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LONG-TERM SICKNESS ABSENCE: CHANGES IN RISK FACTORS AND THE POPULATION AT RISK

ULRIK LIDWALL[1,2], SISKO BERGENDORFF[2], MARGARETHA VOSS[1], and STAFFAN MARKLUND[1]

[1] Karolinska Institutet, Stockholm, Sweden
Department of Clinical Neuroscience, Section of Personal Injury Prevention
[2] Swedish Social Insurance Agency, Stockholm, Sweden
Department of Social Insurance Development

Abstract
Objectives: To investigate changes over time in factors associated with long-term sickness absence (LTSA) and in the fraction of LTSA attributable to these risk factors in 1986–1989 and 2002, respectively. **Materials and methods:** Data from two earlier Swedish studies respectively comprising 1622 and 2009 employees with a history of LTSA (≥ 60 days), and 1019 and 1903 employed members of the general labour force as controls (ages 20–64 years) was used. The studies were conducted before and after extensive changes in the Swedish labour market during the 1990s, and they used sickness absence data from national social insurance records and self-reported information on sociodemographic, lifestyle, and work characteristics. Associations between these factors and LTSA were estimated by logistic regression, and population attributable fractions were calculated. **Results:** The results indicate that, after the 1990s, LTSA was associated with female sex (odds ratio = 1.84, 95% CI: 1.57–2.15) and was also more strongly associated with various aspects of the psychosocial work environment and job situations. A larger population at risk, primarily an ageing workforce, account for a large proportion of LTSA. **Conclusions:** The results confirm consistent associations between LTSA and several established risk factors, and they also reveal a change in the risk panorama. The current findings demonstrate that, to understand the magnitude of LTSA, both risk factors and the population at risk must be monitored over time. Prevention should aim to create healthy workplaces in general and also focus on female-dominated public sector occupations.

Key words:
Sickness absence, work environment, Lifestyle factors, Sociodemographic factors, Population attributable fraction

INTRODUCTION

Sickness absence rates increased in Sweden in the late 1990s and there was also a shift from short-term sickness absence during the 1980s to more long-term sickness absence (LTSA) and sickness absence due to mental disorders [1]. Also in the 1990s, considerable changes occurred in work life and the labour market with higher unemployment and increased precarious employment [2]. Furthermore, several changes occurred that may have an impact on LTSA. For example, the Swedish labour force was growing older [3,4], and there were also more employees exposed to adverse work conditions and a tendency to progressively higher demands on the job [3,5,6]. Particularly unfavourable psychosocial work environments were reported in female-dominated municipal and county council workplaces [2,7–9]. In general, sickness absence is associated with ergonomic conditions and physically demanding work [3,6], but the proportion of employees exposed to adverse physical working conditions was stable during the 1990s. Lifestyle factors that might influence LTSA [3,10,11] were changing, with larger numbers of people with overweight or obesity [11]. The physical health improved during the 1990s, whereas mental well-being deteriorated [12, 13] and sickness absence related to sleeping problems became more prevalent [14].

Most studies of changes and differences in rates of sickness absence are based on aggregated data [1,15,16].

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Address reprint request to U. Lidwall, Department of Social Insurance Development, Statistical Analysis Unit, Swedish Social Insurance Agency, SE-103 51 Stockholm, Sweden (e-mail: ulrik.lidwall@socialagency.se).

Unfortunately, when interpreting the results of such analyses, it is difficult to discern the extent to which any factor correlated with aggregated measures of sick leave also represents an important individual level risk factor. Accordingly, investigations are needed that focus on individuals and their risk factors and the population at risk at different points in time. Some studies have considered the fractions of sickness absence that can be attributed to various risk factors [6,17,18] but, to our knowledge, there have been no assessments aimed at determining the stability of such fractions over time. The aim of the present investigation was to determine whether there were any changes in the factors associated with LTSA and to examine changes in the fraction of LTSA attributable to these risk factors in 1986–1989 and 2002, respectively.

