RISKY HEALTH BEHAVIOURS AND SOCIOECONOMIC INEQUALITIES IN EUROPEAN COUNTRIES: NEW INSIGHTS FROM EUROPEAN SOCIAL SURVEY

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SUMMARY

Objectives: This paper explores education-, income- and occupational class-related inequalities in risky health behaviours including into models all three factors together as well as their interactions, which has not been undertaken by previous studies analysing socioeconomic status (SES) related differences in risky health behaviours.

Methods: Our data source is the special module "Social Inequalities in Health" included into the European Social Survey Round 7 (ESS R7) and conducted in 20 European countries. We run nine separate multilevel binomial logistic regression analyses for all the risky health behaviours with all our independent and control variables including country as the second level random intercept. Into all the models we also included interaction terms to consider possible moderating effects of separate independent variables.

Results: Education and income emerged as factors most consistently related to risky health behaviours, but occupational class differences were also found to be significant: eating vegetables or salad less than once a day and being daily smoker is positively related to lower SES as measured by all three indicators; eating fruits less than once a day is related to lower income and occupational class, while drinking alcohol at least several times a week is positively related to higher education and higher income; being physically active for less than 3 days per week is positively related to lower education; patterns of heavy smoking and binge drinking are inconsistently related to SES variables. We also found considerable regional variation, especially in fruit and vegetable consumption, being physically active and alcohol consumption patterns.

Conclusions: Without careful theoretical consideration linking SES and risky health behaviours, education, income and occupational class cannot substitute each other in the study of SES-related differences of health behaviours, as assumed in the larger part of research on the subject.

Key words: risky health behaviours, socioeconomic inequalities, education, income, occupational class, European social survey round 7

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INTRODUCTION

In the last two decades studies of social inequalities in health have become one of the dominant research trends in social epidemiology and public health studies (1). Researchers focus their attention on differential outcomes of objective and subjective health indicators for different socioeconomic groups. Among the most studied topics are differences of self-rated health and mortality along the lines of socioeconomic positions usually identified by income, education or occupational class (2–7). Various individual level, macro (country/region) level and multi-level models are employed in order to display how socioeconomic structures differentiate health outcomes for individuals and larger populations (3, 4, 6, 8–11). The results of these studies may be summarized by Phelan et al.: "Socioeconomic inequalities in health and mortality are very large, very robust, and very well documented" (12). Moreover, these authors assert that social conditions and socioeconomic status (SES) are the fundamental social causes of health inequalities (13), as they continue to be related to health outcomes and mortality at least since the early nineteenth century.

This association persists in spite of the fact that previously important factors for social health inequalities – infectious diseases, tuberculosis and other health risks clearly related to low SES – have been almost eliminated in the developed world. It appeared that new major causes of mortality and health outcomes (non-communicable diseases such as cancers, heart and cardiovascular illnesses, diabetes, etc.) are related to other types of risk factors such as poor and unbalanced diet, low physical activity, inadequate sleep duration, smoking, alcohol consumption, use of illegal substances, etc. Moreover, it was established that these risky health behaviours are related to psychological, demographic, socioeconomic, cultural, and other factors in their own right (14).

However, most of the empirical studies related to SES and risky health behaviours are either limited to only a very few selected countries, focus on a single risky health behaviour (e.g. smoking) or take into consideration only single socioeconomic determinant: education, income or occupational class. Importantly, we join researchers who argue that even if education, income and social class are closely associated empirically, they refer to different types of socioeconomic resources, making their association with risky health behaviours and, consequently, health outcomes distinctive (14–18).

The main aim of this paper is to identify distinctive patterns of association between education, income, and social class, on the one hand, and risky health behaviours, on the other. We include four dimensions of risky health behaviours: diet (lack of fruit and vegetable consumption), physical exercise (lack of physical activity), smoking (frequency and extent of cigarette smoking), and alcohol consumption (frequency of drinking and binge drinking). Additionally, we attempt to answer this question analysing the larger part of populations of European societies around 2014–15, using data from the European Social Survey Round 7 special module "Social Inequalities in Health", which was devised to provide more encompassing, cross-country comparable and up-to-date data for researchers interested in the social determinants of health outcomes and behaviours. Thus, we also use this unique source of data to explore regional differences in risky health behaviours.

Although this data is already intensively used*, we did not find recent contributions on our research question, with partial exception of Huijts et al. (18), who limited their aims to exploration of the raw impact of education (no control for income and occupational class) and did not take into consideration interactions between SES variables and cross-country variation in the pooled sample analysis. Thus, we extend their analysis by adding income and occupational class variables (as well as interactions between separate SES variables) and running hierarchical regression models for pooled sample analysis. Finally, we attempt to check robustness of our results by running separate models for differently defined samples (with regard to age) and differently coded (transformed) dependent variables (which required, also, different regression modelling choices).

