Workplace as an origin of health inequalities

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Abstract

***Objective*—To investigate the effect of the workplace on the socioeconomic gradient of sickness absence.**

***Design*—Comparison of the relation between socioeconomic status and employee sickness absence in three different towns.**

***Settings*—The towns of Raisio, Valkeakoski, and Nokia in Finland. They are equal in size and regional social deprivation indices, located in the neighbourhood of a larger city, and produce the same services to the inhabitants.**

***Subjects*—All permanent local government employees from Raisio (n=887), Valkeakoski (n= 972), and Nokia (n=934) on the employer's registers during 1991 to 1993.**

***Main outcome measures*—Rates of short (1–3 days) and long (>3 days) spells of sickness absence, irrespective of cause, and separately for infection, musculoskeletal disorder, and trauma.**

***Results*—In blue collar male and female workers, compared with the same sex higher grade white collar workers, the age adjusted numbers of long sick leaves were 4.9 (95% CI 4.2, 5.8) and 2.8 (2.6, 3.1) times higher, respectively. The risk varied significantly between the towns, in men in relation to long sick leaves irrespective of cause and resulting from musculoskeletal disorders, and in women in relation to long leaves resulting from infection. The numbers of long sick leaves were 3.9 (95% CI 2.8, 5.4) times higher in blue collar male workers than in higher grade white collar male workers in Raisio, 4.9 (95% CI 3.8, 6.3) times higher in Valkeakoski, and 5.8 (95% CI 4.5, 7.5) times higher in Nokia. Sickness absence of blue collar employees differed most between the towns. The rates of long sick leaves in blue collar men were 1.46 times greater (95% CI 1.25, 1.72) in Valkeakoski and 1.85 times greater (95% CI 1.58, 2.16) in Nokia than in Raisio. In men, no significant differences were found between the towns as regards the numbers of long sick leaves of higher grade white collar male workers. The socioeconomic gradients differed more between the towns in men who had worked for four years or more in the same employment than in men who had worked for shorter periods. No consistent health gradients of socioeconomic status were evident for short sick leaves among either sex.**

***Conclusions*—In men and to a lesser extent in women, the workplace is significantly associated with health inequalities as reflected by medically certified sickness absence and the corresponding socioeconomic gradients of health.**

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Table 1 Descriptive statistics relating to local government employees in the towns studied (percentages of staff)

	Raisio (n=887)	*Valkeakoski (n=972)*	*Nokia (n=934)*
Sex			
Men	29.9	36.4	32.0
Women	70.1	63.6	68.0
Age (y)			
18–35	24.9	22.1	20.1
36–45	36.3	41.1	44.1
46–63	38.8	36.8	35.8
Occupational status			
Higher-grade white collar workers	37.3	32.0	31.8
Lower-grade white collar workers	33.5	37.1	38.5
Blue collar workers	29.2	29.9	29.7
Time in post (y)			
0–3	26.0	21.9	17.8
Over 3	74.0	78.1	82.2
Position			
Manager or other high status professionals	10.5	6.9	6.5
Teacher	20.4	22.3	19.9
Social worker	1.5	0.6	1.4
Technician, foreman	3.3	3.5	2.6
Registered nurse	4.0	4.6	5.2
Kindergarten teacher	3.8	2.6	2.6
Practical nurse	3.9	5.7	5.9
Office clerk	7.0	10.9	9.3
Children's nurse	5.6	1.0	4.3
Fitter	1.9	2.4	1.5
Motor vehicle driver	1.5	1.3	1.6
Firefighter	3.3	2.0	2.8
Building worker	4.5	7.9	6.9
Cook, waiter	5.4	3.7	4.7
Maintenance personnel	5.7	6.9	4.7
Assistant	4.6	3.1	6.9
Cleaner	10.8	10.9	11.4
Others	2.5	3.8	1.7

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The association between socioeconomic status (SES) and health seems to be such that mortality and morbidity increase constantly as SES decreases, not simply when the threshold of poverty is crossed. There is considerable evidence to support the existence of SES health gradients.[1–9] It has also been found that sex and age modify the gradient.[4 7 10–13] Furthermore, there is evidence that social inequalities in health are dependent on work related factors. For example, SES health gradients have been found to be significantly reduced by adjustment for workplace characteristics, giving information about potential underlying mechanisms of health inequalities.[10 14 15] An alternative way to study the contribution of the work environment to social inequalities in health is to compare to what extent the steepness of gradient varies between workplaces. This approach was taken in this study.

Methods

STUDY POPULATION

The study population was drawn from the employees of the local governments in the

Table 2 Socioeconomic characteristics of the towns

	Raisio	*Valkeakoski*	*Nokia*
Number of residents	22088	21250	26318
Percentage of households owner occupied	73	71	72
Size of household (number of persons /household)	2.4	2.3	2.4
Living area of residence (m^2/resident)	33	35	33
Children (percentage of persons 5 years of age or below)	7	5	7
Elderly residents (percentage of persons 70 years of age or above)	7	10	9
Percentage of households with use of motor vehicle	60	60	60
Low income (percentage of persons with annual income < 80 000 FIM)	46	53	54
Unskilled and skilled manual workers	26	27	27
Unemployed (percentage of workforce)	19	20	21
Immigration (percentage of residents)	7	3	4
Emigration (percentage of residents)	7	3	4

southern Finnish towns of Raisio, Valkeakoski, and Nokia. All are located close to larger cities. On the basis of the employers' records, all municipal employees in these towns working on 1 January 1991 and still working on 31 December 1993 were included in the study. There were 918 men and 1875 women. The numbers of employees in each town were similar (Raisio 887, Valkeakoski 972, Nokia 934).

