Never 282 / 8056 1.0 (ref.) 72 (67, 77)
Former 366 / 3585 1.2 (1.0, 1.4) 95 (89, 101)
<10 73 / 2121 1.3 (1.0, 1.7) 114 (98, 130)
10-19 117 / 3639 1.6 (1.3, 2.0) 115 (102, 128)
20+ 141 / 3104 2.2 (1.7, 2.7) 162 (145, 179)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never 161 / 32816 1.0 (ref.) 11 (10, 12)
Former 186 / 16004 1.4 (1.1, 1.7) 12 (11, 13)
<10 18 / 3746 1.6 (1.0, 2.6) 13 (9, 17)
10-19 27 / 4739 2.3 (1.5, 3.5) 21 (16, 26)
20+ 21 / 3717 2.6 (1.6, 4.1) 17 (12, 22)
Renter
Never 90 / 8798 1.0 (ref.) 17 (15, 19)
Former 80 / 4355 0.9 (0.6, 1.2) 15 (13, 17)
<10 13 / 2252 0.9 (0.5, 1.6) 22 (15, 29)
10-19 28 / 3903 1.4 (0.9, 2.2) 21 (16, 26)
20+ 22 / 3328 1.5 (0.9, 2.5) 13 (9, 17)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never 266 / 32487 1.0 (ref.) 18 (17, 19)
Former 295 / 15517 1.0 (0.9, 1.2) 23 (21, 25)
<10 42 / 3727 2.0 (1.5, 2.8) 31 (25, 37)
10-19 63 / 4696 2.4 (1.8, 3.2) 34 (28, 40)
20+ 64 / 3675 3.0 (2.2, 3.9) 31 (26, 36)
Renter
Never 113 / 8645 1.0 (ref.) 23 (20, 26)
Former 170 / 4123 1.3 (1.0, 1.7) 35 (32, 38)
<10 28 / 2227 1.3 (0.8, 1.9) 35 (27, 43)
10-19 64 / 3831 2.1 (1.5, 2.8) 42 (35, 49)
20+ 67 / 3284 2.2 (1.6, 3.1) 58 (49, 67)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never 432 / 30189 1.0 (ref.) 31 (29, 33)
Former 524 / 14719 1.3 (1.1, 1.5) 44 (42, 46)
<10 64 / 3478 2.2 (1.7, 2.8) 57 (48, 66)
10-19 112 / 4433 3.3 (2.7, 4.1) 92 (81, 103)
20+ 109 / 3492 4.4 (3.5, 5.5) 114 (99, 129)
Renter
Never 200 / 7997 1.0 (ref.) 44 (40, 48)
Former 289 / 3815 1.3 (1.1, 1.6) 66 (61, 71)
<10 56 / 2021 1.6 (1.2, 2.2) 88 (75, 101)
10-19 94 / 3479 2.2 (1.7, 2.8) 94 (82, 106)
20+ 115 / 2984 3.3 (2.6, 4.3) 121 (106, 136)
1 2 3 4 5 6 7
HR (95% CI)

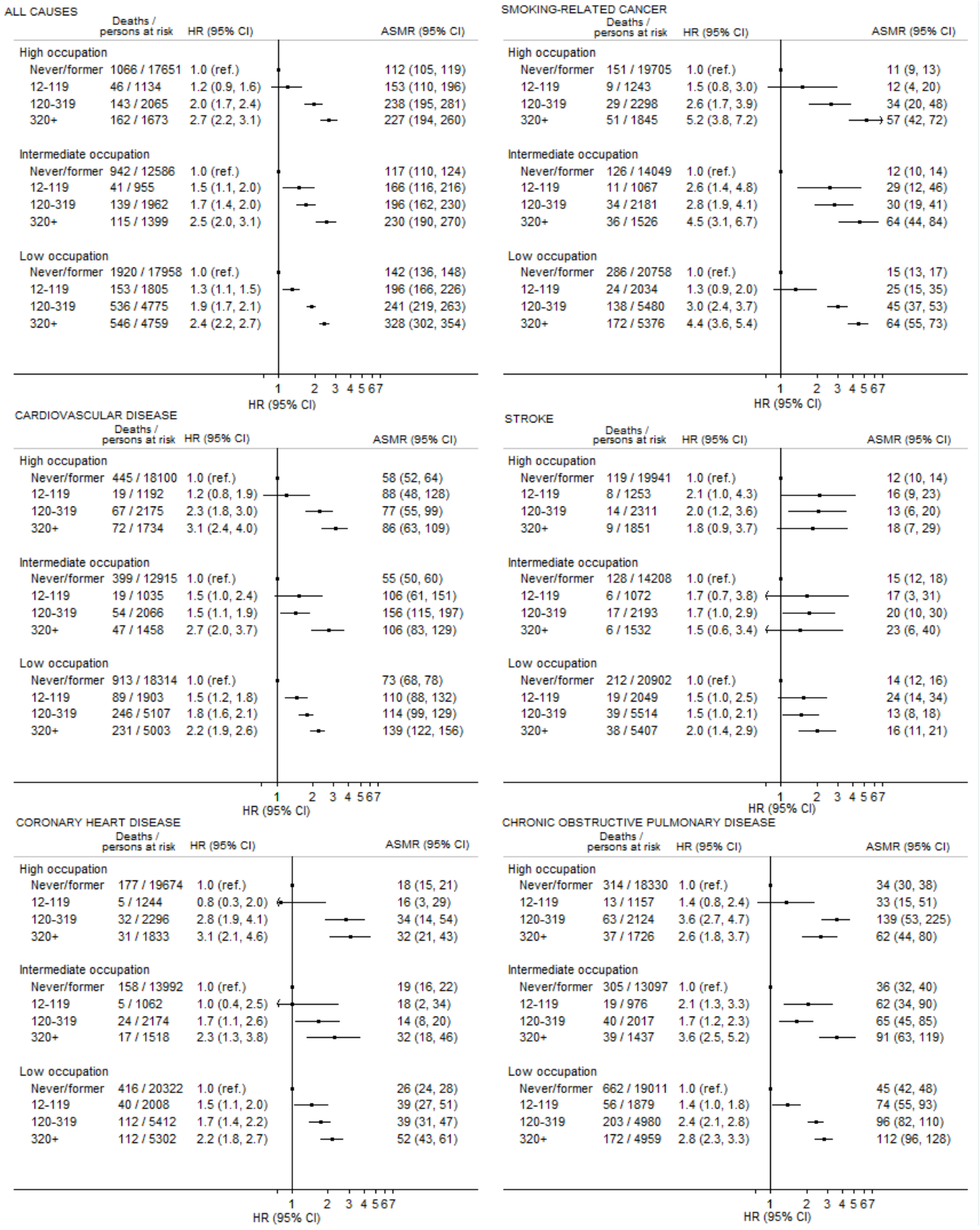
Association between cigarette smoking (number of cigarettes smoked per day) and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by housing tenure, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Housing tenure was divided into 1) Owner and 2) Renter. Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 14.