MATERIAL AND METHODS

Study design

The data used originated from two population-based studies, which were conducted in Sweden by the National Social Insurance Board in 1992 [19] and 2002 [20]. The studies comprise samples of individuals in the labour force with a history of LTSA and from the general working population. These two investigations referred to as Studies I and II here, are summarised in Table 1. The cases investigated (i.e., the two LTSA populations referred to as the 'long-term sick listed') comprised employees aged 20 to 64 years who had had a sick-leave spell lasting at least 60 days during the period 1986–1989 in Study I and in 2002 in Study II. The two control populations consisted of corresponding samples of employees chosen from the entire workforce aged 20 to 64, regardless of their use of sick leave (referred to as the 'working population'). The time span between sampling and report of exposures ranged from two to five years in Study I and five months in Study II. The overall response rate was 69% in Study I and 62% in Study II.

The study was approved by the Regional Ethical Research Committee in Linköping, Sweden.

Measures

Sickness absence

Cases of medically certified spells of LTSA lasting at least 60 consecutive days were identified in national social insurance records and served as the outcome measure. The registers kept by the Swedish Social Insurance Agency cover the entire population of the country and include all sick leave periods that exceed 14 days and entitle claimants to sickness benefits. Non-employed individuals and women on sick leave due to pregnancy-related disorders, according to the current sickness certificate, were omitted from the analysis.

Sociodemographic, family, lifestyle, and work characteristics

Information about the age and sex of participants originated from social insurance registers. All other data were self-reported, such as smoking daily (yes/no), body mass index, education in years, and family situation (cohabiting and children). The categorisation of exposure variables is presented in Table 2. The work characteristics represent both specific work environment factors and more general aspects such as employment status, employment sector, and work hours (weekly average, including overtime).

Exposure to the physical work environment was measured as ergonomic strain (lifting, bending, and repeated or monotonous movements) and contact with hazardous substances (tobacco smoke, gases, dust, and chemicals). Responses were given on a five-point scale ranging from never to most of the time, and mean scores above 3 were considered to represent high exposure. Exposure to the psychosocial work environment was measured as psychological demands, control (decision latitude), and social support, and this was achieved by using the Swedish 17-item battery (in groups of five, six, and six questions) [21] with responses given on a four-point scale. Demand and control were combined into the four different job types originally suggested by Karasek in 1979 [22]: active jobs (high demands/high control); passive jobs (low demands/low control); low-strain jobs (low demands/high control), and high-strain jobs (high demands/low control). Cronbach's alpha were calculated to asses the

Table 1. Summary of the two studies of long-term sickness absence (LTSA) conducted by the National Social Insurance Board[a]

Characteristics	Study I Spring 1992		Study II May 2002	
	Working population	Long-term sick listed	Working population	Long-term sick listed
Register-based LTSA[b]	–	1986–1989	–	2002
Sociodemographic, lifestyle, and work characteristics[c]	the end of 1989	time of onset of LTSA	May 2002	January 2002
Data collection method	Face-to-face interview (questionnaire)		Self-administered postal questionnaire	
Sample size	2 000.0	3 000.0	4 979.0	5 186.0
Response rate (%)	70.3	67.9	63.5	59.9
Total number of respondents	1 406.0	2 036.0	3 160.0	3 106.0
Number excluded from the analysis[d]	387.0	414.0	1 257.0	1 097.0
Final number of participants	1 019.0	1 622.0	1 903.0	2 009.0
Proportion of women (%)	51.4	56.0	52.6	67.2