SOCIOECONOMIC STATUS

Two measures of SES were used. One involved recording the status of higher grade white collar workers (for example, physicians, teachers), lower grade white collar workers (for example, technicians, registered nurses), and blue collar workers (for example, cleaners, maintenance workers), using the occupational title based classification of Statistics Finland.[16] The three level classification of Statistics Finland does not differentiate between degrees of skill and specialisation among blue collar workers. The other measure of SES was based on occupational title

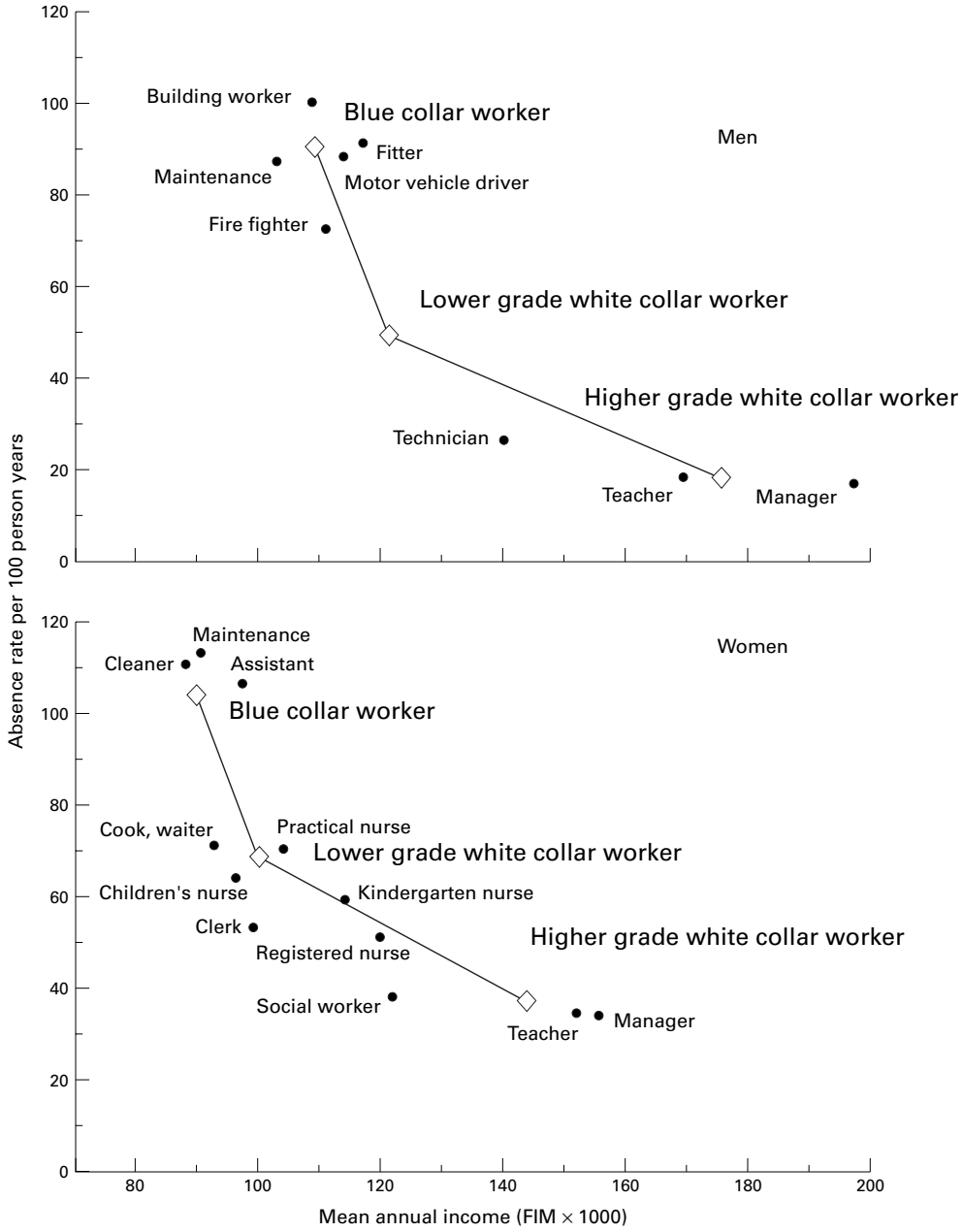

Figure 1 Age adjusted rates of long periods of sick leave (absence rate/100 person years), by occupation and by SES.

and income. Closely related occupations were combined to form eight groups for men and 12 for women. The groups were ranked by annual mean income, on the basis of information from the employers. There were only small differences in annual incomes for each occupation between the three towns because the conditions for municipal workers are agreed upon nationally in Finland.

