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RESEARCH REPORT

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Correspondence to: Dr J Vahtera, Finnish Institute of Occupational Health, Hämeenkatu 10, FIN-20500 Turku, Finland; jussi.vahtera@occuphealth.fi

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Objective: To determine the extent to which sickness absence is predictive of mortality.
Design: Prospective cohort study. Data on medically certified long term absences (>3 days), self certified short term absences (1–3 days), and sick days were derived from employers' records and data on mortality from the national mortality register.
Setting: 10 towns in Finland.
Participants: 12 821 male and 28 915 female Finnish municipal employees with a job contract of five consecutive years. The mean follow up was 4.5 years.
Main results: After adjustment for age, occupational status, and type of employment contract, the overall mortality rate was 4.3 (95% confidence intervals 2.6 to 7.0) and 3.3 (2.1 to 5.3) times greater in men and women with more than one long term absences per year than in those with no absence. The corresponding hazard ratios for more than 15 annual sick days were 4.7 (2.3 to 9.6) and 3.7 (1.5 to 9.1). Both these measures of sickness absence were also predictive of deaths from cardiovascular disease, cancer, alcohol related causes, and suicide. Associations between short term sickness absences and mortality were weaker and changed to non-significant after adjustment for long term sickness absence.
Conclusions: These findings suggest that measures of sickness absence, such as long term absence spells and sick days, are strong predictors of all cause mortality and mortality due to cardiovascular disease, cancer, alcohol related causes, and suicide.

A Medline search with key words "sickness absence", "sickness absenteeism", "sick leave" shows that the number of medical studies on sickness absence has increased, being 280 in the 1980s and 649 in the 1990s. Several studies have used sickness absence as a measure of ill health in working populations.[1–6] However, sickness absence may also be related to factors other than health.[5 7 8] Employees may stay away because of unpleasant or unsatisfying working conditions or because they value their leisure and activities outside work.

Comparatively few published studies have examined the genuineness of sickness absence as a measure of health and none of them has focused on hard end points, such as mortality. One found that sickness absence predicts subsequent serious morbidity and medical retirements.[4] Another investigation concluded, based on self reported morbidity data, that long absences, over seven days, are likely to be health related.[5] Established health risk factors such as smoking, alcohol consumption, and occupational status have also been associated with recorded sickness absence.[1 5 9]

As a further step in determining the health related status of sickness absence, we studied the associations of sickness absence with all cause mortality and mortality attributable to the leading causes of death—that is, cardiovascular disease, cancer, alcohol related causes, and suicide.

METHODS

Study population

Data were drawn from the on-going Finnish 10 town study, which is exploring the health of municipal employees in 10 towns in Finland (Espoo, Naantali, Nokia, Oulu, Raisio, Tampere, Turku, Vantaa, Valkeakoski, and Virrat).[8] These towns, including the five biggest Finnish cities (except the capital) and five smaller nearby towns, provide municipal services for 984 000 inhabitants (19% of the total Finnish population). The ethics committee of the Finnish Institute of Occupational Health approved the study.

The participants were all 41 736 full time municipal employees who had a job contract lasting at least five consecutive years between 1 January 1990 and 31 December 2000 in the 10 towns (only full years of employment were considered). Their mean age was 45.9 (SD 8.4) years. For all periods of employment, we obtained records on date of commencement and, where appropriate, termination of work contracts and date on which each absences began and ended and the reasons stated.

The following demographic factors were obtained from employers' records: sex, age, occupational title, expressed as the 5 digit codes of Statistics Finland, and type of employment contract (permanent or temporary). To indicate occupational status, occupational titles were classified as manual or non-manual work.[10]

Assessment of sickness absence

Data on sickness absence for the first five consecutive years of employment after 1 January 1990 were collected from town records listing periods of sick leave for each employee and including the date on which each sick leave began and ended. In the target organisations, all sick leave certificates, irrespective of where they are issued, must be forwarded for recording. For periods of up to three days, employees complete their own certificates. For absences longer than three days, medical certificates are required. The indices of sick leaves used were annual rate of short and long term absences and the number of sickness absence days per year. We conducted separate analyses for these indices typically used in research,[2 5 7 8 11] as it is possible that their associations with health differ.[2 5]

