

Trajectory analyses of sickness absence among industrial and municipal employees

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Background	Compared with the public sector, the private sector is more susceptible to changes in the economic environment and associated threats of downsizing, outsourcing and transfers of production. This might be assumed to be associated with more restrictive sickness absence practices.
Aims	To investigate whether this difference is reflected in higher sickness absence rates in the public sector and to explore the potential of trajectory analysis in researching such absences.
Methods	The sample consisted of industrial and municipal employees. Latent groups of differential sickness absence during a 6-year study period were searched with a two-response trajectory analysis that jointly captured the spells and the days. Multinomial logistic regressions were used to assess associations of the labour market sector with the set of trajectories obtained.
Results	There were 2207 industrial and 3477 municipal employees in the study group. The analysis assigned the employees to three trajectory groups, the 'low-level', 'middle-range' and 'high-range' groups. The relative risk ratios for the middle-range and the high-range trajectories of public sector employees were not higher after controlling for age, gender and occupational.
Conclusions	In this study, the labour market sector was not a major independent determinant of sickness absence practices. Trajectory analysis can be recommended as a way to determine differential absence practices. The trajectory approach might help occupational health services to identify more accurately the employees who need support to maintain their work ability.
Key words	Finland; register study; trajectory analysis.

Introduction

The motivation to compare the public and private sectors with respect to sickness absence comes from traditional differences in their nature. The public sector has had a reputation for being an 'exemplary employer' with respect to security of job contracts, adherence to legislation and worker protection agreements, and trade union membership among employees [1,2]. Moreover, the public sector is less sensitive to macroeconomic fluctuations than private industry, which has to react to changes in markets by contracting or expanding, or by revising staffing and production. It might be assumed that these differences would be reflected in more restrictive sickness absence practices in the private sector, i.e. employees would be more reluctant to take sick leave as they would be more likely to fear that such absences would threaten their job, and employers would also monitor such absences more

strictly. There is some research on international [3] as well as inter-organization [4,5] differences in sickness absence, but previous research focusing on differences between labour market sectors is scarce. One reason for this paucity may be the lack of suitable data: population level registers evidently do not enable individual level linking between sickness absence and workplace, and surveys seldom measure either absences or workplace characteristics in a manner that would enable workplace- or branch-level comparisons. The data sets collected in the Finnish Public Sector (FPS) study, covering 10 towns, and a research project in a Finnish food processing company, covering four factories in separate localities, have previously been used to study inter-locality of differences in sickness absence [6,7]. We pooled these data in order to study the sector-level differences.

Trajectory analysis has been established as a way to study the differential development of time-dependent

phenomena. This method, also known as latent class analysis [8], was developed in the 1990s [9]. It represents a sophisticated way to assign each individual to the pattern typical of him/her in the long run. Although the method is currently relatively widespread, in the domain of sickness absence research, we are aware of only one previous study that has utilized trajectory analysis to define ‘latent groups’ of individuals with similar absence profiles over time within the study population [10]. This study had long absence spells as the response variable. But trajectory analysis also provides a way to study absence spells and days jointly. It is, however, not clear whether such two-response analysis yields sensible results, as regards real-life interpretations. Our study, therefore, aimed firstly to explore trajectory analysis as a method of research on sickness absence. Our main aim was to test the hypothesis that municipal employees have a higher risk of sickness absence, when differences in personnel structure are controlled for by introducing gender, occupational status and age into the analysis.

Methods

The private sector data came from a food industry company that comprised an administrative unit and four factories in different localities in central Finland [11] and the public sector data from three towns in the FPS study [12] located in the same region (Pirkanmaa) as the factories. The studies were approved by the ethics committee of the Pirkanmaa Hospital District and the Helsinki and Uusimaa Hospital District, respectively. The person register in the study included all employees who had been contracted at the organizations concerned for >3 months over 3 or more years during the period from 1 January 2003 to 31 December 2008. Applying the 3-month criterion enabled us to consider the actual time when the employee was ‘at risk’ of being absent, i.e. all absences other than those due to sickness or regular annual holidays were subtracted from the ‘calendar duration’ of the contract.

