

Trends in long-term sickness absence in Sweden 1992–2008: the role of economic conditions, legislation, demography, work environment and alcohol consumption

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In Sweden, absence from work because of illness or injury has fluctuated considerably over time. This study aimed to identify potentially important factors behind variations in long-term sickness absence. Aggregated data were used to assess factors correlated with the number of ongoing cases of sickness absence lasting more than 59 days. Trends were analysed using statistics from national social insurance records, labour force surveys and other official statistics. Although specific changes in the degree of generosity in the sickness insurance scheme were important in some cases, the results showed no consistent associations for the study period 1992–2008. Men were generally more sensitive to macroeconomic factors than women. Furthermore, compared with earlier findings, workforce composition had less impact on variations in long-term sickness absence. Notably, public health indicators such as alcohol sales and working conditions were clearly related to long-term sick leave during the period under investigation.

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Introduction

There is a long history of longitudinal analysis of aggregated measures of sickness absence for a single country or geographic area (Bäckman, 1998; Doherty, 1979; Dyrstad & Lyso, 1998; Henrekson & Persson, 2004; Hughes, 1982; Lantto & Lindblom, 1987; Norström, 2006; Norström & Moan, 2009). Most of the cited studies examined different indicators of economic and societal conditions in relation to variations in the number of people on sick leave, and they detected associations between such absence and changes in the macroeconomy, the labour market and the sickness insurance system (Doherty, 1979; Dyrstad & Lyso, 1998; Henrekson & Persson, 2004; Hughes, 1982; Lantto & Lindblom, 1987). In addition, a few researchers have reported associations with national

health-related indicators such as alcohol consumption (Norström, 2006; Norström & Moan, 2009).

In the present study, aggregated data were used to assess factors that might be correlated with rises and falls in long-term sickness absence in Sweden over the last two decades. Trends were analysed using sickness absence statistics and amendments to social insurance legislation reported by the Swedish Social Insurance Agency. The analyses were additionally based on statistics on labour market conditions from surveys conducted by Statistics Sweden, mainly the Labour Force Survey, and alcohol sales reported by the Swedish Alcohol Retail Monopoly (*Systembolaget*). The objective was to identify factors that might be important for our understanding of variations in the number of ongoing cases of long-term sickness absence among women and men between 1992 and 2008, focusing on

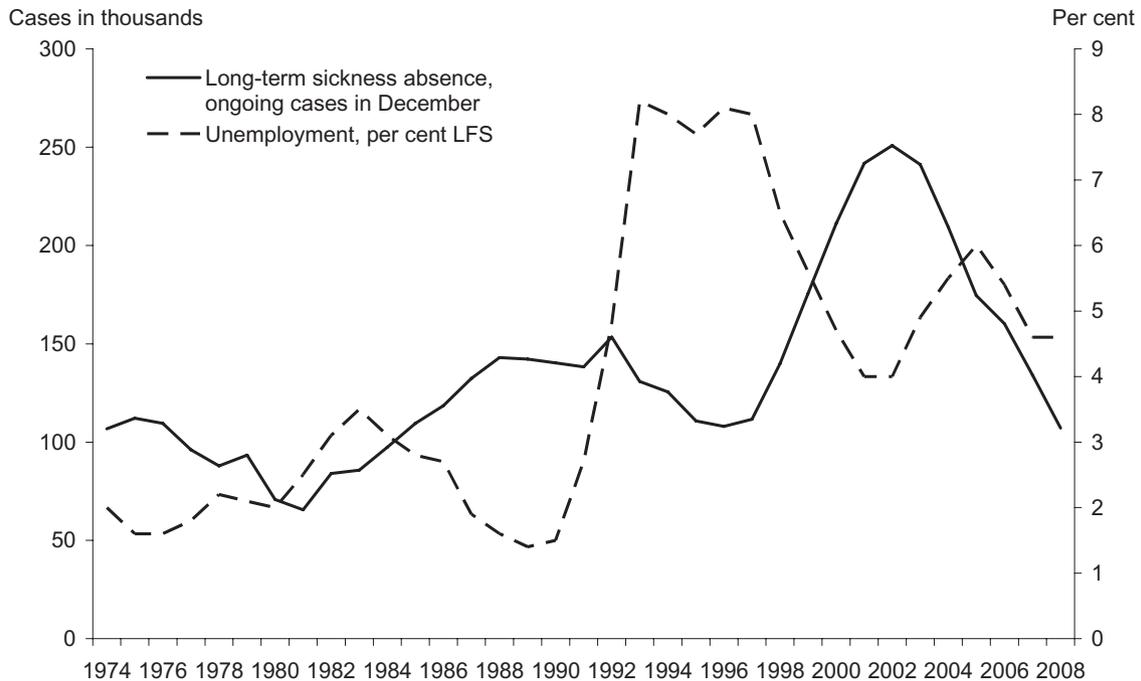


Figure 1. Long-term sickness absence (>59 days) and unemployment according to the Labour Force Surveys (LFS) 1974–2008. Source: Swedish Social Insurance Agency and Statistics Sweden.

amendments to legislation, labour market factors and demography, and changes in working conditions and worker health.

Background

Sickness absence in Sweden has varied considerably over time, particularly during the last two decades, and this pattern has been more pronounced than in most other European countries (Bergendorff et al., 2002). In the early 1980s, there was a decreasing trend in sickness absence, which was reversed to a sharp increase in 1984–1988. Between 1989 and 1996, the rate of such absence steadily decreased, although this course was interrupted in 1997 when long-term sickness absence rose considerably (see Figure 1). During this period, there was also a shift from high levels of short-term sickness absence in the 1980s to more extensive long-term sick leave in the late 1990s (Lidwall, Marklund & Skogman Thoursie, 2005). The increase in the 1990s was also considerably greater among women than men. The level of long-term sickness absence has been higher for women than for men since the early 1980s (Bergendorff et al., 2004). At the end of 2002, the number of ongoing periods of sick leave lasting 60 days or more was around 160,000 for women and just over 90,000 for men. Since 2002, sickness absence has decreased again, and the often mentioned sickness absence rate (i.e. the average number of paid sick days per insured person) reached an all-time low in 2008 (Ighe & Edlund, 2008).

