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Psychosocial work exposures of the job strain model and suicide in France: findings from the STRESSJEM prospective study of 1.5 million men and women over 26 years of follow-up

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Dear Editor,

The impact of psychosocial work exposures on common mental disorders, particularly depression or depressive symptomatology, has been studied extensively,^{1,2} with a high level of evidence for the exposures of the well-known job strain model by Karasek.³ Although the literature is vast on psychiatric morbidity, there is by comparison relatively little on suicide. The recent literature review by Milner et al.⁴ is the first to summarize the associations between psychosocial work factors and suicidality. It showed that some factors may be associated with suicidal outcomes, especially suicide ideation, but underlined the lack of studies on suicide mortality (6 studies only), as well as the lack of quality studies, particularly prospective studies. The aim of our study was to explore the prospective associations between psychosocial work exposures of the job strain model and suicide mortality. An additional objective was to test various exposure measures.

Details of the STRESSJEM study protocol are presented in a previous publication⁵ and in the online supplementary material. In short, the study was based on a nationally representative prospective cohort combining the data of the SUMER survey (DARES, French Ministry of Labour) and of the COSMOP program (Santé publique France). For the study sample of 1,511,456 individuals, 1976-2002 job history data (INSEE DADS Panel data, a random 1/24th sample of the French national working population of employees) were linked to mortality data and causes of death coded according to the ICD over 1976-2005 (French national death registry, INSERM-CépiDc). The codes for suicide were X60-X84 in ICD-10 and the corresponding ICD-9 and ICD-8 codes. A job-exposure matrix (JEM) was used to impute exposure estimates from the validated job strain model questionnaire (JCQ): psychological demands, decision latitude, social support, job strain (high demands and low latitude), iso-strain (job strain and low support), and the four quadrants by Karasek (Table 1). Using all jobs held over 1976-2002, three time-varying exposure measures were calculated: current exposure, cumulative exposure using both current and past exposure, and recency-weighted cumulative exposure using all exposures over a 5-year period and the time elapsed since exposure. The hazard ratio (HR) of suicide was estimated according to time-dependent exposures using Cox proportional hazards models. For the 3 exposure measures, we studied suicide until the end of last job, i.e. during time intervals with a job ('on-the-job' suicide). For the 2 measures of cumulative exposure, to study delayed effects, the follow-up was extended and ended at the time of death or on the 31st December 2002, whichever came first. Finally, we calculated the fractions of suicide attributable to job strain and isostrain.

The studied sample included 1,496,332 individuals, with 798,547 men and 697,785 women (there were missing values for 15,124 individuals, i.e. 1%). Within the 1976-2002 period, 4,486 suicides occurred among men and 1,206 occurred among women, including 1,595 on-the-job suicides among men and 361 among women. Table 1 presents the results of the associations between current exposure and suicide. Low decision latitude among men and low social support among both genders increased the risk of suicide. Job strain and iso-strain were risk factors for suicide for both genders. Passive job and high strain were found to be significant risk factors for men. The model with the highest relative quality was the model with current exposure, however, there was no significant difference with cumulative or recency-weighted cumulative exposures (Supplementary Tables S1-2). The fractions of suicide attributable to current exposure to job strain were 5.29% (95% CI: 1.76%-9.26%) among men and 9.13% (95% CI: 0.83%-18.10%) among women. The fractions attributable to current iso-strain were 3.56% (95% CI: 1.13%-6.34%) among men and 5.91% (95% CI: 0.68%-12.00%) among women.

Our results are consistent with two previous studies that found low decision latitude as a risk factor for suicide.^{6,7} Our study is the first one to report significant associations of low social support, job strain, iso-strain, high strain, and passive job with suicide. It is also the first to support the effects of cumulative exposure to high demands on 'on-the-job' suicide among women. There has been no previous study exploring various measures of exposure in association with suicide, making our study unique in this regard. Nurminen et al. reported that 14.6% of deaths related to depressive episode among men and 9.8% among women were attributable to job strain in Finland.⁸ These estimates were close to the few estimates obtained for job strain-attributable mental disorders.^{9,10} Our present study adds to the literature by providing one of the first estimates for suicide specifically. Interestingly, our study suggests that psychosocial work stressors explain a larger proportion of suicides for women than for men. This may be connected to the fact that women are more likely to be exposed to poor psychosocial working conditions. The causal pathways linking psychosocial work exposures and suicide may be through depression,¹ as depression is a major risk factor for suicide, reinforcing the plausibility of the observed associations.

