

Television viewing and other screen-based entertainment in relation to multiple socioeconomic status indicators and area deprivation: the Scottish Health Survey 2003

E Stamatakis,¹ M Hillsdon,² G Mishra,³ M Hamer,¹ M Marmot¹

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¹Department of Epidemiology and Public Health, University College London, UK; ²Exercise, Nutrition and Health Sciences, University of Bristol, UK; ³MRC Lifelong Health and Ageing Unit, Department of Epidemiology and Public Health, University College London, UK

Correspondence to: Dr E Stamatakis, Department of Epidemiology and Public Health, University College London, 1–19 Torrington Place, London WC1E 6BT, UK; e.stamatakis@ucl.ac.uk

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ABSTRACT

Background: Sedentary behaviour (sitting) is detrimental to health, independently of participation in physical activity. Socioeconomic position (SEP) is known to relate strongly to physical activity participation but we know very little about how SEP relates to sedentary behaviour. This study aimed to assess the relationships between SEP, neighbourhood deprivation and an index of sedentary time.

Methods: Cross-sectional study of a representative sample of 7940 Scottish adults who participated in the 2003 Scottish Health Survey, which collected information on SEP (household income, social class and education), neighbourhood deprivation (Scottish Index of Multiple Deprivation), television and other screen-based entertainment time, and physical activity.

Results: The three indicators of SEP and deprivation index were independently of each other associated with daily times of television and other screen-based entertainment, even after adjustment for occupational and leisure-time physical activity, health status, smoking, alcohol drinking, car ownership and body mass index: income $p = 0.002$; social class $p < 0.001$; education $p < 0.001$, deprivation $p < 0.001$. Also, there was a strong cumulative effect of SEP (a composite scale where 0 = lowest, 9 = highest SEP position) with those in the lowest SEP spending an additional 109 minutes each day on screen-based entertainment compared to those in the highest socioeconomic position ($p < 0.001$ for linear trend).

Conclusion: Adverse socioeconomic position is associated with a cumulative increase in the time spent on screen-based entertainment. Reducing inequalities would be expected to reduce exposure to sedentary behaviours, such as excessive screen-based entertainment times, and therefore reduce the risk of chronic disease.

Physical activity comprises a number of discrete behaviours including recreational activity and sport, occupational activity, transport activity and domestic activity (gardening and housework). Low levels of physical activity are associated with an increased risk of many chronic diseases including coronary heart disease, diabetes mellitus, some cancers and osteoporosis.^{1–2} In recent decades there have been important changes in these behaviours as the need to be active in everyday life has been eroded.^{3–5} The transition from an industrial to service-based economy has left fewer jobs requiring physical work.⁵ More labour-saving technologies in home and work environments and changes in

commuting and shopping patterns – from local to distant – have resulted in greater reliance on motorised transport.³

Traditionally, health research on physical activity has focused on moderate to vigorous intensities with little consideration of sedentary time per se.⁶ In recent years there has been an increasing interest in the health risks of sedentary behaviours such as sitting in cars and watching television and other screen-based entertainment (TVSE). Both TVSE^{7–16} and time spent sitting in cars¹⁷ have been associated with an increased risk of obesity, cardiovascular disease and type 2 diabetes in both cross-sectional and prospective studies. These associations between time spent sitting and the risk of metabolic disease appear to be independent of physical activity. For example, even in those engaging in the levels of physical activity recommended for weight control, time spent sitting is associated with an increased risk of obesity.¹⁸ Television and other screen-based entertainment is highly prevalent in Scotland as 39% of men and 35% of women spent an average of 4 hours or more sitting at a screen per weekday, increasing to 47% for men and 38% for women in the weekend days.¹⁹

It is well-documented that physical activity, along with other behavioural risk factors varies according to socioeconomic position (SEP).^{20–21} In disease outcomes associated with low levels of physical activity, in particular cardiovascular disease, low SEP increases risk.²² However, little is known about the prevalence of sedentary behaviours among adults from different socioeconomic groups. Understanding whether SEP is associated with sedentary behaviour, independently of physical activity, is important for developing policies to reduce the risk of obesity, cardiovascular and metabolic disease. In this study the prevalence of time spent watching TV and in other screen-based entertainment was examined in relation to multiple socioeconomic position indicators and area deprivation, in a representative sample of adults in Scotland.

