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Work intensity in men and work-related emotional demands in women are associated with increased suicidality among persons attending primary care

N Younès , M Rivière , L Plancke , A Leroyer , T Blanchon ,  
M Azevedo Da Silva , M Melchior

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## Highlights

- Among working individuals consulting a primary care physician, 8.0% reported suicidal ideations in the preceding month.
- Suicidality is significantly associated with work intensity in men and with work-related emotional demands in women.
- To prevent suicide, a global strategy should include GPs.

ACCEPTED MANUSCRIPT

**Work intensity in men and work-related emotional demands in women are associated with increased suicidality among persons attending primary care**

N Younès<sup>a,b</sup>, M Rivière<sup>c,d</sup>, L Plancke<sup>e</sup>, A Leroyer<sup>f</sup>, T Blanchon<sup>c</sup>, M Azevedo Da Silva<sup>c,a</sup>, M Melchior<sup>c</sup>

a EA 40-47 University of Versailles Saint-Quentin, Versailles, France

b Academic Unit of psychiatry for adults, Versailles Hospital, Versailles, France

c Sorbonne Universités, UPMC Univ Paris 06, INSERM, Institut Pierre Louis d'épidémiologie et de Santé Publique (IPLESP UMRS 1136), F75013, Paris, France

d Department of Infectious Diseases, Centre Hospitalier Régional, Orléans, France

e Fédération régionale de recherche en psychiatrie et santé mentale Hauts-de-France, Lille, France

f Univ. Lille, CHU Lille, Institut Pasteur de Lille, EA 4483 - IMPECS – IMPact de l'Environnement Chimique sur la Santé humaine, F-59000 Lille, France

**ABSTRACT <250**

**Background.** A large proportion of persons died by suicide are employed at the time of death and work-related factors partly contribute to suicide risk. Our aim was to examine the association between multiple aspects of work organization and suicidal ideation in a study conducted in primary care.

**Methods.** Data came from a study of 2,027 working patients attending a GP representative of patients in the Nord Pas-de-Calais region in France (April-August 2014). Suicidality was assessed using the MINI (Mini International Neuropsychiatric

Interview). Six emergent worked-related factors were explored (work intensity, emotional demands, autonomy, social relationships at work, conflict of values, insecurity of work). Several covariates were considered: patient's and GP's characteristics, and area-level data (material and social deprivation, psychiatrist and GPs' density, suicide attempts and suicide rates)

Results. 8.0% of participants reported suicidal ideation in the preceding month (7.5% of men and 8.6% of women,  $p=.03$ ). In multivariate analyses adjusted for covariates, suicidality was significantly associated with work intensity (OR= 1.65; 95%CI [1.18 – 2.31]) in men and with work-related emotional demands (OR = 1.35; 95%CI [1.01 – 1.80]) in women. Area-level data were not associated.

Limitations. Our cross-sectional study cannot assess the direction of the relationships under study.

Conclusion. Our results emphasise a central role for GPs in suicide prevention among workers and highlight the importance of work-related factors with regard to suicidality in primary care.

**Keywords** : suicidal ideation, work-related factors, job control, emotional demands

## MANUSCRIPT

### INTRODUCTION

Worldwide, suicidal behavior (ideation, attempt, suicide) is a major public health issue (Nock et al., 2008). Epidemiologic studies demonstrate that the risk of suicide is determined by several individual factors: 1) clinical factors such as the presence of a psychiatric disorder, a history of suicide attempts, and a family history of suicide, etc.,

2) social factors such as male gender, lack of a partner and of employment (Yoshimasu et al., 2008) (Nock et al., 2008). However, the role of work-related factors deserves to be explored further.

Being employed appears to protect from suicide. In a finish register-based study, age-adjusted suicide mortality was two to three times higher among the unstably employed and almost fourfold among the long-term unemployed (Maki and Martikainen, 2012). An overall model covering 63 countries in the four world regions indicated that a higher suicide rate preceded a rise in unemployment (lagged by 6 months) and that the effect was non-linear with higher effects for lower baseline unemployment rates (Nordt et al., 2015). Displacement and inductive effects (suicides in persons otherwise unlikely to engage in self-destructive behaviors) have been observed 4 to 6 months after lost of employment in a time series conducted in Sweden (Gemmill et al., 2015).

If suicide rate ratios among economically inactive/unemployed are higher for men and for women compared to the employed, the number of employed persons who die by suicide is higher than the number of unemployed/economically inactive persons who die by suicide (Milner et al., 2015). Some occupational groups, such as farmers and agriculture workers, machine operators and ship's deck crew, labourers, cleaners and elementary occupations, service workers (police), construction workers or health professionals are at especially high risk of suicide (Klingelschmidt et al., 2017; Milner et al., 2013; Milner et al., 2016b; Stanley et al., 2016). It is important to identify beyond occupational contexts specific aspects of the work environment that are associated with higher risk (e.g., psychosocial job stressors). Scientific evidence is needed following high media attention - in France, 3 suicides at work occurred over the course of four months at Renault – a car making company (Le\_Monde, 2009).

