



# Sickness Absence and Precarious Employment: A Comparative Cross-National Study of Denmark, Finland, Sweden, and Norway

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## Abstract

**Background:** Precarious employment is a major social determinant of health and health inequalities with effects beyond the health of workers.

**Objective:** To investigate the association between precarious employment and sickness absence in 4 Nordic countries, Denmark, Finland, Norway, and Sweden.

**Methods:** Logistic regression analyses were conducted separately for each country on data from 4186 respondents aged 15–65 years in Denmark, Finland, Norway, and Sweden derived from the 2010 European Working Conditions Survey. Sickness absence was based on self-reports and defined as absence of seven or more day per year. Precarious employment was operationalized as a multidimensional construct of indicators. Analyses were also conducted separately for men and women.

**Results:** The prevalence of sickness absence was lowest in Sweden (18%), and highest in Finland (28%). 3 precarious employment indicators were positively associated with sickness absence; the pattern being largely similar in the total sample. In the sex-disaggregated sample, 5 precarious employment indicators increased the likelihood of sickness absence; the pattern was heterogeneous, with women generally having significantly higher odds of sickness absence than men. “Low household income” and “sickness presenteeism” were strong predictors of sickness absence among both sexes in most of the 4 studied countries. Sickness absence varied between the Nordic countries in the sex-disaggregated analyses.

**Conclusion:** Precarious employment indicators predicted sickness absence in the Nordic countries. Findings emphasize the need to prioritize informed and monitored collective bargaining for all workers, increase working time flexibility, and improving work conditions.

**Keywords:** Sick leave; Employment; Sex; Workplace; Denmark; Finland; Sweden; Norway

## Introduction

Sickness absence is a growing public health problem that has been widely investigated in the Nordic countries.<sup>1–3</sup> Labor market deregulations over

the past three decades have led to a decline in “Standard Employment Relationship” (SER) (consisting of full-time and stable employment where employees have collective bargaining power, social rights and protections).<sup>4</sup> There has also been a

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concurrent rise of flexible and non-standard employment with associated increase in job insecurity in most European countries;<sup>4</sup> job insecurity in turn increases the risk of poor work conditions, and precarious employment.<sup>5</sup> Precarious employment is a major social determinant of health and health inequalities that affects the health of workers, families, and communities.<sup>6</sup> The term “precarious employment” describes forms of work for remuneration characterized by limited social benefits and statutory entitlements, job insecurity, low job tenure, low wages, and high risks of ill-health.<sup>7</sup> Precarious employment could also be described as a multidimensional construct defined by a number of dimensions encompassing dimensions such as temporality, powerlessness, lack of benefits, and low income.<sup>8</sup> Workers in precarious employment share several labor market characteristics (*eg*, lower credentials, low income, being women, migrants, and non-white race) with the unemployed, while experiencing themselves spells of unemployment; thus, the adverse health effects of precarious employment for workers are similar to those of unemployment, impacting not only on the individual, but also on the health and wellbeing of the family members and dependents relying on income from the worker.<sup>8</sup> In addition, the economic crisis within the EU makes these adverse working conditions a public health problem, worthy of proper and periodic assessment. There have been calls for repeated and periodic analyses using the various dimensions and indicators that constitute in different dimensions employment precariousness.<sup>9</sup>

Research has shown that welfare regimes appear to be an important determinant of employment-related health, and that precarious workers in Scandinavian welfare states report better or equal health status than their counterparts with permanent jobs.<sup>10,11</sup> The welfare regimes in

the Nordic countries are however characterized by features that distinguish them from other countries, such as active welfare states “built” on the foundation of job creation supported by social security, even in the era of global competitiveness; the relatively low social inequalities and poverty; and the corporatism that enables the coordination of economic and social objectives, and a high level of unionization (around 80%).<sup>12</sup> Current knowledge of sex differences in the relationship between precarious employment and sickness absence is limited. Neither has proper attention been given to examining the extent to which gender (the differential roles for men and women) may aid in explaining possible associations. Available research studies have however reported sex differences in sickness absence, with higher rates for females, have been reported in the Nordic countries.<sup>2,3,13</sup> The unequal gender distribution is posited to be influenced by several factors, such as the exposure to physical workloads and psychosocial factors in the workplace,<sup>14</sup> the division of labor that concentrates women in occupations and economic activities with high exposure to work-related psychosocial hazards (*eg*, services).<sup>14</sup> These inequalities are suggested as placing women in more precarious positions than men and a higher risk of sickness absence. There are also surprisingly few comparisons between Nordic countries, and none of these studies have investigated the relation between precarious employment and sickness absence. International comparisons of sickness absence and its correlates are expressly needed to better our understanding of this phenomenon.<sup>15</sup> In light of these observations, the objectives of this comparative study of four Nordic countries were to describe the distribution of sickness absence associated with precarious employment indicators, and to answer the following research questions: (1) Do

For more information on sickness absence in four Nordic countries see <http://www.theijoem.com/ijoem/index.php/ijoem/article/view/667>



the four Nordic countries differ in the association between precarious employment indicators and sickness absence within the total sample? and (2) are there sex differences in sickness absence? If so, what are the possible explanations for such variations, and the extent to which sex differences can be attributed to gender?

## Materials and Methods

### Design and Study Population

We used data from the 2010 edition of the European Working Conditions Survey (2010 EWCS). The EWCS is a 5-year periodical survey conducted under the auspices of the European Foundation for the Improvement of Living and Working Conditions (EUROFUND). Details about the survey design and sampling are reported elsewhere.<sup>16</sup> Briefly, in each country, multistage, stratified random samples of the workforce of each participating country were interviewed using a standardized questionnaire, about their occupational situation, working conditions and health. The sample used in the EWCS is representative of those aged 15 years and over (16 and over in Norway) who are currently in employment and resident in the country being surveyed. We restricted the analytical sample for this investigation to a subgroup of 4186 persons, of which 2203 were women, with response rates between 32% (Norway) and 58% (Denmark), and a country-specific sample size between 1004 (Sweden) and 1085 (Norway).

### Measures

The outcome or dependent variable was “sickness absence,” and was measured with the question: “Over the past 12 months, how many days in total were you absent from work for reasons of health problems?” Responses were dichotomized: absence from work due to illness 7 days or

more within the last 12 months was defined as sickness absence. Similar self-reported measure has been used in previous studies.<sup>17-19</sup> Although register-based sickness absence is considered most accurate, self-reported absenteeism has been shown to be a useful and comparable alternative.<sup>17,18</sup> with good agreement between these measures, and concluding that self-reports of sickness absence are a useful alternative if data from employers' registers are unavailable.

“Precarious employment” was the exposure of interest, and was conceptualized as a multidimensional construct consisting of 11 indicators from 8 dimensions indicative of the current employment at the time of the survey. Recent studies have used similar measures.<sup>9,20-22</sup> Decomposing precarious employment conditions into a multidimensional set of indicators that describe the intrinsic quality of the work task, that reflect the role of employment relationships, and that reveals the wider institutional, social, and political factors that make employment precarious, facilitates a better understanding of the contemporary work situation in a more complete manner. In addition, investigating each precarious employment indicator independently has important policy implications, as it permits the identification, intervention, and periodic monitoring of the different and increasing precarious employment relationships in any social context, given the tendency for contemporary employment relationships to deviate in different respects from the “gold standard” of lifelong full-time SER-employment.<sup>4</sup> A brief definition of the dimensions and description of the proxy indicators are presented in Table 1.

To study variations between groups of employees, a number of socio-demographic factors were included: (1) sex (female, male); (2) age group (corresponding with three main periods in a working career:

