Association between area level socioeconomic deprivation and a cluster of behavioural risk factors: Cross sectional, population based study

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Abstract

Background—The Commission on Social Determinants of Health has urged governments
across the world to promote health equity by reducing the gap between the most and least deprived
individuals in society. Some of this gap can be bridged by promoting healthy lifestyles through
targeted public health policy and interventions.

Methods—Cross-sectional analyses of data on behavioural risk factors, individual
socioeconomic factors, and neighbourhood deprivation score collected from 26,290 adults aged
over 16 years who participated in the 2008 East of England Lifestyle Survey.

Results—After adjustment for individual socioeconomic factors, across quintiles of increasing
neighbourhood deprivation, participants were more likely to smoke and less likely to consume five
portions of fruit and vegetables on five or more days of the week (least deprived versus most
deprived quintile- odds ratios for not smoking 0.45 [0.41 to 0.50]; and fruit and vegetable
consumption 0.70 [0.64 to 0.76] p-trend <0.0001). Greater neighbourhood deprivation and lower
occupational social class were independently associated with a lower summary healthy lifestyle
score (both p-trend <0.0001).

Conclusions—Public health interventions aimed at reducing health inequalities by targeting
behavioural risk factors may focus in particular on reducing smoking and increasing fruit and
vegetable consumption in more deprived communities.

Conflict of interest
None declared.

INTRODUCTION

The influences of individual level behavioural and socioeconomic factors (for example income, education, occupational social class) and health inequalities have been studied extensively. However, the association between behavioural risk factors and levels of neighbourhood deprivation is less clear[1]. Studies show that area level deprivation is associated with atherosclerosis and coronary heart disease but it is unclear how much of this association is mediated by behavioural risk factors[2,3]. Individuals achieving four healthy behaviours (not smoking, moderate alcohol intake- excluding non-drinkers, fruit and vegetable consumption and physical activity) on average have a 14 year higher life expectancy than individuals achieving no healthy behaviours[4] and have a lower incidence of stroke[5,6]. Behavioural risk factors also explain some of the socio-economic inequalities in morbidity and mortality from other chronic diseases[7-13].

The World Health Organisation Commission on Social Determinants of Health has called for national and global health-equity surveillance systems for monitoring of policy and action to reduce health inequity and create a more just and fairer society[14]. Since 1998, the UK government has tried to reduce health inequalities through various national and local initiatives[15,16], and a recently commissioned review highlighted that individuals who live in the poorest areas die, on average, seven years earlier than people in the richest neighbourhoods[17]. A recent study suggested that population-wide best-practice interventions to reduce levels of classic Coronary Heart Disease (CHD) risk factors (blood pressure, cholesterol, blood glucose and smoking cessation) could reduce by 69%- 86% the difference in CHD mortality between high and low socio-economic groups with smoking cessation and reduction of cholesterol concentration accounting for the largest part of the change[18].

While addressing behavioural risk factors can only be a part of the solution to reducing health inequity, it is important to understand the distribution of behavioural risk factors in relation to deprivation if scarce resources for public health interventions are to be used most efficiently to reduce the gap in life-expectancy between the most and least deprived communities. In this study we examined the relationship between area deprivation and the four healthy behaviours, and a summary behaviour score based on these behaviours. We also examined if the association was independent of occupational social class.

METHODS

Study population

The participants were 26,290 men and women aged over 16 years, living in the East of England (population approximately 5.6 million). The East of England Strategic Health Authority is one of 10 Strategic health Authorities in England and covers a wide socioeconomic, urban-rural and ethnic distribution. For the purposes of planning health services, the region is divided into 14 Primary Care Trusts (PCT), and quotas were set for sampling so that at least 1,250 participants were chosen from each PCT. One purpose of the East of England Lifestyle Survey was to compare the 20% most deprived to the 80% least deprived areas within each PCT, hence quotas were set for area deprivation (approximately 40% of the participants were from the most deprived quintile of each PCT in order to obtain sufficient number of participants from the most deprived neighbourhoods). Quotas were also set for age, gender, ethnicity, and working status to provide a representative sample for the entire region.

Procedures

Interviews were conducted by telephone (land-line), using random digit dialling, between 29/10/2008-21/12/2008. A survey questionnaire was developed by regional public health

professionals using questions equivalent to previously validated questionnaires used in major national surveys like the Health Survey for England, General Household Survey and the International Physical Activity Questionnaire (IPAQ). Demographic data on age, gender, ethnicity, residential post-code, working status and occupational social class was collected. Health status was assessed by questions on general health (very good, good, fair, bad or very bad) and presence of long term limiting illness or disability. Self-reported height and weight were used to calculate body mass index (BMI= Weight in Kg/ Height in meters^2).

