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# The effect of multimorbidity on sickness absence by specific diagnoses

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| **Background** | As the world's population ages, the prevalence of multiple chronic and non-chronic health-related conditions is increasing. Research on multimorbidity, the co-occurrence of two or more health-related conditions, has mainly involved patient and older populations. Its effect in working populations, presumably younger and healthier, is not well known but could conceivably affect sickness absence (SA) and ability to return to work. |
| **Aims** | To examine the effect of multimorbidity on the incidence and duration of SA episodes by frequent diagnostic groups. |
| **Methods** | A prospective study (in 2006–2008) of workers in Spain. Information on health-related conditions was gathered with a standardized questionnaire and used to construct a sex-specific multidimensional multimorbidity score (MDMS). In order to estimate the effect of MDMS on incidence and duration of SA episodes due to cardiovascular diseases (CVD), musculoskeletal disorders (MSD) and mental health disorders (MHD), we fitted Cox models adjusted by age, occupational social class and number of prior SA episodes for both sexes. |
| **Results** | The study population was 372 370. Men with high MDMS showed a trend towards higher incidence risk for SA due to CVD and MSD [adjusted hazard ratio (aHR) = 2.03; 95% confidence interval (CI) 1.48–2.78 and aHR = 1.20; 95% CI 1.01–1.43, respectively]. Women showed a similar trend for MSD, but MHD had the strongest association (aHR = 4.78; 95% CI 1.97–11.62) for high MDMS. In both sexes, the effect of MDMS was strongest among those without a prior SA. No consistent associations with SA duration were observed. |
| **Conclusions** | Multimorbidity increased the risk of incident musculoskeletal, mental and cardiovascular SA episodes but not their duration. |
| **Key words** | Cardiovascular disease; chronic conditions; comorbidity; mental health disorder; musculoskeletal disorders; sick leave. |

## Introduction

Sickness absence (SA) has a substantial impact on health care and on economic and personal costs. In the mid-2000s, SA together with permanent disability represented 4–5% of the gross domestic product for some of the Organization for Economic Cooperation and Development (OECD) countries [1]. In Western Europe, average absence rates range from 3 to 6% of working time [2]. While work-related and socio-demographic determinants of SA have been well studied [3,4], those related to worker health status have received less attention. This is despite chronic medical conditions being identified as key determinants of an increase in work-related absences, and therefore a substantial part

of the burden on labour costs [5,6]. Although most workers with chronic health-related conditions are able to work without accommodations or restrictions, they are more likely to have health-related limitations and disabilities than 'healthier' workers [7]. Other authors have noted that health-related limitations are common, affecting over half of workers, and are influenced by organizational factors such as work engagement and decision latitude [8].

Multimorbidity is defined as the co-occurrence of two or more chronic conditions, considering none as the primary one. The number and type of chronic conditions have an incremental effect on predicting work impairment and work absences across combinations of those conditions [9], affecting both quality of life and disability [10]. Interest in the epidemiology of multimorbidity has increased over the last decade, mostly due to its increasing impact in primary care settings and on hospitalization rates, treatments and their associated costs [11]. The need to focus on disease as a whole rather than a single pathology challenges both health care systems and clinical practice. To date, multimorbidity measures have mostly focused on predicting specific outcomes (e.g. mortality) among the elderly and/or patient populations. The applicability of this research to working populations (i.e. presumably younger and healthier than the general population) is, however, much less well studied, with little research examining its impact on key workforce health indicators, such as SA or ability to function at work. In this study, we examine the effect of multimorbidity on the incidence and duration of SA due to three common, high-cost diagnostic groups: musculoskeletal disorders (MSD), mental health disorders (MHD) and cardiovascular diseases (CVD).

