Effect of organisational downsizing on health of employees

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Summary

Background Reduction of personnel by businesses and other organisations (organisational downsizing) is common in Europe, but little is known about its effects on the health of employees.

Methods We used employers' records to investigate the relation between downsizing and subsequent absenteeism because of ill health in 981 local-government workers who remained in employment in Raisio, south-western Finland, during a period of economic decline (1991–95). Data were separated into three time periods: 1991, before downsizing; 1993, major downsizing in some workplaces and occupations; and 1993–95, after downsizing. We obtained data on sick leave from records kept by the occupational health-care unit in Raisio. We also investigated whether the effects of downsizing were dependent on ten other predictors of sick leave.

Findings There was a significant association between downsizing and medically certified sick leave. The rate of absenteeism was 2·3 times greater (95% CI 2·0–2·7) after major downsizing, classified by occupation, than after minor downsizing. The corresponding rate ratios for musculoskeletal disorders and trauma were 5·7 (4·1–8·0) and 2·7 (1·7–4·2), respectively. The effects of downsizing by workplace depended on the age distribution of the staff. When the proportion of employees who were older than 50 years was high, downsizing increased the individual risk of absence because of ill health by 3·2–14·0 times, depending on diagnostic category. When the proportion of employees over 50 years was low, downsizing had only slight effects on health. Other risk factors that increased rates of sick leave after downsizing were age over 44 years, a large workplace, poor health before downsizing, and high income.

Interpretation Downsizing is a risk to the health of employees. But this risk varies according to individual factors, such as age, socioeconomic status, and health, as well as factors related to place of work, for example, size and age structure of the staff.

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Introduction

Downsizing, the reduction of personnel in an organisation, can be an effective tactic to ensure the survival of modern organisations,[1] but it may also have adverse effects on the health of those people who continue to be employees. Downsizing can lead to increased job insecurity, changes in the nature of work and the working environment, and a deterioration in the relationship between management and employees.[2]

There have been few studies of the association between downsizing and health, but much clinical research has been done on the effects of job insecurity. These studies suggest that perceived job insecurity and the threat of redundancy result in anxiety, depression, burnout,[3,4] poor self-reported health status,[5] poor quality of sleep,[6] an increased rate of absenteeism because of ill health,[7] and ischaemic heart disease.[8] However, because feelings of job insecurity are to some extent affected by the personality of the individual, they may not reflect accurately the effects of downsizing. Orpen[4] reported that although perceived job insecurity was related to anxiety and depression among all employees, levels of anxiety and depression did not differ between employees in jobs objectively assessed as safe or unsafe. Van Vuuren and colleagues[9] found that feelings of job insecurity can be attributed not only to downsizing but also to poor managerial decision-making and characteristics such as age, health, and work experience.

We looked at how downsizing between 1991 and 1993 affected the health of Finnish local-government employees. The downsizing in some of the workplaces and occupations was the result of severe economic decline.

Methods

Between 1991 and 1995, Finland faced its most severe economic decline since World War I. Unemployment rose from 3·4% in 1990 to 18·9% in 1993.[10] The number of Finnish local-government personnel fell by 1·4% in 1990–91, by 2·7% in 1991–92, by 7·8% in 1992–93, and by 2·7% in 1993–94.[10]

Our target population was local-government employees of the town of Raisio, in south-western Finland. We used employers' records to identify 981 employees in Raisio who had worked for at least 12 months during the study period (⩾6 months in 1991 before downsizing and ⩾6 months in 1993 when the most extensive downsizing occurred). All the employees agreed to take part in the study. There were 264 men and 717 women. The cohort was followed up from Jan 1, 1991 to Dec 31, 1995. The follow-up time was 1275 person-years for men and 3424 person-years for women.