MATERIALS AND METHODS

ESS Round 7 survey, which is our main data source (we used edition 2.2 dataset)** covered the following 20 countries that released data including indicators relevant for our analysis: Austria, Belgium, Switzerland, the Czech Republic, Germany, Denmark, Spain, Finland, France, the United Kingdom, Hungary, Ireland, Israel, Lithuania, the Netherlands, Norway, Poland, Portugal, Sweden, and Slovenia (Appendix A). We analyse 7 (dependent) variables that reflect risky health behaviours (however, we used different types of categorisation for all of them, which increased substantially the number of analyses performed and dependent variables employed): (in)frequency of eating fruits and vegetables, days of being physically (in)active during the week, cigarette smoking behaviour and number of cigarettes smoked on a typical day, frequency of alcohol drinking, as well as frequency of binge drinking. For our main type of analysis all original answer scales of the variables were dichotomized in order to improve interpretability of findings. Also, to ensure comparability of our findings with those of Huijts et al. (18), we applied similar thresholds for the dependent variables.

How often eat fruits, excluding drinking juice: we distinguish between respondents who consumed fruits at least once a day and respondents who consumed fruits less frequently (risky health behaviour).

How often eat vegetables or salad, excluding potatoes: dichotomization the same as for fruit eating.

How many of the last 7 days walked quickly, did sports or other physical activity 30 minutes or longer: we distinguish between respondents who were physically active on 3 or more days over the last week and those who engaged in this kind of physical activities on 0–2 days (risky health behaviour).

Cigarettes smoking behaviour: we distinguish between respondents who smoke daily (risky health behaviour) and those who are occasional smokers (smoke but not every day or only smoked a few times), former smokers or non-smokers.

How many cigarettes smoke on typical day: we distinguish between respondents who are heavy smokers (smoke 20 or more cigarettes a day; risky health behaviour) and the remaining respondents (including non-smokers). Also, we constructed another variable that excludes former smokers and non-smokers (thus, in this case cigarette smoking behaviour is only compared among current smokers).

In the last 12 months, how often drank alcohol: we distinguish between respondents who drink alcohol at least several times a week (risky health behaviour) and the remaining respondents.

Frequency of binge drinking in the last 12 months (binge drinking defined as 64 grams or more of alcohol for males and 48 grams or more of alcohol for females on a single occasion): we distinguish between respondents who reported binge drinking at least weekly (risky health behaviour) and respondents who reported less frequent binge drinking. Also, we constructed another variable that excludes non-drinking population (thus, in this case frequency of binge drinking is only compared among people who reported drinking alcohol in the last 12 months).

Operationalising indicators of SES, three levels of education were identified according to the ESS Round 7 variable measuring the highest achieved education level classified according to the ISCED standard modified by the ESS Core Scientific Team:

- Low level: ES-ISCED I, ES-ISCED II (base category in all the regression models);
- Middle level: ES-ISCED IIIa, ES-ISCED IIIb; ES-ISCED IV;
- High level: ES-ISCED V1, ES-ISCED V2.

Income in ESS is measured as a country specific variable of deciles of household's total net income (weekly, monthly or annual) from all sources. This conceptualization allows for international comparisons where relative income deciles may be used instead of raw income measures that need standardization in order to account for differing price levels in separate countries (thus, due to deficiency of data collection for this variable Estonian sample was excluded from our analysis).

For the investigation of the occupational class-related differences in risky health behaviours we used the cross-nationally comparable European Socioeconomic Classification (ESeC). This is the most recent elaboration (19) of the Neo-Weberian class theory developed by Robert Erikson, John Goldthorpe and Lucienne Portocarero (in short, EGP theory) (20, 21). We used a transformed (simplified) scale of 5 classes derived from the

*https://www.europeansocialsurvey.org/findings/bibliography.html
**www.europeansocialsurvey.org/data/download.html?r=7

original ESeC scheme, following the recommendations of the designers of this scheme (19 : 21). So, our class scheme includes:
- I+II: salariat (base category in all the regression models);
- III+VI: intermediate employees;
- IV+V: small employers and self-employed;
- VII: lower sales and service employees;
- VIII+IX lower technical and routine employees (manual workers).

We included gender and age control variables (22–24) and confined our main sample to 25 years and older persons, because in most of our countries larger majority of younger adults are still students at higher schools or draftees in military service. In this way, we minimized the number of respondents with "incomplete" socioeconomic positions. To enhance the comparability of our findings with Huijts et al. (18) and other studies using ESS data, we also excluded respondents aged above 75.