**Table 1:** Definition of indicators for the multidimensional precarious employment construct in the 2010 EWCS

Dimension	Indicator	Source indicator(s)	Categories
1	<p>Employment instability</p> <p>Type and duration of employment contract, reflecting the degree of certainty of continuing work. Short contracts predispose workers to job insecurity.</p>	<p>What kind of employment contract do you have?</p>	<p>i) Permanent</p> <p>ii) Non-permanent</p>
2	<p>Low-income level</p> <p>This dimension reflects the receipt of material rewards, <i>ie</i>, monetary rewards (or income) and non-wage benefits. Relative income reflects wage income sufficiency at the household level to meet regular or unexpected expenses.</p> <p>Benefits in nature refers to additional benefits (<i>eg</i>, health insurance) in addition to the 'monetary' wage that are a typical feature of SER-employment, and characterise the most valuable core-employees</p>	<p>Thinking of your household's total monthly income, is your household able to make ends meet?</p> <p>Thinking about your earnings from your main job, what do they include - Advantages of other nature?</p>	<p>i) Low household income meets needs easily</p> <p>ii) Low household income meets needs with difficulty</p> <p>i) Mentioned receiving</p> <p>ii) Not mention receiving</p>
3	<p>Lack of rights and social protection</p> <p>An important aspect of collective organization is the occupational health and safety of workers; insufficient information on these issues is reflective of problems in the communication between management and employees (Underhill and Quinlan 2011).<sup>a</sup></p> <p>Workplace rights provide non-wage employment benefits (<i>eg</i>, holidays, sick leave, <i>etc</i>).</p>	<p>Regarding the health and safety risks related to performance of your job, how well informed would you say you are?</p>	<p>A binary indicator was created, where:</p> <p>i) Well informed</p> <p>ii) Not well informed</p>
4	<p>Incapacity to exercise rights</p> <p>Workers powerlessness to exercise their rights. It includes having to work on exceptional hours regularly (Sunday work and/or overtime work) and not receiving any compensation for these exceptional working times. It is viewed as an indication of low employment quality because the typical SER-employment should provide compensations for extra (non-standard) inputs. Possibly due to workers' lack knowledge of their rights and implicit or explicit threats of job loss or wage cuts. It is complementary to the previous dimension.</p>	<p>Computed from responses to a combination of questions:</p> <p>a) How many hours do you usually work per week in your main paid job?</p> <p>b) How many times a month do you work on Sundays?</p> <p>c) Thinking about your earnings from your main job, what do they include (extra payments for additional hours of work/overtime)?</p> <p>d) Thinking about your earnings from your main job, what do they include (extra payments compensating for Sunday work)?</p>	<p>For the analyses, we created a binary indicator, where:</p> <p>i) Compensated, <i>ie</i>, Doing overwork (&gt;40 hrs a wk) and/or on Sunday, but compensated for it</p> <p>ii) Uncompensated/ No flexible times, <i>ie</i>, Not doing overwork and/or Sunday work, or not being compensated for it.</p>

*Continued*

**Table 1:** Definition of indicators for the multidimensional precarious employment construct in the 2010 EWCS

Dimension	Indicator	Source indicator(s)	Categories
5	Absence of collective bargaining/disempowerment This indicator refers to the way workers' employment conditions, eg, wages, and the setting of working hours, are negotiated (individualized versus collective bargaining). Company-determined working times set with no possibility for changes reflects the erosion of the power of organized labour and "employer-determined employment relations", and are regarded as an expression of poor collective bargaining power of the workers.	Self-determination over schedule	i) By the company (with no possibility for changes) ii) By the worker (who can choose between several fixed work schedules, can adapt within certain limits, and entirely determines working hours)
6	Imbalanced interpersonal power relations Communication and participation with superiors refers to informal power relations of authority and discrimination, reflecting imbalanced workplace relations.	Communication and participation with superiors	For the analyses, we created a binary indicator, where 0 is the value for all positive aspects of communication and participation, and 1 is the value for all negative aspects: i) Yes ii) No
7	Lack of training Training opportunities provided by the employer (on-the-job, on-site or paid for by the employer) is considered as an indicator of internal career and skill development possibilities that reflect the capability of maintaining employment in the future. The indicator shows whether or not respondents have received such training over the last 12 months. Training paid or provided for by the worker is a potential source of inequality.	Training paid for or provided by the employer	For the analyses, we created a binary indicator, where: i) Yes, have received training. ii) No, have not received training.

Continued

**Table 1:** Definition of indicators for the multidimensional precarious employment construct in the 2010 EWCS

Dimension	Indicator	Source indicator(s)	Categories
<p>Low control over working times (or de-standardised working time arrangements)</p> <p>This dimension of employment quality highlights three indicators, which are the different ways in which working time arrangements become de-standardised. These different indicators are conceptually distinct, relatively unrelated, and may affect different employee categories.</p> <p>Schedule unpredictability characterizes the flexibility of working times in work organization. Flexibility in commencement and/or ending the working day reflects mainly employees' needs, whereas unsocial working hours, eg, shift work, long hours, non-fixed day shifts, weekend work, having variable daily working hours, working evenings and nights), reflects mainly employers' needs (Costa, <i>et al</i>, 2004).<sup>b</sup></p>	<p>Schedule unpredictability</p>	<p>Computed from responses to a combination of questions:</p> <p>a) How are your working time arrangements set?</p> <p>b) Do changes to your work schedule occur regularly? (only asked to workers who choose between several fixed work schedule); if yes</p> <p>c) How long before are you informed about these changes?</p>	<p>For the analyses, we created a binary indicator, where:</p> <p>i) No, sudden unpredictable changes</p> <p>ii) Yes, sudden changes</p>
<p>Involuntary* part-time employment refers to employees who work part-time, <i>ie</i>, ≤35 hours per week, but wish to work more hours. It is considered an undesirable situation in relation to working times, and therefore as an indicator of low employment quality. It is often out of the worker's control, and dictated by the employer for such reasons as avoidance of labour rights and social insurance costs associated with a full-time employee. Commonly results in financial difficulties because of underemployment or implicit expectations to perform more hours than are paid.</p>	<p>Involuntary part-time employment.</p>	<p>How many hours per week would you prefer to work at present?</p>	<p>i) No (≥35 hrs/wk)</p> <p>ii) Yes (≤34 hrs/wk)</p>
<p>Long/intensive working times<sup>†</sup>refers to working more than 48 hours a week. The SER ideally protects workers from excessive demands through working hour regulations; the result being working weeks of about 40 hours (Bosch 2004).<sup>c</sup></p>	<p>Long/Intensive working times</p>	<p>How many hours do you usually work per week in your main paid job?</p>	<p>Non intensive (Working &lt;48 hrs)</p> <p>Intensive (Working ≥48 hrs, and in free time)</p>

EWCS=European Working Conditions Survey; SER=Standard Employment Relationship. \*Involuntary=wants to work longer hours. †This excludes the difference between worker- or employer- induced long working hours, given the difficulty in identifying the extent of 'free choice' in this classification (Hochschild AR. The time bind: When work becomes home and home becomes work. New York: Owl Books; 2003). <sup>a</sup>Underhill E, Quinlan M. How precarious employment affects health and safety at work: The case of temporary agency workers. *Relations Industrielles: Industrial Relations* 2011;66:397-421. <sup>b</sup>Costa G, Sartori S, Akerstedt T. Influence of flexibility and variability of working hours on health and well-being. *Chronobiology International* 2006;23:1125-37. <sup>c</sup>Bosch G. Towards a new standard employment relationship in Western Europe. *British Journal of Industrial Relations* 2004;42:617-36.

lift-off (15–29 years), a mid-career period (30–49 years), and the end-of-career period (50–65 years); (3) ethnicity or country of birth, based on responses to the question: “Were you and both of your parents born in this country?” Immigrant status was determined by respondents' reported country of birth in a country outside Denmark, Finland, Norway, and Sweden, with two non-Nordic-born parents (Nordic, others); (4) educational attainment, measured by the highest level completed according to International Standard Classification of Education (ISCED-97) standard (no education/primary, secondary, post-secondary, and tertiary education); (5) occupational class, using the International Standard Classification of Occupations (ISCO) (Legislators, senior officials and managers, professionals/Technicians and associate professionals/Clerks/Service workers, shop and market sales workers/Skilled agricultural and fishery workers/Craft and related trades workers/Plant and machine operators and assemblers/Elementary occupations); (6) labor market sector, assessed by the NACE code classification for sector (Agriculture, forestry, fishing/Industry/Services/Public administration and defence/Other services); (7) company sector (private, public or other sectors), which primarily differentiates who an individual works for. Public sector workers are those that work for some sort of government agency, *eg*, civil service jobs. Workers in non-government organizations may be either private sector workers working within private or individual businesses, *eg*, self-employed, or workers within “other” sectors, including corporations or limited partnerships, *eg*, sales representatives; and (8) sickness presenteeism, measured using responses to the question: “Over the past 12 months, did you ever go to work when you were sick (yes, no)?”

#### TAKE-HOME MESSAGE

- Precarious employment indicators are associated with sickness absence in a largely similar pattern within the total samples in the four Nordic countries.
- The pattern of association between precarious employment and sickness absence is gendered and varies between the Nordic countries.
- Women are more likely than men to take sickness absence, and had significantly higher odds of sickness absence associated with precarious employment indicators than men.
- Income is arguably the most important dimension of precarious employment.
- There is a need to prioritize informed and monitored collective bargaining for all workers, increase working time flexibility for those working irregular hours, and job-related interventions aimed at improving work conditions.

#### Ethics

Based on secondary data that were anonymized directly during the process of data collection, all participants in this study provided informed consent prior to participation in the study; all information was collected confidentially. All participating countries were members of the European Society for Opinion and Marketing Research (ESOMAR). Permission to use the raw survey data was obtained from Eurofound.

