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# **Contribution of material, occupational, and psychosocial factors in the explanation of social inequalities in health in 28 countries in Europe**

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## **Abstract**

### **Objectives**

To analyse the associations between socioeconomic status (SES), measured using occupation, and self-reported health, and to examine the contribution of various material, occupational, and psychosocial factors to social inequalities in health in Europe.

### **Methods**

This study was based on data from the European Quality of Life Survey (EQLS) carried out in 2003. The total sample consisted of 6038 and 6383 working men and women in 28 countries in Europe (response rates: 30.3–91.2%). Each set of potential material, occupational, and psychosocial mediators included between 8 and 11 variables. Statistical analysis was performed using multilevel logistic regression analysis.

### **Results**

Significant social differences were observed for self-reported health, manual workers being more likely to be in poor health (OR=1.89, 95% CI: 1.46–2.46 for men, OR=2.18, 95% CI: 1.71–2.77 for women). Strong social gradients were found for almost all potential mediating factors, and almost all displayed significant associations with self-reported health. Social differences in health were substantially reduced after adjustment for material, occupational, and psychosocial factors, material factors playing a major role. The four strongest contributions to reducing these differences were found for material deprivation, social exclusion, financial problems, and job reward. Taking all mediators into account led to an explanation of the social differences in health by 78–100% for men and women.

### **Conclusion**

The association between SES and poor health may be attributed to differential distributions of several dimensions of material, occupational, and psychosocial conditions across occupational groups. Interventions targeting different dimensions might result in a reduction of social inequalities in health.

**MESH Keywords** Adolescent ; Adult ; Europe ; Female ; Health Status Disparities ; Health Surveys ; Humans ; Male ; Middle Aged ; Occupations ; statistics & numerical data ; Quality of Life ; Regression Analysis ; Self Report ; Sex Distribution ; Sex Factors ; Social Class ; Social Environment ; Social Support ; Socioeconomic Factors ; Workplace ; organization & administration ; psychology ; Young Adult

**Author Keywords** social inequalities in health ; self-reported health ; occupation ; Europe

## **Introduction**

Social inequalities in health have been described across a range of European countries for many health indicators,[1 –13 ] including self-reported health (SRH) which is considered as a powerful predictor of subsequent morbidity and mortality.[14 ] The association between socioeconomic status (SES) and health is one of the most well-known findings in the epidemiological literature: the higher the social class, the lower the prevalence and/or incidence of health problems, illness, disease, and death.

Whilst many studies described social inequalities in health in Europe, studies trying to explain these inequalities are still lacking. Identifying the factors that may contribute to these inequalities could be useful to reduce the prevalence of exposure to these factors, especially among the lowest social groups, and thus to reduce inequalities. Determinants of social inequalities in health are complex, and there are likely to be a number of important mediators, such as material, occupational, psychosocial, and behavioural factors.

Various theories have been developed to explain the pathways and mechanisms underlying these inequalities.[15 –17 ] These theories include the materialist explanation, that put the emphasis on material conditions (i.e. access to goods and services, and exposures to

material risk factors in the living and working environment), the psychosocial explanation, that focuses on psychosocial and stress related influences with a plethora of risk factors such as those related to social support or sense of control, and the behavioural explanation, that emphasizes the importance of behavioural risk factors in explaining social inequalities in health. The relative contribution of these factors has been very rarely explored to date at national level.[18 –20 ] Furthermore, very few studies explored occupational factors, that include specific material and psychosocial factors of the work environment, among other mediators. As explanatory or mediating factors probably are interrelated, some authors have suggested a simplified causal model to disentangle the direct (independent) effect of mediating factors, and their indirect effect through other factors.[18 ;19 ] According to this explanatory model, material factors might affect health inequalities directly or indirectly through psychosocial and behavioural factors, and psychosocial factors might work directly or indirectly through behavioural factors.

To our knowledge, no study has attempted to explain social inequalities in health using harmonised data for Europe as a whole. Most previous studies were based on national or selected samples, and explored only a limited number of mediators that may contribute to these inequalities.[19 –40 ] In addition, some studies describing social inequalities in health in Europe were based on surveys pooling data from several surveys/countries, making comparisons between European countries and generalizations for the whole of Europe difficult.[2 ;7 ;11 ] Mackenbach, in fact, underlined a serious lack of internationally comparable data on the topic of social inequalities in health.[16 ]

Our study aimed at providing an original overview of social inequalities in health in Europe, and at determining mediating factors for these inequalities. Thus, the objectives of the present study were to analyse the associations between SES, measured using occupation, and health, measured using SRH, and to examine the contribution of various material, occupational, and psychosocial factors to social inequalities in health in the working population of Europe.

## Methods

This study was based on the data of the European Quality of Life Survey (EQLS), carried out by the European Foundation for the Improvement of Living and Working Conditions in 2003. Data were collected through face-to-face interviews in the respondent's home. The basic sampling design used in all countries was a multi-stage, random one.[41 ] Overall, more than 26000 interviews took place, covering 28 countries in Europe (see Appendix ). Total response rate was 58.4% (range: 30.3–91.2% across countries, see Table 2 ). For the purpose of this study, people who were not working at the time of the survey were excluded in order to concentrate on the role of occupational factors. Our final study sample included 12421 workers (6038 men and 6383 women).