Karasek, Siegrist and Elovainio proposed theoretical models of workplace characteristics, which can influence health (Elovainio et al., 2002; Karasek et al., 1981; Siegrist, 1996). Recently other psychosocial factors were considered such as job insecurity, role conflict (Finne et al., 2014; Gollac, 2010; Murcia et al., 2013; Niedhammer et al., 2015; Schutte et al., 2015). Psychosocial factors include working time and intensity, emotional demands, social support, autonomy, job insecurity, role conflict, fairness (Finne et al., 2014; Malard et al., 2015; Murcia et al., 2013; Niedhammer et al., 2015; Schutte et al., 2015).

To date, there has been only a limited amount of research on relations between adverse workplace conditions and suicidal behaviors, reporting inconsistent findings that hinder conclusions on the role of work. A recent systematic review and meta-analysis provides evidence that adverse conditions at the workplace are associated with an elevated risk of suicidal ideation and/or behaviours, only from cross-sectional or observational studies (Milner et al., 2017c). In the general population, we founded 6 studies examining adverse workplace conditions and the risk of suicide, 2 studying suicide attempts and 7 studying suicidal ideation.

Regarding suicide, a report based on 28 cases in Germany reported an increased risk among persons with high levels of adversity in terms of chronobiological/physical work conditions, but no effect of job strain as evaluated by Karasek's questionnaire (Baumert et al., 2014). To the contrary, job strain was related to suicide risk in two series of suicide cases in Japan: high psychological demands (long working hours, heavy workloads), low control, low social support and concern over work prospects (Amagasa et al., 2005; Tsutsumi et al., 2007). A Canadian cohort study found an increased risk of suicide associated with low psychological demands (Ostry et al., 2007). A Hungarian case-control study of 194

suicides (psychological autopsy) found no effect of work-related factors after accounting for other characteristics (Almasi et al., 2009). Finally, an Australian case-control study conducted among a nationally representative sample of 23,017 found gender differences in the risk factors of suicide: low job control was more relevant in men and high job demands in women (Milner et al., 2017b).

Regarding suicide attempts, a Canadian cohort study reported an increased risk in case of low social support at work (Ostry et al., 2007). Another US study from 2,855 nationally representative participants showed that two motivational work characteristics (job autonomy and task variety), work-family conflict, and job dissatisfaction indirectly contribute to suicide attempts via depression and suicidal ideation (Howard and Krannitz, 2017).

Regarding suicidal ideation, workplace bullying has been identified as an important risk factor in a longitudinal study conducted from 2005 to 2010 in Norway (OR=2.05; 95% CI [1.08 - 3.89]). Workplace bullying was also identified as a risk factor of suicidal ideation in a nationally representative survey of the Australian working population (Milner et al., 2016a). Other adverse workplace conditions were observed: higher job control, higher supervisor control and job security were associated with lower odds of suicide ideation in adjusted models including gender (Milner et al., 2016a). A French study conducted among young adults (18-37 years of age, n=1,214) found an association between suicidal ideation and job insecurity (Dalglish et al., 2015). Studies reported gender differences for work-environment factors. For instance two large-scale studies conducted among Japanese employees (respectively 2,834 men and 1,284 women and 3,631 men and 2,247 women) found a relationship between suicidal ideation and job stressors (working long hours) in men - but not in women - (Takada et al., 2009). Recently another Australian study on

men's health (11,052 working males) reported elevated odds of suicidal ideation in persons exposed to low job control, job insecurity, unfair pay and job insecurity (Milner et al., 2017a). Further studies are necessary to identify sex-specific differences in a broad range of work-related factors associated with suicide behaviours.

To date, to our knowledge, no study specifically investigated working conditions and suicide risk among persons attending primary care. This study is important for several reasons. First, work-related issues are frequent in primary care: two English studies show that a third of patients seeing a general practitioner for work-related reasons have a mental health issue (Beckley et al., 2011; Hussey et al., 2008). Work-related mental disorders are difficult to address for GPs (de Kock et al., 2016). Second, GPs play a central role in suicide prevention (WHO, 2017). Suicidal behaviours are frequent in primary care: a GP loses a patient by suicide every 4 to 7 years (Gunnell et al., 2002; Marquet et al., 2005), encounters annually one to six persons who attempted suicide (Gunnell et al., 2002; Poma et al., 2011), and 2.4 to 8.2% of primary care patients experience suicidal ideation (Moreno-Kustner et al., 2016; Olfson et al., 1996). Incidence rates of suicide ideation and suicide attempts over a year-long period following a primary care visit were recently measured as very high among substance-using patients in primary care (Hallgren et al., 2017). About half of persons who complete suicide and two thirds of those who attempt suicide visited a GP in the preceding month (Houston et al., 2003; Raue et al., 2006). GP's recognition and management of suicidal patients can be improved (Fanello et al., 2002; Feldman et al., 2007; Houston et al., 2003; Marquet et al., 2005; Poma et al., 2011; Verger et al., 2007).



