

## ELECTRONIC PAPER

# The association between sex segregation, working conditions, and sickness absence among employed women

G Hensing, K Alexanderson

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See end of article for authors' affiliations

Correspondence to:  
Dr G Hensing, Associate Professor, Department of Social Medicine, Sahlgren Academy at University of Göteborg, PO Box 453, SE-405 30 Göteborg, Sweden; gunnel.hensing@socmed.gu.se

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**Aims:** To analyse the association between sickness absence and sex segregation of occupation and of work site, respectively, and to analyse work environmental factors associated with high sickness absence.

**Methods:** The study group consisted of 1075 women employed as nurses, assistant nurses, medical secretaries, or metal workers who answered a questionnaire comprising 218 questions on women's health and living conditions. Sickness absence was collected from employers' and social insurance registers.

**Results:** Women working in the male dominated occupation had in general higher sickness absence compared to those working in female dominated occupations. However, metal workers at female dominated work sites had 2.98 (95% CI 2.17 to 3.79) sick-leave spells per woman and year compared to 1.70 (95% CI 1.29 to 2.10) among those working with almost only men. In spite of a better physical work environment, female metal workers at a female dominated work site had a higher sickness absence than other women, which probably could be explained by the worse psychosocial work environment. Working with more women also had a positive association to increased frequency of sick-leave spells in a multivariate analysis including several known indicators of increased sick-leave.

**Conclusions:** There was an association between sickness absence and sex segregation, in different directions at the occupational and work site level. The mechanism behind this needs to be more closely understood regarding selection in and out of an occupation and a certain work site.

In one of the first studies of sex segregation and health, Hall<sup>1</sup> found that men in male dominated, white collar jobs had the highest work control of all groups, while women in the same group had the second highest work control. Women in male dominated, blue collar jobs had the lowest work control and men in the same group had the next lowest work control. Hall's findings are interesting, showing an interaction of horizontal and vertical segregation, influencing both men and women.

Hunt and Emslie<sup>2</sup> found an association between psychological distress, self assessed health, and occupational sex ratios; the greatest differences were within professional/managerial jobs. Östlin and colleagues<sup>3</sup> studied myocardial infarctions and found a higher risk for both women and men in sex segregated occupations. Alexanderson and colleagues<sup>4</sup> found that the cumulative incidence of sickness absence of women working in extremely male dominated occupational groups (0–10% women employed) was higher than in any other group, and twice as high as for men in that group. The smallest difference in sickness absence was found in occupational groups with a relatively equal sex distribution (40–60% of either sex).

Other studies have shown that sickness absence is high in occupations with low salary, monotonous work tasks, and high physical workload, which might be an explanation of the findings that women in the group of male dominated occupations had higher sick leave.<sup>5–7</sup> However, Hensing and colleagues<sup>8</sup> showed that sickness absence with psychiatric disorders, which to a lesser extent is related to physical workload, varied even more with sex segregation. Women in the group of extremely male dominated occupations (0–10% women) had a three times higher cumulative incidence of sickness absence with psychiatric disorders than men in that stratification group. Finally, it has been shown that sickness absence with pregnancy related disorders varied with regard to level of sex segregation in the different occupational groups.<sup>9</sup>

However, all these studies were performed on occupational groups at aggregated levels, and no information was given at an individual level regarding how many women and men the study participants actually, and usually, worked with during a day. Therefore a study was designed to more closely and at an individual level analyse the relation between the actual distribution of men and women at specific work sites and sickness absence. The aim was more specifically to analyse the relation between sickness absence and sex segregation of the occupation and of the work site, respectively, and to analyse factors in the work environment associated with high sickness absence.

## METHODS

### Study population

The study population consisted of 1417 women aged 17–64 years and employed in four different occupations (table 1). Metal workers were chosen as a male dominated occupation with high sickness absence.<sup>4–8</sup> Assistant nurses were chosen as a female dominated occupation with high sickness absence. Nurses and medical secretaries were included as contrasting occupations, with less physically heavy work as for the first two occupations, and with lower levels of sickness absence. A larger number of metal workers were included than employees from the other three occupational groups, as a pilot study had indicated that many of the employees in this male dominated occupation actually worked in female dominated settings, and that we could expect a higher dropout here.