Mortality assessment

Mortality data after the five year assessment of sickness absence until 31 December 2001 were collected from the national mortality register kept by Statistics Finland (official

Table 1 Adjusted associations of demographics with sickness absence and mortality. 10 Town study, Finland

			Sickness absence			
			Short term (1–3 days)	Long term (over 3 days)	Absence days	Mortality
	Participants (%)	Deaths	Rate ratio (95% CI)	Rate ratio (95% CI)	Rate ratio (95% CI)	Hazard ratio (95% CI)
Sex*						
Men	12821 (31)	166	1.00	1.00	1.00	1.00
Women	28915 (69)	209	1.59 (1.55 to 1.62)	1.24 (1.21 to 1.27)	1.20 (1.17 to 1.23)	0.50 (0.41 to 0.61)
Age group†						
18–45	18187 (44)	72	1.00	1.00	1.00	1.00
>45	23549 (56)	303	0.70 (0.69 to 0.71)	1.09 (1.06 to 1.11)	1.25 (1.22 to 1.28)	3.19 (2.46 to 4.12)
Occupational status‡						
Non-manual	30390 (73)	242	1.00	1.00	1.00	1.00
Manual	11259 (27)	133	1.13 (1.11 to 1.15)	1.72 (1.68 to 1.76)	1.68 (1.64 to 1.72)	1.33 (1.07 to 1.66)
Type of employment‡						
Permanent	39213 (94)	362	1.00	1.00	1.00	1.00
Temporary	2523 (6)	13	0.88 (0.84 to 0.91)	0.63 (0.60 to 0.67)	0.60 (0.57 to 0.64)	0.85 (0.49 to 1.48)

*Adjusted for age; †adjusted for sex; ‡adjusted for sex and age.

Finnish government statistics), using the personal identification number assigned to each Finnish citizen. The database provides virtually complete population mortality data.[12] The dates and causes (from death certificates) of death were obtained for all the participants. In addition to all cause mortality, we analysed deaths from cardiovascular diseases (ICD9 codes 390–459, ICD10 I00–I99)[13 14] and cancer (ICD9 140–208, ICD10 C00–C97) as well as deaths from cancer, separately for smoking related (ICD9 140, 141, 143–150, 157, 160–163, 188, 189, ICD10 C00–C06, C09–C15, C25, C30–C34, C38, C64–C68) and other cancer,[15] and deaths from alcohol related causes (ICD9 141, 143–146, 148–150, 155, 161, 291, 303, 571, 800–998; ICD10 C01–C06, C09, C10, C12–C15, C22, C32, F10, K70, S00–Y91),[16] and suicide (ICD9 E95; ICD10 X60–X84).

Statistical analysis

We checked the records for inconsistencies and combined any overlapping or consecutive periods of sickness absence. For each employee, the numbers of sickness absences and their lengths were computed. As in earlier studies,[1 2] Poisson regression models were fitted to these data to estimate the associations with sex, age group ($\leqslant$45 versus >45 years in the beginning of the follow up), occupational status (manual versus non-manual occupation) and type of employment (temporary versus permanent). Use of the Poisson model implies that the between individual variance in the frequency of absence is equal to the expected frequency of absence. Because the dispersion of absences was greater than that predicted by the Poisson model, we used the square root of deviance divided by degrees of freedom to adjust for standard errors.[1]

To study the association between sickness absence and mortality, indices of absence were categorised into four groups. The person years at risk (of dying) were calculated for each participant from the first day after the five year period at work until 31 December 2001. We used Cox proportional hazard models to estimate the hazard ratios and 95% confidence intervals comparing mortality at each level of absences with no absences. Hazard ratios were adjusted for sex, age in 10 year categories, occupational status and type of employment when appropriate.