In an international perspective, the level of sickness absence in Sweden is high (Barmby, Ercolani & Treble, 2002; Bergendorff et al., 2002; Bonato & Lusinyan, 2004; Hytti, 2006). Bergendorff and colleagues (2002) analysed data from the National Labour Force Surveys and concluded that both the demographic composition of the workforce (i.e. age and sex) and the employment level (particularly among older workers) are important factors contributing to the differences between Sweden and core European countries such as France, Germany and Great Britain. Sweden is also distinguished by a clear negative association between sickness absence and variations in unemployment levels (Bergendorff et al., 2002), and this association has also been apparent with regard to long-term sickness absence (>59 days; see Figure 1). In Finland, which has a social insurance system similar to that in Sweden, sickness-related benefits have remained stable despite fluctuating unemployment levels (Hytti, 2006).

Potential factors influencing the trends in long-term sickness absence

Amendments to insurance legislation, labour market factors and indicators of changes in working conditions and worker health are all potentially associated with changes in long-term sickness absence.

Amendments to legislation

Over the last decades, the Swedish sickness insurance system has been subject to numerous modifications

Table 1. Changes over time in the total level of employee sickness benefits from the Swedish social insurance system or the employer plus supplementary benefits from contractual insurance (per cent of salary).

Time period	Sick day							
	1	2–3	4–14	15–21	22–28	29–90	91–365	366–
1992.01–1993.03	75	75	90	80 + 10	80 + 10	80 + 10	90	90
1993.04–1993.06	0	75	90	80 + 10	80 + 10	80 + 10	80	80
1993.07–1995.12	0	75	90	80 + 10	80 + 10	80 + 10	80	70
1996.01–1996.12	0	75	75	75 + 10	75 + 10	75 + 10	75	75
1997.01–1997.12	0	75	75	75	75	75 + 10	75	75
1998.01–1998.03	0	80	80	80	80	80 + 10	80 + 10	80 + 10
1998.04–2003.06	0	80	80	80 + 10	80 + 10	80 + 10	80 + 10	80 + 10
2003.07–2004.12	0	80	80	80	77.6 + 10	77.6 + 10	77.6 + 10	77.6 + 10
2005.01–2006.12	0	80	80	80 + 10	80 + 10	80 + 10	80 + 10	80 + (10)
2007.01–	0	79.12	79.12	79.12 + 10	79.12 + 10	79.12 + 10	79.12 + 10	79.12 + (10)

Note: Non-employees (e.g. the unemployed) in Sweden do not receive sick pay and have no contractual insurance, and thus they usually have a level of compensation that is 10 percentage points lower than that of employees. As of July 2003, the level of compensation for the unemployed for sick days 2–21 is 77.6 per cent of the qualifying income. In the table, 'supplement from contractual insurance' refers to the general compensation level on the Swedish labour market; there are exceptions.

regarding benefit levels, number of uncompensated qualifying days, employer-paid compensation days (sick pay period) and strictness in applying eligibility rules. The primary prerequisite for receiving sickness benefit is that a person has a disease or injury that reduces his or her ability to work by at least 25 per cent. Depending on the degree to which work ability is decreased, the person can be given full benefit or 75, 50 or 25 per cent compensation. The sickness insurance scheme covers individuals who are working in Sweden and have a minimum wage of 24 per cent of the price base amount (i.e. SEK 10,272 in 2009; the price base amount follows the inflation rate in society and is the basis for a number of social security benefits in Sweden). The actual amount granted is based on the individual's income from work, with an upper limit of 7.5 times the price base amount (i.e. SEK 321,000 in 2009). Up to July 2008, there has been no time limit for the benefit (Ighe & Edlund, 2008). A time limit for receiving the benefit was introduced in the legislation in July 2008 (Ighe & Edlund, 2008). While these fundamental criteria for eligibility have remained essentially unaltered, there have been extensive changes in benefit levels and in the amount of compensation to be paid by the employers, the former being amended ten times between January 1992 and January 2007 (see Table 1).

The most extensive changes that have been introduced have consisted of a sick pay period at the beginning of a sick leave spell to be paid by the employer (1992) and an uncompensated qualifying day (1993). The sick pay period and other means of employer co-financing have been changed six times since 1992 (Table 2). The basic intention of the sick pay period has been to give employers financial incentives to improve the work environment and thus reduce sick leave. To augment the incentives, between January 2005 and

November 2006, employers were also obliged to cover 15 per cent of the sickness cash benefit for absence exceeding 14 days (Ossowicki, 2006). Changes in the sick pay period were also accompanied by modified compensation levels in 1997, 1998, 2003 and 2005. For an average wage earner, the compensation has varied between 75 and 90 per cent of the income. In addition to the amendments to compensation and employer co-financing presented in Tables 1 and 2, changes in the administration of and eligibility for social insurance benefits in case of illness and disability were made on 12 occasions between 1993 and 2008. These revisions, together with the changes in compensation and sick pay periods, are listed in chronological order in Table 2. Modifications in disability pension insurance are also of importance in this context: if the eligibility for disability pension is restricted, more people will remain on long-term sick leave, all other things being equal.

