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Diagnosis-specific sickness absence and all-cause mortality in the GAZEL study

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Abstract

Objective

To examine diagnosis-specific sickness absence as a risk marker for all-cause mortality.

Design

Prospective occupational cohort (the GAZEL study). Medically-certified sickness absence spells greater than 7 days for 15 diagnostic categories, 1990–1992, were examined in relation to all-cause mortality, January 1993-February 2007. The reference group for each diagnostic category was participants with no spell >7 days for that diagnosis.

Participants

French public utility workers (5,271 women and 13,964 men) aged 37–51 in 1990, the GAZEL study. Over the follow-up period there were 144 deaths in women and 758 in men.

Main results

7,875 employees (41.0%) had at least one spell of sickness absence >7 days over the three-year period. The commonest diagnoses were mental disorders, musculoskeletal diseases, respiratory diseases and external causes in both sexes; genitourinary diseases in women, and digestive and circulatory diseases in men. Of these common diagnoses mental disorders in women, hazard ratio (95% confidence intervals) 1.24 (1.1–1.4); and mental disorders 1.35 (1.3–1.5), digestive diseases 1.29 (1.1–1.6) and circulatory diseases 1.35 (1.2–1.6) in men were associated with mortality after adjustment for age, employment grade and sickness absence in all other diagnostic categories.

Conclusions

Employees with medically-certified absence spells of one week or more over a three-year period had a 60% excess risk of early death. In women and men, this excess risk was associated with some of the commonest diagnoses of sickness absence, in particular mental disorders. Sickness absence for mental disorders may be a useful early indicator of groups at increased risk of fatal disease.

Author Keywords mortality, sickness absence, cause-specific, mental disorders, digestive diseases, circulatory diseases

Introduction

Concern has been expressed at government level in many industrialised countries about the rate and cost of sickness absence from work.1–4 Such concerns have fed into a long running debate in the popular press and scientific literature about the contribution of “genuine ” ill-health to sickness absence from work.5–9

Surprisingly, given the level of debate, few studies have examined associations between sickness absence and other medically-certified health outcomes, such as cancer registrations, disability pension, and mortality. Early studies demonstrated strong ecological associations between sickness absence, disability pensions, and mortality among British Postal workers.10 More recently, a series of studies using

individual data have confirmed these ecological observations. Findings from the British Whitehall II study and the Finnish 10-Town study have demonstrated strong associations between all-cause, medically-certified sickness absence and mortality,11;12 and a strong association between all-cause sickness absence and all-cause disability pension was observed in the 10-Town study.13 In a population-based study from Sweden, strong associations between sickness absence spells for mental disorders, digestive diseases, and musculoskeletal diseases and a disability pension for the same diagnosis14 confirmed findings from studies confined to populations with an existing specific sickness absence diagnosis.15;16 However, many of the diagnoses legitimising a disability pension, for example chronic low back pain, rarely imply a risk of early death and so results from studies that have examined the association between diagnosis-specific sickness absence and disability pension cannot be automatically generalized to mortality.

To date only one published study appears to have examined whether the association between all-cause sickness absence and mortality is ubiquitous, or is driven by specific diagnostic categories for sickness absence.17 This relatively small study identified a limited range of diagnostic categories associated with excess mortality within a population all of whom were on long-term sick leave lasting more than 8 weeks. In the present study we examine diagnosis-specific sickness absence as a risk marker for all-cause mortality among participants in the GAZEL study, a large cohort of French public utility workers. We focus on sickness absence for common diagnoses and determine whether observed associations are independent of absences for other diagnoses. Further, in light of the 'gender paradox', the observation of higher rates of morbidity among women but higher rates of mortality among men,18 we examine sex differences in the observed associations.

METHODS

The French GAZEL study is a prospective, occupational cohort study with detailed data from the employer's registers. All new medically-certified sickness-absence spells >7 days over a three-year window from the 1st January 1990 to 31st December 1992 were identified as the exposure and all-cause mortality from 1st January 1993–25th February 2007 as the outcome.

Study population

The GAZEL cohort is comprised of employees of France's national gas and electricity company: Electricité de France-Gaz de France (EDF-GDF). EDF-GDF employs about 150,000 workers in all regions of France, from large cities to small villages, who cover a wide range of white and blue-collars occupations. For most of its existence the company has been in the public sector and the workforce has been very stable. Employee turnover is low and employees are not lost to follow-up even after retirement as pensions are paid by the company itself. EDF-GDF has its own Occupational Health and Social Security system and around 300 physicians have responsibility for health surveillance of the work force.