#### Statistical Analysis

$\chi^2$  test was used to identify potential differences in distribution of outcome and exposure variables in the four studied countries. Multivariate logistic regression analyses were conducted separately for each country to establish which factors were significantly associated with sickness absence. Analyses were initially conducted for the total samples for each country in four steps: (1) a crude association between

precariousness employment indicators and sickness absence; (2) a model adjusted for sex and age only; (3) a crude analysis of precariousness employment indicators entered into the logistic regression model in a single block to control for possible confounding between these indicators, stratified by country; and (4) a model adjusting for sex, age, educational attainment, and occupational class, sickness presenteeism, labor market sector, and company sector. Subsequently, analyses were conducted separately for men and women. Results are expressed as odds ratios (ORs) with their 95% confidence intervals (95% CIs) for each exposure variable. All statistical analyses were carried out in Stata® ver 12.

## Results

Distribution of sickness absence by precarious employment indicators and socio-demographic characteristics in the total sample of the four countries are summarized in Table 2. The prevalence of sickness absence was 18% in Sweden, 19% in Denmark, 24% in Norway, and 28% in Finland. Table 3 presents a crude model and a model adjusted for sex and age only. Women were more likely than men to report sickness absence (OR 1.42, 95% CI 1.21 to 1.66). Employees who were 15–29 years of age were less likely to report sickness absence (OR 0.72, 95% CI 0.56 to 0.93) compared to those who were 50–65 years of age. Table 4 presents the crude and adjusted associations between precarious employment and sickness absence in the total sample stratified by country. The adjusted models showed that “low household income” (all four countries), and “involuntary part-time employment” (Norway only), were positively associated with sickness absence, whilst “non-permanent contract,” “uncompensated flexible working times” (Sweden and Norway only), and “no communication and participation

with superiors” (Norway only) were negatively associated with sickness absence. The highest number of significant indicators was found in Norway. In Table 5, the sex-disaggregated data showed that “low household income” was positively associated with sickness absence among women (all countries except Norway), and among men (Finland and Norway only). “Disempowered/No self-determination over schedule,” and “schedule unpredictability” increased the likelihood of sickness absence only among women in Sweden. Likewise, “involuntary part-time employment” increased the likelihood of sickness absence only among women in Denmark, whilst “lack of training” increased the likelihood of sickness absence only among men in Norway. Women in the occupational class “service workers” (Finland and Sweden only), and male “service workers” and “technicians, associate professionals, and clerks” (Norway only) had higher likelihood of sickness absence compared to the reference group. Women (Denmark only) working in the “agriculture, forestry, fishing” labor sector were more likely than to report sickness absence compared to their counterparts in “other services.” Sickness presenteeism increased the likelihood of sickness absence among both sexes in all the countries, with the exception of males in Sweden and Norway.

## Discussion

The main findings were as follows: (1) precarious employment was associated with self-reported sickness absence; (2) women were more absent than men in all the four Nordic countries, and had significantly higher odds of sickness absence associated with precarious employment indicators than men; and (3) employees in the public sector were more absent from work compared to their counterparts in the private sector.



**Table 2:** Total sample characteristics in precarious employment indicators and sickness absence by countries

Characteristics	Sickness absence											
	Denmark			Finland			Sweden			Norway		
	No n (%)	Yes n (%)	Total n	No n (%)	Yes n (%)	Total n	No n (%)	Yes n (%)	Total n	No n (%)	Yes n (%)	Total n
<b>Preariousness employment indicators</b>	<b>n=867</b>	<b>n=20</b>	<b>n=1069</b>	<b>n=745</b>	<b>n=283</b>	<b>n=1028</b>	<b>n=820</b>	<b>n=184</b>	<b>n=1004</b>	<b>n=820</b>	<b>n=265</b>	<b>n=1085</b>
Type of contract	p=0.034			p=0.003			p=0.003			p=0.002		
Permanent	666 (77)	169 (84)	835	510 (69)	220 (78)	730	622 (76)	158 (86)	780	653 (80)	233 (88)	886
Non-permanent contract	201 (23)	33 (16)	234	235 (31)	63 (22)	298	198 (24)	26 (14)	224	167 (20)	32 (12)	199
Country-specific relative income	p=0.017			p<0.001			p<0.001			p=0.003		
Low household income meets needs easily	784 (90)	171 (85)	955	634 (85)	209 (74)	843	743 (91)	145 (79)	888	744 (91)	223 (84)	967
Low household income meets needs with difficulty	83 (10)	31 (15)	114	111 (15)	74 (26)	185	77 (9)	39 (21)	116	76 (9)	42 (16)	118
Benefits in nature	p=0.782			p=0.308			p=0.528			p=0.550		
Mentioned receiving	387 (45)	88 (44)	475	448 (60)	180 (64)	628	242 (29)	50 (27)	292	143 (17)	42 (16)	185
Not mentioned receiving	480 (55)	114 (56)	594	297 (40)	103 (36)	400	578 (71)	134 (73)	712	677 (83)	223 (84)	900
Information on health and safety	p=0.604			p=0.560			p=0.022			p=0.891		
Well informed	779 (90)	179 (89)	958	660 (89)	247 (87)	907	735 (90)	154 (84)	889	748 (91)	241 (91)	989
Not well informed	88 (10)	23 (11)	111	85 (11)	36 (13)	121	85 (10)	30 (16)	115	72 (9)	24 (9)	96
Uncompensated flexible working times	p=0.864			p=0.301			p<0.001			p=0.001		
Compensated	53 (6)	13 (6)	66	47 (6)	23 (8)	70	80 (10)	35 (19)	115	37 (5)	26 (10)	63
Uncompensated	814 (94)	189 (94)	1003	698 (94)	260 (92)	958	740 (90)	149 (81)	889	783 (95)	239 (90)	1022

**Table 2:** Total sample characteristics in precarious employment indicators and sickness absence by countries

Characteristics	Sickness absence											
	Denmark			Finland			Sweden			Norway		
<b>Precariousness employment indicators</b>	No n=867 n (%)	Yes n=202 n (%)	Total n=1069 n	No n=745 n (%)	Yes n=283 n (%)	Total n=1028 n	No n=820 n (%)	Yes n=184 n (%)	Total n=1004 n	No n=820 n (%)	Yes n=265 n (%)	Total n=1085 n
Self-determination over schedule	p=0.034			p<0.001			p<0.001			p=0.015		
By the worker (disempowered/no self-determination)	538 (62)	109 (54)	647	398 (53)	114 (40)	512	596 (73)	107 (58)	703	472 (58)	130 (49)	602
By the company (disempowered/self-determination)	329 (38)	93 (46)	422	347 (47)	169 (60)	516	224 (27)	77 (42)	301	348 (42)	135 (51)	483
Communication and participation with superiors	p=0.162			p=0.016			p=0.623			p=0.001		
Yes	98 (11)	30 (15)	128	172 (23)	86 (30)	258	283 (35)	60 (33)	343	143 (17)	70 (26)	213
No	769 (89)	172 (85)	941	573 (77)	197 (70)	770	537 (65)	124 (67)	661	677 (83)	195 (74)	872
Lack of training	p=0.968			p=0.065			p=0.379			p=0.371		
Yes	222 (26)	52 (26)	274	277 (37)	123 (43)	400	291 (35)	59 (32)	350	275 (34)	81 (31)	356
No	645 (74)	150 (74)	795	468 (63)	160 (57)	628	529 (65)	125 (68)	654	545 (66)	184 (69)	729
Schedule unpredictability	p=0.099			p=0.027			p=0.193			p=0.114		
No, sudden changes	201 (23)	58 (29)	259	208 (28)	99 (35)	307	161 (20)	44 (24)	205	287 (35)	107 (40)	394
Yes, sudden changes	666 (77)	144 (71)	810	537 (72)	184 (65)	721	659 (80)	140 (76)	799	533 (65)	158 (60)	691
Involuntary part-time employment	p=0.016			p=0.864			p=0.080			p=0.001		
No (≥35 hours/week)	510 (59)	100 (50)	610	486 (65)	183 (65)	669	477 (58)	94 (51)	571	537 (65)	144 (54)	681
Yes (≤34 hours/week)	357 (41)	102 (50)	459	259 (35)	100 (35)	359	343 (42)	90 (49)	433	283 (35)	121 (46)	404

