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Trajectories of sickness absence among salaried workers: evidence from the WORKss cohort in Catalonia (Spain), 2012-2014

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ABSTRACT

Objectives Sickness absence (SA) is a widely studied integrated measure of health status. To better understand how SA behaves over time (SA trajectory) a longitudinal and individual-centred approach will allow identifying groups of individuals who share common characteristics. The aim of this study was to identify and describe SA trajectories and to assess employment conditions and diagnosis groups as determinants.

Setting Working-life and sickness absence administrative records from a representative sample of affiliated with the Spanish Social Security system.

Participants 38 420 workers affiliated with the Spanish Social Security system, born 1949 to 1969 or 1970 to 1990, resident in Catalonia who had SA between 2012 and 2014 (75 212 episodes).

Results We identified three different SA trajectories in both birth cohorts for men and women: low-stable (86.2% to 90.8% of individuals), decreasing (4.4% to 5.9% of individuals) and increasing (4.1% to 8.7% of individuals) accumulated days of SA. The main characteristic of SA trajectories was the medical diagnosis group. The increasing SA trajectory had a higher proportion of workers with SA due to mental disorders compared with the other trajectories. The association analysis showed diagnosis group strongly related with all SA trajectories, particularly SA due to mental disorders showed the strongest association with the increasing trajectory among young men (adjusted OR (aOR): 42.40, 95% CI 17.03 to 105.57). Low salary levels exhibited a strong relationship with decreased accumulation of SA days over time for old women (aOR: 2.08, 95% CI 1.36 to 3.18) and men (aOR: 2.75, 95% CI 1.77 to 4.27). Unskilled manual occupations were associated with increasing trajectories among young women (aOR: 1.36, 95% CI 1.01 to 1.84). No significant differences were observed for other employment conditions across trajectories.

Conclusions Workers with mental disorders are more likely to have increased days of SA, whereas low salary levels at later ages are related to a decrease in SA days over time. Special attention to preventing the course of mental disorders at young and middle age is warranted.

Strengths and limitations of this study

► This study provides novel insight into sickness absence research from a longitudinal and individual-centred approach by investigating sickness absence trajectories.
► Trajectory analysis allows the identification of workers who require specific and early intervention, such as those with mental disorders, which follows an increasing pattern of days of sickness absence over time.
► The use of high-quality administrative registries from a large representative sample of the Spanish working population, together with access to medically certified sickness absence registries, provides higher validity to the results than self-rated sickness absence measures.
► Potential selection bias may be present when classifying workers into categories of accumulated employment-related factors, which could lead to underestimating their relationship with sickness absence trajectories.
► Information related to working conditions, health-related behaviours, healthcare consumption, family structure and prior health status that would be worth considering to identify and describe sickness absence trajectories were not available.

INTRODUCTION

Sickness absence (SA), considered a holistic measure of health status and work functioning,[1] is also one of the basic social benefits provided by welfare states to protect workers unable to work temporarily due to a health limitation.[1–4] SA has a major impact in terms of social, economical and individual burden. According to the Organisation for Economic Cooperation and Development, the expenditures for SA account for 0.8% of the European Union's average annual gross domestic product.[5]

Prior research has built a solid body of evidence focused on studying determinants

and risk factors associated with the incidence and duration of SA episodes.[6–9] Studies have consistently shown that SA follows different behaviour according to sex and age.[10–12] As women tend to have a higher incidence of SA and duration generally increases with age,[13] a separate sex-specific birth cohort analysis would be useful to control for the effect of the study design on assessing the role of other SA determinants. In addition, results from occupational epidemiology, occupational medicine and Social Security schemes in SA research are commonly built on assessing variable-centred measures at one time point or using dichotomous outcomes.[14 15] However, to better understand SA behaviour, a more dynamic longitudinal and person-centred approach is needed,[16] as it will allow the identification of phenotypes of individuals who share similar patterns of SA over time.

Research on the course of SA over time (ie, SA trajectories) is still scarce. The limited number of studies that have investigated SA trajectories were based on the number of overall spells and/or duration,[17–20] or due to specific pathologies, such as acute myocardial infarction and depression.[21 22] The aim of this study was to contribute to expanding the evidence to research questions that arise when investigating longitudinal SA behaviour by identifying and describing SA trajectories based on the accumulated days of SA in two sex-specific birth cohorts of Spanish salaried workers and assess the role of employment conditions and diagnosis group as determinants of SA trajectories.

METHODS
Study population
The study population (n=38 420) was based on a sample of workers affiliated with the Spanish Social Security System who were born during the time period 1949 to 1969 or 1970 to 1990, residents of the Catalonia region and had at least one closed episode of SA between 2012 and 2014 (75 212 total SA episodes). This sample is part of the Spanish WORKing life Social Security (WORKss) cohort.[23] Briefly, the WORKss cohort includes an annual sample of 4% of the total affiliates in the Spanish social security system each year since 2004 (roughly 1.1 million people) who had registered at least one working day. The selection of affiliates followed a panel study methodology using an algorithm of randomised number sequences that match their identification codes. In subsequent years, selected affiliates will continue in the sample if they continue affiliated with the Social Security system. To ensure representativeness, those lost to death or administrative inactivity in a specific year are replaced with an affiliate with similar characteristics from the target until the sample reaches 4%.

SA records were only available for those who live and work in Catalonia, and data were provided by the Catalan Institute for Medical and Health Evaluations. All SA records contain information on the starting/closure date and diagnoses of medically certified SA episodes. In

order to ensure a homogeneous working population that shares similar general socioeconomic characteristics and labour market regulations, we selected two birth cohorts: a young cohort of workers born between 1970 and 1990 (n=24 071, 56% women) and an old cohort born between 1949 and 1969 (n=14 349, 54% women), with an age range of 22 to 42 years in the young cohort and 43 to 63 years in the old cohort in 2012.

Patient and public involvement
Patients were not involved in the study design or conduct of the study. The study was based on secondary administrative records from Spanish social security and the Catalan Institute for Medical and Health Evaluations. The confidentiality of the databases is ensured by a record linkage agreement between Spanish social security, the Catalan Institute for Medical and Health Evaluations and the Centre for Research in Occupational Health-Pompeu Fabra University. Databases arrived to the authors already anonymised.

