Explaining the social gradient in long-term sickness absence: a prospective study of Danish employees

Karl Bang Christensen,¹ Merete Labriola,¹ Thomas Lund,¹ Mika Kivimäki²

ABSTRACT

Objectives: To identify differences in risk of sickness absence between socioeconomic groups, and to examine to what extent these differences can be explained by health behaviour and work environment factors.

Design, setting and participants: A cohort of 5221 employees in Denmark interviewed in 2000 regarding health behaviours and work environment were followed for 18 months in order to assess their rate of sickness absence exceeding eight consecutive weeks. Based on employment grade, job title and education respondents were classified into five socioeconomic position (SEP) groups. Executive managers and academics were the reference group.

Results: For both genders a social gradient in long-term sickness absence rates was evident. In men, controlling for health behaviours and physical work environment factors reduced rate ratios by 22–57%. Controlling for health behaviours alone reduced rate ratios by 6–13%. In women, controlling for health behaviour reduced rate ratios by 5–18%, and controlling for both health behaviours and physical work environment factors reduced rate ratios by 21–44%. Introducing psychosocial factors reduced the rate ratios further, yielding a reduction of 22–53% in the fully adjusted model. In both genders, the largest reductions were seen in skilled blue-collar workers and for semi-skilled or unskilled workers (by 58–59% in men and by 41–53% in women).

Conclusion: A social gradient in long-term sickness absence was found. Physical work environment explained more of this gradient than health behaviour. Also including psychosocial work environment in the model had no effect in men but a small effect among women.

A social gradient in morbidity and mortality is well demonstrated, but only few studies have examined such gradients in relation to long-term sickness absence.¹ ² This is a limitation as long-term sickness absence is emerging as a major public health problem.³ We therefore studied differences between socioeconomic position (SEP) groups in the risk of long-term sickness absence and the extent to which these differences were explained by health behaviours and work environment in a contemporary working population.

PARTICIPANTS AND METHODS

A random sample of Danish employees was interviewed in 2000 as part of the Danish Work Environment Cohort Study (DWECS).⁴ A random population sample of 11 457 people aged 18–69 were invited to participate, and responses from 8583 were ascertained (response rate 75%). Of these, 5566 were employees and 5221 provided information about all health behaviour and work environment factors. Data on long-term sickness absence, defined as receiving sickness absence compensation for eight consecutive weeks during 18 months of follow-up, were obtained by a linkage to a national register of social transfer payments (DREAM). Eight weeks was chosen as the cut-off point, as after this time the case-managing municipal authorities are informed that an individual is on sick leave and the sick leave is recorded to the register of social transfer payments.

Based on employment grade, job title and education respondents were classified into five SEP groups; I: executive managers and/or academics (261 women, 558 men), II: middle managers and/or 3–4 years of further education (517 women, 299 men), III: other white-collar workers (1113 women, 660 men), IV: skilled blue-collar workers (189 women, 521 men), and V: semi-skilled or unskilled workers (482 women, 621 men).

Employees provided data on age, gender and school education (9 years or less; 10 years; high school). Family status was categorised using two variables: number of children living at home (none; one child; two children; three or more children) and cohabitation status (living with a partner, yes/no).

Regarding smoking status the population was divided into non-smokers, ex-smokers, moderate smokers (less than 15 cigarettes/day) and heavy smokers (15 cigarettes/day or more). Categories of alcohol consumption were non-drinkers, moderate drinkers and heavy drinkers consuming more than 14 (for women) or 21 (for men) weekly units of alcohol (cut-off points chosen in accordance with Danish National Board of Health guidelines). Body mass index (kg/m²) was categorised according to the standardised classification of the National Institutes of Health using four categories: underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) and obesity (≥30). Leisure-time physical activity was measured using a single item (responses: less than 2 hours a week; 2–4 hours a week; more than 4 hours a week or strenuous; or more than 4 hours a week and strenuous).

Physical work environment factors were assessed using 11 questions, which were combined into five indices. Three measured uncomfortable work positions: extreme bending or twisting of the neck or back, work with arms lifted or hands twisted and working mainly standing or squatting; and two assessed physical workload in terms of lifting or carrying loads and pushing or pulling loads.⁵

The psychosocial work environment factors included decision authority, skill discretion, quantitative demands, support, intensive quantitative demands,⁶ corresponding closely to those used in previous studies.¹ ³ All work environment factors were used as continuous variables. Levels for physical and psychosocial exposures in the five SEP groups are shown in Table 1.
Poisson regression models were used to calculate rate ratios and 95% confidence intervals. Those receiving another social benefit—for example, those on maternity leave, were not considered to be under risk in that period. Those who emigrated, retired or died were considered to be at risk until the time of emigration, retirement or death. Analyses were done using SAS.