*Continued*

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Characteristics	Sickness absence														
	Denmark				Finland				Sweden				Norway		
	No n (%)	Yes n (%)	Total n	p	No n (%)	Yes n (%)	Total n	p	No n (%)	Yes n (%)	Total n	p	No n (%)	Yes n (%)	Total n
<b>Precariousness employment indicators</b>	<b>n=867</b>	<b>n=202</b>	<b>n=1069</b>		<b>n=745</b>	<b>n=283</b>	<b>n=1028</b>		<b>n=820</b>	<b>n=184</b>	<b>n=1004</b>		<b>n=820</b>	<b>n=265</b>	<b>n=1085</b>
Intensive working times	p=0.036				p=0.322				p=0.028				p=0.004		
Non intensive (<48 hours)	773 (89)	190 (94)	963		678 (91)	263 (93)	941		709 (86)	170 (92)	879		727 (89)	251 (95)	978
Intensive (≥48 hours, and in free time)	94 (11)	12 (6)	106		67 (9)	20 (7)	87		111 (14)	14 (8)	125		93 (11)	14 (5)	107
Sex of respondent	p=0.011				p=0.011				p=0.120				p<0.001		
Male	464 (54)	88 (44)	552		334 (45)	102 (36)	436		395 (48)	77 (42)	472		426 (52)	97 (37)	523
Female	403 (46)	114 (56)	517		411 (55)	181 (64)	592		425 (52)	107 (58)	532		394 (48)	168 (63)	562
Age of respondent (yrs)	p=0.084				p=0.023				p=0.653				p=0.407		
15–29	150 (17)	22 (11)	172		169 (23)	43 (15)	212		60 (8)	17 (10)	77		113 (14)	29 (11)	142
30–49	411 (48)	101 (51)	512		303 (42)	127 (45)	430		372 (49)	80 (46)	452		401 (51)	140 (54)	541
0–65	297 (35)	76 (38)	373		258 (35)	111 (40)	369		332 (43)	76 (44)	408		272 (35)	90 (35)	362
Ethnicity	p=0.358				p=0.559				p=0.336				p=0.327		
Foreign-born	96 (11)	27 (13)	123		41 (6)	13 (5)	54		132 (16)	35 (19)	167		704 (86)	221 (83)	925
Native	771 (89)	175 (87)	946		704 (94)	270 (95)	974		688 (84)	149 (81)	837		116 (14)	44 (17)	160
Education of respondent (ISCED)	p=0.464				p=0.310				p=0.386				p=0.120		
No/Primary education	7 (1)	0 (0)	7		43 (6)	19 (7)	62		10 (1)	3 (2)	13		22 (3)	12 (5)	34
Secondary education	442 (51)	97 (48)	539		353 (47)	142 (50)	495		404 (49)	100 (54)	504		309 (38)	115 (43)	424
Post-secondary education	88 (10)	24 (12)	112		29 (4)	16 (6)	45		406 (50)	81 (44)	487		101 (12)	29 (11)	130
Tertiary education	330 (38)	81 (40)	411		320 (43)	106 (37)	426		—	—	—		388 (47)	109 (41)	497

**Table 2:** Total sample characteristics in precarious employment indicators and sickness absence by countries

Characteristics	Sickness absence											
	Denmark			Finland			Sweden			Norway		
Precariousness employment indicators	No n=867 n (%)	Yes n=202 n (%)	Total n=1069 n	No n=745 n (%)	Yes n=283 n (%)	Total n=1028 n	No n=820 n (%)	Yes n=184 n (%)	Total n=1004 n	No n=820 n (%)	Yes n=265 n (%)	Total n=1085 n
Occupation class (ISCO)	p=0.343			p=0.002			p=0.007			p=0.020		
Legislators, senior officials and managers	73 (8)	7 (4)	80	51 (7)	8 (3)	59	112 (14)	11 (6)	123	144 (18)	27 (10)	171
Professionals	232 (27)	63 (31)	300	132 (18)	33 (12)	165	271 (33)	57 (31)	328	189 (23)	50 (19)	239
Technicians and associate professionals	160 (19)	36 (18)	200	142 (19)	44 (16)	186	17 (2)	37 (20)	208	152 (19)	49 (19)	201
Clerks	50 (6)	14 (7)	64	59 (8)	21 (7)	80	63 (8)	16 (9)	79	37 (4)	17 (6)	54
Service workers*	140 (16)	35 (17)	175	162 (22)	88 (31)	250	82 (1)	30 (16)	112	158 (19)	71 (27)	229
Craft and related trades workers	89 (10)	23 (11)	112	79 (11)	30 (11)	109	50 (6)	19 (10)	69	58 (7)	20 (7)	78
Plant and machine operators and assemblers	56 (7)	12 (6)	68	44 (6)	25 (9)	69	28 (3)	10 (5)	38	46 (6)	15 (6)	61
Elementary occupations	59 (7)	11 (6)	70	68 (9)	31 (11)	99	31 (4)	4 (2)	35	33 (4)	15 (6)	48
Labor market sector	p=0.010			p=0.235			p=0.472			p=0.277		
Agriculture, forestry, fishing	18 (2)	6 (3)	24	23 (3)	4 (1)	27	16 (2)	1 (1)	17	16 (2)	4 (1)	20
Industry	218 (25)	38 (19)	256	144 (19)	56 (20)	200	129 (17)	32 (18)	161	156 (19)	49 (19)	205
Services	291 (34)	52 (26)	343	292 (40)	99 (35)	391	285 (36)	58 (33)	343	291 (36)	79 (30)	370
Public administration and defence	43 (5)	14 (7)	57	21 (3)	11 (4)	32	73 (9)	15 (8)	88	59 (7)	18 (7)	77
Other services	297 (34)	92 (45)	389	257 (35)	113 (40)	370	281 (36)	72 (40)	353	292 (36)	114 (43)	406

Continued

**Table 2:** Total sample characteristics in precarious employment indicators and sickness absence by countries

Characteristics	Sickness absence															
	Denmark				Finland				Sweden				Norway			
	No n (%)	Yes n (%)	Total n	Total n	No n (%)	Yes n (%)	Total n	Total n	No n (%)	Yes n (%)	Total n	Total n	No n (%)	Yes n (%)	Total n	
Precariousness employment indicators	n=867	n=202	n=1069	n=1028	n=745	n=283	n=1028	n=1004	n=820	n=184	n=1004	n=1085	n=820	n=265	n=1085	
Company sector	p<0.001				p=0.014				p=0.109				p=0.004			
Private	543 (63)	86 (43)	629	577	438 (59)	139 (49)	577	508	422 (52)	86 (47)	508	565	450 (55)	115 (43)	565	
Public	286 (33)	110 (54)	396	396	267 (36)	129 (46)	396	423	334 (41)	89 (49)	423	465	329 (40)	136 (52)	465	
Other sector	37 (4)	6 (3)	43	52	38 (5)	14 (5)	52	66	58 (7)	8 (4)	66	55	41 (5)	14 (5)	55	

\*Service workers, shop and market sales workers/skilled agricultural and fishery workers

The first objective of this study was to describe the distribution of precarious employment indicators in the four studied Nordic countries. Sickness absence rate was lowest in Sweden and highest in Finland, consistent with studies showing absenteeism to be highest in Finland,<sup>23</sup> higher sickness in Norway than in Denmark,<sup>1</sup> and higher in Norway compared to Sweden;<sup>24</sup> our findings however contrasted with others,<sup>15</sup> showing higher Swedish than Danish sickness absence rates. Higher absenteeism among women than men in this study was consistent with several other studies,<sup>25, 26</sup> which may be indicative of women's tendency to be proactive regarding their health, consulting health services and being more likely than men to take absence in relation to health issues. Some of these differences may also be due to methodological differences, as some of these studies were not primarily designed to measure sickness absence.

The second objective of this study was to investigate whether the association between precarious employment indicators and sickness absence differed between the four Nordic countries within the total sample. As shown in Table 4, the pattern of sickness absence associated with precarious employment conditions is largely similar in the four countries, emphasizing the commonalities between these welfare states and to such factors as the high levels of labor participation, robust job protection, and sickness insurance system. The similarities between the four countries were also exemplified by the overall positive association between “low household income” and sickness absence, which is consistent with other studies,<sup>27,28</sup> pointing to a negative correlation between income and sickness absence in the Nordic countries. Our finding of the positive association between “involuntary part-time employment” and sickness absence (Norway only) was consistent with findings in an-

**Table 3:** Logistic regression models for the between precarious employment indicators and sickness absence adjusted for sex and age in the total sample of four Nordic countries.