Detailed questions on smoking (status- non smoker, past smoker, current smoker, age when first started to smoke, wanting to quit smoking, quit attempts, quantity, frequency and type), alcohol consumption (type, quantity, frequency), fruit and vegetable intake (number of portions eaten on the previous day, and frequency of consuming at least five portions a day over an average week), and physical activity (measured using the IPAQ-http://www.ipaq.ki.se/ipaq.htm) were included. Physical activity energy expenditure was quantified as metabolic equivalent of task (MET) -minutes/week by multiplying the amount of time spent doing an activity per day, number of days it was carried out per week, and metabolic equivalent (MET) score for that activity according to Ainsworth et al[19]. Participants were categorised as High (meeting any of the following criteria: vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET- minutes/week OR 7 days of any combination of walking, moderate- or vigorous-intensity activities achieving at least 3000 MET- minutes/week), Moderate (meeting any of the following criteria: 3 or more days of vigorous activity of at least 20 minutes per day OR 5 or more days of moderate-intensity activity or walking at least 30 minutes per day OR 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving at least 600 MET- minutes/week), Low (not meeting any of the above criteria) physical activity.

A healthy lifestyle score was calculated based on the number of four healthy behaviours achieved, as identified in previous studies[4]. Each of the following behaviours received a score of 1- not smoking, moderate alcohol consumption (1-14 units/week for women and 1-21 units/week for men), high or moderate levels of physical activity, and eating five or more portions of fruit or vegetables on at least 5 days/week. Hence each participant could get a minimum score of zero and maximum score of four.

The residential post-code of each participant was assigned a neighbourhood deprivation score based on the Index of Multiple Deprivation 2007 which combines a number of indicators, chosen to cover a range of economic, social and housing issues, into a single deprivation score for each small area (n= 32,482) in England[20]. Scores are used to rank small areas, with a high score indicating greater deprivation. Nationally the lowest score is 0.37 (least deprived) and the highest score in 85.46 (most deprived). The lowest score in the East of England is 0.67 (second most affluent nationally) and the highest score is 82.58 (third most deprived nationally). Although the whole range of national deprivation is covered, the average score is 19.45 (median 16.67, sd 12.64), which means that in general the East of England is less deprived than the national average.

Occupational social class was categorised into six classes (based on latest occupation)- Professional, Managerial, Skilled non-manual, Skilled manual, Semi-skilled manual, and Unskilled manual or on state benefit. Employment status was defined as full time employed, part-time employed, retired, and not working. Ethnicity was based on Office of National Statistics (ONS) classifications of 18 different ethnic groups.

Statistical Analyses

The sample was divided into approximate quintiles of area deprivation score and characteristics of participants were compared. A non-parametric test for trend was used to

calculate p-values for significant trend across quintiles for categorical variables, and a linear regression model for continuous variables. Multivariable linear regression analyses were performed to examine the association between BMI, height, weight, healthy lifestyle score and neighbourhood deprivation. Multivariable logistic regression analyses were performed to estimate the odds ratio for each healthy behaviour (outcome variable) comparing quintiles of neighbourhood deprivation (exposure variable), with the least deprived quintile as the reference category. In all regression analyses, robust standard errors were calculated to take account of the clustering of individuals within a PCT. The basic model adjusted for age (Model 1), and subsequent models additionally adjusted for gender, ethnicity (Model 2), employment category, and occupational social class (individual level socioeconomic factors-Model 3). We excluded participants with missing data for ethnicity (n=8), employment category (n=7) and occupational social class (n=537) from all models. In order to examine the independent association with individual level socioeconomic status, we fitted a multivariable logistic regression model to examine the risk of healthy behaviour across six occupational social class categories, using the 'Professional' category as the reference. All analyses were performed using STATA statistical software, version 10 (STATACORP, College Station, USA).

RESULTS

The response rate was 11% and a total of 26,290 interviews were conducted (women n=13,992). Across quintiles of increasing neighbourhood deprivation score, participants were more likely to report that their general health was bad or very bad (7.85% in most deprived quintile versus 3.05% in least deprived quintile) and have a long-term illness or disability that limited activity (20.51% versus 13.05%). Not surprisingly, they were more likely to be unemployed and in semi-skilled or un-skilled occupations (individual-level social economic factors) (Table 1). After adjusting for age, gender, ethnicity and occupational social class, across quintiles of neighbourhood deprivation, participants were shorter (regression coefficient β= −0.30, p<0.0001), heavier (β= 0.39, p<0.0001) and had a higher BMI (β= 0.21, p<0.0001). In contrast with the linear trend of BMI with neighbourhood deprivation, there was no linear trend with occupational social class categories (Figure 1).

As shown in Table 2, there was a linear gradient across quintiles of deprivation for smoking, alcohol consumption and fruit and vegetable intake (all p for trend <0.0001). For example among more deprived communities, smoking prevalence was higher (27.82% in the most deprived versus 13.54% in the least deprived quintile) and smokers were also more likely to want to quit (68.02% versus 63.92%, although p for linear trend across quintiles did not reach statistical significance). Participants were less likely to consume any alcohol (21.28% versus 8.52% non-drinkers in the most deprived versus the most affluent quintile) and less likely to drink in excess (16.17% versus 23.06% hazardous or harmful drinkers). Consumption of fruits and vegetables was also lower (32.85% versus 45.39% achieving the five-a-day recommendations). Fewer participants in the most deprived quintile achieved all four healthy behaviours (12.69% versus 22.27%) and a greater proportion did not achieve any or achieved only a single healthy behaviour (17.91% versus 9.34%) (Figure 2).