SRH was the health indicator studied and was assessed using the following question: "In general, would you say your health is ..." and response categories were "excellent", "very good", "good", "fair", and "poor". The variable was dichotomised as "good" health versus "poor" health ("fair" and "poor").

Occupation was used as an indicator of SES. Occupational groups were constructed according to the International Standard Classification of Occupations (ISCO-2008). Educational level was also used as an additional SES marker.

Three sets of potential mediating conditions were explored: material, occupational, and psychosocial factors. As we had a specific interest in occupational factors, they were distinguished from the other factors.

Material factors included: household tenure, housing conditions (shortage of space, rot in windows/doors/floors, damp/leaks, and lack of indoor flushing toilet, 4 items), crowding (number of persons per room), material deprivation (not able to afford at least one of these amenities or activities: car, home computer, washing machine, heating, holiday, furniture, meat/fish, clothes, and drinks/meals with friends/family, 9 items), financial problems (payment of bills, food, and/or rent, 4 items), neighbourhood conditions (noise, air pollution, lack of recreational/green areas, water quality, and area safety at night, 5 items), quality of public services (health services, education system, public transport, social services, and state pension system, 5 items) and problems with access to medical services (distance to medical centre, delay in getting appointment, waiting time to see the doctor, and cost of seeing the doctor, 4 items).

Occupational factors included: sector of economy (coded using NACE classification), permanency of work contract, number of hours normally worked per week (including any paid or unpaid overtime), daily commuting time, dangerous/unhealthy working conditions, job insecurity (fear of job loss in the next 6 months), psychological demands (demanding/stressful work, and tight deadlines, 2 items), decision latitude (extent of influence at work and interesting job, 2 items), reward (salary and job prospects, 2 items), responsibility for supervising the work of others, and additional paid job.

Psychosocial factors included: marital status, number of children, unpaid work (housework, care for children and/or elderly/disabled relatives, 3 items), work-life imbalance (difficulties to fulfill work and family responsibilities, 3 items), social support (help from family/friends/others in case of illness, advice, financial problems, or feeling low, 4 items), social network (frequency of contacts with

family/friends/neighbours, 4 items), social participation (voluntary work, political activities, and religious services, 5 items), trust level (towards people in general, state pension and social benefit systems, 3 items), and social exclusion (feelings of inferiority or uselessness, and lack of recognition or acceptance, 5 items).

The associations between SES and SRH, between SES and mediating factors, and between mediating factors and SRH were studied using Chi-square test. The associations between SES and SRH were also tested for each country separately, using logistic regression analysis after adjustment for sex and age, SRH being the dependent variable. Managers/professionals were used as the reference group. The associations between SES and SRH in the whole sample were then explored after adjustment for age (model 1) using multilevel logistic regression analysis with the 12421 participants clustered within 28 countries. The potential mediating factors, that displayed social gradients and were associated with SRH, were first introduced separately to model 1. The contribution of each factor (or a set of factors) to the explanation of the social differences in SRH was estimated by the change in OR after inclusion of the variable(s) in the model, according to the formula:  $(OR_{\text{model 1}} - OR_{\text{extended model}}) / (OR_{\text{model 1}} - 1)$ . [42] Positive % values indicated OR reductions and negative % values indicated OR increases. Only factors reducing social inequalities by more than 5% were retained in subsequent models. [32] These models were adjusted for combinations of two groups of factors, and finally adjusted for all factors simultaneously, allowing us to calculate independent and indirect contributions of mediators. Indirect contributions can be interpreted as the contribution of a group of factors (for example material) through another group (for example psychosocial). Such a method has already been presented and used by others. [18 ;19] Analyses were carried out using SAS and performed for men and women separately.

## Results

The description of the sample is presented in Table 1 . Many variables were significantly associated with gender, and almost all variables were also associated with SRH. Only household tenure, work contract, and additional paid job were not associated with SRH. Significant differences were found for SRH and occupation between countries (Table 2 ). The highest prevalences of poor health were observed in eastern countries, and the proportion of manual workers was the highest in these countries, and the lowest in the Scandinavian countries.

The association between occupation and SRH was significant for both genders, manual workers being at higher risk of poor health ( Table 1 ). In each country, after adjustment for sex and age (Table 2 ), the OR of poor health for manual workers was higher than 1 in most cases although not significant for all countries.

All potential mediating factors were associated with occupation, except commuting time for men and marital status among women ( Table 3 ). Strong social gradients were found for many of them, manual workers being more likely to be exposed to housing problems, overcrowding, material deprivation, financial problems, low quality of public services, low access of medical services, temporary contract, dangerous working conditions, job insecurity, low decision latitude, low reward, low social support and network, low social participation, low level of trust, and social exclusion. The factors that displayed inverse social gradients (managers/professionals were more likely to be exposed to long working hours, high psychological demands, responsibility for others, and additional paid job), or no clear social gradient were excluded from the analysis. The final selection of potential mediators is presented in Table 4 .