## Methods

The study population comprised workers registered with the Spanish social security system and covered by one of the largest state health mutual insurance companies (*mutua*; overall insured population 600 161 men and 380 302 women), who in 2006 underwent a standardized medical evaluation by a subsidiary occupational health (OH) service for general health surveillance purposes. In Spain, employers are required by law to provide periodic standard medical evaluations. However, with the exception of specific occupations, undergoing these medical evaluations is mostly voluntary. Occupational physicians performed all evaluations, which included a standardized questionnaire to collect information on chronic conditions (i.e. hypertension, hyperlipidemia, diabetes, venous thrombosis, coronary artery disease, cerebrovascular disease and/or peripheral vascular disease), health behaviours (i.e. tobacco and alcohol consumption) and selected symptoms (i.e. headache, fatigue, sleep disturbances, neck and low back pain). Body mass index was also measured during the physical examination. The questionnaire was developed by the OH service personnel (researchers, technicians and occupational physicians) based on the relevant literature and expert opinion.

The study was a prospective cohort study starting at the time of the 2006 medical evaluation with participants followed for up to 2 years, either until the closure of a first (incident) SA episode or until the end of the study period. In Spain, SA certification is initiated and terminated by a primary care physician in the National Health Service. Information on prior SA episodes occurring within 2 years prior to the medical evaluation, incident SA and other socio-demographic variables were obtained from the official Spanish social security system SA registry. The data from the medical evaluations had been used previously to construct a sex-specific multidimensional multimorbidity score (MDMS) [12]. In a first step, we examined relationships between co-existing health-related chronic conditions, behaviours and symptoms using multiple correspondence analysis (MCA). This technique identifies patterns (i.e. dimensions) of non-random relationships between more than two sets of categorical variables that explain most of the existing variability. In a second step, a MDMS was created based on the contributions of each relevant variable to the total variability explained by the dimensions obtained from the MCA. The study proposal was approved by the Clinical Research Ethics Committee of the Parc de Salut Mar in Barcelona and an agreement assuring participant confidentiality was signed by all stakeholders. All participants gave informed consent for their data to be included in the study. All data were anonymized before being delivered to the research team.

The main outcome variables were incidence and duration (end date of the episode minus the start date + 1 day) of the first SA episode arising after the 2006 medical evaluation. The main covariate was MDMS, which ranged from 0 (no multimorbidity) to 100 (high multimorbidity). Individuals with multimorbidity (i.e. two or more health conditions) were grouped into tertiles of MDMS of low, medium and high multimorbidity levels. In addition, we categorized those without MDMS into two groups: none or one health condition. Prior SA episodes were grouped by their number into three categories (0, 1–4 or ≥5). Socio-demographic and labour characteristics included sex, age (<25, 25–34, 35–44, 45–54, 55–65, >65 years) and occupation coded using the Spanish National Classification of Occupations (CNO93) and grouped by occupational social class [13] [I-management (≥10 employees), II-management (<10 employees), IIIa-administrative, IIIc-manual workers' supervisor, IVa-skilled manual workers, IVb-semi-skilled manual workers and V-unskilled workers]. For incident SA episodes, medical diagnoses were coded using the 9th Revision of the International Classification of Diseases [14] and categorized into three common, high-cost diagnostic groups: CVD (ICD9 390–459), MSD (ICD9 719–739) and MHD (ICD9 290–310).

We fitted Cox models to study the association between multimorbidity and the incidence and duration of first

SA episodes arising during the follow-up period for each diagnostic group. Cox survival analysis estimates the probability that an event will occur in an interval of time if it has not occurred in the previous interval for an outcome at any point in time (i.e. 'hazard' as the ratio of the hazard rate), assuming the hazard ratio (HR) is constant over the time. In this study, the term 'hazard' has a 'protective' connotation, in terms of 'instantaneous risk' of case closure for duration [i.e. adjusted HR (aHR) > 1 represents a shorter duration or 'better outcome' as compared with referents], but is a 'risk factor' for SA incidence (i.e. aHR > 1 represents a higher risk of developing an SA episode or 'worse outcome'). After examining the Schoenfeld residuals, the proportionality of hazard assumption was considered. The proportional hazard assumption was also examined via Kaplan–Meier curves and tested by including interaction terms between each predictor and the logarithm of the follow-up period. The assumption was met for all covariates, except for the number of previous SA episodes ($P < 0.05$) which was included as a time-varying covariate in the Cox models for incidence, adjusted for age and occupational social class. By incorporating interaction terms into the separate models, we checked whether the associations between MDMS and the incidence and duration of SA were dependent on the number of previous SA episodes. We found no meaningful interactions, so the final models were computed without including interactions. All analyses were conducted for men and women separately, using Stata/MP 13© (StataCorp. 2013. Stata Statistical Software: Release 13; StataCorp LP, College Station, TX).

