Sleep Disturbances as a Predictor of Long-Term Increase in Sickness Absence Among Employees After Family Death or Illness

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Study Objectives: This study examined whether sleep disturbances after family death or illness are associated with an increase in health problems and delayed recovery.

Design: Longitudinal observational cohort study.

Setting: Ten cities in Finland.

Participants: A population of 6032 male and 20,933 female city employees.

Interventions: N/A.

Measurements and Results: Self-reports of a family death or illness, the timing of the event, and postevent sleep duration and quality, measured by the Jenkins Scale, were linked with monthly sickness absence records from 36 months prior to the event to 30 months after the event. A repeated-measures Poisson regression analysis with the generalized estimating equation method showed no differences in the preevent absence rates between the employees with and without disturbed sleep. For employees with disturbed sleep, the rate of absence in the month the event occurred was 2.08-fold higher (95% confidence interval: 1.71, 2.53) compared with the employee’s baseline level of sickness absence, and it was still 1.67-fold higher (95% confidence interval: 1.42, 1.98) 19 to 30 months after the event. The corresponding rate ratios were lower for the employees with undisturbed sleep after the event (1.49 and 1.16, respectively). Delayed recovery with disturbed sleep was observed after family illness but not after family death.

Conclusion: These findings suggest that a long-term increase in sickness absence is particularly likely if a family illness is associated with sleep disturbances. Identifying people with sleep disturbances may be important in preventing health problems in the aftermath of a family death or illness.

Keywords: Sleep duration, sleep disturbance, stressful life event, recovery, health problems, sickness absence

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INTRODUCTION

OBSERVATIONAL STUDIES HAVE SHOWN AN INCREASED RISK OF HEALTH PROBLEMS AFTER THE DEATH OR SEVERE ILLNESS OF A FAMILY MEMBER and other stressful life events.1-7 One hypothesis is that increased health problems are particularly likely if these events trigger continued sleep disturbances.8-10 However, the evidence available for this hypothesis is indirect and limited to depression and posttraumatic stress disorders.8-11 Moreover, the studies have dealt mainly with life events which is exploring the health of public-sector employees in 10 towns in Finland.3,5 In 2000 to 2001, all permanent and long-term nonpermanent full-time employees in the service of the towns were asked to participate in the study, and they were sent an identifiable questionnaire. Of the 32,299 respondents (response rate 67%), we excluded those with missing data on event or sleep (n = 462), those with a job contract for less than 6 months in the survey year (n = 781), and those who did not give written consent to link their questionnaire responses to records on sickness absences (n = 4091). Giving consent did not depend on the occurrence of an event (p = .99 in 2 test). The remaining employees, the participants of the study, consisted of 6032 male and 20,933 female employees.

The sample did not differ from the eligible population (i.e., all 43,787 of the full-time public sector employees) in terms of age (mean age 45 years).3 The proportion of men (22%), manual employees (16%), and the mean days of sickness absence in 1997 to 2003 (13.3 per person-year) was slightly lower in the sample than in the eligible population (28% men, 23% manual employees, 15.2 days of sickness absence). The ethics committee of the Finnish Institute of Occupational Health approved the study.

Family Death or Illness

We used 4 items from a list of 16 life events to indicate a family death or illness (death of spouse; death of own child, severe illness of spouse, severe illness of another family member).1 The re-
The 6-item Trait Anxiety Inventory was used into 3 groups: sleep duration 6.5 hours or less, 7 to 8 hours, and 9 = 10 hours or more). As both relatively short and relatively long sleepers have been found to have sleep disturbances was classified as moderate if the mean score indicated sleep problems fewer than 2 nights a week and as severe if the mean score indicated sleep problems at least 2 nights a week. We considered a response of 1 or more nights a week to the question of trouble falling asleep as identifying participants with sleep-onset insomnia, a corresponding average response to the questions on waking up several times and having trouble staying asleep as identifying participants with sleep-maintenance insomnia, and a corresponding response to the question of feeling tired and worn out as identifying those with unrefreshing sleep. The bivariate correlations between sleep-onset insomnia, unrefreshing sleep, and sleep-maintenance insomnia ranged between $r = 0.34$ and $r = 0.46$ (all p values < .001). We determined the time lag in months between the event and the measurement of sleep disturbances.

