ORIGINAL ARTICLE

How consistently distributed are the socioeconomic differences in severe back morbidity by age and gender? A population based study of hospitalisation among Finnish employees

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Aims: To study the socioeconomic distribution of severe back morbidity by age and gender, and to examine to what extent the differences in back morbidity between socioeconomic groups are particularly related to manual work in different age groups.

Methods: Hospital admissions in 1996 for back disorders of 25–64 year old men (3123 of a total 743 961) and women (3043 of 773 936) from the Finnish Hospital Discharge Register were linked with demographic and socioeconomic data from the 1995 population census. Poisson regression analysis was used to calculate the rate ratios for back related hospitalisation by occupational class and education. The distribution of cases according to occupational status and education was presented in relation to the whole occupationally active workforce by age and gender.

Results: Blue-collar (manual) workers had a higher risk of being hospitalised because of back disorders compared with white-collar employees (non-manual) in all age groups among both genders. Manual work versus non-manual work was associated with a 1.3 to 1.4-fold risk (95% CI 1.0 to 1.8) among women and a 1.3 to 1.6-fold risk (95% CI 1.1 to 2.2) among men. The risk of hospitalisation was further inversely associated with educational level within manual and non-manual work in all other age groups except in those aged 55–64 years. Gender related differences were much smaller compared with the socioeconomic ones.

Conclusions: Socioeconomic differences in back morbidity leading to hospitalisation were consistent by age and gender. The results suggest that not only the physical strenuousness of work, but also other causes of severe back disorders are clustered around a subject's socioeconomic status, indicated by formal education. This may have implications for prevention and the planning of rehabilitation.

Back pain is one of the most common complaints in western societies, the annual estimated prevalence rates being around 15–45%.[1] Back problems are relatively unusual among children, but become more prevalent in adolescents.[2] Hospitalisation for back disorders is an uncommon event. In 1996 about 0.4% of occupationally active Finns aged 25–64 years were admitted to hospital because of a back disorder.[3]

Evidence has accumulated on the role of physically heavy work, especially manual materials handling, twisting, bending, and whole-body vibration as risk factors for back disorders.[4–6] In addition, mental stress and psychosocial factors at work,[7 8] as well as lifestyle related factors, such as smoking and being overweight, have been suggested to be associated with back pain.[9 10] People in physically strenuous occupations had an increased risk of being hospitalised because of a back disorder.[3] It is obscure, however, to what extent these differences in back morbidity between occupations are particularly related to manual work.

The study results concerning socioeconomic differences and back pain have been inconsistent and varied between men and women, and little information exists on the age distribution of such differences. Several studies have nevertheless found an increased risk because of back disorders for manual workers compared with non-manual workers.[11–15] There also seems to exist a consistent pattern of occurrence of back pain by the level of education.[16] Particularly, people with low education are more likely than those with high education to be affected by disabling back pain.[12 14 17 18] Lumbar intervertebral disc operation rates in Finland have been shown to increase with decreasing educational level among both men and women.[19 15]

In a previous study[15] we found that occupational status and education were associated with hospitalisation for lumbar intervertebral disc disorders in a multivariate analysis, which was not stratified by age and gender. The primary interest here is to examine to what extent severe back morbidity in general is simultaneously related to manual work and education, and whether such socioeconomic stratification is consistently distributed by age and gender. Therefore, we performed analyses separately for different age groups among men and women. Our study offers a general view of the distribution of severe back disorders by occupational status and education in different age groups among both genders in the total Finnish working population.

MATERIALS AND METHODS

Data on hospital admissions caused by back disorders during the year 1996 were obtained from the Finnish Hospital Discharge Register, which gathers comprehensive information on individual patients' hospital admissions in all Finnish hospitals. The hospitals in Finland are, with few exceptions, owned and run by clusters of municipalities. The main sources of referral to hospital treatment are the public primary health care centres and occupational health services.