Only work sites located in the county of Östergötland, Sweden, were included. A random selection was made of all nurses and assistant nurses employed at geriatric hospital wards of the general hospitals, and of all medical secretaries employed at the general hospitals. There were no private hospitals in the county. A list of all metal industries with women employed was obtained from the metal worker's union. In all, 68 industries were contacted according to a

## Main messages

- There was a gradient in sickness absence related to the horizontal sex segregation at work.
- Women in male dominated occupations had higher sickness absence in general compared to women in female dominated occupations.
- Among metal workers, a male dominated occupation, women at female dominated work sites had higher sickness absence than those at male dominated work sites—in spite of the fact that they had a worse physical work environment.
- Interesting work was associated with lower frequency of short sick-leave spells, while the possibility to decide own work pace was associated to fewer number of sick-leave days.
- Worries about new technology and feeling exhausted after work were associated with a higher number of sick-leave days.

random order of priority on the list, and with respect to obtaining a geographical spread. Fourteen of these were excluded from the study since they no longer had any female employees. Seven industries declined participation. Forty seven industries distributed over different branches and with between 1 and 244 women employed in manufacturing were included. No further selection was done and all the women employed and working in production at these 47 metal industries were included in the study.

## Data collection

All data were collected after informed consent. The project is independent from the employers and information on this was clearly given in the introductory letter. Information was also given in advance to the local unions at the different work places. The Regional Ethics Committee for Human Research at the Faculty of Health Sciences of Linköping University, Sweden, approved this procedure.

## The questionnaire

A questionnaire comprising 218 questions on women's health and living conditions in paid and unpaid work was developed<sup>10,11</sup> and mailed to the home addresses of the included women. Two reminders were sent out, and those who still failed to respond were contacted for a telephone interview.

## Data on sickness absence

All women, both those who answered the questionnaire and those who did not, were asked for permission to collect information on their sickness absence. Such data were obtained both from the employers ( $\leq 14$  days) and from the Social Insurance Offices ( $\geq 15$  days). All women included in this study were covered by the same national sickness insurance. The first seven days of the sick-leave spell could be self certified, but from the eighth day a medical sickness certificate issued by a physician was required. There was no maximum duration of a sick-leave spell. Only data on sick leave were included in this study. Pregnancy and parental leave, and leave for taking care of sick children are regulated in separate insurances. Part time sick leave can be used for those with remaining work ability—that is, instead of being sick listed all working hours an individual can be listed sick for 25%, 50%, or 75% of their working day.

## Policy implications

- Horizontal sex segregation needs to be addressed in programmes aiming at lower sickness absence within industries.
- Reducing the worries about new technology through, for example, information and training might be a way to prevent sickness absence.

## Data analysis

### Questionnaire data

The following question was used to estimate the sex distribution at a single work site: "How many women and men do you usually work together with during an ordinary work day?". The response alternatives were "almost only women", "mostly women", "equal number women and men", "mostly men", and "almost only men". Other work related questions included in the questionnaire and used in the analysis were physical and ergonomic work environment including questions on heavy lifting, noise, dust, and dirt. Questions on psychosocial work environment included the "job strain" model, perceived knowledge for performing work tasks, social support at work, and sexual harassment (a more detailed description of these items can be obtained from the authors on request).<sup>12-14</sup> Questions on income were also included.

### Sickness absence data

Three measures of sickness absence were used, namely frequency, length of absence, and cumulative incidence.<sup>15</sup> *Frequency* was defined as the number of sick-leave spells that started during 1995 with all women in the study group as denominator. All women that were sick listed for the whole year were excluded from the denominator. *Length* of absence was defined as the number of sick-leave days during 1995 per sick listed woman. Part time sick-leave days were summed up. If someone was sick listed 50% of each day during 10 days, this was thus counted as 5 days. Finally, *cumulative incidence* of sickness absence was defined as the proportion women sick listed at least once (full time or part time) during 1995 with all women in the study group as denominator.