Across quintiles of increasing neighbourhood deprivation, participants were more likely to smoke and less likely to consume five portions of fruit and vegetables on five or more days of the week (least deprived versus most deprived quintile- odds ratios for not smoking 0.38 [0.33 to 0.42]; and fruit and vegetable consumption 0.60 [0.55 to 0.66]; adjusted for age, sex, and ethnicity; p for trend <0.0001). The association was attenuated but remained significant when additionally adjusted for individual socioeconomic factors (employment

and occupational social class). This suggests that the effect of neighbourhood deprivation is present over and above the effect of occupational social class (Table 3).

The average healthy lifestyle score was lower across increasing quintiles of neighbourhood deprivation even after adjusting for occupational social class (p for trend <0.0001). Age and sex adjusted mean healthy lifestyle scores were 2.65 for professionals in the most deprived neighbourhood quintile which was comparable to the mean score for semi-skilled manual workers in the least deprived quintile (score 2.61). As shown in Figure 3, there was a linear trend for the summary healthy lifestyle score across the neighbourhood deprivation quintiles and across the six occupational categories (both p for trend <0.0001) with no significant interaction.

DISCUSSION

Main Findings of this study

In this large population based study, increasing neighbourhood deprivation was associated with a higher BMI, shorter adult height (which may suggest long-term deprivation), poorer perception of health, and more long-term limiting illness or disability. Across quintiles of increasing neighbourhood deprivation, participants were more likely to smoke and less likely to consume five portions of fruits and vegetables on at least five day a week. With excess alcohol consumption, the pattern was reversed and across quintiles of increasing neighbourhood deprivation, participants were less likely to exceed the recommendations for alcohol intake (22 units per week for men and 15 units per week for women). Although there was a trend for physical activity with occupational social class, this trend was not present for neighbourhood deprivation. The inverse association between neighbourhood deprivation and the summary healthy lifestyle score was independent of occupational social class.

What is already known on this topic

There is overwhelming evidence that modifiable behavioural risk factors such as smoking, diet, alcohol and physical activity influence health. Khaw et al examined the relationship between four health behaviours: not smoking, not physically inactive, moderate alcohol intake (1-14 units a week), and Vitamin C levels > 50 mmol/l indicating at least five servings of fruit and vegetables every day[4]. Adjusted for age, sex, BMI and social class, relative risks for mortality were 1.77 for smoker versus non-smoker, 1.44 for Vitamin C levels < 50 mmol/l, 1.26 for alcohol intake <1 or > 14 units per week, and 1.24 for physically inactive versus not inactive. The mortality risk for those with four compared to zero health behaviours was equivalent to being 14 years younger[4]. A subsequent paper on the same cohort quantified the association of the four health behaviours with incidence of stroke. In fully adjusted models, the relative risks for incident stroke were 1.69 for smoker versus non-smoker, 1.39 for Vitamin C levels < 50 mmol/l, 1.28 for alcohol intake <1 or > 14 units per week, and 1.29 for physically inactive versus not inactive[5]. These data suggest that successfully promoting the four healthy behaviours can significantly reduce mortality and morbidity.

A recent review to map out the area effects on health identified 86 studies published between July 1998 and December 2005. Most studies found an area (contextual) effect independently of individual level socioeconomic (compositional) effects[21]. Most studies have examined associations between area deprivation and health outcomes such as cardiovascular disease[22], diabetes[23], cognitive impairment[24], quality of life[25], disability[26], self rated health[27] and mortality[28-31] but few have studied the proximal determinants of health outcomes such as behavioural risk factors and obesity which could be mediating the association[23,32]. In particular very few studies have examined the interaction between area

and individual socioeconomic effects[33]. In one study in Scotland the association between a 'bad' diet and area deprivation was present only among affluent households[34] and in another study neighbourhood deprivation was associated with higher body mass index in women but not men, after controlling for individual factors[28].

Three studies found that neighbourhood deprivation was associated with smoking[35-37]. Numerous studies have assessed the contribution of smoking to the socioeconomic differences in mortality and estimates vary from 24% to over 50%[38-40]. Neighbourhood deprivation has also been associated with lower plasma carotenoid and vitamin C levels (both markers of fruit and vegetable intake)[41,42]. Pollack et al found that although alcohol availability was concentrated in the most deprived neighbourhoods, adults in least deprived neighbourhoods were most likely to be heavy drinkers[43]. At an individual level, excess alcohol intake was associated with increasing education, wealth and subjective social status[44].

The association between physical activity and area neighbourhood deprivation is less clear with one study showing that area deprivation was associated with increased sedentary behaviour (measured as TV viewing and screen-based recreation)[45], and another study showing that area deprivation was associated with less moderate or vigorous physical activity among older women[46]. One study found that area deprivation was associated with smoking, less fruit and vegetable intake and exercise habits[47].

What this study adds

This study showed that smoking and a poor diet are the most significant modifiable behavioural risk factors that should be targeted by public health interventions aimed at reducing health inequalities associated with neighbourhood deprivation. More research is needed to investigate the association between drinking behaviour (binge, moderate, hazardous, and harmful drinking) and deprivation so that public health messages regarding moderate drinking can be tailored appropriately. In addition to individual level socioeconomic factors, features in the neighbourhood (such as housing, shops, recreational facilities, the built environment, reputation of the area, peer pressure, isolation from people with healthy behaviours, access to health promotion messages and services) also contribute to unhealthy lifestyles that lead to poorer health. Since there is a neighbourhood effect beyond the individual effect, strategies to reduce inequalities could combine individual level and neighbourhood level approaches. These could include providing a wider range of healthy options to those living in more deprived neighbourhoods.