## Results

The size of the study population was 372 370 and comprised 73% men and 27% women. For SA incidence, the final sample ($n$ = 327 940) excluded workers whose insurance coverage ended before the 2006 medical evaluation or before a recorded SA episode, those who were on SA leave during the medical evaluation and those with incomplete data for the key variables. For SA duration, the final sample ($n$ = 24 351) excluded workers with no SA episodes during the follow-up, and those with episodes longer than the legal duration for SA episodes recognized by the National Security System (>548 days) (Figure 1).

At baseline, participants were more likely to be women (28 versus 27%; $P < 0.001$), less manually skilled (31 versus 32%; $P < 0.001$) and have had fewer prior SA episodes (6 versus 9%; $P < 0.001$) than those excluded. No significant differences were found across MDMS levels between participants and excluded men or women. Compared with women, men were slightly older and worked more frequently in skilled and unskilled manual occupations, while women more often worked in administrative and semi-skilled occupations (results not shown). Participant characteristics by sex and MDMS

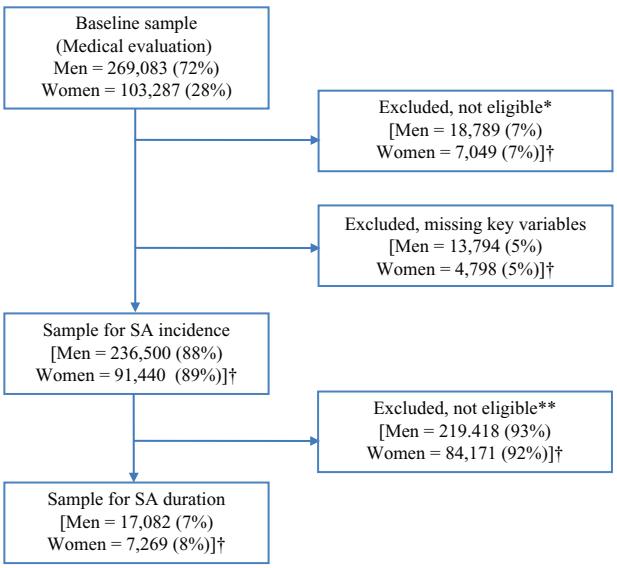


**Figure 1.** Flow chart of sample selection.

score levels are shown in Table 1. The proportion of multimorbidity across MDMS levels was six times higher in men (12%) than in women (2%). In both sexes, higher levels of MDMS were associated with older age (mean ± SD, 51.8 years ± 8.4 and 41.2 ± 9.8 for men and women, respectively). Among men, prior SA episodes and working in management and administrative occupations were associated with higher multimorbidity levels. In women, they were associated with unskilled occupations.

Table 2 presents the associations of MDMS levels with overall and diagnosis-specific SA incidence, after adjusting for age, number of prior SA episodes and occupational social class. The overall 2-year incidence for SA was almost 8% (7 and 8% for men and women, respectively). Among men with multimorbidity, overall SA incidence was 11%, 60% higher [relative risk (RR) = 1.60; 95% confidence interval (CI) 1.57–1.68] than among men without multimorbidity (7%). This was similar in women (RR = 1.54; 95% CI 1.36–1.74). Collectively CVD, MSD and MHD represented 28% (in men) and 30% (in women) of overall incident SA episodes where a diagnosis had been recorded (61 and 66%, respectively). As compared with men without multimorbidity, men with high MDMS showed a trend towards higher incidence risk for those SA initiated for diagnoses of CVD and MSD (aHR = 2.03; 95% CI 1.48–2.78 and aHR = 1.20; 95% CI 1.01–1.43 for high MDMS, respectively). This effect persisted after stratifying by prior SA episodes, increasing among those without a prior SA (aHR = 2.29; 95% CI 1.44–3.64 for CVD and aHR = 1.46; 95% CI 1.11–1.93 for MSD). A similar pattern was observed for MHD although results were only significant for those without prior SA episodes and high MDMS. Among women, this trend was not clearly present for either CVD or MSD. However, there was a strong effect for MHD episodes with aHR = 1.41 (95% CI 1.10–1.81) for low MDMS, and aHR = 4.78 (95% CI 1.97–11.62) for high MDMS levels,