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never/former 545 / 17799 1.00 (ref.) 103 (94, 112)
12-119 29 / 1497 1.7 (1.2, 2.5) 122 (79, 165)
120-319 79 / 2104 2.5 (1.9, 3.2) 181 (113, 249)
320+ 73 / 1349 2.8 (2.1, 3.5) 150 (118, 182)
Intermediate education
Never/former 829 / 16982 1.00 (ref.) 113 (105, 121)
12-119 40 / 1545 1.2 (0.9, 1.7) 213 (150, 276)
120-319 154 / 3935 2.0 (1.7, 2.4) 251 (208, 294)
320+ 164 / 3519 2.4 (2.0, 2.9) 244 (209, 279)
Low education
Never/former 2712 / 14851 1.00 (ref.) 137 (132, 142)
12-119 180 / 996 1.3 (1.1, 1.5) 188 (161, 215)
120-319 604 / 3067 1.8 (1.6, 2.0) 230 (210, 250)
320+ 601 / 3226 2.5 (2.3, 2.7) 324 (299, 349)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never/former 58 / 19638 1.00 (ref.) 7 (5, 9)
12-119 6 / 1644 2.9 (1.2, 6.8) 11 (3, 19)
120-319 18 / 2321 4.4 (2.5, 7.5) 33 (17, 49)
320+ 25 / 1478 7.8 (4.8, 12.7) 39 (24, 54)
Intermediate education
Never/former 112 / 18842 1.00 (ref.) 11 (9, 13)
12-119 9 / 1694 2.0 (1.0, 4.0) 42 (16, 68)
120-319 31 / 4347 2.8 (1.9, 4.2) 17 (10, 24)
320+ 39 / 3848 3.8 (2.6, 5.6) 43 (31, 55)
Low education
Never/former 407 / 17639 1.00 (ref.) 15 (14, 16)
12-119 31 / 1176 1.4 (1.0, 2.0) 24 (16, 32)
120-319 158 / 3628 2.7 (2.3, 3.3) 46 (38, 54)
320+ 198 / 3719 4.3 (3.5, 5.1) 67 (58, 76)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never/former 211 / 18725 1.00 (ref.) 59 (51, 67)
12-119 12 / 1615 2.1 (1.2, 3.7) 45 (21, 69)
120-319 34 / 2248 3.0 (2.1, 4.4) 82 (59, 105)
320+ 33 / 1407 3.6 (2.4, 5.2) 79 (56, 102)
Intermediate education
Never/former 337 / 17533 1.00 (ref.) 57 (51, 63)
12-119 20 / 1645 1.6 (1.0, 2.5) 93 (54, 132)
120-319 55 / 4214 2.0 (1.5, 2.7) 131 (92, 170)
320+ 62 / 3724 2.7 (2.0, 3.6) 109 (84, 134)
Low education
Never/former 1271 / 14511 1.00 (ref.) 70 (66, 74)
12-119 100 / 1029 1.4 (1.1, 1.7) 100 (81, 119)
120-319 285 / 3211 1.7 (1.5, 2.0) 100 (88, 112)
320+ 258 / 3344 2.3 (2.0, 2.6) 133 (118, 148)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never/former 63 / 19800 1.00 (ref.) 13 (10, 16)
12-119 2 / 1649 1.4 (0.3, 5.9) 6 (-2, 14)
120-319 8 / 2335 2.8 (1.3, 6.0) 7 (2, 12)
320+ 2 / 1477 0.9 (0.2, 3.8) 5 (-1, 11)
Intermediate education
Never/former 97 / 19001 1.00 (ref.) 14 (12, 16)
12-119 9 / 1703 2.8 (1.4, 5.5) 22 (13, 31)
120-319 11 / 4373 2.0 (1.1, 3.8) 13 (9, 17)
320+ 12 / 3865 2.7 (1.4, 5.0) 14 (10, 18)
Low education
Never/former 325 / 17878 1.00 (ref.) 14 (11, 17)
12-119 22 / 1194 1.4 (0.9, 2.2) 44 (15, 73)
120-319 53 / 3649 1.5 (1.1, 2.1) 27 (9, 45)
320+ 39 / 3748 1.8 (1.3, 2.5) 37 (18, 56)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never/former 77 / 19690 1.00 (ref.) 14 (11, 17)
12-119 3 / 1644 1.4 (0.5, 4.6) 9 (0, 18)
120-319 17 / 2324 3.9 (2.3, 6.8) 60 (30, 90)
320+ 11 / 1473 3.1 (1.6, 5.9) 18 (8, 28)
Intermediate education
Never/former 127 / 18814 1.00 (ref.) 16 (13, 19)
12-119 5 / 1694 1.0 (0.4, 2.6) 14 (2, 26)
120-319 26 / 4352 2.4 (1.5, 3.6) 33 (19, 47)
320+ 26 / 3840 2.5 (1.6, 3.8) 28 (18, 38)
Low education
Never/former 571 / 17066 1.00 (ref.) 25 (23, 27)
12-119 46 / 1147 1.4 (1.1, 2.0) 37 (26, 48)
120-319 127 / 3544 1.7 (1.4, 2.1) 38 (31, 45)
320+ 128 / 3637 2.4 (1.9, 2.9) 49 (41, 57)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never/former 137 / 18141 1.00 (ref.) 30 (25, 35)
12-119 9 / 1511 2.5 (1.3, 5.0) 63 (22, 104)
120-319 29 / 2143 4.9 (3.2, 7.4) 204 (127, 281)
320+ 18 / 1373 3.5 (2.1, 5.8) 51 (29, 73)
Intermediate education
Never/former 240 / 17511 1.00 (ref.) 33 (29, 37)
12-119 12 / 1573 1.4 (0.8, 2.5) 75 (31, 119)
120-319 40 / 4000 2.5 (1.8, 3.5) 120 (81, 159)
320+ 33 / 3592 2.4 (1.6, 3.5) 67 (45, 89)
Low education
Never/former 955 / 16298 1.00 (ref.) 43 (40, 46)
12-119 71 / 1074 1.5 (1.2, 1.9) 73 (56, 90)
120-319 238 / 3293 2.3 (2.0, 2.6) 87 (75, 99)
320+ 201 / 3431 3.0 (2.5, 3.5) 107 (93, 121)
1 2 3 4 5 6 7
HR (95% CI)