Table 1 Risk for hospitalisation because of back disorders during a year in a total population of Finnish employees aged 25–64 years

	Age-group		25–34		35–44		45–54		55–64	
	Whole population	Hospitalised	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Men										
Years of formal education										
⩽9	189789	1106	1		1		1		1	
10–12	390755	1607	0.9	0.7–1.1	0.8	0.7–0.9	0.8	0.8–0.9	0.9	0.7–1.2
>12	165118	410	0.5	0.3–0.7	0.6	0.5–0.7	0.6	0.5–0.7	0.8	0.6–1.2
Occupational status										
White-collar	368110	1176	1		1		1		1	
Blue-collar	377552	1947	1.3	1.0–1.6	1.4	1.3–1.6	1.4	1.2–1.5	1.4	1.1–1.8
n	745662	3123	616		1111		1122		274	
Women										
Years of formal education										
⩽9	195146	1025	1		1		1		1	
10–12	405574	1555	0.8	0.5–1.2	0.8	0.7–0.9	1.00	0.9–1.1	0.9	0.7–1.2
>12	175627	463	0.5	0.3–0.9	0.6	0.5–0.8	0.8	0.6–0.9	1.1	0.9–1.3
Occupational status										
White-collar	583259	2028	1		1		1		1	
Blue-collar	193088	1015	1.6	1.2–2.2	1.4	1.2–1.6	1.3	1.1–1.4	1.3	1.1–1.5
n	776347	3043	396		989		1314		344	

Poisson regression analyses. Rate ratios (RR) and 95% confidence intervals (CI), occupational status, formal education, personal income, and marital status simultaneously in the model.

Particularly in the larger cities, referral also takes place via the private sector.

The discharge register contains demographic, clinical, and administrative data, dates of admission and discharge, and primary and subsidiary diagnoses. The discharge files also contain the patient's personal identification code that can be used for data linkages within the register and with other administrative databases. It has been estimated that in the late 1980s the register covered about 95% of all hospital discharges.[20] The accuracy of most of the main items has been evaluated to be high when compared with the hospital records of patients.[21]

Classification of back disorders

Categorisation of the hospital discharge data is based on the International Classification of Diseases, 10th revision (WHO 1992). We analysed the diagnoses M40.0–M54.9, which refer to back diseases. Only primary diagnoses were considered. Of all back related diagnoses, 52.7% (men 54.7%) referred to lumbar intervertebral disc disorders (codes M51.1–M51.9), 15.3% (men 15.1%) to lumbago or other back pain syndromes (M54.4, M54.5, M54.8, and M54.8), 12.7% (men 12.2%) to spondylosis or spinal stenosis (M47.1, M47.2, and M47.8–M480), 5.5% (men 5.1%) to sciatica (M54.3), 4.3% (men 4.3%) to cervical disc disorder with radiculopathy (M50.1), 1.9% (men 1.7%) to spondylolisthesis (M43.1), 1.5% (men 1.9%) to cervicalgia (M54.2), 1.1% (men 1.0%) to radiculopathy (M54.1), and other diagnoses comprised 5% (men 4%) of the hospital admissions. Of the people studied, 10.6% had also a secondary diagnosis and 4.2% a third diagnosis. Of secondary diagnoses, 46.7% referred to back disorders (M40.0–M54.9).

Socioeconomic indicators

Information on the socioeconomic status of the patients hospitalised due to back disorders was obtained from the 1995 Population Census, which was also used for data on the population at risk. For the study, Statistics Finland linked individually the patients' 1996 discharge data to their census records using personal identification codes. The linked data set was delivered without personal identification to the Finnish Institute of Occupational Health. We analysed the subjects aged 25–64 years and employed in the end of 1995.

Education

The classification of education in the 1995 Population Census was based on the International Standard Classification of Education (ISCED). For the study, education was classified into three levels according to the highest qualification achieved, corresponding to about 1–9 years (low), 10–12 years (intermediate), or over 12 years (high) of formal education.

Occupational status

Occupational status was classified by Statistics Finland and it is based on occupation and vocational branch.[22] The category of blue-collar employees comprised specialised and non-specialised manual wage earners and the category of white-collar workers included upper and lower white-collar wage earners. Classification of occupational class is independent of education.

Personal income

Information on income in the census came originally from the 1995 taxation register. We classified the annual personal income after taxation into tertiles.