STATISTICAL ANALYSIS
Accumulated days of SA were computed quarterly from 2012 to 2014 to estimate SA trajectories using latent class growth analysis (LCGA), which assigns individuals who follow a similar outcome pattern over time to different subgroups. LCGA considers all individuals belonging to a trajectory to be homogeneous and provides an estimation of class membership probabilities for each individual. The optimal number of trajectories was assessed considering both quantitative and qualitative criteria: the Bayesian Information Criterion (BIC), with lower being best, and the likelihood ratio test (LRT) to assess the improvement in fit for the inclusion of one more class, specifically the Lo-Medell-Rubin (LM-LRT). These two criteria give numerical information on goodness of fit.[24] In addition, to assess class separation, average posterior class probability and entropy were also considered (>0.80 indicated good fit). Also, a minimum size of close to 5% of the study population is preferable for each trajectory group, as SA trajectories with small size could give inaccurate estimates.[25] In addition, researcher criteria were applied to determine the final number of trajectories. Finally, the associations between employment conditions or diagnosis and SA trajectories were assessed using a multinomial logistic regression model.

The SA trajectories were described by different employment conditions: type of contract (permanent or temporary), working time (full-time, part-time >50% up to 99% and part-time ≤50%), occupational category (skilled non-manual, skilled manual, unskilled non-manual and unskilled manual) and salary in quartiles. Medical diagnosis was grouped into the main groups according to the 10th revision of the International Classification of Diseases (ICD-10).[26]

As workers can change their category of employment conditions over time, we assigned individuals to the

category they spent most of the time in paid employment during the follow-up. Similarly, as individuals are likely to have more than one SA episode (43% of our study population) due to the same or a different medical diagnosis, we assigned them to the diagnosis group that accounted for the greatest number of accumulated days of SA. We tested differences in employment conditions and diagnosis groups among trajectories by applying Pearson's X^2 tests for categorical variables and Fisher's test when applicable. The statistical analyses were conducted using Mplus V.7 and R V.3.2.5 for LCGA, and Stata V.13 for the multinomial logistic regression.

RESULTS

We identified three different trajectories of days accumulated in SA trajectories in both birth cohorts for men and women (figure 1): low-stable (86.2% to 90.8% of individuals), decreasing (4.4% to 5.9% of individuals) and increasing (4.1% to 8.7% of individuals) accumulated days of SA. All trajectories had an average probability >0.8, the BIC and LM-LRT for model fit reached their optimum values with three classes in the two cohorts, indicating a good model fit, though the entropy hardly reached 0.8. In men, we identified two trajectory groups of <5% of the study population in both birth cohorts, but we decided on three classes because the LM-LRT for model fit confirmed that three classes was better than two classes to describe the observed data (p<0.001 in both cases). In addition, the BIC was smaller when considering three classes compared with two (111 464 vs 112 064 in the old cohort, and 167 471 vs 168 815 in the young cohort; online supplementary appendix 1). The low-stable trajectory was the most represented in both cohorts for both men and women, with a mean of accumulated days of SA per quarter of 7 to 13 days. Decreasing and increasing trajectories exhibited a higher accumulation of SA days, ranging from 63 to 11 and from 7 to 62 days per quarter, respectively, during the 3 years of follow-up (figures 1 and 2).

Regarding employment conditions, we observed significant differences in salary levels among trajectories in both birth cohorts, with the exception of young women. The decreasing trajectories had the highest proportion of workers with low salaries for both men and women (range 14.5% to 23.1%) compared with the other two trajectories. In addition, women in the old birth cohort belonging to the decreasing and low-stable trajectories had the highest proportion of part-time contracts (27.2% and 27.6%, respectively) compared with the low-stable trajectory. No significant differences were found by type of contract across trajectories.

The main difference among the three SA trajectories was due to the diagnosis group for both men and women in both birth cohorts. More specifically, the increasing trajectory had a higher proportion of workers with SA due to mental disorders (19.2% women and 17.3% men in the young cohort; 17.4% women and 9.8% men in the old cohort) compared with the low-stable and decreasing

patterns. Workers with SA due to musculoskeletal disorders were similarly distributed to the decreasing and increasing patterns, with a higher proportion from the old cohort than the young cohort. However, old women significantly accounted for musculoskeletal disorders in the increasing trajectory (35.2%), in contrast to the decreasing pattern (28.9%). Overall, workers who accumulated SA days for episodes due to infectious and respiratory diseases (tables 1-2) mostly represented the low-stable trajectory. The number of SA episodes followed a similar pattern across trajectories (table 3). Overall, increasing SA trajectories represented to a larger extent long SA spells (median duration range from 25 to 54 days) rather than repeated short ones (data not shown).

The multinomial logistic regression analysis showed that diagnosis was the strongest determinant for all SA trajectories obtained. Compared with episodes due to infectious diseases, individuals who had SA due to mental disorders showed a higher risk to increase accumulated days on SA over time than to develop a low stable trajectory (adjusted OR (aOR): 33.52; 95% CI 16.40 to 68.51 and aOR: 34.09; 95% CI 10.74 to 108.15 for young and old women, respectively; aOR: 42.40; 95% CI 17.03 to 105.57 for young men). Among old women, SA due to musculoskeletal disorders was associated with an increasing SA trajectory (aOR: 25.35; 95% CI 8.07 to 79.64), while for young men it showed an association with a decreasing SA trajectory (aOR: 34.83; 95% CI 11.06 to 109.73).

Low salary levels were significantly associated with a higher risk of decreased accumulated days of SA over time compared with the low stable SA trajectory among older women (aOR: 2.08; 95% CI 1.36 to 3.18) and men (aOR: 2.75; 95% CI 1.77 to 4.27). A similar but weaker association was found among low salary levels and a higher risk of increasing SA trajectories (aOR: 1.51; 95% CI 1.01 to 2.26 for women and aOR: 1.56; 95% CI 1.11 to 2.19 for men). Unskilled manual occupations were associated with an increasing SA trajectory for young women (aOR: 1.36; 95% CI 1.01 to 1.84) (table 4).

