



Original article

Scand J Work Environ Health [2010;36\(5\):394-403](#)

doi:10.5271/sjweh.2909

Gender differences in sickness absence - the contribution of occupation and workplace

by [Laaksonen M](#), [Mastekaasa A](#), [Martikainen P](#), [Rahkonen O](#), [Piha K](#), [Lahelma E](#)

Affiliation: Department of Public Health, University of Helsinki, PO Box 41, Helsinki, FIN-00014, Finland. mikko.t.laaksonen@helsinki.fi

Refers to the following text of the Journal: [2008;34\(4\):260-266](#)

The following articles refer to this text: [2010;36\(6\):515-516](#);
[2012;38\(3\):187-192](#); [2014;40\(4\):361-369](#)

Key terms: [fixed effect](#); [gender](#); [gender difference](#); [man](#); [men](#); [occupation](#); [occupational social class](#); [sickness absence](#); [social class](#); [woman](#); [women](#); [working conditions](#); [workplace](#)

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/20213051



This work is licensed under a [Creative Commons Attribution 4.0 International License](http://creativecommons.org/licenses/by/4.0/).

Gender differences in sickness absence – the contribution of occupation and workplace

by Mikko Laaksonen, PhD,¹ Arne Mastekaasa, PhD,² Pekka Martikainen, PhD,³ Ossi Rahkonen, PhD,¹ Kustaa Piha, MD,¹ Eero Lahelma, PhD¹

Laaksonen M, Mastekaasa A, Martikainen P, Rahkonen O, Piha K, Lahelma E. Gender differences in sickness absence – the contribution of occupation and workplace. *Scand J Work Environ Health*. 2010;36(5):394–403.

Objectives The aim of this study was to examine whether differences in male and female occupations and workplaces explain gender differences in self-certified (1–3 days) and medically confirmed sickness absence episodes of various lengths (≥ 4 days, > 2 weeks, > 60 days). Analyses in the main ICD-10 diagnostic groups were conducted for absence episodes of > 2 weeks. Furthermore, we examined whether the contribution of occupation is related to different distributions of female and male jobs across the social class hierarchy.

Methods All municipal employees of the City of Helsinki at the beginning of 2004 (N=36 395) were followed-up until the end of 2007. Conditional fixed-effects Poisson regression was used to control for differences between occupations and workplaces.

Results Controlling for occupation accounted for half of the female excess in self-certified and medically confirmed episodes lasting > 60 days. In the intermediate categories, this explained about one third of the female excess. The effect of workplace was similar but weaker. Occupational and workplace differences explained the female excess in sickness absence due to mental and behavioral disorders, musculoskeletal diseases, and respiratory diseases. The effect of occupation was clearly stronger than that of social class in self-certified absence episodes, whereas, in medically confirmed sickness absence episodes, gender differences were to a large extent related to social class differences between occupations.

Conclusions Differences between occupations held by women and men explain a substantial part of the female excess in sickness absence. Mental and behavioral disorders and musculoskeletal diseases substantially contribute to this explanation.

Key terms fixed effect; man; occupational social class; woman; working conditions.

In the Scandinavian countries and most of the rest of Europe, women have higher rates of sickness absence than men (1–3). Finland is no exception, with women showing higher rates irrespective of the length of the absence (4). However, the gender gap is larger for short absence episodes and tends to narrow with longer episodes. Studies from other countries have equally shown that women tend to have more sickness absence episodes of all lengths, although the female excess varies somewhat between the studies (5–7).

Working conditions are one potential source of the gender differences in sickness absence. Because the labor markets are strongly segregated into male and

female occupations (8), work tasks and working conditions may differ substantially between men and women, and gender differences in sickness absence may be due to different types of work carried out by women and men. Women are more often in lower white-collar positions while men more often occupy upper white-collar and managerial but also blue-collar positions (9). Women have lower average salaries than men and many female-dominated occupations tend to be less prestigious and have fewer promotion opportunities than male jobs (10). In addition to such vertical differences, there are also horizontal differences between male and female occupations. More often than men, women work

¹ Department of Public Health, University of Helsinki, Helsinki, Finland.

² Faculty of Social Sciences, Department of Sociology and Human Geography, University of Oslo, Oslo, Norway.

³ Population Research Unit, Department of Sociology, University of Helsinki, Helsinki, Finland.

Correspondence: Dr M Laaksonen, Department of Public Health, University of Helsinki, PO Box 41, Helsinki, FIN-00014, Finland. [E-mail: mikko.t.laaksonen@helsinki.fi]

in clerical, service, and sales work, as well as nursing, childcare, and teaching (8). Male and female jobs at the same level in the occupational class structure may thus differ in working conditions, typical work tasks, and the rewards that they offer. Although such gender differences should not be exaggerated, female jobs have been reported to include fewer learning opportunities, more monotonous work tasks, and less decision-making and independent planning than male jobs (11). Occupations held by men often are physically more demanding, although many female jobs are also characterized by physically strenuous work tasks. Women have also been found to report a larger number of adverse work characteristics than men (12).

