

# Material, psychosocial and behavioural factors associated with self-reported health in the Republic of Ireland: cross-sectional results from the SLÁN survey

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## ABSTRACT

**Objectives:** To explore the associations between various material, psychosocial and behavioural factors and self-reported health (SRH), and to determine whether these associations varied according to educational level.

**Design:** Representative national cross-sectional survey.

**Setting:** Republic of Ireland.

**Participants:** 4369 men and 5995 women aged 18 or more (Survey of Lifestyle, Attitudes and Nutrition (SLÁN) 2007).

**Methods:** SRH was measured using one single item. Three groups of factors were studied: material, psychosocial and behavioural factors. Statistical analyses were performed using logistic regression analysis and interaction testing, the sample design being taken into account. All results were adjusted for age and educational level and stratified on gender.

**Results:** When each group of factors was studied separately, non-working status, no private health insurance, inability to afford enough food, no car, being non-married, low social participation, serious neighbourhood problems, low social support, smoking, no alcohol consumption, illicit drug use, low physical activity and obesity were associated with poor SRH. When studied together, some material and psychosocial factors were no longer significant. Four significant interaction terms were found, suggesting that some factors might have a stronger association with SRH among low-educated people.

**Conclusions:** Various types of factors were found to be associated with SRH, and most of these associations were similar according to educational level. Behavioural factors might be intermediate factors in the causal pathways from material and psychosocial factors to SRH. Prevention policies should integrate a large number of factors comprehensively to improve SRH.

## INTRODUCTION

Self-reported health (SRH) has been studied intensively over the last two decades. This

## ARTICLE SUMMARY

### Article focus

- Few studies have investigated a large number of factors in association with self-reported health.
- We assess the associations between a large range of material, psychosocial and behavioural factors and self-reported health, and explore whether these associations varied according to educational level.

### Key messages

- Various material, psychosocial and behavioural factors were associated with self-reported health.
- Most of these associations were found to be similar according to educational level. However, four factors were found to have a stronger association with self-reported health among low-educated people.

### Strengths and limitations of this study

- The study uses a large nationally representative sample, covers a large number of factors exploring material, psychosocial and behavioural aspects, and is based on structured multivariate analyses and formal interaction testing.
- As the study is cross-sectional, no causal conclusions can be drawn, and no information is available on the duration of exposure to the factors considered.

parameter has several advantages for epidemiological research. It constitutes a general single-item question to which the answers can easily be collected via a self-administered or administered questionnaire. It reflects a person's integrated perception of health and is known to take into account the various aspects of health, as suggested by WHO's definition of health, which includes its physical, mental and social aspects. Several authors have reported strong

associations between SRH and more objective measures of morbidity.<sup>1–3</sup> Further, in prospective studies, poor SRH was found to be a significant predictor of mortality.<sup>1 2 4–6</sup> In this study, SRH was used as a general health status marker.

Studies have explored the potential risk factors for poor SRH, and have covered various factors of different nature, such as demographic, educational, social, financial, geographical and behavioural factors.<sup>7</sup> However, each individual study may cover a small number of factors (a median of 7 factors considered per study with multivariate models according to Mantzavinis *et al*<sup>7</sup>) and the authors of this review suggest that forthcoming studies should cover a large number of important factors comprehensively, use a large sample size, and adopt adequate multivariate modelling.

Differences in the risk factors of SRH have been observed according to gender or age, suggesting that some factors may be more pertinent in certain age groups or for one gender.<sup>8 9</sup> Although there is a strong association between social position and SRH (the lower the social group, the higher the prevalence of poor SRH),<sup>10–13</sup> the differences in the risk factors of SRH according to social position have been understudied.

Our study is thus an attempt to fill the gap in the knowledge of the factors associated with SRH, by exploring different types of material, psychosocial and behavioural factors, using a large sample size of a national general population, and exploring the differences in the factors associated with SRH according to educational groups, using adequate multivariate analysis including interaction testing.