Variables	OR (95% CI)	
	Crude	Adjusted
Precariousness employment indicators		
Non-permanent contract	0.60 (0.50 to 0.73)	0.67 (0.54 to 0.83)
Low household income meets needs with difficulty	2.08 (1.71 to 2.53)	2.10 (1.71 to 2.58)
Benefits in nature not received	0.96 (0.82 to 1.11)	1.00 (0.86 to 1.18)
Not well informed on health and safety	1.22 (0.97 to 1.53)	1.31 (1.03 to 1.66)
Uncompensated flexible working times	0.62 (0.48 to 0.79)	0.62 (0.48 to 0.81)
Disempowered/No self-determination over schedule	1.65 (1.43 to 1.92)	1.46 (1.21 to 1.77)
No communication and participation with superiors	0.76 (0.64 to 0.90)	0.83 (0.69 to 0.99)
Lack of training	0.96 (0.82 to 1.12)	0.98 (0.83 to 1.16)
Schedule unpredictability	0.73 (0.62 to 0.85)	1.00 (0.82 to 1.23)
Involuntary part-time employment	1.28 (1.11 to 1.49)	1.20 (1.03 to 1.41)
Intensive working times	0.54 (0.41 to 0.72)	0.80 (0.59 to 1.08)
Sex (Reference: male)		
Female		1.42 (1.21 to 1.66)
Age of respondent (Reference: 50–65 yrs)		
15–29 yrs		0.72 (0.56 to 0.93)
30–49 yrs		0.94 (0.80 to 1.11)

other study,<sup>29</sup> which attributed this to labor market characteristics, such as temporary employment contracts. “Involuntary part-time employment” in Norway has been

linked with job characteristics in female-dominated labor market sectors, working hours, and persistent part-time work traditions entrenched in the society.<sup>30</sup> It is plausible that workers in Norway may be compelled to accept short and part-time engagements under periods of economic difficulty.<sup>30</sup> Norway and Sweden showed further similarities with negative associations between “non-permanent contracts,” “uncompensated flexible working times” and sickness absence. These relationships may be attributed to the “procyclical” nature of sickness absence, often attributed to the negative association between sickness absence and unemployment rate, and *vice versa*. Additional explanations could be labor force composition, in which marginal workers with a higher tendency to be sick enter the labor force during periods of economic boom, causing higher sickness absence; these workers are often unemployed during recessions due to their ill-health. An alternative explanation may however be that this relation is driven by “countercyclical” moral hazard and infections, in which the workload, time pressures, and on-the-job stress of employees is higher than usual during periods of economic expansion.<sup>31,32</sup> Overall, it is logical to postulate that economic incentives in the sickness-insurance scheme may be partly responsible for the cross-country differences in sickness absence between the Nordic countries.

Our third objective was to investigate whether there were sex differences in sickness absence in relation to precarious employment indicators and possible explanations for any such variations. As shown in Table 5, the positive association between sickness absence and “low household income” among women in all the countries (except Norway), and among men (Finland and Norway only), supports earlier findings of an over-representation of low-income workers among those with

**Table 4:** Crude and adjusted associations between precarious employment indicators and sickness absence in the total sample of four Nordic countries. Figures in parenthesis are 95% CI of the OR.

Precariousness employment indicators	Denmark		Finland		Sweden		Norway	
	Crude OR	Adjusted OR*	Crude OR	Adjusted OR	Crude OR	Adjusted OR	Crude OR	Adjusted OR
Non-permanent contract	0.67 (0.43 to 1.04)	0.85 (0.53 to 1.36)	0.67 (0.47 to 0.97)	0.75 (0.50 to 1.11)	0.48 (0.29 to 0.77)	0.49 (0.28 to 0.85)	0.54 (0.35 to 0.84)	0.63 (0.40 to 0.99)
Low household income meets needs with difficulty	1.70 (1.08 to 2.67)	1.79 (1.10 to 2.91)	2.13 (1.51 to 3.01)	1.72 (1.19 to 2.50)	2.45 (1.55 to 3.87)	2.41 (1.45 to 4.01)	2.00 (1.30 to 3.07)	1.85 (1.18 to 1.90)
Benefits in nature not received	1.10 (0.79 to 1.52)	0.94 (0.66 to 1.34)	1.02 (0.74 to 1.40)	1.07 (0.76 to 1.51)	1.07 (0.73 to 1.57)	1.03 (0.68 to 1.57)	1.18 (0.78 to 1.77)	0.98 (0.63 to 1.52)
Not well informed on health and safety	1.15 (0.69 to 1.90)	1.35 (0.79 to 2.29)	1.17 (0.76 to 1.81)	1.12 (0.70 to 1.78)	1.68 (1.04 to 2.72)	1.39 (0.80 to 2.42)	1.14 (0.69 to 1.88)	1.20 (0.71 to 2.02)
Uncompensated flexible working times	1.02 (0.54 to 1.94)	0.95 (0.47 to 1.93)	0.81 (0.47 to 1.39)	0.63 (0.36 to 1.13)	0.49 (0.31 to 0.78)	0.52 (0.32 to 0.86)	0.41 (0.23 to 0.71)	0.37 (0.20 to 0.67)
Disempowered/No self-determination over schedule	1.25 (0.85 to 1.84)	1.11 (0.73 to 1.70)	1.57 (1.13 to 2.19)	1.20 (0.83 to 1.74)	2.05 (1.31 to 3.20)	1.48 (0.89 to 2.45)	1.23 (0.83 to 1.82)	1.02 (0.67 to 1.56)
No communication and participation with superiors	0.73 (0.46 to 1.16)	0.94 (0.58 to 1.52)	0.77 (0.55 to 1.06)	0.89 (0.63 to 1.26)	1.14 (0.79 to 1.64)	1.22 (0.82 to 1.82)	0.60 (0.42 to 0.84)	0.62 (0.43 to 0.88)
Lack of training	1.01 (0.70 to 1.45)	1.04 (0.71 to 1.52)	0.79 (0.59 to 1.06)	0.78 (0.57 to 1.09)	1.20 (0.83 to 1.73)	1.11 (0.75 to 1.64)	1.26 (0.92 to 1.73)	1.24 (0.89 to 1.73)
Schedule unpredictability	0.95 (0.62 to 1.47)	0.85 (0.54 to 1.35)	0.93 (0.66 to 1.32)	0.85 (0.59 to 1.24)	1.58 (0.95 to 2.64)	1.39 (0.79 to 2.44)	1.09 (0.73 to 1.63)	1.02 (0.68 to 1.53)
Involuntary part-time employment	1.37 (0.99 to 1.88)	1.27 (0.90 to 1.80)	1.09 (0.80 to 1.46)	1.10 (0.80 to 1.52)	1.32 (0.94 to 1.85)	1.38 (0.95 to 1.99)	1.63 (1.22 to 2.19)	1.43 (1.05 to 1.96)
Intensive working times	0.71 (0.37 to 1.37)	0.67 (0.33 to 1.33)	1.07 (0.61 to 1.87)	1.03 (0.56 to 1.88)	0.75 (0.41 to 1.39)	0.61 (0.29 to 1.28)	0.61 (0.33 to 1.11)	0.79 (0.42 to 1.48)

\*Adjusted for sex, age, educational attainment, and occupational class, sickness presenteeism, labor market sector, and company sector

**Table 5:** Logistic regression analysis for the association between precariousness employment indicators and sickness absence for males and females by country. Values are OR (95% CI).

Precariousness employment indicators	Denmark		Finland		Sweden		Norway	
	Female	Male	Female	Male	Female	Male	Female	Male
Non-permanent contract	0.78 (0.37 to 1.61)	0.89 (0.46 to 1.73)	0.52 (0.32 to 0.87)	1.47 (0.72 to 2.99)	0.41 (0.18 to 0.94)	0.59 (0.27 to 1.29)	0.64 (0.35 to 1.19)	0.60 (0.29 to 1.26)
Low household income meets needs with difficulty	2.09 (1.02 to 4.29)	1.60 (0.78 to 3.26)	1.66 (1.04 to 2.66)	2.13 (1.06 to 4.25)	2.80 (1.38 to 5.67)	2.09 (0.92 to 4.76)	1.58 (0.87 to 2.85)	3.02 (1.44 to 6.35)
Benefits in nature not received	0.85 (0.52 to 1.41)	1.04 (0.60 to 1.82)	1.06 (0.68 to 1.64)	1.15 (0.63 to 2.09)	0.90 (0.51 to 1.60)	1.26 (0.64 to 2.48)	0.98 (0.50 to 1.94)	0.93 (0.50 to 1.71)
Not well informed on health and safety	1.36 (0.61 to 3.04)	1.36 (0.64 to 2.91)	0.86 (0.47 to 1.58)	1.38 (0.63 to 3.01)	1.58 (0.71 to 3.51)	1.29 (0.56 to 2.96)	1.26 (0.65 to 2.46)	1.17 (0.46 to 2.93)
Uncompensated flexible working times	0.48 (0.12 to 1.84)	1.36 (0.56 to 3.29)	1.07 (0.36 to 3.20)	0.46 (0.22 to 0.97)	0.51 (0.24 to 1.07)	0.54 (0.26 to 1.14)	0.40 (0.14 to 1.15)	0.34 (0.16 to 0.74)
Disempowered/No self-determination over schedule	0.66 (0.36 to 1.21)	1.61 (0.86 to 3.02)	1.12 (0.70 to 1.79)	1.35 (0.70 to 2.61)	2.05 (1.06 to 3.97)	0.69 (0.27 to 1.76)	1.17 (0.69 to 1.97)	0.49 (0.22 to 1.10)
No communication and participation with supervisors	1.08 (0.53 to 2.19)	0.64 (0.32 to 1.31)	0.84 (0.53 to 1.32)	1.07 (0.59 to 1.92)	1.05 (0.62 to 1.77)	1.34 (0.67 to 2.70)	0.66 (0.41 to 1.05)	0.54 (0.30 to 0.96)
Lack of training	1.15 (0.66 to 1.98)	1.01 (0.56 to 1.83)	0.84 (0.55 to 1.27)	0.68 (0.39 to 1.18)	1.11 (0.65 to 1.90)	1.10 (0.58 to 2.09)	0.99 (0.65 to 1.52)	2.09 (1.14 to 3.83)
Schedule unpredictability	0.61 (0.32 to 1.17)	1.11 (0.56 to 2.22)	0.98 (0.61 to 1.58)	0.70 (0.37 to 1.34)	2.76 (1.28 to 5.97)	0.43 (0.16 to 1.16)	1.32 (0.80 to 2.21)	0.45 (0.21 to 0.99)
Involuntary part-time employment	2.45 (1.46 to 4.12)	0.65 (0.36 to 1.17)	1.20 (0.81 to 1.79)	0.96 (0.53 to 1.72)	1.34 (0.81 to 2.21)	1.64 (0.91 to 2.96)	1.46 (0.98 to 2.18)	1.45 (0.83 to 2.53)
Intensive working times	2.13 (0.67 to 6.78)	0.45 (0.18 to 1.11)	1.34 (0.56 to 3.17)	0.60 (0.23 to 1.57)	0.69 (0.22 to 2.20)	0.58 (0.22 to 1.53)	0.86 (0.29 to 2.51)	0.74 (0.32 to 1.70)
Age of respondent								
15–29	0.22 (0.08 to 0.58)	0.72 (0.32 to 1.63)	0.58 (0.32 to 1.04)	0.48 (0.23 to 1.01)	1.22 (0.47 to 3.18)	1.65 (0.58 to 4.65)	0.70 (0.33 to 1.47)	0.87 (0.37 to 2.05)
30–49	0.66 (0.40 to 1.09)	1.08 (0.61 to 1.90)	0.73 (0.47 to 1.15)	1.04 (0.59 to 1.83)	0.61 (0.36 to 1.05)	1.27 (0.68 to 2.40)	0.99 (0.64 to 1.54)	0.88 (0.50 to 1.55)
50–65	1	1	1	1	1	1	1	1



