

Recurrence of Medically Certified Sickness Absence According to Diagnosis: A Sickness Absence Register Study

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Abstract *Introduction* Sickness absence is a major public health problem. Research on sickness absence focuses on interventions aimed at expediting return to work. However, we need to know more about sustaining employees at work after return to work. Therefore, this study investigated the recurrence of sickness absence according to diagnosis. *Methods* We analyzed the registered sickness absence data of 137,172 employees working for the Dutch Post and Telecom. Episodes of sickness absence were medically certified, according to the ICD-10 classification of diseases, by an occupational physician. The incidence density (ID) and recurrence density (RD) of medically certified absences were calculated per 1,000 person-years in each ICD-10 category. *Results* Sickness absence due to musculoskeletal

disorders had the highest recurrence (RD = 118.7 per 1,000 person-years), followed by recurrence of sickness absence due to mental disorders (RD = 80.4 per 1,000 person-years). The median time to recurrent sickness absence due to musculoskeletal disorders was 409 days after the index episode. Recurrences of sickness absence due to musculoskeletal disorders accounted for 37% of the total number of recurrent sickness absence days. For recurrences of sickness absence due to mental disorders this was 328 days and 21%, respectively. Unskilled employees with a short duration (<5 years) of employment had a higher risk of recurrent sickness absence. *Conclusions* Interventions to expedite return to work of employees sick-listed due to musculoskeletal or mental disorders should also aim at reducing recurrence of sickness absence in order to sustain employees at work.

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Introduction

Sickness absence is a major problem, because of the loss of economic productivity, the social insurance costs, and the direct medical costs of long-term disability. In the past, sickness absence was considered to be a socioeconomic and political matter, rather than a medical or public health problem [1, 2]. However, opinions changed after it was reported that men and women with more than 15 days of sickness absence per year are at increased risk of early retirement on medical grounds and have a higher risk of mortality [3–6]. Findings from the British Whitehall II cohort and the French GAZEL cohort showed increased mortality rates among employees who reported sick due to

common disorders, such as mental disorders, respiratory diseases and circulatory diseases [7, 8]. Therefore, sickness absence is now considered to be a major public health problem, and research on sickness absence has been given priority in European countries [9, 10].

Most research on sickness absence has concentrated on the transition of long-term diagnosis-specific sickness absence towards disability pension [11–14]. In many European countries, long-term episodes of sickness absence ultimately result in a disability pension [15]. Since 2004, disability benefits in The Netherlands are granted after 2 years of sickness absence, regardless of the work-relatedness of the impairments. Thus, a disability pension encompasses both work-related injuries and non work-related ill health retirement. Therefore, the societal costs of work disability are high, and expediting return to work is an important goal for interventions.

Although return to work is generally considered to be directly related to recovery, the situation is usually more complex, because varying levels of symptom severity are loosely associated with patterns of sickness absence and work disability. Return to work is conceptualized as a dynamic process that not only involves an off-work phase and a work re-entry phase, but also includes the maintenance phase of sustainability of work performance. If phase-specific goals are not achieved, then there is a risk of a relapse to the off-work phase [16]. It should be noted that this dynamic return to work concept is an expert opinion that is not supported by scientific evidence. However, when return to work is considered to be a dynamic process, achieving full time work is not only an important outcome of successful interventions, but also the maintenance of the work status. This is especially important, because it is likely that there is a risk of recurrent sickness absence after return to work [17]. If this is so, then occupational health monitoring should not end when full return to work is achieved.

Considering the major impact of sickness absence on society, employers, and employees, few studies have reported on the recurrence of sickness absence. 48% of employees with a long-term episode of sickness absence (≥ 6 consecutive weeks) at baseline had a recurrent long-term episode during a 4-year follow-up, compared to 28% of employees with no history of long-term sickness absence at baseline [18]. Recurrences of sickness absence have mainly been reported for employees with musculoskeletal disorders, and especially low back pain [19]. In a cohort of 230 Canadian employees who were sick-listed due to low back pain, 29 (12.6%) had a recurrence of sickness absence due to low back pain within 6 months of return to work [20]. In a population of American employees, Wasiak et al. [21] reported a 17.2% rate of recurrent work disability due to low back pain within 6 months. Within 12 months, 45%

of employees in The Netherlands experienced a recurrence of sickness absence due to low back pain [22]. Troup et al. [23] reported that 502 out of 802 employees, who had been absent from work due to sciatic back pain, had a recurrence of sickness absence within 24 months.