## Dropout analysis

### Questionnaire

Of the 1417 women who were included there was a dropout of 342 women who did not answer the questionnaire (table 1). There was no statistically significant difference in age between the study group and the dropout. The difference in response rate between the occupations was expected and nurses, the group with the highest education, had the highest

**Table 1** Study population and response rate in the project "Women's health and living conditions", Sweden, 1995

Occupation	Study population n (%)	Responded to questionnaire n (%)	Declined collection of sickness absence data n (%)
Medical secretaries	203 (100)	166 (80)	8 (4)
Nurses	203 (100)	176 (87)	3 (1.5)
Assistant nurses	204 (100)	154 (75)	5 (2.5)
Metal workers	807 (100)	583 (72)	21 (2.6)
Total	1417 (100)	1075 (76)	37 (2.6)

participation rate. There were no systematic differences in response rate between the questions included in the questionnaire.

Sickness absence was higher in the dropout group and more of the women not answering the questionnaire had ongoing (at 1 January 1995) long sick-leave spells. On the other hand, the number of women that during the study period commenced a sick-leave spell that turned out to be long was the same as of those with ongoing (at 1 January 1995) long spells (>30 days). To some extent this can compensate for the dropout of those with ongoing sick-leave spells.

### Sickness absence register

Another form of dropout was related to collection of data on sickness absence. There were 37 women, 2.6% who declined the gathering of their sickness absence data (table 1). There were no statistically significant differences with regard to age or occupation between this group and those who accepted collection of data on their sickness absence.

Due to high workload and lack of time, one of the metal industries declined to provide information on sickness absence, which is why information is missing for 16 women on possible sickness absence for the first 14 days of sick-leave spells. Information on sick-leave spells >14 days was obtained from the Social Insurance Offices for these 16 women. Since they were so few in number, we believe that these missing data do not introduce any bias.

### Statistics

All data were standardised for age through direct standardisation using the whole study group as standard. Confidence intervals, 95% level, were calculated by the usual asymptotic formula (parameter estimate  $\pm$  1.96 standard error). Data on sickness absence were stratified for occupation and for sex distribution at work site (tables 2, 3, and 4). In the latter case the stratification was made both for all four occupations collapsed and separately for metal workers (tables 3 and 4). The reason for this was that almost all the nurses, medical secretaries, and assistant nurses, categorised their work sites as including "almost only women" or "mostly women". Therefore the continued analysis of working conditions and sex distribution at work site was performed on metal workers only. A correlation matrix was made with all variables related to work environment included. The associations with sex segregation are described in more detail for those variables that were significantly correlated by stratifying according to level of sex segregation (table 4). Finally, a multiple regression analysis was performed; all variables on working conditions were included in the analysis (table 5, showing only significant variables).

### RESULTS

Differences in sickness absence regarding cumulative incidence, frequency, and length of absence were analysed initially (table 2). Medical secretaries had the shortest length

of sickness absence with 21 sick-leave days/sick listed person. Nurses had the lowest frequency, 0.93 sick-leave spell/person, and cumulative incidence, 53% sick listed at least once. Metal workers had highest cumulative incidence, 74% sick listed at least once, and frequency, 2.01 sick-leave spell/person. Assistant nurses had highest length with 54 sick-leave days per sick listed person, but the difference was only significant in comparison with medical secretaries. A separate analysis with metal workers only revealed that there were small differences in length of absences between sick listed metal workers at female and male dominated work sites, respectively (table 3). However, a larger proportion, 91% of those working with almost only women had been sick listed at least once (table 3). They also had a higher frequency with almost three sick-leave spells/woman and year. In the four other stratification groups (working with almost only men, mostly men, equal number of women and men, and mostly women) there were small differences and no linearity in the findings.