[a] Study I is called the Survey of Long-Term Sickness Absence (LS) [19] and Study II is called the Survey of Health, Working Conditions, Living Conditions, and Sickness Absence (HALS) [20].
[b] Refers to inclusion criteria. In Study I the sample comprised individuals aged 20 to 64 years who had had a sick-leave spell lasting at least 60 days during the period 1986–1989. In Study II, the whole sample comprised 10 781 sickness benefit cases that started in January 2002, and the data presented in the table refer to the 5186 cases with a duration exceeding 59 days in March 2002.
[c] The complete Study I comprises retrospective longitudinal data and register-based sick leave for the period 1986–1992.
[d] Representing non-employed individuals, women on sick leave due to pregnancy-related disorders (according to the current sickness certificate), and listwise deletion of cases with missing values.

reliability of demand, control and social support. To be able to compare changes in the population at risk, an absolute cut-off point was applied, and the mean scores for demand, control, and social support were dichotomised at half the scale, ranging from 1 to 4. Thus a demand-score greater than 2.5 was considered to represent high demands, and so on.

Statistical analysis

Distributions of sociodemographic, lifestyle, and work characteristics from Studies I and II are presented as proportions, separately for women and men. Associations between LTSA and sociodemographic, lifestyle, and work characteristics were estimated by means of logistic regression presented as odds ratios (OR) with 95% confidence

Table 2. Prevalence proportions of sociodemographic, family, lifestyle, and work characteristics among women and men in the two studies

Characteristics	Women				Men			
	Study I		Study II		Study I		Study II	
	Working population n = 524	Long-term sick listed n = 908	Working population n = 1001	Long-term sick listed n = 1351	Working population n = 495	Long-term sick listed n = 714	Working population n = 902	Long-term sick listed n = 658
Age group (years)								
20–29	0.26	0.16	0.18	0.08	0.28	0.18	0.18	0.07
30–39	0.27	0.23	0.25	0.20	0.27	0.22	0.25	0.18
40–49	0.28	0.29	0.23	0.25	0.26	0.25	0.22	0.21
> 49	0.19	0.32	0.34	0.47	0.19	0.35	0.35	0.54

Table 2. Prevalence proportions of sociodemographic, family, lifestyle, and work characteristics among women and men in the two studies — cont.

Characteristics	Women				Men			
	Study I		Study II		Study I		Study II	
	Working population n = 524	Long-term sick listed n = 908	Working population n = 1001	Long-term sick listed n = 1351	Working population n = 495	Long-term sick listed n = 714	Working population n = 902	Long-term sick listed n = 658
Family situation (cohabiting, children)								
No partner or children	0.23	0.24	0.19	0.20	0.37	0.39	0.26	0.23
Partner but no children	0.31	0.37	0.40	0.44	0.27	0.37	0.37	0.47
No partner but children	0.17	0.17	0.06	0.07	0.01	0.02	0.02	0.03
Partner and children	0.29	0.22	0.35	0.30	0.35	0.22	0.35	0.27
Education (years)								
0–9 years	0.36	0.53	0.16	0.28	0.36	0.56	0.22	0.35
10–12 years	0.32	0.27	0.43	0.37	0.40	0.31	0.45	0.42
> 12 years	0.32	0.20	0.41	0.35	0.24	0.13	0.33	0.23
Smoking								
Non-smoker	0.61	0.59	0.82	0.74	0.66	0.61	0.83	0.82
Smoking daily	0.39	0.41	0.18	0.26	0.34	0.39	0.17	0.18
Body mass index (kg/m^2)								
BMI < 25	0.71	0.60	0.66	0.53	0.55	0.45	0.49	0.36
BMI 25–30 (Overweight)	0.23	0.28	0.25	0.34	0.39	0.45	0.41	0.48
BMI > 30 (Obesity)	0.06	0.12	0.09	0.13	0.06	0.10	0.10	0.16
Employment status								
Permanent	0.89	0.91	0.89	0.93	0.93	0.93	0.92	0.95
Temporary	0.11	0.09	0.11	0.07	0.07	0.07	0.08	0.05
Employment sector								
Private	0.37	0.37	0.37	0.29	0.71	0.66	0.70	0.64
Public	0.63	0.63	0.63	0.71	0.29	0.34	0.30	0.36
Work hours/week								
< 35 hours	0.35	0.39	0.29	0.28	0.06	0.08	0.06	0.07
35–45 hours	0.61	0.56	0.62	0.59	0.78	0.78	0.74	0.74
> 45 hours	0.04	0.05	0.09	0.13	0.16	0.14	0.20	0.19
Demand-Control[a]								
Low-strain job	0.36	0.30	0.28	0.18	0.40	0.38	0.32	0.24
High-strain job	0.10	0.16	0.11	0.20	0.07	0.11	0.08	0.18
Active job	0.43	0.38	0.54	0.56	0.45	0.39	0.53	0.52
Passive job	0.11	0.16	0.07	0.06	0.08	0.12	0.07	0.06