LENGTH OF SERVICE

We measured the length of time as a municipal employee, using data from the employers' records. This measure represented an estimate of exposure to the characteristics of the workplace. Recent evidence suggests that exposure to job characteristics is a significant predictor of health.[16]

SICKNESS ABSENCE

Data on absence because of sickness were collected from sick leave certificates for each employee. These give the dates of the sick leaves, and the principal diagnoses. All sick leave certificates relating to the study period, irrespective of place of issue, were forwarded for recording. The employees could in some cases complete their own certificates for sick leaves of up to three days. For sick leaves longer than three days, medical certificates were always required. All sick leaves from 1 January 1991 to 31 December 1993 were noted and

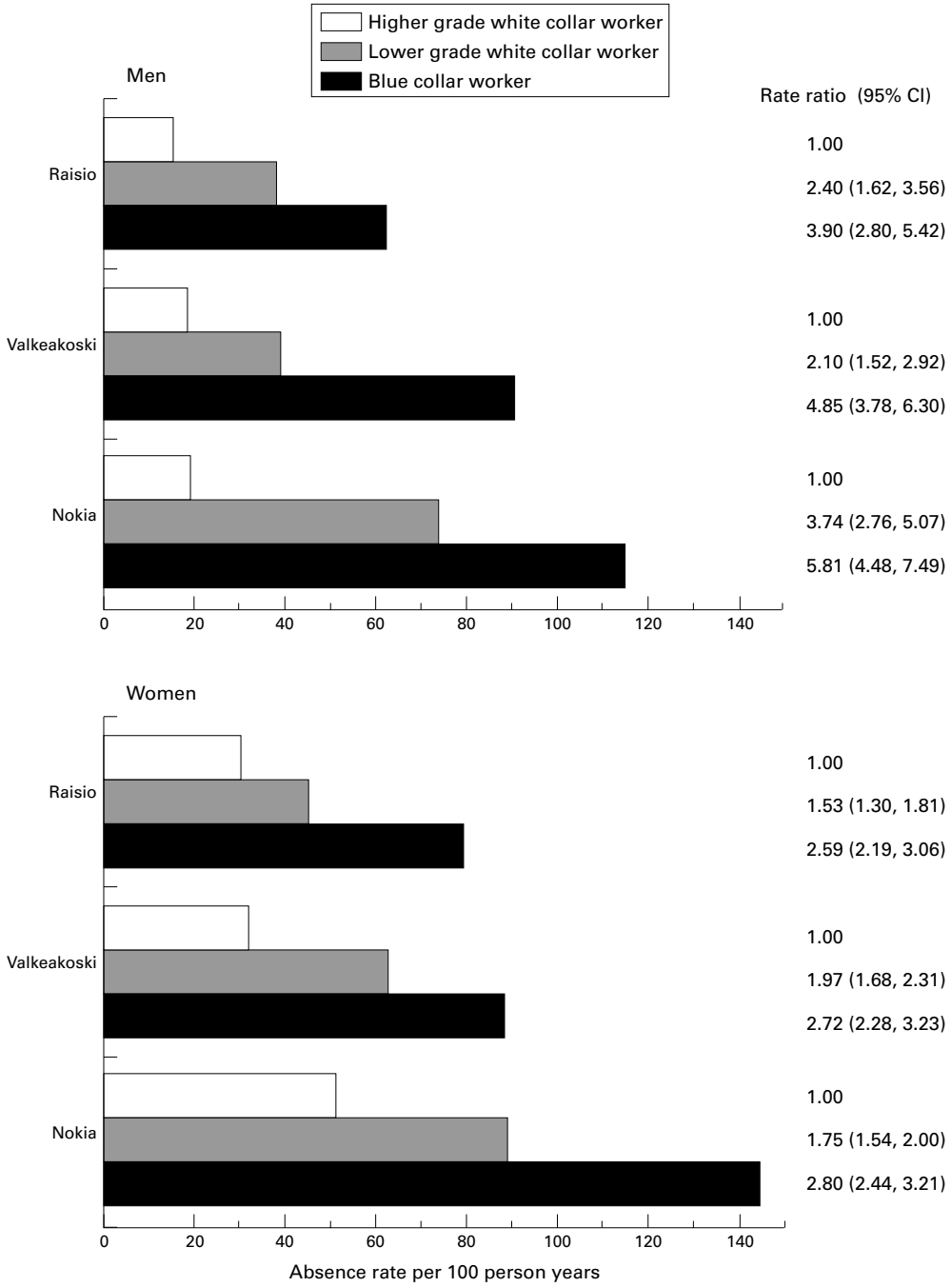

Figure 2 Rate ratios of long periods of sick leave (95% confidence intervals) by SES and by location of workplace.

