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Abstract

Benzodiazepines are broadly used drugs for treating insomnia and anxiety. Although they are known to induce cognitive and psychomotor impairments, their effect on the risk of work accident remains understudied. The objective of this study is to estimate this effect by differentiating between recommended use and overuse, beyond the recommended duration (i.e., uninterrupted use during 4 months). The panel data come from the French National Health Data System, which provided a study population composed of French people who were victims of at least one work accident from 2017 to 2019 (about 2.5 million people). Using a fixed-effect model allows us to deal with time-constant heterogeneity.

Results show a lower risk of work accident for people who consumed benzodiazepines the previous month, although this effect vanishes for people who overused benzodiazepines. For people under 45 years old, this overuse is associated with an increased risk of work accident. Moreover, the whole population shows a slight over-risk in the month following the treatment stoppage, which could come from rebound and catch-up effects. These results indicate that health professionals and benzodiazepines users should be made aware of work accident risk induced by benzodiazepines use, not only at the beginning of treatment but also following extended use and after treatment stoppage. This study provides more evidence on the need to limit the duration of benzodiazepine treatment.

Keywords: *Work accident, occupational accident, benzodiazepine, overuse, overconsumption, SNDS, France*

JEL Codes: *C01, I10, J28*

Introduction

Work accidents (WAs) constitute a major concern, with 350,000 fatal and 264 million non-fatal WAs occurring worldwide in 1998 (Hämäläinen et al., 2006). According to Concha-Barrientos et al. (2005), 3.5 years of healthy life are lost among 1,000 workers every year. In France, more than one million WAs have been identified by the national health insurance fund (*Caisse Nationale de l'Assurance Maladie,* CNAM) in 2018, including commuting accidents. This figure has been increasing from 2013 to 2019, after an overall downward trend since 2000 (CNAM, 2019).

Defining and measuring WA is not an obvious task. First, to be registered, a WA needs to be declared by the employer after a physician diagnostic. Next, WA are significantly under-reported in the EU (Jacinto & Aspinwall, 2004) and the USA (Rosenman et al., 2006). Under-reporting in France has been estimated at around 20% by the French survey *Working Conditions 1998* (Askenazy, 2006). Thus, because of under-reporting, working with administrative databases entails incorporating reporting determinants into the WA determinants. One of the major causes of under-reporting is job insecurity (Probst et al., 2013). Reporting increases for serious accidents in large companies and for qualified people (Askenazy, 2006).

WAs can have deleterious consequences for the victim (such as temporary or permanent deterioration of health and loss of job), for the company (such as cost of hiring and training, increase of occupational hazard risk insurance premium, legal risk in case of fault), for social security (payment of daily allowance, health care reimbursement). The European Agency for Safety and Health at Work (EU-OSHA) estimates (using a Disability Adjusted Life Years methodology) the global cost of work-related accident and illnesses at € 2,680 billion (which is 3.9% of global GDP), and the European cost at 476 billion (which is 3.3% of the European GDP) (EU-OSHA, 2017). Improving WA prevention requires understanding their determinants. The economic literature on work absences and the risk of accident at work is extensive and shine a light on the role of cost of absence, individual characteristics and job characteristics. Nevertheless, the role of health and health care on

WA has been understudied, and may appear ambiguous due to possible mixed intertemporal effects. A bad health is likely to increase the risk of WA. An appropriate access to care requires time off work but may result in improving health and prevent from future WA.

This study is focused on drug consumption. One particular class of drug deserving attention is benzodiazepines (BZDs), which are broadly used as anxiolytics and hypnotics. In France, 13% of the population consumed these at last once in 2015 (ANSM, 2017). Their adverse effects may lead to higher risk of WA (Brandt & Leong, 2017). However, other mechanisms may be involved (such as health improvement and reduction of occupational exposure), and the overall effect remains understudied. Evidence on the risk of WA after using BZD is scarce, and some existing studies present serious methodological bias (Palmer et al., 2016). The sides effects of BZDs are well-known and compensatory mechanisms could exist. In particular, workers may attempt to minimize their exposure or take extra precautions because they are aware of the risk.

The aim of this study is to determine the impact of past BZD use on WA risk. We distinguish different levels of use according to official recommendations. Data come from the French National Health Data System (SDNS), which allows using the entire French population with WA from 2017 to 2019. Using a fixed-effect model on the panel data allows us to deal with time-constant heterogeneity. The results show differences according to treatment duration and are thus useful for understanding the adverse effects of BZD and its interaction with WA risk. In bringing more evidence on the need to limit BZD treatment duration, they encourage paying particular attention to WA risk after treatment stoppage and during extended treatment.