Marital status

Marital status was classified into three categories: unmarried, married, and divorced/widowed. An earlier study on marital status and healthcare use showed that divorced people had an increased risk of being hospitalised compared with married people, after controlling for a number of health indicators and sociodemographic variables.[23] Likewise, personal income may influence one's likelihood of using the healthcare system.[15] We therefore took these factors into account as covariates in the analyses.

Statistical methods

We calculated the rate ratios for occupational status and education for each age group separately for men and women, adjusting for personal income and marital status. Poisson regression models were fitted to the data using the Genmod procedure of the SAS 8.2 software (SAS Institute Inc, Cary, NC, USA). Rate ratios and 95% confidence intervals (95% CI) were calculated. The first category of each independent variable was the reference group. The dependent variable was

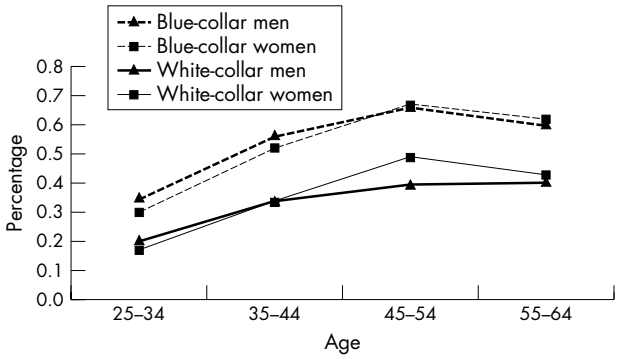

Figure 1 Proportion of subjects hospitalised for back disorders in 1996 among the total Finnish employed population, by age and occupational status.

the first occurrence of hospitalisation because of any back disorder in 1996 (table 1). Thereafter, we examined the age related distribution of back disorders in relation to the whole occupationally active workforce by occupational status, education, and gender. We calculated the population rates of hospitalisation for four age groups, first, by occupational status and gender (fig 1), and secondly, by occupational status and education separately for men (fig 2A) and for women (fig 2B), and presented them as percentages (hospitalised persons/whole population ×100).

RESULTS

In Finland, 0.42% of male and 0.39% of female employees aged 25–64 years were hospitalised for back disorders in 1996. Men had a slightly greater hospitalisation rate than women (1.08 (95% CI 1.00 to 1.16), controlling for age, marital status, education, personal income, and occupational status. In general, the distribution of different back ailments was rather similar by gender, but men had more hospitalisations due to disc disorders (presented in Materials and methods). The mean inpatient time for white-collar men was 4.8 days (SD 3.7), for blue-collar men 5.4 (SD 4.5), for white-collar women 5.5 (SD 4.7), and for blue-collar women 5.7 (5.2).

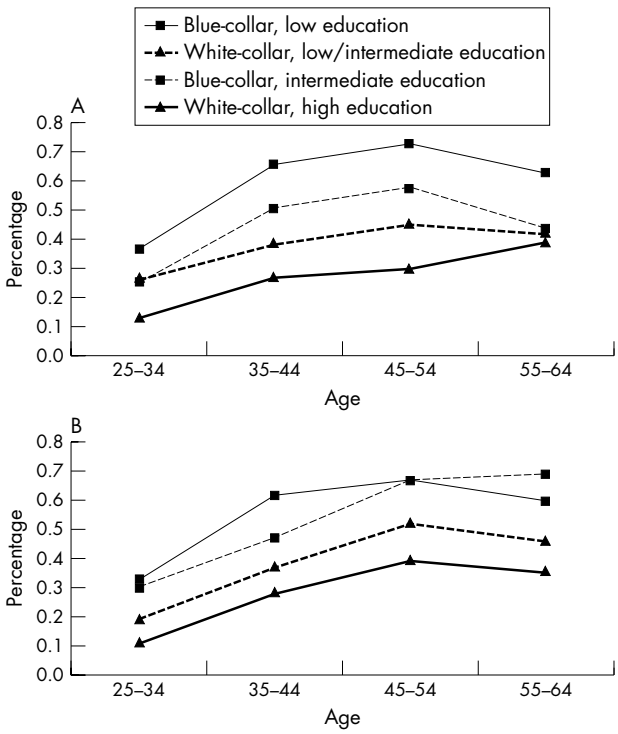

Figure 2 (A) Proportion of subjects hospitalised for back disorders in 1996 among Finnish male employees by age, occupational status, and level of education. (B) Proportion of subjects hospitalised for back disorders in 1996 among female employees by age, occupational status, and level of education.

