Interrelationships between education, occupational class, income and sickness absence

Kustaa Piha¹, Mikko Laaksonen¹, Pekka Martikainen², Ossi Rahkonen¹, Eero Lahelma¹

Background: Socio-economic position measures, such as education, occupational class and income, are well-known determinants of health. However, previous studies have not paid attention to mutual interrelationships between these socio-economic position measures and medically confirmed sickness absence. Methods: The study is a register-based study. The participants were municipal employees of the City of Helsinki aged 25–59 years in 2003. There were 21 599 women and 5841 men participants. Three socio-economic position measures were used, namely three-level education, four-level occupational class and gross individual income quartiles. Main outcome measure was medically confirmed sickness absence spells of 4 days or longer. Inequality indices were calculated using Poisson regression analysis. Results: High education, occupational class and individual income were all consistently associated with lower sickness absence rates among both women and men. After mutual adjustment, education and occupational class remained independent determinants of sickness absence. The association of individual income with sickness absence was practically explained by temporally preceding education and occupational class. Conclusions: Our results indicate that education and occupational class—rather than income—are strong determinants of sickness absence. Education, occupational class and income are complementary socio-economic position measures. To better inform sickness absence policy, future studies should aim to establish whether the observed socio-economic differences reflect broader differences in ill-health, lifestyle and working conditions.

Keywords: sickness absence, socio-economic status, health inequality.

Introduction

Medically confirmed sickness absence is an indicator of health and well-being among employees.¹ When compared with other generic indicators of health, medically confirmed sickness absence represents more severe health conditions and predicts disability pensions²,³ and mortality.⁴,⁵ Since sickness absence causes remarkable financial and human costs, better understanding of the production of sickness absence and its social patterning is important.

Several studies have shown that key socio-economic position measures, namely education, occupational class and income are interrelated with each other and together shape self-rated health, chronic illness and mortality.⁶,⁷ Occupational social class is one of the strongest predictors of sickness absence.⁸–¹¹ The relative strength of the effects of each socio-economic position measure tends to be different and varies between populations, countries and health outcomes¹²–¹⁴ as well as over time.¹⁵,¹⁶ In the UK, occupational class is often seen as a more important determinant compared to education, which is traditionally considered to be significant, for example, in the USA.¹⁷ Studies from Finland suggest that education might be a particularly strong socio-economic determinant of mortality, chronic illness and self-rated health, but also occupational class has shown strong associations with these outcomes.⁸,¹⁵

Several etiological processes may exist behind the associations of different socio-economic position measures with health outcomes.¹⁸ Education provides general knowledge and health-literacy, which may lead to healthier behaviours. Occupational class defines individuals’ position in the social structure and leads to different work-related physical and mental exposures. Income provides material resources and thus enables healthier decisions in everyday life. Different socio-economic position measures should not be understood as substitutes for each other but complementary indicators to be studied jointly, in order to understand their interrelationships.⁸,¹⁴,¹⁹

The different socio-economic position measures also refer to temporally different stages of the life course as education is typically achieved by early adulthood while occupational class and income are determined later.²⁰,²¹ Formal education is often a prerequisite for certain occupations and therefore strongly contributes to occupational class and consecutively income level. Previous studies have shown that interrelationships exist between different socio-economic position measures and health.⁸,¹⁵,²²,²³ These findings may suggest that a disadvantageous position may remain and accumulate over the life course and have in itself negative consequences on health. Thus the effects of one socio-economic position measure may mediate the effects of the other measures that are determined temporally earlier and explain other measures that are determined later. Only few studies on health have considered the different socio-economic interrelationships. Research needs to assess the interrelationships and relative importance of different socio-economic position measures for various health outcomes.

According to studies from various European countries, new sickness absence spells show differences by education, occupational class and income.⁹,¹⁶,²⁴–²⁷ These differences tend to be large. If all employees would be absent from work as seldom as professionals, higher educated and employees with higher income, the sickness absence levels would be much lower and the related costs only a fraction of the current costs. If interrelationships between socio-economic position measures exist, it might be more effective to allocate

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resources to interventions in early phases of the development. Previous studies have not paid attention to such pathways between different socio-economic position measures and sickness absence.

The specific aims of this study are: (i) to examine the associations of key socio-economic position measures with medically confirmed sickness absence and (ii) to assess interrelationships between the socio-economic position measures as determinants of sickness absence.

Methods

Data

This study is part of the Helsinki Health Study on health and well-being among employees of the City of Helsinki.28 The City of Helsinki is the capital of Finland with 40,000 municipal employees.29 The City of Helsinki operates mainly in health care, social welfare services, education, public transport and technical services. All permanent employees aged 25–59 years who were working full-time during the year 2003 were included in this study. Employees with part-time or secondary employment were excluded from the study. The study group included 21,599 women and 5,841 men.