Table 4 presents the changes in ORs for manual workers after inclusion of potential mediating factors in model 1. Among material factors, deprivation, financial problems, and housing conditions contributed to the decrease of social differences for both genders. Quality of public services for men, and access to medical services for women were found to be specific contributors for each sex. Taking these factors into account led to a reduction of the associations between occupation and SRH by 76% and 59% for men and women respectively. Among occupational factors, the biggest contributions to a reduction of social differences were found for reward and dangerous working conditions, and to a lesser extent for economic activity and decision latitude for both genders, as well as job insecurity for women only. Taking these factors into account led to a reduction of the associations between occupation and SRH by 52% and 35% for men and women respectively. Among psychosocial factors, social exclusion and social support contributed to explain social differences in SRH for men and women. Trust level contributed to explain social differences for men only. Taking these factors into account led to a reduction of the associations between occupation and SRH by 46% and 44% for men and women respectively.

The ORs were further reduced when adjusted for combinations of two groups of factors (Table 4 ), the biggest reductions being observed for the combination of material and occupational factors (91% and 73% for men and women). The independent contribution of material factors in relation to occupational factors was 39% (=91-52) and 38% (=73-35) for men and women, and was higher than the independent contribution of occupational factors in relation to material factors: 15% (=91-76) and 14% (=73-59) for men and women. The final contribution of psychosocial factors in relation to both material and occupational factors was lower, as their independent effect was 9% (=100-91) and 5% (=78-73) for men and women.

Finally, the inclusion of the material, occupational, and psychosocial factors together in model 1 reduced further the ORs by 100% in men and by 78% in women, meaning that all groups of mediators independently contributed to the explanation of social inequalities in SRH. Final ORs were consequently no longer significant.

Additional analyses were performed using educational level as a SES marker. The results were essentially the same, initial ORs of 2.10 (95% CI: 1.65–2.66) and 2.01 (95% CI: 1.61–2.52) for poor health were observed for the less educated men and women (model 1), and the main mediating variables were the same. Only access to medical services was found as an additional mediator for men. Material and psychosocial factors contributed to social inequalities to the same magnitude: 75% and 60% for material factors, and 45% and 54% for psychosocial factors, for respectively men and women. Two occupational factors were not found as mediators: economic sector for both genders and decision latitude for men. The contribution of occupational factors was found to be lower using education as a SES marker: 36% and 22% for men and women.

## Discussion

Social inequalities in SRH were observed, with ORs of around 2 for manual workers. Material, occupational, and psychosocial factors contributed to an explanation of these inequalities, and the four biggest contributions were found for material deprivation, social exclusion, financial problems, and reward at work. Material as well as occupational factors played a major role in explaining social inequalities in health. All mediators taken into account together explained social differences in health by 78–100% for men and women, the final ORs being no longer significant for manual workers for both genders.

### Comparison with literature

Poor health was more likely to be reported among manual workers than among workers in higher occupational groups. This inverse relationship between SES and SRH is well documented in the literature, which consistently shows a higher level of poor health for people with a lower educational level, occupational category, or income.[10 ;24 ;39 ] The result from the EQLS data covering 28 countries in Europe is in keeping with a previous study investigating educational inequalities in health in 22 European countries and showing ORs of 1.65 and 1.81 for the lowest educated men and women respectively.[13 ]

Significant differences in SRH were observed between countries. Our study showed that the prevalence of poor health was higher in the eastern countries compared to others for both genders, as other studies had already demonstrated for both morbidity and mortality.[5 ; 43 ;44 ] A differential reporting of SRH across countries may also be suspected due to cultural differences for example. Occupational differences in health were found in almost all countries.

Differences between genders were observed for SES, SRH, and mediating factors, and this reinforces the relevance of studying each gender separately. In terms of social inequalities in health, no difference was found between genders, the magnitude of these inequalities being similar for men and women. Some previous studies have reported however that social differences in health were more pronounced in men than in women.[24 ;37 ] Our study also showed that gender-specific factors may play a role in explaining social inequalities in health, such as trust level and quality of public services among men, and access to medical services among women.

In this study, strong social gradients were found for almost all mediating factors. This is in agreement with previous studies showing that low SES groups are more likely to be exposed, for example, to high material deprivation, low decision latitude, or high job insecurity than higher SES groups.[22 –24 ] Some exceptions may be worth noting such as the occupational factors of psychological demands, working hours, and responsibility for others. Other studies have underlined the inverse social gradient for psychological demands.[23 ;32 ; 33 ;35 ]

Previous studies have explored material,[19 ;20 ;22 ;24 ;34 ;36 ] psychosocial,[19 ;20 ;29 ] and/or occupational factors[23 ;24 ;26 ;27 ; 31 –35 ;37 ;40 ] as mediators for social inequalities in health, but the studies exploring several dimensions at the same time are relatively rare.[19 ;20 ;23 ;24 ;34 ;36 ;37 ;39 ]

In our study, material factors were the set of mediators that contributed the most to reduce social inequalities in health, confirming previous results at national levels.[18 ;19 ] Material deprivation played the biggest role in the explanation of these inequalities for both genders, and this result was consistent with existing literature.[34 ] Financial problems also accounted for a substantial part of the observed differences, as previously reported by other authors studying educational differences in mortality in the Netherlands.[19 ;36 ] Housing conditions, quality of public services (men only), and access to medical services (women only) were also found to contribute to occupational differences in health in our study.