Using a Markov model to construct a hypothetical cohort of employees, with a follow-up of 40 years, Burdorf and Jansen estimated a total sickness absence burden due to low back pain of approximately 140 weeks (6.6%) among employees with a high physical load and approximately 30 weeks (1.4%) among employees with a low physical load during a 40-year career [24]. However, the Markov model assumes that all information about the future is contained in the present state, meaning that future states are independent of past states. In other words, the Markov model assumes that the probability of transition between health states is constant over time and independent of earlier health states. There is evidence, however, that a history of sickness absence predicts future episodes of sickness absence [25]. Furthermore, it is likely that the risk of sickness absence changes when employees return to work [17].

Instead of using a mathematical Markov model for cohort simulation, studying the incidence and recurrence of sickness absence simultaneously may lead to a better understanding of the natural pattern and distribution of sickness absence in the working population. Therefore, the present study investigated the incidence and recurrence of sickness absence according to diagnosis over a 7-year period. If we can identify categories in which sickness absence is a recurrent problem, then preventive efforts can target to those categories.

Methods

Dynamic Cohort Study

This study included employees who worked for the Dutch Post and Telecom in the period from 2001 to 2007. Approximately 70% of the employees worked for the Dutch Post, mostly as post sorters (repetitive arm movements and lifting post bags), postmen (walking long distances and carrying parcels), or post officers (sedentary clerical work and customer services). The other 30% of the employees worked for the Dutch Telecom in the installation and maintenance of telephone, telefax, and internet systems or in call center and customer service activities.

The direct measurement of a cumulative incidence traditionally requires a study of a fixed cohort. Such cohorts are suitable as long as the follow-up time and loss to follow-up are limited. However, the turn-over within our study population was high, especially because Dutch Post

employees work on a temporary basis. This would imply a high loss to follow-up if we chose an inception cohort. Therefore, we preferred a dynamic cohort study design to estimate the incidence density of diagnosis-specific sickness absence. A dynamic cohort is defined as a population that changes because some people enter and others leave during the study period [26]. The advantage of a dynamic cohort is that the population characteristics remain stable, and do not change over time, whereas in an inception cohort, for example, age increases with follow-up.

Employees contributed to the person years at risk as long as they worked for the Dutch Post and Telecom, but their data were right censored on the date on which they left the company, implying that they did not further contribute to the person years at risk, i.e. the denominator of the incidence or recurrence density. Of the 67,316 employees who were included in the study on January 1, 2001, 51,280 resigned or were discharged during the study period. 69,856 employees started working for the Post and Telecom companies after January 1, 2001, and were included on the date that they entered employment; 48,231 of them left their job again before the end of the study period and were right censored on the date on which they left the company.

Sickness Absence Policies

In The Netherlands, employees report sick to their employer, who passes the sick report onto the occupational health service on the first day of sickness absence. If an employee returns to work within the first two weeks of absence, the employer reports the date of return to work to the occupational health service, and the episode remains self-certified. An employee who does not return to work must visit the occupational physician (OP), usually in the third week of absence, for medical certification of sickness absence according to the 10th International Classification of Diseases [27]. If an employee does not keep an appointment to visit the OP because of full return to work, the sickness absence episode is encoded and registered by an administrator on the date of full return to work with equal earnings as before sickness absence.

Exclusion Criteria

- Episodes of sickness absence lasting 1–3 weeks, which were not medically certified;
- 2,880 episodes of sickness absence coded by administrators instead of certified by OPs;
- 2,501 episodes of sickness absence certified by OPs as complaints not elsewhere classified (R00–R99, such as fatigue, diffuse pain, and malaise); it is questionable

whether these are medical diagnoses and, if so, they are likely to be unreliable;

- 653 episodes of sickness absence certified by OPs as pregnancy and child birth (ICD-10 O00 to O99).