We also studied whether the results of all cause mortality were replicable with one year absence records. Instead of five years, all employees who had a job contract of one year or more during the study period were included. This resulted in a cohort of 71 749 full time municipal employees. Their absence records for the first year of employment were obtained as well as mortality after this year (988 deaths during the mean follow up of 7.3 years). We split the follow up period of mortality into two halves (0–5 years; >5 years) to explore the short and long term associations of absences with mortality.

The analyses were performed using the GENMOD and PHREG procedures in the SAS 8.2 program.

RESULTS

For the 12 821 male and 28 915 female full time employees, we identified 407 279 sickness absences for a total of 2 679 466 sickness absence days during a five year period at work. In men, mean rate of short term absences per year was 0.92 and that of long term absences 0.62 resulting in 11.6 absence days per year on the average. In women, the corresponding figures were 1.44, 0.77, and 13.9. During the follow up of 185 717 person years (mean 4.5 years) there were 375 deaths of which 76 were from cardiovascular disease, 53 from smoking related cancer, 112 from other cancer, 109 from alcohol related causes, and 36 from suicides.

As shown in table 1, demographic characteristics were associated with sickness absence and mortality. Male sex was associated with a lower sickness absence rate across all the indicators and higher mortality. Higher age increased the risk of long term absences, total number of absence days and mortality, but decreased the risk of short term absences. Manual occupation was associated with a higher risk of absence and also with a higher mortality. Temporary employees had lower absence rate than permanent employees.

Table 2 shows the associations between sickness absence and mortality by sex. In relation to long term absences, mortality increased as the absence rates increased. Men and women with more than one long absence spell per year had a 3.3 to 4.3 times higher risk of death than those with no such absences. Employees with over 15 absence days per year had a 3.7 to 4.7 times excess risk of mortality. The association of short term absences with mortality was substantially weaker. When analysed in the same model with long term absences, the association of short term absences with mortality vanished altogether while the association of long term absences with mortality remained unchanged (data not shown).

As shown in table 3, sickness absence associated with mortality across age groups, in non-manual and manual employees, and in permanent employees. No significant association between absence and deaths was found in temporary employees. A stratified analysis by sex and occupational status gives very similar results: more than one long absence spell per year was associated with a hazard ratio of 4.91 (95% CI 2.54 to 9.51) in non-manual men, 4.14

Table 2 Adjusted associations of sickness absence with death from all causes. 10 Town study, Finland

	Men			Women		
Measure of sickness absence*	Number of participants (%)	Deaths	Hazard ratio (95% CI)†	Number of participants (%)	Deaths	Hazard ratio (95% CI)†
Short term absences (1–3 days)						
0	2272 (18)	30	1.00	2258 (8)	13	1.00
>0–1	6160 (48)	76	1.06 (0.69 to 1.62)	10895 (38)	67	1.17 (0.65 to 2.12)
>1–2	2758 (21)	38	1.41 (0.87 to 2.28)	8536 (29)	56	1.36 (0.74 to 2.49)
>2	1631 (13)	22	1.59 (0.91 to 2.77)	7226 (25)	73	2.33 (1.29 to 4.22)
Long term absences (>3 days)						
0	3547 (28)	23	1.00	5683 (20)	23	1.00
>0–0.5	4324 (34)	49	1.89 (1.15 to 3.11)	9547 (33)	37	0.99 (0.59 to 1.66)
>0.5–1	2197 (17)	31	2.46 (1.42 to 4.27)	5537 (19)	41	1.88 (1.13 to 3.14)
>1	2753 (21)	63	4.25 (2.57 to 7.03)	8148 (28)	108	3.33 (2.12 to 5.26)
Absence days						
0	1247 (10)	9	1.00	1148 (4)	5	1.00
>0–7	6194 (48)	48	1.29 (0.63 to 2.63)	12685 (44)	47	1.01 (0.40 to 2.55)
>7–15	2466 (19)	28	1.99 (0.93 to 4.24)	6772 (23)	36	1.45 (0.57 to 3.70)
>15	2914 (23)	81	4.73 (2.34 to 9.55)	8310 (29)	121	3.72 (1.51 to 9.14)

*The indices of sickness absence are annual rate of short and long term absences and the number of sickness absence days per year, based on data from five consecutive years at work; †adjusted for age in 10 year categories, occupational status and type of employment contract.

