Using Sickness Absence Records to Predict Future Depression in a Working Population: Prospective Findings From the GAZEL Cohort

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Objectives. We tested the hypothesis that sickness absence from work predicts workers' risk of later depression.

Methods. Study participants (n=7391) belonged to the French GAZEL cohort of employees of the national gas and electricity company. Sickness absence data (1996–1999) were obtained from company records. Participants' depression in 1996 and 1999 was assessed with the Center for Epidemiologic Studies–Depression (CES-D) scale. The analyses were controlled for baseline age, gender, marital status, occupational grade, tobacco smoking status, alcohol consumption, subthreshold depressive symptoms, and work stress.

Results. Among workers who were free of depression in 1996, 13% had depression in 1999. Compared with workers with no sickness absence during the study period, those with sickness absence were more likely to be depressed at follow-up (for 1 period of sickness absence, fully adjusted odds ratio [OR]=1.53, 95% confidence interval [CI]=1.28, 1.82; for 2 or more periods, fully adjusted OR=1.95, 95% CI=1.61, 2.36). Future depression was predicted both by psychiatric and nonpsychiatric sickness absence (fully adjusted OR=3.79 [95% CI=2.81, 5.10] and 1.41 [95% CI=1.21, 1.65], respectively).

Conclusions. Sickness absence records may help identify workers vulnerable to future depression. (*Am J Public Health.* 2009;99:1417–1422. doi:10.2105/AJPH.2008.142273)

In industrialized countries, depression affects up to 20% of individuals at some point during their lifetimes and is a leading cause of disability and decreased quality of life.[1,2] Typically, the disorder begins in adulthood, significantly impairing individuals' ability to fulfill their family and work roles.[3] Depression is a strong, independent, and underestimated risk factor for work-related disability.[4] Fortunately, it can be treated, and research suggests that adequate mental health treatment of affected individuals can improve both their clinical outcomes and work performance.[5,6]

Conversely, individuals' ability to fulfill their usual roles at work, as measured by sickness absence, appears to predict future health.[7–10,11] In particular, sickness absence may predict the occurrence of mental health problems such as depression, but to date this question has not been thoroughly examined.

To test the hypothesis that sickness absence from work predicts future onset of depression, we used data from the GAZEL study, an ongoing occupational cohort study of 20 000 workers,[12] in which exhaustive sickness absence data were collected directly from company records. To account for the possibility that sickness absence reflects prior mental health problems, we restricted the analysis to workers who did not have depression during the 12 months preceding the 1996 assessment and adjusted the analyses for subthreshold depressive symptoms. Additionally, our analyses controlled for participants' demographic characteristics, occupational grade, health behaviors, and work stress, because these factors may be associated with the onset of depression.

METHODS

The GAZEL cohort, which was established in 1989, comprises employees of France's national gas and electricity company, Electricité de France–Gaz de France (EDF–GDF). At baseline, 20 625 workers (15 011 men and 5614 women) aged 35 to 50 years were included. The study uses an annual questionnaire to collect data on health, lifestyle, individual, familial, social, and occupational factors. Various sources within and outside EDF–GDF have provided additional data about the participants; further details of the GAZEL study can be found elsewhere.[12,13]

Measures

Sickness absence. The exposure measure in this study was all medically certified sickness absence lasting more than 7 days in the 3-year period subsequent to the 1996 EDF–GDF questionnaire. We chose to focus on sickness absence of more than 7 days to enhance the comparability of our study findings with prior research and also because such periods of absence have been shown to be a good global measure of health problems.[8,14] Diagnoses for medically certified periods of sickness absence were coded by company physicians using an abridged version of the *International Classification of Diseases, Version 9* (*ICD-9*).[15] For our study, diagnoses for these periods of sickness absence were categorized as psychiatric (*ICD-9*, chapter 5) or nonpsychiatric (all other *ICD-9* chapters). To be included in a particular diagnostic category, participants had to have at least 1 period of sickness absence of more than 7 days for that diagnosis during the 3-year exposure window. Over time, a participant might have several different periods of both psychiatric and nonpsychiatric sickness absence.