DISCUSSION

In this study, three SA trajectories were identified in two birth cohorts of salaried Spanish workers residing in Catalonia during 3 years of follow-up: low-stable, decreasing and increasing accumulated days of SA. We found that the medically certified diagnosis that caused the SA episode was the main factor characterising SA trajectory. More specifically, the increasing trajectory was characterised by a higher proportion of young women who accumulated more days and spells of SA due to mental disorders. Regarding employment conditions, we found that decreasing trajectories had the highest proportion of individuals with low salary levels; the decreasing and low-stable trajectories had the highest proportion of older women with part-time employment. In the association analysis, we found diagnosis to be the strongest determinant for all SA trajectories, particularly SA due to mental disorders with increasing SA trajectories among
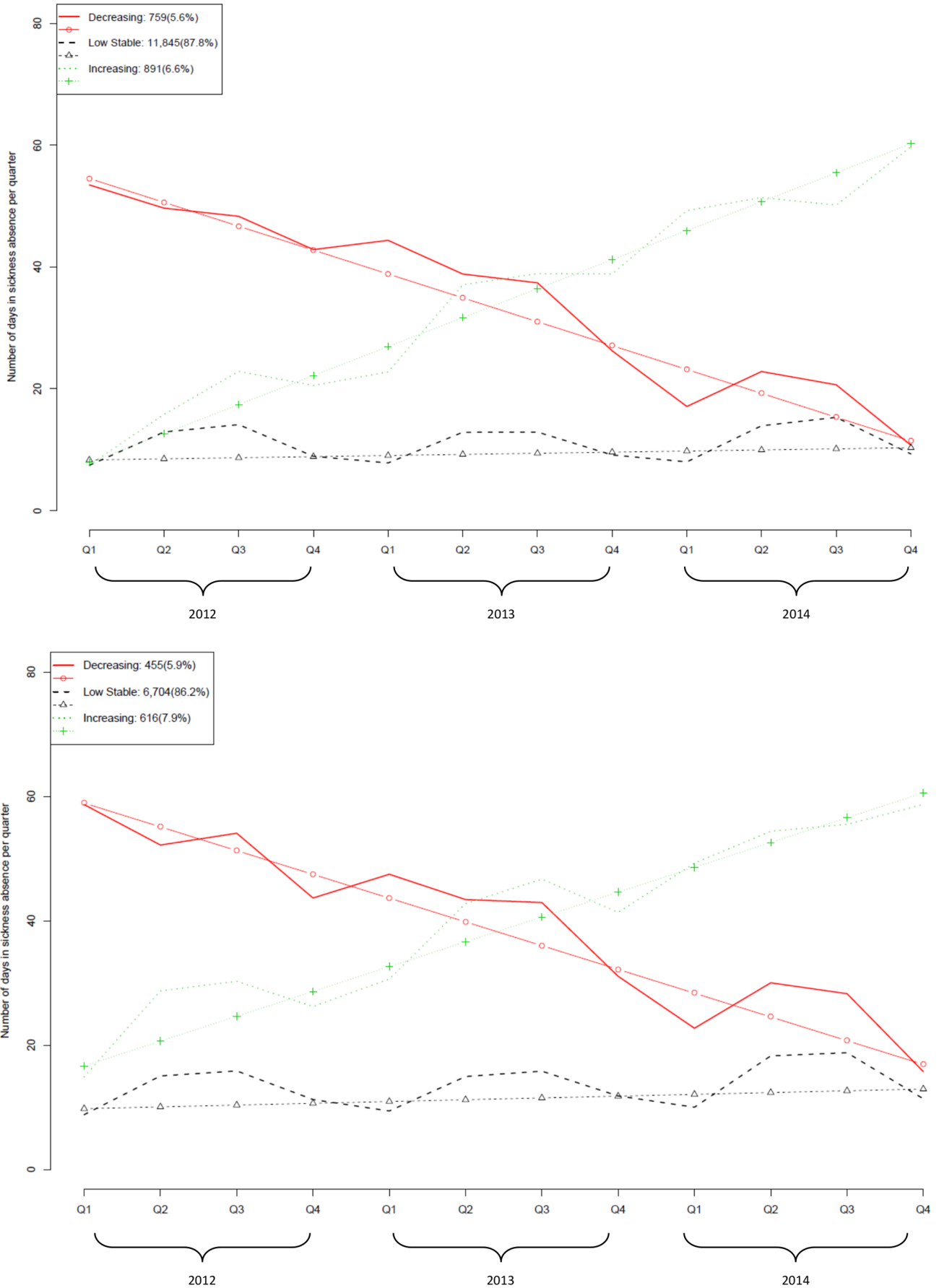
Figure 1 Trajectories of accumulated days of sickness absence per quarter in women born between 1970 to 1990 (n=13 495) or 1949 to 1969 (n=7775). Catalonia, 2012–2014.
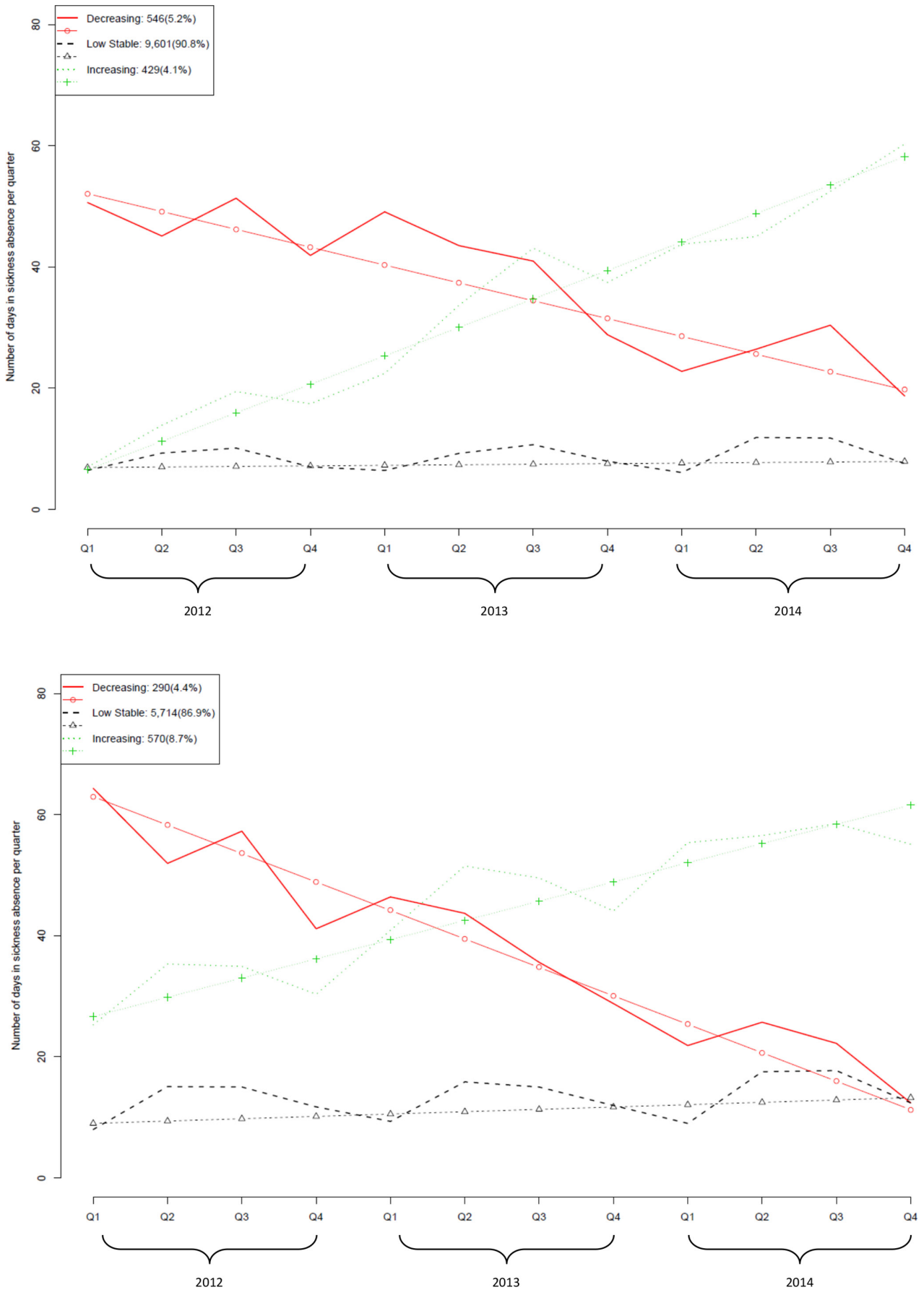
Figure 2 Trajectories of accumulated days of sickness absence per quarter in men born between 1970 to 1990 (n=10576) or 1949 to 1969 (n=6574). Catalonia, 2012–2014.