The medical department of EDF-GDF maintains a comprehensive database on the health of the workforce containing demographic, socioeconomic and occupational data on each employee in addition to a register of sickness absences, accidents, permanent disabilities, compensated diseases, causes of death, cancer and coronary heart disease incidence. In 1989 the GAZEL cohort, a sample of 20,625 EDF-GDF employees, was set up to supplement these data with annual individual level data on lifestyle, self-reported health conditions and the social environment. At baseline these 5,614 women and 15,011 men were aged 35–50.19;20

Sickness absence

National regulations governing sickness absence in France require employees within 48 hours to submit a medical certificate, supplied by the individual's physician, for every day claimed as sickness absence. All EDF-GDF employees receive their salary in full from the employer for every spell of sickness absence, regardless of the length of the spell. Failure to produce a certificate results in loss of pay and may result in disciplinary sanction. All absence spells are recorded and subsequently each sickness absence is verified by EDF-GDF company physicians who code the diagnoses using an abridged version of the International Classification of Diseases (ICD) version 9. If required, company physicians may contact the physician treating the employee to verify the diagnosis. Validity of the sickness absence data has been tested and found to be of high quality.21;22

The exposure measure in this study comprises all new medically-certified sickness absence spells greater than 7 days over a three-year exposure window from the 1st January 1990 to 31st December 1992. Spells of >7 days that started within the exposure window but extended beyond it were included. Diagnoses in 14 ICD-9 chapters were included in the analyses, with the chapters relating to injury, poisoning and external causes collapsed to form one category; external causes. Absence spells with a diagnosis that fell outside the 14 categories were classified as 'Other', and spells with no diagnosis as 'Diagnosis missing'. To be included in a particular diagnostic category participants had to have at least one new sickness-absence spell >7 days for that diagnosis during the three-year exposure window. The reference group for each diagnostic category was all participants who had **no** spell >7 days for that specific diagnosis during the exposure window.

Mortality

All GAZEL participants have been traced for mortality from study entry in 1989. Vital status data are obtained annually from the company. These data are kept up to date by the human resources department and the retirement fund services as they are used to determine receipt of pay or retirement benefits. This study included all deaths between 1st January 1993 and 25th February 2007, a mean of 13.9(minimum <0.1 year–maximum 14.2 years).

Covariates

Analyses were adjusted for age and employment grade in 1990. Employment grade was derived from data supplied by the company and classified for the purposes of this study into three categories; higher (managers), intermediate (technical), and lower grade (clerical and manual). Of the 19,235 participants included in the analyses, data were missing on employment grade for 7 women and 14 men. Average age at start of follow-up was 42.9 (range 37–51) years for women and 45.7 (42–51) years for men. Employment grade was differentially distributed between the sexes. Among women 426 (8.1%) were in the higher, 3336 (63.3%) the intermediate, and 1502 (28.5%) the lower employment grades. The corresponding figures for men were 4250 (30.4%), 7531 (53.9%), and 2169 (15.5%) respectively.

Statistical analysis

Participants included in the present study were all 19,235 employees (5,271 women and 13,964 men) alive and working for EDF-GDF during 1990–1992. Excluded were participants who had died, retired, or left the company before the 1st January 1993 (343 women and 1047 men) and 21 participants missing data on employment grade. Over the follow-up period there were 902 deaths (144 women, 758 men). Cox proportional hazard models were used to calculate hazard ratios (HR) and 95% confidence intervals (95% CI) for all-cause mortality by sickness absence diagnostic category separately for women and men in models adjusted for age, used as a continuous variable, and employment grade. Subsequent analyses examined the independent effect of each sickness absence diagnostic category in analyses simultaneously adjusted for all other sickness absence diagnostic categories, including the 'Diagnosis' missing category. All analyses used the SAS 9.1 program.