Individuals in deprived neighbourhoods achieved a shorter adult height and this may suggest that they suffer worse health from childhood; hence interventions could target early life and childhood and not focus solely on the health of adults, as suggested by other studies as well[48].

Limitations of this study

We cannot rule out response bias due to the method of using random digit dialling since only 83% of UK households have a landline. However, this is unlikely to affect the association between behavioural risk factors and deprivation and the pattern of variation is likely to be a good reflection of the true pattern. We also tried to ensure the sample was representative of the population by setting quotas (in this case, on age, gender, employment status, ethnicity, and neighbourhood deprivation) within each PCT. Although the response rate was low (11%), the quotas on neighbourhood deprivation were set to boost the response from people living in the most deprived areas within each PCT, in order to better reflect the more deprived population (who traditionally are less likely to have a landline)[49].

Self-reported measures may result in biased reporting to socially acceptable behaviours and this is a limitation of all surveys. If individuals in more deprived neighbourhood were more likely to report healthy behaviours, this would attenuate the association and vice versa. When self reported height and weight data collected in this survey were compared to objectively measured height and weight data from Health Survey for England, we found that height was over estimated and weight was under estimated, resulting in lower BMI values[50]. There is no reason to believe that there was a systematic bias in underreporting by neighbourhood deprivation levels, hence any errors would attenuate the association and the true association is likely to be stronger. We have used recommendations for weekly alcohol consumption although these have been replaced by daily recommendations to identify binge drinking patterns. We were not able to calculate daily alcohol consumption based on the data we gathered.

The strengths of this study also merit consideration. The main strength was that a combination of individual and neighbourhood socioeconomic factors was used. Previously validated questions were used to gather comprehensive data on the four important behaviours that are known to have a significant impact on morbidity and mortality. This was a large population based survey including participants from diverse socioeconomic backgrounds and ethnicity. Although the East of England is less deprived on average than England, because quotas were set to interview 40% of the participants from the most deprived quintile of each PCT, the complete ranges of area deprivation scores for the country were captured (minimum IMD 2007 score 0.67 and maximum 82.58) making the findings generalisable to the rest of the country.

Acknowledgments

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a

b
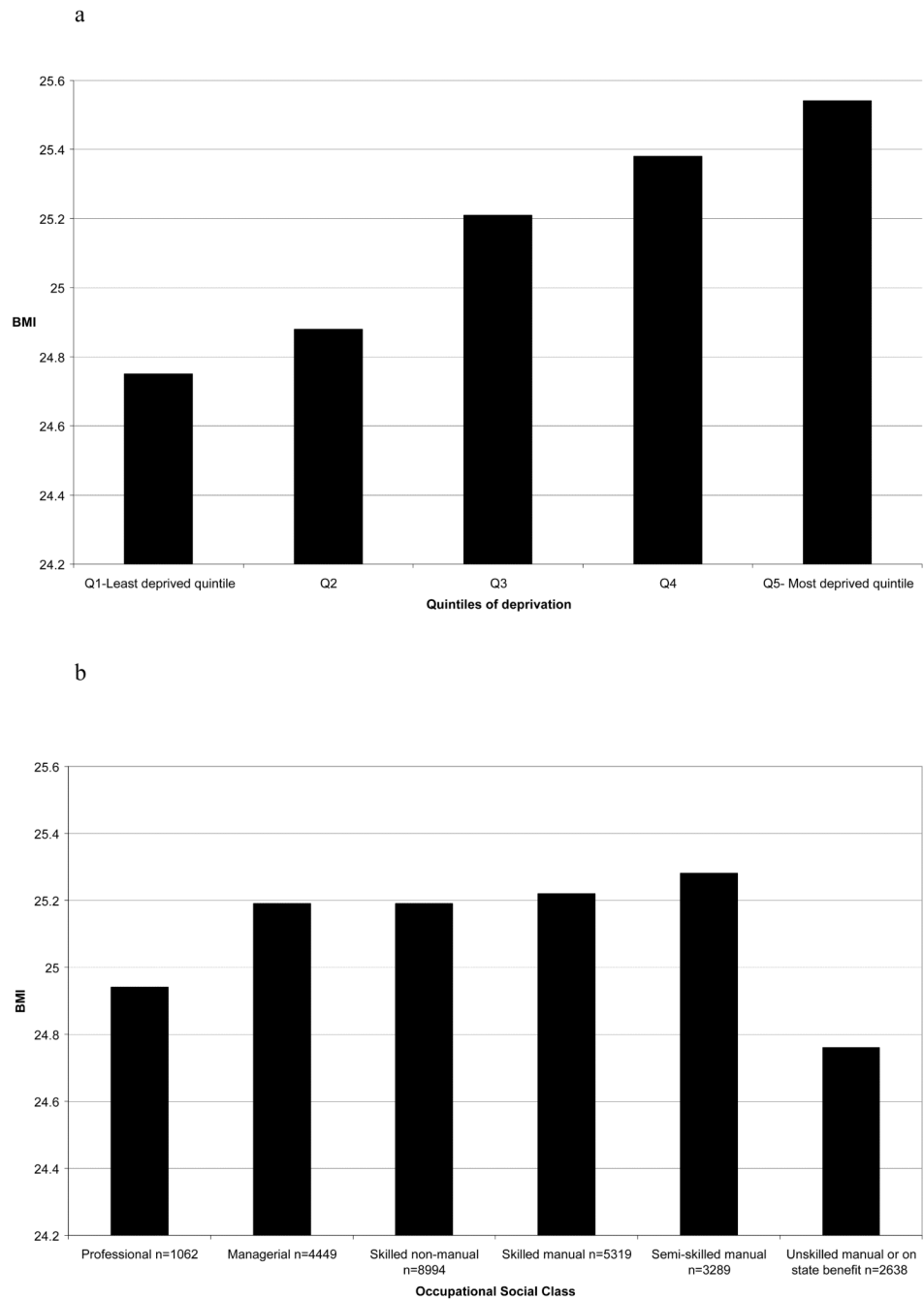
Figure 1.
a: Mean Body Mass Index (adjusted for age, sex, ethnicity and occupational social class) across quintiles of neighbourhood deprivation (p for trend 0.001).
b: Mean Body Mass Index (adjusted for age, sex, ethnicity and neighbourhood deprivation score) across occupational social class categories (p for trend =0.230).