Table 1 Description of sickness absence trajectories in salaried women from the WORKss cohort (n=21 270) based on employment conditions and diagnosis group. Catalonia, 2012–2014

Women	Cohort born 1970–1990 (n=13 495)				Cohort born 1949–1969 (n=7775)			
	Decreasing (5.6%)	Low-stable (87.8%)	Increasing (6.6%)		Decreasing (5.9%)	Low-stable (86.2%)	Increasing (7.9%)	
	N (%)	N (%)	N (%)	P value*	N (%)	N (%)	N (%)	P value*
Type of contract								
Permanent contract	572 (75.4)	8737 (73.8)	687 (77.1)	0.063	386 (84.8)	5639 (84.1)	523 (84.9)	0.818
Temporary contract	187 (24.6)	3108 (26.2)	204 (22.9)		69 (15.2)	1065 (15.9)	93 (15.1)	
Working time								
Full-time	474 (62.5)	7717 (65.1)	559 (62.7)	0.313	331 (72.8)	4854 (72.4)	473 (76.8)	0.009
Part-time: >50% up to 99%	196 (25.8)	2814 (23.8)	233 (26.2)		57 (12.5)	1056 (15.8)	71 (11.5)	
≤50%	89 (11.7)	1314 (11.1)	99 (11.1)		67 (14.7)	794 (11.8)	72 (11.7)	
Occupational category								
Skilled non-manual	146 (19.5)	2554 (21.9)	193 (22.2)	0.379	78 (17.6)	1387 (21.2)	105 (17.8)	0.047
Skilled manual	121 (16.2)	1739 (14.9)	136 (15.6)		68 (15.3)	1056 (16.1)	91 (15.5)	
Unskilled non-manual	411 (55.0)	6309 (54.0)	446 (51.3)		211 (47.5)	3022 (46.1)	270 (45.9)	
Unskilled manual	69 (9.2)	1089 (9.3)	95 (10.9)		87 (19.6)	1087 (16.6)	122 (20.8)	
Salary in quartiles								
High	240 (31.7)	3858 (32.6)	299 (33.5)	0.619	120 (26.4)	2061 (30.8)	150 (24.4)	
Middle-high	240 (31.7)	3743 (31.6)	300 (33.7)		121 (26.6)	2156 (32.2)	207 (33.6)	
Middle-low	194 (25.6)	2973 (25.1)	211 (23.7)		130 (28.6)	1632 (24.4)	165 (26.8)	<0.001
Low	83 (11.0)	1266 (10.7)	81 (9.1)		84 (18.5)	850 (12.7)	94 (15.3)	
Diagnosis group (ICD-10)								
Infectious	9 (1.2)	1240 (10.5)	8 (0.8)	<0.001	3 (0.6)	502 (7.5)	3 (0.4)	<0.001
Neoplasms	17 (2.2)	187 (1.6)	22 (2.5)		37 (8.2)	221 (3.3)	28 (4.6)	
Mental	117 (15.4)	792 (6.7)	171 (19.2)		69 (15.2)	511 (7.6)	107 (17.4)	
Cardiovascular	11 (1.5)	178 (1.5)	16 (1.8)		23 (5.1)	170 (2.5)	17 (2.8)	
Respiratory	6 (0.8)	2560 (21.7)	18 (2.0)		20 (4.4)	1483 (22.2)	15 (2.4)	
Digestive	23 (3.0)	554 (4.7)	26 (2.9)		20 (4.4)	340 (5.1)	23 (3.7)	
Musculoskeletal	253 (33.4)	2464 (20.8)	300 (33.7)		131 (28.9)	1374 (20.5)	217 (35.2)	
Pregnancy	107 (14.1)	700 (5.9)	135 (15.2)		5 (1.1)	25 (0.4)	3 (0.5)	
Injuries and poisoning	69 (9.1)	734 (6.2)	63 (7.1)		61 (13.4)	564 (8.4)	85 (13.8)	
Other	146 (19.3)	2417 (20.4)	132 (14.8)		85 (18.7)	1506 (22.5)	118 (19.2)	
Total	759 (100.0)	11 845 (100.0)	891 (100.0)		455 (100.0)	6704 (100.0)	616 (100.0)	

*Missing values in occupational category (OC), income (I) and diagnosis group (DG): N(%) in the cohorts born 1970 to 1990 (decreasing – DG, 3 (0.55); low-stable – OC, 4 (0.04); I, 1 (0.01); DG, 25 (0.26); increasing - OC, 1 (0.23)) and 1949 to 1969 (low-stable – OC, 4 (0.07); DG, 9 (0.16); increasing - OC, 3 (0.52)) by sickness absence trajectory in the period 2012 to 2014. Salary quartiles based on the average individual salary in the cohorts born 1970 to 1990 (high: 63 778€, middle-high: 21 656€, middle-low: 13 630€, low: 6274€) and 1949 to 1969 (high: 81 226€, middle-high: 25 283€, middle-low: 15 701€, low: 8307€) in the period 2012 to 2014.
*χ^2 tests. ICD-10, International Classification of Diseases, 10th revision.

young men. This result is expected, as the SA trajectory is based on accumulated days of SA, which is closely linked to the prognosis of specific diseases.[27] Low salary levels had a higher risk of decreased accumulated days of SA over time and a weaker association for increasing SA trajectories for older women and men, as well as unskilled occupations increasing SA days over time among young women.