We also included regional variable as a control for cross-country variation in risky health behaviours. We divided ESS Round 7 countries into 5 groups: Anglo-Saxon countries (the United Kingdom and Ireland), Central (continental) European countries (Austria, Belgium, Switzerland, Germany, France, the Netherlands), Eastern European countries (the Czech Republic, Hungary, Lithuania, Poland, Slovenia), Nordic countries (Denmark, Finland, Norway, Sweden) and Southern Europe (Spain, Portugal and Israel).

In terms of analysis, we first run 9 separate multilevel binomial logistic regression analyses (weighted by population, post-stratification and design weights***), for all the risky health behaviours with all our independent and control variables including country as the second level random intercept. All analyses were performed using functions *melogit* (binomial models), *meglm* (linear models) and *meologit* (ordinal models) combined with *svy* prefix (used for inclusion of complex sample parameters) available in the Stata statistical analysis software (version 15.1). Into all the models we included interaction terms between education and income, between education and occupational class, and between income and educational class to consider possible moderating effects of separate independent variables. Also, to take into account non-linear relationships between age and our risky health behaviour indicators, we included a squared term of age as control variable.

In order to test the consistency of statistical significance and direction of the results of our analyses with the main sample (restricted to people aged 25–75) and the dichotomized dependent variables we also performed sensitivity analyses with different samples: sample restricted to people aged 25+; and the full sample. Additionally, we employed different categorisation schemes for dependent variables and modelled data using the corresponding types of regression analysis (categorization information in Appendix C).

RESULTS

We present findings of our analyses separately for each main independent variable: education, household income, and occupational status. We also shortly describe regional differences. Our presentation also includes discussion of different models, samples and differently coded dependent variables that are included into Appendix C. Region specific average predicted probabilities of risky health behaviours related to separate independent variables are reported in Appendix B.

Education and Risky Health Behaviours

According to the results of our analyses, education differentiates risky health behaviours most consistently. Differences are directionally constant and statistically significant across samples and differently coded dependent variables in cases of frequency of eating vegetables and salad, days being physically active per week, cigarette smoking behaviour, and frequency of drinking alcohol (Tables in Appendix C). In the surveyed European countries, mean probability of consuming vegetables or salad once or more times a day for people with tertiary education is 0.796 (95% CI: 0.685–0.907) and 0.693 (95% CI: 0.658–0.728) for people with lower secondary (or lower level of) education (Table 1). Mean probability of being physically active for 3 or more days per week is 0.585 (95% CI: 0.410–0.760) for people with tertiary education and 0.490 (95% CI: 0.042–0.938) for people with lower secondary (or lower level of) education (Table 1). Further, mean probability of being daily smoker (compared to those not ever smoking or those who quit smoking) is 0.147 (95% CI: 0.093–0.201) for people with tertiary education and 0.296 (95% CI: 0.210–0.382) for people with lower secondary (or lower level of) education (Table 2). Finally, mean probability of drinking alcohol at least several times a week is 0.311 (95% CI: 0.231–0.392) for people with tertiary education and 0.264 (95% CI: 0.220–0.309) for people with lower secondary (or lower level of) education (Table 3).

In the remaining cases – frequency of eating fruits, cigarettes smoked on a typical day, and frequency of binge drinking (Tables C1, C5 and C7 in Appendix C) – results depend on either sample, modelling approach or coding of the dependent variable. In the full sample or the one including only people aged 25+, higher frequency of eating fruits is related to higher education (especially, in the binomial case differentiating persons eating fruits once or more times a day from the rest). However, if older people (75+) are excluded the difference becomes insignificant. Also, results of ordinal and linear regressions (that include more complete variation of the dependent variable) do not provide support for the difference hypothesis. Thus, education seems to be relevant for fruit eating behaviour among elderly population and only when it is related to quite frequent vs. very infrequent consumption.

Educational differences regarding cigarettes smoked on a typical day are not consistent, too. They seem to depend on the sample, coding of the dependent variable and modelling approach. Differentiation of the respondents into two groups – heavy smokers (smoking a pack of cigarettes a day or more) vs. rest (including or excluding those that do not smoke at all or quit smoking) – is not related to educational inequalities. However, differentiation into four groups – never smoked, quit smoking, smoke 1–10, and smoke more than 10 cigarettes a day – is related to educational inequalities: people having lower education are prone to smoke more (the results are similar if cigarettes smoked a day are not

***www.europeansocialsurvey.org/docs/methodology/ESS_weighting_data_1.pdf

categorized and linear model applied). All in all, higher education is related to lower extent of smoking cigarettes (or not smoking altogether). We note here that these results contradict to some findings of Huijts et al. (18), as we did not find statistically significant educational differences when analysing binomial dependent variable across different samples: people smoking a pack or more cigarettes vs. the rest of smokers (excluding non-smokers).