Sickness absence was measured as the number of spells and the number of calendar days during a calendar year. If the time at risk was less than a year, the absence was extrapolated into ‘days per person year’. The municipal registers included an ‘occupational status’ variable [13] that was used to dichotomize the employees into ‘white-collar’ and ‘blue-collar’ ones. The food industry employees were classified according to information on wages: shop floor manual workers were paid on an hourly basis, whereas clerical and administrative workers received a monthly salary. The registers also included information on gender and age. In order to estimate individual changes in sickness absence over time, we performed group-based trajectory analysis [14]. This is a semi-parametric modelling method that identifies groups within the sample that differ from each other as much as possible while internally behaving as

similarly as possible. The model used here jointly estimates the developmental trajectories of two or more distinct but theoretically related measurement series, which in this case consisted of 6-year-level counts of the spells and days of sickness absence. The count variables were assumed to be Poisson-distributed and the shape of the trajectories was assumed to be a second-degree curve. The number of trajectories was decided using the Bayesian information criterion (BIC). Trajectory analyses were conducted with R (version 3.0.2). The trajectory groups were illustrated by curves that consist of means of the absence days and spells of the individuals belonging to the group in each year. Multinomial logistic regression analyses were used to study the associations of the sector with the trajectories. The food industry and the trajectory indicating the lowest level of absence were defined as the reference and the outcome was weighted with the posterior probability of belonging to the chosen (i.e. most likely) trajectory group. Results were expressed as relative risk ratios with 95% confidence intervals (CIs). Regression analyses were conducted with IBM SPSS Statistics 20.0.

Results

The study sample included 2207 employees in the food industry company and 3477 municipal employees. Table 1 describes the sample according to sector. The employees were mainly women, particularly in the municipalities. About 80% of the industrial employees were blue collar, whereas among the municipal employees, 22% were blue-collar workers. The sickness absence figures were higher in the food industry.

In order to define the number of sickness absence trajectories, we tried solutions from one to eight groups. According to the BIC values, the three-group solution with a second-order polynomial shape was found to be

Table 1. Gender, occupational status and sickness absence among industrial and municipal employees

	Industrial employees		Municipal employees	
	<i>n</i> (%)	Mean	<i>n</i> (%)	Mean
Gender				
Men	872 (40)		679 (18)	
Women	1335 (60)		3068 (82)	
Occupational status				
Blue-collar employees	1774 (80)		815 (22)	
White-collar employees	433 (20)		2932 (78)	
Age in 2003		37.5		41.8
Sickness absence in 2003–08				
Spells/person year		3.5		2.4
Days/person year		24.4		19.4

the best. For each individual, the analysis produced the probability of belonging to each group and the employees were assigned to their groups according to the highest probability. The trajectories are illustrated in Figure 1.

More than half (53%) of the sample fell into the 'low-level' trajectory group, with about one spell and 5 days yearly across the study period. In the 'middle-range' group, comprising 37% of the sample, the spells increased from about three and a half to nearly five and the days from 20 to >30 per year. The remaining 10% were assigned to the 'high-range' group with respect to both the spells (six to eight) and the days (60 to 100).

Table 2 displays the trajectory groups according to sector. As one might expect on the basis of the average figures (see Table 1), municipal employees dominated the low-level group and industrial employees the high-range group. In line with this, municipal employees' relative risks of being assigned to the middle-range and high-range trajectory groups were significantly small (0.74 and 0.59, respectively) (Table 3). The risks remained

almost unchanged after adjustment for age and gender, whereas adjustment for occupational class made the risk for municipal employees significantly higher. In the fully adjusted model, however, the risk ratios were non-significant (1.12 and 0.94, respectively).

Discussion

This analysis of sickness absence trajectories across a 6-year observation window showed that industrial employees' higher sickness absence rates compared with their counterparts in the municipalities were due to more common 'high-range' and 'middle-range' trajectories among industrial employees. Adjustment for sociodemographic background, in particular for occupational status, equalized industrial employees' risk of high absence rates.