Most workers shared a low-stable pattern driven by accumulated SA days due to infectious or respiratory diseases or musculoskeletal disorders, with a mean <20

Table 2 Description of sickness absence trajectories in salaried men from the WORKss cohort (n=17 150) based on employment conditions and diagnosis group. Catalonia, 2012–2014

Men	Cohort born 1970–1990 (n=10 576)				Cohort born 1949–1969 (n=6574)			
	Decreasing (5.2%)	Low-stable (90.8%)	Increasing (4.1%)		Decreasing (4.4%)	Low-stable (86.9%)	Increasing (8.7%)	
	N (%)	N (%)	N (%)	P value*	N (%)	N (%)	N (%)	P value*
Type of contract								
Permanent contract	416 (76.2)	7306 (76.1)	346 (80.6)	0.095	241 (83.1)	4862 (85.1)	476 (83.5)	0.419
Temporary contract	130 (23.8)	2295 (23.9)	83 (19.4)		49 (16.9)	852 (14.9)	94 (16.5)	
Working time								
Full-time	473 (86.6)	8377 (87.2)	365 (85.0)	0.087	256 (88.2)	5187 (90.8)	506 (88.8)	0.079
Part-time: >50% up to 99%	32 (5.9)	648 (6.8)	26 (6.1)		10 (3.5)	184 (3.2)	15 (2.6)	
≤50%	41 (7.5)	576 (6.0)	38 (8.9)		24 (8.3)	343 (6.0)	49 (8.6)	
Occupational category								
Skilled non-manual	57 (10.4)	1269 (13.2)	44 (10.2)	0.094	62 (21.3)	1144 (20.0)	100 (17.6)	0.756
Skilled manual	239 (43.8)	3916 (40.8)	172 (40.2)		113 (39.0)	2323 (40.7)	243 (42.9)	
Unskilled non-manual	160 (29.3)	3009 (31.4)	151 (35.3)		87 (30.0)	1677 (29.4)	162 (28.6)	
Unskilled manual	90 (16.5)	1403 (14.6)	61 (14.3)		28 (9.7)	566 (9.9)	62 (10.9)	
Salary in quartiles								
High	173 (31.7)	3083 (32.1)	143 (33.4)	0.004	66 (22.8)	1565 (27.4)	132 (23.1)	<0.001
Middle-high	152 (27.8)	3171 (33.0)	137 (31.9)		81 (27.9)	1789 (31.3)	177 (31.1)	
Middle-low	142 (26.0)	2455 (25.6)	109 (25.4)		76 (26.2)	1604 (28.1)	154 (27.0)	
Low	79 (14.5)	891 (9.3)	40 (9.3)		67 (23.1)	756 (13.2)	107 (18.8)	
Diagnosis group (ICD-10)								
Infectious	3 (0.5)	1309 (13.7)	5 (1.1)	<0.001	5 (1.6)	413 (7.2)	4 (0.7)	<0.001
Neoplasms	7 (1.3)	60 (0.6)	9 (2.0)		19 (6.6)	120 (2.1)	23 (4.0)	
Mental	80 (14.7)	456 (4.8)	74 (17.3)		24 (8.3)	279 (4.9)	56 (9.8)	
Cardiovascular	16 (3.0)	187 (2.0)	9 (2.1)		27 (9.3)	234 (4.1)	42 (7.4)	
Respiratory	19 (3.5)	2503 (26.1)	14 (3.3)		11 (3.8)	1181 (20.7)	26 (4.6)	
Digestive	32 (5.9)	626 (6.5)	43 (10.0)		22 (7.6)	531 (9.3)	61 (10.7)	
Musculoskeletal	126 (23.2)	1562 (16.3)	92 (21.5)		89 (30.7)	1216 (21.3)	171 (30.0)	
Injuries and poisoning	186 (34.3)	1291 (13.5)	129 (30.1)		36 (12.4)	482 (8.5)	69 (12.1)	
Other	74 (13.6)	1582 (16.5)	54 (12.6)		57 (19.7)	1249 (21.9)	118 (20.7)	
Total	546 (100.0)	9601 (100.0)	429 (100.0)		290 (100.0)	5714 (100.0)	570 (100.0)	

Missing values in occupational category (OC), income (I) and diagnosis group (DG): N(%) in the cohorts born 1970 to 1990 (decreasing - DG, 3(0.55); low-stable – OC, 4 (0.04); I, 1 (0.01); DG, 25 (0.26); increasing – OC, 1 (0.23)) and 1949 to 1969 (low-stable – OC, 4(0.07); DG, 9 (0.16); increasing – OC, 3 (0.52)) by sickness absence trajectory in the period 2012 to 2014. Salary quartiles based on the average individual salary in the cohorts born 1970 to 1990 (high: 78 928€, middle-high: 25 944€, middle-low: 16 710€, low: 7209€) and 1949 to 1969 (high: 99 880€, middle-high: 36 095€, middle-low: 23 227€, low: 14 171€) in the period 2012 to 2014.
*χ^2 tests. ICD-10, International Classification of Diseases, 10th revision.

accumulated days of SA each quarter. These diagnosis groups included pathologies that usually represent acute disease processes that lead to short-term SA episodes.[28] We identified, especially among young workers, a small but not negligible group with increased accumulated days of SA due mainly to mental disorders, followed by musculoskeletal disorders. SAs due to mental health problems have continuously increased in recent years and shown

Table 3 Distribution of SA closed episodes (n=75212) across sickness absence trajectories by diagnosis groups in the WORKss cohort (n=38420). Catalonia, 2012–2014