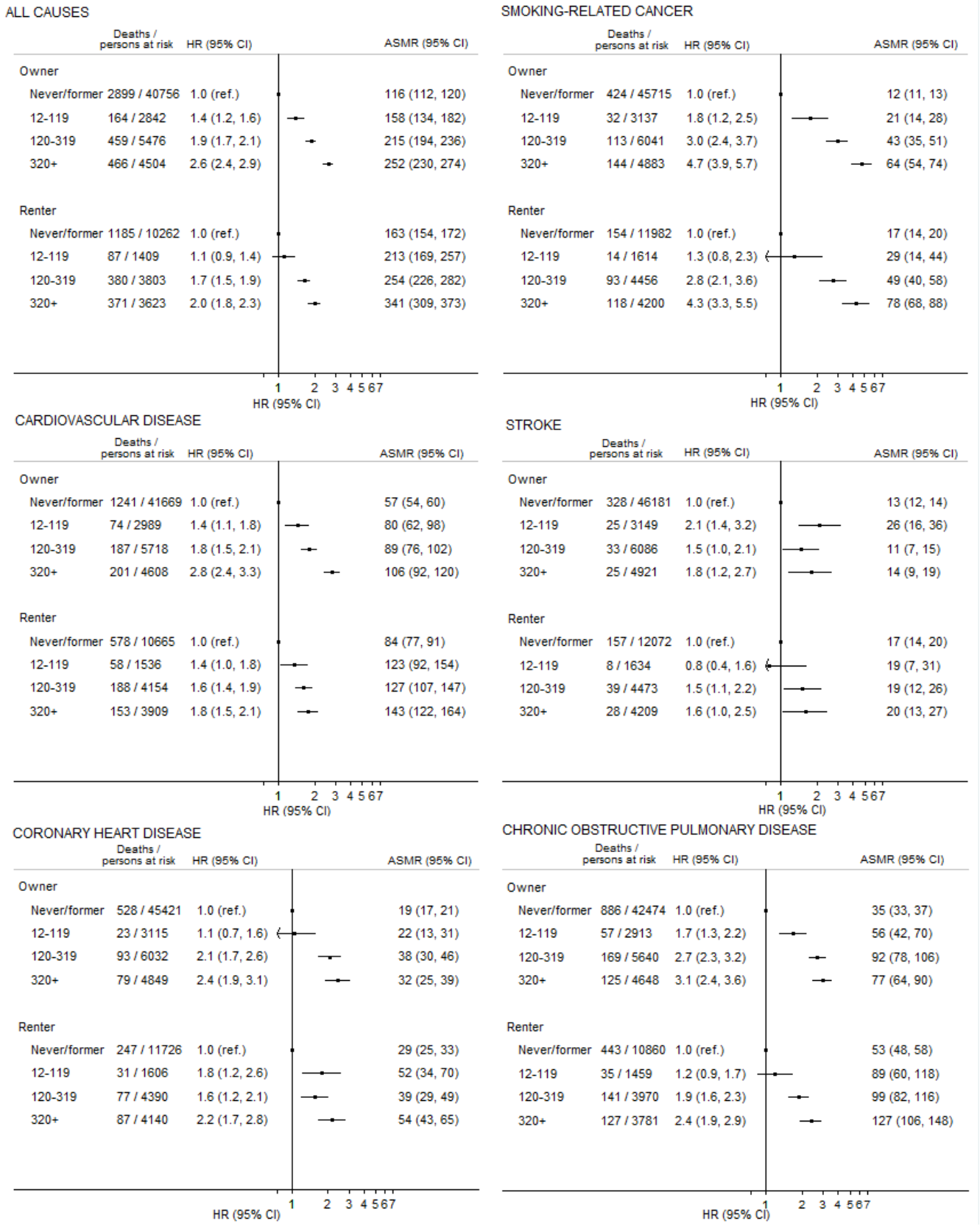
Association between cotinine level (ng/mL) and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 15


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never/former 1066 / 17651 1.0 (ref.) 112 (105, 119)
12-119 46 / 1134 1.2 (0.9, 1.6) 153 (110, 196)
120-319 143 / 2065 2.0 (1.7, 2.4) 238 (195, 281)
320+ 162 / 1673 2.7 (2.2, 3.1) 227 (194, 260)
Intermediate occupation
Never/former 942 / 12586 1.0 (ref.) 117 (110, 124)
12-119 41 / 955 1.5 (1.1, 2.0) 166 (116, 216)
120-319 139 / 1962 1.7 (1.4, 2.0) 196 (162, 230)
320+ 115 / 1399 2.5 (2.0, 3.1) 230 (190, 270)
Low occupation
Never/former 1920 / 17958 1.0 (ref.) 142 (136, 148)
12-119 153 / 1805 1.3 (1.1, 1.5) 196 (166, 226)
120-319 536 / 4775 1.9 (1.7, 2.1) 241 (219, 263)
320+ 546 / 4759 2.4 (2.2, 2.7) 328 (302, 354)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never/former 151 / 19705 1.0 (ref.) 11 (9, 13)
12-119 9 / 1243 1.5 (0.8, 3.0) 12 (4, 20)
120-319 29 / 2298 2.6 (1.7, 3.9) 34 (20, 48)
320+ 51 / 1845 5.2 (3.8, 7.2) 57 (42, 72)
Intermediate occupation
Never/former 126 / 14049 1.0 (ref.) 12 (10, 14)
12-119 11 / 1067 2.6 (1.4, 4.8) 29 (12, 46)
120-319 34 / 2181 2.8 (1.9, 4.1) 30 (19, 41)
320+ 36 / 1526 4.5 (3.1, 6.7) 64 (44, 84)
Low occupation
Never/former 286 / 20758 1.0 (ref.) 15 (13, 17)
12-119 24 / 2034 1.3 (0.9, 2.0) 25 (15, 35)
120-319 138 / 5480 3.0 (2.4, 3.7) 45 (37, 53)
320+ 172 / 5376 4.4 (3.6, 5.4) 64 (55, 73)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never/former 445 / 18100 1.0 (ref.) 58 (52, 64)
12-119 19 / 1192 1.2 (0.8, 1.9) 88 (48, 128)
120-319 67 / 2175 2.3 (1.8, 3.0) 77 (55, 99)
320+ 72 / 1734 3.1 (2.4, 4.0) 86 (63, 109)
Intermediate occupation
Never/former 399 / 12915 1.0 (ref.) 55 (50, 60)
12-119 19 / 1035 1.5 (1.0, 2.4) 106 (61, 151)
120-319 54 / 2066 1.5 (1.1, 1.9) 156 (115, 197)
320+ 47 / 1458 2.7 (2.0, 3.7) 106 (83, 129)
Low occupation
Never/former 913 / 18314 1.0 (ref.) 73 (68, 78)
12-119 89 / 1903 1.5 (1.2, 1.8) 110 (88, 132)
120-319 246 / 5107 1.8 (1.6, 2.1) 114 (99, 129)
320+ 231 / 5003 2.2 (1.9, 2.6) 139 (122, 156)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never/former 119 / 19941 1.0 (ref.) 12 (10, 14)
12-119 8 / 1253 2.1 (1.0, 4.3) 16 (9, 23)
120-319 14 / 2311 2.0 (1.2, 3.6) 13 (6, 20)
320+ 9 / 1851 1.8 (0.9, 3.7) 18 (7, 29)
Intermediate occupation
Never/former 128 / 14208 1.0 (ref.) 15 (12, 18)
12-119 6 / 1072 1.7 (0.7, 3.8) 17 (3, 31)
120-319 17 / 2193 1.7 (1.0, 2.9) 20 (10, 30)
320+ 6 / 1532 1.5 (0.6, 3.4) 23 (6, 40)
Low occupation
Never/former 212 / 20902 1.0 (ref.) 14 (12, 16)
12-119 19 / 2049 1.5 (1.0, 2.5) 24 (14, 34)
120-319 39 / 5514 1.5 (1.0, 2.1) 13 (8, 18)
320+ 38 / 5407 2.0 (1.4, 2.9) 16 (11, 21)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never/former 177 / 19674 1.0 (ref.) 18 (15, 21)
12-119 5 / 1244 0.8 (0.3, 2.0) 16 (3, 29)
120-319 32 / 2296 2.8 (1.9, 4.1) 34 (14, 54)
320+ 31 / 1833 3.1 (2.1, 4.6) 32 (21, 43)
Intermediate occupation
Never/former 158 / 13992 1.0 (ref.) 19 (16, 22)
12-119 5 / 1062 1.0 (0.4, 2.5) 18 (2, 34)
120-319 24 / 2174 1.7 (1.1, 2.6) 14 (8, 20)
320+ 17 / 1518 2.3 (1.3, 3.8) 32 (18, 46)
Low occupation
Never/former 416 / 20322 1.0 (ref.) 26 (24, 28)
12-119 40 / 2008 1.5 (1.1, 2.0) 39 (27, 51)
120-319 112 / 5412 1.7 (1.4, 2.2) 39 (31, 47)
320+ 112 / 5302 2.2 (1.8, 2.7) 52 (43, 61)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never/former 314 / 18330 1.0 (ref.) 34 (30, 38)
12-119 13 / 1157 1.4 (0.8, 2.4) 33 (15, 51)
120-319 63 / 2124 3.6 (2.7, 4.7) 139 (53, 225)
320+ 37 / 1726 2.6 (1.8, 3.7) 62 (44, 80)
Intermediate occupation
Never/former 305 / 13097 1.0 (ref.) 36 (32, 40)
12-119 19 / 976 2.1 (1.3, 3.3) 62 (34, 90)
120-319 40 / 2017 1.7 (1.2, 2.3) 65 (45, 85)
320+ 39 / 1437 3.6 (2.5, 5.2) 91 (63, 119)
Low occupation
Never/former 662 / 19011 1.0 (ref.) 45 (42, 48)
12-119 56 / 1879 1.4 (1.0, 1.8) 74 (55, 93)
120-319 203 / 4980 2.4 (2.1, 2.8) 96 (82, 110)
320+ 172 / 4959 2.8 (2.3, 3.3) 112 (96, 128)
1 2 3 4 5 6 7
HR (95% CI)