We tested the hypothesis that working in the public sector, represented by Finnish municipalities, is an independent risk factor for higher sickness absence. The

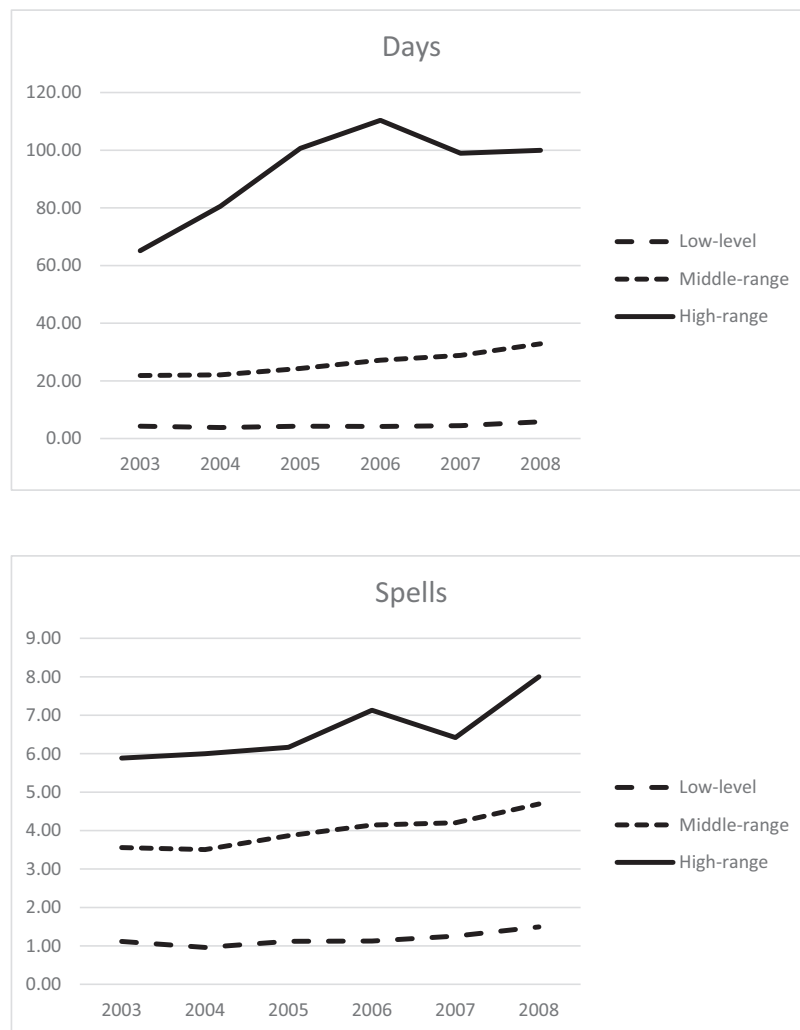


Figure 1. Illustration of the trajectory groups of low level ($n = 3161$, 53%), middle range ($n = 2182$, 37%) and high range ($n = 611$, 10%) of sickness absence.

results did not support the hypothesis. This may indicate that the principles of private sector economic life have infiltrated organizations in the public sector, rather than the opposite. Indeed, neo-liberal regimes and principles of 'new public management' have increasingly gained ground in Finland's public sector since the 1990s [15]. In practice, this has meant changes that tend to increase sickness presence, for example outsourcing and downsizing, increase in the use of fixed-term contracts and stricter norms about hiring substitutes in cases of absence. In other words, using sickness absence as the indicator, we may conclude that the traditional concept of the private–public employment sector distinction is no longer valid, at least in the context of the Scandinavian welfare state as represented by Finland.

This study also launched the two-response trajectory analysis as an alternative statistical method for research on sickness absence, particularly as a method to analyse jointly the spells and days of absence. There have been a couple of previous studies applying trajectory analysis to research on the labour market attachment [16,17], but only one previous study has applied it to absence [10]. Trajectory analysis provides a powerful and statistically well-justified method for disentangling the heterogeneity of sickness absence in a genuinely longitudinal setting. By taking into account both the level and the changes in absence, trajectory analysis defines individuals' absence more accurately than either a simple sum of days or spells during the study periods or survival analyses. Moreover, the groups obtained are realistic: for instance, the 'low-level' trajectory represents employees with 'normal' absence and therefore serves as an appropriate reference group in the regression analyses. One of the advantages of the two-response trajectory approach applied is its ability to distinguish a chance variation across individuals from a real difference [18]. In other words, it

classifies individuals according to sickness absence patterns instead of blindly scoring absence figures over the study period. We also compared absence days and spells in the sectors with a generalized linear model, which has been established as the standard method in previous sickness absence research. The odds ratio for spells of absence in municipal versus industrial employees was 1.12 (CI 1.04–1.21), and 0.97 (CI 0.90–1.05) for days of absence. The finding for spells also supports our hypothesis. Nevertheless, we consider the trajectory analysis performed to be a more appropriate way to analyse sickness absence, at least when it comes to assessing different social contexts as determinants of absence.