The last column of Table 2 presents the expected associations between legislative modifications and the numbers on long-term sick leave at particular points in time. It has been suggested that such amendments can increase, decrease or have ambiguous effects on the number of persons on long-term sick leave. Also, it is generally believed that raising compensation levels results in more long-term sick leave, whereas lowering the benefits decreases the rate of such absence. However, changes in the sick pay period are not assumed to have a direct association in either direction. On the one hand, it is plausible that prolonging of the sick pay period can deter employees from taking sick leave because they do not want to obstruct their relationship with their employer. On the other hand, it might represent an incentive for employers to try to get their employees to extend sick leave spells beyond the

Table 2. Amendments to sickness insurance and disability pension legislation in Sweden 1993–2008.*

Point in time	Legislative change	Hypothesised effect on long-term sickness absence
1993.04	Introduction of one qualifying day without compensation.	Decrease
1993.07	Lower compensation from day 366. More rigorous examination of work capacity for disability pension.	Increase
1995.10	Stricter regulations regarding investigations and decisions.	Decrease
1996.01	Lower compensation days 4–365, higher from day 366.	Decrease
1997.01	More rigorous medical criterion for sickness benefit. Employer-financed sick pay period extended from 14 to 28 days. Labour market reasons no longer accepted as grounds for disability pension for workers aged 60–64.	Ambiguous
1998.01	Higher compensation from sick day 2.	Increase
1998.04	Employer-financed sick pay period reduced from 28 to 14 days.	Increase
1999.01	More lenient criteria for eligibility to disability pension.	Decrease
2002.01	More lenient regulations for investigations and decisions regarding sickness benefit.	Ambiguous
2003.01	Disability pension replaced by 'sickness compensation' (ages 30–64) and 'activity compensation' (ages 19–29).	Ambiguous
2003.07	Stipulated that, after one year of sick leave, disability pension should always be considered as an alternative to sickness benefit. Sickness benefit for unemployed claimants maximised to the level of compensation from unemployment insurance. Employer-financed sick pay period extended from 14 to 21 days. Lower compensation from day 21.	Decrease
2005.01	Employer-financed sick pay period reduced from 21 to 14 days, and co-financing from day 15 introduced. Higher compensation from day 15.	Increase
2006.07	The maximum level of sickness benefit per day raised.	Increase
2006.11	Employer co-financing from day 15 abolished.	Ambiguous
2007.01	The maximum amount of sickness benefit per day lowered. Lower compensation from day 2.	Decrease
2008.03	Recommendations introduced for sickness certification of different diagnoses.	Decrease
2008.07	Stricter criteria for sickness benefit with specific time limits. After 180 days, sickness benefit allowed only if claimant incapable of performing work on the regular labour market. Sickness benefit restricted to 364 days. More stringent criteria for disability pension.	Decrease

* If not otherwise stated, the amendments refer to the sickness insurance scheme. Before 2003, disability pensions were part of the general pension scheme, and in 2003 the successor 'sickness compensation' and 'activity compensation' became a part of the sickness insurance scheme. However, sickness insurance and disability pension are considered as two different schemes in this article and disability pension is the concept used throughout.

sick pay period in order to let the social insurance take over the costs of illness and work inability. Hence, in this sense, the sick pay period may act as a repulsive factor that drives workers with reduced work ability out of the labour market (Kolberg, 1991). Contractual insurance in Sweden offers no supplementary compensation within the sick pay period (see Table 1). Therefore, a shortened sick pay period means higher sickness compensation for employees, and it can be assumed that a reduction or extension of the sick pay period will increase or decrease sickness absence because of higher or lower compensation levels.

It is difficult to determine how the individual legislative amendments have affected long-term sickness absence, because they are so numerous and were introduced simultaneously on several occasions (July 1993, January 1997, April 1998, July 2003, January 2005 and January 2007). Moreover, any influence of such legislative adjustments might precede or lag behind the actual changes in absence over time, and it is also possible that there are cumulative effects of successive modifications in the insurance schemes.

Vocational rehabilitation measures are potentially relevant for the duration of sick leave. However, the role of such measures as regards work resumption seems to be of limited importance (Veerman & Palmer, 2001).

Hence, in this study, changes in the assessment of vocational rehabilitation measures within the social insurance administration have not been taken into account.

Unemployment, the labour force rate, real wages and an ageing workforce

Several studies have indicated that the rate of sickness absence in Sweden decreases in times of recession and increases during economic prosperity, indicating a negative correlation between unemployment levels and sick leave (Bergendorff et al., 2002; Henrekson & Persson, 2004; Johansson & Palme, 1996; Lantto & Lindblom, 1987; Wikman & Marklund, 2003). This general association is probably stronger for short-term sickness absence, and indeed there may even be a positive correlation for long-term absence. Studies have shown that the risk of long-term sick leave is greater during times of higher local unemployment (Marklund & Lidwall, 1997; Virtanen, Kivimäki, Elovainio, Virtanen, & Vahtera, 2005), and such disparities in the direction of the correlation for different lengths of sickness absence may be determined by whether unemployment depends predominantly on variations in the business cycle or if it is structural in nature (Doherty, 1979). As unemployment climbs, the impact of the

business cycle is seen as a reduction in sickness absence among those with jobs (Shapiro & Stiglitz, 1984), at the same time as more jobs are being lost by those with the highest levels of sickness absence (Leigh, 1985). By comparison, the structural effect occurs when those who have become redundant in the labour market, and also have varying degrees of health problems and work incapacity, leave the workforce permanently through various types of alternative support (Skogman Thoursie, Lidwall, & Marklund, 2005). In addition, it is possible that unemployment per se leads to health problems and gives rise to more long-term sickness absence, which in turn can result in exclusion from the labour market (Janlert, 1997). Furthermore, it is plausible that a higher labour force (participation) rate will cause more long-term sick leave because it may increase the probability that individuals with poor health will participate in working life (Virtanen, Liukkonen, Vahtera, Kivimäki, & Koskenvuo, 2003).

Changes in real wages have also been proposed to represent an alternative determinant of paid sickness absence (Bäckman, 1998; Kaivanto, 1997; Thomas, 1980). With rising real wages, more individuals work fewer hours to reach their income target, and hence sickness absence will tend to increase through an 'income effect'. On the other hand, higher real wages increase the relative cost of the time off work, which will tend to reduce sick leave because of a 'substitution effect'. Previous research has shown contradictory results as regards the direction of association between real wages and sickness absence (Bäckman, 1998). However, Bäckman, using annual time series data for the period 1935–1990 in Sweden, found a positive association that supported the idea of an income effect (Bäckman, 1998).