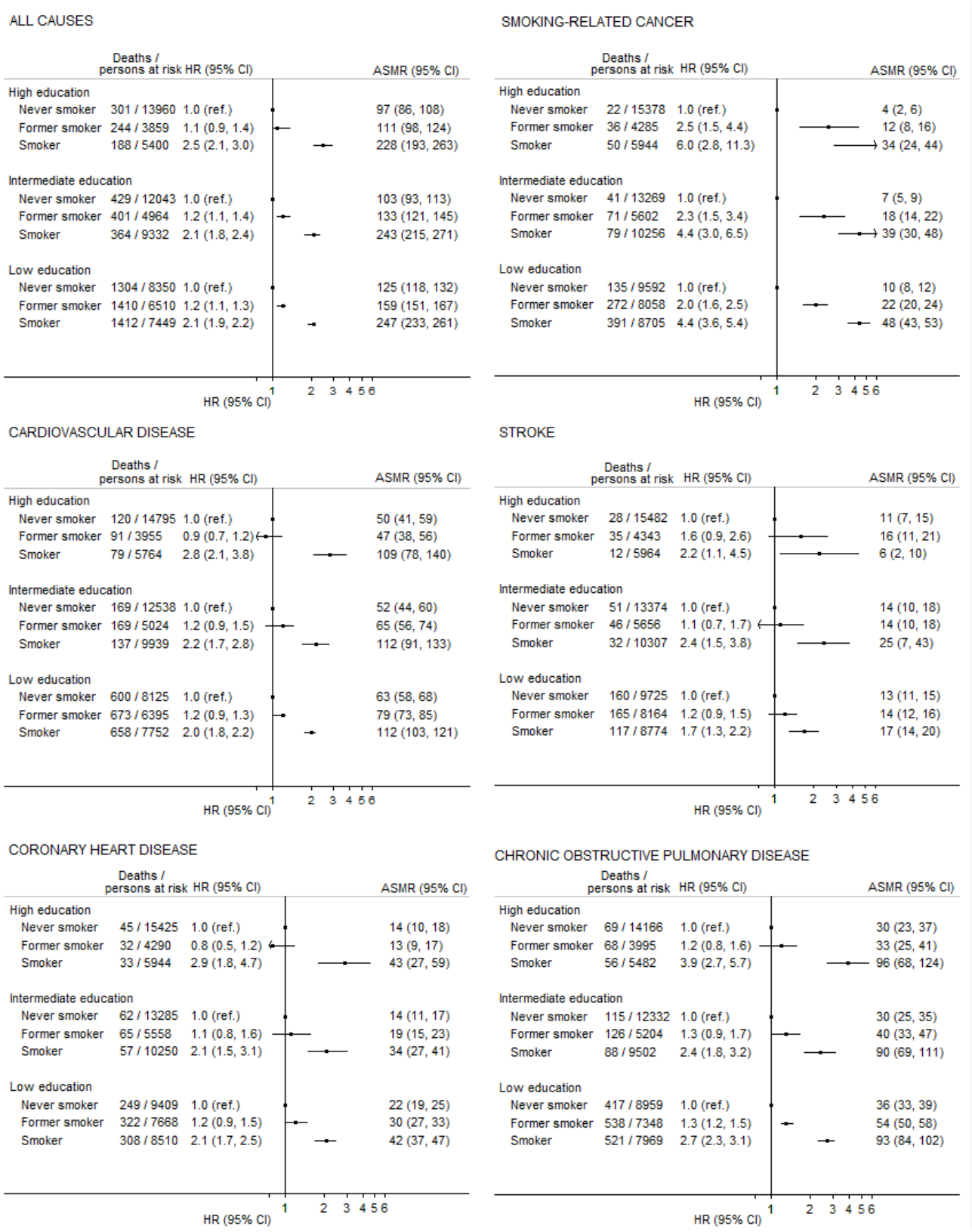
Association between cotinine level (ng/mL) and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by occupational social class, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 16