Blue-collar work and low education were independently associated with an increased risk of back related hospitalisation in all age groups except the oldest, in which the rate ratio for education was not statistically significant (table 1). The hospitalisation rates were smaller for people with high education compared with those of low education. The association between rates for subjects with intermediate education was statistically significantly increased compared with those of low education in the age groups of 35–44 and 45–54 years among men and in those aged 35–44 years among women. The effect of occupational status was rather stable in all age groups. Personal income and marital status were accounted for in the age and gender stratified multivariate Poisson regression analysis. We also calculated the multiplicative interaction terms between occupational status and education in each multivariate analysis, the direct effects of occupational status and education included in the model, but none of them was statistically significant.

In addition, we performed multivariate analyses separately for blue and white-collar workers, to examine whether the effect of education could be different in blue-collar work than in white-collar work, but it was found to be similar. In this analysis we classified education into two categories instead of three. In blue-collar men with formal education for 10 years or more, the rate ratio of hospitalisation was 0.6 (95% CI 0.5 to 0.7) and for white-collar men 0.4 (0.3–0.6), compared with men of low education. In women the rate ratios were 0.8 (95% CI 0.7 to 0.9) and 0.6 (95% CI 0.5 to 0.7) for blue-collar and white-collar subjects, respectively.

Blue-collar workers (fig 1) had more hospitalisations than white-collar workers for both genders. Men and women in blue-collar work had similar rates of hospital admissions in every age group. Differences in admission rates among white-collar employees by gender were small until the age of 45, after which women had more admissions than men.

Figures 2A (men) and 2B (women) illustrate by age the proportion of those hospitalised for a back disorder during 1996 and by combined categories of occupational status and level of education. Blue-collar workers with a low level of education had the highest risk of being hospitalised. White-collar workers with a high education had the lowest hospitalisation rates of all, and also clearly lower ones compared with employees with an intermediate education within the same occupational status. The category of blue-collar workers with a high education was omitted because this combination is rare.

The hospital admission rates in general rose up to the age of 45–54 years and then started to fall except for the blue-collar women with intermediate education and white-collar men with high education.

DISCUSSION

In the present population based analysis of Finnish employees we found that socioeconomic differences in back morbidity leading to hospitalisation were consistently distributed by age and gender. Employees in blue-collar work or with a low education had an increased risk of being hospitalised compared with employees in white-collar work or with a higher education. Gender related differences were much smaller compared with socioeconomic ones. Similar results of self-reported back pain separately according to

education[24] and occupational status[25] by age have been found before.

An essential question here is whether the hospital admissions due to a back disorder indicate back morbidity in general and severe back morbidity in particular. Several studies have shown that the main incentive for seeking help for back pain from a general practitioner is prolonged pain and disability.[26–28] A prerequisite for hospitalisation due to a back complaint is a physician's evaluation of the need for it. Although back disorders are common, hospitalisation for them is a rare event. In a population based study of visits to a physician because of back pain in the United States, less than 2% of the patients were admitted to hospital.[29] In this study, about 0.4% of occupationally active Finns aged 25–64 years were admitted to hospital because of a back disorder during a year. According to a recent study the differences in severe back pain by socioeconomic class were not due to socioeconomic differences in healthcare use.[30] We cannot directly conclude, however, that all people in our study group suffered from a severe back disorder, but probably most of them did. The actual number of severe back disorders in Finland may nevertheless be higher than our estimate based on hospitalisations.