The pattern of increasing long-term sick leave with increasing age is well recognised. Table 3 shows that at the end of 2002 in Sweden, there were 48 long-term sickness absences per 1,000 men and 68 per 1,000 women in the age group 55–64. The age pattern for men was linear, with increasing proportions in older groups. Among women, the absence reached a peak as early as ages 45–54, and the subsequent drop in the age group 55–64 may in part have been the result of many leaving the workforce, in some cases with a disability pension. In addition to the fact that younger people are usually physically healthier, the low number of long-term sickness absences in the youngest age group may be explained by the relatively low level of workforce participation among these individuals. However, the rate of increase in long-term sick leave in young people was high, with the number of such absences more than doubling between 1998 and 2002. Previous studies have shown that both ill health (Marklund & Toomingas, 2001) and the risk of long-term sickness absence (Lidwall, Bergendorff, Voss &

Table 3. Ongoing cases of compensated long-term sickness absence (>59 days) in Sweden per 1,000 registered insured persons in December 1998–2002.

Sex and age group	1998	1999	2000	2001	2002	Change 1998–2002 Per cent
Men						
16–24	2.8	3.4	4.3	5.5	5.7	102
25–34	11.4	13.8	16.6	19.0	20.1	76
35–44	18.9	23.0	27.7	31.7	33.3	76
45–54	28.8	35.2	41.3	46.4	47.6	65
55–64	32.0	38.1	44.0	48.0	48.4	51
16–64	18.9	23.0	27.3	30.9	31.9	69
Women						
16–24	4.6	5.7	7.3	9.3	10.0	116
25–34	21.7	27.5	35.7	43.0	45.1	108
35–44	34.1	43.4	55.5	65.1	69.0	102
45–54	47.6	60.5	74.0	82.3	83.6	76
55–64	42.0	52.0	62.3	67.8	67.6	61
16–64	30.7	39.0	48.7	55.6	57.3	86

Source: Lidwall, Marklund, & Skogman Thoursie, 2005.

Marklund, 2009) increase with increasing age. It is also fair to assume that the older portion of the workforce will be more sensitive to structural changes in the labour market. For instance, the structural consequences of higher unemployment may be reinforced if there is a large proportion of older individuals in the workforce at the same time. All in all, a higher proportion of older persons in the workforce is expected to lead to a higher number of long-term sickness absences.

Changes in factors associated with working conditions and worker health

Overall, the health status of the Swedish population has improved since the 1990s, mainly because of lower rates of smoking and a reduction in related diseases. However, there are indications of poorer mental health and wellbeing (Palme et al., 2003; Persson et al., 2006), and sickness absence linked to sleeping problems has become more prevalent (Åkerstedt, Kecklund, Alfredsson & Selén, 2007; Westerlund et al., 2008). Growing proportions of employees have reported adverse work situations, with a general pattern of increasing job demands during the 1990s (Wikman, 2005). High-stress jobs have been shown to magnify the risk of health problems as well as sickness absence (Michie & Williams, 2003), and detected rises in stress-related disorders and psychiatric problems can be seen as a sign of a tougher work climate (Stansfeld & Candy, 2006). Furthermore, working overtime can lead to strain and elevate the risk of long-term sickness absence, especially among women, because they often have more extensive domestic responsibilities (Lidwall et al., 2009).

Another public health hazard is that alcohol consumption rose during the 1990s in Sweden, and this has been found to be associated with increased sickness absence at both the individual and population level (Hensing & Wahlström, 2004; Norström, 2006; Norström & Moan, 2009).

In the present study, we analysed changes in several factors associated with the health of working people such as alcohol consumption, high work pace, overtime, sleeping problems and stress and strain. We expected to find a positive association between the mentioned factors and long-term sickness absence.

Methods

Long-term sickness absence

Long-term sickness absence was defined as the number of ongoing cases of medically certified sickness absence lasting 60 days or more that were recorded in the Swedish social insurance registers. Long-term sickness absence was analysed separately for women and men, considering the turn of every month during the period December 1992–September 2008. This is one of the few time series of sickness absence data that is of sufficient length to enable assessment of changes over time. The number of long-term sickness absences per 1,000 women and men aged 16–64 was used as dependent variable.

Explanatory variables

Several of the labour market and workforce characteristics considered here originate from the National Labour Force Surveys conducted by Statistics Sweden; these include the unemployment rate, the labour force rate and the proportion of the population aged 55–64 years as a measure of the ageing workforce. We also used a number of variables that reflect changes in working life and worker health. Semi-annual data on work pace, working overtime and sleeping problems were gathered from self-reports made to the Survey of Working Conditions performed by Statistics Sweden. In addition, annual data on self-reported disorders because of stress and strain at work were acquired from the Survey on Work-related Disorders conducted by Statistics Sweden. The semi-annual and annual data were linearly interpolated in our analysis. Real wages were calculated by dividing the sum of wages (deflated by the consumer price index; data from the System of National Accounts) by the number of employed people aged 16–64. Data on alcohol sales (litres of 100 per cent alcohol) were obtained from the Swedish Alcohol Retail Monopoly and were divided by the population aged 16–64. In contrast to the other variables, gender-separated monthly data were not available for wages

and alcohol sales, and thus joint measures for women and men were used instead. Summary statistics for these continuous variables are presented in Table 4. A number of ‘dummy’ variables were also used to study the various legislative amendments in the Swedish sickness insurance scheme; these had a value of zero before an amendment was implemented and a value of one after implementation. The results of these ‘dummies’ are interpreted as the possible change in the number of cases of ongoing long-term sickness absence after the month of an amendment to the insurance scheme.

Statistical analyses

Multiple linear regression models were used to analyse associations between macro indicators and the number of ongoing cases of long-term sickness absence. This methodology was chosen because it allows assessment of how an individual factor such as a change in unemployment affects long-term sick leave, given that other variables included in the model are held constant. The results that are obtained can illustrate how a single unit increase in one factor can have an impact on the number of cases of long-term sickness absence, if there is a causal relationship and no other relevant variables are omitted. The regression analysis is conducted separately for women and men, because the level of long-term sickness absence differs between the sexes, and it may be influenced by different factors as well. As is often the case with time series data, our original series of long-term sickness absence data were non-stationary and exhibited serial correlation. Failing to address serial correlation (or autocorrelation) could result in highly significant parameter estimates and increased risk of obtaining spurious relationships. A preliminary regression analysis using undifferenced series (not presented in detail here) yielded a Durbin-Watson statistic of 0.59 for women and 0.64 for men, clearly indicating positive serial correlation. Hence, the analyses were conducted on stationary first-differenced series (Pindyck & Rubinfeld, 1981). Consequently, the analyses were made on monthly changes in the number of ongoing cases of long-term sick leave.