Recently, social epidemiologists studied individual and area-level factors for suicidal behaviors, in line with Durkheim's historical theory (Durkheim, 1985), advising the use of multilevel methods (Rezaeian et al., 2005) and reporting heterogeneity among studies (Rehkopf and Buka, 2006). A systematic review was performed based on European studies published from 2005 to 2015 and including an area-level measure of socio-economic disadvantage (27 studies from 14 different European countries), including indices of deprivation, the percentage of poverty and the percentage of persons who are unemployed. This study concludes that there is a statistically significant association (in 25/27 studies, all of which were rated as of medium or high quality) between socioeconomic disadvantage and suicidal behavior (and self-harm), particularly among men, with either an independent effect in several studies or mediating area-level or individual factors (Cairns et al., 2017). A subsequent study conducted in England among 2,587 severely depressed individuals found that individual socio-demographic and clinical characteristics explain variation in the risk for suicidal ideation and attempt more than area-level measures (Werbeloff et al., 2016). This question has not been explored in primary care level.

In this context, the objective of our study was to study for the first time in a primary care setting the association between suicidal risk and work-related factors by sex, considering also several covariates, at the patient level, GP level and area level.

## **METHODS**

### **1. Design and Study population**

The Heracles cross-sectional study was conducted between April and August 2014 among working individuals consulting a primary care physician in the Nord and Pas-de-Calais departments (now region "Hauts de France"). Participating GPs, who gave

an oral consent to participate, performed a 15 minute phone training session (including MINI training) and were asked to include working patients aged from 18 to 65 years during the study period, whatever the reason of their appointment. Each GP was asked to include a maximum of 24 patients who were actively employed (at least 6 months of full time employment during the preceding 12 months). Students and persons seeking employment were not included in the study because of the specific relations between these situations and psychiatric disorders (Delara and Woodgate, 2015; Ford et al., 2010; Milanovic et al., 2015). Inclusion criteria were met by 2,036 patients, of whom 9 were excluded because of missing data (Figure 1). GPs recruited patients randomly, following an inclusion schedule provided by the research team to minimize selection bias (Kleinbaum et al., 1981). Participating GPs were asked to propose the study to the first two patients who came to see them regardless of the reason of their appointment – this was repeated for different time slots across a week. If the patient refused to participate or the GP could not include him/her, the GP was asked to fill a form with the characteristics of this patient (age, sex, reason of non-inclusion and psychological distress in the preceding 12 months). Before the consultation, each participating GP gave written information to the patient to inform him/her about the study and their right to participate or not. If they agreed, they signed an informed consent.

Sample size was calculated for an estimated prevalence of 20% for common mental disorders and to have a precision of 10%, providing an estimate of 2,000 patients to be included via their GP.

Of the 1,000 GPs contacted by mail, 185 accepted to participate (GPs response rate = 18.5%) and 121 completed the study (Figure 1). Participating GPs were more likely to be male (sex ratio=1.82), and to be 50 years or older; they were disseminated

throughout the Nord Pas-de-Calais region. Of the 2,531 patients who were invited to participate in the study, 495 patients refused to participate (patient response rate = 80.4%). Non-participants did not differ from participants in terms of age ( $p=0.47$ ) and sex ( $p=0.23$ ). Details of the survey methodology were described elsewhere (Riviere et al., 2017). The study sample available to study the association between suicidal risk and work-related factors was 2,027 patients (of the 2,036 participants, 9 were excluded because of missing data). Comparing with the data of the National Health Insurance for working age patients consulting a GP in the Nord Pas-de-Calais region, participants were older ( $p<0.01$ ) but had a similar sex distribution ( $p=0.08$ ).

This study was conducted by the Sentinelles network (Flahault et al., 2006), part of the INSERM-Paris Sorbonne University research unit UMR-S 1136. This research group has a standing authorization from the French independent administrative authority protecting privacy and personal data (CNIL), n°471 393 to conduct research among GPs and their patients.

## 2. Data

After their regular appointment, GPs interviewed their patients for the purpose of the study. Questionnaires filled by the GP included the following information:

- Suicidal risk ascertained using the short-version of the MINI questionnaire (six items scored yes or no) (Sheehan et al., 1998), which has been found to be most suitable for screening in acute psychiatry (Roaldset et al., 2012). In the preceding month, Q1: “did you think that you would be better off dead or wish you were dead?”, Q2: “did you want to harm yourself or to hurt or injure yourself?”, Q3: “did you think about suicide?”, Q4: “did you have a suicide plan?”, Q5: “did you attempt suicide?” and Q6: “did you ever made a suicide attempt?” For this study, because our aim was to

study suicidality in the preceding month (death ideation, suicide ideation, suicidal attempt) and work-related factors, we used a suicidality index (Q1 or Q2 or Q3 or Q4 or Q5) (Benatov et al., 2017) (Celano et al., 2017).