Depression. For all GAZEL study participants, depression in 1996 and in 1999 was measured with the CES-D (Center for Epidemiological Studies–Depression) scale.[16] This scale includes 20 items that describe symptoms and behaviors

characteristic of depressive disorder. Following previous research, we considered a score of 17 or higher for men and 23 or higher for women to indicate depression.[17]

Covariates. Participants' demographic characteristics and health behaviors were measured in the 1996 GAZEL cohort survey as follows: age (43–50 or 51–57 years), gender (female or male), marital status (divorced, separated, or widowed vs married or living with a partner), tobacco smoking status (nonsmoker or smoker), and alcohol consumption (none, moderate [for women, 1–20 standard units of alcohol/week; for men, 1–27 units/week], or heavy [for women, ≥21 units/week; for men, ≥28 units/week]). Occupational grade (low [manual worker or clerk], intermediate [technician or administrative associate professional], or high [engineer or manager]) was available from EDF–GDF company records. Work stress was measured in the 1997 GAZEL cohort survey with the Karasek Job Content questionnaire[18] as follows: work decision latitude (degree of control over work tasks [9 items]), psychological work demands (workload and time pressures [9 items]), and social support at work (constructive feedback, praise, help when needed from colleagues and supervisors [8 items]). As previously demonstrated, these scales have shown evidence of validity and reliability.[19] To classify participants into low and high levels of exposure for each of the 3 measures of work stress, we used published cutpoints.[19]

Statistical Analysis

For our study, we included all 11 487 GAZEL cohort members who completed the 1996 study questionnaire and were working (1.6% of GAZEL cohort participants died and 17.6% retired prior to 1996; the response rate to the 1996 questionnaire was 75.6%). Additionally, to study the onset of depression, defined as the presence of depression at follow-up, we excluded participants who had depression in 1996, as measured by the CES-D scale (n=3053). In total, 7391 GAZEL participants met the study inclusion criteria and had a valid measure of depression in 1999.

To test the hypothesis that sickness absence predicts future depression, we used logistic regression. First, we studied the relationship between periods of sickness absence of more than 7 days between 1996 and 1999 and depression in 1999, adjusting for sex, age, and occupational grade. Second, we further adjusted the analysis for marital status, tobacco smoking status, alcohol consumption, and subthreshold depressive symptoms, defined as the number of depression symptoms on the CES-D scale that each participant had. Third, we tested whether the relationship between sickness absence and depression varied depending on the underlying medical diagnosis of sickness absence (psychiatric or nonpsychiatric). Fourth, we examined the role of work stress by controlling the analyses for work decision latitude, psychological work demands, and social support at work. Additionally, we verified that the relationship between sickness absence and onset of depression was stable regardless of participants' employment status during the study period. Data were analyzed with SAS statistical software, version 9.1 (SAS Institute Inc, Cary, North Carolina).

RESULTS

Table 1 presents the characteristics of the 7391 GAZEL participants who, in 1996, were employed and free of depression; 26% were women and 48% were older than 50 years. During the 3-year study period, 69% of study participants had no long periods of sickness absence, 18% had 1 long period, and 13% had 2 or more long periods. Three percent of study participants had 1 or more long period of absence with a psychiatric diagnosis and 27% had 1 or more long period of absence with a nonpsychiatric diagnosis. Fewer than 2% of study participants had both psychiatric and nonpsychiatric long periods of absence.

In 1999, 13% of study participants had newly occurring depression. The rate of depression was elevated among participants who were women, were aged younger than 50 years, belonged to a low occupational grade, smoked cigarettes, or were moderate or heavy alcohol drinkers (Table 1). Among work characteristics, high work decision latitude, low psychological work demands, and high social support at work predicted a reduced likelihood of developing depression.

Compared with participants who had no long periods of sickness absence during the study period, we found that those with long periods of leave had an increased probability of future depression, with odds ratios (ORs) of 1.62 (95% confidence interval [CI]=1.37, 1.91) for 1 period and 2.21 (95% CI=1.85, 2.64) for 2 or more periods.

As shown in Table 2, these ORs were slightly reduced but remained statistically significant after adjustment for age, gender, and occupational grade. A further adjustment for marital status, tobacco smoking status, alcohol consumption, and subthreshold depressive symptoms had little effect on these associations (fully adjusted OR=1.53; [95% CI=1. 28, 1.82] for 1 period of sickness absence and fully adjusted OR=1.95 [95% CI=1.61, 2.36] for 2 or more periods).

Examining the underlying medical causes of sickness absence, we found an increased likelihood of future depression among participants who took sickness absence for psychiatric reasons (age-, gender-, and occupational grade–adjusted OR=3.98, 95% CI=3.01, 5.26) and those who took sickness absence for nonpsychiatric reasons (OR=1.48, 95% CI=1.27, 1.72) (Table 2). These associations were slightly reduced but remained statistically significant after we additionally controlled for marital status, tobacco smoking status, alcohol consumption, and subthreshold depressive symptoms (for sickness absence due to psychiatric reasons, OR=3.79, 95% CI=2.81, 5.10; for sickness absence due to nonpsychiatric reasons, OR=1.41, 95% CI=1.21, 1.65).