The outline of our paper is as follow. First we present a literature review relative to determinants of work accidents, second the methodology (including source of data, scope of the study, econometric strategy and some statistics), third the results (including stratified analysis and robustness check), and fourthly the discussion of the results.

Determinants of work accidents

Conceptual framework for absences from work

As WA can lead to a work stoppage, part of WA determinants correlate with the determinants of work absences. From a neoclassical perspective, absences from work result from a trade-off between scheduled work period and leisure. Work absences are inversely related to wages, flexibility (having paid time off), and the perceived degree of occupational safety (Allen, 1981). If the number of contractual hours exceed the desired hours, workers may be encouraged to absent themselves (Brown & Sessions, 1996). High unemployment rate decreases the probability of shirking, by reducing the probability of being rehired in case of loss of job (and thus increasing the opportunity cost of shrinking) (Shapiro & Stiglitz, 1984).

The cost of absence is a major determinant of absence from work. Barmby et al. (2001) have shown the influence of companies' sickpay scheme. In an empirical study using European data, Frick and Malo (2008) find a slight positive effect of sickness benefits on absenteeism, but no effect of employment protection legislation; moreover the impact of some individual workers characteristics is higher than impact of institutional framework. Chaupain-Guillot and Guillot (2017) come to the same conclusion: sick-leave legislation play a role of employees' absence behavior, the most important factor being whether employers are requested to pay full wage in case of illness.

This literature assumes that absenteeism of workers is to some extent voluntary. Moreover, one weakness of economic literature, compared to medical literature, has been to ignore the influence of health on absences in theoretical models, although empirical works show that a disease being correlated with higher absenteeism (Allen, 1981; Brown & Sessions, 1996). Further developments will aim to fill the gap (see e.g. Barmby et al. (1994) and Case & Deaton (2003)).

From a theoretic point of view, on one hand, improvement of working condition could lead to increase work absences because of inclusion of marginal workers and extended working hours of

unhealthy workers; on the other hand, they will reduce the negative health effect and thus lower absenteeism. Empirically, work absences are positively related to bad working conditions, meaning that these are not fully compensated by wages (higher wages should lead employees to accept poor working environment) (Ose, 2005). In the same way, working irregular schedule is associated to higher sickness absence rate (Afsa & Givord, 2014). Overall, factors associated with psychological ill health (such as long hours worked, work overload and pressure, lack of control over work and lack of participation in decision making, unclear management and work role) are associated with sickness absences (Michie & Williams, 2003).

Even if WA is one of the determinants of work stoppage, a high risk of WA can increase work stoppage through indirect channels. Workers exposed to WA risk will strive to minimize their exposure time to this risk and thus have a greater probability of being absent due to a work-related disease (Johansson & Palme, 1996; Ose, 2005). As we mentioned, literature on sickness absences often assumes a share of voluntary absenteeism, due to moral hazard (see for example Askildsen et al. (2005) or Khan and Rehnberg (2009)). Nevertheless, a WA can be considered as an exogenous shock if we assume the independence of the physician's diagnosis and the employer's statement. The risk of moral hazard, although present, seems to be lower than for sickness absences. Thus, WA determinants should be more exogenous than work stoppage determinants. WA determinants can be grouped under individual, organizational, and insurance-related factors.

Individuals factors

According to Pouliakas and Theodossiou (2013), many individual determinants are linked to the risk of WA. Some of the demographic characteristics are being a man (Askenazy, 2006; Guadalupe, 2003; Krause et al., 2001), being between 25 and 35 years of age or over 55 (Guadalupe, 2003), and being of an older age (Ghosh et al., 2004). The European Commission (2009) finds age to be negatively related to non-lethal accidents and positively related to lethal accidents. Socioeconomic and professional characteristics play an important role, as the risk of experiencing a WA is related to low