Table 3 The socioeconomic status (SES) - health gradient in relation to number of sick leave, overall and because of different categories of health problem. Age adjusted rate ratios (RR) and their 95% confidence intervals (95% CI)

	Men				Women				
	Higher grade white collar worker		Lower grade white collar worker	Blue collar worker	Higher grade white collar worker		Lower grade white collar worker	Blue collar worker	Interaction between sex and SES
	Absence rate*	RR	RR (95% CI)	RR (95% CI)	Absence rate*	RR	RR (95% CI)	RR (95% CI)	p value
Short periods of sick leave	60.9	1.00	1.75 (1.41,2.17)	1.47 (1.22,1.77)	97.6	1.00	1.19 (1.07,1.33)	1.13 (0.99,1.29)	0.003
Long periods of sick leave	18.4	1.00	2.69 (2.22,3.27)	4.93 (4.21,5.78)	37.6	1.00	1.84 (1.69,2.01)	2.80 (2.55,3.06)	< 0.001
Sick leave because of an infection	6.1	1.00	2.02 (1.40,2.92)	2.98 (2.21,4.04)	15.6	1.00	1.32 (1.14,1.52)	1.58 (1.34,1.87)	< 0.001
Sick leave because of musculoskeletal disorder	2.8	1.00	5.49 (3.59,8.41)	11.37 (7.80,16.58)	5.8	1.00	3.53 (2.90,4.30)	6.90 (5.67,8.41)	0.04
Sick leave because of trauma	3.2	1.00	3.50 (2.23,5.51)	7.38 (5.00,10.89)	3.9	1.00	1.79 (1.36,2.35)	3.42 (2.59,4.50)	0.004

* Absence rate per 100 person years in higher grade white collar workers. NB Adjusting for place of work do not change these figures.

records were checked for inconsistencies. Overlapping or consecutive spells of sickness absence were combined. A sick leave was categorised as short (≤ 3 days) or long (> 3 days). Long leaves were categorised separately for cases of gastrointestinal and respiratory infection, musculoskeletal disorder, and trauma.[17]

STATISTICAL ANALYSIS

For each employee, the number of sick leaves was calculated. The follow up time was three years for all employees. Absence rates/100 person years and corresponding rate ratios were calculated. The number of sick leaves is a form of count data and therefore Poisson regression models were fitted to the data.[4 18 19] Use of the Poisson model implies that the between individual variance in the sickness absence rates is equal to the expected rate of sickness absence. If the rates vary between people after taking into account the predictors, this may lead to overdispersion relative to that predicted from the Poisson model. When the dispersion of sick leaves was greater than that predicted by the Poisson model, the square root of deviance divided by degrees of freedom was used to adjust for standard errors. This had no effect on the rate ratio estimates, but the widths of the confidence intervals were increased.

We first studied the relation between SES and the number of short and long sick leaves, overall and with reference to the three diagnostic categories (infections, musculoskeletal disorders, traumas). We determined whether the gradients depended on sex by using the cross product term sex × SES as suggested by Cohen and Cohen.[20] We then analysed whether SES health gradients differed significantly between the three towns by entering the cross product term workplace × SES as a predictor in hierarchical regression models. The last step analysed whether the effect of workplace on SES health gradients differed between employees with different lengths of service, by using the cross product term length of service × workplace × SES as a predictor in regression models. The length of service represented an estimate of exposure to the characteristics of the workplace. The models were adjusted for age. All independent variables, except age, were treated as classification variables in the models. Analyses were done separately for men and women.

All analyses were performed using the SAS program. Poisson regression models were calculated using the GENMOD procedure.

Table 4 Joint effect of location of workplace and socioeconomic status on number of sick leave because of different categories of health problem. Age adjusted rate ratios (RR) and their 95% confidence intervals (95% CI)

		Men					Women			
		Higher grade white collar workers		Lower grade white collar workers	Blue collar workers		Higher grade white collar workers		Lower grade white collar workers	Blue collar workers
	p value*	Absence rate†	RR	RR (95% CI)	RR (95% CI)	p value*	Absence rate†	RR	RR (95% CI)	RR (95% CI)
Sick leave because of an infection‡	0.74					0.02				
Raisio		3.6	1.00	2.26 (0.98,5.24)	2.33 (1.11,4.93)		10.9	1.00	1.20 (0.89,1.62)	1.07 (0.75,1.55)
Valkeakoski		5.3	1.00	2.25 (1.22,4.18)	3.60 (2.17,5.96)		15.8	1.00	1.23 (0.96,1.59)	1.26 (0.92,1.72)
Nokia		9.0	1.00	1.89 (1.10,3.25)	2.81 (1.83,4.31)		21.5	1.00	1.28 (1.03,1.59)	1.93 (1.53,2.44)
Sick leave because of musculoskeletal disorder‡	0.04					0.05				
Raisio		2.9	1.00	2.97 (1.24,7.09)	7.91 (3.82,16.32)		5.3	1.00	2.26 (1.58,3.23)	6.09 (4.36,8.51)
Valkeakoski		3.6	1.00	3.69 (1.94,7.04)	9.54 (5.54,16.43)		4.6	1.00	4.18 (2.86,6.12)	7.78 (5.30,11.44)
Nokia		1.9	1.00	13.22 (5.91,29.55)	19.32 (9.12,41.32)		7.5	1.00	3.65 (2.67,4.98)	6.70 (4.89,9.19)
Sick leave because of trauma‡	0.82					0.59				
Raisio		2.0	1.00	4.26 (1.55,11.75)	8.17 (3.27,20.27)		3.1	1.00	1.45 (0.85,2.47)	3.03 (1.81,5.07)
Valkeakoski		3.9	1.00	2.54 (1.26,5.16)	5.81 (3.27,10.33)		3.7	1.00	2.01 (1.24,3.26)	3.03 (1.81,5.10)
Nokia		3.4	1.00	4.60 (2.20,9.64)	9.12 (4.78,17.39)		5.1	1.00	1.66 (1.08,2.53)	3.70 (2.41,5.66)