Finally, level of education is not related to frequency of binge drinking across samples and other conditions (modelling and dependent variable coding) when only drinking people are considered. However, when not drinking people are included the relationship becomes significant and positive.

Household Income and Risky Health Behaviours

Results show that household income is related to different levels of risky health behaviours. Differences are directionally constant and statistically significant across samples and differently coded dependent variables in cases of frequency of eating fruits and vegetables (salad), cigarette smoking behaviour and frequency of drinking alcohol (Tables in Appendix C). In the surveyed European countries, mean probability of eating fruits once or more times a day for people with household income in the lowest decile is 0.649 (95% CI: 0.587–0.710) and 0.725 (95% CI: 0.692–0.758) for people with household income in the highest decile (Table 1). Mean probability of consuming vegetables or salad once or more times a day for people with household income in the lowest decile is 0.675 (95% CI: 0.619–0.731) and 0.783 (95% CI: 0.725–0.841) for people with household income in the highest decile (Table 1).

Further, mean probability of being daily smoker (compared to those not ever smoking or those who quit smoking) is 0.165 (95% CI: 0.051–0.279) for people with household income in the highest decile and 0.333 (95% CI: 0.153–0.512) for people with

Table 1. *Inequalities in eating fruits, vegetables and being physically active according to socioeconomic status and region*

	Eating fruits: once or more times a day			Eating vegetables: once or more times a day			Being physically active: 3–7 days a week		
	APP	95% CI		APP	95% CI		APP	95% CI	
Education									
Low	0.658	0.436	0.880	0.693	0.658	0.728	0.490	0.042	0.938
Middle	0.683	0.623	0.743	0.730	0.647	0.814	0.537	0.250	0.825
High	0.734	0.696	0.772	0.796	0.685	0.907	0.585	0.410	0.760
Total household income									
1st decile	0.649	0.587	0.710	0.675	0.619	0.731	0.542	0.457	0.627
2nd decile	0.658	0.604	0.711	0.689	0.637	0.740	0.541	0.410	0.672
3rd decile	0.667	0.620	0.713	0.701	0.653	0.750	0.540	0.358	0.722
4th decile	0.675	0.635	0.715	0.714	0.668	0.760	0.539	0.304	0.774
5th decile	0.684	0.650	0.718	0.726	0.681	0.772	0.539	0.249	0.828
6th decile	0.692	0.662	0.722	0.738	0.692	0.785	0.538	0.194	0.882
7th decile	0.701	0.673	0.728	0.750	0.702	0.798	0.537	0.137	0.936
8th decile	0.709	0.681	0.736	0.761	0.710	0.812	0.536	0.081	0.991
9th decile	0.717	0.687	0.746	0.772	0.718	0.827	0.535	0.024	1.045
10th decile	0.725	0.692	0.758	0.783	0.725	0.841	0.534	−0.033	1.100
European socioeconomic classification									
I+II: salariat	0.704	0.656	0.751	0.757	0.657	0.856	0.543	0.246	0.840
III+VI: intermediate employees	0.688	0.632	0.744	0.745	0.656	0.834	0.542	0.428	0.656
IV+V: small employers and self-employed	0.707	0.509	0.904	0.769	0.665	0.873	0.558	0.430	0.686
VII: lower sales and service	0.677	0.569	0.784	0.690	0.576	0.804	0.518	0.156	0.880
VIII+IX: lower technical and routine	0.664	0.564	0.763	0.701	0.602	0.801	0.521	−0.142	1.185
Country groups									
Anglo-Saxon countries	0.733	0.702	0.764	0.806	0.764	0.847	0.627	0.548	0.706
Central/continental Europe	0.677	0.646	0.708	0.745	0.665	0.824	0.545	−0.118	1.208
Eastern Europe	0.588	0.459	0.717	0.617	0.506	0.728	0.462	0.376	0.548
Nordic countries	0.670	0.648	0.693	0.741	0.722	0.761	0.591	0.565	0.618
Southern Europe	0.783	0.755	0.810	0.728	0.559	0.897	0.413	0.230	0.597

Source: European Social Survey Round 7 Data (25).
APP – average predicted probabilities; 95% CI – 95% confidence interval for APPs. APPs and their confidence intervals are derived from the results of multilevel binomial logistic regression analyses adjusted for gender, age and age squared; sample is restricted to respondents aged 25–75 (for more detailed information on sample sizes and statistical significance of results see columns E in Tables C1, C2 and C3 in Appendix C).