The objectives of this study were to explore the associations between a large number of material, psychosocial and behavioural factors and SRH in the national population of the Republic of Ireland. An additional objective was to determine whether these associations differed according to educational level.

## METHODS

### Population

The study was based on the data from the Survey of Lifestyle, Attitudes and Nutrition (SLÁN) 2007, which is the third SLÁN in Ireland. Commissioned by the Department of Health and Children, this periodical national cross-sectional survey covers questions regarding health, health behaviours, demographic factors and various aspects of living conditions of respondents. The 2007 survey comprised face-to-face interviews of 10 364 adults, 4369 men and 5995 women (aged 18 years or more) in private households in the Republic of Ireland and the response rate was 62%. The sampling and weighting of this survey were performed to make it representative of the national Irish population. The GeoDirectory, an anonymous list of all addresses in the Republic of Ireland, was used as the sampling frame. The sample used was probabilistic and was selected

using the Economic and Social Research Institute's (ESRI's) RANSAM program. RANSAM is a process for selecting samples in three stages. The first stage involved making a random selection of sampling points based on aggregates of townlands, using a minimum population criterion. These form the primary sampling units (PSUs) or clusters. Following a sort by area characteristics and region, 400 PSUs were systematically selected using a random starting point. Once the required number of PSUs had been selected, a systematic sample of addresses was drawn from within each, again using a random starting point. This resulted in 46 selected addresses per cluster. The third stage involved selecting a respondent at each address. Respondent selection within a household involved implementing a simple randomisation procedure, the so-called next birthday rule. The weighting compensated for any imbalances in the distribution of characteristics in the completed survey sample compared with the population of interest, whether such imbalances occur because of sampling error, from the nature of the sampling frame used, or due to differential response rates within population subgroups. Weighting was a two-stage process: (1) construction of a design weight to compensate for the over-representation of individuals in smaller households (a consequence of the sampling frame used) and (2) calibration of the sample distribution to population totals along a number of dimensions related to gender, age, marital status, economic status, level of education, occupational category, ethnicity, household size and geographical region. Details of the method of sampling are available in the SLÁN 2007 main report.<sup>14</sup> The survey protocol received ethical approval from the Research Ethics Committee of the Royal College of Surgeons in Ireland (RCSI). Study interviews were conducted by a team of trained survey interviewers, coordinated by ESRI. A previous study has already been published by our team on mental health using these data.<sup>15</sup>

### Self-reported health

SRH was measured using the following question: 'In general would you say your health is...?' There were five response categories: 'excellent', 'very good', 'good', 'fair' and 'poor'. The categories 'excellent', 'very good' and 'good' were used to define good SRH and the categories 'fair' and 'poor' were used to define non-good SRH, named poor SRH in the text.

### Potential risk factors of SRH

The selection of the potential risk factors of SRH has been based on both the literature on risk factors of SRH<sup>7</sup> and assumptions, suggesting that some variables may be worth studying (teeth brushing, eg, as poor dental hygiene may be a risk factor for health outcomes).<sup>16</sup> Three groups of potential risk factors were studied: material, psychosocial and behavioural factors. This classification of factors is inspired from other studies.<sup>15 17–19</sup> Material factors were: work status

(ie, working or not), absence of private health insurance, insufficient food budget, living in a rented home, absence of telephone and absence of car. Psychosocial factors were: marital status, social support (Oslo scale, including 3 items on the number of close people, friendly interest, and practical help, with scores in the range 3–8 indicating low support, 9–11 moderate support and 12–14 high support<sup>20</sup>), formal social participation (at least 1 participation of 7 possibilities: sports clubs, political parties, church groups, social clubs, etc) and neighbourhood/area big problems (at least 1 big problem of 9 possibilities: vandalism, insults, poor public transport, etc). Behavioural factors were: smoking habits, alcohol consumption, that is, calculated as the number of standard units consumed in the previous 7 days, binge drinking or frequency of consumption of six standard drinks or more on one occasion once a week or more, consumption of cannabis and other drugs (cocaine, heroin, ecstasy, etc) within the last year, physical activity (International Physical Activity Questionnaire (IPAQ) questionnaire, <http://www.ipaq.ki.se>), body mass index (BMI, classified as normal or underweight <25 kg/m<sup>2</sup>, overweight 25 to <30 kg/m<sup>2</sup> or obese ≥30 kg/m<sup>2</sup>) and teeth brushing less than twice a day. Most items of the questionnaire were selected from national and international survey questionnaires: Centers for Disease Control and Prevention (CDC)-Behavioral Risk Factor Surveillance System (BRFSS), College Lifestyle and Attitudinal National (CLAN) Survey, European Comparative Alcohol Study, European Health Interview Survey (EHIS), Alcohol Use Disorders Identification Test (AUDIT), etc.