Sleep duration was measured with the question "How many hours do you normally sleep during the day and night?" (1 = 6 hours or less, 2 = 6.5 hours,... 9 = 10 hours or more). As both relatively short and relatively long sleepers have been found to have an increased risk of mortality, we divided the participants into 3 groups: sleep duration 6.5 hours or less, 7 to 8 hours, and 8.5 hours or more. The correlation between sleep disturbance (overall score) and sleep duration was weak ($r = -0.22$).

Sickness Absence

We used the participants’ personal identification numbers (a unique number assigned to each Finnish citizen) to link the data to the electronic records kept on sickness absence by the employers. For the respondents who reported an event, we calculated the number of sick days during each month for the 36 months prior to the event to 30 months after the event (67 measurement points). For those without an event, we randomly selected a nonevent month and linked their sickness-absence records to the data in the same manner as for those with an event.

The procedures for recording sick leave in the Finnish public sector are reliable. Each sick leave taken by an employee is recorded, including the dates when each leave starts and ends. Employees are paid full salary during sick leave. Absences due to a family member’s funeral or due to caring for a sick child are not recorded as sick leave. Regulations governing employment in the public sector allow an employee to be absent from work without loss of salary to attend the funeral of a family member. Regulations also allow absence from work for up to 3 days without loss of salary to care for acutely ill children younger than 10 years of age. There are no limitations on the number of such 3-day periods per employee per year. Thus, the participants had no reason to falsely report being ill when attending a family member’s funeral or when caring for a sick child.

Background Variables

Sex, age, education (high school: yes or no), marital status (married or cohabiting; other), and children in household (yes or no) were included in the analysis as demographic factors. We also took into account alcohol abuse, obesity, and depression, as sleep disturbances can be a symptom of these chronic conditions. The participants reported their habitual frequency and amount of beer, wine, and spirits intake. They were classified as having a high alcohol intake if their weekly consumption exceeded 210 g of alcohol. Their body mass index was used to measure obesity (body mass index >27 kg/m²), a correlate of obstructive sleep apnea. Lifetime diagnosis of depression (yes or no) was measured from a checklist of 18 common chronic diseases diagnosed by a physician. Psychological distress was determined using the 12-item version of General Health Questionnaire. As in studies validating the General Health Questionnaire against standardized psychiatric interviews, we used the cut-off point of experiencing at least 4 of the 12 symptoms more than usual to indicate distress (yes or no). The 6-item Trait Anxiety Inventory was used to measure the mean anxiety score. This score was divided into tertiles, and belonging to the highest tertile was classified as an indicator of anxiety (yes or no).

Statistical Analysis

The associations of sleep with background variables and a family death or illness were analyzed with the $\chi^2$ test. The associations of the mean score of the Jenkins Sleep Scale divided into deciles and sleep duration with sickness absence were studied first. The curvilinear trend was tested using the cross-product term “sleep duration” × “sleep duration.” Because sickness absence is a rare event and constitutes count data, the distribution of this discrete variable was modeled with Poisson distribution in the analysis. The use of a Poisson model implies that the between-employee variance in the rates of sick leave equals the expected rate. Because the dispersion of sickness absence differed from that predicted by the Poisson models, the square root of deviance divided by the degrees of freedom was used in these analyses to adjust for standard errors.