Table 2. *Inequalities in smoking behaviour according to socioeconomic status and region*

	Smoking daily			Heavy smoking: ≥ 20 cigarettes per day			Heavy smoking: ≥ 20 cigarettes per day (from smokers)		
	APP	95% CI		APP	95% CI		APP	95% CI	
Education									
Low	0.296	0.210	0.382	0.122	0.085	0.160	0.381	0.360	0.402
Middle	0.253	0.224	0.283	0.093	0.018	0.168	0.327	0.308	0.346
High	0.147	0.093	0.201	0.051	0.011	0.091	0.270	0.253	0.287
Total household income									
1st decile	0.333	0.153	0.512	0.121	0.101	0.141	0.334	0.313	0.355
2nd decile	0.310	0.172	0.448	0.114	0.097	0.130	0.335	0.315	0.356
3rd decile	0.289	0.190	0.388	0.107	0.079	0.135	0.337	0.316	0.357
4th decile	0.268	0.204	0.333	0.101	0.059	0.143	0.338	0.317	0.358
5th decile	0.249	0.211	0.286	0.095	0.040	0.149	0.339	0.319	0.359
6th decile	0.230	0.196	0.264	0.089	0.024	0.154	0.340	0.320	0.361
7th decile	0.212	0.160	0.264	0.083	0.009	0.158	0.342	0.321	0.362
8th decile	0.195	0.121	0.270	0.078	−0.003	0.160	0.343	0.323	0.363
9th decile	0.180	0.084	0.275	0.073	−0.014	0.160	0.344	0.324	0.365
10th decile	0.165	0.051	0.279	0.069	−0.022	0.160	0.346	0.325	0.366
European socioeconomic classification									
I+II: salariat	0.226	0.189	0.262	0.070	−0.023	0.162	0.258	0.235	0.281
III+VI: intermediate employees	0.247	0.019	0.476	0.102	−0.074	0.277	0.361	0.342	0.381
IV+V: small employers and self-employed	0.229	0.073	0.385	0.087	0.035	0.139	0.319	0.300	0.338
VII: lower sales and service	0.225	0.133	0.317	0.087	0.021	0.153	0.330	0.310	0.350
VIII+IX: lower technical and routine	0.264	0.035	0.494	0.115	−0.124	0.353	0.393	0.373	0.412
Country groups									
Anglo-Saxon countries	0.185	0.156	0.215	0.065	0.051	0.079	0.297	0.286	0.308
Central/continental Europe	0.257	0.239	0.275	0.103	0.026	0.181	0.355	0.342	0.367
Eastern Europe	0.269	0.195	0.342	0.110	0.019	0.201	0.343	0.331	0.355
Nordic countries	0.175	0.162	0.189	0.061	0.040	0.081	0.257	0.247	0.268
Southern Europe	0.247	0.223	0.271	0.093	0.047	0.139	0.354	0.342	0.366

Source: European Social Survey Round 7 Data (25)
APP – average predicted probabilities; 95% CI – 95% confidence interval for APPs. APPs and their confidence intervals are derived from the results of multilevel binomial logistic regression analyses adjusted for gender, age and age squared; sample is restricted to respondents aged 25–75 (for more detailed information on sample sizes and statistical significance of results see column E in Table C4 and columns E and F in Table C5 in Appendix C).

household income in the lowest decile (Table 2). Finally, mean probability of drinking alcohol at least several times a week is 0.350 (95% CI: 0.290–0.410) for people with household income in the highest decile and 0.214 (95% CI: 0.175–0.253) for people with household income in the lowest decile (Table 3). Thus, higher incomes in the surveyed European countries are related to healthier diets (eating more fruits, vegetables and salad) and healthier smoking behaviour. However, higher household incomes are also related to higher frequency of drinking alcohol. This finding is consistent with results of other studies on income inequalities of alcohol consumption (26).

With regard to other risky health behaviours – days being physically active per week, cigarettes smoked on a typical day and frequency of binge drinking (Tables C3, C5 and C7 in Appendix C) – results depend on either sample, modelling approach or coding of the dependent variable. Coding of the dependent variable has effect on the relationship between household income and days being physically active per week. Relationship is insignificant when physical activity is coded binomially: being physically active 3 or more times per week vs. less times per week. However, categorized into 4 ordinal groups (0 day, 1–2 days, 3–5 days, 6–7 days) this type of risky health behaviour becomes related to income differences: people with higher incomes seem to be more physically active than people with lower incomes. All in all, household income seems to be relevant for days being physically active per week. Furthermore, significant interaction between household income and education reveals that income-related differences of being physically active are higher for persons with low education. This finding is consistent across samples and different coding of the dependent variable.