Occupational factors contributed to the social differences in health for men and women substantially. Important mediators were reward, dangerous working conditions, and economic activity -that may be an indirect marker of working conditions or occupational exposures-, and also decision latitude and job insecurity (women only). Previous studies have demonstrated the contribution of

occupational factors, especially decision latitude and various markers of ergonomic/physical/chemical exposures, in the association between social class and health.[24 ;31 –33 ;35 ;38 ] Studies reported that 50–74% of occupational differences in health for men and 38–51 % for women were explained by these factors.[32 ;35 ] Job insecurity was reported as a mediator of social inequalities in self-reported health in a previous study in Spain.[24 ] In the present study, reward was also found as a mediator for social inequalities in health, something never reported before.

Psychosocial factors also contributed to reduce social inequalities in health although to a lesser magnitude than the two other sets of mediators. Social exclusion was the factor which contributed the most to the reduction of inequalities, a finding never reported before. Our results were in agreement with studies showing the contribution of social support to social inequalities in health.[37 ] Our findings suggest that trust level may be an additional mediator in social inequalities in health.

The retained mediating factors in our final models were able to explain social differences in SRH by 100% in men and by 78% for women, the final ORs being finally non significant. A previous study[21 ] exploring simultaneously physiological, biological, and behavioural factors observed a reduction of the educational differences in SRH by 40% in a population of Danish employees. The contribution of material, psychosocial, and behavioural factors was also explored in a recent study from South Korea, tending to explain 56.5–77.5% of occupational inequalities in all-cause mortality, for men and women together.[20 ] Material, psychosocial, behavioural, and biomedical factors contributed to reduce social inequalities in mortality by 73–83% in a Norwegian sample.[18 ] Social inequalities in mortality were explained by 100% by material, psychosocial, and behavioural factors in the Netherlands.[19 ]

### **Limitations and strengths**

The response rate (58.4%) in the 2003 EQLS may be considered as low,[41 ] and differed across countries. Consequently, it may be difficult to evaluate the impact on the results. However, previous studies reported that non-participants may be more likely to belong to low social groups, to have poor health behaviours and health outcomes,[45 ] and such a bias may lead to underestimate the prevalence of health outcomes as well as the association between SES and health outcomes. This cross-sectional study was necessarily restricted to working men and women. A selection bias may have occurred, i.e. workers in poor health may have changed or left their job and/or healthier workers may be more likely to work in more difficult jobs. Thus, the associations between work factors and health outcome may be underestimated as well as the contribution of these factors to social inequalities in health. The relative importance of material and psychosocial mediators might be different if the population studied was the whole population, and not only the working population. This study did not take into account lifetime exposure to the different mediating factors. This may lead to an underestimated contribution of the mediating factors to social inequalities in health.[31 ] Some mediating factors may have been neglected in this study; this may be especially the case for behavioural factors (e.g. smoking, alcohol consumption, physical activity) which may play a role in the explanation of social inequalities in health.[23 ;30 ] However, behavioural factors may also be consequences of material, occupational, and psychosocial mediators, and consequently their independent effects may be low, as underlined by others previously.[19 ] All variables studied were based on self-reports. The use of SRH might introduce a reporting bias in our study, but a previous paper[46 ] showed that measurement errors were limited and SRH may have many advantages as a summary health measure. Furthermore, authors have reported that the use of SRH may lead to underestimate social inequalities in health, and not the reverse.[47 ]

The use of a large scale and comparable data across Europe allowed us to study each gender separately and to avoid problems of data comparability between countries.[2 ;7 ] An additional advantage of this study was to be based on face-to-face interviews. Our study was also able to determine the specific mediators of social inequalities for each gender. Our study aimed at describing social inequalities in health and also at determining mediating factors of these inequalities. For this purpose, three different sets of mediating factors were studied, each containing various variables. The relative contributions of material and psychosocial mediators were confirmed in additional analyses using education as a SES marker. However, these analyses were less powerful to identify occupational mediators, maybe because education is a more general SES marker than occupation.

### **Conclusion**

Overall, this study sheds some light on the factors that may mediate social inequalities in health among working men and women in Europe. It emphasises the disadvantages experienced by manual workers and some categories of service workers. This study also underlines the need to address material deprivation, financial problems, social exclusion, -in other words all dimensions of poverty and deprivation-, as well as poor working conditions, to reduce social inequalities in health. More studies are needed to evaluate prospectively the role of a large variety of mediators in these inequalities, to better understand the underlying mechanisms linking these mediators to social inequalities in health, especially as regards specific indicators of morbidity and mortality. Finally, as the mediators and their relative contributions may differ between European countries, forthcoming studies should also focus on contextual factors that may contribute to a better understanding of social inequalities in health in Europe.

### **What is already known on this subject**

- There are social inequalities in health in various European countries
- Explanations for social inequalities in health have been reported but studies exploring a large range of mediating factors are still lacking.
- Explanatory studies using European harmonised data are also missing.

### **What this study adds**

- Social inequalities in self-reported health have been found for both men and women across Europe.
- Selections of mediators covering material, occupational, and psychosocial aspects were able to explain these inequalities by 100% and 78% respectively for men and women.
- The strongest mediators were those related to material deprivation, financial problems, social exclusion, and various working conditions underlying the importance of material and occupational factors.
- Some specific mediators were found according to gender.
- Preventive actions focusing on these mediators may contribute to reduce social inequalities in health.

