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**Diagnosis-specific sick leave as a long-term predictor of disability pension: a 13-year follow-up of the GAZEL cohort study**

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## **Abstract**

**Background** Factors that increase the risk of labour market exclusion are poorly understood. In this study, we examined the extent to which all-cause and diagnosis-specific sick leave predict subsequent disability pension.

**Methods** Prospective cohort study of 20,434 persons employed by the French national gas and electric company (the GAZEL study). New sick-leave spells >7 days in 1990-1992 were obtained from company records. Follow-up for disability pension was from 1994 to 2007.

**Results** The hazard ratio, adjusted for age and occupational position, for disability pension was 3.5 (95% confidence interval 2.7 to 4.5) in men and 2.6 (1.9 to 3.5) in women with one or more sick leave spells >7 days, compared to those with no sick leave. The strongest predictor of disability pension was sick leave with a psychiatric diagnosis; hazard ratio 7.6 (5.2 to 10.9) for men and 4.1 (2.9 to 5.9) for women. Corresponding hazard ratios for sick leave due to circulatory diagnoses in men and women were 5.6 (3.7 to 8.6) and 3.1 (1.8 to 5.3), for respiratory diagnoses 3.9 (2.6 to 5.8) and 2.6 (1.7 to 4.0), and musculoskeletal diagnoses 4.6 (3.4 to 6.4) and 3.3 (2.2 to 4.8), respectively.

**Conclusions** Sick leave with a psychiatric diagnosis is a major risk factor for subsequent disability pension, especially among men. Sick leave due to musculoskeletal or circulatory disorders was also a strong predictor of disability pension. Diagnosis-specific sick leave should be recognised as an early risk marker for future exclusion from the labour market.

## **BACKGROUND**

Although health and longevity are improving over time, [1] the proportion of people out of the workforce due to health disorders, has risen. [2] Similarly, the rates of disability pension (DP) are increasing in many European countries. [2] These trends put a strain on the economy, employers, and insurance companies. [3] There is a need to identify early risk markers for future DP in order for healthcare providers, employers, and others to take preventive actions.

With the exception of very young people, DP is generally preceded by long-term sickness absence. Long-term sick leave has therefore been seen to be a good risk marker for subsequent DP, [4-8] although it is recognised that the majority of both long- and short-term sick-leave spells do not lead to DP. A recent population-based prospective cohort study from Sweden found elevated risks of future DP among persons with sick-leave spells exceeding seven days and also observed that the risk differed according to sick-leave diagnosis. [9] However, the extent to which sick leave is useful in determining long-term risk of DP remains unclear as the follow-up time in most studies has been relatively short. [3] Moreover, very few studies have considered diagnosis-specific sick leave as an early marker for DP because most registers of sickness absence lack data on medical diagnoses of the sick-leave spells.

The aim of this study was, therefore, to investigate all-cause and diagnosis-specific sick leave as long-term risk markers for DP.

## **METHODS**

### **Study design and study population**

This 13-year prospective study uses company register data from the GAZEL cohort study, France. The GAZEL study began in January 1989 when 44,922 employees of France's national gas and electric company, Electricité de France-Gaz de France (EDF-GDF), women aged 35-50 years and men aged 40-50 years, were asked to participate in a long-term observational study. Of these, about 45% participated yielding a sample of 20,625 subjects (27% women). Cohort participants hold civil servant-like status, have benefited from job stability, and have had opportunities for upward occupational mobility during their career. Typically, employees were hired in their 20s and have stayed with the company until old-age retirement, usually between 55 and 60 years of age with less than 1% in the study lost to follow up. [10]

The present analysis included 20,434 GAZEL participants who were employed on January 1<sup>st</sup> 1990 and still alive on January 1<sup>st</sup> 1994. We used records from EDF-GDF company registers to obtain baseline characteristics (sex, age and type of occupation in 1990), sick leave (1990-1992) and the date of DP, old-age pension or death until the end of 2007.