Table 3 Adjusted associations of sickness absence with death by demographics. 10 Town study, Finland

	Age group†		Occupational status†		Type of employment†	
Measure of sickness absence*	18–45 years	over 45 years	Non-manual	Manual	Permanent	Temporary
Long term absences						
0	1.00	1.00	1.00	1.00	1.00	1.00
>0–0.5	1.86 (0.77 to 4.41)	1.31 (0.88 to 1.95)	1.44 (0.93 to 2.21)	1.19 (0.62 to 2.29)	1.43 (0.99 to 2.08)	0.95 (0.23 to 3.90)
>0.5–1	2.63 (1.06 to6.50)	2.09 (1.38 to 3.16)	2.73 (1.75 to 4.26)	1.20 (0.60 to 2.40)	2.27 (1.54 to 3.34)	0.68 (0.07 to 6.12)
>1	4.19 (1.81 to 9.70)	3.78 (1.69 to 5.15)	4.70 (3.13 to 7.06)	2.33 (1.29 to 4.23)	3.94 (2.78 to 5.58)	2.58 (0.62 to 10.65)
Absence days						
0	1.00	1.00	1.00	1.00	1.00	1.00
>0–7	2.07 (0.28 to 15.47)	1.13 (0.62 to 2.03)	1.24 (0.64 to 2.43)	1.01 (0.36 to 2.89)	1.29 (0.70 to 2.36)	0.51 (0.09 to 2.85)
>7–15	2.93 (0.38 to 22.43)	1.68 (0.91 to 3.12)	1.96 (0.97 to 3.93)	1.26 (0.43 to 3.66)	1.90 (1.02 to 3.55)	0.68 (0.09 to 5.03)
>15	7.49 (1.01 to 55.34)	4.16 (2.34 to 7.40)	5.30 (2.75 to 10.23)	2.73 (1.00 to 7.49)	4.69 (2.60 to 8.47)	2.34 (0.43 to 12.76)

*The indices of sickness absence are annual rate of long term absences (>3 days) and the number of sickness absence days per year, based on data from five consecutive years at work; †hazard ratios are adjusted for age in 10 year categories, occupational status, and type of employment contract.

(95% CI 2.45 to 7.00) in non-manual women, 3.13 (95% CI 1.41 to 6.96) in manual men, and 1.42 (95% CI 0.59 to 3.46) in manual women.

Table 4 shows the associations between absence rate and specific causes of death. Employees with more than one long absence spell per year had 4.2 (95% CI 2.0 to 8.9) times higher mortality from cardiovascular disease, 3.0 (95% CI 1.8 to 5.0) times higher mortality from all cancer (not shown in the table), 4.4 (95% CI 2.4 to 8.1) times higher mortality from alcohol related causes and 7.7 (95% CI 2.2 to 27.0) times higher mortality from suicide. The association between absence and cancer was more attributable to cancer not related to smoking than to smoking related cancer. A corresponding risk profile of cause specific mortality was found for employees with over 15 absence days per year.

To explore the short and long term associations of absences with mortality, we used data on one year absence records from a larger sample of all those employees who had a job contract of at least one year during the study period. Table 5 shows the associations between sickness absence and

Table 4 Adjusted associations of sickness absence with death from specific causes. 10 Town study, Finland