**Table 1.** Baseline sample characteristics by sex and MDMS levels[a]

| Characteristics | Total | No health condition | One health condition | MDMS levels | | | *P* value for trend[b] |
|---|---|---|---|---|---|---|---|
| | | | | Low | Medium | High | |
| **Men** | | | | | | | |
| *N* | 236 500 | 141 151 (60) | 65 893 (28) | 9968 (4) | 10 184 (4) | 9304 (4) | |
| Age, mean (SD) | 37.9 (11) | 34.8 (10) | 40.3 (10) | 43.8 (10) | 46.6 (10) | 51.8 (8) | <0.001 |
| No. prior SA | | | | | | | |
| 0 | 221 786 (94) | 133 865 (95) | 61 356 (93) | 9082 (91) | 9225 (91) | 8258 (89) | <0.001 |
| 1–4 | 14 401 (6) | 7116 (5) | 4439 (7) | 871 (9) | 946 (9) | 1029 (11) | <0.001 |
| ≥5 | 313 (0) | 170 (0) | 98 (0) | 15 (0) | 13 (0.2) | 17 (0) | <0.05 |
| Occupational social class[c] | | | | | | | |
| I-Management (≥10 employees) | 19 310 (8) | 11 093 (8) | 5638 (9) | 728 (7) | 946 (9) | 905 (10) | <0.001 |
| II-Management (<10 employees) | 10 647 (5) | 6672 (5) | 2837 (4) | 369 (4) | 409 (4) | 360 (4) | <0.001 |
| IIa-Administrative | 29 351 (12) | 16 428 (12) | 8676 (13) | 1272 (13) | 1502 (15) | 1473 (16) | <0.001 |
| IIc-Supervisor | 13 323 (6) | 7340 (5) | 3806 (6) | 712 (7) | 792 (8) | 673(7) | <0.001 |
| IVa-Skilled manual | 96 877 (41) | 57 499 (41) | 27 213 (41.3) | 4287 (43) | 4200 (41) | 3678 (40) | <0.001 |
| IVb-Semi-skilled manual | 191 116 (8) | 11 163(8) | 5622 (9) | 806 (8) | 815 (8) | 710 (8) | <0.001 |
| V-Unskilled | 47 876 (20) | 30 956 (22) | 12 101 (18) | 1794 (18) | 1520 (15) | 1505 (16) | <0.001 |
| **Women** | | | | | | | |
| *N* | 91 440 | 77 667 (85) | 11 976 (13) | 802 (1) | 744 (1) | 251 (0) | |
| Age, mean (SD) | 35.8 (10) | 35.3 (10) | 39.1 (11) | 40.4 (11) | 37.9 (10) | 41.2 (10) | <0.001 |
| No. prior SA | | | | | | | |
| 0 | 85 137 (93) | 72 774 (94) | 10 771 (90) | 703 (88) | 660 (89) | 229 (91) | <0.001 |
| 1–4 | 6149 (7) | 4782 (6) | 1170 (10) | 97 (12) | 80 (11) | 20 (8) | <0.001 |
| ≥5 | 154 (0) | 111 (0) | 35 (0) | 2 (0) | 4 (1) | 2 (1) | <0.001 |
| Occupational social class[c] | | | | | | | |
| I-Management (≥10 employees) | 7731 (9) | 6743 (9) | 895 (8) | 40 (5) | 39 (5) | 14 (6) | <0.001 |
| II-Management (<10 employees) | 6889 (8) | 6024 (8) | 755 (6) | 48 (6) | 43 (6) | 19 (8) | NS |
| IIa-Administrative | 38 768 (42) | 33 517 (43) | 4618 (39) | 269 (34) | 286 (38) | 78 (31) | <0.05 |
| IIc-Supervisor | 984 (1) | 830 (1) | 135 (1) | 10 (1) | 6 (1) | 3 (1) | <0.05 |
| IVa-Skilled manual | 6568 (7) | 5447 (7) | 959 (8) | 71 (9) | 74 (10) | 17 (7) | <0.001 |
| IVb-Semi-skilled manual | 15 789 (17) | 13 261 (17) | 2200 (18) | 155 (19) | 129 (17) | 44 (18) | <0.001 |
| V-Unskilled | 14 711 (16) | 11 845 (15) | 2414 (20) | 209 (26) | 167 (22) | 76 (30) | <0.001 |