Ethical approval for the GAZEL study was provided by the French Commission Nationale Informatique et Libertés which oversees ethical aspects of data collection in France.

### **Sick-leave data**

All new sick-leave spells exceeding 7 days that began between January 1<sup>st</sup> 1990 and December 31<sup>st</sup> 1992 were included. Diagnoses for medically certified sick-leave spells were coded by company physicians using an abridged version of the International Classification of Diseases 9<sup>th</sup> version (ICD-9). [11] The following five diagnostic categories were used in the present study: Musculoskeletal (ICD-9 Chapter XIII), Psychiatric (V), Circulatory (VII), Respiratory (VIII), and Injuries (XVII). Sick-leave spells in all other diagnostic categories were classified as ‘All Other Diagnoses’. To be included in a particular diagnostic category, participants had to have at least one sick-leave spell >7 days with that diagnosis during the three-year exposure window. Dichotomous variables were derived for each diagnostic category (0 spells,  $\geq 1$  spells). Sick-leave diagnoses were missing for 20% of sick-leave spells during 1990-1992.

### **Disability pension**

At the time of this study, all EDF-GDF employees were covered by a company-run insurance scheme which entitled them to full pay during periods of sickness absence and 80% of their salary during retirement or when on DP. Company policy with regard to long-term sick leave was to grant a DP after five years of sickness absence. However, in order to stay on sickness benefit rather than DP, some workers interrupted their sick leave for a short period, before claiming sickness benefits again. To overcome this problem in the data, DP due to health problems was classified as temporary or permanent DP, or more than 600 sick-leave days during two consecutive years between January 1<sup>st</sup> 1994 and December 31<sup>st</sup> 2007. In order to separate the exposure measure (a new sick-leave spell in 1990-1992) from the outcome measure (DP), a “wash-out” period was used and outcome events in the 12 months (January

1<sup>st</sup>-December 31<sup>st</sup> 1993) immediately following the sickness absence exposure window were not included in the analyses.

### **Covariates**

Age in 1990 was grouped into three categories: 36-39; 40-44, and 45-50 years. Occupational grade in 1990 was available from EDF-GDF company records and coded into three groups: manual worker or clerk (low); technician or administrative associate professional (intermediate); engineer or manager (high).

### **Statistical analysis**

Differences in incidence of DP were tested with Cox proportional hazards models. Each individual in the study was followed from 1<sup>st</sup> January 1994 to date of DP or censored at the date of old-age retirement, death, or at the end of the study, 31<sup>st</sup> December 2007.

In Cox regression models, participants with no new sick leave spells >7 days in 1990-1992 served as the reference category. Hazard Ratios (HR) for the risk of a DP during 1994-2007 were adjusted for age and occupational position. We illustrated the effect of sick leave on the probability of incident DP by psychiatric sick leave, all other types of sick leave, and no new sick leave spells >7 days in the exposure period, using Kaplan Meier curves, tested with the log rank P value. All analyses were stratified by sex as there are sex differences in sickness absence, DP, and possibly in the underlying mechanisms. [3, 12-17] We tested the proportional hazards assumption by including an interaction of each diagnosis-specific absence variable with the log of follow up time. For women but not men, these interactions with time were statistically significant for any sick-leave spell (test for interaction,  $p=0.03$ ) and for all diagnostic categories (tests for interaction, psychiatric diagnoses  $p=0.006$ , circulatory  $p=0.004$ , respiratory  $p=0.02$ , musculoskeletal  $p=0.002$ , injuries  $p=0.03$ ). The interaction results indicated that hazards ratios for women tended to attenuate over follow-up time. To illustrate this, we used a piecewise Cox regression model to estimate separate hazard ratios for < 6 years follow-up and  $\geq 6$  years follow-up. The analyses were conducted using the SAS 9.1 program.