**Table 5 (Continued):** Logistic regression analysis for the association between precariousness employment indicators and sickness absence for males and females by country. Values are OR (95% CI).

Precariousness employment indicators	Denmark		Finland		Sweden		Norway	
	Female	Male	Female	Male	Female	Male	Female	Male
Ethnicity								
Foreign-born	1.41 (0.65 to 1.98)	1.43 (0.68 to 3.02)	0.54 (0.20 to 1.44)	1.23 (0.41 to 3.69)	1.06 (0.55 to 2.34)	0.90 (0.43 to 1.91)	1.01 (0.56 to 1.82)	1.91 (1.00 to 3.64)
Native	1	1	1	1	1	1	1	1
Education of respondent (ISCED)								
No, primary, secondary education	0.86 (0.44 to 1.69)	1.13 (0.55 to 2.34)	0.81 (0.49 to 1.33)	1.58 (0.73 to 3.42)	0.52 (0.04 to 7.33)	†	1.44 (0.84 to 2.49)	0.80 (0.40 to 1.60)
Post-secondary education	0.95 (0.44 to 2.04)	1.14 (0.40 to 3.27)	1.78 (0.67 to 4.75)	1.01 (0.28 to 3.57)	0.79 (0.42 to 1.48)	1.11 (0.51 to 2.42)	1.15 (0.47 to 2.78)	0.93 (0.42 to 2.05)
Tertiary education	1	1	1	1	1	1	1	1
Occupational class (ISCO)								
Legislators, senior officials, managers, professionals	1	1	1	1	1	1	1	1
Technicians, associate professionals, clerks	1.09 (0.58 to 2.06)	0.98 (0.43 to 2.22)	1.56 (0.83 to 2.93)	0.70 (0.30 to 1.65)	1.17 (0.60 to 2.26)	1.44 (0.61 to 3.38)	0.71 (0.41 to 1.23)	2.97 (1.46 to 6.02)
Service workers*	0.96 (0.48 to 1.94)	1.20 (0.55 to 2.63)	2.79 (1.46 to 5.32)	1.32 (0.57 to 3.08)	1.48 (1.08 to 5.68)	1.41 (0.57 to 3.50)	0.83 (0.45 to 1.55)	2.43 (1.14 to 5.20)
Labour market sector								
Agriculture, forestry, fishing	46.16 (4.19 to 508.14)	2.57 (0.57 to 11.60)	0.23 (0.03 to 2.09)	2.07 (0.41 to 10.52)	†	0.43 (0.04 to 4.63)	†	1.86 (0.39 to 8.88)
Industry	2.11 (0.70 to 6.35)	1.23 (0.47 to 3.23)	0.94 (0.42 to 2.12)	1.91 (0.70 to 5.18)	1.06 (0.33 to 3.42)	0.58 (0.19 to 1.77)	1.89 (0.81 to 4.38)	0.93 (0.36 to 2.43)
Services	2.12 (0.89 to 5.02)	1.20 (0.50 to 2.85)	0.91 (0.54 to 1.52)	1.31 (0.53 to 3.22)	1.36 (0.64 to 2.89)	0.72 (0.26 to 1.99)	1.18 (0.67 to 2.07)	0.92 (0.40 to 2.12)
Public administration and defence	0.95 (0.38 to 2.36)	0.72 (0.20 to 2.55)	4.17 (0.98 to 17.76)	2.04 (0.58 to 7.18)	1.33 (0.61 to 2.90)	0.34 (0.07 to 1.80)	0.81 (0.36 to 1.83)	1.08 (0.35 to 3.26)
Other services	1	1	1	1	1	1	1	1

**Table 5 (Continued):** Logistic regression analysis for the association between precariousness employment indicators and sickness absence for males and females by country. Values are OR (95% CI).

Precariousness employment indicators	Denmark		Finland		Sweden		Norway	
	Female	Male	Female	Male	Female	Male	Female	Male
Sickness presenteeism								
No	1	1	1	1	1	1	1	1
Yes	2.91 (1.73 to 4.89)	2.03 (1.19 to 3.47)	2.51 (1.68 to 3.75)	2.32 (1.36 to 3.96)	1.34 (0.81 to 2.21)	1.21 (0.67 to 2.19)	1.55 (1.04 to 2.32)	1.22 (0.74 to 2.01)
Company sector								
Private	0.15 (0.06 to 0.35)	0.62 (0.28 to 1.40)	0.81 (0.49 to 1.35)	0.58 (0.28 to 1.17)	0.52 (0.24 to 1.12)	1.66 (0.69 to 4.01)	0.46 (0.27 to 0.80)	0.80 (0.38 to 1.70)
Public	1	1	1	1	1	1	1	1
Other sector	0.20 (0.04 to 0.95)	0.76 (0.19 to 3.05)	0.68 (0.24 to 1.93)	1.67 (0.51 to 5.41)	0.85 (0.30 to 2.43)	†	1.40 (0.49 to 3.99)	0.76 (0.25 to 2.36)

\*Service workers shop and market sales workers/Skilled agricultural and fishery workers/Craft and related trades workers/Plant and machine operators and assemblers/Elementary occupations

†Omitted due to small number of subjects

high levels of sickness absence in the Nordic countries.<sup>27</sup> Possible explanations for this effect may be the low-income occupational classes, which are usually temporary jobs,<sup>33</sup> and are often accompanied by financial hardship and ill-health, thus increasing the likelihood of sickness absence. Our finding also supported the claim that “income is arguably the most important dimension of precarious employment.”<sup>34</sup> The strong positive association between “no self-determination over schedule” and sickness absence among women (Sweden only), was in line with others,<sup>35</sup> associating the frequent exposure of women working under precarious employment conditions to constant variations in their work schedule, as they were less likely to be unionized or covered by collective bargaining agreements.<sup>4</sup> We suggest that workers not protected by collective bargaining might be less empowered to determine their schedule due to the inherent job insecurity, thereby reducing the likelihood of absenteeism. In Sweden, although the bargaining system is autonomous and the terms and conditions of employment are largely regulated by collective agreements, the responsibility of safeguarding a general level of pay and employment conditions rests of trade unions, and effective enforcement in the workplace is to a large extent covered by a collective agreement. The reason for our finding is unclear; however, it is possible that this may in part be due to atomization of collective bargaining, *ie*, workers (in this case female workers) being ill-informed about the precise terms and conditions of their contract, despite coverage by collective agreements; lack of information is a reflection of workers' low level of control over their employment conditions and the lack of knowledge of the unions' protective role.<sup>36</sup> Our findings therefore, emphasize the need to prioritize collective bargaining for all workers, measures ensuring adequate information on employ-

ment conditions, and control mechanisms enforcing these conditions, if precarious employment is to be properly addressed.