### Educational level

Educational level was assessed using the following question: 'what is the highest level of education you have completed to date?' Educational level was defined using four levels: (1) first level, that is, incomplete primary level education, (2) second level, that is, Intermediate, Junior or Group Certificate, or equivalent (complete primary level), (3) third level, that is, leaving Certificate, Diploma or Certificate (complete secondary level) and (4) fourth level, that is, primary degree, postgraduate or higher degree (university level).

### Statistical methods

All statistical analyses took the sample design, that is, the clusters and weights, into account. All variables used in the study were described for both genders and the differences in the distribution of these variables were tested for comparisons between genders using the  $\chi^2$  Rao-Scott test. The associations between material, psychosocial and behavioural factors and SRH were tested using the  $\chi^2$  Rao-Scott test. All factors significant at 5% for at least one gender were kept for multivariate analysis. First, logistic regression models (models 1–3) were used to study the associations between each set of material, psychosocial and behavioural factors separately and SRH,

with adjustment for age and educational level (if a factor was not significant for both genders, these models were performed again without this factor). Second, all the factors retained in these first models were included in a final model (model 4) including all material, psychosocial and behavioural factors simultaneously, with adjustment for age and educational level. Although inter-relations between factors were found, no collinearity was detected in all models. Interaction terms were tested between educational level and each material, psychosocial and behavioural factor to detect whether the association between a factor considered and SRH differed according to educational level.

All analyses were performed using the Statistical Analysis System (SAS) separately for men and women, as the prevalence of poor SRH and potential risk factors and the risk factors of poor SRH may differ according to gender.

## RESULTS

Table 1 presents the distribution of all variables in the population studied. The prevalence of poor SRH was 12.14% for men and 12.10% for women and there was no difference in this prevalence between genders. Women were more likely to be older and more highly educated. They were more likely to be non-workers and have no car. Women were more likely to be divorced/separated/widowed and men more likely to be single. The prevalence of no social participation was higher among women than among men, but the prevalence of high social support was higher for women than for men. Men were more likely to have unhealthy behaviours (smoking, alcohol consumption, binge drinking, cannabis and drug use, overweight/obesity and teeth brushing of less than twice a day), but the prevalence of high physical activity was higher for men than for women.

The bivariate associations between material, psychosocial and behavioural factors and SRH are also presented in table 1. The prevalence of poor SRH increased with older age, lower educational level, non-working status, no private health insurance, inability to afford enough food and no car for both genders. Home tenure and telephone displayed non-significant associations and were removed from the analysis. The prevalence of poor health increased with separated/divorced/widowed status, no social participation, neighbourhood problems and low social support for both genders. The prevalence of poor health increased with smoking and exsmoking, no alcohol consumption, no binge drinking, low physical activity, overweight/obesity and infrequent teeth brushing for both genders. Cannabis and drug use were associated with SRH among women only.