### **RESULTS**

A higher percentage of women than men had 1 or more sick-leave spell >7 days in 1990-1992 (Table 1). During the 13-year follow-up from 1994, 529 employees were granted a DP; 4.4% of the women and 1.9% of the men. The risk of DP was tripled among men who had a new sick-leave spell >7 days (HR 3.5; 95% CI 2.7-4.5) in 1990-1992, and more than doubled

among women in the corresponding category (HR 2.6; 1.9-3.5), compared to those with no sick leave (Table 2). The HRs for DP varied by sick-leave diagnosis and were high (HRs from 3 to 8) for all the five diagnostic groups studied. The HR for DP was higher for men than women in all diagnostic groups, with the exception of injuries, and was especially high for men who had at least one new sick-leave spell with a psychiatric diagnosis: 7.56 compared to 4.14 for women (test for sex interaction,  $p=0.019$ ). There was also a high likelihood of DP among men with sick leave due to a circulatory disease (HR 5.6) or musculoskeletal disease (HR 4.6). For all diagnostic groups, the HRs for DP in women were higher in the first six years of follow-up than in the later years of follow-up (Table 3).

**Table 1.** GAZEL cohort participants (N=20,434), incidence of sick-leave spells >7 days (SL) 1990-1992, and disability pension (DP) 1994-2007, in women and men.

Variables	Women			Men		
	n (%)	SL; n (%) <sup>2</sup>	DP; n (%) <sup>3</sup>	n (%)	SL; n (%) <sup>2</sup>	DP; n (%) <sup>3</sup>
<b>All</b>	5518 (100)	3082 (55.9)	245 (4.4)	14916 (100)	5280 (35.4)	284 (1.9)
<b>Sick leave</b>						
0 spells	2436 (44.2)		56 (2.3)	9636 (64.6)		92 (1.0)
>=1 spells	3082 (55.8)		189 (6.1)	5280 (35.4)		192 (3.6)
<b>Sick leave diagnoses<sup>1</sup></b>						
V Psychiatric	740 (13.4)		71 (9.6)	575 (3.9)		44 (7.7)
VII Circulatory	250 (4.5)		18 (7.2)	526 (3.5)		29 (5.5)
VIII Respiratory	576 (10.4)		36 (6.3)	815 (5.5)		35 (4.3)
XIII Musculoskeletal	696 (12.4)		51 (7.4)	1358 (9.1)		67 (4.9)
XVII Injury	416 (7.5)		33 (7.9)	1203 (8.1)		41 (3.4)
All other diagnoses	1420 (25.7)		90 (6.3)	1617 (10.8)		61 (3.8)
<b>Age</b>						
36-39	1709 (31.0)	924 (54.2)	78 (4.6)	0		
40-44	2135 (38.7)	1205 (56.4)	108 (5.1)	7173 (48.1)	2517 (35.1)	190 (2.7)
45-50	1674 (30.3)	953 (56.9)	59 (3.5)	7743 (51.9)	2763 (35.7)	94 (1.2)
<b>Occupational position</b>						
Low	1564 (28.3)	1016 (65.0)	88 (5.6)	2326 (16.0)	1272 (54.7)	84 (3.6)
Intermediate	3500 (63.4)	1900 (54.3)	147 (4.2)	8118 (54.4)	3022 (37.2)	153 (1.9)
High	454 (8.2)	166 (35.6)	10 (2.2)	4472 (30.0)	986 (22.1)	47 (1.1)

<sup>1</sup> >=1 spell due to respective diagnoses; groups are not mutually exclusive as participants may have spells in more than one category

<sup>2</sup> % of women or men who had at least one sick-leave spell

<sup>3</sup> % of women or men who were disability pensioned



**Table 2.** Hazard ratios (HR) and 95% confidence intervals (CI) of incident disability pension (DP) in 1994-2007 in women and men by sick leave in 1990-1992. Adjusted for age and occupational class.