We found mixed results regarding “schedule unpredictability.” The positive association with sickness absence among women (Sweden only), was consistent with studies linking this association to work stress, low employee control over working times, especially among female employees.<sup>37</sup> Exposure of workers in precarious employment to poor working conditions and tighter work schedules compared to their counterparts working under non-precarious employment conditions tends to limit their coping abilities and increases work stress-related illness. The practical implications of this finding is that increasing working time flexibility for employees who work irregular hours promotes workers' coping strategies, as well as their health and well-being. On the other hand, the negative association between “schedule unpredictability” and sickness absence among men (Norway only) in this study contradicted other studies,<sup>38</sup> with increased sickness absence in relation to irregular working hours with no control over time in Norway. We postulate that this finding may also be related to the procyclical nature of sickness absence in which reduced job security constitutes a lesser problem during economic upturns with low or decreasing unemployment or result from changes in the labor force composition over the business cycle, with marginal workers largely employed when demand for labor increases, and unemployment is reduced.<sup>31</sup> “Lack of training” among men (Norway only) predicted higher sickness absence, consistent with other studies indicating increased coping capacity of individuals, especially for older workers with job training,<sup>39</sup> and poor mental well-being was associated with lack of training among women in the traditional welfare regime.<sup>22</sup> Our finding of a positive associa-

tion between “involuntary part-time employment” and sickness absence among women in Denmark was consistent with studies.<sup>29,30</sup> Possible explanations are that where part-time employment results from limited employment choices, particularly for women, it increases the risk of negative health impacts, as previously shown,<sup>40</sup> or that taking up part-time work is an attempt by women, more than men, to resolve their work-family imbalances.<sup>41</sup> Regarding company sector, our finding that women working in “private service” (Denmark, and Norway), and “other sectors” (Denmark only) were less likely to report absence than workers in “public service,” was in line with previous studies,<sup>42</sup> showing higher sickness absence risks among public sector employees compared to private sector employees. The degree of employment protection for public sector employees largely exceeding that in the private sector, especially employees in the municipal sector,<sup>42</sup> may explain these differences. The negative association between “non-permanent contracts,” compared to permanent contracts, and sickness absence both in the total sample (Sweden and Norway only), and among women (Finland and Sweden only), was consistent with other studies.<sup>43</sup> This is most likely related to fear of job loss among non-permanent workers, rather than an actual deterioration in health. Our finding of reduced sickness absence associated with “uncompensated flexible working times” among men (Finland and Norway only), was contrary to findings in another study linking unpaid overtime and number of hours worked with decrease self-rated health and psychological well-being.<sup>44</sup> We speculate that those with “uncompensated flexible working times” are less prone to taking sick leave for fear of dismissal or other related retaliating actions, and also have lower expectations for job advancement; as a result, they tend to increase their efforts in the form of unpaid

extra-hours.<sup>45</sup> The negative association between “no communication and participation with superiors” and sickness absence (Norway only) in the present study was an unexpected finding, since poor communication and lack of employee involvement has frequently been reported to lead to absences,<sup>39</sup> more so in Nordic countries where workers’ direct communication about their work-related performance and problems with their superior is among the highest levels in European workplaces.<sup>16</sup> However, job insecurity and fear of job loss among workers in precarious employment cannot be overlooked as a possible explanation.

Several explanatory characteristics of the respondents were also found to have played a role in the association between precarious employment and sickness absence. Occupational class increased the likelihood of sickness absence for male “service workers” and “technicians, associate professionals, and clerks” compared to “legislators, senior officials, managers, and professionals” (Norway only), and for female “service workers” (Finland and Sweden only); this corroborated findings from previous studies attributing this social gradient in sickness absence to physical (and psychosocial) working conditions,<sup>46,47</sup> more than health-related behaviors outside of work.<sup>14</sup> Possible explanations for this association may be heterogeneous, and may reflect the gender concentration of women in occupations and economic activities (*ie*, “services”) with greater exposure to work-related psychosocial exposures,<sup>11</sup> and the greater exposure of women within the same job title to unequal working tasks.<sup>48</sup> Labor market sector (“agriculture, forestry, fishing”) increased sickness absence among women (Denmark only); this finding however demands cautious interpretation, due to the extremely low proportion of respondents in this category within the data. However, this associa-

tion may be related to the gendered segregation of the labor market, where men and women face differential hazards from different jobs and tasks even within the same industry.<sup>49</sup> We also found “sickness presenteeism” to be a strong predictor of sickness absence within all the countries and both sexes (except for men in Sweden and Norway), corroborating findings from studies attributing this to fear of job loss.<sup>5</sup> We agree with the general consensus that sickness presenteeism increases the risk of illness by limiting time needed for recuperation, and is a predictor of even higher levels of subsequent sickness absence.<sup>50</sup>

The negative associations between several socio-demographic characteristics and sickness absence found in this study also warrant explaining. Younger (15–29 years) women showed a lower likelihood of sickness absence compared to their older (50–65 years) counterparts (Denmark only), consistent with previous research.<sup>13,14,24</sup> The stricter views of older persons in the Nordic countries regarding when it is acceptable to take sickness absence,<sup>13</sup> may account for this. We argue that the effect of age may be due to a combination of factors, such as younger women working under precarious employment conditions, the physically demanding nature of these jobs, and women being disproportionately affected by workplace flexibility. Our finding stresses the need for job-related interventions aimed at improving employment and work conditions for younger workers, *eg*, informed union protection. Contrasting findings were however reported in a longitudinal study indicating increased sickness absence in the youngest workers in Denmark.<sup>51</sup> It is worthy of note that socio-demographic characteristics, such as educational level and ethnicity were not significantly associated with sickness absence in the four countries, which is in line with studies where the focus is on work-related absence rather than due to

general health issues.<sup>52</sup> In summary, major variations in the association between precarious employment and sickness absence were identified between the Nordic countries in the sex-disaggregate analyses. The differences in sickness absence between the Nordic countries may be attributed to the structure and administration of the sickness-insurance system in each country is a major factor influencing country differences in sickness absence between the Nordic countries,<sup>27</sup> such as the more generous sickness benefits in Norway. Other plausible factors include variation in labor market conditions and social conditions, such as unemployment rate, as this is correlated with sickness absence.<sup>53</sup>

The large study population allowing for cross-national comparisons and the nationally representative design permitting the study of employees across different work settings are the main strengths of this study. Other strengths include overcoming common limitations when comparing sickness absence rates between countries (*ie*, differences in definitions of sickness absence, variation in the criteria for inclusion and exclusion, dissimilar populations being compared); measurement of sickness absence with the same question in all countries within the 2010 EWCS, which enhances the comparability of responses and results across countries; the novelty of our study is the investigation of precarious employment indicators as a predictor of sickness absence in nationally-representative samples of the Nordic working population; and the consideration of possible gender perspectives in explaining findings between both sexes. The main limitation of this study is that the variables are self-reported, with consequent risk of recall bias. However, studies indicate good agreement between self-reported and register data on sickness absence.<sup>17,18</sup> The cross-sectional design of this study precludes drawing causal or reverse causation inferences.

The limited scope of factors (*eg*, lifestyle, working in a manual job, having multiple concurrent jobs, and prior health status) known to affect sickness absence in this study leaves room for residual confounding. Focus on the employed only may have excluded people undergoing long-term sickness, thus introducing the risk of selection bias. Unavailability of data on sickness absence spells and duration restricted the analysis of recurrent sickness absences.

Our findings emphasize the need to prioritize informed and monitored collective bargaining for all workers, increase working time flexibility for those working irregular hours, and job-related interventions aimed at improving work conditions for younger individuals, if precarious employment is to be properly addressed.

**Conflicts of Interest:** None declared.

## References

1. Krane L, Fleten N, Stapelfeldt CM, *et al*. Comparison of sick leave patterns between Norway and Denmark in the health and care sector: a register study. *Scand J Public Health* 2013;**41**:684-91.
2. Hensing G, Andersson L, Brage S. Increase in sickness absence with psychiatric diagnosis in Norway: a general population-based epidemiologic study of age, gender and regional distribution. *BMC Med* 2006;**4**:19.
3. Laaksonen M, Martikainen P, Rahkonen O, Lahelma E. The effect of occupational and workplace gender composition on sickness absence. *J Occup Environ Med* 2012;**54**:224-30.
4. Benach J, Amable M, Muntaner C, Benavides FG. The consequences of flexible work for health: are we looking at the right place? *J Epidemiol Community Health* 2002;**56**:405-6.
5. Virtanen P, Vahtera J, Kivimäki M, *et al*. Labor market trajectories and health: a four-year follow-up study of initially fixed-term employees. *Am J Epidemiol* 2005;**161**:840-6.
6. Commission on Social Determinants of Health (CSDH). Closing the gap in a generation: health equity through action on the social determinants of