	Cause of death†				
Measure of sickness absence*	Cardiovascular disease (76 deaths)	Smoking related cancer (53 deaths)	Other cancer (112 deaths)	Alcohol related cause (109 deaths)	Suicide (36 deaths)
Long term absences					
0	1.00	1.00	1.00	1.00	1.00
>0–0.5	1.79 (0.82 to 3.91)	1.59 (0.69 to 3.68)	1.14 (0.56 to 2.33)	1.11 (0.56 to 2.20)	2.03 (0.54 to 7.68)
>0.5–1	1.57 (0.63 to 3.91)	1.21 (0.45 to 3.26)	2.84 (1.44 to 5.63)	2.49 (1.27 to 4.89)	3.03 (0.75 to 12.35)
>1	4.19 (1.96 to 8.94)	1.95 (0.83 to 4.60)	3.72 (1.95 to 7.06)	4.44 (2.40 to 8.12)	7.73 (2.22 to 26.98)
Absence days					
0	1.00	1.00	1.00	1.00	1.00
>0–7	2.07 (0.48 to 8.85)	1.83 (0.43 to 7.87)	1.61 (0.38 to 6.87)	0.75 (0.31 to 1.82)	0.53 (0.11 to 2.58)
>7–15	1.99 (0.43 to 9.31)	1.68 (0.36 to 7.89)	2.84 (0.66 to 12.29)	1.32 (0.52 to 3.32)	1.04 (0.21 to 5.31)
>15	7.35 (1.75 to 30.83)	2.81 (0.65 to 12.21)	7.96 (1.93 to 32.85)	3.23 (1.36 to 7.65)	3.36 (0.76 to 14.94)

*The indices of sickness absence are annual rate of long term absences (>3 days) and the number of sickness absence days per year, based on data from five consecutive years at work; †hazard ratios are adjusted for age in 10 year categories, occupational status, and type of employment contract.

Table 5 Short and long term associations of sickness absence with all cause death. One year absence from a sample of all participants with at least one year at work. 10 Town study, Finland

	Deaths within five years				Deaths after five years†			
	Men		Women		Men		Women	
	Participants (deaths)	Hazard ratio‡ (95% CI)	Participants (deaths)	Hazard ratio (95% CI)	Participants (deaths)	Hazard ratio (95% CI)	Participants (deaths)	Hazard ratio (95% CI)
Short term absences								
0	10543 (118)	1.00	18252 (91)	1.00	8761 (118)	1.00	14799 (98)	1.00
1–2	6937 (80)	1.16 (0.87 to 1.54)	21730 (88)	0.97 (0.72 to 1.30)	5780 (91)	1.29 (0.98 to 1.69)	17350 (105)	1.01 (0.77 to 1.33)
>2	2154 (37)	2.12 (1.46 to 3.08)	12133 (66)	1.66 (1.20 to 2.29)	1725 (23)	1.32 (0.84 to 2.07)	9378 (73)	1.52 (1.12 to 2.07)
Long term absences								
0	13097 (115)	1.00	30188 (97)	1.00	10689 (127)	1.00	23920 (117)	1.00
1	3972 (51)	1.40 (1.01 to 1.96)	12462 (61)	1.45 (1.06 to 2.00)	3345 (53)	1.24 (0.90 to 1.72)	9928 (80)	1.53 (1.15 to 2.04)
>1	2565 (69)	2.67 (1.96 to 3.65)	9465 (87)	2.43 (1.81 to 3.26)	2232 (52)	1.76 (1.26 to 2.46)	7679 (79)	1.80 (1.35 to 2.41)
Absence days								
0	7949 (77)	1.00	12643 (50)	1.00	6508 (78)	1.00	10110 (53)	1.00
1–15	8262 (63)	0.90 (0.64 to 1.26)	27638 (90)	1.00 (0.71 to 1.42)	6784 (85)	1.14 (0.84 to 1.56)	21795 (119)	1.15 (0.83 to 1.59)
>15	3423 (95)	2.66 (1.95 to 3.63)	11834 (105)	2.16 (1.54 to 3.04)	2974 (69)	1.76 (1.26 to 2.46)	9622 (104)	1.85 (1.33 to 2.58)

Instead of five years, all employees who had a job contract of one year or more during the study period are included. *The indices of sickness absence are the observed number of short and long term absences (1–3 days and >3 days, respectively) and the number of sickness absence days from the first year at work; †the mean follow up 8.4 years; ‡hazard ratios are adjusted for age in 10 year categories, occupational status, and type of employment contract.

Key points

- Men and women with more than one long absence spell or over 15 absence days per year are at increased risk of death.
- Increased risk of death relates to overall mortality and mortality attributable to cardiovascular disease, cancer, alcohol related causes, and suicide.
- The association between short term absences and mortality is substantially weaker.

mortality after adjustment for age in 10 year categories, occupational status, and type of employment contract. In men and women, long term sickness absences and sick days predicted mortality within and after the first five years of follow up. Short absence spells were associated with mortality during both periods of follow up in women, but in men the association was observed only within the first five years.