In relation to other register-based research on sickness absence, the strength of the present study was that instead of drawing on sickness insurance statistics, which miss short spells, we had access to records kept by employers, which included the dates of the beginning and end of all periods of sickness absence of all eligible employees. In addition to covering short-term absence, which is particularly important for analysing absence spells, these registers had the advantage of enabling an exact accounting of the time each individual had been employed, i.e. at risk of sickness absence. Different 'healthy worker effects' may have confounded the comparison of industrial and municipal employees. However, the possibility of such confounding was reduced as we allowed employees with values for three or more of the six measurement years to contribute to the trajectories. Municipalities are the principal public sector employer in Finland and the private sector organization represents a major branch of industry. Moreover, earlier studies have shown that there is significant variation in sickness absence, both between the factories belonging to the company studied [7] and between the municipalities participating in the FPS study [6]. Therefore, it is improbable that the samples were biased due to particular sickness absence practices in the workplaces or localities.

Sickness absence indicates a weak attachment to the labour market, both as an actual manifestation and as a predictor. An interesting prospect for future research is to study the ways in which sickness absence trajectories are linked to trajectories of labour market attachment assessed by other indicators, for example less stable employment contracts, unemployment and retirement. It would also be

Table 2. Sickness absence trajectories during 2003–08 by labour market sector

Trajectory	Industrial employees	Municipal employees
Low level	47%	56%
Middle range	40%	35%
High range	13%	9%

Table 3. Relative risk ratios with 95% CIs among the municipal employees of assuming middle-range and high-range sickness absence trajectories in comparison with industrial employees

Trajectory	Relative risk ratio, adjusted for			
	None	Gender and age	Occupational status	Occupational status, gender and age
Low level	Ref.	Ref.	Ref.	Ref.
Middle range	0.74 (0.66–0.82)	0.67 (0.59–0.76)	1.19 (1.03–1.37)	1.12 (0.97–1.30)
High range	0.59 (0.50–0.70)	0.45 (0.37–0.54)	1.25 (1.01–1.55)	0.94 (0.76–1.17)

Statistically significant results are marked as bold.

interesting to explore the potential of other longitudinal methods, for example sequence analyses, in the field of sickness absence research. In our introduction, we asked whether, after controlling for the effects of age, gender and occupational status, there might be a 'residual difference' that would give a reason to pay special attention to sickness absence in one of the sectors. The results indicate that attempts to reduce sickness absence through interventions in working conditions or individual rehabilitation are equally important in both sectors, rather than that such policy measures would be redundant. Nevertheless, our analysis suggests that we should be cautious about making unduly straightforward interpretations of the differences in crude figures for sickness absence on average. A trajectory approach might also be useful for applying policies at both workplace and individual levels: for example, in Finland, there is a threshold of 90 sickness absence days after which an employee needs an occupational health physician's statement on their ability to continue in work. Instead of, or in addition to, such simple cut-off criteria, a more penetrating trajectory approach could help to identify employees who need support. Occupational healthcare professionals, as well as employees and employers, are certainly thinking in this way, but largely intuitively. Further analyses of sickness absence trajectories are important to provide them with evidence-based knowledge.

Key points

- The findings of this study do not support the assumption of more restrictive sickness absence practices and consequent lower absence levels in the private sector than in the municipal sector in Finland.
- Trajectory analysis enables the identification of differential developments embedded in longitudinal sickness absence data. With two-response trajectory analysis, it is possible to take into account both the days and the spells of sickness absence.
- Covering even short spells and analysing spells and days jointly, this study represents a novel way to study sickness absence records.

Funding

Finnish Work Environment Fund; Academy of Finland.

Acknowledgements

The authors are grateful to the Finnish Work Environment Fund and to the Academy of Finland for their financial support.

Conflicts of interest

None declared.

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