Women and men not only often have different occupations, but they are also unequally clustered into workplaces. Working conditions at the workplace level are potentially important predictors of sickness absence (13, 14). Poor workplace climate has been shown to be associated with sickness absence (15). There may also be cultural differences between workplaces that affect sickness absence behavior among the employees (16). Both occupations and workplaces may thus involve varying conditions that expose women and men to different health hazards and differ with regard to the work ability they presuppose. In particular, adverse working conditions may affect the risk of musculoskeletal diseases, psychiatric symptoms, and injury that occur frequently among middle-aged populations and constitute major reasons for sickness absence.

The contribution of working conditions to gender differences in sickness absence can be examined in various ways. One approach is to adjust statistically for various working conditions and assess whether the adjustment narrows or even eliminates the gender differences (4, 17). A limitation of this procedure is that all working conditions cannot be measured or can be measured only partially. If the measurement of working conditions is inadequate, their effects are likely to be underestimated.

Another approach is to examine women and men who work in the same occupations. Previous studies have examined whether those working in typical occupations of the opposite gender, such as male nurses or female metal workers, have equally high sickness absence rates as the majority gender in these occupations (18, 19). Similar levels of sickness absence among women and men would suggest that working conditions rather than gender affect the sickness absence rates. A limitation of this approach is that those working in typical occupations of the opposite gender are likely to be a selected group and may not be representative of all employed women and men.

A third approach is to use fixed-effect regression analysis to control for working conditions across the whole range of occupations (or workplaces) (6, 20). In

this approach only employees who work in the same occupations are compared and between-occupation variation is omitted. An advantage of this procedure is that the individuals compared are identical with respect to all occupational characteristics, irrespective of whether those characteristics can be measured or not. The procedure gives an overall estimate of the extent to which there are gender differences in sickness absence that are not due to occupational or workplace differences. Comparison of fixed-effects estimates with those of ordinary regression shows how much occupation and workplace contribute to the gender differences in sickness absence. However, the particular working conditions (or other factors that people in same the occupations or workplaces may share) leading to these differences cannot be identified.

In this study, using prospective register data from the City of Helsinki employees, we applied the fixed-effect approach to examine differences between women's and men's occupations and workplaces as possible explanations for gender differences in sickness absence.

Our specific aims were to examine whether: (i) gender differences in sickness absence episodes of various lengths are explained by differences in women's and men's occupations or workplaces; (ii) controlling for occupation or workplace has similar effects on gender differences in sickness absence resulting from different diagnoses; and (iii) the contribution of occupation to gender differences in sickness absence is related to vertical differences in women's and men's occupations (ie, occupational social class).

Methods

As the capital of Finland, Helsinki has 578 000 inhabitants (1 024 000 in the greater Helsinki area). The municipality of the City of Helsinki is the largest employer in the country, providing jobs for approximately 40 000 people (21). Of these employees, 74% are women. There are a large number of different blue- and white-collar occupations within various branches such as social and healthcare, education, cultural services, public transportation, environmental and technical maintenance, and public administration.

Data for our study were derived from the employer's registers of the City of Helsinki. The target population included all permanent and temporary employees on 1 January 2004 (N=36 395) who were followed-up until the end of 2007 or until the work contract terminated. The number of sickness absence episodes during the follow-up period was used as the outcome variable. We examined separately self-certified (1–3 days) and medically confirmed absence episodes of various lengths

(≥4 days, >2 weeks, and >60 days). Absence due to sickness of a dependent child or own accident or injury at work were excluded. Other interruptions such as maternal or parental leaves were subtracted from the follow-up time. The overall number of person-years in the analyses was 104 959 with a mean follow-up time of 2.9 years.

The City of Helsinki personnel register does not include diagnoses for sickness absence episodes. These diagnoses were linked to the data from the register of the Social Insurance Institution of Finland using a personal identification number. This register is used for reimbursement purposes and it only includes diagnoses for sickness absence episodes >9 weekdays. We therefore used this information to derive diagnoses for absence episodes of >2 weeks. A diagnosis was found for 93% of the sickness absence episodes in the City of Helsinki registers. We examined the main diagnostic groups including >500 sickness absence cases during the follow-up: neoplasms (ICD C00–D48, 718 episodes), mental and behavioral disorders (F00–F99, 3103 episodes), diseases of the nervous system (G00–G99, 622 episodes), circulatory diseases (I00–I99, 703 episodes), respiratory diseases (J00–J99, 882 episodes), diseases of the digestive system (K00–K93, 688 episodes), musculoskeletal diseases (M00–M99, 4154 episodes), injury at leisure time (S00–T98, 1775 episodes), and other (O00–O99, 2279 episodes, including 537 pregnancy-related diagnoses).

Occupations were based on the job title as found in the City of Helsinki register, including occupations

such as assistant nurse or elementary school teacher. Workplaces were based on the City of Helsinki's administrative division of departments and their sub-units. It should be noted, however, that some of the workplaces defined in this way, like dental care of the southern Helsinki district, may be physically located at several clinics that could not be separated for the purpose of this study. Table 1 gives more details about the occupations and workplaces. Occupational social class was classified into six hierarchical categories: managers, professionals, semi-professionals, routine non-manual employees, skilled manual workers, and unskilled manual workers. The classification was made on the basis of qualifications required for the job, supervisory status, and position of the job in the organizational hierarchy (22).