family income, rural residence, and job dissatisfaction (Dembe et al., 2004); while a lower risk of work injury absence is associated with higher education, occupational class, and individual income (Piha et al., 2013). Blue-collar workers are affected more due to their being exposed to biological, physical, and biomechanical risks. In particular, exposure to noise and manual material handling are associated with risk of work injury for both genders, while work injuries among men are significantly associated with thermic constraints and vibrations. Psychosocial work factors are involved as well, including low social support, job strain, and iso-strain (Kim et al., 2009; Niedhammer et al., 2018). Manual workers and farmers (and, to a lesser degree, men in intermediate occupations, clerks, craftsmen, and tradesmen) have a much higher occurrence of occupational accidents than men in higher-level occupations, while craftsmen and tradesmen have more traffic accidents (Khlat et al., 2008). A poor work environment or perception of it plays a role in occupational injuries (Ghosh et al., 2004). Shift work and long working hours also seem to be detrimental to safety (Wagstaff & Sigstad Lie, 2011).

According to Guadalupe (2003), fixed-term contracts increase the risk of work accidents due to the employer's lower investment in human capital and the employee's greater effort to increase the probability of being rehired. However, after controlling for working conditions, these temporary workers exhibit fewer injuries than permanent workers, thus indicating that poorer working conditions are responsible for this increased risk (Amuedo-Dorantes, 2002). Hernanz and Toharia (2006) found similar results by controlling for job characteristics. For Benavides et al. (2006), the differences between temporary and permanent workers could come from job experience and knowledge of workplace hazards, because the significance of differences disappears when controlling for length of employment (except for fatal injuries that are clearly related to work). Accidents are also more severe for temporary workers than for permanent ones, although most of this difference is due to under-reporting the least serious accidents among temporary workers (Picchio & van Ours, 2017).

Health status could affect the risk of WA through direct and indirect channels. Symptoms of disease may be directly related to an increased risk of WA. For instance, insomnia is related to impaired work performance and higher risk of WA (Daley et al., 2009). More widely, chronic health problems (Palmer et al., 2008) and mental health problems (Palmer et al., 2014) are associated with higher risk of WA. Medical treatments may also be associated with WA, especially psychotropic medications (Palmer et al., 2016). From another side, ill health may result in unemployment. Work absences will increase during the year following occurrence of cancer, and employability of workers suffering of cancer decrease over time (Barnay et al., 2015). Moreover, men suffering from anxiety and men and women suffering from depression are less likely to remain in their job (Barnay & Defebvre, 2019). Absence from work should lead to a decrease in WA rate.

Organizational and firm characteristics factors

Determinants of work accidents can also occur at the organizational level, with the size of the firm appearing to be a particularly important determinant. Large enterprises experience fewer WAs because they invest in job safety (Ruser, 1985). In France, statistics show an inverted-U curve: the WA frequency index is 24 per 1,000 employees in microenterprises (below 10 employees); 42 in small- and medium-sized enterprises (between 10 and 250 employees); and 30 in enterprises with more than 250 employees (author's calculation). This curve profile is reported in other studies and would come from under-reporting in small enterprises (Oleinick et al., 1995; Sørensen et al., 2007). There are more physical constraints in small, independent enterprises (small enterprises that are part of a larger group have better work environments), but the psychological demand is less (weak correlation) (Sørensen et al., 2007). Moreover, the size relation is identical across most industry groups; and the occupational safety and health (OSH) management system is of higher quality in larger enterprises. Fewer WAs result from health prevention programs and prevention strategies, as well as from global OSH prevention and assessment systems, all of which are more frequently

followed in larger firms (Pouliakas & Theodossiou, 2013). In addition, large companies may be more aware of increased monitoring by regulators and insurers (Fenn & Ashby, 2004).

Insurance-related factors

From a theoretical point of view, wage and compensation benefits affect the financial cost of sick leave for employees: high daily benefits should increase the number and duration of work stoppages by lowering their cost (compensation of loss of income) (Krueger, 1990), while high wages should lower work stoppages by increasing their cost (higher loss of income). However, this effect is hard to observe because of the potential endogeneity of wage (the wage increases with the risk of WA), as found by Kaestner and Grossman (1998) in their empirical study using the USA's National Longitudinal Survey of Youth, waves 1984 and 1988. However, the theory remains confirmed, as daily benefits have a negative effect on sick leave (although rarely significant) and, even though the wage has a negative effect (as predicted by the theory), it is significant in only half of the estimates. When enterprises pay compensation benefits, they encourage a reduction in WAs. Enterprises in France have to pay a social security contribution for the risk of WA. For each enterprise with over 150 employees, this contribution is calculated directly on the basis of its number of WAs over the previous 3 years, while this calculation is mixed for enterprises of between 20 and 150 employees. This contribution system has demonstrated efficacy in reducing the number of WAs (Lengagne, 2018).