Women

Diagnosis group (ICD-10)	SA episodes, cohort born 1970–1990 (n=27 794)				SA episodes, cohort born 1949–1969 (n=15665)			
	Decreasing (6%)	Low-stable (86.6%)	Increasing (7.4%)	P value	Decreasing (6.1%)	Low-stable (85.1%)	Increasing (8.8%)	P value
	Episodes (%)	Episodes (%)	Episodes (%)		Episodes (%)	Episodes (%)	Episodes (%)	
Infectious	124 (7.4)	3547 (14.7)	162 (8.0)	<0.01*	33 (3.4)	1446 (10.8)	66 (4.7)	<0.01†
Neoplasms	22 (1.3)	262 (1.0)	38 (1.9)		59 (6.2)	328 (2.5)	40 (2.9)	
Blood	14 (0.8)	48 (0.2)	4 (0.2)		2 (0.2)	30 (0.2)	5 (0.4)	
Metabolism	13 (0.8)	84 (0.4)	13 (0.6)		5 (0.5)	68 (0.5)	7 (0.5)	
Mental	191 (11.4)	1295 (5.4)	268 (13.0)		113 (11.8)	871 (6.6)	197 (14.2)	
Neurological	26 (1.6)	467 (1.9)	39 (1.9)		25 (2.6)	318 (2.4)	65 (4.7)	
Eyes	12 (0.7)	241 (1.0)	12 (0.6)		15 (1.6)	275 (2.1)	23 (1.7)	
Ear	11 (0.7)	330 (1.4)	15 (0.7)		14 (1.5)	292 (2.2)	21 (1.5)	
Cardiovascular	24 (1.4)	260 (1.1)	32 (1.6)		35 (3.7)	287 (2.2)	34 (2.5)	
Respiratory	155 (9.3)	5844 (24.4)	243 (11.8)		95 (9.9)	3181 (24.0)	149 (10.8)	
Digestive	73 (4.4)	1378 (5.7)	88 (4.3)		39 (4.1)	782 (5.9)	54 (3.9)	
Skin	10 (0.6)	247 (1.0)	12 (0.6)		4 (0.4)	149 (1.1)	9 (0.6)	
Musculoskeletal	415 (24.8)	3934 (16.4)	465 (22.6)		274 (28.6)	2473 (18.6)	427 (30.8)	
Urogenital	136 (8.1)	1143 (4.8)	82 (4.0)		36 (3.8)	526 (4.0)	51 (3.7)	
Pregnancy	160 (9.6)	1120 (4.7)	230 (11.2)		6 (0.6)	39 (0.3)	6 (0.4)	
Perinatal	4 (0.2)	12 (0.1)	–		–	1 (0.0)	–	
Congenital	5 (0.3)	23 (0.1)	3 (0.1)		2 (0.2)	11 (0.1)	4 (0.3)	
Other symptoms	141 (8.4)	2363 (9.8)	201 (9.8)		70 (7.3)	1183 (8.9)	90 (6.5)	
Injuries and poisoning	101 (6.0)	1119 (4.7)	126 (6.1)		98 (10.2)	814 (6.1)	119 (8.6)	
External causes	26 (1.6)	215 (0.9)	17 (0.8)		33 (3.4)	170 (1.3)	16 (1.2)	
Health services	10 (0.6)	63 (0.3)	5 (0.2)		–	33 (0.2)	2 (0.1)	
Total	1673 (100.0)	23995 (100.0)	2055 (100.0)		958 (100.0)	13277 (100.0)	1385 (100.0)	

Men

Diagnosis group (ICD-10)	SA episodes, cohort born 1970–1990 (n=20 200)				SA episodes, cohort born 1949–1969 (n=11 553)			
	Decreasing (4.9%)	Low-stable (89.9%)	Increasing (5.2%)	P value	Decreasing (5.1%)	Low-stable (86.3%)	Increasing (8.6%)	P value
	Episodes (%)	Episodes (%)	Episodes (%)		Episodes (%)	Episodes (%)	Episodes (%)	
Infectious	69 (7.1)	3195 (17.6)	89 (8.3)	<0.01†	35 (6.0)	971 (9.7)	23 (2.4)	<0.01†
Neoplasms	13 (1.4)	88 (0.5)	28 (2.6)		30 (5.1)	179 (1.8)	34 (3.4)	
Blood	–	10 (0.1)	–		1 (0.2)	8 (0.1)	6 (0.6)	
Metabolism	4 (0.4)	30 (0.2)	8 (0.8)		7 (1.2)	49 (0.5)	10 (1.0)	
Mental	116 (11.8)	736 (4.1)	133 (12.5)		49 (8.4)	483 (4.9)	92 (9.3)	
Neurological	10 (1.0)	265 (1.5)	29 (2.7)		43 (7.3)	104 (1.0)	20 (2.0)	

Continued

Table 3 Continued

Men	SA episodes, cohort born 1970–1990 (n=20 200)				SA episodes, cohort born 1949–1969 (n=11 553)			
	Decreasing (4.9%)	Low-stable (89.9%)	Increasing (5.2%)	P value	Decreasing (5.1%)	Low-stable (86.3%)	Increasing (8.6%)	P value
	Episodes (%)	Episodes (%)	Episodes (%)		Episodes (%)	Episodes (%)	Episodes (%)	
Eyes	9 (0.9)	231 (1.3)	16 (1.5)		12 (2.0)	244 (2.5)	23 (2.3)	
Ear	10 (1.0)	206 (1.1)	9 (0.8)		6 (1.0)	173 (1.7)	10 (1.0)	
Cardiovascular	25 (2.5)	259 (1.4)	13 (1.2)		38 (6.5)	343 (3.4)	58 (5.9)	
Respiratory	83 (8.4)	4904 (27.1)	142 (13.3)		37 (6.3)	2198 (22.1)	83 (8.4)	
Digestive	68 (6.9)	1267 (7.0)	83 (7.8)		38 (6.5)	871 (8.7)	91 (9.2)	
Skin	14 (1.4)	327 (1.8)	23 (2.2)		3 (0.5)	141 (1.4)	10 (1.0)	
Musculoskeletal	225 (22.9)	2693 (14.9)	214 (20.1)		153 (26.1)	2052 (20.6)	311 (31.4)	
Urogenital	13 (1.3)	422 (2.3)	17 (1.6)		14 (2.4)	425 (4.3)	27 (2.7)	
Congenital	3 (0.3)	17 (0.1)	1 (0.1)		–	10 (0.1)	2 (0.2)	
Other symptoms	64 (6.5)	1511 (8.3)	67 (6.3)		38 (6.5)	877 (8.8)	82 (8.3)	
Injuries and poisoning	235 (23.9)	1768 (9.8)	185 (17.4)		63 (10.8)	654 (6.6)	91 (9.2)	
External causes	23 (2.3)	121 (0.7)	6 (0.6)		17 (2.9)	145 (1.5)	15 (1.5)	
Health services	–	40 (0.2)	2 (0.2)		2 (0.3)	29 (0.3)	2 (0.2)	
Total	984 (100.0)	18090 (100.0)	1065 (100.0)		586 (100.0)	9956 (100.0)	990 (100.0)	

Missing values: Episodes (%) in the cohorts born 1970 to 1990 (women: decreasing, 1 (0.06); low-stable, 67 (0.27); increasing, 3 (0.14); men: decreasing, 3 (0.30); low-stable, 58 (0.32)) and 1949 to 1969 (women: decreasing, 1 (0.10); low-stable, 41 (0.31); increasing, 3 (0.22); men: decreasing, 2 (0.34); low-stable, 17 (0.17); increasing, 2 (0.20)) by sickness absence trajectory in the period 2012 to 2014.

Episodes: sickness absence episodes with closure date.

*χ^2 tests.

†Fisher exact tests with Monte Carlo simulations.

ICD-10, International Classification of Diseases, 10th revision; SA, sickness absence.