Data were separated into three time periods: 1991, before the downsizing; 1993, the worst point of the downsizing; and 1993–95, when downsizing slowed down. For 1991 and 1993–95 data consisted of recorded information about absenteeism because of ill health between Jan 1 and Dec 31, 1991, and between Jan 1, 1993, and Dec 31, 1995, respectively. For 1993, data included: the degree of downsizing—ie, reductions in working hours in different occupations and in different places of work between 1991 and 1993; sex; age; income; marital status; organisational tenure; size of household; change in occupational title, workplace, or both; size of place of work; and proportion of employees older than 50 years at the workplace. We defined major downsizing as a reduction in hours worked of more than 18% and minor downsizing as a reduction of less than 8%.

We classified downsizing by occupation and by place of work.

	Year				
	1991	1992	1993	1994	1995
Working hours*					
Sex					
Men	320	311 (−2·8)	289 (−7·1)	288 (0·0)	295 (2·4)
Women	917	846 (−7·7)	775 (−8·4)	800 (3·2)	810 (1·3)
Age (years)					
18–35	364	304 (−16·5)	231 (−24·0)	198 (−14·3)	205 (3·5)
36–45	422	389 (−7·8)	371 (−4·6)	390 (5·1)	382 (−2·1)
46–63	451	464 (2·9)	462 (−0·4)	500 (8·2)	518 (3·6)
Total	1237	1157 (−6·5)	1064 (−8·0)	1088 (2·3)	1105 (1·6)
Sickness days†	1032	1141 (10·6)	1176 (3·1)	1177 (0·0)	1290 (9·6)

Annual % of change in parentheses. *Person-years at work. †Days per 100 person-years.

Table 1: **Working hours and days off work because of ill health among local-government employees in Raisio, 1991–95**

We obtained information from the employers' records for all periods of employment in Raisio, which included dates for the start and end of employment, occupational titles, places of work, and the dates of when each period of absence began and ended. We calculated hours of work by subtracting the number of days absent from work, irrespective of cause, from the total working hours, for each occupational group and for each place of work between Jan 1 and Dec 31, 1991, and between Jan 1 and Dec 31, 1993. Occupations were classified according to Statistics Finland (32 occupational groups).[11] Working hours in 1991 and 1993, expressed as person-years, were calculated for each occupation and for each place of work. The extent of downsizing by occupation and by place of workplace was indicated by the percentage reduction in working hours in 1993 compared with working hours in 1991. We used four categories for the reduction in hours worked for both measures of downsizing (<8%; 8–12%; 13–18%; >18%). We excluded all occupations and workplaces of fewer than five employees.

Data on sick leave were collected from records kept by the occupational health-care unit in Raisio. These computer-based records list periods of sick leave for each employee, and include the date on which sick leave began and ended and the diagnosis in coded form. All sick-leave certificates, irrespective of where they are issued, must be forwarded for recording. For periods of absenteeism of up to 3 days, employees may complete their own certificates. For absences longer than 3 days, medical certificates are required. We grouped all periods of sick leave that occurred before downsizing (between Jan 1 and Dec 31, 1991) and those that occurred after downsizing (between Jan 1, 1993, and Dec 31, 1995). We checked records for inconsistencies and combined overlapping or consecutive periods of sick leave. Periods of sick leave were classified as short spells (≤3 days) and long spells (>3 days). Long periods of absence were classified separately for cases of musculoskeletal disease and trauma.[12]

We also investigated ten other potential predictors of sick leave: the rate of sick leave before downsizing; sex; age (mean age 41·1 [SD 9·0] years); annual income, grouped into 17 categories (group mean 5·3 [3·4]) that differed successively by FIM 12 000 and were transformed logarithmically because of skewness; change in occupational title, place of work, or both between 1991 and 1993