METHODS

Study population

The 2003 Scottish Health Survey (SHS) featured a nationally representative sample of adults living in households in Scotland. The sample was selected using multi-stage stratified probability sampling design with postcode sectors selected at the first

stage and household addresses selected at the second stage. Further details of the study design are described elsewhere.^{23 24} Ethical approval was granted by the Local Research Ethics Councils.

Measurements

Sedentary time, physical activity and other covariables

Data were collected during household-based interviews. Sedentary behaviour questions enquired about the average time spent collectively on TVSE (television and “any other type of screen such as computer or video game”) on the typical weekday and weekend day in the 4 weeks prior to the interview. Although there is currently no information on the reliability and criterion validity of the TVSE questions, the previously reported¹⁶ strong direct correlations of TVSE time with waist circumference and body mass index and the inverse correlation with physical activity support their convergent validity. Physical activity questions included frequency (number of days) and duration (minutes per day) of participation in heavy housework, heavy ‘Do-It-Yourself’ (DIY)/gardening (home maintenance), walking for any purpose, and recreational sports and exercises. Occupational activity was assessed by asking respondents how physically active they are at work (very active, fairly active, not very active, not at all active). Their response was combined with information on whether their occupation was full or part-time and the nature of their occupation using the Standard Occupational Classification 1990.²⁵ The combined information was used to classify occupational physical activity as inactive, light or moderate and above. The criterion validity of the Scottish Health Survey physical activity questions is supported by an accelerometry study on 106 general population British adults (45 men).²⁶ Additional questions assessed whether respondents had limited their activities due to health reasons in the last 2 weeks, their perceived health status (very good/good/fair/bad/very bad), and their alcohol consumption (units per week), smoking status (never smoked, occasional ex-smoker, regular ex-smoker, current smoker), doctor-diagnosed cardiovascular disease (ischaemic heart disease or stroke) and diabetes, and car ownership. Height and weight were measured by the interviewers using stadiometers (Chasmors Ltd, London, UK) and Tanita electronic digital scales (Tanita Incorporation, Japan). Body mass index (BMI) was calculated as weight (in kg) divided by squared height (in m).

Socioeconomic position and deprivation

Social class was determined using the Registrar General’s classification and was grouped as I&II (professional and managerial/technical), III non-manual, III manual, IV semi-skilled manual and V unskilled manual. Income was converted to equivalised annual household income that is adjusted for the number of persons in the household using the McClements scoring system.²⁷ The income data presented here are based on quartiles. Educational classification was based on highest qualification obtained and was categorised as Level 0 (no qualification or pre-school leaving qualification), Level 1 (O grade, standard grade, GCSE or equivalent), Level 2 (Higher grade, A level, GSVQ advanced or equivalent), Level 3 (HNC, HND, SVQ Levels 4 or 5 or equivalent), and Level 4 (first degree, higher degree or professional qualification, eg teaching or accountancy). Area deprivation was assessed using the Scottish Index of Multiple Deprivation (SIMD), which is a measure of area-based multiple deprivations. It is based on 31 indicators in six individual domains of current income, employment, housing, health, education, skills and training and

geographic access to services and telecommunications. The Scottish Index of Multiple Deprivation is calculated at data zone level, enabling small pockets of deprivation to be identified (data zones have between 500 and 1000 people living in them). The data zones are ranked from most deprived (1) to least deprived (6505) on the overall SIMD index.²⁸ The Scottish Index of Multiple Deprivation is reported here using quintiles.