We explored changes in sickness absence in relation to a stressful life event with repeated measurements of sickness absence. Because repeated measurements of sickness absence of the same person are correlated observations, we applied a repeated-measures Poisson regression analysis with the generalized estimating equations method. The generalized estimating equations method takes into account both the overdispersion of sickness absence between persons and the correlation between sickness absence within persons, and it is not sensitive to missing cases at repeated measurements, as the analysis estimates the working correlation from data containing missing values using the all-available-pairs method, in which all nonmissing pairs of data are used in the moment estimators of
the working-correlation parameters. We used a combination “event-sleep problem” variable with 4 values (no event, no sleep problem; event, no sleep problem; no event, sleep problem; and event, sleep problem) in the analyses for the occurrence of sleep disturbances in general, sleep-onset insomnia, sleep-maintenance insomnia, and unrefreshing sleep, as well as for a short duration of sleep. We calculated the adjusted means of the monthly sickness-absence figures and their 95% confidence limits for 6 time periods (13 to 36 months and 1 to 12 months prior to the event, the month the event occurred, and 1 to 6 months, 7 to 18 months, and 19 to 30 months after the event) from models including the interaction term for the time × “event-sleep problem” combination variable. We compared these means between and within the exposed and unexposed men and women. The analyses were adjusted for demographics. Additional adjustments were made for obesity, high alcohol intake, history of diagnosed depression, and postevent psychological distress and anxiety.

RESULTS

Table 1 shows the average sleep duration of the 6032 men and 20,933 women. Of these men and women, 64.4% slept 7 to 8 hours, 20.7% slept less than 7 hours, and 8.0% slept more than 8 hours. The median sleep length was longer for the women than for the men (7.5 vs 7.0 hours, χ² test for sex difference p < .001), but the women more often reported disturbed sleep (33.4% vs 30.7%, χ² test for sex difference p < .001). Tables 2 and 3 show the associations between the quality and duration of sleep and the characteristics of participants. The prevalence for disturbed sleep was 1.2- to 1.4-fold for obese and heavy-drinking participants and 2.1- to 2.8-fold for those with mood disturbances or a history of diagnosed depression. In all, 1493 family deaths or illnesses were measured for the participants during the year. Among the men and women with the event, compared with those without such an event...
Sleep quality was assessed using a global mean score of ≥ 3 on the Jenkins Sleep Scale and sleep duration with the question “How many hours do you normally sleep during the day and night?” Psychological distress was assessed using the General Health Questionnaire (cut-off point 3/4) and trait anxiety by the Trait Anxiety Inventory (highest tertile vs others). P values are for the difference between the study variable and sleep (χ^2).

BMI refers to body mass index.

Table 3—Quality and Duration of Sleep Among the 20,933 Women by Study Variables

<table>
<thead>
<tr>
<th>Marital status</th>
<th>Participants by quality of sleep, no. (%)</th>
<th>p</th>
<th>Participants by duration of sleep in h, no. (%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marital status</td>
<td>Total (n = 6988)</td>
<td></td>
<td>With undisturbed sleep ≤ 6.5 (n = 4302)</td>
<td></td>
</tr>
<tr>
<td>Married or cohabiting</td>
<td>15364 (74)</td>
<td>.01</td>
<td>3018 (71)</td>
<td>.001</td>
</tr>
<tr>
<td>Single, divorced or widowed</td>
<td>5355 (26)</td>
<td></td>
<td>1225 (29)</td>
<td></td>
</tr>
<tr>
<td>Children in household</td>
<td></td>
<td></td>
<td>3656 (25)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>9699 (47)</td>
<td>.001</td>
<td>2148 (49)</td>
<td>.001</td>
</tr>
<tr>
<td>Yes</td>
<td>11044 (53)</td>
<td></td>
<td>7901 (54)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td>991 (54)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>10394 (50)</td>
<td>.001</td>
<td>1901 (45)</td>
<td>.001</td>
</tr>
<tr>
<td>No high school</td>
<td>10230 (50)</td>
<td></td>
<td>7529 (52)</td>
<td></td>
</tr>
<tr>
<td>Obesity (BMI &gt; 27)</td>
<td></td>
<td>.001</td>
<td>914 (50)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15530 (75)</td>
<td></td>
<td>2950 (70)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5071 (25)</td>
<td></td>
<td>11013 (77)</td>
<td></td>
</tr>
<tr>
<td>High alcohol intake*</td>
<td></td>
<td>.001</td>
<td>1402 (76)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19499 (94)</td>
<td></td>
<td>3991 (93)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1332 (6)</td>
<td></td>
<td>13664 (94)</td>
<td></td>
</tr>
<tr>
<td>Lifetime diagnosis of depression</td>
<td></td>
<td>.001</td>
<td>1738 (94)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16862 (86)</td>
<td></td>
<td>289 (7)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2730 (14)</td>
<td></td>
<td>919 (6)</td>
<td></td>
</tr>
<tr>
<td>Psychological distress</td>
<td></td>
<td>.001</td>
<td>117 (6)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15032 (72)</td>
<td></td>
<td>2689 (63)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5813 (28)</td>
<td></td>
<td>10893 (75)</td>
<td></td>
</tr>
<tr>
<td>Trait anxiety</td>
<td></td>
<td>.001</td>
<td>1373 (74)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15348 (75)</td>
<td></td>
<td>3208 (81)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5100 (25)</td>
<td></td>
<td>12077 (88)</td>
<td></td>
</tr>
<tr>
<td>Death or illness of a family member</td>
<td></td>
<td>.001</td>
<td>1498 (85)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19651 (94)</td>
<td></td>
<td>735 (19)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1282 (6)</td>
<td></td>
<td>1715 (12)</td>
<td></td>
</tr>
</tbody>
</table>