There was a clear seasonal variation in the series of long-term sickness absence data that we analysed. Therefore, a number of dummy variables indicating calendar month were used, and they were retained in all the estimated regression models. The analyses were carried out in three steps: in model I, a single regressor was estimated to assess the bivariate association with long-term sickness absence; in model II, all regressors were entered into the regression; in model III, a manual stepwise backward selection approach was applied, and only variables statistically significant at $p < 0.05$ were kept in the final model.

Table 4. Summary statistics for monthly data December 1992–September 2008 (if not otherwise stated).

	Number of observations	Mean	Standard deviation	Minimum	Maximum
Women					
Long-term sickness absence ^a	190	36.3	11.9	20.3	59.6
Population aged 55–64 ^b	190	18.5	2.07	15.9	21.1
Labour force rate ^b	190	75.8	1.93	71.5	81.6
Unemployment rate ^c	190	5.5	1.44	3.0	9.4
High work pace ^d	(190)	57.1	3.40	50.8	61.0
Overtime work ^d	(190)	30.9	2.26	25.6	35.0
Sleeping problems ^d	(190)	19.9	3.39	12.3	23.4
Stress and strain ^e	(190)	10.2	2.86	5.8	13.6
Men					
Long-term sickness absence ^a	190	21.9	5.4	13.0	32.4
Population aged 55–64 ^b	190	17.9	2.25	14.8	20.7
Labour force rate ^b	190	80.2	1.82	77.2	85.9
Unemployment rate ^c	190	6.4	1.89	3.6	11.4
High work pace ^d	(190)	42.1	2.98	36.4	46.0
Overtime work ^d	(190)	37.2	2.07	32.4	40.1
Sleeping problems ^d	(190)	17.2	2.17	12.6	20.3
Stress and strain ^e	(190)	5.9	1.66	3.6	8.2
Real wages (women and men) ^f	190	127.6	14.99	100.0	152.5
Alcohol sales (women and men) ^g	190	0.48	0.10	0.32	0.74

^a Ongoing cases of compensated sickness absence lasting ≥ 60 days (*Source*: Swedish Social Insurance Agency) per 1,000 in the population aged 16–64 (*Source*: Labour Force Survey, Statistics Sweden).

^b Proportion (per cent) of population aged 16–64 (*Source*: Labour Force Survey, Statistics Sweden).

^c Proportion (per cent) of workforce aged 16–64 (*Source*: Labour Force Survey, Statistics Sweden).

^d Proportion (per cent) of employed persons aged 16–64 who reported experiencing the following: (1) can decide the *work pace* at most half the time; (2) have to cut down on lunches, *work overtime*, or bring work home; (3) have work-related *sleeping problems*. Surveys conducted October–November. Semi-annual data for the period 1993–2007 (a total of eight observations). Missing values imputed by linear interpolation or use of first/last recorded value (*Source*: Survey on Working Conditions, Statistics Sweden).

^e Proportion (per cent) of employed persons aged 16–64 who reported having disorders caused by *stress* or other psychological *strain* at work. Surveys were conducted January–March, and annual data represent 1995–2006 and 2008 (a total of 13 observations). Missing values imputed by linear interpolation or use of first/last recorded value (*Source*: Survey on Work-Related Disorders, Statistics Sweden).

^f Wages (System of National Accounts, Statistics Sweden) per employed person aged 16–64 (*Source*: Labour Force Survey, Statistics Sweden) deflated by consumer price index (CPI, *Source*: Statistics Sweden) and expressed as index with December 1992 = 100.

^g Litres of 100 per cent alcohol per capita ages 16–64 (*Source*: The State Alcohol Monopoly, Systembolaget).

Results

The results of the current analyses of long-term sickness absence are presented in Table 5. The column headed ‘Model I’ includes the bivariate associations observed after adjustment for calendar month; this model actually comprises 26 different regressions, one for each regressor, but only the estimates for the explanatory regressors are shown here. The application of Model 1 indicated that although long-term sickness absence did change after amendments to relevant legislation, especially for men, the changes that occurred were only to a limited extent congruent with expectations. There was an upward trend during the 1990s for both women and men, and a downward trend from 2003 and onwards, regardless of whether the legislative modifications entailed more generous or more restrictive sickness insurance rules. Neither the composition of the workforce nor labour market factors showed an anticipated consistent pattern. Also, there was a negative association with unemployment for men, which was contrary to what was expected for long-term sickness absence. The

same applies to the rise in the labour force rate and the higher proportion of older people in the workforce, both of which were hypothesised to increase long-term sickness absence. However, working conditions and factors related to worker health were, as predicted, positively associated with long-term sickness absence, particularly among men.

In model II, estimates of all the variables were entered in the regression, whereas in the final model III only significant variables were retained after stepwise deletion of insignificant variables (Table 5). Several diagnostic tests were conducted to assess the appropriateness of the linear regression model (Pindyck & Rubinfeld, 1981). Residual plots revealed no violation of the assumptions for normality or homoscedasticity. However, there were problems with multicollinearity in the fitted models, as indicated by tolerance and variance inflation factor statistics (not presented in detail here) (Norusis, 1994).

For both women and men, the estimates in models II and III revealed a pronounced monthly variation involving less long-term sickness absence during the

Table 5. Multivariate regression analysis (ordinary least squares) of factors associated with changes in long-term sickness absence.