Statistical analysis

The number of sickness absence episodes among women and men were first calculated in five-year age groups for descriptive purposes. Rates of absence episodes of different lengths are reported per 100 person-years.

The baseline model without occupation or workplace was estimated with ordinary Poisson regression. Conditional fixed-effects Poisson regression (23) was used to examine how controlling for occupation and workplace affect gender differences in sickness absence. Differences in the individual follow-up times were taken into account using the logarithm of the time until censoring as the

Table 1. Descriptive information of all employees of the City of Helsinki on 1 January 2004 and the two study populations including gender-mixed occupations or workplaces and gender-mixed occupation–workplace (O–W) combinations only.

	All employees				Study population 1: gender-mixed occupations & workplaces				Study population 2: gender-mixed O–W combinations			
	Women ^a (N=28 346)		Men ^b (N=8049)		Women ^a (N=27 797)		Men ^b (N=7357)		Women ^c (N=20 134)		Men ^d (N=6484)	
	N	Mean size	N	Mean size	N	Mean size	N	Mean size	N	Mean size	N	Mean size
Occupations	228	124	214	38	196	141	196	38	..	..	..	..
Workplaces	343	83	323	25	317	88	317	23	..	..	..	..
O–W combinations	2889	10	1594	5	..	..	..	..	1034	19	1034	6
Number of episodes/100 person-years												
Self-certified	202	..	130	..	202	..	131	..	205	..	138	..
Medically confirmed												
≥4 days	98	..	64	..	99	..	60	..	100	..	62	..
>2 weeks	24	..	17	..	24	..	16	..	24	..	16	..
>60 days	4.9	..	3.9	..	4.9	..	3.7	..	4.7	..	3.6	..
Percent employees												
Permanent	77	..	83	..	77	..	82	..	75	..	80	..
Full-time	91	..	94	..	91	..	94	..	91	..	94	..

^a Mean age 43.6 years, standard deviation 10.9.

^b Mean age 44.2 years, standard deviation 10.4.

^c Mean age 42.9 years, standard deviation 11.0.

^d Mean age 43.6 years, standard deviation 10.4.

offset. Bootstrap confidence intervals with 200 replications were calculated to handle for overdispersion (24).

In fixed-effect methods, the variation between units – in this case occupations and workplaces – is ignored and only the within-unit variation is examined. The advantage of this method is that the between-unit variation may be contaminated by unmeasured occupational and workplace characteristics that vary between the units. Ignoring the between-unit variation will ensure that the compared units are identical with respect to all stable characteristics, whether those characteristics can be measured or not. A disadvantage is that the standard errors are likely to increase because part of the data will be discarded. However, this is not a serious problem when the analyzed population is large. In the original data, consisting of all permanent and temporary employees, there were 246 occupations and 349 workplaces. Because only within-unit variation was used, all single-gender occupations and workplaces were excluded, which yielded 196 occupations (mean size 179, range 2–1760) and 317 workplaces (mean size 111, range 2–817). In all analyses, only both gender-mixed occupations and workplaces are included.

Cross-classified occupation–workplace combinations were further examined as this provides the most detailed control for job and workplace characteristics. However, since only gender-mixed units are used in the analyses, a large proportion of occupation–workplace combinations

were excluded. In the original dataset, there were 3459 occupation–workplace combinations of which 1034 (mean size 26, range 2–775) included both women and men. Table 1 compares the original dataset and the two study populations used in the analyses including gender-mixed occupations or workplaces and occupation–workplace combinations only. Even if up to two thirds of the original occupation–workplace combinations and one fourth of persons in these combinations were excluded, all populations are very similar with respect to sickness absence among women and men.

To control for vertical differences between male and female occupations, occupational social class was included in the analysis as a categorical variable. By subtracting the effect of occupational social class from that of detailed occupation, one can separate the horizontal differences that exist between occupations that are at the same level in the social class structure. All analyses were carried out using STATA 9.2 (StataCorp LP, College Station, TX, USA).

Results

Table 2 presents the number of sickness absence episodes of different lengths per 100 person-years stratified by age group and gender. During the follow-up period, the occurrence of sickness absence episodes of all lengths was higher among women than men. However, the gender differences were smaller in longer absence episodes. Self-certified absence episodes of 1–3 days were more common among younger age groups, whereas those of >2 weeks and >60 days were more common among older employees. In self-certified absence episodes, gender differences were slightly more pronounced in the older age groups, while in medically confirmed absence episodes the opposite held true.

Table 3 presents the effects of controlling for occupation, workplace, and their combination on gender differences in sickness absence episodes of different lengths using the fixed-effect approach. Women had 54% higher age-adjusted occurrence of self-certified sickness absence than men. Controlling for occupation explained half of this gender difference. Controlling for workplace also explained the difference but less so than occupation. Controlling for the occupation–workplace combination had about the same effect as controlling for occupation only.