Individual level information on the employees' sickness absence and its determinants was obtained from the personnel and sickness absence registers included in the information system of the City of Helsinki. The registers include precise information of all employees and their employment periods and sickness absence spells on an accuracy of 1 day. If an employee had more than one employment period during 2003, information about education, occupational class and individual income and other determinants was gathered from the longest period. All sickness absence spells of the staff of the City of Helsinki for the year 2003 were included in this study. Consecutive and overlapping sickness absence spells were combined. Only sickness absence spells covered by the actual working time were included so the time of the employment was taken into account for each employee. The outcome used was 4 days or longer sickness absence spells, for which the City of Helsinki requires a medical certification from all employees.

Educational level was classified as high, if the employee had graduated from the upper secondary school. Intermediate school and comprehensive school were classified as intermediate level. Employees with compulsory education only were classified as low education group.

Occupational class was classified into four categories according to the job title of each employee: managers and professionals, such as teachers and physicians; semi-professionals, such as nurses and foremen; routine non-manuals, such as clerical employees, child minders and home assistants; and manual workers, such as technical and cleaning workers.23

The employees were divided into income quartiles according to their monthly individual salary from the employment for the City of Helsinki. The income covers only own wage or salary and does not include income from other sources, such as secondary employment, investments or income transfers. Individual income depicts more closely the individual socio-economic position than full household disposable income.6

Methods

Age-adjusted relative risks (RRs) for each socio-economic position group were calculated using Poisson regression analysis in accordance with various sickness absence studies.3,5,11 Further analyses were made to temporally analyse consecutive socio-economic position measures together.

Also, inequality indices were calculated using Poisson regression models. In these analyses, socio-economic position indicators were used as continuous variables. In this way, a single index figure for the effect of each socio-economic position indicator on medically confirmed sickness absence was obtained. Furthermore, relative percent reduction in the index value after adding explanatory and mediating indicators was calculated. The inequality index has an interpretation as the average change in the RR of sickness absence for each step in socio-economic position indicator. Increasing the number of classes in the indicator decreases the numerical value of the index. The analyses were conducted in steps. First, the age-adjusted gross effect of each socio-economic position indicator on sickness absence was analysed. Second, each possible combination of two socio-economic position indicators was analysed to be able to assess interrelationships between these indicators. Third, the analyses were conducted with all three socio-economic position indicators to assess the net effect of each socio-economic position indicator at a time after taking account for two other socio-economic position indicators. In addition, interactions were assessed by making separate analyses in each socio-economic position indicator category at a time.

All analyses were performed separately for women and men using SAS statistical software, version 8.20

Results

About half of the study group belonged to highly educated group (table 1). Women were most often occupied in semi-professional positions while proportionally more men were managers and professionals or manual workers. Since the cut-off points for income quartiles were calculated for the genders combined, more men than women belonged to the highest income quartile.

Consistent socio-economic gradients existed showing that a high position by education, occupational class or individual income was associated with low level of sickness absence among both women and men (table 2). For each indicator, medically confirmed sickness absence was about

| Table 1 Distributions of socio-economic position measures (%) and age-adjusted average number (SA) of medically confirmed sickness absence spells per 100 person years among the staff of the City of Helsinki |
|--------------------|-----------------|-----------------|-----------------|
| Education          | Percentage  | SA a            | Percentage  | SA a            |
| High               | 53            | 51              | 50            | 33              |
| Intermediate       | 31            | 82              | 32            | 73              |
| Low                | 17            | 115             | 19            | 95              |
| Occupational class |                |                  |               |                  |
| Managers and professionals | 25          | 44              | 36            | 27              |
| Semi-professionals    | 22          | 59              | 18            | 46              |
| Routine non-manuals               | 45            | 85              | 16            | 58              |
| Manual workers        | 8             | 107             | 29            | 102             |
| Individual income     |                |                  |               |                  |
| Highest             | 21            | 48              | 40            | 33              |
| Second quartile      | 27            | 66              | 20            | 56              |
| Third quartile       | 27            | 86              | 15            | 89              |
| Lowest              | 24            | 81              | 26            | 79              |
| All                 | 71            | 71              | 57            |                  |
| Number              | 21,599       | 5,841           |                |                  |

a: Average number of medically confirmed sickness absence spells for 100 person years
Individual income and education explained 50% and occupational class nearly all of the difference by occupational class. In the final model, simultaneously adjusting for all three socio-economic position measures, practically no independent effect was left for income.