Role of benzodiazepines and contribution of this study

Relationship between health and absences from work are highly complex because of the many factors involved. Untreated health problems may increase work absences but medical treatments as well. Ill health is also associated with changes in employment, thus to the exposure to occupational risk. Among psychotropic medication, BZDs are frequently used treatments of insomnia and anxiety (ANSM, 2017). BZDs can cause cognitive impairment (Buffett-Jerrott & Stewart, 2002), increase the risk of falling in the elderly (Brandt & Leong, 2017; Pariente et al., 2008), and lead to behavioral

disorders (Hall & Zisook, 1981). The risk of road accident after consuming BZDs is well known (Dassanayake et al., 2011; Gustavsen et al., 2008; Ravera et al., 2011). In France, 3.4% of road traffic accidents may be related to medication intake, and half of them to BZD intake (ANSM, 2013).

Kaestner and Grossman (1998) showed that drug use could increase WA risk for men. Some psychotropic medication could also increase WA risk (Palmer et al., 2016). Some studies find no relationship between WA and BZD or anxiolytic consumption, such as that by Montastruc et al. (1992), who find that knowledge of risk provides an incentive to avoid BZD use. Others show a positive relationship (Palmer et al., 2014; Voaklander et al., 2006; Wadsworth et al., 2003). Some of these studies are prone to the bias of reverse causation, as BZD use increases after a WA (Barnay & Baudot, 2020). To assess the role played by BZDs in accidents, patients are sometimes tested (blood or urine) after an accident, without any evidence of BZD use being greater than in the general population (Girre et al., 1988; Kurzthaler et al., 2005; Price, 2014). This approach allows the declarative bias to be avoid, which is common in case of psychotropic drug use (including BZD) (Fendrich et al., 2004; Rockett et al., 2006).

This study aims to fill the gap in the existing literature: not to examining the direct effect of BZDs on the risk of WA, like in a clinical trial, but using real life data (including all compensatory mechanisms that could exist) and trying to address numerous bias, in particular the bias of reverse causality.

Methodology

Data

We rely on the French National Health Data System (*Système national des données de santé*, SNDS). The SNDS contains individual data used for billing and reimbursement (Tuppin et al., 2017). The National Health Insurance is mandatory for all people living in France (French and foreigners). The database includes information related to outpatient health care consumption (such as physician consultation, drugs reimbursed); hospitals data (private and public); compensated days off work (sick

leave, maternity, WA or occupational diseases); and information relatives to long-term diseases, which open access to specific health care reimbursement (ALD, for its acronym in French).

More specific information is available for people whose WA leads to at least 4 days off work. These data are relative to the employee (such as years of service, contract type, and position), the employer (such as number of employees and total payroll amount), and the WA (such as circumstances of the accident and kind of injury).

Population and scope of the study

The study population is insured by the general scheme, which covers mainly private-sector employees and their relatives, except for farmers. The relative WA data that are available pertain to almost 76% of the population living in France in 2015 (Tuppin et al., 2017). The inclusion criteria are: having experienced at least one WA from 2017 to 2019 and being between 16 and 79 years of age in 2017. In this age group and during these years, all the WA occurred in France are included, except for farmers, civil servants and self-employed workers.

The study period is 36 months (i.e. from January 2017 to December 2019). The study population is 2,544,237 at the beginning of 2017 (deceased people are excluded in the month following death). In France, the National Health Insurance compensates commuting accidents as regular WA. In this study, WAs include accidents occurred in the place of work (workplace accidents) and accidents occurred between residence and work or between work and catering area (commuting accidents).

Econometric strategy

We gathered panel data by calendar month, thus covering 36 periods. We estimate a monthly WA probability with a linear probability model, using the 4 previous months as a control variable (thus, the 4 first periods are not used for the estimation). Fixed-effects are used in order to eliminate any time-constant variable that is especially useful in our case due to the lack of individual social and economic data.