Next, to test whether the association between sickness absence and future depression was explained by work stress, we adjusted our statistical models for work decision latitude, psychological work demands, and social support at work. We found that these work stress factors predicted future depression but did not explain the effect of sickness absence; after adjustment for work stress factors, odds ratios of future depression were 1.89 for those with 2 or more periods of sickness absence, compared with 2.04 prior to adjustment. Overall, this applied to sickness absence due to both psychiatric and nonpsychiatric reasons (results not shown).

Finally, as shown in Table 3, we found that sickness absence predicted the onset of depression both among participants who retired and among those who remained employed during the study follow-up.

TABLE 1—Demographic, Social, and Behavioral Characteristics of Study Participants and Their Odds of Developing Depression During Study: GAZEL Cohort, France, 1996–1999

Characteristic	No. (%)	OR (95% CI)
Age, y		
43–50 (Ref)	3875 (52.4)	1.00
51–57	3516 (47.6)	0.72 (0.63, 0.83)
Gender		
Men (Ref)	5506 (74.5)	1.00
women	1885 (25.5)	1.23 (1.06, 1.45)
Marital status		
Married or living with partner (Ref)	6619 (89.6)	1.00
Single, divorced, separated, or widowed	770 (10.4)	1.29 (1.05, 1.58)
Occupational grade		
High (Ref)	766 (10.4)	1.00
Intermediate	3825 (51.8)	1.10 (0.95, 1.27)
Low	2793 (37.8)	1.34 (1.07, 1.68)
Tobacco smoking status		
Nonsmoker (Ref)	6067 (83.0)	1.00
Smoker	1242 (17.0)	1.33 (1.12, 1.57)
Alcohol consumption		
None (Ref)	833 (11.3)	1.00
Moderate	5730 (77.7)	1.38 (1.13, 1.69)
Heavy	815 (11.1)	1.32 (1.07, 1.62)
No. of stressful life events		
0 (Ref)	5782 (79.5)	1.00
≥1	1519 (20.5)	0.89 (0.75, 1.06)
Work decision latitude		
Low (Ref)	2779 (41.7)	1.00
High	3890 (58.3)	0.75 (0.65, 0.86)
Psychological work demands		
Low (Ref)	3382 (50.9)	1.00
High	3261 (49.1)	1.82 (1.58, 2.10)
Social support at work		
Low (Ref)	2948 (45.6)	1.00
High	3521 (54.4)	0.60 (0.52, 0.70)
Long periods of sickness absence[a]		
For any reason		
0 (Ref)	5070 (68.6)	1.00
1	1362 (18.4)	1.62 (1.37, 1.91)
≥2	954 (12.9)	2.21 (1.85, 2.64)
For psychiatric reasons		
0 (Ref)	7145 (96.7)	1.00
≥1	241 (3.3)	4.71 (3.61, 6.16)
For nonpsychiatric reasons		
0 (Ref)	5359 (72.6)	1.00
≥1	2027 (27.4)	1.71 (1.37, 1.91)
Diagnosis missing		
0 (Ref)	6992 (94.7)	1.00
≥1	394 (5.3)	1.65 (1.27, 2.13)

Note. OR = odds ratio; CI = confidence interval. Study was restricted to those employees (n = 7391) of Electricité de France–Gaz de France who did not have self-reported depression at study baseline.
[a]From 1996–1999. Defined as more than 7 days.

DISCUSSION

Our study, which was based on a large prospective occupational cohort study, suggests that sickness absence predicts the occurrence of future depression among healthy middle-aged workers. Workers who took a sickness absence of more than 7 days from work during a 3-year period were up to twice as likely to develop depression as workers who did not. Depression was most strongly related to sickness absence due to psychiatric reasons; however, absences due to nonpsychiatric reasons also predicted future depression. The association between sickness absence and future onset of depression was not entirely explained by confounding by participants' demographic characteristics, occupational grade, health behaviors, subthreshold depressive symptoms, or work stress factors. Overall, our findings suggest that among working individuals, sickness absence may be a useful predictor of future mental health problems.