Among men, occupational class mediated 64% and income mediated 34% of the difference by education (table 3). As among women, adding income besides occupational class did not reduce the inequality index by education any further. Among men, education explained 22% of the difference by occupational class, and adjusting for income increased 9% the difference by occupational class. In the final model, simultaneously adjusting for all three socio-economic position measures, practically no independent effect was left for income.

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Table 2 Long sickness absence spells/100 person years among the staff of the City of Helsinki in 2003 (Poisson regression analysis, RR)

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Age</th>
<th>Age + education</th>
<th>Age + education + class</th>
<th>Age + education + class + income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RR (95% CI)</td>
<td>RR (95% CI)</td>
<td>RR (95% CI)</td>
<td>RR (95% CI)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
</tr>
<tr>
<td>Occupational class</td>
<td></td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
</tr>
<tr>
<td>Individual income</td>
<td></td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
<td>0.94 (0.94–0.95)</td>
</tr>
</tbody>
</table>

CI: confidence interval

Table 3 Inequality index for medically confirmed sickness absence spells per 100 person years among the staff of the City of Helsinki by socio-economic position measures

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
<th>Gross effect</th>
<th>Education + occupational class</th>
<th>Education + income</th>
<th>Occupational class</th>
<th>Education + occupational class + income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RR (95% CI)</td>
<td>RR (95% CI)</td>
<td>Red⁰</td>
<td>RR (95% CI)</td>
<td>Red⁰</td>
<td>RR (95% CI)</td>
<td>Red⁰</td>
</tr>
<tr>
<td>Education</td>
<td>1.45 (1.44–1.45)</td>
<td>1.25 (1.25–1.25)</td>
<td>−44%</td>
<td>1.32 (1.32–1.33)</td>
<td>−29%</td>
<td>−</td>
<td>1.25 (1.24–1.25)</td>
</tr>
<tr>
<td>Occupational class</td>
<td>1.37 (1.36–1.37)</td>
<td>1.23 (1.23–1.23)</td>
<td>−38%</td>
<td>−</td>
<td>−11%</td>
<td>−11%</td>
<td>1.22 (1.22–1.23)</td>
</tr>
<tr>
<td>Individual income</td>
<td>1.26 (1.26–1.26)</td>
<td>−</td>
<td>−50%</td>
<td>1.04 (1.04–1.04)</td>
<td>−85%</td>
<td>1.01 (1.00–1.01)</td>
<td>−96%</td>
</tr>
<tr>
<td>Education</td>
<td>1.74 (1.73–1.75)</td>
<td>1.27 (1.26–1.28)</td>
<td>−64%</td>
<td>1.49 (1.48–1.50)</td>
<td>−34%</td>
<td>−</td>
<td>1.28 (1.27–1.29)</td>
</tr>
<tr>
<td>Occupational class</td>
<td>1.55 (1.55–1.56)</td>
<td>1.43 (1.42–1.43)</td>
<td>−22%</td>
<td>−</td>
<td>9%</td>
<td>1.49 (1.48–1.49)</td>
<td>−11%</td>
</tr>
<tr>
<td>Individual income</td>
<td>1.40 (1.40–1.41)</td>
<td>−</td>
<td>−40%</td>
<td>0.96 (0.95–0.96)</td>
<td>−110%</td>
<td>0.94 (0.94–0.95)</td>
<td>−115%</td>
</tr>
</tbody>
</table>

CI: confidence interval

a: The proportion of the difference in sickness absence by socio-economic position measure, that is explained or mediated by another socio-economic position measure, is calculated from the reduction in inequality indices. For example, among women, occupational class mediated 44% of the difference by education ([1.45 – 1.25]/(1.45 – 1))

b: All models adjusted for age

Two to three times more common in the lowest socio-economic category than in the highest. The gradients were on average one-third steeper among men than women. No single socio-economic position measure gradient was considerably steeper from another. Adjusting for occupational class reduced the effect of education considerably among both men and women, while further adjusting for income did not reduce the effect any more. Adjusting for education reduced the effect of occupational class considerably, and further adjusting for income reduced the effect little more. The effect of income was practically disappeared after adjusting for education and occupational class.

Among women, occupational class mediated 44% and income mediated 29% of the difference in sickness absence by education (table 3). Adding income besides occupational class did not reduce the inequality index by education any further. Among women, 38% of the difference by occupational class was explained by education and 11% mediated through income. Adding income besides education did not affect the difference by occupational class any further. Among women, education explained 50% and occupational class nearly all of the difference by income. In the final model, simultaneously adjusting for all three socio-economic position measures, no independent effect was left for income.