Table 2. Prevalence proportions of sociodemographic, family, lifestyle, and work characteristics among women and men in the two studies — cont.

Characteristics	Women				Men			
	Study I		Study II		Study I		Study II	
	Working population n = 524	Long-term sick listed n = 908	Working population n = 1001	Long-term sick listed n = 1351	Working population n = 495	Long-term sick listed n = 714	Working population n = 902	Long-term sick listed n = 658
Social support[b]								
Strong	0.93	0.90	0.90	0.76	0.96	0.91	0.90	0.77
Weak	0.07	0.10	0.10	0.24	0.04	0.09	0.10	0.23
Ergonomic exposure								
High	0.35	0.50	0.36	0.51	0.31	0.47	0.34	0.49
Low	0.65	0.50	0.64	0.49	0.69	0.53	0.66	0.51
Exposure to hazardous substances								
High	0.07	0.09	0.09	0.13	0.11	0.19	0.17	0.30
Low	0.93	0.91	0.91	0.87	0.89	0.81	0.83	0.70

[a] In Study I, the coefficient alpha reliability values for demand and control were, respectively, 0.65 and 0.71 for women and 0.66 and 0.69 for men; the corresponding values in Study II were 0.77 and 0.73 for women and 0.75 and 0.73 for men.
[b] The coefficient alpha reliability for social support was 0.86 for women and 0.83 for men in Study I, and was 0.83 both for women and men in Study II.

intervals (CIs). These analyses were conducted separately for men and women in order to detect gender-specific associations, and they were mutually adjusted for all other variables. To enable comparison of associations over time, the same set of factors was used from both studies. Since it is incorrect to make direct comparisons of OR across the studies, the focus was instead placed on differences in factors associated with LTSA between the two studies. The regression analyses were performed using SPSS for Windows (release 15.0.0). Population attributable fractions were calculated as suggested by Rothman and Greenland, based on estimated risk factors (significant OR in either one or both studies with criteria set at p-values ≤ 0.10 due to differences in sample sizes) and the proportion of exposed among the 'long-term sick listed' [23]. This fraction theoretically corresponds to the proportion of LTSA in the population that might have been prevented if the exposed individuals had had a situation just as favourable as the unexposed individuals, given a causal association between the exposure and LTSA that is not distorted by any bias [24].

RESULTS

Changes in the population at risk

Sociodemographic, lifestyle, and work characteristics of the 'working population' and the 'long-term sick listed' in Studies I and II are presented in Table 2. The differences seen in these characteristics when comparing the 'working population' in the two studies corresponds well with the overall change observed in the Swedish labour force [4,5,9,11,12]. Members of the 'working population' in Study II were older and had a higher formal education compared to their counterparts in Study I. Over time, there were fewer daily smokers but increasing numbers of people who were overweight or obese. Along with growing demands at work, the number of active jobs increased while passive jobs and low-strain jobs decreased. The prevalence of weak social support at work increased as well. Furthermore, the prevalence of overtime work increased between the studies, whereas characteristics of the physical work environment were fairly stable over time with increased exposure to hazardous substances among men as an exception.