### **Appendix– Countries and codes in EQLS 2003**

<b>Countries</b>	<b>Codes</b>
Austria	AT
Belgium	BE
Bulgaria	BG
Cyprus	CY
Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	GR
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Malta	MT
Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
Turkey	TR
United Kingdom	GB



## Footnotes:

Competing interests: None.

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**Table 1**

Prevalence of self-reported health according to age, occupation, and mediating factors

	Men (N=6038)			Women (N=6383)		
	N	%	% poor health	N	%	% poor health
<b>Self-reported health</b>						
good	4887	81.14		4896	76.91	
poor	1136	18.86		1470	23.09	
<b>Age group</b>			****			****
[18;30[	1270	21.03	11.45	1369	21.45	13.54
[30;40[	1693	28.04	13.27	1897	29.72	17.49
[40;50[	1643	27.21	21.86	1727	27.06	26.57
50 or more	1432	23.72	28.58	1390	21.78	35.84
<b>Socioeconomic status (SES) - Occupation</b>			****			****
managers, professionals	603	10.06	14.81	675	10.69	20.72
technicians and associate professionals	1964	32.77	16.36	1843	29.19	19.99
clerical support workers	410	6.84	13.27	1033	16.36	19.92
service and sales workers	900	15.02	18.04	1269	20.10	21.98
manual workers	2116	35.31	23.87	1493	23.65	30.94
<b>Psychosocial factors</b>						
<b>Marital status</b>			****			****
married or living with partner	4128	69.05	20.44	4058	64.06	22.55
never married and not living with partner	1335	22.33	12.25	1101	17.38	16.92
separated or widowed	515	8.61	23.69	1176	18.56	30.66
<b>Number of children</b>			****			****
no child	2031	34.14	13.43	1675	26.57	17.10
at least one child	3918	65.86	21.77	4628	73.43	25.21
<b>Unpaid work</b>			NS			****
Q1	2106	34.88	17.55	1000	15.67	19.52
Q2	1697	28.11	19.98	1619	25.36	22.89
Q3	1042	17.26	20.62	836	13.10	29.46
Q4 (high)	1193	19.76	18.07	2928	45.87	22.60
<b>Work life imbalance</b>			****			****
Q1	1439	25.16	15.03	1265	20.75	15.43
Q2	1490	26.05	14.31	1585	26.00	18.29
Q3	1604	28.04	20.04	1826	29.95	24.53
Q4 (high)	1187	20.75	27.48	1420	23.29	32.65

Social support			****			****
high	4907	86.86	17.19	5304	88.15	19.94
low	742	13.14	26.22	713	11.85	42.08
Social network			NS			*
Q1	1060	18.06	18.21	1456	23.34	21.43
Q2	1863	31.74	18.84	2019	32.37	22.09
Q3	1363	23.22	17.90	1394	22.35	22.74
Q4 (low)	1584	26.98	20.52	1368	21.93	26.54
Social participation			*			*
more than one activity	3294	8.03	14.92	467	7.43	19.27
one activity	2181	36.64	19.93	2455	39.04	22.39
none	478	55.33	18.81	3366	53.53	24.18
Trust level			****			****
confident	3817	72.31	16.41	4054	73.05	20.40
not confident/careful	1462	27.69	23.07	1496	26.95	27.56
Social exclusion			****			****
Q1	1615	28.78	12.01	1715	29.25	13.00
Q2	1436	25.59	17.55	1554	26.51	19.18
Q3	1282	22.84	19.50	1321	22.53	25.89
Q4 (high)	1279	22.79	26.82	1273	21.71	36.06
<b>Material factors</b>						
Housing conditions			****			****
0 problem	3832	64.22	15.50	3874	61.42	19.44
1 problem	1351	22.64	21.76	1568	24.86	24.74
2 problems or more	784	13.14	29.59	865	13.71	36.18
Crowding			***			****
<1	3253	55.03	17.09	3471	55.39	20.66
≥1	2658	44.97	21.14	2796	44.61	25.89
Material deprivation			****			****
no deprivation	3350	59.71	13.52	3122	53.22	14.07
1–2 deprivations	1078	19.22	20.48	1243	21.19	24.32
3–5 deprivations	779	13.89	29.29	1035	17.64	33.24
6 deprivations or more	403	7.18	32.75	466	7.94	48.37
Financial problems			****			****
no	4417	76.01	15.96	4481	73.10	18.34
yes	1394	23.99	28.60	1649	26.90	35.85
Neighbourhood problems						