* Test for interaction between location of workplace and socioeconomic status. † Absence rate per 100 person years in higher grade white collar workers. ‡ Length of sick leave over three days.

Results

The sociodemographic characteristics and occupational structures were almost identical between the employees in each town (table 1). For example, the mean age in Raisio was 42.2 years (range 18–61 years, standard deviation 8.9 years), in Valkeakoski 42.7 (19–61, 8.6) years, and in Nokia 42.5 (20–61, 8.9) years. In all three locations, four of five employees had worked for at least four years for the municipality. According to Statistics Finland (1996),[20] characteristics related to the degree of social deprivation do not differ significantly between the towns (table 2).

The overall rates of sickness absence differed significantly between the towns. In men, the rates of long sick leaves were 1.36 times greater (95% CI 1.20, 1.57) in Valkeakoski, and 1.76 times greater (95% CI 1.55, 2.01) in Nokia, than in Raisio. The corresponding figures for women were 1.24 (95% CI 1.15, 1.36) and 1.92 (95%CI 1.79, 2.08).

SES health gradients in relation to long sick leaves were observed for both measures of SES, the three level SES indicator (higher grade white collar workers; lower grade white collar workers; blue collar workers) and the occupation-based SES indicator (occupations ranked by mean income) (fig 1). The gradients were observed for men and women and in relation to long sick leaves separately for infections, musculoskeletal disorders, and