Table 2 presents the results from logistic regression analyses, each set of factors being studied separately. As binge drinking, cannabis use and teeth brushing were not significant for both genders, they were not kept in

**Table 1** Description of the population studied and associations between material, psychosocial and behavioural factors and SRH (percentages using sample design and  $\chi^2$  Rao-Scott test)

	Men			Women			p Value†
	n	Per cent	Per cent of poor SRH	n	Per cent	Per cent of poor SRH	
Total	4369			5995			
SRH							ns
Good	3725	87.86		5164	87.90		
Poor	635	12.14		813	12.10		
Age (years)			***			***	**
18–29	826	25.46	3.27	1081	24.99	5.01	
30–44	1341	32.05	7.05	1969	30.16	5.28	
45–64	1334	29.34	17.14	1844	28.81	15.27	
65+	868	13.14	30.49	1101	16.03	30.31	
Educational level			***			***	**
First level	847	20.07	27.61	994	19.23	30.56	
Second level	936	18.62	13.87	1140	15.81	13.35	
Third level	1702	44.55	7.26	2745	47.21	7.31	
Fourth level	884	16.76	4.66	1116	17.74	3.71	
Material factors							
Work status			***			***	***
Working	2879	70.96	6.15	2983	50.89	5.33	
Not working	1467	29.04	26.71	2960	49.11	19.00	
Private health insurance			***			***	ns
Yes	2302	51.16	7.91	3078	49.86	7.82	
No	2009	48.84	16.17	2818	50.14	15.77	
Afford to buy food			***			**	ns
Always	3597	85.37	11.08	4889	84.27	11.33	
Usually or less	550	14.63	18.42	855	15.73	15.97	
Home tenure			ns			ns	ns
Owned	3343	74.24	11.90	4524	74.06	12.20	
Rented	990	25.76	12.92	1419	25.94	11.58	
Telephone			ns			ns	ns
Yes	4146	97.32	11.91	5729	97.59	11.95	
No	127	2.68	18.11	147	2.41	18.44	
Car			***			***	***
Yes	3435	80.50	10.72	4484	75.48	9.39	
No	790	19.50	17.61	1320	24.52	20.20	
Psychosocial factors							
Marital status			***			***	***
Cohabiting/married	2433	54.91	12.02	3416	52.11	12	
Single	1488	38.99	10.05	1470	32.58	6.79	
Separated/divorced/widowed	438	6.10	26.72	1093	15.31	23.46	
Social participation			***			***	*
Yes	2564	59.82	8.47	3416	56.51	9.09	
No	1732	40.18	17.88	2492	43.49	15.71	
Neighbourhood problems			*			*	ns
No	2764	64.51	11.31	3689	62.85	11.07	
Yes	1528	35.49	14.08	2217	37.15	13.38	
Social support			***			**	***
High	2141	48.81	11.98	3149	53.44	10.78	
Moderate	1759	41.41	10.68	2255	38.45	12.56	
Low	415	9.78	19.24	508	8.11	17.61	
Behavioural factors							
Smoking			***			**	***
Non-smoker	2016	46.67	8.49	3303	57.47	10.65	
Exsmoker	1083	22.85	15.97	1076	16.10	13.27	
Smoker	1228	30.48	14.89	1565	26.43	14.51	

Continued



Table 1 Continued

	Men			Women			p Value†
	n	Per cent	Per cent of poor SRH	n	Per cent	Per cent of poor SRH	
Alcohol (drinks/week)			***			***	***
1–7	1128	25.96	10.12	2224	36.95	8.24	
0	1580	34.43	17.08	2879	47.58	16.61	
8–14	846	20.37	9.34	616	11.46	5.71	
>14	770	19.24	9.08	210	4.01	7.43	
Binge drinking			**			**	***
Less than once a week	3041	67.57	13.48	5274	87.22	12.50	
More than once a week	1277	32.43	9.31	637	12.78	7.82	
Cannabis			ns			*	***
No	4056	92.13	12.14	5761	96.87	12.20	
Yes	262	7.87	11.43	132	3.13	6.02	
Drugs			ns			***	***
No	4099	96.16	11.94	5671	98.19	11.54	
Yes	133	3.84	17.88	106	1.81	27.97	
Physical activity			***			***	***
High	1325	32.33	4.82	953	16.61	5.62	
Moderate	1799	41.49	11.64	3104	52.90	9.34	
Low	1154	26.18	22.54	1841	30.48	19.69	
BMI (kg/m <sup>2</sup> )			***			***	***
<25	1687	41.92	10.81	3178	58.84	9.50	
≥25 and <30	1839	42.46	10.96	1632	28.24	14.15	
≥30	659	15.62	18.23	746	12.92	18.91	
Teeth brushing			***			***	***
≥2/day	2462	60.93	8.53	4660	80.65	9.33	
<2/day	1748	39.07	17.36	1122	19.35	19.84	

†p Value for the comparison of the distribution between men and women.