Worked-related factors: we used a national French questionnaire proposed by experts in the field based on the international scientific literature (Gollac, 2010). It combines questions measuring demand - control – social support developed in Karasek's model (Karasek et al., 1981; R.A. Karasek and T. Theorell, 1990); questions measuring effort/reward balance in Siegrist's model (Siegrist, 1996), and questions about organizational justice from Moorman's questionnaire (Moorman, 1991), questions from the Copenhagen Psychosocial Questionnaire (Kristensen et al., 2005), questions from the General Nordic Questionnaire for Psychological and Social Factors at Work (Dallner et al., 2000) and from the Working Conditions and Control Questionnaire (Hansez, 2008). The questionnaire contains 20 questions, exploring 6 dimensions: 1) work intensity: "I receive orders or contradictory indications", "I have to provide an excessive amount of work", "I have too much to think about", "I face difficulties to conciliate work and family tasks", "I have the time to do my job", 2) emotional demands: "I work in direct contact with the public (users, students, patients, travelers, clients)"; "I am in contact with people in distress"; "I experience tensions with an audience (users, students, ...)"; "I have to hide emotions", "I happen to be afraid during work", "During my work, I am exposed to verbal, physical or psychological aggression", 3) autonomy: "I have very little freedom to decide how I do my job"; "I can fully employ my skills", 4) social relationships at work: "My work is recognized for its value", "The colleagues I work with help me carry out my tasks", "I have support from my superiors", 5) conflict of values: "In my work I have to do things that I disagree with"; "I have the means to do quality work", and 6)

job insecurity: “I feel able to do the same work as now until I retire”, “I fear to lose my job”. Responses were “yes” or “no” for Q1 to Q4 and “always”/ “often”/ “sometimes”/ “never” for the other factors numbered from 1 to 4. This questionnaire has not been validated. We assessed its reliability by computing an alpha Cronbach coefficient which varied between 0.34 to 0.68. The reliability was lower for ethical conflicts ( $\alpha=0.34$ ), emotional demands ( $\alpha=0.44$ ) and higher for work intensity ( $\alpha=0.48$ ), insecurity of work ( $\alpha=0.48$ ), autonomy ( $\alpha=0.65$ ) and social work relations ( $\alpha=0.68$ ).

All the work-related factors examined were grouped according to the 6 dimensions defined in the Gollac report and a Z-score was calculated for each dimension (Gollac, 2010). For more readability the dimensions were classified in bivariate analyses as high if the score was above the third quartile and as low if not, and in multivariable models they were used as continuous variable.

- Covariates:

Patient’s characteristics and others psychosocial factors:

We considered already known risk-factor of suicidality:

- sociodemographics (age, gender, family status, income, level of education)
- past somatic or psychiatric disorders
- common mental disorders, also investigated by the MINI questionnaire: major depression (in the preceding 6 months), generalized anxiety (in the preceding 2 weeks), alcohol abuse (in the preceding 12 months) (Sheehan et al., 1998)
- occupational group: they were classified in three groups: blue collars (farmer/manual workers), pink collars (technician/associate

professional/clerk/service worker) and white collars (manager/professional) (Min et al., 2015)

- company size (number of workers)
- job instability (type of contract)

Primary care characteristics:

- reason of medical appointment (somatic, psychological, chronic disease management)
- GP sociodemographics (age, gender)
- practice characteristics (size of practice; attitude towards psychological distress; opportunity to collaborate with mental health specialists)

Area-level data (by proximity area):

- material deprivation assessed with the FDep (Moreno-Betancur et al., 2015). All the indicators (except the proportion of persons employed as manual workers): median household income, proportion of persons with a high school degree among those older than 15 years, proportion of persons who are unemployed
- social deprivation: loneliness, single parenthood, widowhood/divorce (Pampalon et al., 2014)
- psychiatrists density, psychologists density, GPs density
- hospitalization rate for suicide attempts, suicide rate

### **3. Statistical analysis**

Differences in suicidality as a function of participant characteristics among men and women were assessed using Chi-squared tests.

Covariates associated with study outcomes with  $p < 0.2$  were included in the multivariate analysis. We performed multilevel logistic regression models with geographical area as level one and patient as level two. We stratified by gender because of the differences by sex reported in literature on suicidal behaviors (Freeman et al., 2017; Mergl et al., 2015) and because of differences by gender reported above in literature on job stressors (Milner et al., 2017b). Suicidality was the dependent variable and the 6 psychosocial characteristics were the exposures. Statistical models were adjusted for each exposure variable and other covariates that were associated with suicidality in a multivariable logistic model excluding occupational factors. Age and occupational group were included directly in the adjustment variables, even if non-significant in order to adjust on them. All analyses were performed using GNU R software version 3.1.1 (lme4 package).

## RESULTS

### 1. Sample description

Of the 2,027 participants, 163 (8.0%) reported suicidality in the month preceding the medical appointment (7.5% ( $n=70$ ) for men and 8.6% ( $n=93$ ) for women) ( $p=.04$ ;  $\chi^2=0.71$ ).  $N=6$  men and  $N=7$ women, respectively 8.6% of men scored as “suicidal” and 7.5% of women scored as “suicidal” should be in self-harming behavior rather than in suicidal behavior. 137 (6.8%) had a history of lifetime suicidal attempt and 12 (0.6%) a history of past month suicide attempt. Suicide risk was high for  $N=23$  men (2.5%) and for  $N=41$ women (3.8%).

Suicidal patients were mostly female (57.1%). Characteristics of suicidal patients by sex are presented in Table 1.

### 2. Suicidality and work-related factors

### Bivariate analyses

In men, suicidality was associated with being older, having lower educational level, lower income level, having past psychiatric disorders and attending the GP for somatic or psychological purposes. Men who were suicidal also reported higher levels of job insecurity, work intensity, high emotional demands, high conflict of values and low social relationships at work. None of GP nor area-level data were associated with suicidality (Table 1).