For both follow up periods, the associations between sickness absence and cause specific mortality followed the same pattern as all cause mortality (data not shown). For example, employees with more than one long absence spell per year had 1.9 (95% CI 1.2 to 3.0) times higher cardiovascular mortality in the first five years of follow up, and 2.1 (95% CI 1.3 to 3.2) times higher cardiovascular mortality after this period. The corresponding figures for cancer were 2.4 (95% CI 1.2 to 3.3) and 1.4 (95% CI 1.0 to 2.0). For deaths from alcohol related causes, the figures were 3.4 (95% CI 2.3 to 5.1) and 2.2 (95% CI 1.5 to 3.3), and for suicide 2.8 (95% CI 1.8 to 4.5) and 2.0 (95% CI 0.9 to 4.2).

DISCUSSION

No previously published study so far has linked sickness absence with all cause and cause specific mortality. Our findings on municipal employees show that high rates of sickness absence are associated with increased mortality. The specific strengths of this study were a large sample size covering all municipal occupations, the use of reliable absence and mortality registers, and determination of sickness absence levels on the basis of a long period of employment, minimising the effect of chance on the measurement of the predictor. A limitation was lack of data on other indicators of health and health risk behaviours.

Our findings suggest that increasing rate of long term sickness absence is associated with gradually increasing death rate in men and women, across age and occupational groups, and for both five and one year absence records. The association between long term sickness absence is unlikely to result from sickness absence close to death, because the association remained even after excluding such absences. The results on the annual number of absence days closely corresponded to those obtained for long term absences,

Policy implications

- Absence data provide an important source of information about health or consequences of ill health in working populations.
- Sickness absence data cover information on the health problems that the employees face in their everyday life. The impact of measurement on the responses obtained is minimised.

showing increased mortality for employees with more than 15 absence days per year.

Our data on cause specific mortality suggest that long term sickness absence and sick days reflect a large variety of diseases including those related to health risk behaviours. These indices of absence predicted cardiovascular and cancer mortality, two leading causes of death in Western societies,[17] suicide, a marker of depression or other mental health problems, as well as deaths from smoking and alcohol related causes.[15 16] Our prospective results are in line with an earlier retrospective study that found an association between sickness absence and suicide in men.[17] A high rate of sickness absence found for heavy drinkers[6] is likely to be attributable to a greater incidence of alcohol induced diseases, a more severe course of these or other diseases, and poorer treatment or compliance to treatment. In this study, long sick leaves predicted mortality from cardiovascular disease, cancer, and alcohol related causes within the first five years after the assessment of absences, and also after this. A plausible explanation for this is that such severe illnesses, because of progression or relapse, can lead to death even several years after return to work from a long sick leave.

Short term sickness absences, comprising periods of one to three days, was a relatively weak predictor of mortality. After adjustment for long term absences, the association between short term absences and mortality fully attenuated. In line with this, prior evidence shows that short term sickness absence is not associated with age, occupational status, or job insecurity in the same way as morbidity and mortality are.[2 5 8] Moreover, one day absences are more common on Mondays and Fridays than on other weekdays, a finding not possible to explain by daily variation in illness.[8] Together these findings suggest that short term sickness absence has less to do with health than other forms of sickness absence do.

In comparison with self reported measures of health, data on sickness absence can have several advantages. Systematically recorded sickness absence data cover information on the health problems faced by employees during every workday of each study period. Thus the quality of such data in terms of coverage, accuracy, and consistency over time can be higher than that attainable with self reports. As the process of recording sick leave is a routine procedure, the impact of measurement on the responses being obtained is minimised.