Employees who were absent for longer than 1 year were right censored after 365 days of sickness absence, because a disability pension was granted after 1 year of work disability. Although Dutch disability pension policies changed on January 1, 2004, the recurrence density of medically certified sickness absences did not change abruptly (Fig. 1). The gradual increase in recurrence density up to 2004 and the gradual decrease, thereafter, are due to the time needed for an index episode and a recurrent episode to occur, respectively. Based on these results, we chose to continue to censor employees after 1 year of sickness absence despite the policy changes.

Incidence and Recurrence Density

The first medically certified episode of sickness absence since January 1, 2001, or since the date of entering employment, was regarded as the index episode in this study. It should be acknowledged that this is not necessarily the first episode of sickness absence exceeding 3 consecutive weeks, because people who were employed in January, 2001, may have had earlier episodes of sickness absence. The incidence density (ID) was calculated by dividing incident episodes of sickness absence in each ICD-10 category by the person-years at risk of the total population, and was expressed per 1,000 person-years.

Episodes of certified sickness absence starting more than 28 days after full return to work with equal earnings, were regarded as recurrences. The recurrence density (RD) of sickness absence was calculated by dividing the number of recurrences in an ICD-10 category by the person-years of employees who had a previous episode of sickness absence within the same ICD-10 category. The time to onset of the first recurrence of sickness absence after the

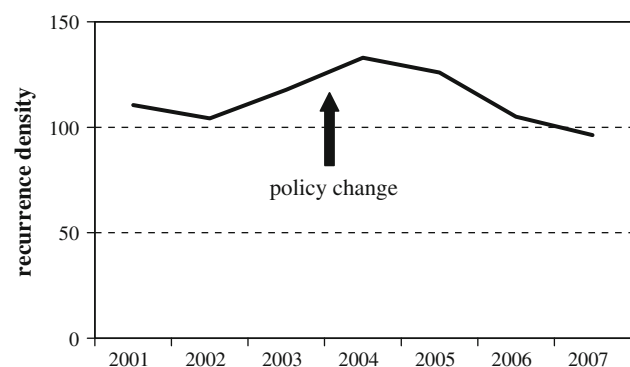


Fig. 1 Trend in the recurrence density per 1,000 person-years during the study period

index episode and the median duration of recurrent episodes of sickness absence, were calculated with Kaplan–Meier survival analysis. We also counted the total number of days of recurrent sickness absence episodes to assess the burden of recurrent sickness absence per ICD-10 category.

Statistical Analysis of Recurrences

The following characteristics were retrieved from the human resources registers of the companies: gender (male, female), age (<35, 35–44, 45–54, ≥55 years), marital status (married, unmarried), employment (full-time, i.e. ≥36 h per week, or part-time, i.e. <36 h per week), the duration of employment (0–4 years, 5–9 years, 10–14 years, 15–19 years, ≥20 years), and salary scales (1–2, 3, 4–5, 6–7, ≥8 reflecting net monthly salaries on a full-time basis ranging between EUR 1,200 and EUR 3,000). The salary scales reflected the occupational level rather than the household income. The socioeconomic status (SES) was determined from the zip code of the employee's home address. The zip codes were linked to a status score based on tables of the Netherlands Institute for Social Research, in which all zip codes in the Netherlands are ranked on a scale from 1 to 4,000, with 1 indicating the richest neighbourhood and 4,000 the poorest neighbourhood. This proxy for SES is commonly used by the Dutch authorities for socioeconomic policy-making [28, 29]. We computed the quartiles of these status scores, distinguishing between high, upper average, lower average, and low SES.