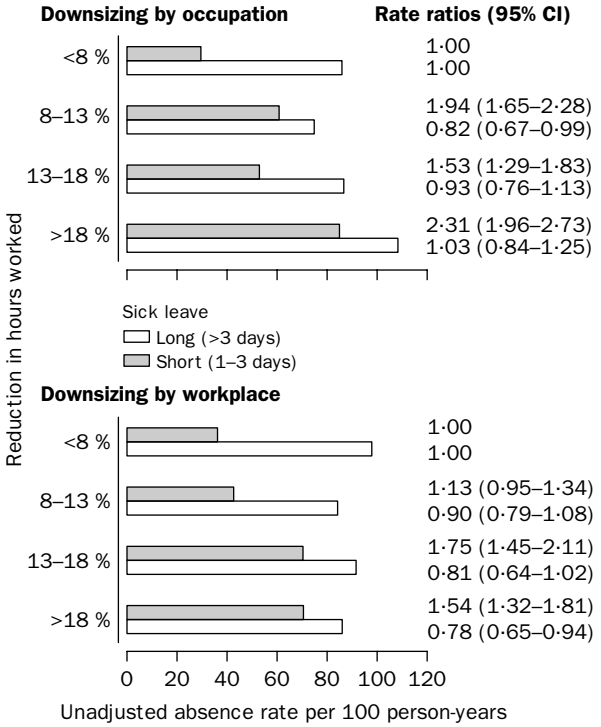

Figure 1: Rate ratios for short and long spells of sick leave associated with downsizing
Adjusted for sex, age, income, and sick leave before downsizing.

(no or yes, 79 employees affected); length of time as a local-government employee before 1991 (<3 years, n=179; 3–10 years, n=352; >10 years, n=450); size of place of work (number of person-years worked in the place of work in 1993 (1–20, n=450; >20, n=464); proportion of hours worked in 1993 by employees older than 50 years (mean 26·9 [13·0]%); marital status (768 married, 213 not married); and size of household (1–3, n=631; >3, n=350).

Statistical analysis

We calculated the number of periods of sick leave and the follow-up period in person-years for each employee. The rate of absenteeism per 100 person-years and the corresponding rate ratios were calculated. Because the number of spells of sick leave is a form of count data, Poisson regression models were fitted to the data.[13,14] Use of the Poisson model implies that the between-employee variance in rates of sick leave is equal to the expected rate of sick leave. When rates of sick leave vary between individuals, after taking account of the predictors, this may lead to overdispersion relative to that predicted from the Poisson model. When the dispersion of periods of sick leave was greater than that predicted by the Poisson model, we used the square root of deviance divided by degrees of freedom to adjust for SEs. This

Degree of downsizing	Person-years	Sick leave due to musculoskeletal disorders			Sick leave due to trauma		
		Absence rate per 100 person-years	Unadjusted rate ratio (95% CI)	Adjusted rate ratio (95% CI)*	Absence rate per 100 person-years	Unadjusted rate ratio (95% CI)	Adjusted rate ratio (95% CI)*
By occupation							
<8%	873	5·6	1·00	1·00	4·6	1·00	1·00
8–12%	616	16·7	2·98 (2·12–4·19)	2·78 (1·97–3·92)	9·9	2·16 (1·45–3·22)	2·07 (1·38–3·10)
13–18%	772	16·3	2·91 (2·09–4·04)	2·58 (1·81–3·68)	4·7	1·02 (0·65–1·60)	1·22 (0·74–2·01)
>18%	490	38·8	6·90 (5·04–9·45)	5·71 (4·10–7·96)	10·8	2·36 (1·56–3·56)	2·65 (1·70–4·15)
By workplace							
<8%	693	10·4	1·00	1·00	3·3	1·00	1·00
8–12%	646	12·8	1·24 (0·90–1·69)	1·14 (0·83–1·57)	8·4	2·52 (1·54–4·10)	2·32 (1·42–3·78)
13–18%	303	18·2	1·75 (1·23–2·48)	1·58 (1·10–2·25)	10·9	3·28 (1·93–5·59)	3·83 (2·23–6·59)
>18%	928	25·9	2·49 (1·91–3·24)	1·73 (1·30–2·30)	7·8	2·34 (1·46–3·74)	3·02 (1·83–4·95)

For downsizing by occupation and workplace, p for trend <0·001 for musculoskeletal disorders and trauma. *Adjusted for age, sex, income, and sick leave before downsizing.