In medically confirmed sickness absence episodes of ≥ 4 days, women had 63% higher age-adjusted occurrence than men. Controlling for occupation explained a third of this difference. As with self-certified absence episodes, controlling for workplace had smaller effect than occupation and controlling for the occupation–

Table 2. The number of self-certified and medically confirmed sickness absence episodes of different lengths (per 100 person years) by age-group and gender.

Gender	N	Self-certified	Medically confirmed		
			≥ 4 days	>2 weeks	>60 days
Women (age in years)					
18–24	1188	176.3	71.0	11.0	1.1
25–29	2353	261.0	99.0	20.4	2.9
30–34	2939	254.3	109.0	23.8	3.6
35–39	3748	230.9	97.7	20.2	3.4
40–44	4127	215.7	95.7	20.9	3.6
45–49	4253	203.0	98.8	24.0	4.7
50–54	4101	187.8	108.0	29.0	6.4
55–59	4129	159.0	93.9	27.7	7.1
≥ 60	1508	126.0	79.7	25.1	6.1
All ages	28 346	202.0	98.4	24.1	4.9
Men (age in years)					
18–24	165	123.3	37.8	6.2	2.4
25–29	558	188.7	62.3	11.0	1.3
30–34	895	178.5	61.7	12.1	2.4
35–39	1209	169.3	65.5	13.8	2.8
40–44	1257	137.5	68.8	16.6	3.1
45–49	1146	121.9	64.8	17.9	3.8
50–54	1145	112.3	73.5	20.8	4.6
55–59	1203	81.0	56.6	19.9	6.7
≥ 60	471	51.5	38.8	15.8	5.3
All ages	8049	129.8	63.7	16.7	3.9

Table 3. The effect of controlling for occupation, workplace and their combination (O–W) using the fixed effect (FE) on gender differences in sickness absence episodes of different lengths. Rate ratio (RR) for sickness absence risk among women as compared to men (RR for men 1.00) after adjustment for age. [95% CI= 95% confidence interval]

	Self-certified		Medically confirmed					
	RR	95% CI	≥4 days		>2 weeks		>60 days	
			RR	95% CI	RR	95% CI	RR	95% CI
Baseline	1.54	1.49–1.59	1.63	1.56–1.69	1.53	1.46–1.62	1.30	1.18–1.43
FE occupation	1.27	1.21–1.34	1.41	1.35–1.48	1.36	1.26–1.47	1.12	1.01–1.24
FE workplace	1.36	1.28–1.43	1.59	1.41–1.57	1.41	1.31–1.51	1.19	1.03–1.36
FE O–W combination	1.25	1.19–1.31	1.42	1.34–1.48	1.35	1.24–1.46	1.14	0.98–1.31

Table 4. The effect of controlling for occupation, workplace and their combination (O–W) using the fixed effect (FE) on gender differences in sickness absence of >2 weeks in the largest diagnostics categories. Rate ratio (RR) for sickness absence risk among women as compared to men (RR for men 1.00) after adjustment for age. [95% CI= 95% confidence interval]

Diagnostic category	Baseline		FE occupation		FE workplace		FE O–W combination	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Neoplasms	2.88	2.17–3.83	3.35	2.33–4.80	3.14	2.32–4.25	3.23	2.15–4.87
Mental & behavioral disorders	1.56	1.39–1.75	1.20	1.03–1.39	1.44	1.26–1.65	1.17	1.01–1.36
Diseases of the nervous system	1.73	1.31–2.30	1.94	1.45–2.61	1.53	1.09–2.13	1.81	1.32–2.49
Circulatory diseases	0.86	0.70–1.07	0.91	0.70–1.18	0.83	0.64–1.07	0.80	0.57–1.17
Respiratory diseases	1.79	1.43–2.24	1.45	1.12–1.88	1.55	1.22–1.98	1.57	1.18–2.06
Diseases of the digestive system	0.81	0.67–0.98	0.73	0.56–0.96	0.85	0.69–1.07	0.74	0.54–0.98
Musculoskeletal diseases	1.87	1.69–2.08	1.61	1.36–1.91	1.61	1.41–1.84	1.58	1.32–1.87
Injury at time of leisure	0.94	0.83–1.07	0.85	0.71–1.01	0.91	0.78–1.05	0.84	0.69–1.02
Other diseases	2.03	1.72–2.39	2.19	1.79–2.66	2.11	1.78–2.49	2.36	1.92–2.91

workplace combination had a similar effect as controlling for occupation only. Analyzing absence episodes of >2 weeks essentially resulted in the same findings except that the age-adjusted baseline association was slightly weaker. For absence episodes of >60 days, the gender differences were again smaller. Controlling for occupation now explained more than half of this association. Controlling for workplace had a slightly weaker effect than occupation. Controlling for the occupation–workplace combination did not account for more of the differences than controlling for occupation only.