Variables	Women	Men
	(n= 5518, DP n =245) HR (95% CI )	(n = 14916, DP n = 284) HR (95% CI )
<b>No sickness absence in 1990-92</b>	1	1
<b>Category of sick leave diagnoses</b>		
V Psychiatric	4.14 (2.90, 5.91)	7.56 (5.24, 10.89)
VII Circulatory	3.10 (1.82, 5.28)	5.62 (3.69, 8.56)
VIII Respiratory	2.62 (1.72, 3.99)	3.92 (2.64, 5.84)
XIII Musculoskeletal	3.29 (2.24, 4.82)	4.64 (3.35, 6.42)
XVII Injury	3.42 (2.22, 5.27)	3.00 (2.06, 4.37)
All other diagnoses	2.68 (1.91, 3.75)	3.64 (2.62, 5.05)
Any sick leave	2.61 (1.94, 3.53)	3.46 (2.68, 4.47)

**Table 3.** Hazard ratios (HR) and 95% confidence intervals (CI) of incident disability pension (DP) in 1994-2007 in women by sick leave in 1990-1992. Adjusted for age and occupational class.

Variables	< 6 years follow-up	>= 6 years follow-up
	(n= 5518, DP n =149) HR (95% CI )	(n = 5518, DP n =96 ) HR (95% CI )
<b>No sickness absence in 1990-92</b>	1	1
<b>Category of sick leave diagnoses</b>		
V Psychiatric	6.09 (3.84, 9.67)	2.14 (1.18, 3.89)
VII Circulatory	5.13 (2.73, 9.62)	1.05 (0.32, 3.44)
VIII Respiratory	3.33 (1.91, 5.80)	1.91 (0.99, 3.69)
XIII Musculoskeletal	5.11 (3.14, 8.31)	1.44 (0.71, 2.89)
XVII Injury	4.52 (2.58, 7.91)	2.32 (1.15, 4.66)
All other diagnoses	3.61 (2.30, 5.65)	1.75 (1.04, 2.94)
Any sick leave	3.33 (2.20, 5.02)	1.90 (1.22, 2.96)

There were large differences in the cumulative probability of DP associated with psychiatric sick leave, as compared to all other sick leave and no sick leave during the exposure period, (Figure 1). The risk was highest among those who initially had a sick-leave spell due to a psychiatric diagnosis and lowest among those with no new sick-leave spell in 1990-1992. Probability of DP was similar in men and women in the first 4-6 years; in the period that followed, women had a higher probability of DP than men for psychiatric sick leave, other sick leave, and no sick leave.

**Figure 1.** Cumulative hazard function for disability pension in 1994-2007 among participants of the GAZEL cohort who in 1990-1992 had no new sick leave spells >7 days, those who had such sick leave spells due to psychiatric disorders, and those who had sick leave spells with other diagnoses, respectively, for women and men.

## DISCUSSION

This 13-year follow-up of DP showed high relative risks among employees who had been sickness absent compared to those with no sick leave. Although the association between sick leave and DP was strong in both sexes, the hazard ratios were higher among men than women. This was especially noticeable for psychiatric diagnoses for which the HR was 7.6 in men, even though a washout period of one year was used. These data suggest that sickness absence of >7 days should be regarded as a risk marker for future DP, especially sick leave due to psychiatric or circulatory diagnoses.

Although sick leaves are common there are hardly any studies of the long-term consequences of being sickness absent. [18, 19] To date, most studies have focused on risk factors for sickness absence rather than sickness absence as a risk factor for DP. [20-22] However, risk factors for sickness absence are not necessarily the most important information needed by doctors, employees, or employers when considering sick leave at an individual level. [3] Earlier research on the GAZEL cohort has found a remarkably persistent association between sickness absence and future long-term self-rated health status for the majority of diagnostic categories for sickness absence [23] and mortality. [24] The results of the present study indicate that more attention should also be paid to sickness absence as a marker of future risk of DP.