If there were any inaccuracies in the recording process of sickness absence in this study, the observed hazard ratios would represent underestimates of the true risks. However, we assume that attendance at work is reliably recorded in the Finnish public sector.[2 8] Employees are paid full salary during sick leaves. Employers receive compensation from the Finnish Social Insurance Institution for loss of salary attributable to sick leaves lasting more than nine days. To receive the full compensation to which they are entitled, employers are obligated to keep strict records of all sick leaves. Moreover, the presently observed differences in sickness absence between sexes, age groups, and socioeconomic groups agree with the findings of other studies,[18 19] and with the socioeconomic gradients reported for other indices of health.[19–21]

In each year, 58%–67% of men and women had no long term sick leave. To determine low, intermediate, and high levels of sickness absence as accurately as possible, we originally required a five year employment period for the measurement of sickness absence. However, our additional analyses showed that even one year information on sickness absence may be sufficient to identify a group of employees with increased mortality risk observable even several years after assessment of absence rate.

As expected, women's age adjusted mortality was lower than that of men,[18 22] but they had more sick leaves than men. In our data, higher absence rates among women cannot be attributed to maternity leaves or absences because of a sick child because such absences are not included in sickness statistics. The finding of women's higher absence frequency is in accordance with previous research,[1 3] and may reflect sex differences in morbidity, the perception of health, and behaviour in response to illness (for example, seeking health care).[5 23] In self reported indices of health, such as self rated global health status, ratings among women are also less favourable than those among men.[22 24] The stronger association between short absences and mortality in women than in men may indicate sex differences in attitudes towards short term and long term sickness absences.

Potential explanations for the statistically non-significant association between sickness absence and mortality found in non-permanent employees are lack of statistical power, attending work while ill, and health related selection, which has worn off among permanent personnel.[25 26] Several studies show that the exit from labour market partly depend on health.[27 28] This notion was supported by our finding on the low level of sickness absences among those who had succeeded in keeping their temporary job for five consecutive years.

Further research on the generalisability of these findings is needed to examine whether differences in sickness absence policies, societal expectations, and the sector of work may moderate the observed associations between sickness absence and mortality. Absence thresholds depend on the system of repayment.[29] However, data from the British Whitehall II study suggest that our results are not only limited to the Finnish society.[30] Further research on the mechanisms linking ill health, sickness absence, and mortality is needed to clarify the extent to which the association between sickness absence and mortality is related to health.

Conclusions

High levels of sickness absence, as indicated by the rate of long term spells and the number of annual sick days, are associated with increased all cause and cause specific mortality and thus these measures may provide an important source of information about employee health and consequences of ill health in epidemiological studies. Based on mortality data, the rate of short term sickness absences is less justified as a measure of health.

Authors' affiliations

J Vahtera, J Pentti, Finnish Institute of Occupational Health, Turku, Finland
M Kivimäki, Department of Psychology, University of Helsinki, Finland

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Conflicts of interest: none declared.

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ECHO

Measuring the health of nations: analysis of mortality amenable to health care

Ellen Nolte, Martin McKee

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Objective: To assess whether and how the rankings of the world's health systems based on disability adjusted life expectancy as done in the 2000 *World Health Report* change when using the narrower concept of mortality amenable to health care, an outcome more closely linked to health system performance.
Design: Analysis of mortality amenable to health care (including and excluding ischaemic heart disease).
Main outcome measure: Age standardised mortality from causes amenable to health care.
Setting: 19 countries belonging to the Organisation for Economic Cooperation and Development.
Results: Rankings based on mortality amenable to health care (excluding ischaemic heart disease) differed substantially from rankings of health attainment given in the 2000 *World Health Report*. No country retained the same position. Rankings for southern European countries and Japan, which had performed well in the report, fell sharply, whereas those of the Nordic countries improved. Some middle ranking countries (United Kingdom, Netherlands) also fell considerably; New Zealand improved its position. Rankings changed when ischaemic heart disease was included as amenable to health care.
Conclusion: The 2000 *World Health Report* has been cited widely to support claims for the merits of otherwise different health systems. High levels of health attainment in well performing countries may be a consequence of good fortune in geography, and thus dietary habits, and success in the health effects of policies in other sectors. When assessed in terms of achievements that are more explicitly linked to health care, their performance may not be as good.

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