Data handling and statistical analyses

The main outcome variable was daily screen entertainment time calculated as [(average weekend day time*2)+(average weekday time*5)]/7. Exposure variables were SEP (income, social class, and education) and area deprivation. Confounders or mediators were recreational physical activity, occupational physical activity, self-reported health status, doctor-diagnosed diabetes and CVD, smoking and alcohol drinking, health-related limited activity, car ownership and household cluster. Likelihood ratio χ^2 tests (categorical variables) or univariable linear regression (continuous variables) were used to examine the relationships between TVSE time (<2, 2 to <3, 3 to <4, ≥ 4 hours/day) and demographic characteristics, health status, and health behaviour factors. Age-standardised and sex-specific mean TVSE time and 95% confidence limits were plotted by each SEP exposure. Log-likelihood ratio tests were carried out to examine whether sex and time of the week (weekdays vs weekend days) were effect-modifiers of the relationship between SEP and screen entertainment time. To assess the effect of SEP on TVSE, a series of regression models were fitted: first the model was adjusted for age and sex (model 1), further adjusted for other SEP indicators (model 2), further adjusted for area deprivation (model 3), and further adjusted for all covariates minus the physical activity variables (model 4). To examine whether the screen-based entertainment-SEP/deprivation relationships were independent of physical activity, the final model was further adjusted for occupational and non-occupational physical activity (model 5). Results are presented as regression coefficients and 95% confidence intervals. Multicollinearity between SEP indicators was assessed by performing variance inflation factor tests (VIF). Generally, VIF values exceeding 10 indicate the presence of multicollinearity.²⁹ In the present models, VIF values were no greater than 1.45 for any independent variable or confounder. To examine whether the different social indicators have a cumulative effect on TVSE, an aggregate social position score was developed based on respondents’ position in the income, social class and education scales used. For each SEP indicator, respondents were assigned between zero (lowest income and social class group, education level 0 and level 1) and three points (highest income and social class groups, educational level 4) and the resulting score ranged from zero (lowest SEP) to nine (highest SEP). It was aimed to obtain an indication of the convergent validity of this SEP score by plotting it against a number of variables that are known to relate strongly to SEP (smoking rates, self-reported general health, car ownership and obesity status) and by examining if it correlated with area deprivation.

All data were weighted for non-response to provide estimates that are representative of adults living in Scotland. All analyses were done using SPSS version 13 with the exception of the effect modification tests that were done using Stata version 10.

RESULTS

The SHS 2003 sample had 8148 potentially eligible adults (3610 men). Initially, 208 respondents with extreme TVSE values

were excluded (>530 minutes/day which corresponds to >4 standard deviations of the unweighted sample TVSE mean) leaving 7940 (3506 men) valid cases that were entered in the analyses involving deprivation and education. Due to missing information on income and social class, analyses involving income included 7079 cases (3156 men) and analyses involving social class included 7865 (3476 men) cases.

Table 1 presents the sample characteristics by TVSE time. Television and other screen-based entertainment was associated with increased age, lower non-occupational and occupational physical activity, higher obesity, more doctor-diagnosed CVD and diabetes, less favourable self-reported health status, more limited activities due to health reasons, and higher rates of smoking.

Men reported a mean of 214 (±136) and women 192 (±123) TVSE minutes per day. Figure 1 presents the age-standardised daily TVSE time and 95% CI by income quartiles, social class, education level and deprivation quintile. Television and other screen-based entertainment time shows a strong gradient with all exposure variables, and is particularly pronounced for income and education (difference between top and bottom groups were 82 and 80 minutes respectively) and the confidence limits of the mean had little or no overlap. Although sex appeared to be an effect modifier in the relationship between education and TVSE (p = 0.002), no apparent differences between men and women were observed (online table 1 and online figure 1 in the Appendix). Whether or not the relationship between SEP and TVSE varies by time of the week (weekdays vs weekend days) was also examined. The patterns were almost identical between weekdays and weekend days (online figure 2).

The strong association between TVSE and each SEP/deprivation indicator persisted following mutual adjustments for other SEP indicators and other potential confounders (table 2). Mutual adjustments for other SEP indicators and deprivation (models 2 and 3 in table 2) attenuated the regression coefficients toward the null but the overall trend remained statistically significant. Further adjustments for other confounders (model 4) attenuated the coefficients further, most notably for income and education, with no effect on the overall trend. Finally, adjustments for non-occupational and occupational physical activity (model 5) had little effect on the regression coefficients, indicating that the relationships between TVSE and SEP/deprivation are independent of physical activity. According to

the fully adjusted coefficients in table 2, education level and area deprivation showed the strongest correlations with TVSE.

The convergent validity of the aggregate SEP score is supported by its strong gradient with self-reported health status (p<0.001), smoking status (p<0.001), car ownership (p<0.001) and SIMD (p<0.001). The SEP score was strongly related with screen entertainment time (figure 2) with respondents at the bottom of the scale (SEP score = 0) reporting 109 more minutes/day than those at the top of the scale (SEP score = 9). The strong relationship persisted following adjustments for potential confounders including physical activity (table 3).