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never/former 2899 / 40756 1.0 (ref.) 116 (112, 120)
12-119 164 / 2842 1.4 (1.2, 1.6) 158 (134, 182)
120-319 459 / 5476 1.9 (1.7, 2.1) 215 (194, 236)
320+ 466 / 4504 2.6 (2.4, 2.9) 252 (230, 274)
Renter
Never/former 1185 / 10262 1.0 (ref.) 163 (154, 172)
12-119 87 / 1409 1.1 (0.9, 1.4) 213 (169, 257)
120-319 380 / 3803 1.7 (1.5, 1.9) 254 (226, 282)
320+ 371 / 3623 2.0 (1.8, 2.3) 341 (309, 373)
1 2 3 4 5 6 7
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never/former 424 / 45715 1.0 (ref.) 12 (11, 13)
12-119 32 / 3137 1.8 (1.2, 2.5) 21 (14, 28)
120-319 113 / 6041 3.0 (2.4, 3.7) 43 (35, 51)
320+ 144 / 4883 4.7 (3.9, 5.7) 64 (54, 74)
Renter
Never/former 154 / 11982 1.0 (ref.) 17 (14, 20)
12-119 14 / 1614 1.3 (0.8, 2.3) 29 (14, 44)
120-319 93 / 4456 2.8 (2.1, 3.6) 49 (40, 58)
320+ 118 / 4200 4.3 (3.3, 5.5) 78 (68, 88)
1 2 3 4 5 6 7
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never/former 1241 / 41669 1.0 (ref.) 57 (54, 60)
12-119 74 / 2989 1.4 (1.1, 1.8) 80 (62, 98)
120-319 187 / 5718 1.8 (1.5, 2.1) 89 (76, 102)
320+ 201 / 4608 2.8 (2.4, 3.3) 106 (92, 120)
Renter
Never/former 578 / 10665 1.0 (ref.) 84 (77, 91)
12-119 58 / 1536 1.4 (1.0, 1.8) 123 (92, 154)
120-319 188 / 4154 1.6 (1.4, 1.9) 127 (107, 147)
320+ 153 / 3909 1.8 (1.5, 2.1) 143 (122, 164)
1 2 3 4 5 6 7
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never/former 328 / 46181 1.0 (ref.) 13 (12, 14)
12-119 25 / 3149 2.1 (1.4, 3.2) 26 (16, 36)
120-319 33 / 6086 1.5 (1.0, 2.1) 11 (7, 15)
320+ 25 / 4921 1.8 (1.2, 2.7) 14 (9, 19)
Renter
Never/former 157 / 12072 1.0 (ref.) 17 (14, 20)
12-119 8 / 1634 0.8 (0.4, 1.6) 19 (7, 31)
120-319 39 / 4473 1.5 (1.1, 2.2) 19 (12, 26)
320+ 28 / 4209 1.6 (1.0, 2.5) 20 (13, 27)
1 2 3 4 5 6 7
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never/former 528 / 45421 1.0 (ref.) 19 (17, 21)
12-119 23 / 3115 1.1 (0.7, 1.6) 22 (13, 31)
120-319 93 / 6032 2.1 (1.7, 2.6) 38 (30, 46)
320+ 79 / 4849 2.4 (1.9, 3.1) 32 (25, 39)
Renter
Never/former 247 / 11726 1.0 (ref.) 29 (25, 33)
12-119 31 / 1606 1.8 (1.2, 2.6) 52 (34, 70)
120-319 77 / 4390 1.6 (1.2, 2.1) 39 (29, 49)
320+ 87 / 4140 2.2 (1.7, 2.8) 54 (43, 65)
1 2 3 4 5 6 7
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never/former 886 / 42474 1.0 (ref.) 35 (33, 37)
12-119 57 / 2913 1.7 (1.3, 2.2) 56 (42, 70)
120-319 169 / 5640 2.7 (2.3, 3.2) 92 (78, 106)
320+ 125 / 4648 3.1 (2.4, 3.6) 77 (64, 90)
Renter
Never/former 443 / 10860 1.0 (ref.) 53 (48, 58)
12-119 35 / 1459 1.2 (0.9, 1.7) 89 (60, 118)
120-319 141 / 3970 1.9 (1.6, 2.3) 99 (82, 116)
320+ 127 / 3781 2.4 (1.9, 2.9) 127 (106, 148)
1 2 3 4 5 6 7
HR (95% CI)

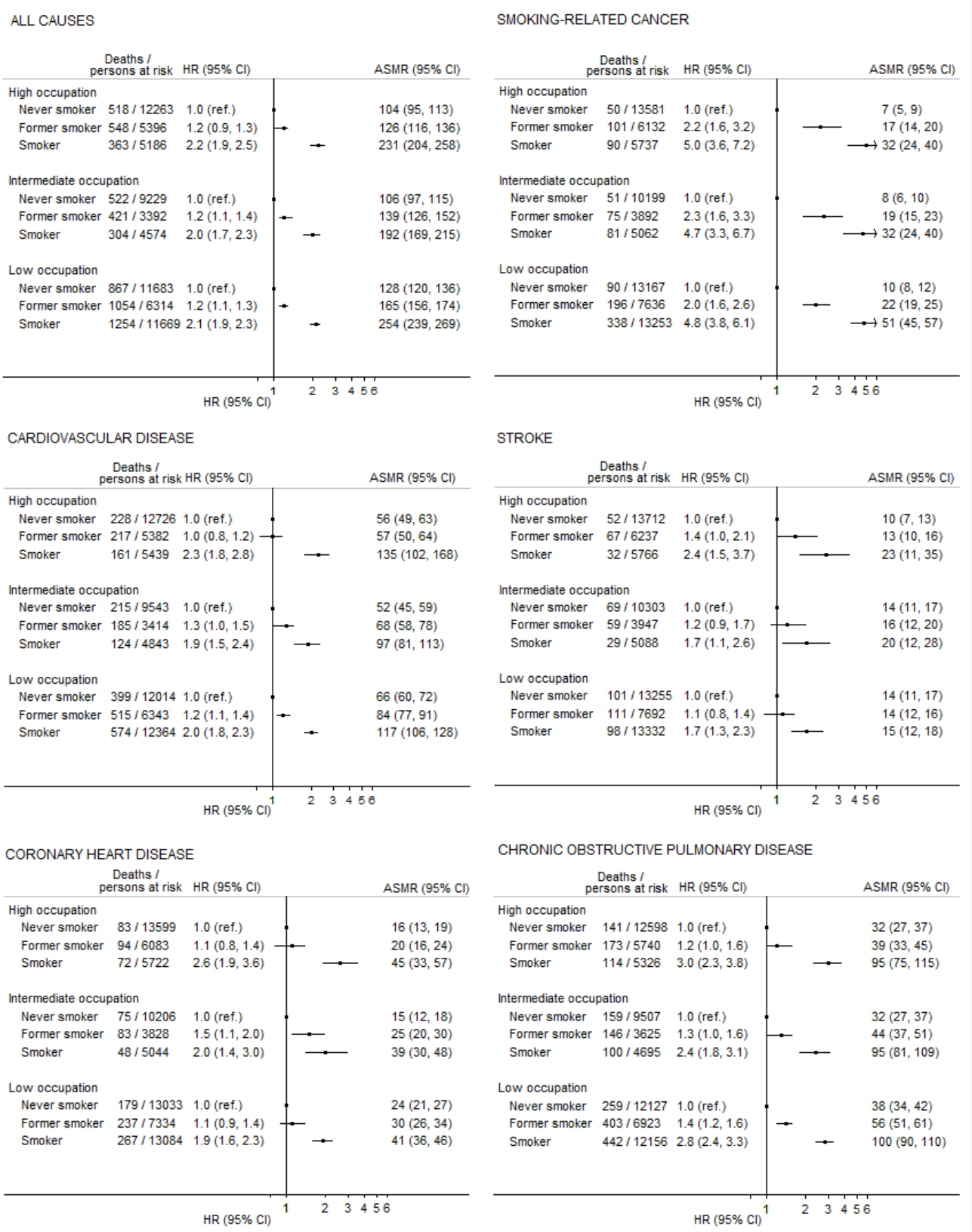
Association between cotinine level (ng/mL) and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by housing tenure, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Housing tenure was divided into 1) Owner and 2) Renter. Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 17