Table 2: **Sick leave due to musculoskeletal disorders and trauma by degree of downsizing**

	Long periods of sick leave		
	Absence rate per 100 person-years	Rate ratio (95% CI)	
		Unadjusted	Adjusted
Sick leave before downsizing			
No	29·2	1·00	1·00
Yes	69·3	2·38 (2·10–2·69)	2·40 (2·13–2·72)
Sex			
Men	46·4	1·00	1·00
Women	54·9	1·18 (1·05–1·34)	1·12 (0·79–1·01)
Age (years)			
<35	47·0	1·00	1·00
35–44	49·7	1·06 (0·92–1·21)	1·12 (0·97–1·28)
>44	59·7	1·27 (1·11–1·45)	1·36 (1·19–1·56)
Income†			
High	26·2	1·00	1·00
Low	62·0	1·70 (1·53–1·88)	1·81 (1·62–2·03)
Size of household			
1–3	56·3	1·00	1·00
>3	45·9	0·81 (0·73–0·91)	0·88 (0·79–0·99)
Size of workplace			
1–20	47·0	1·00	1·00
>20	60·5	1·29 (1·16–1·43)	1·22 (1·09–1·36)
Proportion of staff older than 50 years†			
<14%	52·5	1·00	1·00
⩾40%	37·2	0·86 (0·78–0·96)	0·80 (0·72–0·89)

*Adjusted for age, sex, and sick leave before downsizing. †Cut-off ±1 SD.

Table 3: **Absence rates and rate ratios of factors that predict long periods of sick leave**

calculation did not affect the rate ratio estimates, but widened the confidence intervals. We standardised continuous variables—ie, level of income and percentage of employees older than 50 years. The relation between continuous variables and spells of sick leave was analysed by the linear term in the Poisson models.

The first step of our analysis examined the relation between downsizing and number of short and long periods of sick leave overall and with reference to the two diagnostic categories (musculoskeletal disorder and trauma). We adjusted rate ratios and their 95% CIs for age, sex, level of income, and sick leave before downsizing. We investigated linearity in the relation between downsizing and sick leave by fitting the linear term in the Poisson models. Curvilinear trend was tested by the crossproduct term downsizing multiplied by downsizing.[15] The next step analysed the associations between other predictors (eg, age, sex, level of income) and periods of sick leave. We used the crossproduct term to analyse the interaction between other predictors and downsizing, which we treated as a continuous variable.[15] Estimates of the rate of sick leave adjusted for age, sex, and sick leave before downsizing were calculated from these models, together with the corresponding rate ratios and their 95% CIs for different levels of other predictors.

For all analyses we used the SAS program package. Poisson regression models were calculated by the GENMOD procedure.

Results

According to the employers' records, hours worked in Raisio fell by 14·5% between 1991 and 1993, after which time they gradually increased. However, the number of hours worked in 1995 was 10·7% less than that before the decline; this reduction in hours worked was greater among women (16·1%) than among men (9·9%). During this period, the age profile of employees changed greatly. Before the decline, almost a third of hours worked related to employees aged 35 years or younger. After 1993, the worst year of the decline, fewer than a fifth of hours worked related to this age-group. By contrast, hours worked by individuals older than 45 years increased from a third to almost half of total hours worked. During this period, there was a substantial increase in days off work because of ill health (table 1).

Figure 2: Interaction between downsizing by workplace and other predictors of sick leave

Rate ratios adjusted for age, sex, and sick leave before downsizing. *p for interaction <0·001. †Cut-off ±1 SD.