*High alcohol intake refers to consumption of ≥ 210 g/week.

Figure 2 illustrates the changes in sickness absence during the follow-up of those with or without a family death or illness by quality and duration of sleep. There was a significant interaction between time and the “event-sleep problem” combination variable (p for interaction .013 for men and < .001 for women). Among the men and women, the average number of sick days increased after an event. However, this increase was much greater, and the recovery slower, in combination with disturbed sleep than in combination with undisturbed sleep. For the men and women combined, the rate of absence in the month the event occurred was 2.08-fold (95% CI: 1.71, 2.53) when compared with their baseline level of sickness absence. At 19 to 30 months after the event, this ratio was still 1.67-fold (95% CI: 1.42, 1.98). The corresponding ratios for the exposed participants with undisturbed sleep were 1.49 (95% CI: 1.21, 1.85) and 1.16 (95% CI: 0.99, 1.36), respectively. The effect of a family death or illness on sickness absence was not dependent on the duration of sleep among the women. This association was studied among the women only, as sleep duration did not depend on family death or illness among the men.

Figure 3 presents changes in sickness absence after the event by the severity of postevent sleep disturbances. The increase in the average number of sick days was dependent on the severity.
of sleep problems (p value for interaction between the “event-sleep problem severity” combination variable and time < .001). Compared to the no-event group, the rate of absence in the month the event occurred was 2.98-fold (95% CI: 2.28, 3.74) for those with severely disturbed sleep, 1.84-fold (95% CI: 1.38, 2.45) for those with moderately disturbed sleep, and 1.40-fold (95% CI: 1.12, 1.74) for those with undisturbed sleep. At 19 to 30 months after the event, this ratio was still 1.64-fold (95% CI: 1.30, 2.05) in combination with severe sleep problems and 1.46-fold (95% CI: 1.18, 1.80) in combination with moderate sleep problems. Those with undisturbed sleep had recovered at 1 to 6 months after the event.

To evaluate whether the associations between the event, sleep disturbances, and sickness absence were attributable to comorbidity, we compared a model adjusted for demographic characteristics with a model additionally adjusted for obesity, alcohol intake, history of depression, and postevent psychological distress and anxiety (Table 4). Although the magnitude of the changes was smaller, the general pattern was independent of the adjustments.