The analysis was conducted in steps: firstly, rate ratios were adjusted for age and family status; next, rate ratios were adjusted for age, family status and health behaviour. In a third step rate ratios were adjusted for age, family status, health behaviour and physical work environment factors; and, finally, rate ratios were adjusted for age, family status, health behaviour, physical and psychosocial work environment factors.

In order to study the impact on the overall social gradient analyses in which the SEP group variable was added as a linear term were also considered.

### RESULTS

The rates of long-term sickness absence in the study population in the age groups -20, 21–30, 31–40, 41–50, 51–60 and 61+ were

### Table 1 Exposure levels for the five socioeconomic position groups

<table>
<thead>
<tr>
<th>Exposure variables</th>
<th>I Executive managers/academics</th>
<th>II Middle managers/3–4 years further education</th>
<th>III Other white-collar workers</th>
<th>IV Skilled blue-collar workers</th>
<th>V Semiskilled and unskilled workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme bending or twisting of neck/back</td>
<td>5.5 (13.2)</td>
<td>9.2 (14.7)</td>
<td>10.5 (15.7)</td>
<td>21.3 (21.1)</td>
<td>20.7 (21.4)</td>
</tr>
<tr>
<td>Work with arms lifted or hands twisted</td>
<td>4.8 (11.0)</td>
<td>6.3 (11.7)</td>
<td>8.3 (14.1)</td>
<td>19.8 (20.9)</td>
<td>16.7 (19.7)</td>
</tr>
<tr>
<td>Working mainly standing or squatting</td>
<td>8.4 (11.6)</td>
<td>20.3 (16.0)</td>
<td>18.6 (18.9)</td>
<td>38.0 (20.5)</td>
<td>33.3 (20.4)</td>
</tr>
<tr>
<td>Lifting or carrying loads</td>
<td>5.2 (10.1)</td>
<td>13.3 (17.8)</td>
<td>13.6 (18.1)</td>
<td>26.2 (22.2)</td>
<td>25.0 (20.8)</td>
</tr>
<tr>
<td>Pushing or pulling loads</td>
<td>4.1 (11.7)</td>
<td>11.9 (18.4)</td>
<td>13.2 (20.3)</td>
<td>23.2 (22.6)</td>
<td>26.0 (24.0)</td>
</tr>
<tr>
<td>Decision authority</td>
<td>66.1 (22.5)</td>
<td>57.3 (23.8)</td>
<td>47.6 (25.5)</td>
<td>45.3 (24.7)</td>
<td>34.6 (25.6)</td>
</tr>
<tr>
<td>Skill discretion</td>
<td>85.4 (12.4)</td>
<td>82.9 (13.6)</td>
<td>75.6 (16.3)</td>
<td>73.8 (16.7)</td>
<td>58.8 (22.6)</td>
</tr>
<tr>
<td>Quantitative demands</td>
<td>51.9 (20.6)</td>
<td>42.9 (21.4)</td>
<td>37.0 (21.1)</td>
<td>35.1 (19.3)</td>
<td>29.7 (20.1)</td>
</tr>
<tr>
<td>Support</td>
<td>67.0 (23.8)</td>
<td>69.1 (23.9)</td>
<td>70.2 (24.1)</td>
<td>67.3 (24.8)</td>
<td>66.2 (27.7)</td>
</tr>
<tr>
<td>Intensive quantitative demands</td>
<td>54.6 (27.0)</td>
<td>54.3 (26.8)</td>
<td>54.2 (26.5)</td>
<td>52.5 (26.3)</td>
<td>50.8 (29.6)</td>
</tr>
</tbody>
</table>

Exposure levels for the five socioeconomic position groups. Mean score (SD) on indices ranging from 0 to 100, where 0 corresponds to the lowest and 100 corresponds to the highest level.

Poisson regression models were used to calculate rate ratios and 95% confidence intervals. Those receiving another social benefit—for example, those on maternity leave, were not considered to be under risk in that period. Those who emigrated, retired or died were considered to be at risk until the time of emigration, retirement or death. Analyses were done using SAS.

The analysis was conducted in steps: firstly, rate ratios were adjusted for age and family status; next, rate ratios were adjusted for age, family status and health behaviour. In a third step rate ratios were adjusted for age, family status, health behaviour and physical work environment factors; and, finally, rate ratios were adjusted for age, family status, health behaviour, physical and psychosocial work environment factors.