Gender, age, salary scales, SES, marital status, and employment were included as covariates in a Poisson regression analysis for counts in SPSS version 15 for Windows. The Poisson regression model is expressed as:

$$P(y = k | x_1, x_2, \dots, x_i) = e^{-\mu} \mu^k / k! \quad \text{with } k = 0, 1, 2, 3, \dots$$

in which the log of the mean μ is assumed to be a linear function of the independent variables:

$$\log(\mu) = \text{intercept} + b_1 * x_1 + b_2 * x_2 + \dots + b_i * x_i$$

Considering the huge study population, we chose a 1% significance level ($\alpha = 0.01$) and computed 99% confidence intervals (CIs).

Results

A total of 137,172 employees contributed 363,461 person-years to the study population and 36,342 employees had at least one certified episode of sickness absence between January, 2001 and December, 2007.

The highest IDs were found for sickness absence due to musculoskeletal disorders and mental disorders (Table 1).

The RD of sickness absence due to musculoskeletal disorders was 118.7 per 1,000 person-years, which is 1.5 times higher than the RD in the total population (81.6 per 1,000 person-years). The RD of sickness absence due to mental disorders was 80.4 per 1,000 person-years, which is of the same magnitude as the RD in the total population.

The shortest median time to onset of a recurrent episode of sickness absence was found in the category of infectious diseases (Table 2). However, days of sickness absence due to recurrent infectious diseases accounted for only 1% of the total number of days of recurrent sickness absence. The median time to onset of a recurrent sickness absence due to musculoskeletal disorders was 409 days after the index episode. Recurrences of sickness absence due to musculoskeletal disorders accounted for 37% of the total number of days of recurrent sickness absence. The median time to onset of recurrent sickness absence due to mental disorders was 328 days after the index episode, and recurrent episodes of sickness absence due to mental disorders accounted for 21% of the total number of days of recurrent sickness absence.

Of the 12,129 employees with an episode of sickness absence due to musculoskeletal disorders, 10,678 had complete data, and in 1,451 cases (12%) data on one or more independent variables were missing. 6,211 of the 7,197 employees with an episode of sickness absence due to mental disorders had complete data, and in 986 cases (14%) data on one or more independent variables were missing. Poisson regression analysis only included employees with complete data, and showed that employees of upper average and high SES had a lower risk of recurrent episodes of sickness absence due to musculoskeletal disorders compared to employees of low SES (Table 3).

Employees in higher salary scales had a lower risk of recurrent sickness absence due to musculoskeletal and mental disorders than employees in salary scale 1–2 or 3. Employees who worked for the company for ≥ 5 years also had a lower risk of recurrences due to musculoskeletal and mental disorders compared to employees who worked for the company for <5 years.

Discussion

This study presents data on the incidence and recurrence of episodes of medically certified sickness exceeding three consecutive weeks of absence from work. The ID and RD of sickness absence due to musculoskeletal disorders were the highest, followed by sickness absence due to mental disorders. Our results showed that recurrences of sickness absence due to musculoskeletal disorders or mental disorders were, in particular, a societal and economic burden, because they accounted for 58% of the total number of

Table 1 Incidence density (ID) and recurrence density (RD) of sickness absence (SA) per 1,000 employee-years according to ICD-10 category

Sickness absence diagnosis	ICD-10 codes	<i>N</i>	ID (99% CI)	<i>N</i>	RD (99% CI)
Diseases of the musculoskeletal system	M00–M99	12,129	46.3 (45.3–47.2)	4,023	118.7 (113.8–123.5)
Mental & behavioral disorders	F00–F99	7,197	27.7 (27.0–28.4)	1,400	80.4 (74.9–86.0)
Diseases of the respiratory system	J00–J99	4,568	23.3 (22.6–24.0)	788	74.6 (67.8–81.5)
Injury & poisoning	S00–T98	4,555	19.6 (19.0–20.2)	480	41.9 (37.0–46.8)
Disease of the digestive system	K00–K93	1,920	10.4 (10.0–10.8)	215	47.5 (39.2–55.9)
Diseases of the nervous system & sensory organs	G00–H95	1,559	8.0 (7.6–8.4)	201	51.9 (42.4–61.3)
Diseases of the circulatory system	I00–I99	1,356	6.9 (6.5–7.2)	182	52.9 (42.8–63.0)
Diseases of the genitourinary system	N00–N99	991	5.2 (4.9–5.5)	95	38.8 (28.5–49.0)
Neoplasms	C00–D48	618	2.8 (2.6–3.1)	53	42.0 (27.1–56.8)
Infectious & parasitic diseases	A00–B99	566	2.5 (2.3–2.8)	13	9.6 (2.7–16.5)
Diseases of the skin & subcutaneous tissues	D50–D89	501	2.7 (2.5–3.0)	45	35.5 (21.8–49.1)
Endocrine & metabolic diseases	E00–E90	270	1.3 (1.2–1.5)	43	61.2 (37.1–85.3)
Disease of blood & blood forming organs	L00–L99	112	0.6 (0.5–0.7)	4	14.2 (0.0–32.5)
Total		36,342	101.6 (100.2–102.9)	7,542	81.6 (79.1–84.0)