Study Limitations

Several issues need to be considered in interpreting our results. We measured depression with the CES-D scale. This instrument is valid for the screening of depressive symptomatology, but it cannot be equated with a diagnostic measure of major depressive disorder.[20] Specifically, as with other self-reported depression scales, the CES-D might not distinguish depression from general psychological distress.[21] Nevertheless, the CES-D has excellent sensitivity compared with clinical diagnoses of depression, suggesting that it rarely leads to false negative results. Moreover, there is evidence that high levels of depressive symptoms that can be identified with the CES-D are serious enough to cause impairment and require medical attention.[22]

Because depression tends to be chronic,[23] it is possible that elevated rates among workers who took sickness absence during the 3-year study period resulted from mental health problems existing before the baseline assessment in 1996. To address this concern, we restricted the study population to individuals who were free of depression at study baseline and we adjusted the analyses for subthreshold depressive symptoms. We acknowledge, however, that our study may include workers who had an earlier history of depression that we were not

TABLE 2—Odds of Participants Developing Depression During Study Period, by Number of Long Periods of Sickness Absence: GAZEL Cohort, France, 1996–1999

No. of Long Periods of Sickness Absence	OR (95% CI)
All sick leave	
Partly adjusted model[a]	
0	1.00
1	1.59 (1.34, 1.88)
≥2	2.13 (1.77, 2.56)
Fully adjusted model[b]	
0	1.00
1	1.53 (1.28, 1.82)
≥2	1.95 (1.61, 2.36)
By medical diagnosis	
Partly adjusted model[c]	
0	1.00
≥1 for psychiatric reasons	3.98 (3.01, 5.26)
≥1 for nonpsychiatric reasons	1.48 (1.27, 1.72)
≥1 with missing diagnosis	1.33 (1.01, 1.74)
Fully adjusted model[d]	
0	1.00
≥1 for psychiatric reasons	3.79 (2.81, 5.10)
≥1 for nonpsychiatric reasons	1.41 (1.21, 1.65)
≥1 with missing diagnosis	1.24 (0.94, 1.65)

Note. OR = odds ratio; CI = confidence interval. A long period of sickness absence is defined as more than 7 days. Study was restricted to those employees (n = 7290) of Electricité de France–Gaz de France who did not have self-reported depression at study baseline; a few participants with incomplete data were dropped from the analysis. Sickness absence groups are not mutually exclusive as participants may have had periods of absence in more than 1 category; results for each diagnostic category are therefore adjusted for the other 2 diagnostic categories.
[a]Adjusted for age, gender, and occupational grade.
[b]Adjusted for age, gender, occupational grade, marital status, tobacco smoking status, alcohol consumption, and subthreshold depressive symptoms.
[c]Adjusted for age, gender, occupational grade, and long periods of sick leave for other diagnoses.
[d]Adjusted for age, gender, occupational grade, marital status, tobacco smoking status, alcohol consumption, subthreshold depressive symptoms, and long periods of sickness absence for other diagnoses.

TABLE 3—Odds of Participants Developing Depression, by Number of Long Periods of Sickness Absence and Employment Status at Follow-Up: GAZEL Cohort, France, 1996–1999

No. of Long Periods of Sickness Absence	Remained Employed During Follow-Up, OR (95% CI)	Retired During Follow-Up, OR (95% CI)
All sickness absences		
Partly adjusted model[a]		
0	1.00	1.00
1	1.55 (1.29, 1.86)	1.48 (0.91, 2.40)
≥2	2.19 (1.79, 2.68)	1.70 (1.02, 2.85)
Fully adjusted model[b]		
0	1.00	1.00
1	1.49 (1.23, 1.80)	1.45 (0.89, 2.38)
≥2	1.98 (1.61, 2.44)	1.74 (1.02, 2.95)
By medical diagnosis		
Partly adjusted model[c]		
0	1.00	1.00
≥1 for psychiatric reasons	4.39 (3.26, 5.91)	2.00 (0.74, 5.41)
≥1 for nonpsychiatric reasons	1.46 (1.22, 1.71)	1.40 (0.93, 2.11)
≥1 with missing diagnosis	1.37 (1.02, 1.82)	1.11 (0.49, 2.52)
Fully adjusted model[d]		
0	1.00	1.00
≥1 for psychiatric reasons	4.23 (3.08, 5.82)	1.67 (0.59, 4.74)
≥1 for nonpsychiatric reasons	1.39 (1.18, 1.64)	1.41 (0.92, 2.15)
≥1 with missing diagnosis	1.24 (0.92, 1.68)	1.18 (0.51, 2.71)

Note. OR = odds ratio; CI = confidence interval. For those who remained employed during follow-up, n = 5527; for those who retired during follow-up, n = 1763. A long period of sickness absence was defined as more than 7 days. The study was restricted to those employees of Electricité de France–Gaz de France who did not have self-reported depression at study baseline. Sickness absence groups are not mutually exclusive, and participants may have had periods of absence in more than 1 category; results for each diagnostic category are therefore adjusted for the other 2 diagnostic categories.
[a]Adjusted for age, gender, and occupational grade.
[b]Adjusted for age, gender, occupational grade, marital status, tobacco smoking status, alcohol consumption, and subthreshold depressive symptoms.
[c]Adjusted for age, gender, occupational grade, and long periods of sick leave for other diagnoses.
[d]Adjusted for age, gender, occupational grade, marital status, tobacco smoking status, alcohol consumption, subthreshold depressive symptoms, and long periods of sickness absence for other diagnoses.

able to account for. Importantly, our results suggest that sickness absence predicts the occurrence of depression among workers who are not depressed at a specific point in time, whatever their past mental health history.