In order to study the impact on the overall social gradient analyses in which the SEP group variable was added as a linear term were also considered.

### Table 2 Rate ratios (RR) and 95% confidence intervals (CI) for onset of long-term sickness absence during 18 months of follow-up (absolute and relative change in rate ratios when adjusting)

<table>
<thead>
<tr>
<th>Model</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RR (95% CI)</td>
<td>RR (95% CI)</td>
</tr>
<tr>
<td>Adjusted for age and family status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive managers/academics</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Middle managers/3–4 years further education</td>
<td>2.04 (0.93 to 4.47)</td>
<td>3.02 (1.18 to 7.78)</td>
</tr>
<tr>
<td>Other white-collar workers</td>
<td>2.67 (1.39 to 5.13)</td>
<td>4.34 (1.77 to 10.69)</td>
</tr>
<tr>
<td>Skilled blue-collar workers</td>
<td>3.56 (1.85 to 6.85)</td>
<td>3.47 (1.21 to 10.01)</td>
</tr>
<tr>
<td>Semiskilled and unskilled workers</td>
<td>4.22 (2.23 to 9.79)</td>
<td>5.80 (2.28 to 14.75)</td>
</tr>
<tr>
<td>SEP as a linear term</td>
<td>1.37 (1.21 to 1.55)</td>
<td>1.30 (1.14 to 1.47)</td>
</tr>
<tr>
<td>Adjusted for age, family status and health behaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive managers/academics</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Middle managers/3–4 years further education</td>
<td>1.89 (0.86 to 4.15)</td>
<td>2.87 (1.11 to 7.38)</td>
</tr>
<tr>
<td>Other white-collar workers</td>
<td>2.50 (1.30 to 4.84)</td>
<td>3.88 (1.57 to 9.58)</td>
</tr>
<tr>
<td>Skilled blue-collar workers</td>
<td>3.25 (1.68 to 6.31)</td>
<td>3.10 (1.07 to 8.96)</td>
</tr>
<tr>
<td>Semiskilled and unskilled workers</td>
<td>3.66 (1.91 to 7.03)</td>
<td>4.73 (1.84 to 12.15)</td>
</tr>
<tr>
<td>SEP as a linear term</td>
<td>1.33 (1.17 to 1.51)</td>
<td>1.24 (1.09 to 1.41)</td>
</tr>
<tr>
<td>Adjusted for age, family status, health behaviour and physical work environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executive managers/academics</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Middle managers/3–4 years further education</td>
<td>1.59 (0.72 to 3.53)</td>
<td>2.40 (0.92 to 6.24)</td>
</tr>
<tr>
<td>Other white-collar workers</td>
<td>1.85 (0.94 to 3.64)</td>
<td>3.24 (1.30 to 8.04)</td>
</tr>
<tr>
<td>Skilled blue-collar workers</td>
<td>1.58 (0.75 to 3.33)</td>
<td>2.18 (0.74 to 6.45)</td>
</tr>
<tr>
<td>Semiskilled and unskilled workers</td>
<td>1.83 (0.90 to 3.73)</td>
<td>3.24 (1.23 to 8.56)</td>
</tr>
<tr>
<td>SEP as a linear term</td>
<td>1.10 (0.95 to 1.28)</td>
<td>1.14 (0.99 to 1.32)</td>
</tr>
<tr>
<td>Adjusted for age, family status, health behaviour, physical and psychosocial work environment</td>
<td></td>
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<tr>
<td>Executive managers/academics</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Middle managers/3–4 years further education</td>
<td>1.60 (0.72 to 3.56)</td>
<td>2.37 (0.91 to 6.18)</td>
</tr>
<tr>
<td>Other white-collar workers</td>
<td>1.76 (0.88 to 3.54)</td>
<td>3.01 (1.19 to 7.59)</td>
</tr>
<tr>
<td>Skilled blue-collar workers</td>
<td>1.46 (0.68 to 3.16)</td>
<td>2.06 (0.69 to 6.17)</td>
</tr>
<tr>
<td>Semiskilled and unskilled workers</td>
<td>1.77 (0.83 to 3.79)</td>
<td>2.76 (1.00 to 7.65)</td>
</tr>
<tr>
<td>SEP as a linear term</td>
<td>1.09 (0.93 to 1.29)</td>
<td>1.09 (0.93 to 1.28)</td>
</tr>
</tbody>
</table>

SEP, socioeconomic position.