Among men, occupational class mediated 64% and income mediated 34% of the difference by education (table 3). As among women, adding income besides occupational class did not reduce the inequality index by education any further. Among men, education explained 22% of the difference by occupational class, and adjusting for income increased 9% the difference by occupational class. In the final model, simultaneously adjusting for all three socio-economic position measures, no independent effect was left for income. Additional analyses showed that interactions between socio-economic position measures were mostly weak. However, the effects of education on sickness absence appeared to be particularly strong among low income and manual worker women (data not shown).
Discussion

This study examined the interrelationships among socio-economic position measures as determinants of medically confirmed sickness absence. Medically confirmed sickness absence was considered as a health indicator.1–3

A high position by education, occupational class and individual income were all consistently associated with lower sickness absence rates among both women and men. Among women, education and occupational class were strong independent determinants of medically confirmed sickness absence. Among men, occupational class was the strongest individual determinant of medically confirmed sickness absence, but its effects were partly explained by education, which also was an independent determinant of sickness absence. The effect of individual income was explained by education and occupational class among both women and men. Interrelationships between socio-economic position measures of medically confirmed sickness absence were prominent among both genders.

This study showed that low education is an important individual determinant of subsequent medically confirmed sickness absence and supports findings from our previous study.16 This finding could result from several reasons. First, education is already determined in early adulthood. Especially within the public sector, studied by us, educational qualifications are needed for many occupations and work tasks, such as teachers and nurses, and therefore they determine future occupational position and income to a large extent. This also explains why part of the effect of education is mediated through occupational class. Second, education gives people more understanding and knowledge about health related factors including health behaviours and helps them make healthier decisions in everyday life and leads to healthier lifestyles. Third, selection could provide healthier people with better opportunities to higher education, but this effect is likely to be limited.31

Occupational class was an independent determinant of medically confirmed sickness absence and its effect was stronger among men than women. This is consistent with findings from previous studies.9,10,25–27 Several reasons could explain this result as suggested by previous research.11 First, occupational class mediates part of the effects of education, as found in this study. Second, occupation greatly shapes physical and mental working conditions, which both affect health directly and modify employees’ potential to work, when an illness reduces their working ability. For example, a cleaner is more exposed to heavy manual work than an administrative worker, who differ considerably from their less educated counterparts.

The effects of individual income on medically confirmed sickness absence were basically explained by education and occupational class. First, this might be due to income differences being relatively narrow in Finland and progressive taxation levelling disposable incomes even more. Second, public health insurance and services in Finland buffers against most of the financial consequences of sickness absence. Third and possibly most important, the City of Helsinki is a hierarchical public sector working place, where income is strictly defined by collective bargaining contracts. In the collective bargaining contracts, tenure, education and working title primarily define the wage level. However, it is possible that income differences in sickness absence are curvilinear instead of being linear, because employees with the lowest income cannot afford to be absent from work due to sickness because of lack of material resources.

Adjusting for individual income slightly strengthened the association of occupational class with sickness absence among men. This suggests that sickness absence is differently distributed between individual income and occupational status. In other words, there are male manual workers, who earn more than their higher occupational class counterparts, but who do have higher sickness absence rates.

Analyses on interactions revealed that the effect of education on sickness absence was stronger among low income and manual worker women. This may indicate that there could be women with higher education in low paid and manual work, who differ considerably from their less educated counterparts.

This study showed that interrelationships between socio-economic position measures of sickness absence can be found as previous studies have shown for other health indicators.9,15,22 However, the previous studies on sickness absence have only considered one or two socio-economic position measures at a time. In our study, education, which is determined in early adulthood, was a particularly strong determinant of both further socio-economic position measures and sickness absence. We can presume that education gives facilities to healthy life in many ways and also promotes achieving higher socio-economic positions.

To deepen our knowledge on these pathways, the focus of research should be widened to earlier determinants, such as childhood socio-economic position, and later sickness absence. To deepen our understanding at the other end of the pathways, more research is needed on different socio-economic position indicators and more severe disability, such as disability pensions.

Our findings suggest the areas where preventive measures could be most feasible. First, education gives resources that carry further through life course. Equal opportunities for education are usually a responsibility of the public sector and cannot be compensated by occupational health care. It is unclear how further professional training or education at later stages of the life course affect sickness absence.

Second, working conditions and work-related risk factors, which are unevenly distributed between occupational classes, are important and are a responsibility of both the employer and occupational health care. Third, income transfers or financial risk sharing only are unlikely to reduce sickness absence substantially. However, sickness should not lead to additional material difficulties which could be detrimental to the health.

Conflicts of interest: None declared.

Key points

- Education, occupational class and income are complementary socio-economic position measures. Interrelationships exist between these socio-economic position measures and sickness absence.
- High education and occupational class are independently associated with lower sickness absence rates among both women and men.
- In order to reduce sickness absence, preventive measures should be targeted to younger age groups to promote educational attainment and to working conditions that differ between occupational classes.
References


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