Women

Men

Figure 2.
Percentages of women and men in each neighbourhood deprivation quintile achieving none, 1, 2, 3 or 4 healthy behaviours.

Figure 3.
Mean Healthy lifestyle score across quintiles of neighbourhood deprivation and six categories of occupational social class (adjusted for age and sex; p for trend <0.0001).

Table 1

Characteristics of 26,290 men and women who participated in the East of England Lifestyle survey (2008) by approximate quintiles of neighbourhood deprivation score (IMD 2007).

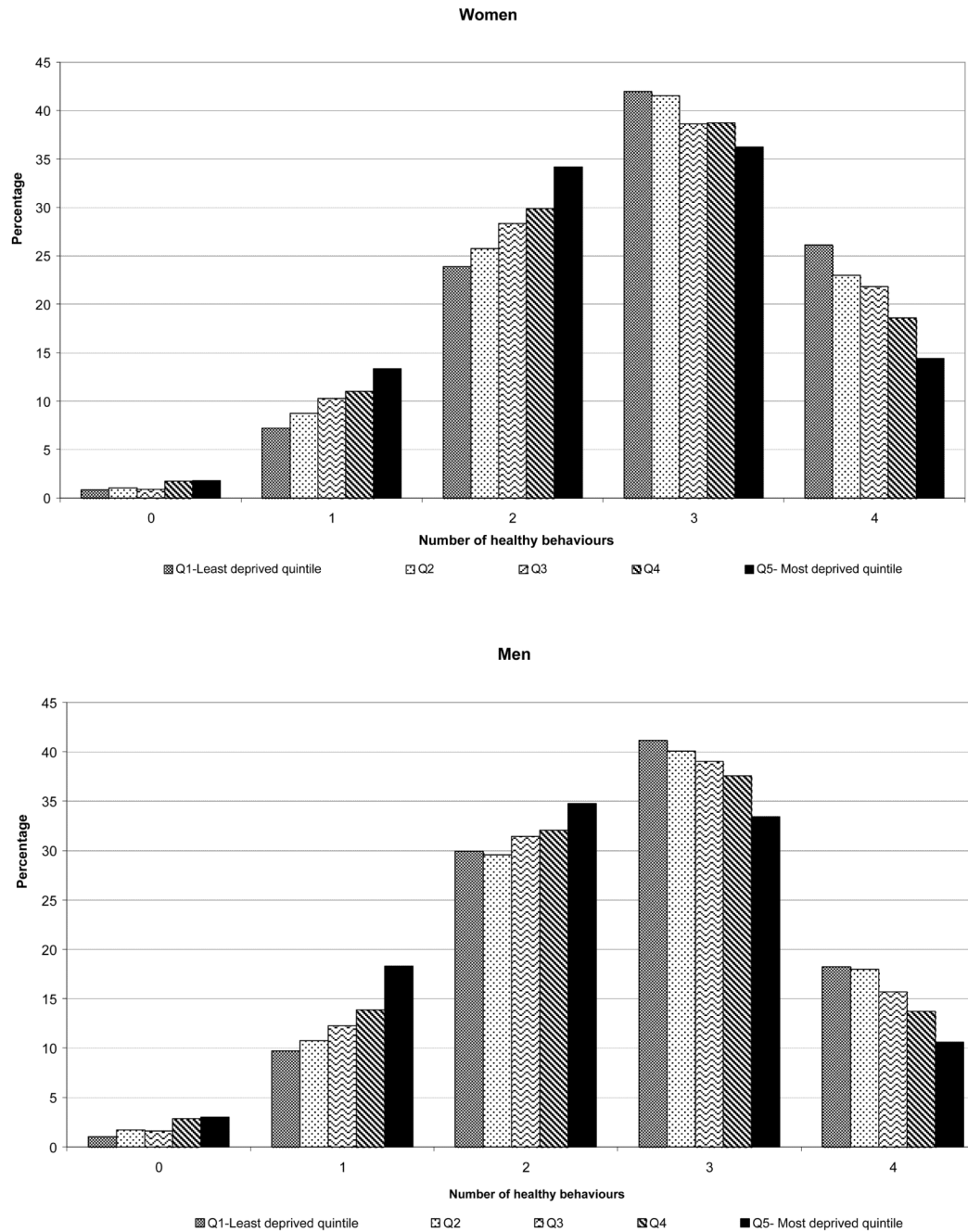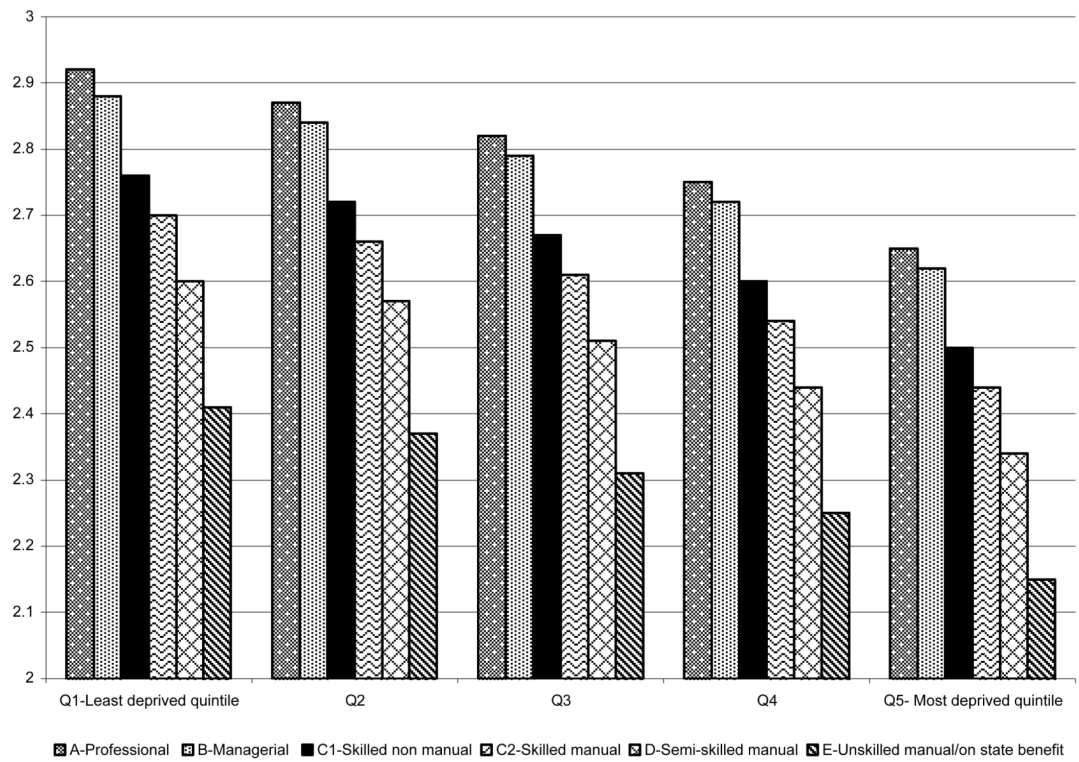| Variables[a]	Quintiles of neighbourhood deprivation score[b]					
	Q1 (n=5281) IMD score 0.67-8.54	Q2 (n=5248) IMD score 8.55-13.52	Q3 (n=5248) IMD score 13.53-20.15	Q4 (n=5287) IMD score 20.18-29.54	Q5 (n=5226) IMD score 29.56-82.58	p-trend[c]
Age in years-mean (sd)	47.83 (18)	47.79 (18)	48.66 (18)	47.79 (18)	46.01 (19)	<0.0001
Gender						<0.0001
Men n=12298	48.91	46.82	46.28	46.70	45.16	
Women n=13992	51.09	53.18	53.72	53.30	54.84	
Ethnicity						<0.0001
White British n=23279	91.86	91.44	90.28	87.82	81.29	
White other n=1094	03.84	04.15	03.89	04.39	04.54	
Black and minority ethnicity n=1909	04.28	04.36	05.83	07.75	14.12	
Self perception of health						<0.0001