Figures are numbers (%) unless otherwise stated. NS, non-significant.
[a]MDMS >0 and ≥2 health conditions categorized into tertiles.
[b]*P* trend: *P* for linear trend across multimorbidity levels.
[c]According to Spanish National Classification of Occupations, 1993 (CNO93).

and greatest among those without a prior SA and with high MDMS (aHR = 7.49; 95% CI 2.37–23.70). In contrast, there were no significant associations between multimorbidity and duration of SA episodes, regardless of the presence or absence of prior SA episodes, except for women with MHD who had no prior SA episodes and high MDMS (aHR = 3.43; 95% CI 1.00–11.76) (Table 3).

## Discussion

We found multimorbidity to be an independent factor for incident SA episodes but not for their duration. The effect on incidence was notable among men, those with high multimorbidity, in the absence of prior SA, and in all three diagnosis-specific groups. Prior SA is a strong predictor of risk of future episodes [15]. However, the presence of multimorbidity added predictive value, especially among those without prior SA episodes. In contrast, it had little effect on SA duration, except in women with a mental health-related absence with high multimorbidity but no prior SA. These findings are relevant to the ageing working population, as the prevalence of chronic conditions is increasing [16], associated with reductions in quality of life, physical and cognitive capacity, which in turn can unfavourably affect employability [17], work ability [18], productivity and disability [19].

Few studies, mostly cross-sectional, have addressed the effect of multiple chronic conditions on SA [6,9]. Where they have done so this effect was generally estimated by grouping individuals based on the presence/absence of selected chronic health conditions [20,21], having two or more chronic conditions [5], their number

**Table 2.** Associations [aHR[a] (95% CI)] of MDMS levels with incidence for the first diagnosis-specific SA episodes, during 2 years of follow-up after 2006, overall and depending on having prior SA episodes