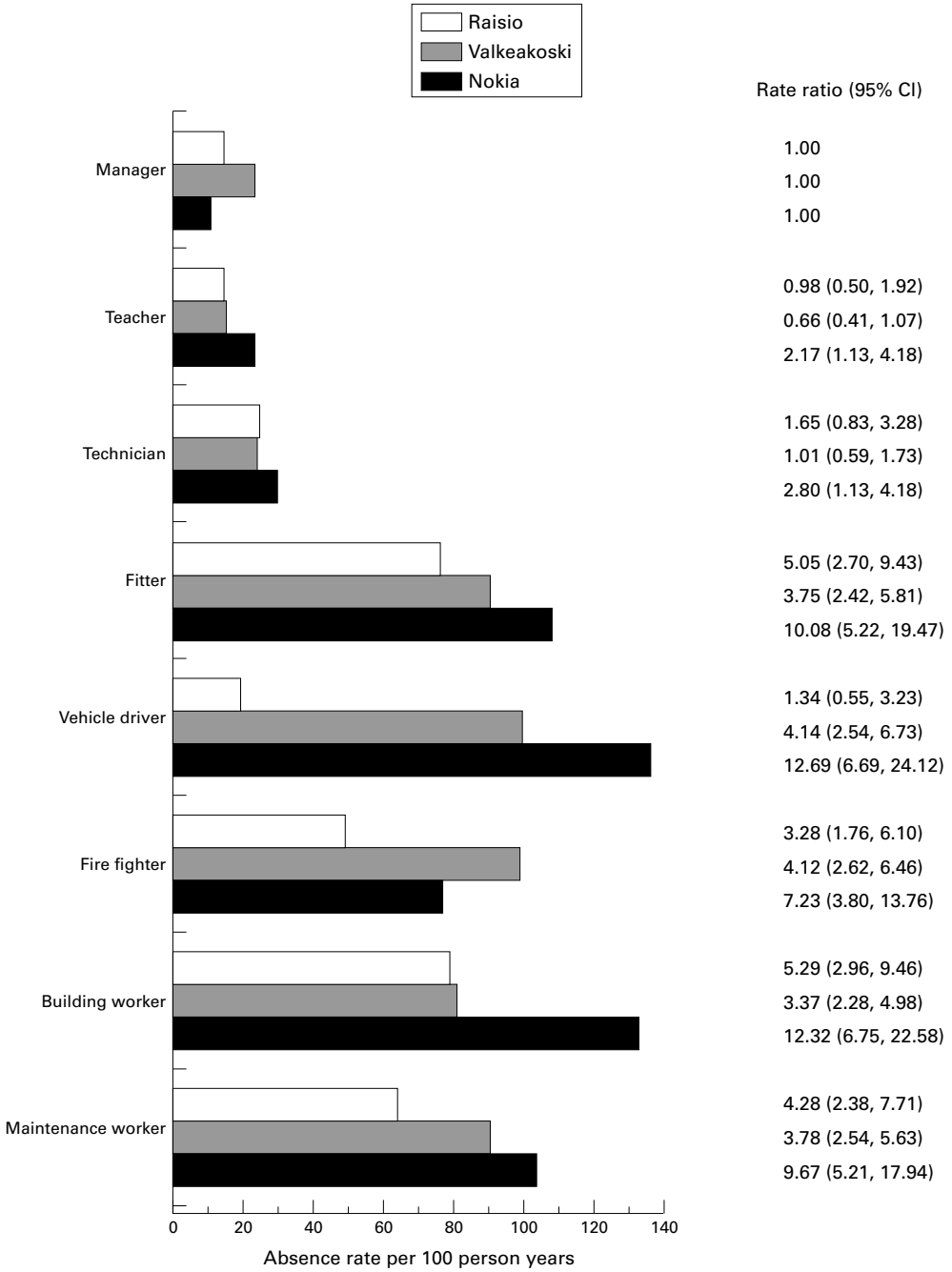

Figure 3 Rate ratios of long periods of sick leave (95% confidence intervals), by occupation and by level of income (lowest for maintenance workers, highest for managers) in men in the Finnish towns of Raisio, Valkeakoski, and Nokia .

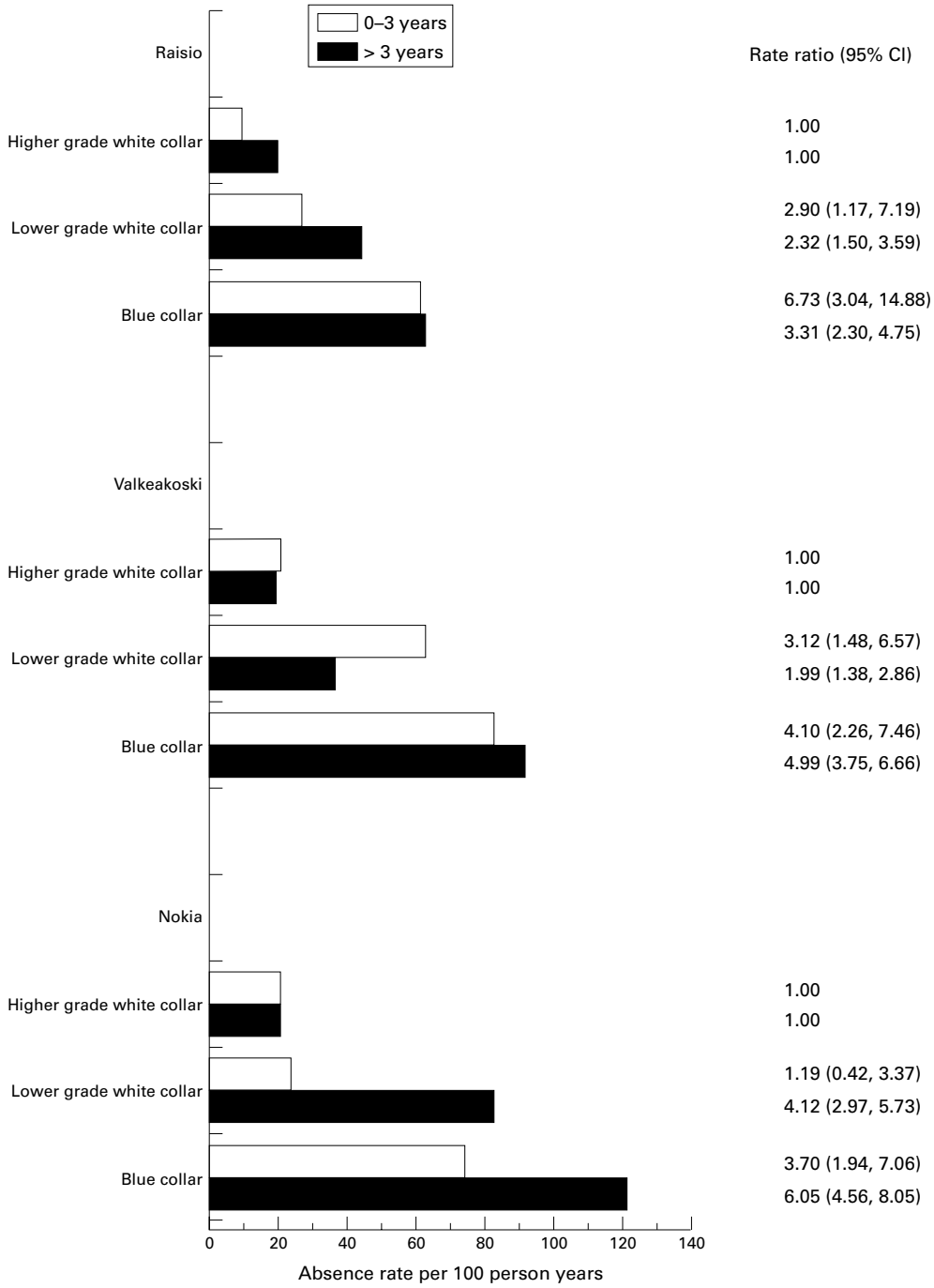

Figure 4 Rate ratios of long periods of sick leave (95% confidence intervals) by SES, by location of workplace, and by duration of employment.

traumas as causes of sick leave (table 3). The gradient was steepest in the case of musculoskeletal disorders, the risk in blue collar men being more than 10 times higher, and in blue collar women seven times higher than in the same sex higher grade white collar workers. The gradient was least steep in relation to sick leaves attributable to infections (three times higher in blue collar men and 1.6 times higher in blue collar women compared with the highest same sex SES group). The interaction between sex and SES had a statistically significant effect on the absence rates. The gradients were steeper in men than in women.