In order to examine the working conditions within the different stratification groups more closely those variables that were significantly associated with sex distribution at the work site were analysed (table 4). The proportion of metal workers reporting being responsible over life and material values increased with a higher proportion of men at the work site (table 4). The same was true regarding influence over own work schedule and work tasks. Furthermore, 38% of the women working with almost only men considered their work important, which can be compared to 17% among those working with only women. The analysis of indexes on influence, stimulus, and control at work showed the same pattern (table 4). Metal workers working with almost only men had the highest mean value indicating higher work control. Job strain was also estimated and found to be highest among metal workers working with almost only women (table 4). These findings indicated that working conditions were better among metal workers who worked almost only with men. However, when the physical work environments were analysed, we found that metal workers working with almost only men to a larger extent were exposed to a dirty environment, to a disturbingly high sound level, and to heavy lifting (table 4). A higher proportion of the metal workers who worked almost only with men or mostly with men had been exposed to sexual harassment (table 4). Furthermore, we found that monthly income increased with number of men at the work site, but the differences were small and the precision low.

Finally, in the multivariate analysis of metal workers' sickness absence we found a negative association between "interesting work" and increased frequency of short sick-leave spells (1–7 days). There was a positive association between higher frequency of short sick-leave spells and more women at work site, exposure to gas, dust, smoke, etc, open communication with work mates, as well as for having work mates with problems (table 5). Factors negatively associated with frequency of longer sick-leave spells ( $\geq$ 8 days) were

**Table 2** Sickness absence among women in four different occupations in the project "Women's health and living conditions", Sweden, 1995

Occupation*	No. of women	No. sick listed	Cumulative incidence, %	Ratio†	Frequency (95% CI)	Ratio**	Length (95% CI)	Ratio†
Medical secretaries	195	106	54	1.02	1.19 (0.94 to 1.44)	1.28	21 (11 to 30)	0.62
Nurses	200	106	53	1.00	0.93 (0.73 to 1.14)	1.00	34 (19 to 49)	1.00
Assistant nurses	199	123	62	1.17	1.34 (1.09 to 1.59)	1.44	53 (35 to 70)	1.56
Metal workers	786	582	74	1.40	2.01 (1.82 to 2.16)	2.16	50 (42 to 57)	1.47
Total	1380	917	66		1.67 (1.56 to 1.78)		44 (39 to 49)	

\*Medical secretaries, nurses, and assistant nurses are female dominated occupations; metal working is a male dominated occupation.

†Ratio was calculated with nurses as the reference group.

**Table 3** Sickness absence among female metal workers in relation to sex segregation at the work site in the project "Women's health and living conditions", Sweden, 1995

Level of sex segregation at work site	No. of women	Cumulative incidence, %	Ratio*	Frequency (95% CI)	Ratio*	Length (95% CI)	Ratio*
Almost only men	88	73	1.00	1.70 (1.29 to 2.10)	0.90	44 (26 to 61)	0.98
Mostly men	159	71	1.07	2.02 (1.69 to 2.36)	1.07	52 (36 to 69)	1.16
Equal no. of women and men	133	73	1.00	1.89 (1.55 to 2.24)	1.00	45 (29 to 60)	1.00
Mostly women	90	61	0.84	1.78 (1.29 to 2.26)	0.94	43 (21 to 65)	0.96
Almost only women	46	91	1.25	2.98 (2.17 to 3.79)	1.58	40 (13 to 68)	0.89
Total	516	72		1.99 (1.80 to 2.18)		45 (37 to 54)	

\*The group with equal no. women and men at the work site was used as reference group.

influence over own work schedule, opportunity to learn new things at work, and longer duration in commuting time (table 5). Opportunity to decide over own work pace was negatively associated with number of sick-leave days, while there was a positive association with worries over new technology and feelings of exhaustion after work (table 5).

## DISCUSSION

### Horizontal and vertical sex segregation and the association with sickness absence

We found that working in a male dominated occupation was associated with higher frequency of sick-leave spells and with a high cumulative incidence. These findings were in line with the findings by Alexanderson *et al* and Hensing *et al* on sickness absence and sex segregation of occupational groups.<sup>4 8 9</sup> Thus, there is some empirical support for the

association between sickness absence and sex segregation at the level of occupational groups, as well as occupations. However, the mechanisms involved are not clear but could include stress, selection of certain women to male dominated occupations, male as the norm at male dominated work places involving both ergonomic and psychosocial factors, fewer job alternatives for women not interested in health care, child care, or teaching, and possibly several others.<sup>16 17</sup>