			***			****
Q1	1880	32.20	15.70	1808	29.46	17.41
Q2	1150	19.70	19.60	1158	18.87	20.35
Q3	1580	27.06	20.70	1705	27.78	24.87
Q4 (high)	1229	21.05	20.26	1466	23.89	29.07
Quality of public services			****			****
Q1	1336	27.12	14.69	1417	27.95	16.58
Q2	1194	24.23	16.67	1175	23.18	21.08
Q3	1242	25.21	20.18	1350	26.63	26.21
Q4 (low)	1155	23.44	23.28	1128	22.25	29.47
Access to medical services			****			****
Q1	2358	47.26	14.86	2290	41.67	17.13
Q2	710	14.23	20.14	861	15.67	21.74
Q3	1036	20.77	25.29	1284	23.37	28.81
Q4 (low)	885	17.74	28.68	1060	19.29	33.59
<b>Occupational factors</b>						
Economic activity			****			****
fishing/agriculture	307	5.87	26.06	157	2.79	29.49
industry	1186	22.66	22.03	727	12.93	29.70
construction	711	13.58	18.48	111	1.97	18.02
service	3030	57.89	17.23	4628	82.30	22.07
Number of hours per week			***			***
less than 32 hours	414	7.12	23.49	1420	22.90	21.51
32–48	3903	67.11	17.56	4063	65.53	22.67
more than 48 hours	1499	25.77	20.76	717	11.56	28.67
Daily commuting time			**			*
less than 60 minutes	4058	74.60	21.35	4384	76.08	25.40
60 minutes or more	1382	25.40	17.84	1378	23.92	21.83
Dangerous working conditions			****			****
no	3535	59.70	15.33	4742	76.20	20.69
yes	2386	40.30	23.90	1481	23.80	30.56
Job insecurity			****			****
low	4963	87.21	17.42	5156	86.35	21.13
high	728	12.79	25.76	815	13.65	35.02
Psychological demands			**			****
low	3052	51.68	17.49	3590	58.02	20.79
	2854	48.32	20.04	2598	41.98	26.00

high						
Decision latitude at work			**			****
high	3223	54.55	17.03	3329	53.68	20.43
low	2685	45.45	20.60	2872	46.32	25.94
Reward			****			****
high	3371	57.64	14.70	2917	47.45	17.11
low	2477	42.36	24.34	3230	52.55	28.22
Responsibility for supervising others			NS			**
no	3547	59.57	19.04	4591	72.87	24.01
yes	2407	40.43	18.68	1709	27.13	20.87

Chi-square test:

\* : p<0.05;

\*\* : p<0.01;

\*\*\* p<0.001;

\*\*\*\* p<0.0001

Q1, Q2, Q3, Q4: quartiles of scores in the whole sample

Other variables (household tenure, work contract, and additional paid job) were not significantly associated with self-reported health

**Table 2**

Differences in response rate, self-reported health, occupation, and association between occupation and self-reported health between countries

Country	AT	BE	BG	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SK	SI	ES	SE	TR	GB	p
<b>Response rate (%)</b>	63.9	70.4	81.0	82.4	75.1	52.4	68.8	91.2	83.4	91.2	39.6	75.1	32.5	63.1	72.8	64.1	66.1	91.0	62.0	66.4	59.8	55.7	51.0	61.6	30.3	53.6	37.0	79.2	
<b>MEN</b>																													
<b>Poor self-reported health (%)</b>	13.8	14.8	18.3	2.4	18.0	8.5	44.5	22.2	13.1	22.6	7.4	26.9	6.7	5.2	42.8	42.5	18.4	11.1	23.1	30.7	30.4	27.5	10.5	22.8	13.6	18.6	18.6	16.0	****
<b>Occupation (%)</b>																											****		
Managers, professionals	13.5	7.5	5.3	12.2	8.6	11.3	16.0	9.4	11.6	12.2	7.8	6.0	6.3	18.2	10.9	11.0	14.9	10.8	4.5	6.4	3.7	12.2	7.3	7.4	11.4	17.0	5.4	16.7	
Technicians and associate professionals	38.3	46.5	30.3	42.1	29.8	27.6	29.4	33.7	36.0	34.8	41.2	23.6	30.5	38.7	24.0	24.7	30.5	39.7	33.5	24.8	29.4	25.9	28.9	26.2	31.4	33.2	38.4	36.8	
Clerical support workers	8.5	5.8	0.8	1.2	4.9	9.6	0.0	7.9	6.0	6.4	8.3	2.8	3.4	12.5	1.1	0.9	16.1	16.7	16.6	3.5	7.3	2.1	7.3	12.1	6.4	3.2	3.5	7.5	
Service and sales workers	11.7	12.8	14.4	20.1	19.6	15.1	16.8	21.8	15.4	7.8	14.6	16.5	7.4	15.7	21.7	16.4	10.9	13.2	18.1	5.9	16.1	20.6	17.9	12.1	16.5	21.9	12.8	5.8	
Manual workers	28.0	27.4	49.2	24.4	37.1	36.4	37.8	27.2	31.1	38.7	28.1	51.1	52.4	14.9	42.3	47.0	27.6	19.6	27.2	59.4	43.6	39.2	38.6	42.3	34.3	24.7	39.9	33.3	
<b>WOMEN</b>																													
<b>Poor self-reported health (%)</b>	16.2	16.6	28.6	1.8	19.6	13.5	44.1	21.6	18.0	17.3	10.3	28.5	7.3	6.4	55.7	58.1	20.3	24.6	22.3	29.4	40.6	40.4	10.8	25.8	14.9	20.9	27.1	13.4	****
<b>Occupation (%)</b>																											****		
Managers, professionals	11.6	7.0	8.4	9.0	8.9	7.8	18.1	7.0	10.1	11.9	4.9	16.8	10.9	13.2	16.9	20.2	6.5	10.0	4.9	7.2	3.8	19.1	10.4	16.3	10.6	7.1	12.9	10.1	
Technicians and associate professionals	20.1	50.2	34.7	44.9	18.9	21.1	24.2	26.8	35.3	22.9	36.8	19.4	28.6	39.8	30.5	27.0	24.6	34.2	19.3	29.3	23.1	20.6	24.6	22.4	33.5	43.7	44.3	30.7	
Clerical support workers	23.1	12.1	8.8	0.6	19.3	18.4	5.5	23.7	14.0	26.2	15.1	15.7	14.5	24.1	11.0	7.3	26.1	31.7	24.2	18.6	12.8	12.9	19.7	19.7	12.8	10.9	14.3	16.8	
Service and sales workers	25.8	14.4	9.6	29.9	24.8	34.0	24.2	34.5	28.4	29.4	15.7	13.4	16.1	9.8	15.1	16.1	13.8	16.7	38.5	4.8	11.5	17.5	21.4	10.9	11.7	27.0	2.9	13.9	
Manual workers	19.4	16.3	38.6	15.6	28.2	18.8	28.0	8.0	12.1	9.6	27.6	34.7	29.8	13.2	26.5	29.4	29.0	7.5	13.1	40.1	48.7	29.9	24.0	30.6	31.3	11.2	25.7	28.5	
<b>OR of poor health <sup>a</sup></b>	2.58 *	2.03	4.96 *	1.23	2.62	1.21	2.35	2.83 *	1.47	3.24 *	3.65	2.53 *	2.10	8.02	1.51	1.74	10.91	0.52	1.92	3.09 *	1.50	2.85 *	3.10	3.24 *	0.91	1.17	0.80	1.47	