\*p&lt;0.05.

\*\*p&lt;0.01.

\*\*\*p&lt;0.001.

BMI, body mass index; SRH, self-reported health; ns, non-significant.

the models. All material, psychosocial and behavioural factors were significantly associated with SRH, except inability to afford enough food and marital status for women, and no car for men.

Table 3 presents the final model including all material, psychosocial and behavioural factors together. Poor health was associated with older age, lower educational level, and non-working status for both genders, with no private health insurance and inability to afford enough food for men, and no car for women. Being alone and low social support for men, and neighbourhood problems for women increased the prevalence of poor health. Smoking, no alcohol consumption, low physical activity and overweight/obesity were associated with poor health for both genders, as well as drug use for women. As the analyses of all factors together lead to a reduction in ORs for material factors and especially for psychosocial factors, it is more likely that behavioural factors may be intermediate factors between material and psychosocial factors and SRH.

Table 4 summarises the results for the significant interaction terms found between educational level and factors. Only five significant interactions were observed

for inability to afford enough food for men, and for no car, neighbourhood problems, drug use and BMI for women. The interaction between educational level and BMI among women suggested that the association between obesity and SRH was much stronger among high-educated women. The four other interactions showed that the associations with inability to afford enough food for men, and no car, neighbourhood problems and drug use for women were stronger among low-educated people.

## DISCUSSION

### Main results

A variety of factors were found to be associated with SRH. Non-working status, absence of private health insurance (for men), inability to afford enough food (for men) and absence of car (for women) were material risk factors of poor SRH. Regarding psychosocial factors, being alone and low social support for men and serious neighbourhood problems for women increased the prevalence of poor SRH. Current and past smoking, use of illicit drugs (for women), low physical activity,

**Table 2** Associations between material (model 1), psychosocial (model 2) and behavioural (model 3) factors and poor SRH: results from logistic regression analysis with each set of factors separately (adjusted for age and educational level) and using sample design

	Men OR	95% CI		Women OR	95% CI	
Model 1	N=3966			N=5468		
Working status	***			***		
Working	1			1		
Not working	3.231	2.398	4.354	2.252	1.732	2.929
Private health insurance	**			*		
Yes	1			1		
No	1.508	1.167	1.948	1.428	1.079	1.889
Afford to buy food	**			ns		
Always	1			1		
Usually or less	1.745	1.186	2.569	1.282	0.970	1.694
Car	ns			**		
Yes	1			1		
No	1.218	0.905	1.640	1.442	1.122	1.854
Model 2	N=4229			N=5794		
Marital status	***			ns		
Cohabiting/married	1			1		
Single	1.735	1.307	2.303	1.071	0.793	1.448
Separated/divorced/widowed	1.677	1.187	2.369	1.015	0.765	1.345
Social participation	***			**		
Yes	1			1		
No	1.604	1.276	2.017	1.432	1.147	1.789
Neighbourhood problems	**			***		
No	1			1		
Yes	1.369	1.081	1.733	1.441	1.162	1.786
Social support	***			*		
High	1			1		
Moderate	0.929	0.719	1.200	1.250	0.978	1.597
Low	1.927	1.321	2.811	1.605	1.135	2.268
Model 3	N=3975			N=5260		
Smoking	***			***		
Non-smoker	1			1		
Exsmoker	1.527	1.167	1.997	1.360	0.983	1.882
Smoker	2.284	1.621	3.220	2.059	1.557	2.723
Alcohol (drinks/week)	**			**		
1-7	1			1		
0	1.452	1.076	1.960	1.552	1.193	2.020
8-14	1.005	0.660	1.531	0.860	0.547	1.353
>14	0.787	0.536	1.156	1.028	0.518	2.040
Drugs	*			***		
No	1			1		
Yes	2.722	1.176	6.301	3.854	1.809	8.211
Physical activity	***			***		
High	1			1		
Moderate	1.852	1.279	2.683	1.345	0.952	1.900
Low	3.618	2.544	5.145	2.395	1.659	3.459
BMI (kg/m <sup>2</sup> )	*			**		
<25	1			1		
≥25 and <30	0.826	0.626	1.091	1.253	0.972	1.616
≥30	1.277	0.913	1.788	1.715	1.248	2.357