We studied a population of middle-aged workers employed by a large national company based in France. GAZEL cohort members are generally healthier than the population they were drawn from,[24,25] which calls into question the generalizability of our findings. Reassuringly, overall patterns of sickness absence and depressive symptomatology in the GAZEL cohort are comparable to those reported from other occupational cohorts such as the Whitehall II study of British civil servants.[26] Thus, sickness absence most likely predicts depression in other settings.

Study Strengths

Our study also has a number of strengths. First, we studied a large longitudinal cohort composed of women and men working in a variety of blue-collar and office-based occupations. Second, our study population consisted of workers who were not depressed at study baseline. Third, the turnover rate in the GAZEL cohort is very low, and less than 1% of participants were lost to follow-up during the study period. Fourth, the CES-D is a well-validated instrument for the assessment of depressive symptoms in nonclinical populations.[17] Fifth, in our study, sickness absence data were collected through administrative records[12] rather than participants' self-reports[27] and were unlikely to be affected by participants' depression. Sixth, our analysis accounted for risk factors of depression such as age, sex, marital status, occupational grade, health behaviors,

subthreshold depressive symptoms, and work stress.

Study Implications

Compared with workers who had no sickness absence during a follow-up period of 3 years, those who took long periods of sickness absence for psychiatric and nonpsychiatric reasons were 4 and 1.5 times more likely to develop depression, respectively. What are the implications of these findings? If workers who take sickness absence have elevated rates of later mental health problems, should sickness absence rates be reduced at all cost? It may seem that 1 way of "preventing" sickness absence is to limit paid sickness absence provisions. However, international comparisons suggest that such policies are largely ineffective. For instance, only half of US workers receive paid sick leave, but sickness absence rates in the United States are higher than in Denmark, where workers are paid in full for up to 1 year of sickness absence.[28,29] Thus, limiting workers' ability to miss work when they are ill may not decrease population rates of sickness absence. On the contrary, such strategies may actually hamper productivity: individuals who attend work while ill may work less efficiently, are likely to remain ill for longer periods of time, and, if contagious, put their coworkers at risk of becoming ill as well.[28]

What could be the mechanisms of the association between sickness absence and depression? Sickness absence is unlikely to be an important cause of depression; however, it captures a wide range of risk factors involved in the etiology of depression and may represent a useful indicator of future mental health and quality of life.[11] Moreover, sickness absence appears to influence individuals' risk of social isolation, unhealthy lifestyle behaviors (high alcohol and tobacco use, low exercise, poor nutrition), financial difficulties, and poor psychological well-being,[7,30] thereby indirectly increasing the likelihood of poor mental health.

The first implication of our results is that sickness absence data can be used for public health purposes, to monitor workers' health across companies, occupations, industries, and over time. In contrast to individual measures of health, which require workers' active collaboration, sickness absence records are often routinely available in administrative databases and thus may constitute a thorough, accurate, and inexpensive indicator of future mental health.

A second implication is that workers on sickness absence may constitute an appropriate target group for health-promoting interventions. For instance, in a recent study based at EDF–GDF, workers who took more than 7 consecutive days of sickness absence over a 1-year period were asked to take part in a mental health screening program.[31] Following the screening, workers with a diagnosable mental disorder were randomly assigned to an intervention, which proved successful in improving mental health outcomes up to 1 year later. Similar interventions have been effectively implemented in other countries[32,33] and could be generalized more broadly.

Conclusions

Our study indicates that, in a population of workers who do not have depression, those who take sickness absence are vulnerable to future depression, suggesting that sickness absence is a valid indicator of later health. Sickness absence information may be of use to physicians, policymakers, and employers in assessing workers' health, as well as in implementing interventions that aim to prevent the onset of mental health problems. ■

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Contributors

M. Melchior and J. Head conceptualized the study and designed the hypothesis. M. Goldberg, M. Zins, and J. Head prepared the data, and J. Head analyzed the data. M. Goldberg and M. Zins are the principal investigators of the GAZEL study. All authors were involved in interpreting the data and in writing the article.

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Human Participant Protection

The GAZEL study received approval from the national commission overseeing ethical data collection in France (Commission Nationale Informatique et Liberté).

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