Table 4 Association between employment conditions and diagnosis group with sickness absence trajectories in salaried workers from the WORKss cohort (n=38420). Catalonia (Spain), 2012–2014

Sickness absence trajectories[a]

	Women				Men			
	Cohort: 1970–1990 (n=13495)		Cohort: 1949–1969 (n=7775)		Cohort: 1970–1990 (n=10576)		Cohort: 1949–1969 (n=6574)	
	Decreasing vs low stable	Increasing vs low stable	Decreasing vs low stable	Increasing vs low stable	Decreasing vs low stable	Increasing vs low stable	Decreasing vs low stable	Increasing vs low stable
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Type of contract								
Permanent contract	1	1	1	1	1	1	1	1
Temporary contract	0.98 (0.81 to 1.19)	0.97 (0.81 to 1.17)	0.80 (0.60 to 1.07)	0.83 (0.64 to 1.07)	0.87 (0.69 to 1.10)	0.79 (0.60 to 1.03)	0.82 (0.57 to 1.19)	0.85 (0.64 to 1.12)
Working time								
Full-time	1	1	1	1	1	1	1	1
Part-time: >50% up to 99%	1.11 (0.92 to 1.33)	1.18 (1.00 to 1.40)	0.62 (0.45 to 0.85)	0.62 (0.46 to 0.82)	0.78 (0.53 to 1.16)	0.94 (0.62 to 1.45)	0.82 (0.41 to 1.62)	0.80 (0.46 to 1.40)
≤50%	1.08 (0.83 to 1.41)	1.22 (0.95 to 1.57)	0.84 (0.59 to 1.19)	0.82 (0.60 to 1.14)	0.87 (0.60 to 1.26)	1.53 (1.03 to 2.27)	1.13 (0.69 to 1.86)	1.42 (0.99 to 2.04)
Salary in quartiles								
High	1	1	1	1	1	1	1	1
Middle-high	1.02 (0.83 to 1.25)	1.03 (0.85 to 1.24)	0.99 (0.73 to 1.34)	1.33 (1.02 to 1.74)	0.81 (0.64 to 1.03)	0.88 (0.68 to 1.14)	1.27 (0.88 to 1.83)	1.16 (0.90 to 1.51)
Middle-low	1.02 (0.81 to 1.30)	0.83 (0.66 to 1.04)	1.56 (1.12 to 2.17)	1.48 (1.09 to 2.01)	1.00 (0.76 to 1.30)	0.86 (0.64 to 1.15)	1.42 (0.96 to 2.11)	1.13 (0.85 to 1.49)
Low	1.03 (0.74 to 1.44)	0.65 (0.47 to 0.92)	2.08 (1.36 to 3.18)	1.51 (1.01 to 2.26)	1.60 (1.12 to 2.29)	0.82 (0.52 to 1.29)	2.75 (1.77 to 4.27)	1.56 (1.11 to 2.19)
Occupational category								
Skilled non-manual	1	1	1	1	1	1	1	1
Skilled manual	1.21 (0.91 to 1.60)	1.17 (0.90 to 1.53)	0.88 (0.59 to 1.31)	0.83 (0.58 to 1.18)	1.28 (0.93 to 1.77)	1.26 (0.88 to 1.81)	0.70 (0.48 to 1.02)	1.09 (0.82 to 1.45)
Unskilled non-manual	1.17 (0.94 to 1.45)	1.01 (0.83 to 1.23)	1.08 (0.79 to 1.48)	0.94 (0.71 to 1.24)	1.12 (0.81 to 1.56)	1.44 (1.00 to 2.06)	0.78 (0.54 to 1.12)	1.00 (0.76 to 1.33)
Unskilled manual	1.07 (0.77 to 1.51)	1.36 (1.01 to 1.84)	1.00 (0.67 to 1.49)	1.08 (0.76 to 1.53)	1.24 (0.84 to 1.83)	1.32 (0.85 to 2.05)	0.57 (0.34 to 0.97)	1.04 (0.71 to 1.53)
Diagnosis group (ICD-10)								
Infectious	1	1	1	1	1	1	1	1
Neoplasms	11.92 (5.19 to 27.39)	17.12 (7.47 to 39.25)	28.78 (8.77 to 94.44)	19.49 (5.82 to 65.28)	51.91 (13.09 to 205.93)	38.56 (12.52 to 118.71)	12.40 (4.52 to 34.02)	19.24 (6.52 to 56.77)
Mental	20.11 (10.14 to 39.86)	33.52 (16.40 to 68.51)	21.61 (6.75 to 69.19)	34.09 (10.74 to 108.15)	75.97 (23.87 to 241.82)	42.40 (17.03 to 105.57)	6.75 (2.54 to 17.94)	20.69 (7.41 to 57.74)
Cardiovascular	8.76 (3.58 to 21.46)	13.05 (5.45 to 31.26)	20.84 (6.15 to 70.59)	15.33 (4.41 to 53.32)	38.06 (10.98 to 131.97)	12.15 (4.03 to 36.67)	9.13 (3.46 to 24.06)	18.47 (6.54 to 52.19)
Respiratory	0.32 (0.11 to 0.91)	1.08 (0.47 to 2.49)	2.33 (0.69 to 7.87)	1.61 (0.46 to 5.63)	3.36 (0.99 to 11.38)	1.45 (0.52 to 4.03)	0.77 (0.26 to 2.22)	2.27 (0.79 to 6.53)
Digestive	5.45 (2.49 to 11.92)	6.72 (3.00 to 15.05)	8.05 (2.33 to 27.88)	11.44 (3.41 to 38.42)	22.38 (6.83 to 73.39)	17.70 (6.98 to 44.93)	3.34 (1.25 to 8.90)	11.47 (4.13 to 31.84)
Musculoskeletal	14.24 (7.30 to 27.80)	18.33 (9.05 to 37.14)	15.91 (5.04 to 50.23)	25.35 (8.07 to 79.64)	34.83 (11.06 to 109.73)	15.17 (6.15 to 37.44)	5.94 (2.40 to 14.74)	14.31 (5.27 to 38.81)
Pregnancy	21.46 (10.79 to 42.71)	28.56 (13.89 to 58.72)	37.41 (8.41 to 166.35)	21.79 (4.17 to 113.89)	N/A	N/A	N/A	N/A
Injuries and poisoning	12.45 (6.16 to 25.14)	12.84 (6.11 to 26.99)	18.23 (5.68 to 58.51)	24.71 (7.75 to 78.74)	62.66 (19.97 to 196.60)	25.29 (10.31 to 62.01)	6.18 (2.40 to 15.93)	14.87 (5.38 to 41.12)
Other	8.22 (4.17 to 16.17)	8.26 (4.03 to 16.94)	9.32 (2.93 to 29.62)	12.38 (3.91 to 39.15)	20.33 (6.39 to 64.64)	8.82 (3.52 to 22.12)	3.64 (1.45 to 9.16)	9.40 (3.45 to 25.63)

aOR, adjusted OR; ICD-10, International Classification of Diseases, 10th revision; N/A, not available.