DISCUSSION

In a representative sample of adults, it was found that those with poorer socioeconomic circumstances, with less education and who live in deprived neighbourhoods spent greater time each day watching screen-based entertainment. The four measures of SEP were independent of each other and acted cumulatively. Daily TVSE time increased linearly with each additional indicator of SEP. The effect of SEP on hours of TVSE was independent of potential confounding factors such as physical activity in leisure time and at work and general health.

The study is large, representative of adults living in Scotland and has multiple indicators of SEP, separate measures of leisure, domestic and occupational physical activity, as well as a range of potential confounding factors such as health status and other health behaviours. It is believed that this is the first study to examine the effect of multiple indicators of SEP on the time spent each day on screen-based entertainment.

A limitation of the present study is that TVSE was self-reported. Questions on television viewing and computer use time have been shown to underestimate sedentary time among Flemish adults when compared with tri-axial accelerometry.³⁰ It is believed that there is no evidence suggesting a systematic error in reporting sitting behaviour by SEP. If this is the case, under-reporting is equally likely in high and low SEP groups and therefore would not alter the direction of the observed association between SEP and TVSE time. Another limitation is that there is no information on the reliability and criterion validity of the questions assessing TVSE in the SHS. Although acknowledging this limitation it is encouraging that a recent

Table 1 Characteristics of the sample and selected behavioural variables by average daily time spent in TV and other screen-based entertainment

	Hours/day				Total	Trend p
	<2	2 to <3	3 to <4	4+		
N	1380	2201	1639	2720	7940	
Sex (% men)	41.7	45.6	49.5	50.7	47.3	
Mean age (±SD)	43.5 (18.0)	45.1 (17.2)	47.1 (18.2)	49.4 (19.8)	46.6 (18.6)	<0.001§
Physical activity level (% meeting recommendation*)	58.1	55.9	51.3	37.7	49.3	<0.001†
Work activity (% not active at work‡)	59.3	59.6	62.5	74.4	65.1	<0.001†
Obesity (BMI>30 kg/m ²)	17.3	22.3	25.4	29.0	24.2	<0.001†
Doctor-diagnosed CVD (coronary heart disease or stroke) (%)	6.0	6.3	7.6	13.1	8.8	<0.001†
Doctor-diagnosed diabetes (%)	2.0	2.8	3.2	5.8	3.7	<0.001†
Self-reported general health (% good/very good)	81.5	81.4	73.8	62.5	73.5	<0.001†
Current smoker (%)	23.5	24.2	28.2	34.7	28.4	<0.001†
Limited activity due to health (%)	14.9	13.0	14.2	19.9	15.9	<0.001†
Car ownership (%)	81.1	81.8	78.5	64.0	75.0	<0.001†
Mean alcohol units/week (±SD)	11.7 (32.5)	11.3 (19.2)	11.5 (14.7)	11.7 (21.3)	11.6 (22.3)	0.806§

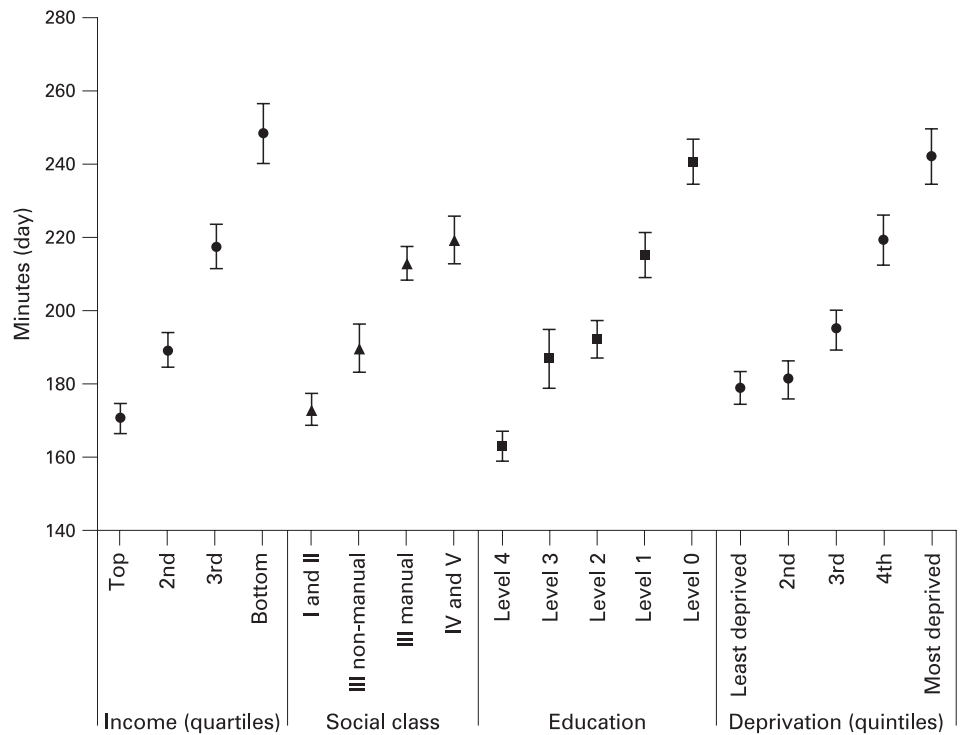
*Defined as ≥150 minutes of moderate to vigorous activity a week.