Absenteeism for long periods, irrespective of cause (figure 1) and because of musculoskeletal disorders and trauma (table 2), was related to the degree of downsizing. The risk of long periods of absence was 1·9–6·9 times greater after major (>18%) than after minor (<8%) downsizing. Adjustment for employees' demographic characteristics and their health status before downsizing did not significantly affect the results.

There was a significant linear relation between downsizing classified by occupation or by workplace and long periods of sick leave, irrespective of cause, and separately with regard to absence because of musculoskeletal disorder and trauma ($p<0·001$). The relation between degree of downsizing by workplace and short periods of absence was linear and inverse ($p<0·01$). The relation between downsizing by occupation and short periods of absence was *U*-shaped ($p=0·032$).

We also found that other factors were associated with high rates of lengthy sick leave: low socioeconomic status; ill health before downsizing; age over 44 years; a small size of household; a large workplace; and a low proportion of employees older than 50 years of age (table 3). In workplaces with younger employees, the absence rate was higher than in the other workplaces. However, in

	Long periods of sick leave		Sick leave due to musculoskeletal disorders	
	p	Major *vs* minor downsizing,* rate ratio (95% CI)	p	Major *vs* minor downsizing,* rate ratio (95% CI)
Sick leave before downsizing	0·037		0·178	
No		1·80 (1·32–2·44)		—
Yes		2·59 (2·20–3·04)		—
Age (years)	<0·001		0·050	
<35		1·25 (0·92–1·69)		2·74 (1·41–5·37)
35–44		2·94 (2·29–3·75)		6·45 (4·07–10·27)
>44		2·81 (2·27–3·48)		7·07 (4·90–10·18)
Proportion of staff older than 50 years†	<0·001		<0·001	
<14%		1·37 (1·07–1·75)		2·39 (1·51–3·79)
⩾40%		3·40 (2·68–4·34)		14·04 (8·51–22·75)

Rate ratios adjusted for age, sex, and sick leave before downsizing.
*Downsizing >18% *vs* downsizing <8%. †Cut-off ±1 SD.

Table 4: **Interactions between downsizing by occupation and other predictors of sick leave**

workplaces with older employees, the risk of increased absenteeism, after downsizing, was higher. Change in occupational title, workplace, or both, organisational tenure, and marital status were not related to absence because of ill health.

The association between downsizing and long spells of sick leave was dependent on other factors related to individuals and places of work (figure 2, table 4). Individuals older than 44 years and those in workplaces with a high proportion of older employees were at greatest risk of long periods of sick leave. This finding was indicated by both measures of downsizing, but was most pronounced for sick leave due to musculoskeletal disorders. In large workplaces and among employees with a high income, major downsizing by workplace, but not by occupation, was associated with increased risk of absence. After major downsizing classified by place of work, there was a two-fold increase in the risk of musculoskeletal disorders among employees with households of fewer than four people than among those with larger households (p=0·011). This increase was not affected by adjustment for age, sex, and health status before downsizing.

The effect of downsizing on short-term sick leave (1–3 days) did not depend on variables associated with the individual or workplace.

Discussion

Our findings suggest that there is a linear increase in the risk of long-term sick leave after downsizing. On the basis of the extensive Whitehall II studies,[13,16] lengthy absence because of sickness seems to reflect accurately the health of employees. In our study, all long spells of absence had been certified by a doctor. We assessed absence according to frequency, a measure more stable and less susceptible to error than other measures of absenteeism.[17,18] If account is also taken of the objective assessment of downsizing and the longitudinal study design, our results provide strong evidence that downsizing represents a risk to the health of employees.

The broader context of this study, severe economic decline, is also important. A common assumption is that adverse effects of economic decline on public health are associated with a reduced capacity of society to provide adequate preconditions for health. A main contributor to health impairment in this context has been unemployment and its consequences.[19–23] Our findings indicate that individuals who remain in work during a period of economic recession may suffer from an increase in ill health; the extent to which employees' health is affected will depend on the degree of downsizing. However, it is not clear whether downsizing during a more stable economic period would result in similar health risks for employees.