RESULTS

Altogether there were 12,498 sickness absence spells >7 days (5,303 in women, 7,195 in men). These absences occurred among 7,875 (41.0%) of the 19,235 study participants. Absences were approximately evenly divided between spells of 8–14 days (21.6% in women, 26.7% in men) and spells of 15+ days (21.2% in women and 30.5% in men). The distribution of sickness absence spells by diagnostic category and sex is shown in Table 1. With the exception of external causes, levels of sickness absence were higher among women than men in every diagnostic category.

Approximately 19% of spells >7 days were missing a diagnosis in both sexes. Of spells with diagnoses, the most common categories in women were mental disorders (13.8%), musculoskeletal diseases (12.3%), respiratory diseases (10.7%), genitourinary diseases (7.9%), and external causes (7.4%). The most common categories in men were musculoskeletal diseases (17.4%), external causes (16.1%), respiratory diseases (10.3%), mental disorders and digestive diseases (7.5%), and circulatory diseases (6.8%).

Half of the 902 deaths occurred among the 7,875 participants with at least one spell of sickness absence >7 days during the exposure window. Table 2 shows the hazard ratio for mortality for each diagnostic category by sex. There is strong evidence of an association with mortality for sickness absence with a diagnosis of neoplasm or endocrine diseases in women, and the indication of an association among women with the diagnosis mental disorders. Most diagnostic categories were associated with mortality in men, one exception being genitourinary diagnoses. For diseases of the nervous system and sense organs estimates of mortality risk were similar in both sexes, but numbers of deaths in women were very small. Although hazard ratios in the remaining diagnostic categories appear to differ between the sexes, the interaction term for sex only reached statistical significance at the $p<0.05$ level for neoplasm, mental disorders, and musculoskeletal diseases.

Hazard ratios for the mortality associated with each sickness absence diagnostic category, mutually adjusted for sickness absences in all other diagnostic categories, are shown in Table 3. For a number of diagnostic categories this adjustment results in a substantial reduction in the risk for mortality, probably a reflection of the effects of co-morbidity. Sickness absence with the diagnosis mental disorders remained an independent predictor of mortality in both sexes; hazard ratio 1.24 (95% confidence interval 1.1–1.4) in women and 1.35 (1.3–1.5) in men. Further diagnostic categories associated with mortality after adjustment for sickness absences in all other diagnostic categories were neoplasm 1.78 (1.6–2.0) in women and 2.05 (1.8–2.3) in men; endocrine diseases in women, 1.82 (1.2–2.7); and digestive diseases 1.35 (1.2–1.6), circulatory diseases 1.35 (1.2–1.6), and skin diseases 1.75 (1.3–2.3) in men.

DISCUSSION

Forty-one percent of employees in this middle-aged working population had a spell of sickness absence >7 days over a three-year period. The commonest diagnoses in women were mental disorders, diseases of the musculoskeletal system, and respiratory diseases, followed by genitourinary diseases and external causes. In men, sickness absence with musculoskeletal diseases and external causes were

the most common, followed by respiratory diseases, mental disorders, digestive diseases, and circulatory diseases. Of these common diagnoses, mental disorders in women, and mental disorders, digestive diseases and circulatory diseases in men were associated with mortality after adjustment for age, employment grade, and sickness absence spells in all other diagnostic categories. Less common diagnostic categories associated with mortality after adjustment for other sickness absences were; neoplasm in both sexes, endocrine diseases in women, and skin diseases in men.

Methodological issues

This study has the benefit of a large sample size with a relatively long follow-up. Additional benefits are high quality sickness absence data, with diagnoses from company physicians, and mortality data, both from the employer's registers. The exclusion of participants who died, retired or left the company before the end of the 3-year sickness absence exposure period is likely to have resulted in conservative estimates of associations. Similarly the fact that Gazel is a cohort of volunteers means that those who chose to participate are likely to be healthier than those who did not. Although the study includes employees from only one company, they cover a wide range of jobs from manual worker to senior manager in all regions of a large country, so can be regarded as representative of the general population of that age employed in the public sector

Two limitations that apply are common to most studies of cause-specific sickness absence. Firstly, sickness absence is a complex phenomenon as some people may come to work despite disease and the decision to take sickness absence may be influenced by other factors in addition to disease severity. Secondly, the diagnosis is established at the beginning of the absence spell. For long absences this initial diagnosis may mask an underlying disease that manifests over time, resulting in misclassification of the later stages of the sickness absence spell. It also means that the participant is unable to contribute data to other diagnostic categories during the absence spell although co-morbid conditions may occur.