in a UK study to be the main medical diagnosis of long-term SA, above musculoskeletal disorders.[12] Common mental disorders, such as anxiety and depression, are strong predictors of long-term and recurrent SA, and they affect health over an extended period.[29] A Finnish study investigating SA trajectories preceding disability retirement showed that patients belonging to the high-stable SA trajectory were more likely to retire because of common mental disorders.[27] Recently, sociodemographic factors, morbidity characteristics and employment status were found to be predictors of work disability trajectory among workers struggling with long-lasting SA depressive episodes.[22] In our study, the increasing trajectory revealed a concerning group of workers who had a continuously increasing number of days out of work due to mental health-related diagnoses. Facing an unbalanced relationship between mental health limitations and work-related demands may be a cause of a delayed return to work, with recurrent SA episodes and steadily accumulating SA days over time. We found this pattern to be more noticeable among all women and young men. A further step should be to investigate the in depth patterns of SA due to mental diagnoses and its predictors among the young-middle age working population. Our study took a broad approach to examining the general picture of SA patterns over time among a Spanish working population; a diagnosis-specific approach would help disentangle SA trajectories more accurately. However, as we included the total number of SA episodes, our study accounts for SA recurrence, but only for the 3 years of follow-up.

Mental disorders and musculoskeletal disorders are the leading causes of long-term SA.[30] In general, approximately one in four SA episodes are due to musculoskeletal disorders.[31] Similarly, we found musculoskeletal disorders distributed across the two non-stable trajectories. In a prior study, high-stable work absence patterns were strongly associated with the number of pain sites in middle-aged workers.[18] Workers belonging to this trajectory likely had more severe, long-lasting musculoskeletal pathologies and accumulated multiple pain locations. In contrast, those in the decreasing and low-stable patterns may have had SA episodes due to other isolated, acute and short-term specific musculoskeletal diagnoses, such as cervical or low back pain. As physical and mental ill-health are associated, musculoskeletal disorders may also be considered as a somatisation of a mental health problems or co-occur with a diagnosed mental pathology,[32 33] leading to a limited health status that accumulates long periods of SA.[34]

We found that, apart from salary, employment conditions did not define the SA patterns. However, a higher proportion of workers with low salary had a decreased number of days of SA over time compared with the other two SA patterns. Disincentives related to SA benefits payment regulation could partially explain this result. In Spain, entitlement to SA benefits starts the fourth sick day, with a maximum duration of 1 year, and an extension of 6 months if recovery is expected during this period.

The amount of SA benefit varies between 60% and 75% of the salary for private sector employees; the employer pays from the 4th to 15th day and the Social Security system from the 16th day onwards.[35 36] It is likely that loss of economical resources, particularly among workers with the lowest salaries, encourage them to return to work earlier, reducing the number of days of SA and receiving a reduced income from benefits. Second, perceived insecurity associated with more precarious employment conditions could lead to a fear of dismissal.[37] Changes in labour market regulations in 2012 in Spain led to more flexible labour relationships, which has contributed to an increase in unstable workplaces and perceived insecurity.[38] The association analysis showed that low salary was a determinant of both decreasing and increasing SA trajectory among older workers. A possible explanation for a decreasing number of days of SA, as mentioned above, may be presenteeism (ie, to attend to work while sick) due to reduced economical coverage of the SA provision. Along these lines, a US study found that more than half of workers went to work sick due to a lack in coverage of paid SA.[39] In addition, presenteeism could affect older workers more because of higher perceived job insecurity, as they know that in the case of job loss their chances of getting a new job are reduced compared with their younger counterparts. On the other hand, increased SA days related to low salary may be explained because workers postpone the onset of the SA episode as much as possible to maintain their full salary, while the existing health problem becomes more severe and the SA becomes longer. Similarly, a comorbidity could arise during an SA, which could lead to a long-term SA, especially in the case of mental or musculoskeletal disorders with one or more co-diagnoses.[34] In addition, it is possible that, to a lesser extent, the replacement rate for long-term SA episodes (representing 75% of the salary from day 21 onwards in Spain) may be an incentive to lengthen the SA. Some studies have shown that increases in the generosity of the SA provision are related to increases in SA duration, and that this increase does not translate into an improvement in employee health.[40 41] However, another study showed that generous SA benefits are related to a decrease in the number of days of SA in the long-term, which supports that no incentive exists to extend SA longer than strictly necessary for medical reasons.[4]

A large body of prior research has found worst health outcomes for temporary workers,[42–44] but our study showed that employment conditions, such as type of contract, working time and occupational category, did not differ across SA patterns. One limitation to consider is a potential selection bias when classifying workers into categories of employment conditions. We classified individuals based on the employment condition in which they spent the most time. However, a person who was mainly employed with a permanent contract during the follow-up could, for example, accumulate more days on SA while employed as a temporary worker. This may lead to an underestimation of the relationship between

employment conditions and SA patterns. Similarly, information related to working-related conditions, health-related behaviours, healthcare consumption and family structure that would be worth considering to identify and describe SA patterns were not available. In addition, accounting for the effect of baseline health status prior to the SA follow-up was not possible because of the lack of health-related data and prior SA episodes. Finally, SA episodes without a closure date were not included in the study; thus, we were not accounting for some ongoing long-term episodes and may have underestimated accumulated days of SA.

Our findings are likely to be relevant to other working populations. The data came from a high-quality administrative registry that provides a large representative sample of the working population appropriated for the aim of our study. Health-related data derived from medical diagnosis certifications conducted by general physicians from the National Health Service provides a higher validity of results compared with self-reported SA measures, as shown in other studies.[45] In addition, selection of the two birth cohorts allowed us to control for the potential effects of age and contextual factors on SA behaviour, as each cohort includes individuals that share similar socioeconomic characteristics and labour market regulation contexts.

Our results from the trajectory analysis may be useful for guiding occupational health professionals in the more accurate identification of individuals who need support to maintain their work ability and facilitate their return to work. As mental disorders seem to drive a pattern of increasing SA, early detection of workers at risk of mental disorders would help in developing more tailored interventions to deal with and prevent mental health problems in future working life, especially among young workers. Future research should focus on patterns of SA by diagnosis groups and specific pathologies over time. Special attention is warranted on the course of mental disorders among young and middle-aged workers.

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