†Based on likelihood ratio x² tests.

‡Defined as reporting being not very active or not active at all at work and having an occupation that is inactive by nature.

§Based on univariable linear regression tests.

Figure 1 Age-standardised means and 95% confidence limits of daily time spent in television viewing and other screen-based entertainment. Adults aged 16 and over living in Scotland in 2003.



review³¹ concluded that sedentary time questions focusing on television and computer use may have the strongest reliability and validity among non-occupational sedentary behaviour questions. Although the SHS questions did not probe for each sedentary behaviour separately, television viewing and computer use most probably account for the overwhelming proportion of TVSE time reported in the present study. Finally, the study is cross-sectional preventing any conclusions about the causal nature of SEP on TVSE time.

Studies of SEP and sedentary behaviour are few and far between as the establishment of sitting time as a risk factor is in its infancy. Also, studies vary in how they assess and define sitting time, making comparison difficult. However, some aetiologic studies assessing the association between TV viewing

and various health outcomes, have reported descriptive statistics on SEP and TV viewing. They consistently concur with the findings of this study in that low household income, education and living in a deprived area are associated with greater time spent watching TV and screen-based entertainment.^{16 32 33}

In terms of the practical importance of the present results, it was found that when all covariables are taken into account, the differences between the lowest and the highest four SEP score groups is approximately an hour a day (51–64 minutes). For a 70 kg person the per day difference between sitting and strolling at 1.5–2 km/hr of body weight for an hour could be as high as 70–100 kcal (2000–3000 kcal per month).³⁴ Having, for example, obesity development in mind, this could be the equivalent of an extra 200–300 g of accumulated fat tissue. This is substantial, considering that the World Health Organization³⁵ specifically recommends approaches to augment non-exercise activity and thereby increase energy expenditure by ~200 kcal/day and there is evidence in support of such a recommendation.^{36 37} Further, it is not unlikely that an additional hour of sitting a day is linked with other adverse health consequences, such as augmentation of certain disturbances in the metabolism of lipids in the endothelium of the capillaries that are linked with sitting.³⁸ However, it is not possible at this stage to quantify the severity of these consequences and their impact on the risk for chronic disease development in the long term.

A possible explanation for the observed relationship between TVSE and social class is that those who spend most of their working day in manual tasks compensate by sitting more in leisure time. Previous reports have shown that occupational physical activity may moderate the relationship between SEP and physical activity.³⁹ Manual workers engaged in heavy physical activity at work may compensate by doing less physical activity in their leisure time.³⁹ A cross-sectional study of 1048 working adults in Australia assessing the mediating effect of sitting time on socioeconomic differences in rates of overweight and obesity, reported variations in the association between SEP

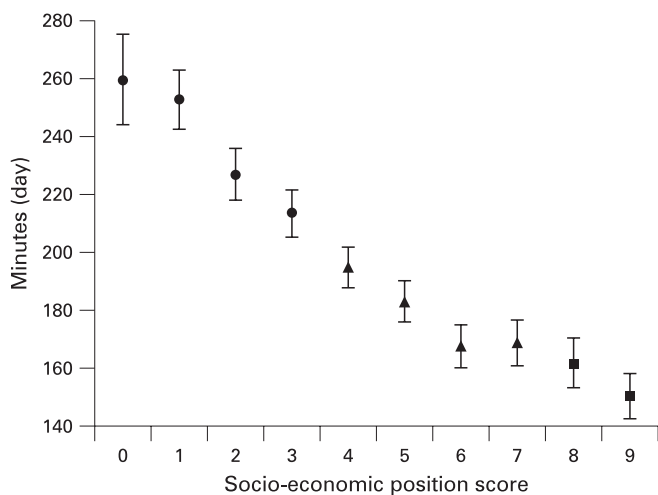


Figure 2 Age-standardised means and 95% confidence limits of daily time spent in television viewing and other screen-based entertainment by socioeconomic position score (0 = lowest position, 9 = highest position).