In women, suicidality was associated with lower educational level, lower income level, past psychiatric disorders and attending the GP for somatic or psychological purposes. Women who were suicidal also reported higher levels of job insecurity, high work intensity, high emotional demands, high conflict of values and low social relationships at work. None of GP nor area-level data were associated with suicidality (Table 1).

### Multivariate analysis

Associations between work-related factors and suicidality varied with gender. In analyses adjusted on age, occupational group, family status, level of education, past unemployment, past psychiatric disorders, present depression (MINI), alcohol abuse, job insecurity, the odds ratio (OR) of suicidality per unit increase of work intensity was 1.65 [95% confident interval (CI) = 1.18 – 2.31] in men and the OR of suicidality per unit increase of emotional demands was 1.35 [95% CI = 1.01 – 1.80] in women. Non-significant associations were found for men with emotional demands, relationships at work and job insecurity and for women with work intensity and conflict of values.



With the Bonferroni's correction, results remain significant in men ( $p=.004$ ) but were not anymore significant in women ( $p=.05$ ), which means that results are stronger in men.

## **DISCUSSION**

### **Main outcome**

In our study conducted among a large sample of working persons consulting a GP, we found that 8.0% reported suicidal ideation in the preceding month (death ideation, suicide ideation, suicidal attempt). Work-related factors associated with suicidality were varied with gender. In men, suicidality was associated with high work intensity ([OR= 1.65; 95% CI [1.18 – 2.31]). In women, suicidality was associated with emotional demands ([OR = 1.35; 95% CI [1.01 – 1.80]). Area-level data were not associated with suicidality in primary care but only individual data.

### **Prevalence of suicidality in primary care**

The prevalence of suicidality among primary care patients measured in our study is consistent with previous studies (Moreno-Kustner et al., 2016; Olfson et al., 1996). In 2003-2004, a European study measured suicidal ideation in 2,599 consecutive GP attendees aged 18-75 years (age mean 49.5, SD: 14.9) in six countries (United Kingdom, Spain, Slovenia, Portugal, The Netherlands, Estonia) and obtained a similar prevalence of 8.2% (Moreno-Kustner et al., 2016). Suicide ideation was estimated to affect 9.1% of persons in a study conducted among 816 patients randomly sampled from the primary care rolls of 4 Veterans Integrated Service Network hospitals with an oversampling of women (Magruder et al., 2012). The prevalence of suicidal ideation was slightly higher among primary care patients who

used psychoactive substances in 7 primary care clinics in Washington (Hallgren et al., 2017). We show for the first time that the prevalence of past month suicidality among primary care patients who are working also affects 8.0% of persons. We report no sex difference in the prevalence of suicidal ideation in this population, as found in some (Magruder et al., 2012) but not all studies (Bauer et al., 2013). In other populations, the prevalence of suicidality was described as higher among women (Bernal et al., 2007; Han et al., 2017). The relatively high prevalence of suicidality indicates that GPs are central in suicide prevention also among working primary care patients (Fanello et al., 2002; Poma et al., 2011; WHO, 2017). GPs encounter difficulties in this role (Fanello et al., 2002; Poma et al., 2011; WHO, 2017).

This raises the question of interventions in primary care: increasing awareness of suicide-related issues in working age population (Wasserman et al., 2012) and improving risk assessment skills (Saini et al., 2016). Systematic screening (Bostwick, 2010) or interactive interventions, to open the door for providers to inquire about suicide, have been highlighted (Duberstein and Jerant, 2014).

To date, suicide prevention delivered by GPs has not been shown to be effective as shown in a systematic review and meta-analysis (Milner et al., 2017d).

### **Suicidality and work-related factors**

Our main result is the association between suicidality and work-related factors shown for the first time in primary care in univariate and multivariate analysis. We were able to take into account several factors, including present depression which has been shown as mediating or confounding effect of work-related factors (Law et al., 2014) and present alcohol abuse also a well known factor associated with suicidality (Harford et al., 2018). This means that the associations between suicidality and work-

related factors exist in themselves and are not explained by depression. Similar results were reported in general or occupational settings, even if the comparability is limited by differences in measure, methods and designs. Large-scale studies conducted among Japanese employees found relationships between high job stress and suicidal ideation in men in stepwise multivariate logistic regression analyses (Sugawara et al., 2013; Takada et al., 2009). The association between suicidal ideation and low job control in men is consistent with data from some previous studies of suicide risk (Amagasa et al., 2005) (Almasi et al., 2009; Milner et al., 2016a; Milner et al., 2017c). For women, the association between emotional demands and suicidality is consistent with results of studies of the Danish workforce, where an elevated risk of depression was related to high emotional demands in women (Wieclaw et al., 2008). Our results could also be in part related to results between higher insecurity and suicidal ideation (Milner et al., 2016a; Milner et al., 2017c) as our measure of emotional demands included insecurity.

We did not confirm the association between higher supervisor control and lower suicidal ideation (Milner et al., 2016a) but our questionnaire did not explore precisely this aspect but rather autonomy.