About one fifth of spells in the present study lack a diagnosis. These spells, 75% of which are of short duration (8–14 days), were not associated with early death. It is possible that in other diagnostic categories associations with mortality exist only for a subgroup with very long spells of sickness absence. However, unfortunately, the present study is underpowered to examine associations with mortality for spells of different durations in most diagnostic categories..

Findings

Levels of sickness absence were higher in women than men and mental disorders, musculoskeletal diseases, and respiratory diseases were the commonest diagnoses for sickness absence. These patterns reflect those observed previously in the GAZEL cohort, other studies, and national statistics on sickness absence for most industrialised countries.2;5;22;23

All-cause sickness absence has been shown to predict mortality at least as well as more established general health indicators such as self rated health, longstanding illness and a composite measure of common clinical conditions. It has been proposed that is because sickness absence is sensitive to the full array of illness employees experience during their work life.11 However, little previous work has been able to determine whether the association is ubiquitous, or is driven by specific diagnostic categories for sickness absence. Our findings show that in women the association appears to be driven by a limited number of diagnostic categories, while in men it is more ubiquitous, with strong evidence of an association with mortality for the majority of diagnostic categories. Some of these associations reflect co-morbidity as the evidence weakens on adjustment for absence spells in all other diagnostic categories, but an association with mental disorders remains in both sexes indicating that this may be a useful early indicator of groups at high risk of subsequent fatal disease.

The strong associations between sickness absence for specific diagnostic categories and mortality observed in the present study compliment those between all-cause sickness absence and disability pension or mortality observed in this and other cohorts,10–12;14;24 as well as those between cause-specific sickness absence and cause-specific disability pensions.14 The only previously published study to examine associations between diagnosis-specific sickness absence and mortality was carried out within a population all of whom had been absent for a minimum of 8 weeks.17 Using the general population as standard, women and men with a diagnosis of cancer and men with the diagnosis 'mental' or 'other' (respiratory, neurological, digestive) had higher standardised mortality ratios. All these findings are replicated in the present study in the diagnosis specific analyses (not mutually adjusted for spells with other diagnoses), with additional associations observed for mental disorders in women; and endocrine diseases, circulatory diseases, and diseases of the sense organs, skin and musculoskeletal system in men.

Sickness absence for mental disorders was the commonest sickness absence diagnosis in women and the prevalence was considerably greater than in men, 14% versus 8%. Such findings have been documented previously,2;25–30 and reflect common observations of gender differences in minor mental disorders. A number of studies have identified major mental disorders as predictors of mortality,31;32 and have demonstrated stronger associations in men than in women.32 However, observations of associations between minor mental disorders and mortality have produced mixed findings, with both positive associations and null findings observed.33;34

Two other common reasons for sickness absence, digestive and circulatory diseases, were associated with mortality in men after adjustment for sickness absence spells in all other diagnostic categories. Further research will be needed to determine the specific diagnoses that are driving the association between digestive diseases and mortality. In industrialised countries, circulatory diseases are generally more common and cause more deaths in men than in women of working ages,35 and higher rates in men have been demonstrated previously in the GAZEL population.36 Our study suggests that sickness absence with the diagnosis circulatory diseases may be a stronger predictor of death in men than women (sex interaction p=0.06).

Further diagnostic categories associated with mortality after adjustment for other absences were; neoplasm in both sexes, endocrine diseases in women, and skin diseases in men. The commonest cause of early death among persons of working age in France is cancer, with cancers of the lung and upper aero-digestive tracts especially high in men.36 Mortality associated with the diagnosis neoplasm was much higher in men (HR 6.2) than in women (HR 2.23). However, after adjustment for other sickness absence diagnoses the hazard ratio for men dropped to 2.05 while that for women was little changed, 1.78. This might indicate that among men many absences with the diagnosis neoplasm are for non-malignant tumours, or cancers with a high survival rate, such as prostate cancer. There were only a small number of deaths among women in the sickness absence category endocrine diseases and among men in the category skin diseases. An examination of the specific diagnoses for the absence spells within these categories, as well as the cause of death, is needed before any interpretation of these findings can be attempted. For example, the diagnosis may relate to conditions derivative of the process leading to death, as in a diagnosis of skin disease among participants with HIV/AIDS.