Table 2 Associations between time spent in TV and other screen-based entertainment with deprivation and multiple indicators of socioeconomic status

	Model 1*	Model 2*	Model 3*	Model 4*	Model 5*
	Coefficient§ (95% CI)	Coefficient§ (95% CI)	Coefficient§ (95% CI)	Coefficient§ (95% CI)	Coefficient§ (95% CI)
Income (N = 6865)†					
Top Quartile‡ (mean, 95% CI)	169 (163 to 175)	185 (179 to 192)	191 (185 to 198)	201 (194 to 207)	201 (195 to 207)
3rd	21.7 (13.1 to 30.2)	9.5 (0.8 to 18.1)	5.7 (-2.9 to 14.3)	2.3 (-6.2 to 10.7)	4.3 (-4.0 to 12.7)
2nd	51.9 (43.3 to 60.6)	28.7 (19.6 to 37.9)	20.9 (11.5 to 30.2)	5.5 (-3.8 to 14.8)	4.5 (-4.7 to 13.7)
Bottom Quartile	83.6 (74.9 to 92.4)	55.2 (45.5 to 64.8)	44.0 (34.0 to 54.0)	21.4 (11.3 to 31.6)	17.5 (7.4 to 27.6)
Trend p	<0.001	<0.001	<0.001	<0.001	0.002
Social Class (N = 7683)†					
I&II‡ (mean, 95% CI)	177 (171 to 183)	192 (186 to 198)	196 (190 to 202)	196 (190 to 202)	195 (189 to 200)
III Non-manual	21.3 (10.8 to 31.8)	8.7 (-1.7 to 19.1)	7.6 (-2.7 to 17.9)	9.6 (-0.5 to 19.6)	7.1 (-2.9 to 17.0)
III Manual	37.7 (30.3 to 45.1)	18.6 (10.9 to 26.2)	13.2 (5.6 to 20.8)	12.2 (4.8 to 19.6)	14.4 (7.1 to 21.8)
IV & V	47.6 (39.4 to 55.8)	22.9 (14.3 to 31.4)	16.4 (7.8 to 25.0)	14.7 (6.4 to 23.1)	17.1 (8.8 to 25.4)
Trend p	<0.001	<0.001	<0.001	0.001	<0.001
Education (N = 7972)†					
Level 4** ‡ (mean, 95% CI)	164 (158 to 170)	176 (170 to 183)	183 (177 to 190)	192 (185 to 198)	189 (183 to 196)
Level 3††	21.2 (8.7,33.6)	14.5 (2.1 to 27.0)	9.0 (-3.4 to 21.4)	5.9 (-6.1 to 17.8)	10.1 (-1.8 to 21.9)
Level 2‡‡	30.5 (21.4 to 39.6)	19.2 (9.9 to 28.5)	14.7 (5.4 to 24.0)	10.9 (1.9 to 19.9)	14.4 (5.5 to 23.4)
Level 1§§	54.1 (45.0 to 63.2)	37.9 (28.3 to 47.5)	30.1 (20.4 to 39.7)	21.9 (12.5 to 31.3)	25.1 (15.7 to 34.4)
Level 0¶¶	77.8 (69.7 to 86.0)	57.0 (48.0 to 66.0)	44.6 (35.4 to 53.8)	26.1 (17.0 to 35.2)	29.0 (20.0 to 38.0)
Trend p	<0.001	<0.001	<0.001	<0.001	<0.001
Deprivation (N = 7972)†					
Bottom (least deprived) quintile‡ (mean, 95% CI)	177 (171 to 184)	191 (185 to 197)	n/a	200 (194 to 207)	199 (193 to 205)
2nd	6.8 (-1.9 to 15.6)	-0.8 (-9.5 to 7.8)	n/a	-3.1 (-11.5 to 5.3)	-1.9 (-10.2 to 6.4)
3rd	21.1 (12.1 to 30.2)	6.4 (-2.7 to 15.4)	n/a	-2.0 (10.8 to 6.8)	1.4 (-7.4 to 10.1)
4th	50.0 (41.1 to 58.9)	31.2 (22.1 to 40.2)	n/a	16.4 (7.5 to 25.3)	19.3 (10.5 to 28.1)
Top quintile (Most Deprived)	73.4 (64.5 to 82.4)	46.5 (37.2 to 55.9)	n/a	22.3 (12.9 to 31.7)	23.3 (14.0 to 32.6)
Trend p	<0.001	<0.001		<0.001	<0.001