Table 3. Associations between sociodemographic, family, life style and work characteristics and long-term sickness absence among women and men in Studies I and II presented as odds ratios with 95% confidence intervals, mutually adjusted for all other variables

Variable	Women		Men	
	Study I	Study II	Study I	Study II
Female sex (ref. = Male sex)	1.08 (0.89–1.31)	1.84 (1.57–2.15)	1.00	1.00
Age group (years)				
20–29	1.00	1.00	1.00	1.00
30–39	1.31 (0.94–1.83)	1.79 (1.28–2.51)	1.31 (0.91–1.90)	1.75 (1.14–2.69)
40–49	1.62 (1.12–2.33)	2.05 (1.46–2.87)	1.40 (0.96–2.04)	2.17 (1.40–3.36)
> 49	2.59 (1.68–4.00)	2.44 (1.77–3.35)	2.54 (1.65–3.91)	3.34 (2.19–5.09)
Family situation (cohabiting, children)				
Partner but no children	1.00	1.00	1.00	1.00
No partner or children	1.13 (0.82–1.55)	1.09 (0.84–1.39)	1.23 (0.86–1.75)	0.94 (0.70–1.26)
No partner but children	1.53 (1.02–2.30)	1.13 (0.76–1.67)	1.58 (0.58–4.26)	1.21 (0.59–2.47)
Partner and children	1.17 (0.81–1.68)	1.02 (0.80–1.32)	0.84 (0.59–1.21)	0.83 (0.62–1.11)
Education (years)				
> 12	1.00	1.00	1.00	1.00
0–9	1.67 (1.22–2.28)	1.52 (1.16–1.99)	2.04 (1.42–2.93)	1.38 (0.99–1.92)
10–12	1.30 (0.95–1.76)	0.95 (0.77–1.18)	1.47 (1.03–2.10)	1.29 (0.97–1.72)
Smoking				
Non-smoker	1.00	1.00	1.00	1.00
Smoking daily	1.13 (0.89–1.43)	1.43 (1.15–1.78)	1.20 (0.93–1.56)	0.71 (0.53–0.96)
Body mass index BMI (kg/m^2)				
BMI < 25	1.00	1.00	1.00	1.00
BMI 25–30 (Overweight)	1.19 (0.91–1.56)	1.37 (1.12–1.68)	1.31 (1.01–1.69)	1.32 (1.04–1.68)
BMI > 30 (Obesity)	1.74 (1.13–2.67)	1.43 (1.07–1.91)	1.61 (1.00–2.61)	1.62 (1.14–2.30)
Employment status				
Temporary	1.00	1.00	1.00	1.00
Permanent	1.05 (0.73–1.53)	1.44 (1.04–2.00)	0.91 (0.56–1.49)	1.26 (0.79–2.02)
Employment sector				
Private	1.00	1.00	1.00	1.00
Public	1.18 (0.92–1.51)	1.45 (1.19–1.76)	1.42 (1.08–1.87)	1.51 (1.18–1.93)
Work hours/week				
35–45 hours	1.00	1.00	1.00	1.00
< 35 hours	1.12 (0.88–1.43)	0.95 (0.78–1.17)	1.23 (0.76–2.01)	1.30 (0.83–2.04)
> 45 hours	1.14 (0.66–1.96)	1.62 (1.20–2.19)	0.98 (0.69–1.39)	1.03 (0.78–1.36)
Demand-Control				
Low-strain job	1.00	1.00	1.00	1.00
High-strain job	1.13 (0.75–1.70)	1.81 (1.32–2.49)	1.05 (0.65–1.69)	2.11 (1.41–3.15)
Active job	0.97 (0.74–1.26)	1.22 (0.98–1.52)	0.88 (0.66–1.16)	1.15 (0.89–1.49)

Table 3. Associations between sociodemographic, family, life style and work characteristics and long-term sickness absence among women and men in Studies I and II presented as odds ratios with 95% confidence intervals, mutually adjusted for all other variables — cont