For men, the place of work had a significant effect on the steepness of the SES health gradient in relation to long sick leaves (p value for interaction between SES and location of workplace 0.03) and especially those because of musculoskeletal disorders (p=0.04) (fig 2, table 4). For example, the risk of long sickness absence in blue collar men, compared with higher grade white collar men, was four times higher in Raisio, five times higher in Valkeakoski, and six times higher in Nokia. The results were similar for the multilevel occupation-based SES indicator (fig 3).

The sick leaves differed most between the towns in relation to blue collar men. The rates

Table 5 Effects of location of workplace and occupation (ranked by level of income) on age adjusted rate ratios (RR) and their 95% confidence intervals (95% CI) of number of long sick leaves in women. Incomes were highest for managers and other high status professionals

	Location of workplace			
	Raisio		*Valkeakoski*	*Nokia*
	*Absence rate**	*RR*	*RR (95% CI)*	*RR (95% CI)*
Managers and other high status professionals	30.1	1.00	1.15 (0.74, 1.79)	1.43 (0.95, 2.15)
Teachers	25.8	1.00	1.06 (0.82, 1.38)	2.08 (1.60, 2.64)
Social workers	37.2	1.00	1.20 (0.51, 2.80)	0.98 (0.47, 2.03)
Registered nurses	20.5	1.00	3.25 (2.05, 5.16)	2.91 (1.84, 4.57)
Kindergarten teachers	53.9	1.00	1.07 (0.71, 1.62)	1.28 (0.86, 1.90)
Practical nurses	41.8	1.00	1.60 (1.13, 2.27)	2.20 (1.58, 3.06)
Office clerks	27.1	1.00	1.87 (1.36, 2.58)	2.74 (2.01, 3.73)
Childrens' nurses	43.8	1.00	0.78 (0.39, 1.57)	2.14 (1.57, 2.92)
Assistants	84.8	1.00	1.09 (0.82, 1.46)	1.49 (1.19, 1.88)
Cooks, waiters	65.9	1.00	0.79 (0.57, 1.09)	1.40 (1.08, 1.84)
Maintenance workers	97.3	1.00	0.96 (0.60, 1.54)	1.79 (1.11, 2.89)
Cleaners	80.8	1.00	1.20 (1.02, 1.42)	1.88 (1.62, 2.18)

* Absence rate per 100 person years in Raisio.

of long sick leaves were 1.46 times greater (95% CI 1.25, 1.72) in Valkeakoski and 1.85 times greater (95% CI 1.58, 2.16) in Nokia than in Raisio. For lower grade white collar men, the respective figures were 1.03 (95% CI 0.73, 1.43) and 1.94 (95% CI 1.43, 2.64) for Valkeakoski and Nokia. No differences were found between the towns in relation to higher grade white collar male workers (rate ratios compared with Raisio were 1.17 (95% CI 0.80, 1.72) and 1.26 (95% CI 0.85, 1.84) for Valkeakoski and Nokia, respectively). The results related to the multilevel occupation-based SES indicator replicated these observations. The rates of sick leaves in the low income occupations were significantly higher in Nokia than in Raisio. The corresponding rate ratios were 1.61 (95% CI 1.21, 2.14) for maintenance workers, 1.66 (95% CI 1.31, 2.11) for building workers, 1.57 (95% CI 1.06, 2.32) for fire fighters and 6.75 (95% CI 3.23, 14.11) for vehicle drivers. No significant differences were found in other occupations between the towns.

For male employees, the difference in the SES health gradient in relation to long sick leaves between the towns depended on length of service (p for interaction between SES, location of workplace and duration of employment 0.02) (fig 4). It was evident only in employees who had worked in the same employment for more than three years.

In women, the place of work associated with the steepness of the SES health gradient only in relation to sick leaves attributable to infections (p=0.02) (table 4). The risk of infection was the same in all SES groups in Raisio and in Valkeakoski. In Nokia, blue collar women had almost a two times higher risk of infection than higher grade white collar women. Absences because of infection differed most between the towns in relation to blue collar women. The rates of infections were 1.70 times greater (95% CI 1.17, 2.47) in Valkeakoski and 3.57 times greater (95% CI 2.58, 4.95) in Nokia than in Raisio. In lower grade white collar women, the respective figures were 1.65 (95% CI 1.32, 2.07) and 2.16 (95% CI 1.74, 2.67) for Valkeakoski and Nokia. In higher grade white collar women, the rate ratios compared with Raisio were 1.45 (95% CI 1.08, 1.96) and 1.98 (95% CI 1.49, 2.64) for Valkeakoski and Nokia, respectively.