Table 4 presents the effects of controlling for occupation, workplace, and their combination on gender differences in sickness absence in the main diagnostic groups. The analysis concerns absence episodes of >2 weeks, for which diagnoses were available. Women had higher occurrence of sickness absence in all main diagnostic groups except circulatory diseases, diseases of the digestive system, and injury. The female excess was highest in neoplasms with nearly three times more sickness absence episodes than men, while in the other diagnostic groups the relative risk varied between 1.5–2. Pregnancy-related diagnoses accounted for half of the

female excess in the residual category of “other diseases”. In the case of mental and behavioral disorders, respiratory diseases, and musculoskeletal diseases, controlling for occupation attenuated the female excess in sickness absence. In neoplasms, diseases of the nervous system, and “other diseases”, the differences tended to increase when controlling for occupation. Controlling for workplace again had weaker effect than controlling for occupation. The female excess in sickness absence due to mental and behavioral disorders, diseases of the nervous system, respiratory diseases, and musculoskeletal diseases attenuated. Controlling for the occupation–workplace combination generally had a fairly similar effect as controlling for occupation only. In the diagnostic groups with a male excess, controlling for occupation, workplace, and their combination generally had only small effects and the differences tended to increase rather than decrease. Excluding pregnancy-related diagnoses from “other diseases” did not change the contribution of occupation or workplace to the gender differences in this category.

We finally examined whether controlling for detailed occupation had a larger effect on gender differences in

sickness absence than controlling for occupational social class only (table 5). Irrespective of the length of the absence, detailed occupation explained more of the gender differences than occupational social class. In the case of self-certified sickness absence episodes, the explanation by occupational social class was less than half of that by detailed occupation. In medically confirmed absence episodes, occupation accounted for a third more of the female excess than occupational social class.

Discussion

A clear female excess was observed in sickness absence episodes of all lengths. The female excess was slightly larger in medically confirmed than self-certified absence episodes, but narrowed for longer medically confirmed absence episodes.

The first aim of this study was to examine whether controlling for occupation, workplace, and their combination would explain the female excess in sickness absence episodes of different lengths. Controlling for occupation explained half of the female excess in self-certified and medically confirmed episodes lasting >60 days. In the intermediate categories, about one third of the female excess was explained. Controlling for workplace also accounted for the gender differences but less than controlling for occupation. However, controlling for the occupation–workplace combination had similar effect as controlling for occupation only. This suggests that while differences in women's and men's occupations contribute to the female excess in sickness absence, workplace has little impact when differences in occupations are taken into account.

The second aim of this study was to examine whether controlling for occupation, workplace, and their combination would explain gender differences in sickness absence due to different diagnoses. A female excess in sickness absence was found in six of the nine diagnostic groups, but not in circulatory diseases,

diseases of the digestive system, and injury. The female excess was largest in neoplasms, where breast cancer has a notable effect on female disease rates. Previous studies have also found female excess in sickness absence in most diagnostic groups (5, 25).

Controlling for occupation attenuated the gender differences in sickness absence due to mental and behavioral disorders, musculoskeletal diseases, and respiratory diseases. Mental and behavioral disorders and musculoskeletal diseases are by far the largest diagnostic groups thus contributing substantially to the overall female excess in sickness absence. These are also the diagnostic groups that one could plausibly expect to be most strongly associated with working conditions. More often than men, women work in lower white-collar occupations that tend to be characterized by lack of autonomy and tight schedules and may, therefore, be psychosocially demanding. Women report symptoms of anxiety and depression more often than men (26, 27) and these are likely to be reflected in sickness absence levels. Many female occupations, for example in health services and kitchen work, involve physically heavy work tasks that predispose employees to musculoskeletal diseases.

For mental and behavioral disorders, musculoskeletal diseases, and respiratory diseases, controlling for workplace attenuated the female excess in sickness absence similar to when controlling for occupation. In addition, the female excess in sickness absence due to diseases of the nervous system attenuated as well. Thus, in this diagnostic group, controlling for occupation and workplace had opposite effects. Also in sickness absence due to circulatory diseases and diseases of the digestive system, which had a slight male excess, the effects of controlling for occupation and workplace had opposite effects. However, in these diagnostic groups the effects of controlling for either occupation or workplace were rather weak. Controlling for the occupation–workplace combination generally had only a slightly larger effect than controlling for occupation only.

Previous studies have shown that pregnancy may be an important reason for the female excess in sickness

Table 5. Comparing the effects of social class (vertical differences in occupations) and detailed occupation on gender differences in sickness absence episodes of different length. Rate ratio (RR) for sickness absence risk among women as compared to men (RR for men 1.00) after adjustment for age. [95% CI= 95% confidence interval]

	Self-certified		Medically confirmed					
			≥4 days		>2 weeks		>60 days	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Baseline	1.54	1.49–1.59	1.63	1.56–1.69	1.53	1.46–1.62	1.30	1.18–1.43
Social class	1.43	1.37–1.48	1.49	1.43–1.55	1.42	1.34–1.50	1.18	1.06–1.31
FE occupation	1.27	1.21–1.34	1.41	1.35–1.48	1.36	1.26–1.47	1.12	1.01–1.24

absence at least in the younger age groups (28, 29). In our study, diagnoses were available only for sickness absence episodes of >2 weeks. Within the diagnostic category of "other diseases", pregnancy-related diagnoses were responsible for a half of the female excess in sickness absence, and excluding these diagnoses did not change the contribution of occupation and workplace to the gender difference found in this category. The data did not include information about family situation (past reproductive history, small children at home, marital status, or the like) and these factors could not be taken into account in this study. Our previous study based on questionnaire data showed that marital status and having small children in the family had no effect on gender differences in sickness absence irrespective of the length of the absence (4).