\*p<0.05.

\*\*p<0.01.

\*\*\*p<0.001.

OR in italics: significant at 5%.

BMI, body mass index; SRH, self-reported health; ns, non-significant.

**Table 3** Associations between material, psychosocial and behavioural factors (model 4) and poor SRH: results from logistic regression analysis with all sets of factors simultaneously (adjusted for age and educational level) using sample design

Model 4	Men (N=3586) OR	95% CI		Women (N=4818) OR	95% CI	
Age (years)	***			***		
18–29	1			1		
30–44	2.886	1.580	5.271	1.135	0.675	1.910
45–64	7.990	4.237	15.066	3.238	1.895	5.534
65+	9.256	4.664	18.370	4.208	2.374	7.457
Educational level	**			**		
First level	2.325	1.446	3.741	2.123	1.176	3.836
Second level	1.808	1.129	2.897	1.210	0.704	2.080
Third level	1.446	0.942	2.220	1.287	0.780	2.123
Fourth level	1			1		
Material factors						
Work status	***			***		
Working	1			1		
Not working	2.959	2.097	4.175	2.126	1.575	2.870
Private health insurance	*			ns		
Yes	1			1		
No	1.348	1.009	1.802	1.232	0.903	1.680
Afford to buy food	*			ns		
Always	1			1		
Usually or less	1.629	1.108	2.395	1.235	0.888	1.718
Car	ns			**		
Yes	1			1		
No	0.954	0.680	1.338	1.576	1.163	2.136
Psychosocial factors						
Marital status	*			ns		
Cohabiting/married	1			1		
Single	1.585	1.125	2.233	0.908	0.633	1.302
Separated/divorced/widowed	1.528	1.037	2.252	0.820	0.570	1.179
Social participation	ns			ns		
Yes	1			1		
No	1.140	0.865	1.503	1.181	0.917	1.522
Neighbourhood problems	ns			**		
No	1			1		
Yes	1.227	0.936	1.608	1.501	1.165	1.934
Social support	*			ns		
High	1			1		
Moderate	0.772	0.568	1.049	1.219	0.922	1.611
Low	1.414	0.905	2.209	1.469	0.990	2.180
Behavioural factors						
Smoking	***			***		
Non-smoker	1			1		
Exsmoker	1.555	1.159	2.085	1.345	0.938	1.928
Smoker	2.016	1.379	2.947	1.905	1.391	2.607
Alcohol (drinks/week)	**			**		
1–7	1			1		
0	1.413	1.037	1.927	1.570	1.181	2.087
8–14	1.184	0.783	1.789	0.874	0.527	1.451
>14	0.729	0.486	1.095	1.082	0.538	2.177
Drugs	ns			**		
No	1			1		
Yes	1.993	0.941	4.221	3.421	1.471	7.956
Physical activity	***			***		
High	1			1		
Moderate	1.521	0.994	2.327	1.337	0.911	1.964
Low	2.833	1.901	4.224	2.250	1.502	3.371

Continued

Table 3 Continued

Model 4	Men (N=3586) OR	95% CI		Women (N=4818) OR	95% CI	
BMI (kg/m <sup>2</sup> )	*			**		
<25	1			1		
≥25 and <30	0.946	0.713	1.255	1.398	1.056	1.850
≥30	1.539	1.087	2.178	1.787	1.274	2.507

\*p<0.05.

\*\*p<0.01.

\*\*\*p<0.001.