Relationship of household income to cigarettes smoked on a typical day are also not consistent. They seem to depend on the sample, coding of the dependent variable and modelling approach. The patterns are almost exactly the same as for the relationship between education and cigarettes smoked per day. First, differentiation of the respondents into two groups – heavy smokers (smoking a pack of cigarettes a day or more) vs. rest (including or excluding those that do not smoke at all or quit smoking) – is not related to income inequalities. Second, categorization of cigarettes smoked a day into four groups or non-categorized version of this dependent variable reveals relationship with income inequalities: people having lower income are prone to smoke more. Thus, higher household income might be considered to be related with lower extent of smoking cigarettes (or not smoking at all).

Similarly, to the case of relationship between education and frequency of binge drinking, household income is not related to frequency of binge drinking across samples and other conditions (modelling and dependent variable coding) when only alcohol drinking people are taken into consideration. However, when not drinking people are included the relationship in almost all cases becomes significant and positive. Again, analysis of choices related to dependent variable coding have important influence on the relationship between household income levels and binge drinking frequency.

Occupational Class and Risky Health Behaviours

Relationship between occupational class and risky health behaviours is consistently significant with regard to eating fruits, vegetables and salad as well as cigarette smoking behaviour (Tables in Appendix C). In the surveyed European countries, mean probability of eating fruits once or more times a day for lower technical and routine occupational class (VIII+IX) is 0.664 (95% CI: 0.564–0.763) and 0.704 (95% CI: 0.656–0.751) for the salariat

Table 3. *Inequalities in alcohol consumption according to socioeconomic status and region*

	Drinking alcohol: at least several times a week			Binge drinking: at least weekly			Binge drinking: at least weekly (from drinkers)		
	APP	95% CI		APP	95% CI		APP	95% CI	
Education									
Low	0.264	0.220	0.309	0.149	−0.083	0.380	0.189	0.127	0.251
Middle	0.280	0.179	0.382	0.153	0.003	0.303	0.186	0.116	0.256
High	0.311	0.231	0.392	0.118	0.026	0.210	0.147	0.103	0.191
Total household income									
1st decile	0.214	0.175	0.253	0.135	0.088	0.182	0.185	0.131	0.239
2nd decile	0.227	0.187	0.267	0.137	0.097	0.177	0.184	0.128	0.239
3rd decile	0.241	0.199	0.283	0.139	0.080	0.198	0.182	0.125	0.239
4th decile	0.255	0.211	0.298	0.141	0.051	0.231	0.181	0.122	0.239
5th decile	0.270	0.224	0.315	0.143	0.018	0.268	0.179	0.119	0.239
6th decile	0.285	0.237	0.332	0.145	−0.017	0.307	0.178	0.116	0.240
7th decile	0.300	0.250	0.350	0.147	−0.053	0.347	0.177	0.113	0.241
8th decile	0.316	0.263	0.369	0.149	−0.090	0.388	0.176	0.110	0.242
9th decile	0.333	0.276	0.389	0.152	−0.128	0.431	0.175	0.107	0.243
10th decile	0.350	0.290	0.410	0.154	−0.166	0.474	0.174	0.104	0.244
European socioeconomic classification									
I+II: salariat	0.287	0.183	0.392	0.141	−0.056	0.338	0.171	0.114	0.228
III+VI: intermediate employees	0.283	0.199	0.367	0.147	0.072	0.222	0.181	0.114	0.247
IV+V: small employers and self-employed	0.336	0.067	0.606	0.173	0.060	0.286	0.213	0.110	0.317
VII: lower sales and service	0.250	0.117	0.383	0.128	−0.104	0.360	0.163	0.124	0.202
VIII+IX: lower technical and routine	0.256	0.099	0.413	0.137	0.055	0.220	0.175	0.116	0.234
Country groups									
Anglo-Saxon countries	0.284	0.191	0.378	0.315	0.283	0.347	0.384	0.339	0.429
Central/continental Europe	0.338	0.286	0.389	0.117	−0.145	0.379	0.141	0.130	0.152
Eastern Europe	0.167	0.131	0.202	0.110	0.097	0.123	0.142	0.117	0.166
Nordic countries	0.207	0.188	0.225	0.158	0.119	0.198	0.178	0.159	0.196
Southern Europe	0.246	0.099	0.393	0.097	0.072	0.122	0.144	0.065	0.223

Source: European Social Survey Round 7 Data (25)