Variable	Women		Men	
	Study I	Study II	Study I	Study II
Passive job	1.32 (0.90–1.94)	1.06 (0.72–1.57)	1.26 (0.80–1.99)	1.09 (0.66–1.77)
Social support				
Strong	1.00	1.00	1.00	1.00
Weak	1.59 (1.04–2.44)	2.33 (1.81–3.01)	1.97 (1.16–3.36)	2.11 (1.55–2.88)
Ergonomic exposure				
Low	1.00	1.00	1.00	1.00
High	1.55 (1.21–1.99)	1.49 (1.22–1.82)	1.54 (1.18–2.03)	1.37 (1.06–1.78)
Exposure to hazardous substances				
Low	1.00	1.00	1.00	1.00
High	1.01 (0.65–1.59)	1.18 (0.88–1.58)	1.67 (1.16–2.40)	1.70 (1.28–2.26)

Changes in the risk panorama

In Study II, female sex showed a stronger association with LTSA (OR = 1.84, 95% CI: 1.57–2.15) after controlling for all other factors presented in table 3. No such difference was found between the women and men in Study I. Stratifying the analysis by sex indicated an emerging age trend between Studies I and II, reflected by stronger associations with LTSA in subjects aged 30–49 compared to those aged 20–29.

Considering sociodemographic, lifestyle, and work characteristics, the differences between Studies I and II were more obvious among women than men. For the women, daily smoking, overweight, permanent employment, public sector employment, active jobs, and working more than 45 hours a week were all associated with LTSA in Study II but not in Study I.

Both among women (OR = 1.81; 95% CI: 1.32–2.49) and men (OR = 2.11; 95% CI: 1.41–3.15) having a high-strain job was associated with LTSA in Study II but not in Study I. Furthermore, for both sexes in both studies, weak social support was consistently associated with LTSA, and the same applied to high ergonomic exposure. A consistent association between exposure to hazardous substances and LTSA was found solely for men.

Changes in the population attributable fractions

As mentioned above, there were some apparent differences between Study I and Study II with regard to exposure levels and associations between exposures and LTSA. These changes over time may have affected the number of persons on long-term sick leave, and hence population attributable fractions were calculated for significant factors (see table 4). The results showed that, for both sexes, age contributed to LTSA more in Study II than in Study I. In the age groups 30 to 39 and 40 to 49 this was due to an increased risk, whereas in individuals aged > 50 this was due to increased size of the population at risk. The population attributable fraction due to low education decreased over time, mainly because the level of education had risen over time in the working population. There were increases in population attributable fractions for women and smoking, as well as for overweight or obesity for both sexes; the former was due to increased risk, whereas the latter could be explained by increased exposure.

Major increases in population attributable fractions were found for women in permanent as well as public sector employment, and these changes were attributed to the stronger associations with LTSA. The population attributable fraction for overtime work rose for women due to both a larger population at risk and stronger associations between overtime

Table 4. Population attributable fractions[a] for long-term sickness absence in Studies I and II

Risk factor	Women		Men	
	Study I	Study II	Study I	Study II
Age group (20–29 ref.)				
30–39	0.05	0.09	0.05	0.08
40–49	0.11	0.13	0.07	0.11
> 49	0.20	0.28	0.21	0.38
Family situation (Partner but no children ref.)				
Single parent	0.06	0.01	–	–
Education (> 12 years ref.)				
0–9 years	0.21	0.10	0.29	0.10
10–12 years	0.06	–0.02	0.10	0.09
Smoking (Non-smoker ref.)				
Smoking daily	0.05	0.08	0.07	–0.07
Body mass index (BMI < 25 ref.)				
BMI 25–30 (Overweight)	0.04	0.09	0.11	0.12
BMI > 30 (Obesity)	0.05	0.04	0.04	0.06
Employment status (Temporary ref.)				
Permanent	0.04	0.28	–	–
Employment sector (Private ref.)				
Public	0.10	0.22	0.10	0.12
Work hours/week (35–45 hours ref.)				
> 45 hours	0.01	0.05	–	–
Demand-Control (Low-strain job ref.)				
High-strain job	0.02	0.09	0.01	0.09
Active job	–0.01	0.10	–	–
Social support (Strong ref.)				
Weak	0.04	0.14	0.04	0.12
Ergonomic exposure (Low ref.)				
High	0.18	0.17	0.16	0.13
Exposure to hazardous substances (Low ref.)				
High	–	–	0.08	0.12