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 301 / 13960 1.0 (ref.) 97 (86, 108)
Former smoker 244 / 3859 1.1 (0.9, 1.4) 111 (98, 124)
Smoker 188 / 5400 2.5 (2.1, 3.0) 228 (193, 263)
Intermediate education
Never smoker 429 / 12043 1.0 (ref.) 103 (93, 113)
Former smoker 401 / 4964 1.2 (1.1, 1.4) 133 (121, 145)
Smoker 364 / 9332 2.1 (1.8, 2.4) 243 (215, 271)
Low education
Never smoker 1304 / 8350 1.0 (ref.) 125 (118, 132)
Former smoker 1410 / 6510 1.2 (1.1, 1.3) 159 (151, 167)
Smoker 1412 / 7449 2.1 (1.9, 2.2) 247 (233, 261)
1 2 3 4 5 6
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 22 / 15378 1.0 (ref.) 4 (2, 6)
Former smoker 36 / 4285 2.5 (1.5, 4.4) 12 (8, 16)
Smoker 50 / 5944 6.0 (2.8, 11.3) 34 (24, 44)
Intermediate education
Never smoker 41 / 13269 1.0 (ref.) 7 (5, 9)
Former smoker 71 / 5602 2.3 (1.5, 3.4) 18 (14, 22)
Smoker 79 / 10256 4.4 (3.0, 6.5) 39 (30, 48)
Low education
Never smoker 135 / 9592 1.0 (ref.) 10 (8, 12)
Former smoker 272 / 8058 2.0 (1.6, 2.5) 22 (20, 24)
Smoker 391 / 8705 4.4 (3.6, 5.4) 48 (43, 53)
1 2 3 4 5 6
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 120 / 14795 1.0 (ref.) 50 (41, 59)
Former smoker 91 / 3955 0.9 (0.7, 1.2) 47 (38, 56)
Smoker 79 / 5764 2.8 (2.1, 3.8) 109 (78, 140)
Intermediate education
Never smoker 169 / 12538 1.0 (ref.) 52 (44, 60)
Former smoker 169 / 5024 1.2 (0.9, 1.5) 65 (56, 74)
Smoker 137 / 9939 2.2 (1.7, 2.8) 112 (91, 133)
Low education
Never smoker 600 / 8125 1.0 (ref.) 63 (58, 68)
Former smoker 673 / 6395 1.2 (0.9, 1.3) 79 (73, 85)
Smoker 658 / 7752 2.0 (1.8, 2.2) 112 (103, 121)
1 2 3 4 5 6
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 28 / 15482 1.0 (ref.) 11 (7, 15)
Former smoker 35 / 4343 1.6 (0.9, 2.6) 16 (11, 21)
Smoker 12 / 5964 2.2 (1.1, 4.5) 6 (2, 10)
Intermediate education
Never smoker 51 / 13374 1.0 (ref.) 14 (10, 18)
Former smoker 46 / 5656 1.1 (0.7, 1.7) 14 (10, 18)
Smoker 32 / 10307 2.4 (1.5, 3.8) 25 (7, 43)
Low education
Never smoker 160 / 9725 1.0 (ref.) 13 (11, 15)
Former smoker 165 / 8164 1.2 (0.9, 1.5) 14 (12, 16)
Smoker 117 / 8774 1.7 (1.3, 2.2) 17 (14, 20)
1 2 3 4 5 6
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 45 / 15425 1.0 (ref.) 14 (10, 18)
Former smoker 32 / 4290 0.8 (0.5, 1.2) 13 (9, 17)
Smoker 33 / 5944 2.9 (1.8, 4.7) 43 (27, 59)
Intermediate education
Never smoker 62 / 13285 1.0 (ref.) 14 (11, 17)
Former smoker 65 / 5558 1.1 (0.8, 1.6) 19 (15, 23)
Smoker 57 / 10250 2.1 (1.5, 3.1) 34 (27, 41)
Low education
Never smoker 249 / 9409 1.0 (ref.) 22 (19, 25)
Former smoker 322 / 7668 1.2 (0.9, 1.5) 30 (27, 33)
Smoker 308 / 8510 2.1 (1.7, 2.5) 42 (37, 47)
1 2 3 4 5 6
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High education
Never smoker 69 / 14166 1.0 (ref.) 30 (23, 37)
Former smoker 68 / 3995 1.2 (0.8, 1.6) 33 (25, 41)
Smoker 56 / 5482 3.9 (2.7, 5.7) 96 (68, 124)
Intermediate education
Never smoker 115 / 12332 1.0 (ref.) 30 (25, 35)
Former smoker 126 / 5204 1.3 (0.9, 1.7) 40 (33, 47)
Smoker 88 / 9502 2.4 (1.8, 3.2) 90 (69, 111)
Low education
Never smoker 417 / 8959 1.0 (ref.) 36 (33, 39)
Former smoker 538 / 7348 1.3 (1.2, 1.5) 54 (50, 58)
Smoker 521 / 7969 2.7 (2.3, 3.1) 93 (84, 102)
1 2 3 4 5 6
HR (95% CI)