| Men ($n$ = 236 500) | | | | | | |
|---|---|---|---|---|---|---|
| Diagnoses (ICD9-CM) | Cases | One health condition ($n$ = 65 893) | MDMS levels | | | $P$ value for trend |
| | | | Low ($n$ = 9968) | Medium ($n$ = 10 184) | High ($n$ = 9304) | |
| MSD | | | | | | |
| Total | 2108 | 1.14 (1.03–1.26) | 1.29 (1.08–1.54) | 1.15 (0.96–1.38) | 1.20 (1.01–1.43) | 0.001 |
| Prior SA | 1236 | 1.13 (0.99–1.28) | 1.78 (0.94–1.48) | 1.01 (0.81–1.28) | 1.07(0.86–1.33) | NS |
| No prior SA | 872 | 1.15 (0.98–1.34) | 1.46 (1.10–1.92) | 1.39 (1.05–1.83) | 1.46 (1.11–1.93) | <0.001 |
| Mental disorders | | | | | | |
| Total | 482 | 0.92 (0.74–1.13) | 0.78 (0.50–1.20) | 1.02 (0.70–1.48) | 1.17 (0.82–1.69) | NS |
| Prior SA | 282 | 0.85 (0.65–1.12) | 0.74 (0.43–1.30) | 0.71 (0.42–1.20) | 0.85 (0.53–1.40) | NS |
| No prior SA | 200 | 0.99 (0.71–1.38) | 0.78 (0.35–1.66) | 1.67 (0.97–2.88) | 1.86 (1.02–3.23) | <0.05 |
| CVD | | | | | | |
| Total | 426 | 1.19 (0.94–1.51) | 1.62 (1.12–2.37) | 1.68 (1.19–2.37) | 2.03 (1.48–2.78) | <0.001 |
| Prior SA | 219 | 1.15 (0.83–1.60) | 1.33 (0.78–2.27) | 1.30 (0.79–2.14) | 1.80 (1.18–2.77) | <0.01 |
| No prior SA | 206 | 1.22 (0.86–1.71) | 1.99 (1.18–3.35) | 2.17 (1.34–3.52) | 2.29 (1.44–3.64) | <0.001 |
| Women ($n$ = 91 440) | | | | | | |
| | Cases | One health condition ($n$ = 11 976) | MDMS levels | | | $P$ value for trend |
| | | | Low ($n$ = 802) | Medium ($n$ = 744) | High ($n$ = 251) | |
| MSD | | | | | | |
| Total | 987 | 1.22 (1.04–1.43) | 1.43 (0.91–2.24) | 1.66 (1.04–2.65) | 1.08 (0.35–3.72) | <0.001 |
| Prior SA | 617 | 1.22 (1.01–1.48) | 1.32 (0.78–2.26) | 1.85 (1.12–3.11) | 1.26 (0.31–5.08) | <0.01 |
| No prior SA | 370 | 1.17 (0.89–1.55) | 1.67 (0.74–3.76) | 0.97 (0.74–3.76) | 0.83 (0.11–5.91) | NS |
| Mental disorders | | | | | | |
| Total | 388 | 1.41 (1.10–1.81) | 1.55 (0.73–3.30) | 1.34 (0.55–3.25) | 4.78 (1.97–11.62) | <0.001 |
| Prior SA | 225 | 1.01 (0.72–1.42) | 1.10 (0.41–2.98) | 1.07 (0.34–3.34) | 3.10 (0.76–12.61) | NS |
| No prior SA | 163 | 2.21 (1.54–3.18) | 2.39 (0.76–7.56) | 1.77 (0.44–7.18) | 7.49 (2.37–23.70) | <0.001 |
| CVD | | | | | | |
| Total | 82 | 2.03 (1.27–3.26) | 0.83 (0.11–6.15) | 1.32 (0.18–9.56) | – | NS |
| Prior SA | 56 | 2.05 (1.17–3.61) | 1.18 (0.16–8.72) | 1.68 (0.23–12.32) | – | NS |
| No prior SA | 26 | 1.88 (0.78–4.52) | – | – | – | NS |

[a]Adjusted for age, number of 2 years previous sickness absence episodes and occupational social class. ICD9-CM, The International Classification of Diseases, 9th Revision, Clinical Modification; NS, non-significant.

[22] or several combinations of those conditions [9] among older workers. We explore this further and our results are generally in agreement with this limited previous literature [5,9]. We also examined this effect in specific diagnostic subgroups. It was more evident for CVD episodes in men, possibly due partially to the number of questionnaire items devoted to cardiovascular conditions and risk factors, with fewer focusing on other high-cost chronic conditions (e.g. mental disorders, musculoskeletal diseases or tumours). Despite this, we still found associations between high multimorbidity and increased risk of new SA episodes due to musculoskeletal and mental disorders, the latter being especially strong among women. We did not find an effect on SA duration. Besides health-related, conditions other factors influence time to return to work, including job characteristics, psychosocial factors and organizational factors [7,22–24]. Unfortunately, except for occupational social class, we were unable to assess the effects of these other variables, as they were unavailable.