Variable	Women			Men		
	Model I	Model II	Model III	Model I	Model II	Model III
(Constant)	–	–14.887**	–5.555***	–	–5.921*	–1.947***
Calendar month	–	–	–	–	–	–
January (reference)	–	–	–	–	–	–
February	–	–1.147***	–1.159***	–	–0.779***	–0.775***
March	–	0.474***	0.540***	–	–0.289***	–0.283***
April	–	–0.039	–0.081	–	–0.411***	–0.342***
May	–	–0.407*	–0.470***	–	–0.593***	–0.511***
June	–	–2.517***	–2.091***	–	–1.234***	–1.128***
July	–	–1.213***	–0.414*	–	–0.398*	–0.305**
August	–	–2.314***	–1.820***	–	–1.142***	–1.077***
September	–	–1.488***	–1.300***	–	–1.076***	–1.024***
October	–	1.364**	1.417**	–	0.168	0.211**
November	–	0.908***	0.939***	–	0.046	0.072
December	–	–0.818**	–0.410	–	–0.755***	–0.712***
Changes in regulations						
1993.04	0.199	–0.606*		0.063	–0.543***	–0.582***
1993.07	0.451*	0.647**		0.322**	0.464**	0.522***
1995.10	0.171	–0.694**		0.197***	–0.289*	
1996.01	0.223*	0.435		0.224***	0.312*	
1997.01	0.180*	–0.181		0.187***	–0.097	
1998.01	0.121	0.218		0.146***	0.026	
1998.04	0.088	0.062		0.127***	0.125	
1999.01	–0.049	–0.418		0.042	–0.228	–0.284***
2002.01	–0.592***	–0.544**	–0.442***	–0.255***	–0.266**	–0.359***
2003.01	–0.672***	–0.054		–0.308***	0.026	
2003.07	–0.727***	–0.624**	–0.872***	–0.334***	–0.176	
2005.01	–0.591***	–0.342		–0.261***	–0.181	
2006.07	–0.220***	0.053		–0.495***	–0.122	
2006.11	–0.508***	–0.223		–0.227***	–0.217	
2007.01	–0.489***	–0.059		–0.215***	–0.082	
2008.03	–0.436*	–0.344		–0.177	–0.163	
2008.07	0.092	0.883***		0.020	0.321**	
Unemployment rate	–0.047	0.095		–0.039***	–0.019	
Labour force rate	–0.182***	0.066		–0.104***	0.010	
Real wages	–0.007**	–0.024		–0.001	–0.015	–0.024**
Population aged 55–64	–0.088***	0.077		–0.021**	–0.018	–0.197***
High work pace	0.023*	0.144	0.096***	0.017**	0.132*	0.149***
Overtime work	0.043**	0.047		0.052***	0.050	
Sleeping problems	0.007	0.016		0.031***	–0.068	
Stress and strain	–0.016	0.081		0.006	0.148	0.326***
Alcohol sales	–2.969***	3.496***	1.953**	–1.037***	2.598***	2.508***
No. observations	189	189	189	189	189	189
R ² (adj.)	–	0.879	0.870	–	0.862	0.860
Durbin-Watson	–	2.206	1.879	–	2.474	2.212

Significance: *** at 1 per cent level, ** at 5 per cent level, * at 10 per cent level.

Models estimated using differenced data (lag 1). Ongoing cases of compensated sickness absence lasting ≥ 60 days per 1,000 in the population aged 16–64 years. Monthly data for December 1992 to September 2008.

Model I, calendar month and a single regressor; Model II, full model with all regressors; Model III, final model with significant regressors retained ($p < 0.05$). Parameter estimates presented are unstandardised regression coefficients. –, No estimates presented (multiple models).

summertime. Also, it appeared that a few legislative amendments in particular led to changes in the number of cases of such prolonged absence. The two implemented in 1993, which entailed introduction of a qualifying day and a stricter disability pension scheme, resulted in expected associations for men, which were seen as, respectively, decreased and increased long-term sickness absence. Model II indicated a similar pattern for women in relation to the 1993 amendments, but these associations were insignificant in the reduced

final model. For men, an expected negative association with the legislative modification in 1999 was also found; this was observed as a decrease in long-term sick leave due to more generous application of the disability pension scheme. Both women's and men's long-term sickness absence were negatively associated with the legislative adjustment made in January 2002. However, as anticipated, only women were negatively influenced by the amendments introduced in July 2003, which was seen as a decrease in long-term sick leave

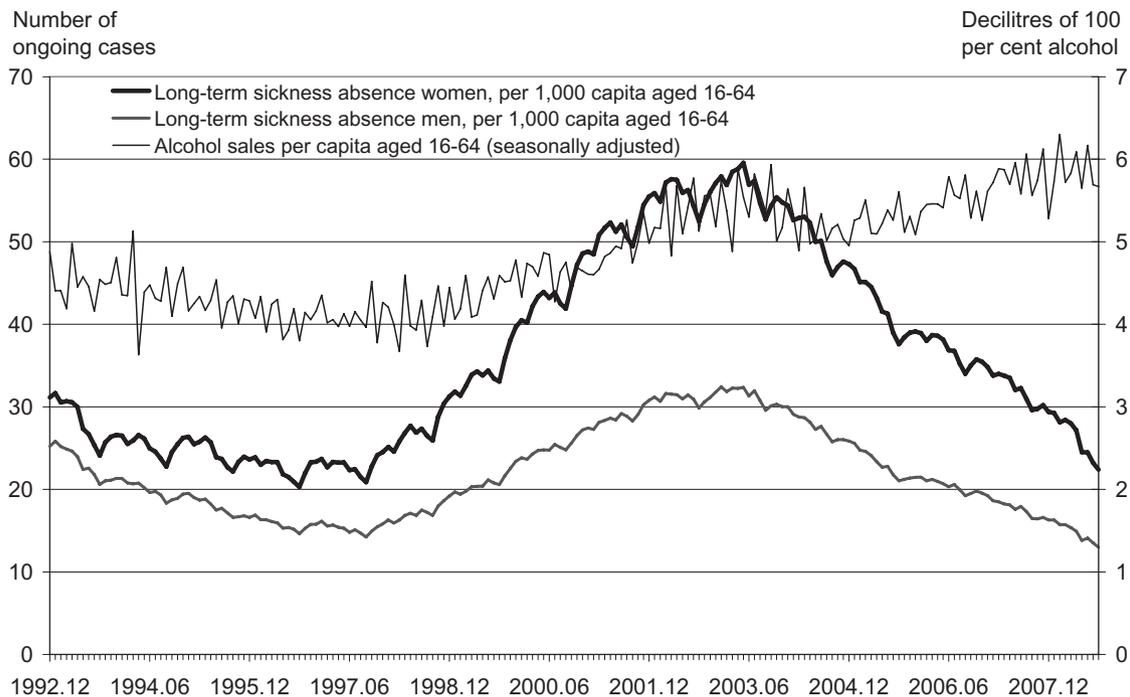


Figure 2. Long-term sickness absence (>59 days) and alcohol sales December 1992–September 2008.

rate because of the increased inflow to disability pension and more restrictive rules in the sickness insurance scheme.