The third aim of this study was to examine the extent to which the effect of occupation is related to hierarchical differences between women's and men's jobs in the socio-economic structure. In sickness absence episodes of all lengths, detailed occupation explained more of the gender differences than occupational social class. In self-certified absence episodes, the explanation by occupational social class was considerably smaller than detailed occupation, suggesting that horizontal segregation between occupations has a marked effect on the female excess in sickness absence. In medically confirmed absence episodes, the proportion explained by occupational social class was closer to that accounted for by occupation, suggesting that the explanation by occupation was more related to vertical differences between occupations.

Comparing the results to previous studies

The fixed-effect analysis takes into account all differences in occupations and workplaces whether these differences can be measured or not. Furthermore, the method is not susceptible to measurement error in working conditions. Thus, this method provides more efficient control for occupational and workplace characteristics than direct adjustment for a range of specific measured working conditions. A drawback of the method, however, is that it does not identify which occupational or workplace characteristics are influential. Comparing the results to those obtained by direct adjustment may shed light on these characteristics.

We have previously examined gender differences in sickness absence in this same study population using a subset of employees aged ≥ 40 years, for whom survey data on potential explanatory factors were available (4). Physical work demands accounted for a third of gender differences in medically confirmed sickness absence episodes of any length; in longer absence episodes, they played an even larger role. Higher prevalence of work fatigue among women also explained part of the gender differences in absence episodes of >2 weeks. Mental

demands, job strain, job satisfaction, and bullying at the workplace had no effects on gender differences in sickness absence. In our study, the impact of controlling for occupational differences using the fixed effect was of similar magnitude to what we found in our previous study. Thus, physical workload and work fatigue may be the factors that explain most of the impacts of occupation on gender differences in medically confirmed absence.

In our previous study, adjusting for specific working conditions had no effect on gender differences in self-certified sickness absence. In this study, however, controlling for occupation or workplace led to a considerable decrease in gender differences in self-certified absence. This suggests that gender differences in self-certified sickness absence are explained by occupational and workplace characteristics other than those measured in our previous study. Restricting the fixed-effect analyses to those aged ≥ 40 years provided similar results as those presented earlier, but the explanations were slightly larger for medically confirmed absence episodes.

The fixed-effect approach has previously been applied in two Norwegian studies examining gender differences in sickness absence in four distinct samples (6, 20). In agreement with analyses comparing the effects of occupation and workplace (20), we also found that controlling for occupation had a stronger effect than controlling for workplace. In all three studies, controlling for the occupation-workplace combination instead of occupation alone had minor effects only. Thus, the distribution of women and men across different occupations has important implications for gender differences in sickness absence, while the distribution of men and women across workplaces is less important.

There are also differences in the results of these three studies. As in the case of the sample of Norwegian civil servants (20), we found that controlling for occupation attenuated gender differences in sickness absence. Among Norwegian railway company employees, however, gender differences widened after controlling for occupation. A weak tendency towards increasing gender differences was also found in the general Norwegian population (6). The results indicate that the effects of occupation and workplace on gender differences in sickness absence depend on how men and women are distributed across occupations within the population under examination. In some populations, women seem to be allocated to less healthy occupations than men, and controlling for occupation therefore reduces gender differences in sickness absence. In other populations, the situation may be more balanced or even reversed.

It is also interesting to compare the within-occupation gender differences in sickness absence (ie, the gender differences that remain after controlling for occupation) between the different study populations. In our latest study, women had 1.27 times as many

self-certified absences than men in the same occupations, and 1.41 times as many medically confirmed absences. The corresponding estimates in the Norwegian studies were very similar (6, 20). Overall, these results show that the female excess in sickness absence remains even after differences in occupations have been taken into account. In all the studies, larger gender differences were found for medically confirmed than self-certified sickness absence episodes.

Methodological considerations

The strengths of this study included the large study population, prospective study design, and complete register-based data on all variables. The generalizability of these results to the private sector is not warranted since occupations, their distribution, and gender distributions within the occupations differ from those of the public sector. The majority of occupations and workplaces studied here were female-dominated, and the applicability of the results to male-dominated employment sectors may be limited.