- health. Geneva: WHO organization, **2008**.
7. Vosko LF. Precarious Employment: Towards an Improved Understanding of Labour Market Insecurity. In: Vosko LF, ed. *Precarious Employment: understanding labour market insecurity in Canada*. McGill Queen's Press, **2006**:3-39.
  8. Benach J, Muntaner C. Precarious employment and health: developing a research agenda. *J Epidemiol Community Health* 2007;**61**:276-7.
  9. Puig-Barrachina V, Vanroelen C, Vives A, et al. Measuring employment precariousness in the European Working Conditions Survey: the social distribution in Europe. *Work* 2014;**49**:143-61.
  10. Virtanen M, Nyberg ST, Batty GD, et al. Perceived job insecurity as a risk factor for incident coronary heart disease: systematic review and meta-analysis. *BMJ* 2013;**347**:f4746.
  11. Benach J, Muntaner C, Santana V. Employment conditions and health inequalities. Final Report to the WHO Commission on Social Determinants of Health. Geneva: WHO, **2007**.
  12. Becker UWE. The Scandinavian Model: Still an Example for Europe? *IPG* 2007;**4**:41-57. Available from [http://library.fes.de/pdf-files/ipg/ipg-2007-4/05\\_becker\\_us.pdf](http://library.fes.de/pdf-files/ipg/ipg-2007-4/05_becker_us.pdf) (Accessed October 15, 2015).
  13. Holmaas TH, Dahl S-Å, Skjeret F. Attitudes towards sickness absence in the Nordic countries. Stein Rokkan Center for Social Studies, Health Economics Bergen, Working paper, **2008**.
  14. Allebeck P, Mastekaasa A. Chapter 5. Swedish Council on Technology Assessment in Health Care (SBU). Chapter 5. Risk factors for sick leave - general studies. *Scand J Public Health Suppl* 2004;**63**:49-108.
  15. Lund T, Christensen KB, Vaez M, et al. Differences in sickness absence in Sweden and Denmark: the cross national HAKNAK study. *Eur J Public Health* 2009;**19**:343-9.
  16. European Foundation for the Improvement of Living and Working Conditions (Eurofound). Fifth European Working Conditions Survey. Luxembourg, **2012**.
  17. Voss M, Stark S, Alfredsson L, et al. Comparisons of self-reported and register data on sickness absence among public employees in Sweden. *Occup Environ Med* 2008;**65**:61-7.
  18. Ferrie JE, Kivimäki M, Head J, et al. A comparison of self-reported sickness absence with absences recorded in employers' registers: evidence from the Whitehall II study. *Occup Environ Med* 2005;**62**: 74-9.
  19. Sigursteinsdóttir H, Rafnsdóttir GL. Sickness and sickness absence of remaining employees in a time of economic crisis: a study among employees of municipalities in Iceland. *Soc Sci Med* 2015;**132**:95-102.
  20. Vives A, Amable M, Ferrer M, et al. The Employment Precariousness Scale (EPRES): psychometric properties of a new tool for epidemiological studies among waged and salaried workers. *Occup Environ Med* 2010;**67**:548-55.
  21. Vives A, Vanroelen C, Amable M, et al. Employment precariousness in Spain: Prevalence, social distribution, and population-attributable risk percent of poor mental health. *Int J Health Serv* 2011;**41**:625-46.
  22. De Moortel D, Vandenheede H, Vanroelen C. Contemporary employment arrangements and mental well-being in men and women across Europe: a cross-sectional study. *Int J Equity Health* 2014;**13**:90.
  23. Gimeno D, Benavides FG, Benach J, Amick BC 3rd. Distribution of sickness absence in the European Union countries. *Occup Environ Med* 2004;**61**:867-9.
  24. Berge C. [International Comparisons of Sickness Absence]. *Økonomiske Analyser*; 2012;**31**:24-30. [In Norwegian]
  25. Fried Y, Melamed S, Ben-David HA. The joint effects of noise, job complexity, and gender on employee sickness absence: an exploratory study across 21 organizations – the CORDIS study. *J Occup Organ Psychol* 2002;**75**:131-44.
  26. Løkke AK, Eskildsen JK, Jensen TW. Absenteeism in the Nordic countries. *Employee Relations* 2006;**29**:24-9.
  27. Ose SO. [Knowledge on sickness absence: new Norwegian contributions]. Report, SINTEF, Trondheim, **2010**. [In Norwegian]
  28. Piha K, Laaksonen M, Martikainen P, et al. Interrelationships between education, occupational class, income and sickness absence. *Eur J Public Health* 2010;**20**:276-80.
  29. Kjeldstad R, Nymoeh EH. Part-time work and gender: Worker versus job explanations. *International Labour Review* 2012;**151**:85-107.
  30. Kjeldstad R, Nymoeh EH. Underemployment in a gender segregated labour market. Discussion Papers No. 613, March 2010 Statistics Norway, Research Department. **2010**.

31. OECD. *Sickness, Disability and Work: Breaking the Barriers* (Vol. 3): Denmark, Finland, Ireland and the Netherlands. OECD Publishing, Paris, **2008**. doi: 10.1787/9789264049826-en.
32. Pichler S. Sickness absence, moral hazard, and the business cycle. *Health Econ* 2015;**24**:692-710.
33. Van Lancker W. The European world of temporary employment. Gendered and poor? *European Societies* 2012;**14**:83-111.
34. Cranford CJ, Vosko LF. Conceptualizing precarious employment: mapping wage work across social location and occupational context. In: Vosko LF, editor. *Precarious Employment: understanding labour market insecurity in Canada*. Montreal and Kingston: McGill-Queen's University Press, **2006**:49.
35. Menéndez M, Benach J, Muntaner C, *et al.* Is precarious employment more damaging to women's health than men's? *Soc Sci Med* 2007;**64**:776-81.
36. Hannif ZN, Lamm F. When non-standard work becomes precarious: Insights from the New Zealand call centre industry. The International Review of Management Studies University of Wollongong Research Online Faculty of Business – Papers **2005**;16:324-50. Available from <http://ro.uow.edu.au/cgi/viewcontent.cgi?article=1453&context=buspapers> (Accessed October 22, 2015).
37. Ala-Mursula L, Vahtera J, Linna A, *et al.* Employee worktime control moderates the effects of job strain and effort-reward imbalance on sickness absence: the 10-town study. *J Epidemiol Community Health* 2005;**59**:851-7.
38. Olsen KM, Dahl S-Å. Working time: implications for sickness absence and the work–family balance. *Int J Soc Welf* 2010;**19**:45-53.
39. Michie S, Williams S. Reducing work related psychological ill health and sickness absence: a systematic literature review. *Occup Environ Med* 2003;**60**:3-9.
40. Gash V. Preference or constraint? Part-time workers' transitions in Denmark, France and the United Kingdom. *Work Employ Soc* 2008;**22**:655-74.
41. Artazcoz L, Borrell C, Cortès I, *et al.* Occupational epidemiology and work related inequalities in health: a gender perspective for two complementary approaches to work and health research. *J Epidemiol Community Health* 2007;**61**:ii39-45.
42. Labriola M, Lund T, Burr H. Prospective study of physical and psychosocial risk factors for sickness absence. *Occup Med (Lond)* 2006;**56**:469-74.
43. Virtanen M, Kivimäki M, Vahtera J, *et al.* Sickness absence as a risk factor for job termination, unemployment, and disability pension among temporary and permanent employees. *Occup Environ Med* 2006;**63**:212-7.
44. Robone S, Jones A, Rice N. Contractual conditions, working conditions and their impact on health and well-being. *Eur J Health Econ* 2011;**12**:429-44.
45. Pannenberg M. Long-Term Effects of Unpaid Overtime: Evidence for West Germany. *Scott J Polit Econ* 2005;**52**:177-93.
46. Christensen KB, Labriola M, Lund T, Kivimäki M. Explaining the social gradient in long-term sickness absence: a prospective study of Danish employees. *J Epidemiol Community Health* 2008;**62**:181-3.
47. Hansen HT, Ingebrigtsen T. Social class and sickness absence in Norway. *Acta Sociologica* 2008;**51**:309-27.
48. Messing K, Mager Stellman J. Sex, gender and women's occupational health: the importance of considering mechanism. *Environ Res* 2006;**101**:149-62.
49. Breslin FC, Ibrahim S, Smith P, *et al.* The demographic and contextual correlates of work-related repetitive strain injuries among Canadian men and women. *Am J Ind Med* 2013;**56**:1180-9.
50. Taloyan M, Aronsson G, Leineweber C, *et al.* Sickness presenteeism predicts suboptimal self-rated health and sickness absence: a nationally representative study of the Swedish working population. *PLoS One* 2012;**7**:e44721.
51. Pedersen J, Bjorner JB, Burr H, Christensen KB. Transitions between sickness absence, work, unemployment, and disability in Denmark 2004–2008. *Scand J Work Environ Health* 2012;**38**:516-26.
52. Singh-Manoux A, Clarke PJ, Marmot MG. Multiple measures of socio-economic position and psychosocial health: proximal and distal measures. *Int J Epidemiol* 2002;**31**:1192-9.
53. Askildsen JE, Bratberg E, Nilsen OA. Unemployment, labor force composition and sickness absence: a panel data study. *Health Econ* 2005;**14**:1087-101.