Conclusions

The present study confirmed findings from previous studies that sickness absence is a risk marker for all-cause mortality. In addition, we showed that both in women and men part of this excess mortality was due to sickness absence for specific diagnoses known to be predictive of death. However, in this population the much more general category of mental disorders also seemed to remain a strong risk marker for mortality in both sexes after adjustment for absence in all other diagnostic categories.

WHAT IS ALREADY KNOWN

Although there is a strong association between all-cause sickness absence and mortality, it is not known whether this association is ubiquitous or driven by specific diagnostic categories.

WHAT THIS STUDY ADDS

Over a 3-year period 40% of employees in this study had a sickness absence spell of more than one week and a 60% increased risk of early death.

Part of this excess mortality was due to sickness absence for diagnoses known to be predictive of death. However, the more general category of mental disorders was also a strong risk marker for mortality.

POLICY IMPLICATIONS

Employees with medically certified absence for mental diagnoses should be considered a population at elevated risk of fatal disease.

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Competing Interests: None.

Ethical Approval: The GAZEL study received the approval of France's national ethics committee (Commission Nationale Informatique et Liberté, CNIL).

Contributors: JEF, HW and ASM were involved in the conception and design of the present study. The data were prepared by MZ, MM, and JH and analysed by JV and MK. All the authors were involved in the interpretation of the data. JF wrote the initial draft and all successive

drafts of the paper. All authors contributed to drafts and approved the final version of the paper. MG and MZ are the principal investigators on the GAZEL study.

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Table 1

Diagnoses for all medically–certified sickness absence spells >7 days (1990–1992) and all-cause mortality 1993–2007 for 5271 women (2969 cases with ≥1 spell of sickness absence) and 13964 men (4908 cases with ≥1 spell of sickness absence) from the GAZEL cohort study, aged 37 to 51 in 1990 and in employment 1st January 1990–31st December 1992

	Women (N=5271)		Men (N=13,964)	
	Cases†		Cases†	
ICD-9 diagnostic categories	**N**	**% of all cases**	**N**	**% of all cases**
Infectious and parasitic diseases	65	1.23	95	1.32
Neoplasm	285	5.37	147	2.04
Endocrine, nutritional and metabolic diseases	73	1.38	88	1.22
Diseases of the blood and blood-forming organs	29	0.55	4	0.06
Mental disorders	733	13.82	540	7.51
Diseases of nervous system	42	0.79	57	0.79
Diseases of sense organs	88	1.66	155	2.15
Diseases of the circulatory system	249	4.70	488	6.78
Diseases of the respiratory system	565	10.65	742	10.31
Diseases of the digestive system	282	5.32	540	7.51
Diseases of the genitourinary system	419	7.90	223	3.10
Diseases of the skin and subcutaneous tissue	45	0.85	79	1.10
Diseases of musculoskeletal system and connective tissue	652	12.29	1254	17.43
External causes	394	7.43	1159	16.11
Other	369	6.96	267	3.71
Diagnosis missing	1013	19.10	1357	18.86
(No absence spell >7 days)	(2302)		(9056)	

† A case is a participant who has had at least one spell of absence >7 days for that diagnosis during the three-year exposure window. S/he may appear in more than one diagnostic category

Table 2

Age and employment grade–adjusted hazard ratios for all–cause mortality (1993–2007) for sickness absence spells >7 days (1990–1992) by diagnosis for 2969 women with ≥1 spell of sickness absence and 4908 men with ≥1 spell of sickness absence in the GAZEL cohort study