In this study, the hospitalisation rates varied consistently according to occupational status in every age group among both genders. There might be several explanations for these socioeconomic differences. Firstly, the gap in hospital admissions between blue-collar and white-collar workers may reflect true differences in back morbidity related to, for example, occupational factors, such as physical or psychosocial strain at work, and to non-occupational factors, such as being overweight and smoking. Secondly, it is possible that there are no differences in the incidence of back disorders but physical workload is a risk factor for progression to more severe forms of morbidity after back pain has occurred. Thirdly, there exists the possibility that there are no differences in the occurrence of back disorders but that manual workers find it more difficult to cope with any back pain when meeting physical or psychosocial demands at work, and this leads to increased use of health services. Fourthly, perhaps there are no differences in back morbidity but rather some lifestyle factors, which are more common in manual workers, worsen back disorder. Lastly, there may be no actual differences in morbidity but the evaluation of needed hospital care could be dependent on the supposed harm that the disorder causes for an individual at work. This would imply that physicians were inclined to overestimate the severity of back disorders in manual workers. However, the finding that the mean inpatient time did not differ much between manual and non-manual workers does not support this. Furthermore, it is possible that the explanation for socioeconomic differences is a combination of some of the aforementioned or relates to as yet unknown factors.

Hagen *et al* [4] studied early retirement because of back pain. They concluded that the stepwise, monotonous relation between socioeconomic position and disability retirement due to back pain, even at the higher end of the socioeconomic scale, indicates that the relation between social class and back pain disability cannot be explained solely in terms of manual versus non-manual jobs. The results of our study support this view, as back morbidity was inversely associated with educational level within blue and white-collar work in every age group except the oldest.

Aside from the physical strain, some work related psychosocial factors also tend to cluster in the lower socioeconomic strata. In our 28 year follow up study of industrial employees[31] it was found that low job control and low supervisor support together explained about one half of the difference in risk for back related hospitalisation (other than disc diseases) between white-collar and blue-collar workers.

Education is associated not only with one's work tasks, but it can also be a marker of specific personal traits such as intelligence, acquisition of adaptive skills, or awareness of risky health behaviours.[32] For example, smoking is more common among the lower educational groups.[33] Also a high body mass index often associates with low educational level.[34] It is plausible that such factors are among the mediators of the associations between education and hospital admissions for back disorders. The explanation for the stronger effect of education on back morbidity in the younger age groups may be found in the educational differences between the generations, or possibly the decreasing importance of education on back morbidity at older age.

The classification of socioeconomic status was based primarily on occupation. It has been modified especially for the statistics and research purposes of the Nordic countries. We pooled the two categories of blue-collar workers into one group and labelled them as ''manual workers'', and all the white-collar workers were labelled as ''non-manual workers''. We assumed that most of the blue-collar workers had manual and physically straining work tasks, and that most of the white-collar workers had non-manual and physically lighter tasks. This categorisation is crude but it is also clear and widely used in socioeconomic research. Socioeconomic status and education are interrelated so that a low level of education usually leads to limited occupational choices. In the Finnish working population aged 25–64 years, only 1.4% of men and 2.1% of women in manual work had education of more than 12 years. Respectively, 12.1% of men and 19.1% of women in non-manual work had education of less than nine years. The interesting result here was, however, that low education was associated with increased back morbidity in both manual and non-manual workers and not only between these occupational groups, when personal income and marital status were adjusted for.

General access to health care, regional equity, and the use of services according to need have been the central targets of Finnish health policy. These targets have mainly been achieved.[35] It has been shown that lower income groups use hospital care more than the better off who for their part receive surgical care more often than the others.[36] Income is usually strongly associated with one's work tasks and education. We found that including income and marital status into the multivariate analysis had only a slight effect on the rate ratios for hospitalisation by occupational status and education.

The strengths of this study are, firstly, that it is population based, including all occupationally active employees aged 25–64 years in Finland, and, secondly, the relatively well defined outcome variable—that is, clinically verified diagnoses at hospital level. Examining the one year incidence of hospital admissions was adequate for our principal goal—namely to describe how socioeconomic factors were associated with back related hospitalisation by age and gender.

In conclusion, our study revealed consistent socioeconomic differences in back morbidity by age and gender, and the effects by occupational status and education were independent. This may mean that not only the physical strenuousness of work but a complex set of other causes of severe back disorders as well is clustered around a subject's socioeconomic status, indicated by formal education. In order to understand the complexity of the associations and probable causative factors connected to back disorders, it is essential to know how people's position in the social hierarchy—that is, in work and private life—affects their health, and what the factors and mechanisms behind social status are. Appropriate planning for the prevention of severe back disorders, as well

as rehabilitation for employment, requires an overall picture of a worker's living conditions and lifestyle.

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