OR in italics: significant at 5%.

BMI, body mass index; SRH, self-reported health; ns, non-significant.

overweight and obesity, and no alcohol consumption were behavioural risk factors of poor SRH. When material, psychosocial and behavioural factors were studied separately, all these factors, plus low social participation, were significantly associated with SRH and in general for both genders. No difference in the association between these factors and SRH was observed according to educational level, except for obesity that displayed a stronger association among high-educated women and for four factors (inability to afford enough food for men, and no car, neighbourhood problems and drug use for women) that displayed stronger associations among low-educated people. Finally, behavioural factors may be the intermediate factors in the associations between material and psychosocial factors and SRH.

### Comparison with literature

No difference in the crude prevalence of poor SRH was found between genders in our study. Furthermore, no difference in SRH between genders was observed even after adjustment for age and educational level (OR men vs women 1.062; 95% CI 0.909 to 1.242). Other studies showed that the prevalence may be a little higher among women than among men.<sup>11 13 21 22</sup> The prevalence of poor SRH increased with older age groups, in agreement with other studies.<sup>12 21</sup> Educational level was strongly associated with SRH; the lower the educational level, the higher was the prevalence of poor SRH, which is completely consistent with previous results<sup>10–13 21</sup> and with a previous analysis in the Republic of Ireland, utilising data from the previous 1998 SLÁN survey.<sup>23</sup> Social differences in SRH appeared to be stronger among men than among women, but without statistical significance. Other studies found similar results,<sup>12</sup> or the opposite,<sup>10 13</sup> or mixed results.<sup>11</sup>

A large number of potential risk factors of poor SRH were studied in our analyses, and covered a large number of important factors as recommended previously.<sup>7</sup> These factors were classified according to three groups of factors, already used in previous studies.<sup>15 17 22</sup> Although men and women were studied separately, most risk factors were found to be the same for both genders.

Four material factors were observed as risk factors of poor SRH. Non-working status had the strongest

association with SRH. Other studies found that non-working status was associated with poor SRH.<sup>24</sup> This association may be linked to a selection bias (healthy worker effect), as people in poor health may be more likely to be excluded from the labour market. The other material risk factors were related to economic conditions (absence of private health insurance and inability to afford enough food, both of which may have a direct impact on health) and material living conditions (absence of car). Other studies showed that private health insurance,<sup>25</sup> economic hardship or problems,<sup>21 22</sup> car ownership,<sup>26</sup> and mixed indicators such as deprivation measures including car ownership and housing tenure<sup>27</sup> were risk factors of SRH.

Four psychosocial factors were associated with SRH in our study, at least in the analyses exploring psychosocial factors separately from material and behavioural factors. Neighbourhood problems were significantly associated with poor SRH among women even in the analyses taking all types of factors into account. Being non-married was observed as a risk factor for men, in agreement with previous studies.<sup>21 28</sup> Social capital measured using trust, social participation and social network resources,<sup>29–31</sup> and various aspects of the neighbourhood environment<sup>31–34</sup> and social support<sup>21 22 34</sup> were associated with SRH in the literature.

Five behavioural factors were associated with SRH in our analyses. The strongest associations were found for low physical activity and smoking for both genders, and drug use for women. Other authors underlined the role of smoking,<sup>9</sup> no alcohol consumption,<sup>9</sup> physical inactivity<sup>9 22 35</sup> and obesity<sup>9 22 36</sup> in SRH. The unexpected association between no alcohol consumption and poor SRH may at least in part be explained by two phenomena: a selection bias (people in poor health because of alcohol may have stopped drinking) and a reporting bias, leading to an underestimate of alcohol consumption, especially among those with alcohol-related problems. To our knowledge, no previous study has shown an association between use of illicit drugs and SRH in the general population.