CI confidence interval

Table 2 Survival analysis of episodes of recurrent sickness absence

	ICD-10 codes	Time to onset in days (99% CI) after index episode	Median duration in days (99% CI)	Total (%) sickness absence days of all recurrences
Diseases of the musculoskeletal system	M00–M99	409 (386–432)	36 (34–38)	424,697 (37%)
Mental & behavioral disorders	F00–F99	328 (284–372)	62 (55–69)	246,162 (21%)
Diseases of the respiratory system	J00–J99	396 (353–439)	11 (10–12)	79,889 (7%)
Injury & poisoning	S00–T98	457 (375–539)	35 (30–40)	104,407 (9%)
Disease of the digestive system	K00–K93	259 (148–370)	28 (20–36)	53,600 (5%)
Diseases of the nervous system & sensory organs	G00–H95	303 (205–401)	21 (15–27)	54,159 (5%)
Diseases of the circulatory system	I00–I99	343 (179–507)	65 (44–86)	70,666 (6%)
Diseases of the genitourinary system	N00–N99	274 (187–361)	39 (21–57)	39,139 (4%)
Neoplasms	C00–D48	205 (92–318)	215 (38–392)	34,884 (3%)
Infectious & parasitic diseases	A00–B99	174 (18–380)	34 (0–99)	9,248 (1%)
Diseases of the skin & subcutaneous tissues	D50–D89	291 (230–352)	18 (11–25)	15,015 (1%)
Endocrine & metabolic diseases	E00–E90	406 (176–636)	40 (21–59)	12,946 (1%)
Disease of blood & blood forming organs	L00–L99	373 (11–757)	50 (0–178)	4,377 (0%)
Total		384 (367–401)	35 (34–36)	1,148,187 (100%)

CI confidence interval

days of recurrent sickness absence. Recurrences of sickness absence due to musculoskeletal disorders and mental disorders were especially frequent in unskilled employees with a short duration of employment.

Musculoskeletal complaints, and particularly low back pain and neck/shoulder/arm pain, are a major health problem in the Netherlands. Our results showed that musculoskeletal disorders were the most common specific cause of sickness absence, and the recurrence of musculoskeletal disorders has been reported to range between 3 and 86% [30]. The lack of agreement on recurrence rates

has been attributed to differences in the definition of a recurrence [31, 32] and the heterogeneity of populations in which the rates were calculated. Our results showed that 50% of the recurrences of *sickness absence* due to musculoskeletal disorders occurred within 409 days (i.e. approximately 13½ months) after the index episode. This is in agreement with the findings of Van Duijn and Burdorf, who reported that 45% of employees in The Netherlands experienced a recurrent sickness absence due to low back pain within 12 months. It should be noted that we studied recurrent sickness absence, which may have resulted in an

Table 3 Poisson regression analysis of recurrent sickness absence due to musculoskeletal and mental disorders adjusted for company