APP – average predicted probabilities; 95% CI – 95% confidence interval for APPs. APPs and their confidence intervals are derived from the results of multilevel binomial logistic regression analyses adjusted for gender, age and age squared; sample is restricted to respondents aged 25–75 (for more detailed information on sample sizes and statistical significance of results see column E in Table C6 and columns E and F in Table C7 in Appendix C).

class (I+II) (Table 1). Similarly, mean probability of consuming vegetables or salad once or more times a day for lower technical and routine occupational class (VIII+IX) is 0.701 (95% CI: 0.602–0.801) and 0.757 (95% CI: 0.856–0.657) for the salariat class (I+II) (Table 1). Differences of fruit and vegetable consumption between the salariat class (I+II) and lower sales and service class (VII) are inconsistent across samples. It is only consistently significant in the full sample, which means that these differences are somewhat higher among the youngest and the oldest people.

Further, relationship between physical activity and occupational class is only consistently significant in the samples that include people older than 75 years (Table C3 in Appendix C). Representatives of lower technical and routine occupational class (VIII+IX) as well as of lower sales and service class (VII) are physically active fewer days per week than the salariat class (I+II). Thus, it seems that exclusion of the youngest and the oldest people from the sample eliminates occupational class differences of being physically active.

Inspecting relationship between cigarettes smoking behaviour and occupational class we see only one consistent and significant relationship (Table C4 in Appendix C). The class of small employers and self-employed (IV+V) is less likely to smoke daily than representatives of the salariat class (I+II). At the same time, relationship between occupational class and the number of cigarettes smoked daily is much more complex. First, it is clear that this relationship depends on the coding of the dependent variable (Table C5 in Appendix C). Differentiation of the respondents into two groups – heavy smokers (smoking a pack of cigarettes a day or more) vs. rest (including or excluding those that do not smoke at all or quit smoking) – is strongly related to occupational class inequalities. Compared to other classes (with a partial exception of intermediate employees (III+VI) class), representatives of the salariat class (I+II) are less prone to be heavy smokers. This difference is even stronger among the smokers (that is if only people who smoke are analysed): mean probability of smoking a pack of cigarettes a day or more (vs. smoking less cigarettes) for the salariat class (I+II) is 0.258 (95% CI: 0.235–0.281) while for all the other classes it is equal to or higher than 0.300 (Table 2). Also, if only smokers are considered, independent variable categorisation and coding does not have influence on the relationship – it stays rather consistent and significant in all the analysed alternative cases. However, if non-smokers are included dependent variable coding exerts considerable influence on the results of analysis. In some cases, directionally contradictory results are obtained. These finding indicate that conceptual and operational definitions of heavy smoking have to be considered with great care as results depend on these definitions quite heavily.

Importantly, we can also observe that interaction of occupational class and education exerts influence on the occupational class differences of heavy smoking. This finding is consistent across samples and modelling approaches, however, only for those smoking. It can be seen that occupational class difference in being heavy smoker (smoking a pack of cigarettes a day or more) vs. smoking less cigarettes (and excluding non-smokers) is smaller for higher educated representatives of the lower sales and service class (VII), if compared to the salariat class (I+II) (Table C5 in Appendix C). Also, occupational class difference between smoking a pack of cigarettes a day or more and smoking less cigarettes among people with upper secondary or advanced vocational education (compared to people with lower education) is smaller for representatives of the small employers and self-employed class (IV+V), when compared to the salariat class (I+II).

Finally, we could not establish any coherent pattern of occupational class differences in alcohol consumption (Tables C6 and C7 in Appendix C). However, it seems that at least frequency of drinking alcohol when this variable is not dichotomized into frequent drinkers (drinking alcohol at least several times a week) and infrequent drinkers or abstainers is related to occupational class: representatives of the lower sales and service class (VII) are less prone to drink alcohol more frequently than representatives of the salariat class (I+II).

Risky Health Behaviours in Different Regions of Europe

With regard to regional differences in risky health behaviours we see that relationship is most consistent in cases of fruit and vegetable consumption, being more physically active, as well as alcohol consumption (Tables of Appendix C). Compared to Southern European countries, people in Central (continental) and Eastern Europe as well as in Nordic countries are less likely to consume fruits once or more times a day. People in Anglo-Saxon countries consume more vegetables (salad) compared to Eastern European and Nordic countries (also, less consistently compared to Central European countries). People in Anglo-Saxon countries are most physically active together with representatives of Nordic and Central (continental) European countries. Less physically active are people in Southern and Eastern Europe. Regional differences in alcohol consumption are also quite consistent (Tables C6 and C7 in Appendix C). People in Eastern Europe (and to a less consistent extent in Nordic countries) are less likely to drink alcohol at least several times a week compared to Central (continental) European countries. However, the largest comparative share of binge drinkers resides in the Anglo-Saxon countries (compared to residents of all other analysed regions). With regard to regional differences in cigarettes smoking behaviour results are rather inconsistent.