Very good/good n=20045	81.59	79.43	75.78	74.23	70.86	
Fair n=4767	15.36	16.10	18.69	19.42	21.28	
Bad/very bad n=1430	03.05	04.47	05.54	06.35	07.85	
Has long term limiting illness or disability which limits activity n=4363	13.05	14.63	16.84	17.97	20.51	<0.0001
Work category						<0.0001
Full time employed n=13056	52.11	50.78	49.75	50.01	45.62	
Part-time employed n=2961	11.19	12.00	11.17	10.93	11.02	
Retired n=5962	22.44	22.73	24.09	23.04	21.09	
Not working n=4304	14.24	14.42	14.98	16.02	22.23	
Occupational social class						<0.0001
Managerial or Professional n= 5511	31.89	24.66	20.39	16.36	11.44	
Skilled manual, clerical, junior managerial or professional n= 14313	54.19	55.39	56.29	55.34	50.98	
Semi- un-skilled or on state benefit n=5927	12.01	17.85	21.28	26.31	35.36	
BMI unadjusted mean (se)	24.79 (0.12)	24.90 (0.12)	25.26 (6.47)	25.40 (0.09)	25.40 (0.11)	<0.0001
BMI[d] mean (se)	24.75 (0.12)	24.88 (0.11)	25.21 (0.12)	25.38 (0.09)	25.53 (0.09)	<0.0001
Height[d] mean (se)	169.8 (0.29)	169.4 (0.13)	169.2 (0.12)	169.2 (0.18)	168.4 (0.17)	<0.0001
Weight[d] mean (se)	72.28 (0.31)	72.27 (0.31)	73.11 (0.29)	73.52 (0.25)	73.58 (0.32)	<0.0001

[a] Values are percentages for categorical variables and means (standard deviations or standard errors) for continuous variables.