[a] Population attributable fraction = p*(OR –1)/OR, where p stands for the proportion of exposed in the group of 'long-term sick listed' [23]. Proportions of exposed among 'long-term sick listed' originate from table 2, and OR originate from Table 3.
"–" Indicates insignificant risk factors in both studies (p-values > 0.10).

work and LTSA. The increased population attributable fraction for high-strain jobs both among women and men was almost entirely related to elevated risks. For women in active jobs, the changes were linked to both a larger population at risk and higher risk. The relevance of social support increased primarily because of more extensive exposure to weak social support at the workplace. For women, the proportion of LTSA that could be attributed to the physical work environment was consistently around 18% and was linked entirely to ergonomic exposure. For men, the sum of population attributable fraction for physical work environment, i.e. ergonomic exposure and substance exposure, was around 25%, with a growing fraction related to greater exposure to hazardous substances.

DISCUSSION

The present results indicate that increased LTSA in Sweden may well be explained by a combination of changes in both the risk panorama and the size of the population at risk. In this context, it seems that employment conditions and factors related to the psychosocial work environment were more pertinent in the early 2000s than in the late 1980s, especially for women. In 2002, LTSA among women was clearly associated with permanent and public sector employment, adverse psychosocial work environments, and overtime work. Since the proportions of women in permanent and public sector employment are high, even moderate changes in exposure to adverse working conditions may have a substantial impact on LTSA. Furthermore, overweight and obesity played an important role in the LTSA of both sexes, whereas daily smoking was associated with LTSA only among women in 2002. The results also revealed that the age gradient had become stronger over time, and a marked relationship with LTSA was noted even for people who were relatively young (aged 30–39) in 2002.

The changes in the Swedish employed workforce presented here correspond well with what has been reported elsewhere [2,4,5,8]. Furthermore, the indications from other Swedish studies regarding changes in the aetiology of long-term sickness absence support the results presented in our study [7,9,12–14,25,26]. Still, the excess risk of LTSA among women in Study II could not be explained by the conventional factors used in the present investigation. Home-related stress and work-family imbalance are known to be more evident among working women than working men [27–29], and this may represent factors influencing increased gender differences in the prevalence of LTSA.

The association between permanent employment and LTSA for women can be interpreted in several ways. Since temporary employees have lower job security, they may be reluctant to hamper future job prospects by making extensive use of sick leave compared to permanent employees [30,31]. Permanent employment could also be related to job strain, because the high level of formal job security in Sweden increase the likelihood that employees will experience downsizing, expansion, or reorganisation, which are associated with sickness absence [25,32]. The job strain hypothesis associated with employment security may be more plausible for LTSA [33], given that the sick leave behaviour of temporary employees is more sensible in relation to recurrent short-term absence.

The public sector in Sweden is highly gender segregated. Women are employed mainly in the core activities comprising the welfare services offered by the municipalities and county councils (schools, childcare, elderly care services, social services, and health care), whereas most of the male employees function as managers, administrators, technicians, maintenance staff, policemen, or military personnel [34]. Working in the public sector in general, and in municipal jobs in particular, has been reported to be a risk factor for LTSA [6,25,26], and the association that is emerging for women may be explained by impairment of the psychosocial work environments in this sector during the 1990s [2,7–9]. It is possible that budget cuts and the 'new public management' aimed at increasing productivity have come in conflict with certain qualities of working closely with clients or patients who need care or some other kind of assistance [7,27].