The fixed-effect method is based on comparison of employees working in the same occupation or workplace in order to control for all job-related characteristics, whether they can be measured or not. However, having the same occupational title or workplace does not guarantee that working conditions will be identical for all employees. Even in the same occupations, work tasks may vary between men and women (30). In addition to occupation, we controlled for occupation–workplace combinations. The general finding from US, Norwegian, and Swedish studies is that in the same occupation–workplace units, women receive lower wages than men, but the differences are small (31–33). Although similar evidence for other job characteristics is not available, it is reasonable to assume that within occupation–workplace combinations differences between men’s and women’s working conditions are small, and thus unlikely to account for more than a minor part of the within-occupation–workplace differences in sickness absence.

The classifications of occupations and workplaces used in our study may be considered rather crude since several hundreds of people were included in many of the occupations and workplaces. It is possible that a more detailed classification would have explained more of the gender differences. The classification of workplaces in particular is problematic since people grouped in the same workplace do not necessarily work together. However, using more detailed classification would almost inevitably increase the number of single-gender units, which are excluded from the analyses. Some studies have shown increased sickness absence rates in the most gender-segregated occupations (34, 35). Since

such occupations were omitted, the observed gender differences might be smaller than in the total population. However, our comparison of the original dataset and the study populations included in the analyses showed similar levels of sickness absence among women and men.

In the interpretation of the results, we have presumed that occupations and workplaces primarily reflect the effects of working conditions. However, people working in the same occupations and workplaces may also share various other characteristics, like health behaviors and social networks, and they may come from similar backgrounds. It is not possible to estimate precisely the contribution of working conditions and how much the other possible common factors might explain. Although working conditions are the most feasible explanation for these findings, crediting all the effects of occupation and workplace to working conditions might overestimate their effects. These results suggest that, in particular for shorter sickness absence episodes in studies based on direct adjustment of measured factors, some of the effects of working conditions may have been left unnoticed; to find out which specific working conditions are influential, it is important to strive for better measurement of working conditions in questionnaire surveys. It should also be acknowledged that, in practice, separating vertical and horizontal segregation is difficult (36). A more detailed measurement of occupational class could have provided stronger vertical effect and simultaneously weakened the effect of horizontal segregation.

Concluding remarks

Clear gender differences were found in sickness absence episodes of all lengths. Differences between occupations held by women and men explained a substantial part of the female excess in sickness absence. Mental and behavioral disorders and musculoskeletal diseases contributed to the explanation substantially. Also differences between workplaces accounted for some of the gender differences, but to a lesser extent than those between occupations. A considerable part of the explanation by occupation was related to vertical differences between male and female occupations in the social class hierarchy.

Sickness absence indicates temporary inability to carry out one’s work-related tasks, and predicts future disability pension and mortality (37, 38). Although the exact nature of sickness absence as a health indicator is not yet established, it has been increasingly used as an outcome in health research. However, more than many other health outcomes, sickness absence may be affected by contextual and environmental factors. In particular, working conditions might affect sickness absence directly without health problems as the mediating factor. It would therefore be important to conduct similar analyses also using other kinds of health outcomes.

Acknowledgements

The study was supported by the Academy of Finland.