[b] Each participant was assigned a IMD 2007 score for post-code of residence.

[c] Non-parametric test for trend for categorical variables and linear regression for continuous variables.

[d] BMI, height and weight adjusted for age, sex, ethnicity (18 categories) and occupational social class (6 categories).

Table 2

Distribution of four behavioural factors among 26,290 men and women who participated in the East of England Lifestyle survey (2008) by approximate quintiles of neighbourhood deprivation score (IMD 2007).

Variables Percentage[a]	Quintiles of neighbourhood deprivation score					
	Q1	Q2	Q3	Q4	Q5	p-trend
Smoking [b]						<0.0001
Yes n=5298	13.54	16.60	19.34	23.51	27.82	
No n=20987	86.42	83.40	80.64	76.45	72.81	
Want to quit smoking (among smokers n=5298)[c]						0.136
Yes n=3485	63.92	66.02	64.73	64.92	68.02	
No n=1573	31.47	29.28	31.82	30.17	20.29	
Alcohol consumption [d]						<0.0001
Non-drinker n=3489	8.52	9.95	12.73	13.94	21.28	
Moderate drinker n=16942	66.88	66.60	64.96	64.27	59.47	
Hazardous drinker n=4022	18.10	16.63	15.63	14.34	11.77	
Harmful drinker n=1247	04.96	04.86	04.84	04.65	04.40	
Consumption of at least five portions of fruit and vegetables [e]						<0.0001
Less than 1 day/week n=3952	12.63	13.99	13.87	15.87	18.83	
1-4 days per week n=11777	41.81	43.27	44.34	46.66	47.91	
5-7 days/week n=10473	45.39	42.44	41.37	37.09	32.85	
Physical activity level [f]						0.287
High n=11209	41.34	43.20	41.94	43.71	43.00	
Moderate n=8896	35.81	34.05	34.26	32.48	32.59	
Low n=5875	21.72	21.91	22.58	22.60	22.92	
Healthy Lifestyle score[g] n=25739						
Healthy lifestyle score –mean (se)	2.76 (0.01)	2.70 (0.01)	2.63 (0.03)	2.54 (0.02)	2.41 (0.04)	<0.0001
Healthy lifestyle score –mean (se) adjusted for age and sex	2.76 (0.01)	2.70 (0.01)	2.63 (0.03)	2.54 (0.02)	2.40 (0.04)	<0.0001
Healthy lifestyle score –mean (se) adjusted for age, sex, ethnicity and occupational social class	2.71 (0.01)	2.67 (0.02)	2.62 (0.02)	2.56 (0.07)	2.49 (0.01)	<0.0001
Mean healthy lifestyle score adjusted for age and sex across occupational social class categories						
Professional n=1062	2.91	2.87	2.81	2.75	2.65	
Managerial n=4449	2.89	2.84	2.79	2.72	2.62	
Skilled Non-Manual n=8994	2.75	2.71	2.66	2.59	2.49	
Skilled Manual n=5319	2.70	2.66	2.61	2.54	2.44	
Semi-Skilled Manual n=3289	2.61	2.57	2.51	2.44	2.35	
Unskilled manual/ on state benefit n=2638	2.41	2.37	2.31	2.25	2.15	

[a] Percentages may not add up to 100% due to missing data.

[b] Answer to question 'Do you smoke cigarettes, roll-ups, cigars, or a pipe at all nowadays?'

[c] Current smokers asked 'would you like to give up smoking altogether?'

[d] Non-drinker – O units/ week, Moderate drinker 1-21 units/week for men and 1-14 units/week for women, Hazardous drinker 22-50 units/week for men and 15-35 units/week for women, Harmful drinker >51 units/week for men and >36 units /week for women

[e] Answer to the question 'Can you tell me how often, on average, you eat five portions of fruit or vegetables a day?'

[f] Physical activity measured using IPAQ.

[g] Score calculated based on number of the 4 healthy behaviours achieved: Not current smoker, Moderate alcohol consumption, consuming five portions of fruit and vegetables on at least five days a week, and high or moderate levels of physical activity. All scores calculated using robust standard errors to account for clustering of individuals within a PCT. Participants with missing data on ethnicity and occupational social class were excluded.

Table 3a

Adjusted odds ratios for behavioural factors among 25,739 men and women who participated in the East of England Lifestyle survey (2008) by approximate quintiles of neighbourhood deprivation score (IMD 2007).