The reduction in the ORs associated with material and psychosocial factors, when studied together with behavioural factors, may be explained by an intermediate role of



**Table 4** Results for significant interaction terms between educational level and factors in association with poor SRH (stratified analyses for each gender and educational level)

	OR (95% CI)	
	Men	Women
Unable to afford enough food	p=0.0056	p=0.0213
Women		
Neighbourhood problems	p=0.0249	
Other drugs	p<0.0001	
BMI $\geq 30$ kg/m <sup>2</sup>	p=0.0460	
Educational level		
First level	1.913 (0.980 to 3.731)	1.712 (0.998 to 2.937)
Second level	1.029 (0.516 to 2.049)	1.832 (1.146 to 2.930)
Third level	2.043 (1.078 to 3.873)	1.366 (0.800 to 2.332)
Fourth level	0.238 (0.040 to 1.424)	0.180 (0.041 to 0.803)

OR adjusted for age and all other material, psychosocial and behavioural factors (see table 3).

OR in italics: significant at 5%.

The model for women and the fourth level of education was performed without other drugs (too small number of high educated women using other drugs). BMI, body mass index; SRH, self-reported health.

behavioural factors in the association between material and psychosocial factors and SRH. Other authors have suggested similar pathways, such as, for example, Joung *et al*<sup>87</sup> showing that behavioural factors may explain a considerable amount of the association between marital status and SRH. As underlined by Mantzavinis *et al*,<sup>7</sup> not all candidate risk factors can be dealt with in the same way in multivariate analyses, because some of them may be intermediate steps in the causal pathways to SRH. This is why our final multivariate model (model 4) may underestimate the role of material and psychosocial factors in SRH, and models 1–3 may also be informative.

### Strengths and limitations

The strengths of this study deserve to be mentioned. The study was based on a large representative national sample of the general population in the Republic of Ireland. As our analyses took the sample design of the survey into account, it may be possible to generalise the results for the whole Irish population. As the sample was large enough, it allowed us to study men and women separately, a point that may be crucial given the expected differences between genders regarding health status, and material, psychosocial and behavioural factors. The outcome was SRH, which is a valuable and well-known indicator of health status and a powerful predictor of future morbidity and mortality outcomes.<sup>1 2 4–6</sup> However, studies have suggested that this outcome may lead to an underestimate of the association between social position and SRH, because of a differential reporting of health status according to social position.<sup>38</sup> A large number of important factors were explored to cover various material, psychosocial and behavioural aspects. These factors were studied using structured multivariate analyses that also included formal interaction testing to explore the differences in the associations according to social position measured by educational level. This point has been examined very rarely in the literature and for outcomes other than SRH.<sup>39 40</sup> Social position was measured using educational level, which is a pertinent variable in the general population. Our analyses were stratified on gender and adjusted for age. Furthermore, additional analyses that took chronic conditions into account suggested that, although somewhat reduced, most of the associations were still significant after adjustment for chronic diseases. Additional analyses were performed with multiple imputation of missing values (multiple imputation by chained equations (MICE) method) and provided similar results (supplementary table 1).

The study also has several limitations. As it is cross-sectional, no causal conclusions can be drawn. Furthermore, a reverse causation may not be excluded as poor SRH may also have an impact on various material, psychosocial and behavioural factors. The response rate may be considered satisfactory (62%), although a participation bias may not be excluded totally, and as the survey is based on a household interview, it excludes institutionalised or homeless people. Nevertheless, as our analyses

took the sample design (including weights) into account, this potential bias is likely to have no impact on the results. No information was available on the duration of exposure to the factors considered and this may lead to an underestimate of the associations observed. Although the study covered a large number of variables, some may have been neglected. Finally, all variables were self-reported and a reporting bias related to common method variance might have occurred and lead to an overestimate of the associations observed.

## Conclusion

This study showed associations between various material, psychosocial and behavioural factors and SRH. Prevention policies and health promotion should take all the dimensions of these factors into account when planning preventive actions and programmes. Furthermore, as almost all of the associations were found to be similar according to educational level, our results suggest that preventive policies might be oriented to the whole general population for most factors. However, four interaction terms suggested that some factors might have stronger effects on SRH among low-educated people; this point should be confirmed by other studies. Forthcoming prospective studies may also be needed to confirm our results and provide a better understanding of the associations observed.

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