Results about area-level data not associated with suicidality but only individual data are in line with the recent review that we confirmed in primary care (Cairns et al., 2017).

### **Limitations**

Several limitations of our study should be acknowledged.

First, as our study is cross-sectional, we are unable to assess the direction of the relationships and to make causal interpretations about suicidal ideation and work-

related factors. As we studied self-reported work-factors, there is a possibility of dependent misclassification: patients who reported suicidal ideation could be more sensitive to workplace problems. Longitudinal studies are necessary to complete the investigation of these relationships.

Second, we were not able to control for some individual factors that have been related to suicidal ideations: family history of suicidal behaviour (Rodante et al., 2016), presence of a confidant, use of stress reduction techniques (Takada et al., 2009), precise marital status (Milner et al., 2016a), personality disorder and other substance use disorders (Hallgren et al., 2017), childhood maltreatment (Duprey et al., 2018).

Third, our study was conducted in the Nord and Pas-de-Calais department, i.e. one of the poorest in France with 4,000,000 inhabitants, the former Nord and Pas-de-Calais department has the second highest density in France (324 inhabitants per km<sup>2</sup>). Those highly industrialized departments during the first half of the 20<sup>th</sup> century, suffered since 1950 from industrial decline, mines, textile and steel industries gradually closing. Despite the growth of services and some specialized industries (car, rail and glass), levels of education, unemployment (15%), and poverty and health indicators (e.g. life expectancy) are unfavourable. The Nord and Pas-de-Calais departments have a low density of GPs (11% less than in France) and other medical specialities (24% less than in France) (Plancke and Bavdek, 2013). Suicide rates are higher than the national median rate (CepiDc; Plancke et al., 2014). Results about suicidal prevalence should be replicated in others areas.

Fourth, we acknowledge a low GP response rate, which could lead to a possible selection bias. It could explain the relatively high percentage of easiness with mental health problems. Our sample was not nationally representative but it has

characteristics that are comparable to those of French GP (in terms of gender,  $p=.56$  and of age  $p=.1$ ) (Gautier A, 2009).

Fifth, the questionnaire was not validated even if we checked its reliability. We also acknowledge limitations of the MINI questionnaire to screen for suicidal risk (Sheehan et al., 1998). The MINI questionnaire shows a low positive predictive value (sensitivity) and high specificity (Runeson et al., 2017). Our suicidality index was interesting to measure current suicidality (in the preceding month). However, it has not been validated, even if suicidality has been explored in the literature in this way. MINI includes self-harming (we verified that less than 9% could have been identified as suicidal instead of presenting self-harming behavior).

Despite these limitations, the results of this study are valuable because they constitute the first study on the prevalence of suicidality among working adults in primary care ascertained with a standardized diagnostic tool (Sheehan et al., 1998) and on work-related factors associated with suicidality in primary care, varying with gender, considering several covariates, at the patient, GP and area levels.

## **CONCLUSIONS**

Our results emphasise a central role for GP's in suicide prevention among workers and highlight the importance of reported work-related factors with regard to suicidality, varying with gender (low job control for men and high emotional demands, insecurity in women). These preliminary results should be acknowledged in primary care.

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## COMPETING INTERESTS

All authors declare that they do not have any competing interests and declare independence from the funders.

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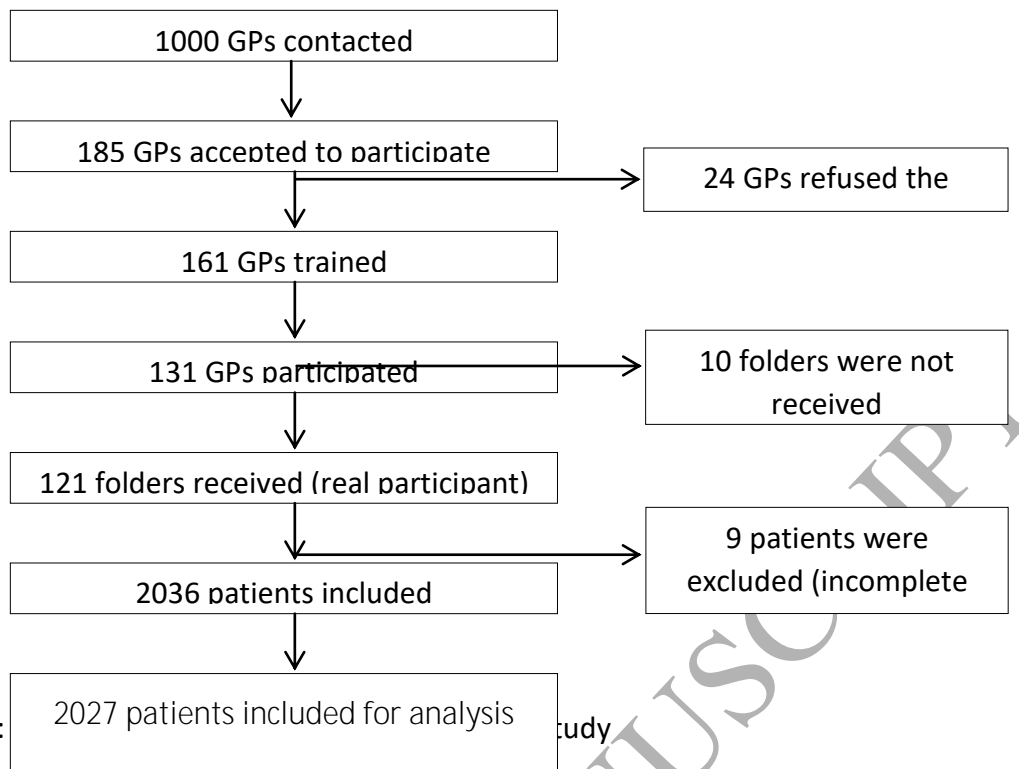