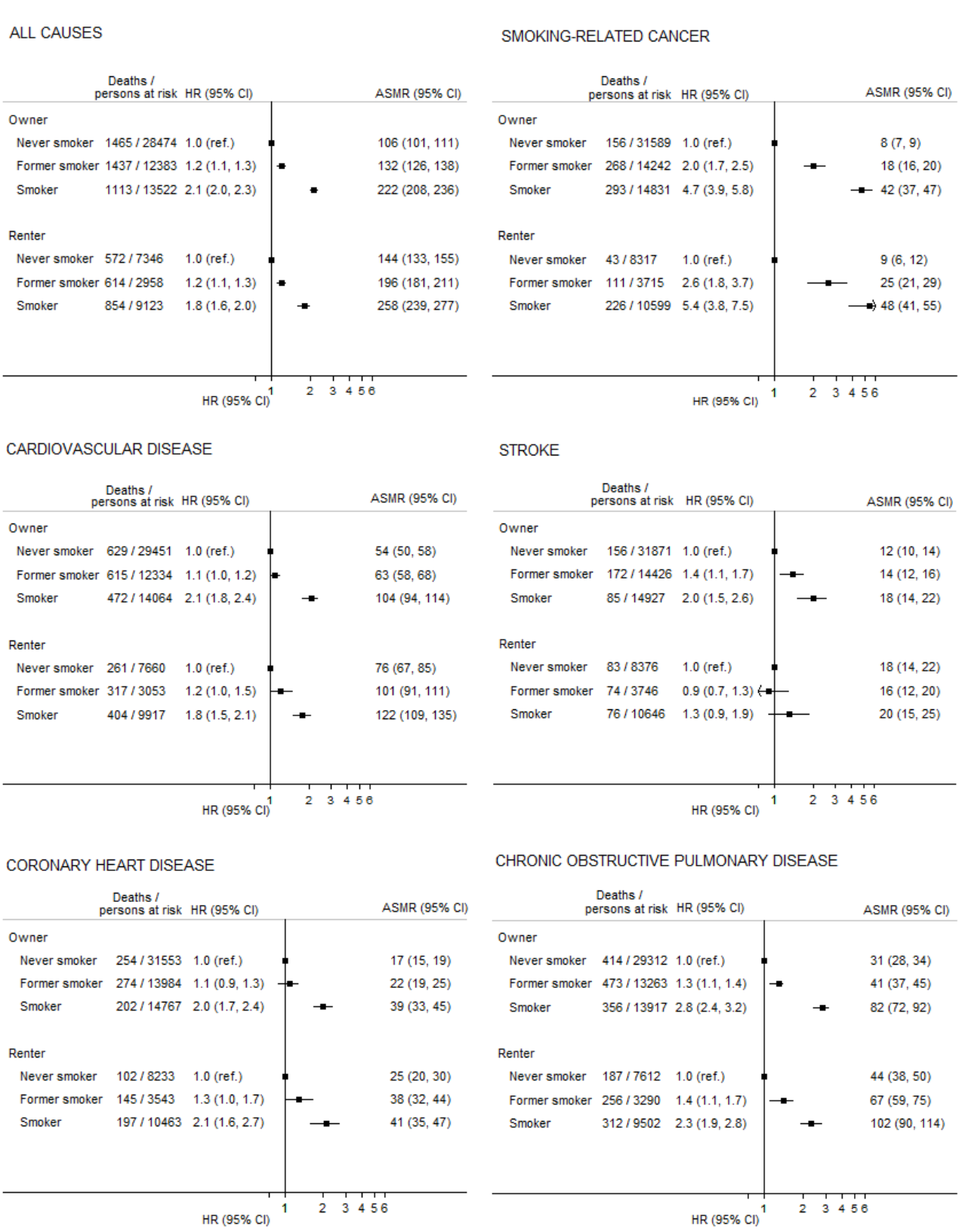
Association between self-reported smoking and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by educational level, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from age when finished full-time education: high (18 years or above), intermediate (16-17 years), and low (15 years or below). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.

eFigure 18


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 518 / 12263 1.0 (ref.) 104 (95, 113)
Former smoker 548 / 5396 1.2 (0.9, 1.3) 126 (116, 136)
Smoker 363 / 5186 2.2 (1.9, 2.5) 231 (204, 258)
Intermediate occupation
Never smoker 522 / 9229 1.0 (ref.) 106 (97, 115)
Former smoker 421 / 3392 1.2 (1.1, 1.4) 139 (126, 152)
Smoker 304 / 4574 2.0 (1.7, 2.3) 192 (169, 215)
Low occupation
Never smoker 867 / 11683 1.0 (ref.) 128 (120, 136)
Former smoker 1054 / 6314 1.2 (1.1, 1.3) 165 (156, 174)
Smoker 1254 / 11669 2.1 (1.9, 2.3) 254 (239, 269)
1 2 3 4 5 6
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 50 / 13581 1.0 (ref.) 7 (5, 9)
Former smoker 101 / 6132 2.2 (1.6, 3.2) 17 (14, 20)
Smoker 90 / 5737 5.0 (3.6, 7.2) 32 (24, 40)
Intermediate occupation
Never smoker 51 / 10199 1.0 (ref.) 8 (6, 10)
Former smoker 75 / 3892 2.3 (1.6, 3.3) 19 (15, 23)
Smoker 81 / 5062 4.7 (3.3, 6.7) 32 (24, 40)
Low occupation
Never smoker 90 / 13167 1.0 (ref.) 10 (8, 12)
Former smoker 196 / 7636 2.0 (1.6, 2.6) 22 (19, 25)
Smoker 338 / 13253 4.8 (3.8, 6.1) 51 (45, 57)
1 2 3 4 5 6
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 228 / 12726 1.0 (ref.) 56 (49, 63)
Former smoker 217 / 5382 1.0 (0.8, 1.2) 57 (50, 64)
Smoker 161 / 5439 2.3 (1.8, 2.8) 135 (102, 168)
Intermediate occupation
Never smoker 215 / 9543 1.0 (ref.) 52 (45, 59)
Former smoker 185 / 3414 1.3 (1.0, 1.5) 68 (58, 78)
Smoker 124 / 4843 1.9 (1.5, 2.4) 97 (81, 113)
Low occupation
Never smoker 399 / 12014 1.0 (ref.) 66 (60, 72)
Former smoker 515 / 6343 1.2 (1.1, 1.4) 84 (77, 91)
Smoker 574 / 12364 2.0 (1.8, 2.3) 117 (106, 128)
1 2 3 4 5 6
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 52 / 13712 1.0 (ref.) 10 (7, 13)
Former smoker 67 / 6237 1.4 (1.0, 2.1) 13 (10, 16)
Smoker 32 / 5766 2.4 (1.5, 3.7) 23 (11, 35)
Intermediate occupation
Never smoker 69 / 10303 1.0 (ref.) 14 (11, 17)
Former smoker 59 / 3947 1.2 (0.9, 1.7) 16 (12, 20)
Smoker 29 / 5088 1.7 (1.1, 2.6) 20 (12, 28)
Low occupation
Never smoker 101 / 13255 1.0 (ref.) 14 (11, 17)
Former smoker 111 / 7692 1.1 (0.8, 1.4) 14 (12, 16)
Smoker 98 / 13332 1.7 (1.3, 2.3) 15 (12, 18)
1 2 3 4 5 6
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 83 / 13599 1.0 (ref.) 16 (13, 19)
Former smoker 94 / 6083 1.1 (0.8, 1.4) 20 (16, 24)
Smoker 72 / 5722 2.6 (1.9, 3.6) 45 (33, 57)
Intermediate occupation
Never smoker 75 / 10206 1.0 (ref.) 15 (12, 18)
Former smoker 83 / 3828 1.5 (1.1, 2.0) 25 (20, 30)
Smoker 48 / 5044 2.0 (1.4, 3.0) 39 (30, 48)
Low occupation
Never smoker 179 / 13033 1.0 (ref.) 24 (21, 27)
Former smoker 237 / 7334 1.1 (0.9, 1.4) 30 (26, 34)
Smoker 267 / 13084 1.9 (1.6, 2.3) 41 (36, 46)
1 2 3 4 5 6
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
High occupation
Never smoker 141 / 12598 1.0 (ref.) 32 (27, 37)
Former smoker 173 / 5740 1.2 (1.0, 1.6) 39 (33, 45)
Smoker 114 / 5326 3.0 (2.3, 3.8) 95 (75, 115)
Intermediate occupation
Never smoker 159 / 9507 1.0 (ref.) 32 (27, 37)
Former smoker 146 / 3625 1.3 (1.0, 1.6) 44 (37, 51)
Smoker 100 / 4695 2.4 (1.8, 3.1) 95 (81, 109)
Low occupation
Never smoker 259 / 12127 1.0 (ref.) 38 (34, 42)
Former smoker 403 / 6923 1.4 (1.2, 1.6) 56 (51, 61)
Smoker 442 / 12156 2.8 (2.4, 3.3) 100 (90, 110)
1 2 3 4 5 6
HR (95% CI)