Odds Ratios[a]		Quintiles of neighbourhood deprivation score				
	Q1	Q2	Q3	Q4	Q5	p-trend[b]
Not Smoking						
Model 1	1	0.79 [0.71-0.88] ***	0.64 [0.56-0.73] ***	0.51 [0.44-0.58] ***	0.41 [0.34-0.50] ***	<0.0001
Model 2	1	0.78 [0.71-0.87] ***	0.63 [0.55-0.71] ***	0.49 [0.43-0.55] ***	0.38 [0.33-0.42] ***	<0.0001
Model 3	1	0.83 [0.74-0.92] **	0.69 [0.61-0.77] ***	0.55 [0.49-0.62] ***	0.45 [0.41-0.51] ***	<0.0001
Consuming five portions of fruits and vegetables on at least 5 days/week						
Model 1	1	0.88 [0.81-0.97] *	0.84 [0.75-0.93] **	0.71 [0.66-0.76] ***	0.60 [0.54-0.66] ***	<0.0001
Model 2	1	0.87 [0.79-0.96] **	0.83 [0.74-0.92] **	0.70 [0.65-0.75] ***	0.60 [0.55-0.66] ***	<0.0001
Model 3	1	0.91 [0.83-0.99] *	0.89 [0.80-0.97] *	0.77 [0.72-0.82] ***	0.70 [0.64-0.76] ***	<0.0001
High or moderate levels of physical activity						
Model 1	1	1.00 [0.94-1.07]	0.97 [0.87-1.08]	0.96 [0.87-1.05]	0.90 [0.80-1.01]	0.487
Model 2	1	1.01 [0.94-1.07]	0.99 [0.89-1.10]	0.98 [0.90-1.08]	0.98 [0.91-1.04]	0.949
Model 3	1	1.02 [0.96-1.09]	1.02 [0.92-1.13]	1.03 [0.94-1.13]	1.06 [0.99-1.12]	0.254
Moderate alcohol consumption [c]						
Model 1	1	0.99 [0.91-1.09]	0.92 [0.82-1.03]	0.90 [0.83-0.98] *	0.75 [0.60-0.79] *	0.045
Model 2	1	0.98 [0.89-1.08]	0.94 [0.85-1.03]	0.93 [0.87-1.00]	0.86 [0.82-0.90] ***	<0.0001
Model 3	1	0.99 [0.90-1.10]	0.95 [0.86-1.06]	0.96 [0.88-1.04]	0.91 [0.86-0.96] ***	0.0002
Not exceeding recommended limits for alcohol consumption [d]						
Model 1	1	1.09 [0.98-1.21]	1.16 [1.03-1.31] *	1.27 [1.16-1.38] ***	1.57 [1.28-1.92] ***	<0.0001
Model 2	1	1.07 [0.97-1.19]	1.12 [0.99-1.26]	1.20 [1.11-1.30] ***	1.37 [1.28-1.48] ***	<0.0001
Model 3	1	1.04 [0.94-1.16]	1.07 [0.95-1.20]	1.13 [1.05-1.21] *	1.23 [1.15-1.32] ***	<0.0001

*
P <0.05

**
P<0.01

***
P <0.001 for significant odds ratios compared to the first quintile for IMD score (least deprived).

[a]Model 1-adjusted for age. Model 2- adjusted for age, gender, ethnicity (18 categories). Model 3- Model 2+ adjusted for work category (four categories) and occupational social class (six categories).

[b]Test for linear trend across quintiles of deprivation using regression model.

[c]Moderate alcohol consumption – 1-21 units per week for men and 1-14 units per week for women.

[d]Alcohol consumption less than 22 units per week for men and 15 units per week for women (includes non-drinkers).

Table 3b

Odds ratios for behavioural risk factors by occupational social class adjusted for age, sex, ethnicity, work category, and neighbourhood deprivation score (IMD 2007).

Odds ratios	Occupational social class						
	Professional	Managerial	Skilled non-manual	Skilled manual	Semi-skilled manual	Un-skilled manual or on state benefit	p-trend
Not Smoking	1	0.86 [0.63-1.18]	0.62 [0.45-0.84] **	0.50 [0.37-0.68] ***	0.43 [0.33-0.56] ***	0.33 [0.24-0.46] ***	<0.0001
Consuming five portions of fruits and vegetables on at least 5 days/week	1	0.83 [0.75-0.93] **	0.63 [0.57-0.70] ***	0.56 [0.50-0.62] ***	0.46 [0.41-0.53] ***	0.50 [0.44-0.57] ***	<0.0001
High or moderate levels of physical activity	1	0.90 [0.77-1.04]	0.82 [0.70-0.96] *	0.90 [0.79-1.03]	0.85 [0.72-1.00]	0.58 [0.48-0.69] ***	<0.0001
Moderate alcohol consumption	1	1.22 [1.06-1.42] **	1.20 [1.06-1.37] **	1.16 [1.00-1.33] *	1.12 [0.97-1.30]	0.81 [0.71-0.93] **	<0.0001
Not exceeding recommended limits for alcohol consumption	1	1.34 [1.14-1.56] ***	1.45 [1.27-1.65] ***	1.55 [1.36-1.76] ***	1.77 [1.53-2.04] ***	1.94 [1.53-2.48] ***	<0.0001

*
P <0.05

**
P<0.01

***
P <0.001 for significant odds ratios compared to Professional occupation.