References

- Allebeck P, Mastekaasa A. Swedish Council on Technology Assessment in Health Care (SBU), chapter 5: risk factors for sick leave - general studies. *Scand J Public Health Suppl.* 2004;63:49–108.
- Barnby T, Ercolani M, Treble J. Sickness absence: an international comparison. *Econ J.* 2002;112:315–32.
- Gimeno D, Benavides FG, Benach J, Amick BC III. Distribution of sickness absence in the European Union countries. *Occup Environ Med.* 2004;61:867–9.
- Laaksonen M, Martikainen P, Rahkonen O, Lahelma E. Explanations for gender differences in sickness absence: evidence from middle-aged municipal employees from Finland. *Occup Environ Med.* 2008;65:325–30.
- Feeney A, North F, Head J, Canner R, Marmot M. Socioeconomic and sex differentials in reason for sickness absence from the Whitehall II Study. *Occup Environ Med.* 1998;55:91–8.
- Mastekaasa A, Dale-Olsen H. Do women or men have the less healthy jobs?: an analysis of gender differences in sickness absence. *Eur Sociol Rev.* 2000;16:267–86.
- Melchior M, Niedhammer I, Berkman LF, Goldberg M. Do psychosocial work factors and social relations exert independent effects on sickness absence?: a six year prospective study of the GAZEL cohort. *J Epidemiol Community Health.* 2003;57:285–93.
- Melkas H, Anker R. Gender equality and occupational segregation in Nordic labour markets. Geneva: International Labour Organization; 1998.
- Statistics Finland. Employment statistics. Helsinki: Statistics Finland; 2002. Population, 3.
- Emslie C, Hunt K, Macintyre S. Gender or job differences?: working conditions amongst men and women in white-collar occupations. *Work Employment Soc.* 1999;13:711–29.
- Kauppinen K, Kandolin I. Gender and working conditions in the European Union. Duplin: European Foundation for the Improvement of Living and Working Conditions; 1997.
- Matthews S, Hertzman C, Ostry A, Power C. Gender, work roles and psychosocial work characteristics as determinants of health. *Soc Sci Med.* 1998;46:1417–24.
- Christensen KB, Nielsen ML, Rugulies R, Smith-Hansen L, Kristensen TS. Workplace levels of psychosocial factors as prospective predictors of registered sickness absence. *J Occup Environ Med.* 2005;47:933–40.
- Marklund S, Bolin M, von Essen J. Can individual health differences be explained by workplace characteristics?: a multilevel analysis. *Soc Sci Med.* 2008;66:650–62.
- Piirainen H, Räsänen K, Kivimäki M. Organizational climate, perceived work-related symptoms and sickness absence: a population-based survey. *J Occup Environ Med.* 2003;45:175–84.
- Virtanen P, Siukola A, Luukkaala T, Savinainen M, Arola H, Nygård CH, et al. Sick leaves in four factories-do characteristics of employees and work conditions explain differences in sickness absence between workplaces? *Scand J Work Environ Health.* 2008;34(4):260–77.
- Smeby L, Bruusgaard D, Clausen B. Sickness absence: could gender divide be explained by occupation, income, mental distress and health? *Scand J Public Health.* 2009;37:674–81.
- Evans O, Steptoe A. The contribution of gender-role orientation, work factors and home stressors to psychological well-being and sickness absence in male- and female-dominated occupational groups. *Soc Sci Med.* 2002;54:481–92.
- Hensing G, Alexanderson K. The association between sex segregation, working conditions, and sickness absence among employed women. *Occup Environ Med.* 2004;61:e7.
- Mastekaasa A, Olsen KM. Gender, absenteeism, and job characteristics. *Work Occup.* 1998;25:195–228.
- Helsingin kaupunki. Henkilöstöraportti 2008 [City of Helsinki. Personnel Report 2008]. Helsinki; Helsingin kaupunki; 2009.
- Lahelma E, Martikainen P, Rahkonen O, Roos E, Saastamoinen P. Occupational class inequalities across key domains of health: results from the Helsinki Health Study. *Eur J Public Health.* 2005;15:504–10.
- Cameron AC, Trivedi PK. Regression analysis of count data. Cambridge: Cambridge University Press; 1998.
- Efron B, Tibshirani RJ. An introduction to the bootstrap. New York (NY): Chapman and Hall; 1993.
- Ferrie JE, Vahtera J, Kivimäki M, Westerlund H, Melchior M, Alexanderson K, et al. Diagnosis-specific sickness absence and all-cause mortality in the GAZEL study. *J Epidemiol Community Health.* 2009;63:50–5.
- Baumeister H, Harter M. Prevalence of mental disorders based on general population surveys. *Soc Psychiatry Psychiat Epidemiol.* 2007;42:537–46.
- Pirkola SP, Isometsä E, Suvisaari J, Aro H, Joukamaa M, Poikolainen K, et al. DSM-IV mood-, anxiety- and alcohol use disorders and their comorbidity in the Finnish general population – results from the Health 2000 Study. *Soc Psychiatry Psychiatr Epidemiol.* 2005;40:1–10.
- Alexanderson K, Sydsjö A, Hensing G, Sydsjö G, Carstensen J. Impact of pregnancy on gender differences in sickness absence. *Scand J Soc Med.* 1996;24:169–76.
- Sydsjö A, Sydsjö G, Alexanderson K. Influence of pregnancy-related diagnoses on sick-leave data in women aged 16–44. *J Womens Health Gend Based Med.* 2001;10:707–14.
- Messing K, Dumais L, Courville J, Seifert AM, Boucher M. Evaluation of exposure data from men and women with the same job title. *J Occup Med.* 1994;36:913–7.
- Milgrom EMM, Petersen T, Snartland V. Equal pay for equal work?: evidence from Sweden and a comparison with Norway and the US. *Scand J Econ.* 2001;103:559–83.

32. Petersen T, Morgan LA. Separate and unequal – occupation establishment sex segregation and the gender wage gap. *Am J Sociol.* 1995;101:329–65.
33. Petersen T, Snartland V, Becken LE, Olsen KM. Within-job wage discrimination and the gender wage gap: the case of Norway. *Eur Sociol Rev.* 1997;13:199–213.
34. Alexanderson K, Leijon M, Åkerlind I, Rydh H, Bjurulf P. Epidemiology of sickness absence in a Swedish county in 1985, 1986 and 1987: a three year longitudinal study with focus on gender, age and occupation. *Scand J Soc Med.* 1994;22:27–34.
35. Mastekaasa A. Sickness absence in female- and male-dominated occupations and workplaces. *Soc Sci Med.* 2005;60:2261–72.
36. Blackburn RM, Jarman J, Brooks B. Occupational stratification: the vertical dimension of occupational segregation. *Work Employment Soc.* 2001;15:511–38.
37. Vahtera J, Pentti J, Kivimäki M. Sickness absence as a predictor of mortality among male and female employees. *J Epidemiol Community Health.* 2004;58:321–6.
38. Kivimäki M, Forma P, Wikström J, Halmeenmäki T, Pentti J, Elovainio M, et al. Sickness absence as a risk marker of future disability pension: the 10-town study. *J Epidemiol Community Health.* 2004;58:710–1.

Received for publication: 11 November 2009