For country codes, see appendix

Chi-square test/logistic regression analysis:

\* : p&lt;0.05;

\*\* : p&lt;0.01;

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

\*\*\*\* p&lt;0.0001

<sup>a</sup> OR adjusted for sex and age (manual workers vs managers), each country being studied separately**Table 3**

Mediating factors according to occupational groups

%	Men						Women						
	Professionals, managers	Technicians, associate professionals	Clerical support workers	Service, sales workers	Manual workers	P-value	Professionals, managers	Technicians, associate professionals	Clerical support workers	Service, sales workers	Manual workers	P-value	
<b>Material factors</b>													
Tenant tenure)	(household	25.25	28.29	28.92	36.82	35.22	****	27.83	28.42	30.44	38.02	34.93	****

High level of housing problems	7.24	9.36	10.10	13.79	18.78	****	10.78	10.59	10.33	14.31	20.73	****
Overcrowding	33.39	39.13	34.32	51.02	53.61	****	38.02	39.91	41.76	42.64	56.90	****
High material deprivation	2.08	3.08	1.29	5.78	14.55	****	5.28	3.53	4.77	7.37	17.54	****
Financial problems	15.52	17.91	12.76	25.95	33.38	****	22.95	21.20	21.34	27.60	39.45	****
High level of neighbourhood problems	22.11	22.36	22.56	22.30	18.98	*	28.04	26.31	22.24	20.62	23.17	****
Low quality of public services	20.36	22.11	19.71	23.17	26.89	**	21.62	21.84	21.73	18.81	27.12	****
Low access to medical services	12.09	15.27	17.26	20.08	21.26	****	18.93	18.97	17.58	15.10	25.18	****
<b>Occupational factors</b>												
Economic sectors						****						****
fishing/agriculture	2.89	2.03	0.85	2.48	12.49		2.08	1.64	1.88	0.26	7.42	
industry	12.16	18.36	18.64	10.19	34.99		6.07	6.03	14.17	3.59	32.55	
construction	10.10	10.89	4.80	4.97	22.08		1.91	1.58	4.76	0.51	1.95	
service	74.85	68.72	75.71	82.36	30.44		89.95	90.74	79.18	95.64	58.08	
Temporary contract	14.98	11.16	15.97	25.98	27.06	****	13.24	16.79	17.12	25.22	27.04	****
More than 48h per week	32.53	32.98	10.42	23.39	21.38	****	17.81	14.39	4.22	9.10	12.42	****
Daily commuting time ≥ 60 min	25.75	23.89	28.72	23.85	26.86	NS	26.51	24.25	27.82	20.61	22.50	***
Dangerous working conditions	22.22	29.66	14.89	47.40	57.31	****	18.47	19.25	12.33	28.88	35.81	****
High job insecurity	9.14	8.65	8.14	13.80	18.48	****	10.28	11.49	11.89	11.89	21.05	****
High psychological demands	53.94	52.45	44.67	44.77	45.08	****	49.85	48.16	38.32	35.20	38.76	****
Low decision latitude	25.88	28.65	48.14	54.70	62.49	****	27.49	32.69	49.70	47.45	69.12	****
Low reward	21.84	31.09	32.27	48.86	57.71	****	38.40	43.52	44.84	60.31	69.40	****
Responsibility for supervising others	61.11	61.82	34.32	25.87	21.99	****	46.03	40.75	20.55	20.62	12.04	****
Additional paid job	12.61	7.95	6.90	7.42	6.60	****	9.08	8.6	6.34	6.87	4.29	****
<b>Psychosocial factors</b>												
Separated or widowed	10.15	8.38	7.16	7.87	9.06	****	18.48	17.91	17.04	20.40	18.87	NS
At least one child	67.84	69.13	54.79	65.35	65.07	****	70.40	71.14	70.87	76.24	76.81	****
High unpaid work	20.23	20.32	22.44	21.22	18.10	*	44.74	45.31	43.95	47.52	46.75	**
Work life imbalance	18.84	20.69	12.78	20.80	23.11	****	25.42	23.47	17.66	21.44	27.69	****