Figure 4 shows the changes in sickness absence after a family death or illness among the participants who had sleep-onset insomnia, sleep-maintenance insomnia, or unrefreshing sleep after the event. In all cases, there was a significant interaction between time and the “event-sleep problem” combination variable (p < .001). No difference in the immediate reaction to the event was observable between the groups, the increase in the absence rate in the month the event occurred was 2.01-fold (95% CI: 1.80, 2.25) among those with sleep-onset insomnia, 2.03-fold (95% CI: 1.61, 2.55) among those with sleep-maintenance insomnia, and 2.05-fold (95% CI: 1.67, 2.50) among those with unrefreshing sleep when compared with their baseline level of sickness absence. Regarding the recovery, however, a delayed recovery was associated especially with the presence of sleep-onset insomnia after the event. At baseline there was no difference in the absences between the event group and the no-event group

Figure 1—Associations of the Jenkins Sleep Questionnaire score deciles and duration of sleep with sickness absence. Means and SEM derived from age-adjusted Poisson regression analysis. *Difference from the reference group p < .001.

Figure 2—Effect of death or illness of a family member on sickness absence according to postevent quality and duration of sleep. Means and SEM derived from a repeated-measures Poisson regression generalized estimating equation analysis adjusted for age, education, and family characteristics (marital status, children in household). Poor sleep quality was assessed using a global mean score of ≥ 3 on the Jenkins Sleep Scale.
of participants positive for sleep-onset insomnia, sleep-maintenance insomnia, or unrefreshing sleep. However, for sleep-onset insomnia, the postevent absence rates remained elevated over the whole follow-up period; whereas, for sleep-maintenance insomnia and unrefreshing sleep, the postevent absence rates declined to the levels of the no-event, sleep-problem groups.

Figure 5 illustrates the associations between postevent sleep disturbances and sickness absence by type of event among the men and women combined. Immediately after a death of a spouse or child (n = 75), there was a sharp increase in the absence rate. Although the increase was greater among the participants with disturbed sleep (9.02-fold, 95% CI: 5.25, 15.52 compared with the baseline level) than among those with undisturbed sleep (5.93-fold, 95% CI: 3.49, 10.09), full recovery in both groups was observable 7 to 18 months after the event. A severe illness in the family (n = 1432), on the contrary, was associated with a long-lasting increase in the absence rate, but only among those with sleep problems.

We examined whether the effect of sleep disturbances on health depended on the time lag between the measurement and the event. The highest mean scores for sleep disturbances on the Jenkins Scale were found immediately after the event, and there was a declining trend in the mean scores as the time lag increased (p = .02). For the men and women, the mean score measured in the month the event occurred was 3.11 (SEM 0.2), the score measured 1 to 2 months afterward was 2.88 (SEM 0.07), and the score measured 3 to 5 months afterward was 2.73 (SEM 0.6). A greater time lag was not associated with a further decrease in the mean score 6 to 12 months after the event, with the mean score being 2.74 (SEM 0.5).

We compared the changes in sickness absence among those whose sleep problems were measured either 0 to 5 months or 6 to 12 months after the family death or illness with those without sleep problems after the event. Neither the magnitude nor the duration of the changes in sickness absence depended on the time lag between the event and the measurement of sleep disturbances. Compared with that of the no-event group, the rate of absence
Our study is the first to show that the occurrence and severity of sleep problems are powerful predictors of nonrecovery from stressful events, such as family illness.

We can not determine with certainty the time order between the exposure and the development of a sleep disturbance. However, our findings are in line with recent research suggesting that sleep disturbances are not necessarily only secondary symptoms of prevalent morbidity. Sleep disturbances may develop before an illness, they can be treated without concurrent treatment of the comorbid disorder, and they have been found to be a risk factor for the development of the comorbid disorder.

Table 4—Effect of Death or Illness of a Family Member on Sickness Absence Among the Men and Women Combined According to Postevent Sleep Disturbances

<table>
<thead>
<tr>
<th>Participants, no.</th>
<th>Months in relation to the event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RR (95% CI)</td>
</tr>
<tr>
<td>13-36 before</td>
<td>1.00</td>
</tr>
<tr>
<td>1-12 before</td>
<td>1.00</td>
</tr>
<tr>
<td>0</td>
<td>1.00</td>
</tr>
<tr>
<td>1-6 after</td>
<td>1.23 (1.07, 1.42)</td>
</tr>
<tr>
<td>7-18 after</td>
<td>1.39 (1.18, 1.64)</td>
</tr>
<tr>
<td>19-30 after</td>
<td>1.39 (1.20, 1.59)</td>
</tr>
</tbody>
</table>