Selection bias may have been present since we only included the first SA episode during follow-up, as this may have underestimated how duration evolved due to the influence of new or recurrent episodes. Although the proportion of men (60%) and women (40%) insured by the *mutua* was representative of the Spanish working population [25], the under-representation of women in our study, together with the generally low prevalence of multimorbidity among women, may have affected the consistency of results. Women underwent fewer medical evaluations than men and reported fewer chronic conditions. In contrast, in the general population, women tend

**Table 3.** Associations [aHR[a] (95% CI)] of MDMS levels with duration for diagnosis-specific SA episodes, during 2 years of follow-up after 2006, in men and women overall and depending on having prior SA episodes

| Men ($n$ = 17 082) | | | | | | |
|---|---|---|---|---|---|---|
| Diagnoses (ICD9-CM) | Cases | One health condition ($n$ = 5184) | MDMS levels | | | $P$ value for trend |
| | | | Low ($n$ = 1004) | Medium ($n$ = 1045) | High ($n$ = 1143) | |
| MSD | | | | | | |
| Total | 2067 | 0.99 (0.89–1.09) | 0.92 (0.77–1.10) | 0.88 (0.73–1.06) | 0.83 (0.70–0.99) | <0.05 |
| Prior SA | 1211 | 0.98 (0.86–1.12) | 0.86 (0.68–1.08) | 1.01 (0.79–1.27) | 0.77 (0.61–0.96) | <0.05 |
| No prior SA | 856 | 1.02 (0.87–1.19) | 1.03 (0.78–1.35) | 0.75 (0.78–1.36) | 0.94 (0.70–1.24) | NS |
| Mental disorders | | | | | | |
| Total | 459 | 0.98 (0.68–1.44) | 1.26 (0.78–2.03) | 1.04 (0.71–1.55) | 0.99 (0.66–1.44) | NS |
| Prior SA | 266 | 1.12 (0.84–1.50) | 1.38 (0.78–2.46) | 0.92 (0.53–1.62) | 1.15 (0.69–1.92) | NS |
| No prior SA | 193 | 0.87 (0.62–1.24) | 1.27 (0.53–3.02) | 1.23 (0.53–3.02) | 1.23 (0.68–2.22) | NS |
| CVD | | | | | | |
| Total | 419 | 0.78 (0.61–1.00) | 0.65 (0.45–0.96) | 1.01 (0.70–1.44) | 0.80 (0.58–1.11) | NS |
| Prior SA | 216 | 0.87 (0.62–1.26) | 0.60 (0.34–1.07) | 1.12 (0.67–1.87) | 1.06 (0.66–1.68) | NS |
| No prior SA | 203 | 0.66 (0.47–0.94) | 0.63 (0.35–1.10) | 0.76 (0.46–1.28) | 0.61 (0.38–0.98) | NS |
| Women ($n$ = 7269) | | | | | | |
| | Cases | One health condition ($n$ = 1325) | MDMS levels | | | $P$ value for trend |
| | | | Low ($n$ = 107) | Medium ($n$ = 93) | High ($n$ = 27) | |
| MSD | | | | | | |
| Total | 972 | 0.85 (0.73–1.01) | 0.83 (0.53–1.30) | 0.69 (0.43–1.11) | 0.54 (0.17–1.68) | <0.05 |
| Prior SA | 607 | 0.80 (0.65–0.97) | 0.81 (0.47–1.38) | 0.62 (0.37–1.06) | 0.48 (0.12–1.94) | <0.01 |
| No prior SA | 365 | 1.02 (0.77–1.37) | 0.96 (0.45–2.15) | 0.98 (0.31–3.09) | 0.85 (.012-6.12) | NS |
| Mental disorders | | | | | | |
| Total | 379 | 1.06(0.82–1.36) | 0.83 (0.39–1.77) | 1.12 (0.46–2.74) | 1.23 (0.50–3.03) | NS |
| Prior SA | 221 | 1.12 (0.79–1.57) | 0.87 (0.32–2.42) | 1.81 (0.40–3.78) | 0.59 (0.14–2.47) | NS |
| No prior SA | 158 | 1.05 (0.72–1.53) | 0.68 (0.20–2.28) | 1.35 (0.31–5.94) | 3.43 (1.00–11.76) | NS |
| CVD | | | | | | |
| Total | 81 | 0.73 (0.41–1.30) | 0.27 (0.03–2.24) | 1.77 (0.19–16.07) | 1.00 (0.46–2.20) | NS |
| Prior SA | 55 | 0.66 (0.29–1.47) | 0.21 (0.22–1.90) | 2.73 (0.26–28.77) | – | NS |
| No prior SA | 26 | 0.42 (0.13–1.37) | – | – | – | NS |