Low social support	11.07	11.41	8.70	13.38	16.04	****	9.77	10.03	8.04	11.90	17.44	****
Low social network	26.35	25.04	27.05	25.58	29.87	*	22.51	21.08	21.71	19.09	25.00	***
No social participation	43.54	51.68	52.94	59.37	60.73	****	45.37	46.42	57.21	57.09	60.76	****
Not confident (trust level)	22.32	23.98	19.29	31.23	33.45	****	22.65	24.92	24.92	27.36	33.25	****
Social exclusion	12.52	17.31	18.80	23.99	31.37	****	13.41	17.12	21.23	22.72	31.11	****

Chi-square test:

\* : p<0.05;

\*\* : p<0.01;

\*\*\* p<0.001;

\*\*\*\* p<0.0001.

Chi-square test performed on variables as described in Table 1 .

**Table 4**

Contribution of mediating factors to social inequalities in health: results from multilevel logistic regression analysis

	Men		Women	
	Poor health		Poor health	
	OR <sup>a</sup> (95% CI)	% <sup>b</sup>	OR <sup>a</sup> (95% CI)	% <sup>b</sup>
Model 1	<b>1.89</b> (1.46–2.46)		<b>2.18</b> (1.71–2.77)	
<b>Material factors</b>				
Model 1 + housing conditions	<b>1.80</b>	10 <sup>c</sup>	<b>2.08</b>	8 <sup>c</sup>
Model 1 + crowding	<b>1.91</b>	–2	<b>2.16</b>	2
Model 1 + material deprivation	<b>1.39</b>	56 <sup>c</sup>	<b>1.60</b>	49 <sup>c</sup>
Model 1 + financial problems	<b>1.65</b>	27 <sup>c</sup>	<b>1.84</b>	29 <sup>c</sup>
Model 1 + quality of public services	<b>1.76</b>	15 <sup>c</sup>	<b>2.20</b>	–2
Model 1 + access to medical services	<b>1.86</b>	3	<b>2.00</b>	15 <sup>c</sup>
Model 1 + MATERIAL FACTORS	1.21 (0.88–1.65)	76	<b>1.48</b> (1.11–1.97)	59
<b>Occupational factors</b>				
Model 1 + economic activity	<b>1.79</b>	11 <sup>c</sup>	<b>2.09</b>	8 <sup>c</sup>
Model 1 + dangerous working conditions	<b>1.71</b>	20 <sup>c</sup>	<b>2.01</b>	14 <sup>c</sup>
Model 1 + job insecurity	<b>1.86</b>	3	<b>2.08</b>	8 <sup>c</sup>
Model 1 + decision latitude	<b>1.84</b>	6 <sup>c</sup>	<b>2.00</b>	15 <sup>c</sup>
Model 1 + reward	<b>1.66</b>	26 <sup>c</sup>	<b>2.00</b>	15 <sup>c</sup>
Model 1 + OCCUPATIONAL FACTORS	<b>1.43</b> (1.05–1.95)	52	<b>1.77</b> (1.33–2.36)	35
<b>Psychosocial factors</b>				

Model 1 + social support	<b>1.78</b>	12 <sup>c</sup>	<b>2.04</b>	12 <sup>c</sup>
Model 1 + social network	<b>1.91</b>	-2	<b>2.17</b>	1
Model 1 + social participation	<b>1.88</b>	1	<b>2.16</b>	2
Model 1 + trust level	<b>1.74</b>	17 <sup>c</sup>	<b>2.24</b>	-5
Model 1 + social exclusion	<b>1.61</b>	31 <sup>c</sup>	<b>1.78</b>	34 <sup>c</sup>
Model 1 + PSYCHOSOCIAL FACTORS	<b>1.48</b> (1.09–2.00)	46	<b>1.66</b> (1.27–2.17)	44
<b>Model 1 + material and occupational factors</b>	1.08 (0.75–1.56)	91	1.32 (0.94–1.85)	73
<b>Model 1 + material and psychosocial factors</b>	1.11 (0.79–1.56)	88	<b>1.40</b> (1.03–1.91)	66
<b>Model 1 + occupational and psychosocial factors</b>	1.17 (0.82–1.66)	81	<b>1.51</b> (1.11–2.07)	57
<b>Model 1 + material, occupational, and psychosocial factors</b>	1.00 (0.67–1.49)	100	1.26 (0.88–1.80)	78

<sup>a</sup> OR for manual workers adjusted for age (reference group: managers/professionals)

<sup>b</sup>  $(OR_{\text{model 1}} - OR_{\text{extended model}}) / (OR_{\text{model 1}} - 1)$

<sup>c</sup> Factors with a contribution > 5% included in extended models

Bold OR: significant at 5%