The econometric model is written as follows:

$$y_{it} = \beta_0 + \beta_1 benzo_{it-4\to t-1} + \beta_2 \sum_{t-4}^{t-1} X_i + \alpha_i + u_{it}$$

with t = 5, 6…, 36. y_{it} is a dummy variable indicating whether or not individual i had a WA in month t; $benzo_{it-4\to t-1}$ is a qualitative variable with four modalities (no BZD reimbursement in the 4 previous months; past use (treatment stopped): at least one BZD reimbursement in months t-4 to t-2 and none in t-1; recent use (ongoing treatment): at least one BZD reimbursement in month t-1; and overuse: at least one BZD reimbursement each month from t-4 to t-1). Data are relative to reimbursed medicines, but do not allow knowing the reality of drug intake; thus, this study equates *BZD use* to *BZD reimbursement*, i.e., dispensation in a pharmacy. *Overuse* means exceeding the treatment durations recommended by the French National Authority for Health (HAS, for its initials in French) for anxiolytic BZDs: 12 weeks at most (HAS, 2018). X is the vector of control variables. All control variables are summed over a 4-month period (except for dummies). These are: dummies for admission in chronic psychiatric disease or any other kind of chronic disease opening additional right to reimbursement (*Affections de longue durée*, ALD); the total price of psycholeptics (antipsychotics, anxiolytics, and hypnotics, excluding BZDs), of antidepressants, and of other reimbursed medicines; the number of consultations to a GP (including home visits), to a psychiatrist, or to another specialist doctor; the number of days hospitalized; the number of compensated days off work (due to sickness, maternity, WA, or occupational disease). α_i is the vector of fixed effects (i.e. differences between individuals stable over time), u_{it} contains unobserved time-varying factors. Due to the 4-month lag variables, *t* goes from 5 to 36.

Other estimates have been made using different interest variables. Instead of a categorical variable with four modalities, two variables are used: a dummy variable indicating at least one BZD use in the previous month (ongoing treatment) and a continuous variable related to the treatment intensity. For treatment intensity, two variables have been tested (the number of BZD boxes consumed during

the preceding 4 months and the number of months in which BZD was used at least once in the preceding 4 months). This other specification of the model allows to study the effect of BZDs from a different point of view (by looking the differentiated effects of current use and intensity), instead of threshold defined by health authorities.

The use of fixed effects prevents to estimate coefficient of time-constant factors. In order to observe whether BZD use has heterogeneous effects into some specific subpopulation, analyses have been stratified.

Control variables are relative to the 4-month period preceding the month t. This choice was made for the sake of consistency with the period taking into account for BZD use. The maximum treatment duration recommended by health authorities for BZD is 12 weeks. So we consider a period of 4 months without treatment stoppage as an overuse, and then control for other care consumption during that time. The occurrence of a WA probably leads to a strong increase in care consumption. To avoid simultaneity, we use lagged variables. This assumes a persistence effect, i.e., the past value is predictive of current value. These variables allow taking into account, on the one hand, health status via care consumption and, on the other hand, number of working days via days of hospitalization and those compensated for being off work (for sickness, WA, and occupational disease). The model is not dynamic (i.e. past WA are not included in the model), because dynamic models with fixed effects are biased (Nickell, 1981), and because of the small share of study population with more than one WA in the 3 years study period (14%). Nevertheless, a robustness check has been made by restricting modeling to the population with a single WA throughout the study period.

The use of individual fixed effects allows eliminating time-constant heterogeneity. Some of these variables are missing from the database (such as social origin, type of employment, and professional exposure) and could, at least partially, be controlled by fixed effects model. Employment is considered as a fixed effect (because known only at the time of WA), but it could change in the study

period. A robustness check is made by comparing two subpopulations: with fixed-term contract (supposed to change more frequently of job) and with permanent contract (supposed to change less frequently of job) at the time of WA.

Due to the potentially large number of missing variables that could be controlled by fixed effects, the choice is made to not use random effects. This choice is strengthened by the very likely correlation between independent variables and unobservable heterogeneity.

Statistics

In 2017, for the whole population, the mean age is 37.4, with 41.8% being women. Workplace accidents constitute the majority of WAs (gathering workplace and commuting accidents) and affect 87% of the population experiencing a WA in 2017, compared to commuting accidents affecting 14% of the same population. Table 1 shows the statistics on the study population's care consumption by year and by year of WA occurrence. The care consumption is highest in the years with WA, and it decreases with distance from this year. For example, WA victims in 2019 visited a GP 5.20 times on average, while WA victims in 2018 and 2017 did so, respectively, 3.57 and 3.10 times. We can observe the same with BZD dispensation: in 2019, 15.7% of WA victims in 2019 use BZD, compared to 13.9% and 13.3%, respectively, for victims in 2018 and 2017.