In this study, neither the unemployment rate nor the labour force rate was found to be associated with long-term sickness absence. Nevertheless, negative association with such absence was observed for real wages among men, and surprisingly, also for an ageing workforce. Considering the factors related to working conditions and worker health, long-term sick leave showed a significant positive association with high work pace for both women and men, and for men a positive association was also found for disorders related to stress and strain at work.

Increasing alcohol consumption (measured as higher sales) is expected to raise the number of ongoing long-term sickness absences among both women and men. It is estimated that a monthly increase in consumption amounting to 1 decilitre of 100 per cent alcohol will increase the number of long-term sickness absences among men by approximately 2.5 and among women by 2.0 per 10,000 aged 16–64. Figure 2 illustrates long-term sickness absence for women and men plotted against alcohol sales. The trajectories of alcohol consumption and long-term sickness absence are reasonably similar up to the end of 2004, although there was a considerable increase in long-term sick leave for women from the summer of 1997 onwards. However, from 2005 to 2008, alcohol sales continued to rise while long-term sickness absence dropped substantially. Accordingly, the association found between

alcohol sales and long-term sickness absence can be attributed to the period before 2005, and therefore factors other than alcohol consumption must have accounted for the development of long-term sickness absence from 2005 onwards.

Discussion

Specific amendments that have been made in the Swedish sickness insurance scheme since 1993 were found to be only moderately associated with subsequent changes in the number of cases of long-term sickness absence among women and men. There was an upward trend during the 1990s and a downward trend from 2003 onwards, regardless of the degree of generosity of the sickness insurance rules. In addition, the decline in long-term sick leave since 2003 cannot be explained by the other explanatory variables used in the study. The Swedish Social Insurance Agency has officially interpreted the use of a stricter assessment of the right to sickness absence benefits, as the reason for the decrease in sick leave since 2003, despite there being no specific amendments to legislation in that respect before 2008 (Swedish Social Insurance Agency, 2007).

Furthermore, we did not find the expected associations between prolonged sick leave and the composition of the labour force and labour market factors measured as unemployment rates, workforce participation rates, and the proportion of older persons in the workforce. However, as anticipated, such absence was positively

associated with working conditions, factors related to worker health and alcohol consumption.

Both of the legislative amendments made in 1993 (reduced sickness insurance compensation as a result of introduction of a qualifying day and a stricter disability pension scheme) resulted in expected findings for men. However, it is also plausible that less generous compensation of short-term sick leave led to more long-term absence. In a study of sickness absence among Swedish postal workers (Voss, Floderus & Diderichsen, 2001), it was observed that short-term sick leave was reduced and long-term sickness increased after the introduction of a qualifying day in 1993.

The amendment to legislation made in 1999 had an expected negative association with absence among men, seen as a decrease in long-term sick leave as a result of a more lenient disability pension scheme. In addition, a negative association for both men and women was found with the legislative modification implemented in January 2002, which included more lenient regulations for investigations and decisions regarding sickness absence benefit. No a priori assumptions were made about that amendment, and the negative estimates for both sexes probably partly reflect the break in the upward trend in long-term sickness absence that occurred in the summer of 2002. For women, the downward shift in long-term sickness absence was augmented by the new legislation in July 2003, which involved some restrictive changes in sickness insurance and probably increased the inflow to disability pension. Our results partly contradict previous studies showing associations between amendments to regulations and sickness absence in general (Doherty, 1979; Dyrstad & Lyso, 1998; Henrekson & Persson, 2004; Hughes, 1982; Lantto & Lindblom, 1987; Lidwall et al., 2005). This disparity might be related to the fact that long-term sickness absence differs from overall sickness absence. In short, compared with short-term sick leave, long-term sickness absence is likely to be more closely connected with illness and disease (Khan & Rehnberg, 2009; Kivimäki et al., 2003), and is therefore less likely to be more extensively affected by changes in regulations concerning aspects such as compensation levels and marginal adjustments to eligibility rules.

The lack of a consistent association between long-term leave and specific amendments to the sickness insurance scheme may also be related to another feature of the Swedish system, namely, the fact that expansive modifications are often made during an upward trend in sickness absence, and restrictive changes are usually made after sickness absence rates have already started to decline. Such timing of policy amendments tends to strengthen, rather than alter, an ongoing trend towards a rise or fall in sickness absence rates caused by other factors.

There were also apparent seasonal variations in the number of people on long-term sick leave, although little is known in that context. The monthly variation with less long-term sickness absence during the summer can probably not be explained by influenza epidemics and colds during the winter, since sick leave spells because of such illnesses rarely exceed 2 months (Lidwall, 2002). A more reasonable interpretation is that holidays and other forms of paid or unpaid leave from work in the summer months may serve as buffers for those with reduced work capacity.

Two main explanations have been proposed to interpret the link between economic cycles and sickness absence. First, it has been suggested that higher unemployment has a disciplining effect on the behaviour of the workforce. This means that a greater risk of unemployment reduces the propensity to take sick leave, because people are afraid of losing their jobs (Shapiro & Stiglitz, 1984), or in other words, higher unemployment lowers sickness absence in the group still in work. Second, it is possible that extensive unemployment leads to people with higher levels of sick leave being excluded from the workforce, thereby reducing sickness absence (Leigh, 1985). Since unemployed persons in Sweden have the right to paid sick leave, this interpretation will hold true only if individuals who have a high rate of sick leave and lose their jobs subsequently reduce their use of sick benefits while they are unemployed. A third plausible explanation might be that the pace of working life increases during an economic boom so that more employees cannot keep up and therefore take sick leave (Wikman & Marklund, 2003). However, the present study found no evidence that changes in unemployment or labour force rates are associated with long-term sickness absence.