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female-dominated groups tend to develop more lenient norms
and skilled workers for men), one explanation could be that
(nursing and teaching being common occupations for women
SEP III tend to be either female-dominated or male-dominated
those women belonging to SEP group IV. Since occupations in
rates were higher in women belonging to SEP group III than in
6 months of follow-up showed a strong social gradient ranging
2.3, 4.4, 4.6, 5.8, 5.5, 1.9 per 100 person years, respectively. The
216 months of follow-up showed a strong social gradient ranging
from 3.1% (group I) to 11.2% (group V) for women and from
2.5% (group I) to 9.2% (group V) for men.

Table 2 shows rate ratios for the onset of sickness absence for
socioeconomic position groups II to V compared with group I by
gender.

For both men and women rate ratios adjusted for age and
family status were similar to crude rate ratios (not shown). In
men the rate ratios were higher in lower SEP groups and the
differences were statistically significant (likelihood ratio test: p<0.0001). In women the differences in the rate ratios were also
statistically significant (likelihood ratio test: p<0.0001), but
rates were higher in women belonging to SEP group III than in
those women belonging to SEP group IV. Since occupations in
SEP III tend to be either female-dominated or male-dominated
(nursing and teaching being common occupations for women
and skilled workers for men), one explanation could be that
female-dominated groups tend to develop more lenient norms
and standards with regard to sickness absence than are found in
more male-dominated contexts.

In men, SEP groups III, IV and V had significantly higher rate
of long-term sickness absence, rate ratios adjusted for age and
family status ranged from 2.67 to 4.22. Further adjustment for
health behaviour reduced these rate ratios by 6–15%, the largest
change occurred for SEP group V where the rate ratio dropped to
3.66. The difference between rate ratios remained statistically
significant (likelihood ratio test: p = 0.0005). Further adjusting
for physical work environment factors yielded rate ratios that
were reduced by 51–57% compared to those adjusted for age
and family status. Again the largest changes were seen for SEP
group IV, where the rate ratio was 1.58 and SEP group V where
the rate ratio was 1.83. The difference between rate ratios was
no longer statistically significant (likelihood ratio test: p = 0.4134). Introducing psychosocial work environment factors
into the analysis yielded no substantial change in rate ratios or
in the likelihood ratio test of equality (p = 0.4959). The pattern
was similar for the overall estimate of the social gradient
obtained by introducing SEP as a linear term.

In women SEP groups II–V had significantly higher absence rate
than SEP group I. Rate ratios adjusted for age and family status
ranged from 3.02 to 5.80. Adjusting for health behaviour reduced these rate ratios by 5–18%, the largest change occurring for SEP
group V where the rate ratio dropped to 4.73. The difference
between rate ratios remained statistically significant (likelihood
ratio test: p = 0.0017). Further adjusting for physical work
environment factors yielded rate ratios that were reduced by 21–
44% compared to those adjusted for gender and family status,
again the largest change was for SEP groups IV and V. For SEP
group IV the initial rate ratio of 3.47 was reduced by 37% to 2.18
and for SEP group V the initial rate ratio of 5.80 was reduced by
44% to 3.24. The difference between rate ratios was borderline
significant (likelihood ratio test: p = 0.0258). Introducing psycho-
social factors reduced the rate ratios further, yielding a reduction of
22–55% in the fully adjusted model. The difference between rate
ratios was no longer statistically significant (likelihood ratio test:
p = 0.0780). Again, the pattern was similar for the overall estimate
of the social gradient obtained by introducing SEP as a linear term.

Beyond the demand-control-support model several other
psychosocial factors (emotional demands, demands of hiding
emotions, job insecurity, management quality, role conflicts,
reward, meaning in work, predictability and conflicts at work)
were studied, but introducing these did not further reduce the
social gradient (results not shown).

CONCLUSIONS
A social gradient in long-term sickness absence was evident. In
previous studies the explanatory factors accounted for part of the
social gradient in sickness absence.1 2 The present study used data
from a general working population with a full range of socio-
economic positions rather than from specific workplace samples
and a more comprehensive assessment of physical work environ-
ment and health behaviours. In general, physical work environ-
ment factors explained more of this gradient than health
behaviours and these factors in combination explained a large
part of the differences in long-term sickness absence between SEP
groups. The effect of introducing psychosocial factors into the
most adjusted model led to a relatively small additional reduction
in the rate ratios, the effect being larger in women than in men.

Competing interests: None.

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*J Epidemiol Community Health* 2008 62: 181-183
doi: 10.1136/jech.2006.056135

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