In assessments of the economic effects of organisational downsizing, both long-term and short-term absence should be taken into account. We found that downsizing increased the rate of long-term absence; by contrast, the rate of short-term absence was inversely related to the degree of downsizing. Studies have shown that long periods of absence are likely to be related to a medically certified illness, whereas short-term absence may not be related to illness in all cases.[13,16] Although downsizing increases ill health, it reduces absenteeism not related to health: on average, the short periods of absence fell by 14% and long-term sick leave rose by 16–31%.

The immediate financial advantages of downsizing need to be balanced against the costs that result from an increase in absenteeism. In our study, 8–13% of savings in labour costs achieved by downsizing were lost because of an increase in days of absence among employees who remained at work for the following 3 years. On this basis, the economic benefits of downsizing remain convincing. However, downsizing may also affect the performance of employees. Research suggests that perceived insecurity can disrupt group performance,[24] reduce productivity, and increase staff turnover.[25,26] But some studies suggest downsizing can sometimes lead to increased effort and productivity.[27,28] Research into changes in both absence and productivity in relation to downsizing is needed.

Our findings have several implications for the prevention of sickness among employees and the identification of potential groups at risk of absenteeism in workplaces—ie, older individuals with high socioeconomic status at large workplaces. The proportion of older employees in a workplace seems to be of particular importance. In workplaces with a high proportion of older employees, major downsizing by workplace may lead to a ten-fold increase in the risk of an individual developing musculoskeletal disorders compared with minor downsizing. In a place of work with a low proportion of older employees, downsizing does not increase risks to employees' health.

Musculoskeletal disorders, especially back pain, are the most common cause of disability in workers.[29] An increasing trend in the prevalence of this age-related health disorder has been reported in Europe.[30,31] Effective preventive measures, not only for older employees but also for those working in places where there is a high proportion of older employees, could keep to a minimum the potential adverse health effects of downsizing.

Contributors

Jussi Vahtera was the principal investigator, coordinated the project, designed, checked, and collated the data, supervised the data analysis, and contributed to the writing of the paper. Mika Kivimäki was the principal writer of the paper and advised on the design, execution, and data analysis. Jaana Pentti developed the measure of dcownsizing, analysed the data, advised on the interpretation of the results, and contributed to the writing of the paper.

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Monitoring the results of cardiac surgery by variable life-adjusted display

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Summary

Background Conventional assessment of the outcome of cardiac surgery usually takes the form of retrospective mortality figures and, at best, indicates an average performance over time. Summary tables conceal good and bad runs, and without risk adjustment they are difficult to interpret. We developed a refinement of the cumulative sum method that weights death and survival by each patient's risk status and provides a display of surgical performance over time.

Methods The variable life-adjusted (VLAD) plot shows the difference between expected and actual cumulative mortality. VLAD shows whether a surgeon's performance is above or below what might be expected. This mortality-scoring system accumulates penalties for each death and rewards for every survivor, based on the inherent risk of perioperative death of each case concerned.

Findings We illustrate the results of three performance reviews, displayed as VLADs. The first shows the results of an individual surgeon for 547 consecutive cardiac-surgical cases. The overall mortality was 36% less than that predicted by the Parsonnet scoring system. The second displays the results for 5000 consecutive patients who underwent cardiopulmonary bypass between 1992 and 1996, divided into six contemporaneous series. The predicted mortality was 9% compared with 6% actual mortality. The third is a plot for a trainee surgeon and clearly shows how a period of poor performance was identified and then substantially improved, which would not have been revealed by conventional tables of summary statistics.

Interpretation VLAD provides a graphical display of risk-adjusted survival figures for individual surgeons or units over time and could be modified to monitor performance over a range of treatments and outcomes.

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Introduction

There is public and media interest in surgical results, particularly those for cardiac surgery.[1] During the 1970s and 1980s mortality figures fell to low levels for most