Table 1: Characteristics of the participants (patients, GPs, environmental and work) according to suicidality by sex

Patient Characteristics	Men (n=939)					Female (n=1086)				
	Suicidal		Non suicidal		p f <sup>2</sup> )	Suicidal		Non suicidal		p f <sup>2</sup> )
	N	%	N	%		N	%	N	%	
Age group					0.02					0.24
[18-35]	11	15.7	236	27.2	(5.36)	23	24.7	327	33.0	(2.87)
[36-50]	33	47.1	391	45.1		41	44.1	407	41.1	
[51-65]	26	37.1	240	27.7		29	31.2	257	25.9	
Occupational grade					0.06					0.06
blue collar	18	26.1	203	24.0	(1.98)	8	8.9	44	4.6	(5.93)
white collar	15	21.7	251	29.7		14	15.6	233	24.1	
Pink collar	36	52.2	391	46.3		68	75.6	689	71.3	
Educational level					<0.01					0.01
< High school degree	42	60.9	369	42.7	(7.83)	43	46.2	326	32.9	(6.16)
≥ High school degree	27	39.1	495	57.3		50	53.8	665	67.1	
Family status					0.47					0.26
Lives alone	17	24.3	173	19.9	(0.51)	30	32.3	261	26.3	(1.24)
Lives with a partner or parents	53	75.7	695	80.1		63	67.7	731	73.7	
Household income (in €)					0.02					0.05
[0-3.000]	19	35.2	190	27.0	(1.29)	33	44.0	248	32.2	(3.77)
3.000 +	35	64.8	513	73.0		42	56.0	522	67.8	
Number of worker in the company					0.58					0.61
1 to 5	14	20.3	145	17.4	(1.97)	17	18.9	185	19.2	(1.82)
6 to 25	19	27.5	202	24.2		23	25.6	246	25.5	
26 to 250	16	23.2	175	21.0		24	26.7	204	21.2	
250 +	20	29.0	312	37.4		26	28.9	329	34.1	
Psychiatric history					<0.01					<0.01
Yes	12	18.2	51	6.2	(11.51)	28	32.6	98	10.3	(34.47)
No	54	81.8	770	93.8		58	67.4	852	89.7	
Somatic history					0.19					0.58
Yes	26	38.8	250	30.3	(1.74)	27	30.3	256	27.0	(0.31)
No	41	61.2	576	69.7		62	69.7	693	73.0	
Purpose of consultation with GP					<0.01					0.10
Somatic					(27.00)					(2.70)
Yes	26	37.1	595	68.5		53	57.0	656	66.1	
No	44	62.9	274	31.5		40	43.0	337	33.9	
Psychological					<0.01					<0.01
Yes	37	52.9	122	14.0	(66.67)	51	54.8	215	21.7	(48.86)
No	33	47.1	747	86.0		42	45.2	778	78.3	
Chronic disease management					0.85					0.08
Yes	14	20.0	159	18.3	(0.04)	6	6.5	134	13.5	(3.15)
No	56	80.0	710	81.7		87	93.5	859	86.5	
Past unemployment					0.09					0.18
Yes	30	42.9	279	32.1	(2.92)	20	21.5	284	28.6	(1.79)
No	40	57.1	590	67.9		73	78.5	709	71.4	
Precarity					0.03					<0.01
Yes	27	39.7	229	27.0	(4.46)	39	42.9	227	23.4	(15.74)
No	41	60.3	620	73.0		52	57.1	743	76.6	
MINI identified psychiatric disorders					<0.01					<0.01
Major depressive disorders					(150.10)					(161.61)
Yes	49	70.0	108	12.4		68	73.9	164	16.5	
No	21	30.0	761	87.6		24	26.1	829	83.5	
Generalized anxiety disorders					<0.01					<0.01
Yes	49	70.0	162	18.6	(95.15)	63	67.7	248	25.0	(74.03)
No	21	30.0	707	81.4		30	32.3	745	75.0	
Alcohol abuse					<0.01					0.01
Yes	27	38.6	113	13.0	(31.40)	11	11.8	45	4.5	(7.82)
No	43	61.4	756	87.0		82	88.2	948	95.5	

p: Chi-square test (comparison between suicidal and non-suicidal patient for men and women separately)

Table 1: (continued)