	Musculoskeletal ($N^a = 10,678$)		Mental ($N^a = 6,211$)	
	<i>N</i>	RR ^b (99% CI ^c)	<i>N</i>	RR ^b (99% CI ^c)
Gender				
Male	6,730	1	3,477	1
Female	3,948	0.98 (0.92–1.03)	2,734	1.00 (0.93–1.09)
Age				
<35 years	2,023	1	1,340	1
35–44 years	3,492	0.97 (0.91–1.04)	2,232	0.92 (0.85–1.01)
45–54 years	3,794	1.00 (0.93–1.07)	2,048	0.91 (0.82–1.00)
≥55 years	1,369	1.05 (0.96–1.14)	591	1.05 (0.92–1.20)
Marital status				
Unmarried	3,769	1	2,601	1
Married	6,909	0.98 (0.94–1.03)	3,610	0.95 (0.89–1.01)
Socioeconomic status				
Low	2,708	1	1,470	1
Lower average	2,659	0.95 (0.90–1.01)	1,573	1.00 (0.92–1.09)
Upper average	2,618	0.94 (0.89–0.99)**	1,560	1.02 (0.94–1.11)
High	2,693	0.93 (0.88–0.98)**	1,608	1.01 (0.93–1.09)
Employment				
Full-time	5,518	1	3,556	1
Part-time	5,160	1.01 (0.95–1.07)	2,655	1.03 (0.94–1.12)
Duration of employment				
<5 years	3,580	1	2,014	1
5–9 years	1,407	0.68 (0.63–0.72)**	758	0.72 (0.65–0.79)**
10–14 years	960	0.82 (0.75–0.89)**	773	0.81 (0.73–0.90)**
15–19 years	919	0.77 (0.70–0.84)**	679	0.81 (0.73–0.91)**
≥20 years	3,812	0.83 (0.77–0.89)**	1,987	0.81 (0.74–0.89)**
Salary scale				
1 and 2	3,578	1	1,133	1
3	3,980	0.96 (0.90–1.04)	1,289	0.92 (0.82–1.03)
4 and 5	1,302	0.87 (0.80–0.95)**	1,063	0.88 (0.78–0.99)*
6 and 7	1,221	0.79 (0.72–0.87)**	1,497	0.87 (0.78–0.98)**
≥8	597	0.66 (0.58–0.75)**	1,229	0.82 (0.72–0.93)**

^a Cases with missing values on independent variables are excluded

^b RR rate ratio

^c CI confidence interval with * $P < 0.01$ and ** $P < 0.001$

underestimation of the recurrence of musculoskeletal pain when employees with complaints continued to work instead of reporting sick.

Recurrences of sickness absence due to musculoskeletal disorders were found to be associated with significant additional suffering, high medical costs, and losses in productivity, contributing disproportionately to the total societal burden of musculoskeletal disease [33–35]. Our results showed that the burden of recurrent sickness absence, in terms of the number of working days lost due to recurrent sickness absence, was highest in the category of musculoskeletal disorders: 37% of days of recurrent sickness absence were due to musculoskeletal disorders.

Recurrent episodes of sickness absence due to musculoskeletal disorders were related to SES with employees with a low SES being at higher risk than employees of high SES. Health problems and sickness absence are known to occur more frequently among employees with a low SES than in employees of high position [36–40]. Recurrent sickness absence due to mental disorders, however, was not related to the socioeconomic status of employees. Apparently, recurrent sickness absence due to mental disorders is as common in employees with a high SES as in employees of low SES.

The salary scales were associated with the recurrence of sickness absence. Employees with a salary scale ranging

from 1 to 3 were mostly unskilled postmen and post sorters, or cable workers, whereas, those with a salary scale of 4 and higher were skilled post officers, administrators, computer experts, and managers. Obviously, due to the type of work they do, unskilled employees are at increased risk of recurrent sickness absence due to musculoskeletal disorders.

Besides the type of work, the duration of employment was related to the recurrence of sickness absence. Employees with a short record of service had a higher risk of recurrent sickness absence due to musculoskeletal and mental disorders. On the one hand, employees with a short duration of employment may have difficulties in coping with the work demands. On the other hand, employees who have worked only a few years for a company are likely to be less committed to the company and may find it easier to report sick when having complaints, compared to employees who have worked for ≥ 5 years for a company.