One reason why this study did not find associations with an ageing workforce or unemployment could have to do with the specific time period which included two very dramatic ups and downs in long-term sickness absence in Sweden. However, when the analysis was restricted to the period 1992–2003 the results did not change in this respect. The use of first-differenced series as a more strict methodology may be another reason for the unexpected results. Additional analyses (not reported in detail here) revealed that unemployment and labour force rates were significantly associated with long-term sick leave when undifferenced series were analysed. The explanatory power of different labour market factors may also have been reduced by the fact that this study included relevant factors that have often been ignored in other studies, such as working conditions, worker health and alcohol consumption.

Even more surprising is the lack of a positive association between changes in long-term sickness absence rates and the increased proportion of the population in the age group 55–64. In a previous study by our research

team (Lidwall et al., 2005), similar data were used and the results showed strong positive correlations between prolonged sick leave and an ageing population up to the year 2003. Notably, although the number of older people in the population continued to rise up to 2006, the level of long-term sickness absence had continuously decreased since 2002. Based on those findings, it was hypothesised that some previously assumed effects of an ageing population could instead be explained by other factors, such as changes in working conditions (Lidwall et al., 2005). The negative consequences of a faster pace in working life are probably reinforced by a workforce that is getting older and might find it difficult to keep up. A combination of an increased proportion of older workers and greater work demands may have led to more extensive long-term sickness absence during the late 1990s in Sweden (Wikman & Marklund, 2003). Support for such a potential interaction between an ageing workforce and changes in working conditions were also given in additional analyses (not reported in detail here), because a positive association with the ageing workforce was found when changes in working life and worker health were omitted from the model. Hence, some of the previously found associations between an ageing workforce and long-term sick leave could be attributed to changes in working conditions.

In the current study, a negative association was found between long-term sickness absence and real wages for men. Hypothetically, as real wages rise, fewer hours of work will be needed to reach the income target, and hence it can be assumed that sickness absence will increase as the result of an 'income effect'. However, higher real wages will also raise the relative price of time off work, which tends to reduce sickness absence due to a 'substitution effect'. The present findings support the idea of a substitution effect for men, meaning that higher real wages among men will increase the relative price (cost) of being on long-term sick leave, and consequently such absence will be reduced. This does not agree with previous studies showing a positive association between higher pay and the general level of sick leave in Sweden, and hence it supports existence of the income effect (Bäckman, 1998; Norström, 2006). Since the measures used in the cited investigations are more closely related to short-term sickness absence, it seems that the income effect related to higher real wages is more evident for people with shorter periods of sick leave, and the substitution effect might apply primarily to long-term sickness absence.

In the present study, we observed that working conditions and worker health were associated with long-term sickness absence among both women and men. In addition, such absence was significantly and positively associated with high work pace in both sexes, and, for men, it was also positively correlated with disorders

caused by stress and strain at work. In the 1990s, increasing numbers of employees in Sweden were exposed to adverse work conditions and a tendency towards progressively greater demands on the job (Wikman, 2005). High-stress work magnifies the risk of various illnesses and sickness absence (Michie & Williams, 2003), and the increase in stress-related disorders and psychiatric problems may be a sign of more demanding working conditions (Stansfeld & Candy, 2006). A recent study conducted in Sweden found that working conditions in general, and the psychosocial work environment in particular, had an increasingly marked association with long-term sickness absence during the 1990s (Lidwall et al., 2009). However, since the measures of working conditions of the present study were interpolated, it is necessary to observe caution when interpreting the results. We did not investigate the role of the physical circumstances in the workplace, despite the likely impact of those aspects on prolonged sick leave (Allebeck & Mastekaasa, 2004). Compared with changes in the psychosocial work environment, changes in the physical working conditions seem to be more stable over time (Lidwall et al., 2009; Wikman, 2005), indicating less explanatory power of the aggregated data. Nevertheless, the current results do suggest that it is important to consider working conditions and worker health when analysing changes in sickness absence over time.

Another health-related factor observed in our investigation was the rise in alcohol sales, which potentially increased the number of ongoing periods of long-term sickness absence for both women and men. Previous studies have shown positive associations between per capita alcohol consumption and sickness absence in general for men in Sweden and Norway (Norström, 2006; Norström & Moan, 2009), and the present results indicate that alcohol consumption may be a population risk factor for long-term sick leave in women as well.

The strengths of our study are that we analysed a long time series of comparable sickness absence data, and used a broad array of explanatory variables. It is also beneficial that the absence data originated from national registers, since they cover all medically certified sick leave periods that exceed the sick pay period and entitle claimants to sickness benefits. The study covered the entire Swedish population and included all sick leave periods that exceeded 59 days. However, a weakness of analyses based on aggregated information means that it is difficult to draw conclusions about causal relationships. Links can only be established in the form of correlations, which must be remembered when interpreting the results of studies using aggregated data. Multicollinearity was also an evident problem in the present regression models, which means that some of the independent variables were linearly related. Inasmuch as there is no straightforward way to

deal with multicollinearity, it is again warranted to observe caution when attempting to draw conclusions from the findings. Some measurement difficulties should also be mentioned. The indicator of alcohol consumption did not include unrecorded consumption such as alcohol purchased outside the country. Furthermore, the indicators of working conditions had been obtained in surveys, with their particular limitations. The lack of specific measures of real wages and alcohol consumption considering women and men separately is also a possible source of bias in the estimated associations. In addition, there may have been other causal factors that were not identified in the study, which represent another potential cause of bias.

Conclusions

Despite the potential importance of specific changes in the sickness insurance scheme, the present study revealed no consistent pattern in the associations with long-term sick leave. However, the results do suggest that the rate of such absence might be more sensitive to macroeconomic factors for men than for women. Furthermore, the composition of the workforce does not seem to have had a significant impact on variations in long-term sickness absence during the last decades. Instead, our findings imply that public health indicators such as alcohol sales and factors related to working conditions and worker health are associated with prolonged periods of sick leave.

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