Table 1: Yearly statistics (2017-2019)

Year	2017		2018			2019		
WA in 2017	**No**	**Yes**	**No**	**Yes**	**-**	**Yes**	**-**	**-**
WA in 2018	**-**	**-**	**No**	**No**	**Yes**	**No**	**Yes**	**-**
WA in 2019	**-**	**-**	**-**	**-**	**-**	**No**	**No**	**Yes**
Demographics								
Age	37.0***	38.0	37.6***	39.2***	38.3	40.3***	39.4***	38.6
Share of women	42.3%***	41.0%	43.0%***	41.4%***	41.3%	41.7%***	41.6%***	42.1%
BZD								
At least one reimbursement in the year	11.6%***	16.3%	11.5%***	14.8%***	16.4%	13.3%***	13.9%***	15.7%
At least 4-month continuous use in the year¶	1.74%***	2.13%	1.94%***	2.75%***	2.34%	2.71%***	2.55%***	2.15%
Other drugs reimbursed								
Mean amount reimbursed for psycholeptics (except BZD)	3.96	4.14	3.63***	4.13***	3.88	3.90***	3.63*	3.37
Mean amount reimbursed for antidepressants	3.17***	3.67	3.15***	4.27***	3.54	3.83***	3.55***	2.96
Mean amount reimbursed for other drugs	123***	155	125***	155	155	138*	135	136
Exemption for chronic disease								
Psychiatric disease	2.41%***	2.71%	2.55%***	2.99%***	2.83%	3.30%***	3.09%***	2.89%
Other diseases	7.71%***	8.69%	8.21%***	9.77%***	8.98%	10.86%***	10.06%***	9.45%
Mean number of doctor consultations								
General practitioner	0.69***	6.27	2.83***	3.89***	5.57	3.10***	3.57***	5.20
Psychiatrist	0.02***	0.18	0.15***	0.24***	0.17	0.23***	0.22***	0.16
Other specialist doctor	0.33***	1.08	0.73***	1.08***	1.04	0.88***	0.98***	0.93
Absences from work								
Mean days off work (sickness, maternity, WA, or occupational disease)	13.7***	41.0	12.2***	39.6***	41.8	28.1***	38.1***	38.7
Mean hospitalization days	0.74***	1.20	0.68***	1.49***	1.20	1.42***	1.43***	1.17
N	1,599,378	944,859	756,133	833,810	953,075	754,036	842,432	944,342

Field: Population having had at least one WA from 2017 to 2019 (N = 2,544,237).
Note: for each year (2017 to 2019), statistics are stratified according the year of occurrence of WA. For instance, in 2017, the first column refers to population without WA in 2017, while the second one refers to those with at least a WA occurring in 2017, regardless of the occurrence of a later accident.
*Note 2: for significance tests, T tests are used for continuous variables and Chi-squared tests for dichotomous variables. The reference variable is the one for which WA = 1 the given year (e.g. WA = 1 in 2017 the year 2017). ***: significant at 0.1% threshold; **: significant at 1% threshold; *: significant at 5% threshold; no asterisk: not significant at 5% threshold.*
-: the variable is not used for stratification.
Interpretation: People without WA in 2017 are 37 years old in average in 2017, and 42.3% of them are women.
¶: the 4-month continuous use of BZD is calculated from January 2017, thus this variable is not comparable between 2017 and the following years.

Throughout the 3-year study period, 85.6% of the population experienced a single WA, 11.8% experienced two WAs, and only 2.6% experienced three or more WAs.

Results

Results of estimations

Table 2 shows results of WA risk estimation by step-by-step approach. In the first estimate, all uses of BZD are associated with a decrease in WA risk (reference: no use). To explain this negative association, we can assume a lower probability to work for people with a worse health (captured by BZD use), which seems to dominate the potential adverse effects of BZDs. But if the working status varies over time, the effect is not controlled by fixed-effects.

As expected, the effect size decreases when adding control variables. All control variables refer to the 4 previous months. In the comprehensive model (Estimate 6), overuse becomes insignificant, the effect of recent use remains negative; and the effect of past use becomes positive on the risk of WA. The change of sign occurs when adding the compensated days off work during the 4 previous months. This strengthens the hypothesis of decrease in working time among people treated with BZD. Logically, we observe a negative influence of non-work days (compensated days off work and hospitalized days), which are days of non-exposition to WA risk.