	Men (n=939)					Female (n=1086)				
	Suicidal		Non suicidal		p f(2)	Suicidal		Non suicidal		p f(2)
	N	%	N	%		N	%	N	%	
<b>GPs Characteristics</b>										
GP's gender					0.24					0.08
Male	46	65.7	634	73.0	(1.36)	50	53.8	632	63.6	(3.14)
Female	24	34.3	235	27.0		43	46.2	361	36.4	
GP's age					0.68					0.36
[18-39]	6	8.6	74	8.5	(1.51)	6	6.5	108	10.9	(3.20)
[40-49]	19	27.1	261	30.0		35	37.6	311	31.3	
[50-59]	28	40.0	374	43.0		38	40.9	392	39.5	
60 +	17	24.3	160	18.4		14	15.1	182	18.3	
Size of practice population					0.42					0.13
0-500	7	10.8	85	10.5	(2.84)	7	8.0	112	12.1	(5.70)
5000 - 1000	40	61.5	426	52.7		52	59.1	475	51.2	
1000- 1500	10	15.4	195	24.1		13	14.8	213	23.0	
1500+	8	12.3	102	12.6		16	18.2	127	13.7	
Easiness with Mental health problems					1.00					1.00
High	56	83.6	695	83.9	(<0.01)	74	81.3	775	81.5	(<0.01)
Low	11	16.4	133	16.1		17	18.7	176	18.5	
High opportunity to work with mental health specialists					0.73					0.41
High	33	48.5	385	45.6	(0.12)	41	44.6	482	49.7	(0.69)
Low	35	51.5	460	54.4		51	55.4	488	50.3	
<b>Environmental data</b>										
Social deprivation					0.42					0.56
High	16	22.9	244	28.1	(0.64)	28	30.1	265	26.7	(0.35)
Low	54	77.1	625	71.9		65	69.9	728	73.3	
Material deprivation					0.48					0.89
High	31	44.3	341	39.2	(0.49)	42	45.2	435	43.8	(0.02)
Low	39	55.7	528	60.8		51	54.8	558	56.2	
Density of psychiatrist					0.11					0.11
High	58	82.9	638	73.4	(2.54)	81	87.1	790	79.6	(2.59)
Low	12	17.1	231	26.6		12	12.9	203	20.4	
Density of psychologist					0.56					0.62
High	55	78.6	649	74.7	(0.33)	75	80.6	773	77.8	(0.24)
Low	15	21.4	220	25.3		18	19.4	220	22.2	
Density of GP					0.10					0.40
High	57	81.4	621	71.5	(2.73)	76	81.7	768	77.3	(0.71)
Low	13	18.6	248	28.5		17	18.3	225	22.7	
Mortality index					0.10					0.13
High	18	25.7	316	36.4	(2.76)	18	19.4	271	27.3	(2.35)
Low	52	74.3	553	63.6		75	80.6	722	72.7	
Hospitalisation rate					0.17					0.67
High	17	24.3	287	33.0	(1.88)	22	23.7	261	26.3	(0.18)
Low	53	75.7	582	67.0		71	76.3	732	73.7	
<b>Work Characteristics</b>										
Work intensity					<0.01					<0.01
High	31	44.3	739	85.0	(37.18)	40	43.0	236	23.8	(15.61)
Low	39	55.7	130	15.0		53	57.0	757	76.2	
Emotional demands					0.00					<0.01
High	33	47.1	187	21.5	(22.30)	47	50.5	209	21.0	(39.43)
Low	37	52.9	682	78.5		46	49.5	784	79.0	
Autonomy					0.72					0.86
High	24	34.3	273	31.4	(0.13)	27	29.0	274	27.6	(0.03)
Low	46	65.7	596	68.6		66	71.0	719	72.4	
Conflict of values					<0.01					<0.01
High	34	48.6	265	30.5	(11.73)	55	59.1	331	33.3	(19.13)
Low	36	51.4	604	69.5		38	40.9	662	66.7	
Social relationships at work					<0.01					<0.01
High	13	18.6	348	40.0	(8.94)	9	9.7	318	32.0	(23.60)
Low	57	81.4	521	60.0		84	90.3	675	68.0	
Insecurity					0.01					<0.01

High	30	42.9	243	28.0	(6.26)	39	41.9	253	25.5	(10.89)
Low	40	57.1	626	72.0		54	58.1	740	74.5	

*p*: Chi-square test (comparison between suicidal and non-suicidal patient for men and women separately)

Table 2: Odds ratios (95% confidence intervals) of suicidality according to work-related characteristics (continuous variables) by sex\*

	Men			Women		
	OR	CI 95%	p	OR	CI 95%	p
Work intensity	1.65	1.18 – 2.31	<0.01	<b>1.17</b>	<b>0.86 – 1.56</b>	<b>0.28</b>
Emotional demands	1.13	0.82 – 1.56	0.44	1.35	1.01 – 1.80	0.04
Autonomy	1.04	0.72 – 1.52	0.82	0.98	0.72 – 1.33	0.88
Conflict of values	0.95	0.67 – 1.36	0.79	0.96	0.71 – 1.32	0.81
Social relationships at work	0.97	0.66 – 1.42	0.87	0.82	0.59 – 1.16	0.27
Insecurity	0.88	0.61 – 1.28	0.50	0.88	0.65 – 1.18	0.39

\* Multivariate analyses adjusted on: age, occupational group, family status, level of education, past unemployment, present depression (MINI), alcohol abuse, job insecurity