Length of sickness absence might be influenced more by the occupation being a blue collar occupation rather than by being male dominated. This was supported by our more detailed analysis of sickness absence among the metal workers, where we found very small differences in sick-leave length between those working in a female or a male dominated work site. Earlier studies on sickness absence and sex segregation have only analysed cumulative incidence

**Table 4** Proportion of female metal workers reporting certain working conditions, the mean values of influence, stimulus, and control at work, job strain, and monthly income in relation to sex segregation at the work sites, "Women's health and living conditions", Sweden, 1995

Working conditions	Correlation to sex segregation*	Level of sex segregation at work site				
		Almost only men (n = 89)	Mostly men (n = 159)	Equal number (n = 133)	Mostly women (n = 90)	Almost only women (n = 46)
<b>Proportion (%) having these working conditions to a large degree (95% CI)</b>						
Responsible for the life and safety of other people	-0.17	39 (28 to 50)	29 (22 to 36)	27 (19 to 35)	25 (17 to 34)	8 (0 to 17)
Responsible for large material values	-0.18	57 (46 to 68)	49 (41 to 57)	47 (38 to 56)	36 (26 to 46)	28 (16 to 41)
Exposed to sexual harassment at work	-0.19	15 (8 to 22)	8 (3 to 12)	2 (0 to 4)	3 (0 to 7)	2 (0 to 5)
Can influence own work schedule	-0.17	54 (44 to 65)	44 (37 to 52)	36 (28 to 44)	42 (32 to 53)	24 (11 to 37)
Can decide when work tasks shall be done	-0.17	65 (55 to 76)	55 (47 to 63)	50 (42 to 59)	58 (48 to 68)	32 (18 to 46)
Exposed to gas, dust, smoke, oil, grime	-0.36	59 (48 to 70)	36 (29 to 44)	27 (19 to 34)	12 (5 to 19)	19 (8 to 30)
Disturbing high sound level	-0.24	80 (71 to 89)	74 (67 to 81)	69 (61 to 77)	45 (35 to 56)	48 (32 to 63)
Heavy lifting	-0.15	61 (50 to 72)	61 (54 to 69)	66 (58 to 74)	43 (32 to 53)	37 (23 to 51)
Do you consider your work important	-0.15	38 (28 to 49)	32 (25 to 40)	36 (28 to 44)	26 (17 to 35)	17 (5 to 29)
<b>Mean values of indexes (95% CI)</b>						
Influence over work†	-0.17	4.94 (4.56 to 5.33)	4.46 (4.21 to 4.72)	4.29 (4.00 to 4.59)	4.42 (4.10 to 4.74)	3.51 (3.12 to 3.90)
Stimulus at work†	-0.13	10.16 (9.67 to 10.64)	9.43 (9.09 to 9.76)	9.20 (8.85 to 9.56)	9.75 (9.29 to 10.21)	8.72 (7.89 to 9.55)
Control at work†	-0.17	15.11 (14.35 to 15.87)	13.91 (13.41 to 14.40)	13.52 (12.94 to 14.09)	14.17 (13.49 to 14.85)	12.23 (11.16 to 13.29)
Job strain	0.15	0.83 (0.76 to 0.90)	0.91 (0.85 to 0.96)	0.95 (0.89 to 1.01)	0.88 (0.80 to 0.97)	1.13 (0.98 to 1.28)
<b>Monthly income (95% CI)</b>						
Income: SEK	-0.16	13708 (13226 to 14190)	12612 (12262 to 12962)	12183 (11737 to 12630)	12373 (11831 to 12915)	12249 (11244 to 13253)

\*Variables presented in table had a significant (95% level) correlation to sex distribution according to a correlation matrix performed with all variables related to work included in questionnaire.

†The higher the mean value, the stronger influence over work.