Strengths of the study include: very large nationally representative sample of men and women; long follow-up; no response, participation, selection, attrition, or reporting bias

(although a healthy worker effect may have operated for the study of current exposure with on-the-job suicide and led to an underestimation of the exposure-outcome associations); adjustment for other occupational exposures used as proxies for social position; use of validated JCQ and of various time-varying measures of exposure; and mortality data provided by the national registry. A number of limitations should, however, be acknowledged: limited number of available adjustment variables; residual confounding bias; use of JEM leading to non-differential misclassification and bias towards the null hypothesis; missing information for some jobs that was treated using midcensoring; no evaluation of complete working life-course exposure measures; and potential underestimation of suicide among the causes of death.

Our study showed that psychosocial work exposures of the job strain model were associated with suicide. As the estimated fraction of suicide attributable to these exposures may be substantial, intensifying research effort in this topic and prevention policies towards psychosocial work exposures may be crucial to improve mental health at work and prevent suicide.

We wish to dedicate this paper to the memory of our highly valued colleague, Allison Milner, who died tragically and prematurely in August 2019.

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Statement of Ethics

Ethical permissions were granted by French ethics committees: Commission Nationale de l'Informatique et des Libertés (no 762430V1 and no 04-1274) and Conseil National de l'Information Statistique (no 2009X705TV).

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

IN is the principal investigator who designed the project and drafted and revised the manuscript. JFC and AM made substantial contributions to the design of the project. JFC, AM and AL were involved in revising the manuscript critically for important scientific content. JFC was in charge of all statistical analyses. BGP is in charge of the COSMOP dataset at Santé publique France and TC is in charge of the SUMER dataset at DARES; they both

provided technical help on these datasets. All authors have read, reviewed and approved the final version of the manuscript.

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Table 1. Associations between current exposure and suicide among men and women

	MEN N=798,547 HR (95% CI) (Suicides=1,595)	WOMEN N=697,785 HR (95% CI) (Suicides=361)
High psychological demands ^a	0.92 [0.81-1.05] ns	1.27 [0.99-1.62] ns
Low decision latitude ^a	1.34 [1.20-1.50] ***	1.28 [0.96-1.71] ns
Low social support ^a	1.34 [1.20-1.50] ***	1.37 [1.09-1.74] **
High psychological demands ^b	1.05 [0.91-1.21] ns	1.27 [0.98-1.65] ns
Low decision latitude ^b	1.19 [1.00-1.42] *	1.14 [0.78-1.65] ns
Low social support ^b	1.18 [0.99-1.42] ns	1.27 [0.94-1.71] ns
Job strain ^a	1.28 [1.09-1.51] **	1.35 [1.03-1.77] *
Isostrain ^a	1.29 [1.09-1.53] **	1.36 [1.04-1.78] *
Quadrants by Karasek^a		
Active job (ref)	1	1
Low strain	1.01 [0.85-1.21] ns	0.68 [0.44-1.06] ns
Passive job	1.32 [1.14-1.54] ***	1.03 [0.73-1.45] ns
High strain	1.41 [1.18-1.68] ***	1.31 [0.94-1.83] ns

^a Each exposure was studied separately

^b Demands, latitude and support were studied simultaneously

High strain (high demands and low latitude), low strain (low demands and high latitude), passive job (low demands and low latitude), and active job, the reference group (high demands and high latitude)

All models were adjusted for calendar time, biomechanical, physical, chemical and biological exposures

*p<0.05, **p<0.01, ***p<0.001