Coefficients refer to mean time (minutes/day) differences from the reference category. n/a, non-applicable for deprivation, model 3 adds adjustments for deprivation to the other SES indicator models.

*Model 1: adjusted for age and sex; model 2: further adjustments for other SES indicators; model 3: further adjustments for deprivation (Income, social class and education models); model 4: further adjustments for self-assessed general health, doctor-diagnosed diabetes and CVD, smoking, alcohol drinking, limited activity due to poor health, car ownership, and household cluster; model 5: further adjustments for occupational and non-occupational physical activity.

†Sample sizes in this table are weighted for non-response.

‡Referent group. The values correspond to minutes/day of TVSE.

§For example, a positive coefficient of 8.5 indicates that a specific category had a mean TVSE that is 8.5 minutes higher than the referent group.

**First degree, higher degree or professional qualification, eg teaching or accountancy.

††HNC, HND, SVQ Levels 4 or 5 or equivalent.

‡‡Higher grade, A level, GSVQ advanced or equivalent.

§§O grade, standard grade, GCSE.

¶¶Pre-school leaving qualification or below.

and sitting time according to the day of the week and the type of sitting.⁴⁰ Respondents living in deprived neighbourhoods and with low education spent less time sitting on weekdays, whereas low education was associated with more time spent sitting on weekend days. Also, a greater number of working hours per week was associated with more time spent sitting during week and weekend days but less time spent sitting during leisure, indicating desk-based occupations. The differences in weekday and weekend day sitting suggest that workers who spent most of their working day sitting compensated by sitting less in leisure time. However, other studies have not found evidence of compensatory behaviour. An Australian cross-sectional study found no difference in leisure-time physical activity by level of occupational sitting.³⁵ In a cross-sectional study of Dutch workers, sitting time at work varied considerably by type of occupation but not sitting during leisure time.⁴¹ In this study sitting time at work was not assessed although adjustment for occupational physical activity did not

remove the association between social class and TVSE time. In fact, 78% of men in Social Class III manual reported no or only light physical activity at work compared to 89% of men in Social Classes I and II (data not shown), suggesting few adults are engaged in heavy manual work demanding rest during leisure time.

It is possible that adults relying on lower incomes cannot afford to engage in recreational activities such as going to a gym/leisure centre or playing sports. In the UK, household expenditure on recreation and culture increases with each decile of household income.⁴² Households on lower incomes are also more likely to report money as a barrier to participation in physical activity.⁴³ It is also possible that low-income households spend what disposable income they have on screen-based entertainment in the home. However, data on family spending show that households in the lowest spending decile are far less likely to own a computer or satellite receiver than households in the top decile.⁴⁴ Low income households are less

Table 3 Associations between time spent in TV and other screen-based entertainment and aggregate socioeconomic position score