DISCUSSION

Results of our analysis most consistently confirm that higher SES is related to healthier diet. Eating vegetables and salad less frequently is related to both lower education, lower income and lower occupational status. However, less frequent eating of fruits is only related to lower income and occupational class. Thus, different mechanisms behind health-related behaviour may be relevant even with regard to quite similar instances of them. Relationship between SES and less frequent physical activity was confirmed with regard to only one indicator, that of education. Thus, in this case it seems that cognitive mechanisms are most important among those identified by Pampel et al. (14). These authors in a large scale review article identified nine explanations of the relationship between SES and health behaviour: deprivation and stress; fewer benefits for longevity; latent traits; class-related distinctions; lack of knowledge and access to information; personal efficacy and agency; aids and available resources; community (neighbourhood) opportunities; social support, social cohesion, and peer influence (14).

Relationship of smoking behaviour and SES is quite contradictory. While for being a smoker (and a daily smoker, too) all three indicators of SES are relevant (smokers tend to be overrepresented in lower status groups), extent of smoking (number of cigarettes smoked on a typical day) is inconsistently differentiated by education, income and occupational class.

The findings about association of alcohol consumption and SES are very similar. More frequent alcohol consumption was related to higher education and income, however, not related to occupational status. Moreover, extent of binge drinking was almost unrelated to SES. We may hypothesize that engagement into smoking and alcohol drinking is governed by quite different mechanism than extent of either smoking or drinking. Importantly, in case of alcohol consumption, positive relationship between higher SES and more frequent drinking was confirmed. This result contradicts cognitive interpretation of relationship between alcohol consumption and SES. However, it gives support for the interpretation explaining this difference in terms of occupational class distinctions.

Importantly, our analysis revealed that all three indicators of SES are related to risky health behaviours and these relationships hold after cross-controlling with other indicators and even their interactions. Two interactions between independent variables were consistently related to risky health behaviours. First, it appeared that income-related differences of being physically active are higher for persons with low education. Second, we established that interaction of occupational class and education has effect on the occupational class differences of heavy smoking. This result was found to be consistent across samples and modelling approaches, however, only for those smoking.

In addition, our analysis showed that regional differences in risky health behaviours are considerable. This relationship is most consistent in cases of fruit and vegetable consumption, being more physically active, as well as alcohol consumption. However, regional differences in cigarettes smoking behaviour are rather inconsistent.

CONCLUSIONS

Higher education in the surveyed European countries is related to healthier diet (even though reflecting only consumption of vegetables and not fruits), higher levels of physical activity, and smaller probability of smoking daily. However, higher education is also related to higher frequency of drinking alcohol. Household income is related to eating fruits and vegetables (salad) more frequently, cigarette smoking behaviour and frequency of drinking alcohol. Relationship between occupational class and risky health behaviours is consistently significant with regard to eating fruits, vegetables and salad as well as cigarette smoking behaviour. Our analysis also disclosed that regional differences in risky health behaviours are considerable. Importantly, analysis choices, especially related to dependent variable coding, have very important influence on the relationship between binge drinking frequency and educational attainment. Thus, without careful theoretical consideration linking SES and risky health behaviours, education, income and occupational class cannot substitute each other in the study of the SES-related differences of health behaviours, as assumed in the larger part of research on the subject.

Electronic Supplementary Material

This article contains supplementary material (Appendix A–C) available at https://www.doi.org/10.17605/OSF.IO/J5DXV

Appendix A

Table A1. Realized samples and their selection procedures in the analysed countries of the European Social Survey (ESS) Round 7

Appendix B

Table B1. Inequalities by socioeconomic status and region in eating fruit and vegetables, being physically active, smoking behaviour and alcohol consumption.

Appendix C

Table C1. Multi-level regressions of eating fruit on socioeconomic status, region and control variables

Table C2. Multi-level regressions of eating vegetables or salad on socioeconomic status, region and control variables

Table C3. Multi-level regressions of days being physically active per week on socioeconomic status, region and control variables

Table C4. Multi-level regressions of smoking behaviour on socioeconomic status, region and control variables

Table C5. Multi-level regressions of cigarettes smoked on typical day on socioeconomic status, region and control variables

Table C6. Multi-level regressions of alcohol consumption on socioeconomic status, region and control variables

Table C7. Multi-level regressions of binge drinking on socioeconomic status, region and control variables.

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Conflict of Interests

None declared

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