Our results are in line with those of the largest study on this topic to date, the population-based cohort study of all 176,629 persons of working age living in a Swedish county. [9] In that study, 18% of participants had a new sick-leave spell of greater than 7 days during 1985. Over a follow-up of 11 years, 7% were granted DP with an overall 4-fold hazard for DP in the first five years and a 3-fold hazard in the following five years. Moreover, there was great variation in risk by diagnosis with risk highest for psychiatric diagnoses. An important difference is that the Swedish investigation [9] found musculoskeletal sick-leave diagnoses (rather than circulatory diagnoses) to be the second strongest predictor of future DP, with hazard ratios of 7 and 4, respectively, for the two follow-up periods. Further comparisons are hampered by the population-based design of the Swedish study in that levels of ill health are likely to be higher, given that unemployed and inactive individuals, who tend to have high rates of disease and DP, were included. In the present study, we adjusted for occupational position, known to be a predictor of both rates of sick leave and rates of DP, whereas data on occupational position was not available in the Swedish study. Also, in the Swedish study analyses were not stratified by sex. Sickness-absence studies have repeatedly shown that women have higher rates of sickness absence and DP than men [25-27] Nevertheless, it seems as if the future consequences of sickness absence, in terms of the relative risk of DP, might be higher for men, an observation that confirms findings from a Scandinavian study. [28]

Psychiatric disorders are very common in the population and rates of sickness absence due to psychiatric disorders have increased in many Western nations over the last decade. [29-32] In agreement with our findings, several studies have indicated that long-term sick leave with psychiatric diagnoses is a risk factor for DP. Karlsson et al [4] and Gjesdal et al [5, 6] observed this for sick-leave spells that exceeded eight weeks, and Vaez et al [31] for spells greater than 3 months. The present study extends these findings by showing that diagnosis-specific sick leave >7 days may also represent an important risk marker for DP.

### **Methodological considerations**

In recent decades, the level of sickness absence has fluctuated considerably in some countries, e.g. the Netherlands, Sweden, and Norway. [20, 33] However, this is not the case in France, which makes it a good setting for this type of study. A further strength of this study is the low turnover among employees at EDF-GDF. However, this also means that the results might not be generalizable to worksites where the turnover is higher. Other strengths are the unusually long follow-up period (13 years), good data quality, and no missing data for the outcomes. A

limitation is that the study is based on volunteers. However, the extent of healthy worker bias is likely to be comparable to that observed in other occupational cohort studies. [34, 35]

The validity of sick-leave diagnoses has been questioned, yet seldom studied. The few studies conducted conclude that the validity is in fact high, especially when using high ICD-chapter levels, as was the case in our analysis. [36] In the present study, the diagnoses were confirmed by an occupational health physician, further strengthening the validity. Of course, the high rate of sick-leave spells lacking a diagnosis is a limitation of this study. However, psychiatric sick-leave diagnoses probably have especially high validity. This is because they are considered to be most stigmatizing and so would not be assigned if not accurate.[30, 37] The use of a “wash-out” period of one year could, if anything, lead to an underestimation rather than overestimation of the risk.

## **Conclusion**

These data suggest that diagnosis-specific sickness absence should be recognised as a marker of future DP and considered as an indicator of need for preventive measures. In particular, psychiatric sickness absence should be considered as a risk factor for future early exclusion from the workforce.

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Competing interests: None.

#### **What is already known**

- Rates of disability pension or ill-health retirement are increasing in many European countries.
- Sick leave is associated with risk of disability pension in the short term but few studies have examined the long-term risk of disability pension.

#### **What this study adds**

- Sick leave of more than seven days was a strong predictor of disability pension over thirteen years of follow-up.
- Associations were particularly strong for sick leave with a psychiatric diagnosis, especially among men.
- Also short-term sick leave could be considered as a risk marker for future exclusions from the labour market.

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