Policy Implications

One policy implication of our findings is that the (cost-)effectivity of return to work interventions among sick-listed employees with musculoskeletal disorders or mental disorders should not only be estimated according to the duration of the sickness absence episode, but should also be based on recurrent sickness absences after full return to work with equal earnings, especially among unskilled workers with a short record of service. Molde Hagen noticed that, during a 3 year follow-up, there were fewer days of sickness compensation in the intervention group than in the control group [41]. However, this difference was caused by a more rapid return to work during the first year, while there was no significant difference in the second or third year. By performing multi-state analysis, Lie et al. [42] found a short-term effect of an intervention on the transition of the state 'sick-listed' to the state 'returned to work', but no long-term effects on the probability to remain in the latter state. Our results showed that without any intervention, 50% of recurrent episodes of sickness absence due to musculoskeletal disorders occurred within 409 days after the index episode, and 50% of recurrent episodes of sickness absence due to mental disorders within 328 days. Thus, the other 50% of recurrences do not occur in the first year after the index episode. Future intervention studies should not only focus on expediting return to work, but also at sustaining employees at work [43].

Another policy implication of our findings is that, given the considerable burden of recurrent sickness absence, prevention of relapse should be part of any treatment program or intervention aimed at return to work. This implies that employees who have returned to work after a long-term episode of sickness absence are monitored by

health care providers to determine whether they are able to sustain the full work status. When complaints increase, or work functioning decreases, employees may consult health care providers who can teach them how to perform activities of daily living, despite their impairments [44], or support them when work adjustments are necessary. Ergonomic worksite assessments, work adjustments, and contacts between health care provider and the workplace reduced the duration of disability and the associated costs [45, 46]. Although these studies did not focus on recurrences of sickness absence, we assume that workplace-based interventions can be important to sustain employees in their work after a long-term episode of sickness absence. It would be worthwhile to investigate the effects of such interventions as a relapse prevention strategy. Future inception cohort studies are necessary to identify constructs of recurrent sickness absence needed for policy-making. If the results of future clinical trials show that workplace-based interventions also reduce recurrent sickness absence, then they should be targeted at unskilled employees in low occupational classes with a short record of service and low socioeconomic positions, because our results indicate that these employees have the highest risk of recurrent sickness absence.

Strengths and Weaknesses of the Study

The strength of our study is that we could monitor a large dynamic population of employees over a period of 7 years. Furthermore, we used the OP diagnosis on the sickness certificates. However, selecting episodes of sickness absence that are medically certified by OPs implies a source of bias, because sickness absence with a duration of 1–3 weeks is not medically certified, and was not included in the study. Sickness absence was analyzed according to the ICD-10 categories, because the validity of specific diagnoses within the ICD-10 categories has been subject to much debate in occupational health care [47]. The sickness absence register only contained one ICD-10 code per episode, which is a common shortcoming in studies of this type [48]. If an OP changes a diagnosis during an episode of sickness absence, for instance, from a physical disorder to mental disorder, the entire episode is certified as mental disorder. This means that we had no knowledge about co-morbidity. Furthermore, it should be acknowledged that recurrent sickness absence can have different causes, even within the same ICD category. For instance, an employee who was absent from work because of low back pain can have a recurrent episode of sickness absence due to shoulder pain.

Diagnosis-specific recurrences can have been overestimated if OPs are more inclined to certify symptoms and signs in line with earlier diagnoses [48]. The recurrence

rates may also be biased by return to work. Employees with a serious disease are less likely to return to work, which might explain, for instance, the lower recurrence rates of neoplasms. The risk of recurrence may also have been underestimated because of the high turnover in the study population, since employees who have been absent due to sickness are more likely to resign or to be discharged than employees who have never reported sick [49]. Moreover, the recurrence of sickness absence may depend on social compensation systems. For example, in the Dutch sickness absence insurance system, sickness absences with an interval of less than 28 calendar days, are considered as one episode. However, various different definitions of recurrent episodes have been proposed in research on sickness absence [31, 32]. Therefore, we assume that there are societal differences in the risk of recurrent sickness absence, and recommend that similar research should be carried out in other countries.

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