Diagnosis	**Women N =5,271**			**Men N =13,964**			**p-value sex interaction**
	N cases†	**N deaths (in cases)**	**HR (95% CI)***	**N cases**†	**N deaths (in cases)**	**HR (95% CI)***	
Infectious and parasitic diseases	65	0		95	10	1.76 (0.94–3.29)	0.94
Neoplasm	285	17	2.23 (1.34–3.70)	147	41	6.20 (4.53–8.50)	0.008
Endocrine, nutritional and metabolic diseases	73	6	3.05 (1.35–6.90)	88	11	2.12 (1.17–3.85)	0.61
Diseases of the blood and blood-forming organs	29	0		4	0		
Mental disorders	733	29	1.49 (0.99–2.24)	540	69	2.26 (1.76–2.90)	0.04
Diseases of nervous system	42	3	2.51 (0.80–7.89)	57	8	2.37 (1.18–4.75)	0.99
Diseases of sense organs	88	4	1.74 (0.64–4.70)	155	15	1.78 (1.07–2.97)	0.98
Diseases of the circulatory system	249	6	0.80 (0.35–1.81)	488	49	1.81 (1.35–2.41)	0.06
Diseases of respiratory system	565	19	1.17 (0.72–1.91)	742	66	1.48 (1.14–1.91)	0.24
Diseases of the digestive system	282	9	1.13 (0.57–2.21)	540	42	1.35 (0.99–1.85)	0.54
Diseases of genitourinary system	419	12	1.18 (0.62–2.02)	223	13	0.95 (0.55–1.65)	0.87
Diseases of the skin and subcutaneous tissue	45	1	0.75 (0.11–5.41)	79	10	1.94 (1.04–3.63)	0.31
Diseases of musculoskeletal system and connective tissue	652	16	0.78 (0.46–1.32)	1254	99	1.29 (1.04–1.60)	0.03
External causes	394	12	1.04 (0.57–1.88)	1159	79	1.13 (0.89–1.43)	0.55
Other	369	9	0.84 (0.43–1.65)	267	26	1.59 (1.07–2.35)	0.07
Diagnosis missing	1013	26	0.93 (0.61–1.43)	1357	95	1.18 (0.95–1.47)	0.15

† A case is a participant who has had at least one spell of absence >7 days for that diagnosis during the three-year exposure window. S/he may appear in more than one diagnostic category

* The reference group for each diagnostic category is participants with **no** spell >7 days for that specific diagnosis

Table 3

Age and employment grade–adjusted hazard ratios for all–cause mortality (1993–2007) for sickness absence spells >7 days (1990–1992) by diagnosis for 2969 women with ≥1 spell of sickness absence and 4908 men with ≥1 spell of sickness absence in the GAZEL cohort study, mutually adjusted for spells in all other diagnostic categories

Diagnosis	**Women N =5,271**			**Men N =13,964**		
	N cases†	**N deaths (in cases)**	**HR (95% CI)***	**N cases**†	**N deaths (in cases)**	**HR (95% CI)***
Infectious and parasitic diseases	65	0		95	10	1.31 (0.89–1.93)
Neoplasm	285	17	1.78 (1.59–2.00)	147	41	2.05 (1.80–2.34)
Endocrine, nutritional and metabolic diseases	73	6	1.82 (1.21–2.73)	88	11	1.36 (0.91–2.05)
Diseases of the blood and blood-forming organs	29	0		4	0	
Mental disorders	733	29	1.24 (1.11–1.38)	540	69	1.35 (1.25–1.45)
Diseases of nervous system	42	3	1.53 (0.65–3.56)	57	8	1.23 (0.89–1.69)
Diseases of sense organs	88	4	1.01 (0.57–2.17)	155	15	1.31 (0.90–1.92)
Diseases of the circulatory system	249	6	0.66 (0.32–1.40)	488	49	1.35 (1.16–1.56)
Diseases of respiratory system	565	19	1.02 (0.73–1.42)	742	66	1.07 (0.92–1.25)
Diseases of the digestive system	282	9	0.82 (0.46–1.47)	540	42	1.29 (1.05–1.59)
Diseases of genitourinary system	419	12	0.97 (0.62–1.51)	223	13	1.09 (0.78–1.51)
Diseases of the skin and subcutaneous tissue	45	1	0.78 (0.13–4.87)	79	10	1.75 (1.31–2.34)
Diseases of musculoskeletal system and connective tissue	652	16	0.81 (0.60–1.11)	1254	99	1.05 (0.95–1.17)
External causes	394	12	1.25 (0.87–1.80)	1159	79	1.08 (0.91–1.27)
Other	369	9	0.95 (0.60–1.52)	267	26	1.07 (0.77–1.47)
Diagnosis missing	1013	26	0.86 (0.56–1.32)	1357	95	1.01 (0.81–1.26)

† A case is a participant who has had at least one spell of absence >7 days for that diagnosis during the three-year exposure window. S/he may appear in more than one diagnostic category

* The reference group for each diagnostic category is participants with **no** spell >7 days for that specific diagnosis