Association between self-reported smoking and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by occupational social class, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Socioeconomic position (SEP) derived from occupational social class based on the UK Registrar's General categories: high (professional, managerial and technical), intermediate (skilled non-manual), and low (manual occupations). Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population

eFigure 19


ALL CAUSES
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 1465 / 28474 1.0 (ref.) 106 (101, 111)
Former smoker 1437 / 12383 1.2 (1.1, 1.3) 132 (126, 138)
Smoker 1113 / 13522 2.1 (2.0, 2.3) 222 (208, 236)
Renter
Never smoker 572 / 7346 1.0 (ref.) 144 (133, 155)
Former smoker 614 / 2958 1.2 (1.1, 1.3) 196 (181, 211)
Smoker 854 / 9123 1.8 (1.6, 2.0) 258 (239, 277)
1 2 3 4 5 6
HR (95% CI)
SMOKING-RELATED CANCER
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 156 / 31589 1.0 (ref.) 8 (7, 9)
Former smoker 268 / 14242 2.0 (1.7, 2.5) 18 (16, 20)
Smoker 293 / 14831 4.7 (3.9, 5.8) 42 (37, 47)
Renter
Never smoker 43 / 8317 1.0 (ref.) 9 (6, 12)
Former smoker 111 / 3715 2.6 (1.8, 3.7) 25 (21, 29)
Smoker 226 / 10599 5.4 (3.8, 7.5) 48 (41, 55)
1 2 3 4 5 6
HR (95% CI)
CARDIOVASCULAR DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 629 / 29451 1.0 (ref.) 54 (50, 58)
Former smoker 615 / 12334 1.1 (1.0, 1.2) 63 (58, 68)
Smoker 472 / 14064 2.1 (1.8, 2.4) 104 (94, 114)
Renter
Never smoker 261 / 7660 1.0 (ref.) 76 (67, 85)
Former smoker 317 / 3053 1.2 (1.0, 1.5) 101 (91, 111)
Smoker 404 / 9917 1.8 (1.5, 2.1) 122 (109, 135)
1 2 3 4 5 6
HR (95% CI)
STROKE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 156 / 31871 1.0 (ref.) 12 (10, 14)
Former smoker 172 / 14426 1.4 (1.1, 1.7) 14 (12, 16)
Smoker 85 / 14927 2.0 (1.5, 2.6) 18 (14, 22)
Renter
Never smoker 83 / 8376 1.0 (ref.) 18 (14, 22)
Former smoker 74 / 3746 0.9 (0.7, 1.3) 16 (12, 20)
Smoker 76 / 10646 1.3 (0.9, 1.9) 20 (15, 25)
1 2 3 4 5 6
HR (95% CI)
CORONARY HEART DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 254 / 31553 1.0 (ref.) 17 (15, 19)
Former smoker 274 / 13984 1.1 (0.9, 1.3) 22 (19, 25)
Smoker 202 / 14767 2.0 (1.7, 2.4) 39 (33, 45)
Renter
Never smoker 102 / 8233 1.0 (ref.) 25 (20, 30)
Former smoker 145 / 3543 1.3 (1.0, 1.7) 38 (32, 44)
Smoker 197 / 10463 2.1 (1.6, 2.7) 41 (35, 47)
1 2 3 4 5 6
HR (95% CI)
CHRONIC OBSTRUCTIVE PULMONARY DISEASE
Deaths / persons at risk
HR (95% CI)
ASMR (95% CI)
Owner
Never smoker 414 / 29312 1.0 (ref.) 31 (28, 34)
Former smoker 473 / 13263 1.3 (1.1, 1.4) 41 (37, 45)
Smoker 356 / 13917 2.8 (2.4, 3.2) 82 (72, 92)
Renter
Never smoker 187 / 7612 1.0 (ref.) 44 (38, 50)
Former smoker 256 / 3290 1.4 (1.1, 1.7) 67 (59, 75)
Smoker 312 / 9502 2.3 (1.9, 2.8) 102 (90, 114)
1 2 3 4 5 6
HR (95% CI)

Association between self-reported smoking and death from all causes, smoking-related cancer, CVD, stroke, coronary heart disease, and chronic obstructive pulmonary disease, separately by housing tenure, from pooled cohort samples of 12 Health Survey for England and 3 Scottish Health Surveys conducted between 1994 and 2008 (N = 81476). Housing tenure was divided into 1) Owner and 2) Renter. Hazards ratios (95% CI) from Cox proportional hazards model are adjusted for age, sex, cohort, body mass index, physical activity and excessive alcohol, and are indicated by squares and the 95% confidence interval by the horizontal lines. X-axes are natural log-scaled. Age-standardized mortality rates calculated using the 2015 Standard European Population.