**Table 5** Association of work related factors for sick-leave spells of 1–7 days duration and  $\geq 8$  days duration, respectively, and for sick-leave days in a multivariate linear analysis controlling for all other work related factors, “Women’s health and living conditions”, Sweden, 1995

Independent variable	B coefficient	95% CI
<b>Frequency of sick-leave spells of 1–7 days duration</b> [R <sup>2</sup> 0.114 (11.4% of the variance explained)]		
Interesting work	–0.527	–0.882 to –0.172
More women at work place	0.390	0.198 to 0.582
Exposed to gas, dust, smoke, oil, grime	0.317	0.084 to 0.550
Open communication with work mates	0.405	0.105 to 0.705
Work mates with problems	0.276	0.060 to 0.492
<b>Frequency of sick-leave spells of <math>\geq 8</math> days duration</b> [R <sup>2</sup> 0.085 (8.5% of the variance explained)]		
Can influence own work schedule	–0.07	–0.137 to –0.003
Have to work fast	0.117	0.027 to 0.207
Age	0.008	0.002 to 0.014
Learn new things at work	–0.113	–0.197 to –0.029
Longer commuting time	–0.007	–0.013 to –0.001
<b>Number of sick-leave days</b> [R <sup>2</sup> 0.057 (5.7% of the variance explained)]		
Decide own work pace	–8.055	–14.086 to –2.024
Worried about new technology	7.127	0.753 to 13.501
Exhausted after work	6.276	0.206 to 12.346

and not length of sickness absence. However, different types of measures are needed to get a comprehensive picture of sickness absence.<sup>15–18</sup> The willingness and possibility of the employer to offer vocational rehabilitation also affects the length of an absence.

### Work environment and sex segregation among female metal workers

In spite of a better physical work environment female metal workers at a female dominated work site had a higher sickness absence than other women, which probably could be explained by the worse psychosocial work environment. Marmot,<sup>19</sup> for example, found that psychosocial risk factors in the work environment were more strongly associated with sickness absence than physical risk factors. One aspect of the psychosocial work environment is job strain.<sup>20</sup> The association between sickness absence and job strain is not quite clear. Several authors report that low job demand and low control are associated with sickness absence rather than the job strain (high demand, low control) situation per se.<sup>6, 21–23</sup> In the multivariate analysis we found a negative association between “can influence own work schedule” and number of long sick-leave spells ( $\geq 8$  days) and between “can decide own work pace” and number of sick-leave days. These items are part of the job strain model, but they were only significantly associated as items. The job strain model was included into the multivariate analysis but it did not reach significance to any of the sickness absence measures used. Our study lends support to earlier findings that factors related to control over work are important in relation to sickness absence.

To have interesting work was associated with fewer short sick-leave spells (table 5). Similar findings have been reported by Marmot *et al*<sup>7</sup> who found a strong association between short sick-leave spells and job dissatisfaction. The association between sick leave and the possibility to learn new things at work was not supported by the recently reported findings from Sweden Post, where “few or no possibilities of education and training” was not associated with sickness absence incidence.<sup>24</sup> Our finding on shorter sick-leave among those with longer duration in time of work travel is more contradictory. One possible explanation is that

a longer commuting time (irrespective if by car, bus, train, bicycle, or walking) gives an opportunity to prepare for the day and perhaps also relax after work.

It has been shown that social support at and outside work is associated with low sickness absence, with an exception regarding men.<sup>21–25</sup> Open communication with work mates might be seen as an indicator of good social support at work and it is therefore not easy to explain why this item was associated with an increased number of long sick-leave spells. However, it might be that open communication and work mates with problems reflects an “absence culture” at the work site.<sup>26</sup> It is possible that the employees working in such an absence culture encourage each other to be absent in periods of strain be it due to ill health, pressure at work, or problems at home.

Worries about new technology or about organisational changes have been shown to vary positively with sickness absence, which might be explained by physical or mental ill health.<sup>11–24</sup> Worries are closely connected to anxiety and it might be that individual mental health problems is a confounding factor in associations between worries and sickness absence. Women and men with mental health problems and psychiatric disorders have been shown to have an increased sickness absence in spells with other diagnoses, especially musculoskeletal diagnoses.<sup>11–27</sup>

### Methodological considerations

This study was cross sectional and it is thus not possible to draw any conclusions regarding causal effects. We suggest that further studies be done with other occupational groups before conclusions regarding other occupations are drawn. Furthermore, although the dropout was low, we cannot say anything about the dropout with regard to number of women and men at the work site. However, we consider it an advantage that most of the analyses are performed on a single occupational group. This reduces to some extent the problems with exposure bias, the validity of instruments used, and differences in practice within the social insurance.