	Model 1*	Model 2*	Model 3*
	Coefficient† (95% CI)	Coefficient† (95% CI)	Coefficient† (95% CI)
Socioeconomic position score			
0 (lowest position)‡ (mean, 95% CI)	264 (253 to 276)	238 (227 to 250)	234 (223 to 246)
1	-9.4 (-23.6 to 4.7)	-4.6 (-18.4 to 9.2)	-0.2 (-13.9 to 13.4)
2	-34.0 (-48.0 to -19.9)	-20.5 (-34.3 to -6.7)	-14.9 (-28.6 to -1.2)
3	-49.7 (-64.0 to -35.5)	-28.1 (-42.2 to -14.0)	-21.6 (-35.7 to -7.6)
4	-66.0 (-80.5 to -51.4)	-34.5 (-49.0 to -20.0)	-30.1 (-44.5 to -15.7)
5	-76.2 (-91.4 to -61.0)	-41.6 (-56.8 to -26.3)	-35.5 (-50.6 to -20.3)
6	-94.3 (-109.9 to -78.7)	-53.3 (-69.0 to -37.7)	-50.6 (-66.2 to -35.1)
7	-97.8 (-113.9 to -81.6)	-56.2 (-72.5 to -40.0)	-53.7 (-69.8 to -37.6)
8	-103.3 (-120.8 to -85.8)	-59.6 (-77.1 to -42.0)	-58.7 (-76.0 to -41.3)
9 (highest position)	-112.1 (-128.2 to -95.9)	-64.8 (-81.1 to -48.4)	-64.4 (-80.6 to -48.1)
Trend p	<0.001	<0.001	<0.001
R ² Change	0.068	0.018	0.020

*Model 1: adjusted for age and sex; model 2: further adjustments for self-reported general health, doctor-diagnosed diabetes and CVD, smoking, alcohol drinking, limited activity due to poor health, car ownership and household cluster; model 3: further adjustments for occupational and non-occupational physical activity.

†Coefficients indicate mean screen entertainment time differences between the reference category and each category of the socioeconomic position score, eg a negative value of -45.5 indicates that a specific category had a mean time that is 45.5 minutes lower than the referent group

‡Referent group. The values correspond to minutes/day of TVSE

likely to own a car that would allow them to travel to destinations that might encourage physical activity. That said, adjustment for car ownership did not significantly alter the present observations.

Attributes of residential neighbourhoods may reduce the likelihood of spending time outside in recreational pursuits. Physical activity facilities (eg leisure centres, gyms, swimming pools) are fewer in poorer neighbourhoods reducing opportunities for some forms of physical activity.^{45 46} Ironically, low-income households appear to have greater access to unaffordable private sector gyms.⁴⁶ It is not always true that more deprived neighbourhoods have less access to physical activity promoting resources. A study in Scotland has shown that people living in deprived neighbourhoods have better access to public green space and children's play areas than people living in more affluent neighbourhoods.⁴⁷ It may be that access to facilities is mediated by concerns about personal safety. Perceptions of neighbourhood safety may also discourage spending time outside the home. Concerns about personal safety are frequently associated with low levels of physical activity and concerns about personal safety are greater in lower SEP groups.⁴⁸ Furthermore, at least in women, there is evidence that time spent TV viewing is more valued in low SEP women compared to high SEP women.⁴⁹

The results of this study show that the hours spent in TVSE each day increase cumulatively with each indicator of low SEP. The cumulative effect of multiple indicators of SEP has also been reported for physical activity levels in older women. It indicates that there are multiple pathways through which SEP impacts on sedentary behaviours such as sitting.

Sitting time, independent of physical activity, appears to be an important risk factor for metabolic and cardiovascular disease and adults in poorer socioeconomic circumstances experience greater exposure to sitting than adults in more affluent circumstances. Therefore, reducing inequalities would be expected to reduce the time spent sitting in adults at risk of chronic disease. In order to develop appropriate public health strategies and programmes, further research is required to understand why men and women in poorer socioeconomic circumstances spend a greater proportion of time each day watching TV and other screen-based entertainment compared to more affluent adults.

What is already known on this subject

- ▶ Television and other screen-based entertainment is a key indicator of sitting behaviour.
- ▶ Sitting behaviour is an independent predictor of adverse health outcomes.
- ▶ Although physical activity and exercise show a strong direct socioeconomic gradient, little is known about the socioeconomic distribution of sitting behaviours.

What this study adds

- ▶ Time spent in screen-based entertainment shows a very strong inverse gradient with income, social class, education and a direct gradient with area deprivation.
- ▶ Reducing socioeconomic inequalities in these behaviours may reduce health inequalities.

Conclusion

Adults living in deprived neighbourhoods report more hours per day of TV viewing and other screen-based entertainment independent of their personal socioeconomic circumstances. Similarly, adults with poorer personal socioeconomic circumstances, independent of how deprived their neighbourhood is, spend more time each watching screen-based entertainment. Sedentary behaviours in addition to physical activity are important risk factors for chronic disease including obesity and therefore reducing inequalities in these behaviours is required to reduce health inequalities.

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