DISCUSSION

Data on a 5.5-year period of the recorded sickness absence of 26,965 public-sector employees with 1493 family deaths or illnesses suggest that disturbed sleep after an event is an association with a greater increase in health problems and delayed recovery. This finding was seen for both sexes. Comorbidity, as indicated by mood disturbances, obesity, and high alcohol intake, did not explain these results. A short duration of sleep was not associated with greater vulnerability after a family death or illness. The strengths of our study include the exact timing of the occurrence of the person-independent life event and the linkage with recorded data on health before and after the event.

Our findings are in line with previous indirect evidence on the importance of sleep disturbances in the association between stressful life events and health. Prior studies have found subjective problems with sleep to be common after exposure to such events. Earlier studies have also reported that sleep disturbances predict the onset of major depression in bereaved persons and that they are associated with a posttraumatic decline in immune function. However, our study is the first to show that the occurrence and severity of sleep problems are powerful predictors of nonrecovery from stressful events, such as family illness.

We can not determine with certainty the time order between the exposure and the development of a sleep disturbance. However, our findings are in line with recent research suggesting that sleep disturbances are not necessarily only secondary symptoms of prevalent morbidity. Sleep disturbances may develop before an illness, they can be treated without concurrent treatment of the comorbid disorder, and they have been found to be a risk factor for the development of the comorbid disorder.

Severe illness in the family may induce caregiver stress, a potential risk factor for both sleep disorders and sickness absence. It is not clear whether caregiver stress explains the associations between events, sleep disturbances, and sickness absence. The checklist approach used in our study treats all family deaths and severe illnesses equivalently, ignoring the perceived stressfulness of each event and its specific context. Thus, it is possible that sleep disturbances were common, especially when the event caused stressful situations that lasted long after the event. Although the small number of family deaths allows only preliminary conclusions, our finding of delayed recovery among poor sleepers after a family illness rather than family death may indicate a distinction between these 2 stressors in terms of health. Illnesses affecting family members, in particular, seem to increase the “cost of caring.” Unfortunately, the categories of family illness did not specifically measure illnesses of parents, which are common causes of caregiver stress. Women traditionally fulfill...
absence similarly for men and women. For this reason, an increase in the caregiver role is unlikely as a sole explanation for our findings.

Predisposing vulnerability to sleep disturbance among people with postevent sleeping problems is another potential explanation for the increased rates of sickness absence after a family death or illness. Twin studies support the existence of trait-specific vulnerability to subjective sleep disturbance and suggest that personality (neuroticism and extraversion) and liability to symptoms of anxiety and depression increase the risk of sleep problems,29,30 a risk factor for medical problems and sickness absence.31 However, several findings suggest that predisposing vulnerability may not explain elevated absence rates in the present study. Indeed, there was a strong association between sleep disturbance and the occurrence of an independent life event—a family death or illness. In addition, the mean score of the Jenkins Sleep Scale was highest immediately after the event, and there was a decreasing tendency with an increasing time lag. Furthermore, severity of the perceived sleep problem was related to the degree of increase in average number of sick days after the event.

The fact that sleep disturbances are a symptom of a variety of chronic conditions raises the question of their independent effect on health.18 Among employees with no events, moderately disturbed sleep, compared with undisturbed sleep, was associated with a 1.20 (95% CI: 1.15, 1.26) times higher rate of sickness absence even after adjustment for several important risk factors of disturbed sleep, such as obesity, a correlate of sleep apnea20; alcohol abuse17,18; and depression.18 The corresponding rate ratio for severely disturbed sleep was 1.57 (95% CI: 1.49, 1.65). Although these adjustments are not sufficient to rule out the possibility of residual confounding due to medical comorbidity, an underlying health problem is not a likely explanation for the poor postevent recovery among those who had a sleep disturbance because their preevent absence levels were the same as those of the unexposed persons with sleep disturbance. We also feel that chronic conditions are not likely to produce exacerbated health differences that are limited to time periods near or after a person-independent life event but are not apparent a couple of years prior to the event.