It is possible that there is a *selection* of women to male dominated departments within metal industry, so that the healthiest women are offered jobs or stay employed there.

Pålsson<sup>28</sup> found, in a study of female assembly workers, a “healthy worker” selection. Those women who quit the job also had a high sickness absence. However, their levels of absence were lower after leaving the job, implying that these women were less fit to work as assembly workers. Our results might also reflect another selection of women with health problems to female dominated departments, since the work was less physically demanding in those departments. This can explain the higher levels of sickness absence among women working at departments with almost only other women. We have found no studies on selection of women in and/or out of jobs related to male or female domination of them. However, Östlin and colleagues<sup>3</sup> found a selection of men with poorer health into the extremely female dominated occupation of secretaries. In another study Östlin<sup>29</sup> found that persons with health problems are selected to physically less demanding jobs, which could be one explanation of our findings.

A methodological problem here, as in all studies based on questionnaires, is that all data on exposure at work are self reported. Thus, the validity of the reports on number of women and men within the work site can be discussed, based as they were on estimations made by the women themselves. No exact limits were given in the question. The strongest differences were found between the two most extreme stratification groups (working with almost only women, working with almost only men) and the findings were not always linear. Misclassification with regard to sex distribution at work site might be the reason for this. We have been conservative in our interpretations, which are based on the extreme stratification groups. Further methodological developments are needed regarding such questions. It is an advantage that data on sickness absence were not self reported but based on administrative statistics with high validity.<sup>30 31</sup>

## Conclusions

At an occupational level, the women in the male dominated occupation in this cross sectional study had higher sickness absence measured as cumulative incidence and frequency than those in the female dominated occupations. However, at a work site level, women in the male dominated occupation metal work that worked at male dominated works sites had lower sickness absence than those that worked in female dominated work sites—in spite of a worse physical environment, indicating that psychosocial factors are more important for sickness absence. Selection, exposure to worse psychosocial working conditions, a possible low esteem of self or type of work, or a certain absence culture among women, can be explanations of these findings. The role of sex segregation for ill health and sickness absence need to be studied further, preferably with a longitudinal design in order to reduce selection bias and more fully understand the mechanism involved.