Otherwise in the long sick leaves, the steepness of the gradient in women did not differ significantly between the towns (p for interaction between SES and location of workplace 0.08) (fig 2, tables 4 and 5). This finding was not dependent on the length of service (p for interaction between SES, location of workplace and length of service 0.28).

No consistent SES health gradients were evident for short sick leaves (table 3). However, in higher grade white collar men the absence rate was lower than in lower grade white collar workers or blue collar workers. In women, the absence rates were almost identical across the SES groups. The interaction between sex and SES was significant.

KEY POINTS

- Workplace significantly contributes to health inequalities as indicated by medically certified sickness absence and the corresponding socioeconomic gradients of health.
- This contribution seems to be stronger for men than for women and evident only after a sufficient time of exposure to workplace characteristics.
- Interventions at organisational level may be an effective way to reduce health inequalities in working population.

Discussion

We found that the workplace had a significant effect on sickness in both sexes. Moreover, the workplace seemed to contribute to health inequalities. In men and to a lesser extent in women, the SES health gradient differed between the three towns studied. In addition, length of service, which determines the time of exposure of a subject to workplace characteristics, affected differences in the SES health gradient between the three towns in men. Differences were significant only in employees with four or more years of service, not in those with shorter periods of service. The effect of workplace on the SES health gradient accordingly increased with the time of employment in that particular workplace. In other studies, a clear cumulative effect of social environmental factors throughout life, including childhood, has been found.[9 22 23]

Previous studies[24 25] have shown that long sick leaves based on a physician's examination reflect employees' health fairly accurately. In contrast, a short sick leave is more often related to factors other than illness (for example, problems in the family or the desire to extend a weekend or holiday). Consistent with this, we found SES health gradients in relation to medically certified long term sick leaves but not in short sick leaves. Our findings may thus reflect actual differences in health rather than differences in the morale or voluntary absence behaviour of workers.

In men especially, the SES health gradient of musculoskeletal disorders differed between the three towns. This finding is important because musculoskeletal disorders, back pain in particular, are the commonest causes of disability in working populations. The prevalence of such health problems is also increasing.[27 28] In women, the SES health gradients of infections significantly differed between the three towns.

Our findings suggest that the health of men and women of low SES can be affected by factors associated with the location of their workplaces. In contrast, high SES can protect men from the effects of the workplace. Women, however, may not benefit consistently from high SES: in locations where health problems were particularly likely among female blue collar workers, they were also particularly likely among female white collar workers. Previous research has shown that the inability of women to benefit from high SES can relate to factors affecting their private lives. Koskinen and Martelin[11] found that SES health gradients in women depended on marital status. Married women did not benefit from high SES as much as married men. The benefits of high SES were similar in unmarried men and women. Conflict between the demands of work and duties at home could result in health problems, particularly in women with a high occupational status.[29 30]

Although the workplace was significantly associated with SES health gradients, you should be cautious in drawing causal interpretations from our results. Employees from the three workplaces did not only differ in terms of organisational and work characteristics. They also lived in different areas (for example, the place of residence for each participant was not identifiable in this study). It is possible that some non-work characteristics of these environments, differences in competition from other employers or standards in local private industries may explain the differences in gradients. However, the observed dependency of health inequality on the length of service supports the importance of workplace characteristics. Differences in gradients between workplaces were particularly evident among employees with a long exposure to the characteristics of their workplace.

Inequality in relation to health is the major unsolved public health problem in the industrialised world.[7] Our findings suggest that such inequalities can be related to characteristics of the workplace. Changes in work life could also be significant in relation to the increase in health inequality recently detected in western Europe, including Finland.[6 19 31 32] What differences between workplaces could be responsible for differences in SES health gradients in relation to long sick leaves? The three towns studied were similar in size and social deprivation scores.[33] All are located near larger cities. All provide similar services to their inhabitants. In each town, the distributions of age, sex, and occupation were similar for the municipal workers. Pay systems and levels as well as the possibility for permanent retirement were similar. All the employees were from the same ethnic group and all were in stable employment. The three locations therefore did not differ substantially in terms of organisational context, tasks to be carried out, staffing structures, and personnel characteristics. The SES health gradients in relation to long sick leaves nevertheless differed markedly between the towns, and health inequality must accordingly also have differed markedly. A relevant next step in attempting to increase understanding about health inequalities could therefore be to develop objective means of measuring patterns of work and describing work environments at different organisational levels in different locations. Such development could also offer possibilities of devising ways to reduce health inequalities and the resultant costs of sickness absenteeism to organisations and society. We will explore this issue in more detail in an ongoing longitudinal study on eight towns.

Although many research findings confirm the existence of health inequality, relatively little is known about how such inequality can be reduced.[34] Our findings are consistent with the assumption that health inequalities can be reduced through interventions at organisational level.

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Conflicts of interest: none.

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