A genetically influenced set of traits has been found to increase a person’s probability of selecting himself or herself into a high-risk environment likely to produce stressful life events.32 Trait anxiety is a relatively stable behavioral predisposition that also reflects the degree of arousal brought about by adverse stimuli.31 In our study, it is unlikely that increased rates of sickness absence after a family death or illness would have been due to such a predisposition among people with disturbed sleep. We focused on a single event that is likely to occur for reasons that are random with respect to the exposed person and the health outcome,32 and controlling for trait anxiety and psychological distress had hardly any effect on our results.

Sleep duration was distributed approximately normally, with 9% of the participants sleeping 6 hours or less, 14% of them sleeping 6.5 hours, 70% sleeping 7 to 8 hours, and 8% sleeping more than 8 hours. These figures are well in line with those reported elsewhere.16,34 The association between sleep duration and sickness absence was U shaped, corresponding to findings for other indicators of health, such as mortality.14,35 We found a relatively weak association between family death or severe illness and sleep duration among the women and no association...
among the men. Short sleep was commoner after the event, while no difference was found for long sleep. Furthermore, we found no evidence of differences between short sleepers and others in the vulnerability to the event or recovery from the event. Thus, exposure to severe life events or increased vulnerability to such situational factors seems to be unlikely explanations for the results of previous studies suggesting an increased risk of health impairment among short and long sleepers when compared with those who sleep approximately 7 to 8 hours.\textsuperscript{34,35} However, as in previous studies, we measured sleep duration by self-reports, and such measurement may reflect, in addition to actual sleep amount, other factors, such as personality traits, lifestyle, or social desirability.\textsuperscript{36}

We used sickness-absence records, a byproduct of the clinical care of working populations, to detect health problems. Sickness absence can be considered a measure of health if the concept of health is understood in terms of social, physical, and mental functioning.\textsuperscript{39} Sickness-absence records are independent archival data minimizing the possibility of common method bias, the risk of selective recall bias, and other problems characterizing research with self-reported data. Observational studies have shown stressful life events to be associated with an increased risk of postevent health problems, including acute infections,\textsuperscript{4,5} mental disorders,\textsuperscript{8,10} and asthma,\textsuperscript{5} all of which are common causes of sickness absence.\textsuperscript{37} Obviously, some of the sick leaves represent voluntary absenteeism not related to physical or mental illness,\textsuperscript{38} and some employees work while ill and record no absences.\textsuperscript{39} Thus, sickness absence is in, some ways, a subjective assessment of health despite objective data collection. However, this subjective component is an unlikely source of a major bias when it is considered that sickness absence has been found to be a more powerful predictor of all-cause mortality than are established self-reported health measures and available objective measures of specific physical illnesses and medical conditions,\textsuperscript{12} as well as a strong predictor of specific causes of death, such as cardiovascular disease, cancer, alcohol-related causes, and suicide,\textsuperscript{13} and a risk marker for future disability retirement.\textsuperscript{30}

Our cohort was 78% female and racially homogeneous (white employees), corresponding to Finnish municipal workers in general.\textsuperscript{11} The use of a relatively homogeneous working population as the study sample reduced potential confounding, but such a sample was open to survivor effect, because only those still at work after a life event were included and those most severely affected did not appear in the sample. Our results may therefore be an underestimate rather than an overestimate of the true effect. Future research with preevent measurements of sleep and more diverse samples is needed to evaluate the significance and generalizability of our findings. Further studies are also needed to determine whether sleep disturbances after a stressful life event represent a causal agent for morbidity, an early indicator of new incident disease, a vulnerability marker, or a marker of preexisting underlying disease.

CONCLUSIONS

Death or illness in the family is not an exceptional event in adulthood. Our findings suggest that a long-term increase in sickness absence is particularly likely if a family illness is associated with sleep disturbances. Identifying people with sleep disturbances may be important in preventing health problems in the aftermath of a family death or illness.

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