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## Authors' affiliations

**G Hensing**, Department of Social Medicine, University of Göteborg, Sweden

**K Alexanderson**, Department of Social Medicine and Public Health Sciences, Linköping University, Sweden

## REFERENCES

- Hall EM. Gender, work control, and stress: a theoretical discussion and an empirical test. *Int J Health Services* 1989;**19**:725–45.
- Hunt K, Emslie C. Men's work, women's work? Is there an effect of taking account of occupational sex ratios on gender differences in health. In: Orth-Gomer K, Chesney M, Wenger N, eds. *Women, stress and heart disease* Stockholm: Lawrence Erlbaum Associates, 1998:87–107.
- Östlin P, Alfredsson L, Hammar N, et al. Myocardial infarction in male and female dominated occupations. *Occup Environ Med* 1998;**55**:642–4.
- Alexanderson K, Leijon M, Åkerlind I, et al. Epidemiology of sickness absence in a Swedish County in 1985, 1986 and 1987. *Scand J Soc Med* 1994;**22**:27–34.
- Vogel J, Kindlund H, Diderichsen F. *Working conditions, illness and sickness absence in 1975–1989* (in Swedish). Swedish: Statistics Sweden, 1992.
- North F, Syme SL, Feeney A, et al. Explaining socioeconomic differences in sickness absence: the Whitehall II study. *BMJ* 1993;**306**:361–6.
- Marmot M, Feeney A, Shipley M, et al. Sickness absence as a measure of health status and functioning: from the UK Whitehall II study. *J Epidemiol Community Health* 1995;**49**:124–30.
- Hensing G, Alexanderson K, Åkerlind I, et al. Sick-leave due to minor psychiatric morbidity: role of sex integration. *Soc Psychiatry Psychiatr Epidemiol* 1995;**30**:39–43.
- Alexanderson K, Hensing G, Carstensen J, et al. Pregnancy-related sickness absence among employed women. *Scand J Work Environ Health* 1995;**21**:191–8.
- Hensing G, Alexanderson K. The relation of adult experiences of domestic harassment, violence and/or sexual abuse to health and sickness absence. *Int J Beh Med* 2000;**7**:1–18.
- Savikko A, Alexanderson K, Hensing G. Do mental health problems increase sickness absence due to other diseases? *Soc Psychiatry Psychiatr Epidemiol* 2001;**36**:310–16.
- Karasek R, Baker D, Marxer R, et al. Job decision latitude, job demands, and cardiovascular disease: a prospective study of Swedish men. *Am J Public Health* 1981;**71**:694–705.
- Karasek R, Theorell T. *Healthy work*. Basic Books Inc., 1990.
- Hanson BS, Östergren PO. Different social network and social support characteristics, nervous problems and insomnia: theoretical and methodological aspects in some results from the population study 'men born in 1914', Malmö, Sweden. *Soc Sci Med* 1987;**25**:849–59.
- Hensing G, Alexanderson K, Allebeck P, et al. How to measure sickness absence? Literature review and suggestion of five basic measure. *Scand J Soc Med* 1998;**26**:133–44.
- Moss Kanter E. *Men and women of the corporation*. New York: Basic Books, 1993.
- Marklund S, ed. *Worklife and health in Sweden 2000*. Stockholm: National Institute for Working Life, 2001.
- Telnes G. Sickness certification in general practice: a review. *Fam Pract* 1989;**6**:58–65.
- Marmot M. Work and other factors influencing coronary health and sickness absence. *Work Stress* 1994;**8**:191–201.
- Theorell T, Karasek R. Current issues relating to psychosocial job strain and cardiovascular research. *J Occup Health Psychol* 1996;**1**:9–26.
- North F, Syme SL, Feeney A, et al. Psychosocial work environment and sickness absence among British civil servants: the Whitehall II Study. *Am J Public Health* 1996;**86**:332–40.
- Kivimäki M, Vahtera J, Thomson L, et al. Psychosocial factors predicting employee sickness absence during economic decline. *J Appl Psychol* 1997;**82**:858–72.
- Niedhammer I, Bugel I, Goldberg M. Psychosocial factors at work and sickness absence in the Gazel cohort: a prospective study. *Occup Environ Med* 1998;**55**:735–41.
- Voss M, Floderus B, Diderichsen F. Physical, psychosocial, and organisational factors relative to sickness absence: a study based on Sweden Post. *Occup Environ Med* 2001;**58**:178–84.
- Stansfeld S, Rael EGS, Head J, et al. Social support and psychiatric sickness absence: a prospective study of British civil servants. *Psychol Med* 1997;**27**:35–48.
- Nicholson N, Johns G. The absence culture and the psychological contract— who's in control of absence? *Academy of Management Review* 1985;**10**:397–407.
- Hensing G, Spak F. Psychiatric disorders as a factor behind sick-leave in other diagnoses. A general population based study. *Br J Psychiatry* 1998;**172**:250–6.
- Pålsson B, Horstmann V, Attewell RG, et al. Sick-leave and disability pensions among female assembly workers. *Eur J Public Health* 1997;**7**:162–8.
- Östlin P. The “health-related selection effect” on occupational morbidity rates. *Scand J Soc Med* 1989;**17**:265–70.
- Burdorf A, Post W, Bruggeling T. Reliability of a questionnaire on sickness absence with specific attention to absence due to back pain and respiratory complaints. *Occup Environ Med* 1996;**53**:58–62.
- Fredriksson K, Toomingas A, Torgen M, et al. Validity and reliability of self-reported retrospectively collected data on sick leave related to musculoskeletal diseases. *Scand J Work Environ Health* 1998;**24**:425.