Still, the psychosocial work environment represents a general problem that is not restricted to women in the public sector [8,35]. Our findings indicate that jobs with significant psychological demands, which entail both high-strain and active job situations, are associated with LTSA. Having active jobs seems to be troublesome for many women and this situation is bothersome because jobs of this type are becoming increasingly common. In a recent study conducted in Denmark, it was estimated that seven different psychosocial work environment factors could account for about one third of all sick-leave days [17]. By comparison, the added attributable fractions calculated in the present investigation for demand-control and social support are 33% for women and 21% for men, although they increase substantially over the studied period, which indicates that psychosocial factors gradually had a greater impact on LTSA in Sweden.

The current results also show an increase in the size of the population at risk due to overweight or obesity, but a decline in the corresponding share of daily smokers. Notably, daily smoking was associated with LTSA in women, which might be explained by selection effects or by gender differences in nicotine addiction and consumption patterns. Research has shown for women, both a more pronounced socioeconomic gradient in smoking habits [36] and a clearer association between smoking and depression [37].

From the late 1980s in Study I to the early 2000s in Study II, the age gradient became more marked and an association with LTSA emerged for younger individuals (ages 30 to 49). This cohort may have become more vulnerable to increased demands at work or to exposure factors that were not considered in our study, such as difficulties in handling the combination of domestic responsibilities and gainful employment. The size of the high-risk group comprising individuals aged 50 or older increased considerably over the studied period, which also made a substantial contribution to LTSA. The opposite can be seen for education, that is, the proportion of individuals with only a primary school education decreased. In addition, education may have become a weaker indicator of socioeconomic status over time. Other investigations applying more sophisticated measures have shown strong associations between socioeconomic status and sick leave [38, 39].

Due to the cross-sectional design it is not possible to draw definitive conclusions about causal pathways, and the differences between the two investigations constitute a potential source of bias. The fact that cases in Study I were identified during a four year period and in Study II during one month is not likely to cause serious bias given our choice of statistical analysis. However, an obvious advantage is that the same sets of factors and exposure measures were used in both studies. It is also beneficial that the sickness absence data originated from the national social insurance register, which means that there was no misclassification of the outcome measures. The retrospective approach of self-reporting of employment and working conditions could pose problems with reversed aetiology, because individuals with experience of LTSA may have been more inclined to attribute their sickness absence to exposures at work and outside work. The issue of potential recall bias should also be considered, especially in Study I, which allowed a longer time span between exposure and reporting, although that problem may have been reduced by the face-to-face interview technique. Still, increased job demands reported in the two studies correspond well with earlier findings [5]. The response rate was somewhat higher in Study I than in Study II, but the patterns of non-response were similar, showing higher rates for younger participants and men [19,20]. Lower response rates are expected for individuals with less education, a lower socioeconomic status, and a marginal position in the labour market [40,41]. Furthermore, it is likely that the rates will be lower for people on long-term sick leave due to physical and mental health impairments [41]. If such health differences are connected with the factors analysed, the associations may have been underestimated. Another source of underestimation of associations is that the 'working population' group also contains subjects on long-term sick leave. Since these numbers were higher in Study II, the underestimations are probably higher in that study.

CONCLUSIONS

The present results demonstrate that it is important to systematically revise risk factors over time and monitor changes in the population at risk. It is apparent that an ageing workforce as well as increased obesity and overweight in the working population contribute to increased LTSA. Since the 1990s, working conditions in general and the psychosocial work environment in particular seems to have a growing importance for LTSA, especially among women. It is disturbing that an association has emerged between active jobs and LTSA, because such working conditions are becoming increasingly common. This situation calls for actions aimed at creating healthy workplaces, particularly in female-dominated occupations in the public sector.

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