[a]Adjusted for age, number of 2 years previous sickness absence episodes and occupational social class. ICD9-CM, The International Classification of Diseases, 9th Revision, Clinical Modification; NS, non-significant.

to visit general practitioners more often and are more likely to report health-related symptoms and poor self-perceived health [26]. Moreover, the healthy worker effect may be selecting out less healthy workers among women. We also lacked information regarding chronic conditions or SA for workers who did not undergo the 2006 medical evaluation. Other considerations should be considered when interpreting our findings. Chronic conditions were self-reported but mostly centred on standard variables of medical evaluations and CVD and risks. Moreover, the questionnaire was not specifically designed for this study. Thus, chronic health conditions and symptoms were likely to have been underestimated based on this limited list. Nonetheless, questionnaires and physical examinations were completed by occupational physicians, so clinical criteria and assessment should have reduced misclassification.

Previous studies found reasonable agreement between self-reported morbidity and medical records [27], and strong associations and sensitivity with subjective health status [10]. Workers may have different reasons for undergoing the medical evaluation, ranging from voluntary participation to mandatory determination of fitness-for-duty before entering a job or following sick leave. Although the working population was appropriate for our study aim and our findings are relevant, generalization to other working populations requires caution. Workers undergoing medical evaluations are often healthier and more prone to knowing their health status than the general population [28], so the prevalence of multimorbidity, as well as SA incidence and duration, may have been underestimated. In fact, the overall 2-year incidence in our sample (8%) was much lower than the annual incidence (25%) of SA in Spain in 2006 [29].

Study strengths included using a multimorbidity score, based on relationships among clustering health-related conditions as a measure of disease burden. This measure provides a multidimensional view of health status rather than focusing on an index or diagnosis leading to a workplace absence. Furthermore, by combining administrative data on SA history with data from medical evaluations, this 4-year longitudinal study design achieved a large sample size that allowed analysis by specific diagnosis groups.

Even though our data came from one of the largest mutual insurance companies in the country, with national representation, generalization to other working populations requires care. To improve internal validity, future studies should compile information from individual medical records, work-related factors and administrative SA management databases, within a comprehensive, nationally representative sample of workers registered in social security systems. Low back pain, arthritis, migraine, depression, CVD, asthma [30] and cancer represent the most common disabling chronic conditions among working adults. While episodes due to musculoskeletal, mental disorders and CVD were included in our study, others were not because of their low incidence (e.g. 3% for neoplasm). A limitation to consider is possible underestimation of prevalence for some diagnostic groups due to missing ICD9 codes for the total SA episodes (over 30% of the study population). Future studies should investigate the effect of multimorbidity on episodes caused by other highly disabling or limiting conditions.

In conclusion, examining multimorbidity may help prevent future SA episodes by improving our approach and surveillance of workers coping with health-related limitations who may benefit from workplace interventions.

## Key points

- Previous research on multimorbidity has focused on patient and older populations, but studies on workforce members are scarce.
- We found multimorbidity was an independent factor for incident sickness absence episodes due to musculoskeletal, mental disorders and cardiovascular diseases, but not consistently for duration.
- Because of the ageing working population, measuring multimorbidity may help design health promotion programmes and interventions focused on improving our approach to surveillance of individuals with health-related limitations, promoting better work participation, favouring work retention and preventing future sickness absence.

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## Conflicts of interest

None declared.

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