Regarding other variables, new recognitions for long term diseases (ALD) during the 4 previous month resulted in a lower probability of WA, which probably come from a decrease in the probability to be exposed (loss of job, decrease in working time, decrease of exposure during work). We put apart admission for chronic psychiatric illness, given the potential correlation with new BZD use, but we do not see any particularity compared to other chronical illnesses. The doctors' consultations have also a negative effect on the WA risk (psychiatrists apart for the same reason). The explanation could be mixed: deterioration of health state (resulting in lower exposure, via days off or work adjustment) and protective effect of consultations (prevention and recommendations on the proper use of medication). Both BZD prescription and WA ascertainment require consulting a doctor. Concomitant drug use could also affect the risk of WA, and this effect should be captured by

variables related to drug use. We put apart antidepressant as BZD are frequently used in the beginning of an antidepressant treatment. Their effect on the risk of WA is positive (through adverse effects of treatments, such as effects on attention, vigilance, motor coordination), which corroborates other studies (Haslam et al., 2005; Palmer et al., 2014). Other drugs have no significant effect.

Table 2: Estimations of WA probability (Step-by-step model)

Variables	Estimate 1		Estimate 2		Estimate 3		Estimate 4		Estimate 5		Estimate 6	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
BZD												
Overuse	-0.0125	< 0.0001	-0.0115	< 0.0001	-0.0094	< 0.0001	-0.0025	< 0.0001	0.0007	0.0302	0.0006	0.0522
Recent use	-0.0109	< 0.0001	-0.0104	< 0.0001	-0.0097	< 0.0001	-0.0040	< 0.0001	-0.0021	< 0.0001	-0.0020	< 0.0001
Past use	-0.0073	< 0.0001	-0.0070	< 0.0001	-0.0065	< 0.0001	-0.0012	< 0.0001	0.0008	< 0.0001	0.0008	< 0.0001
ALD												
Psychiatric	-	-	-0.0302	< 0.0001	-0.0292	< 0.0001	-0.0276	< 0.0001	-0.0218	< 0.0001	-0.0215	< 0.0001
Other diseases	-	-	-0.0209	< 0.0001	-0.0195	< 0.0001	-0.0149	< 0.0001	-0.0105	< 0.0001	-0.0101	< 0.0001
Drugs reimbursed												
Other psycholeptics	-	-	-	-	0.0000	0.0019	0.0000	0.0466	0.0000	0.1654	0.0000	0.1389
Antidepressants	-	-	-	-	-0.0001	< 0.0001	-0.0001	< 0.0001	0.0000	0.0039	0.0000	0.0139
Other drugs	-	-	-	-	0,0000	< 0.0001	0.0000	< 0.0001	0.0000	0.0984	0.0000	0.2527
Doctor consultations												
GP	-	-	-	-	-	-	-0.0043	< 0.0001	-0.0029	< 0.0001	-0.0029	< 0.0001
Psychiatrist	-	-	-	-	-	-	-0.0008	< 0.0001	-0.0002	< 0.0001	-0.0001	0.0020
Other specialists	-	-	-	-	-	-	-0.0050	< 0.0001	-0.0023	< 0.0001	-0.0022	< 0.0001
Absence from work												
Compensated days off work	-	-	-	-	-	-	-	-	-0.0003	< 0.0001	-0.0003	< 0.0001
Hospitalization days	-	-	-	-	-	-	-	-	-	-	-0.0001	< 0.0001

Field: Population having had at least one WA from 2017 to 2019 (N = 2,544,237).
Interpretation: In Estimate 1, BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is associated with a decrease of 1.2 pp (percentage points) of WA probability in month t.

The Table 3 points out findings considering BZD intensity (number of boxes reimbursed or number of month with at least a box reimbursed) or intensity associated with a dummy variable of use in the previous month.

BZD use in the preceding month still has a negative effect on the risk of WA (Estimates 8 and 10). In stark contrast, the intensity of use correlates with an over-risk of WA (whether this intensity is approximated by number of BZD boxes consumed or by number of months of use) (Estimates 7 to 10). That means a reduction of WA risk for a short BZD use preceding month t, but an increase of risk

with the quantity of BZD used. Results are unchanged for other variables, except for other drugs treatment, whose effect became positive and significant.

Table 3: Estimations of WA risk (with controls for intensity of BZD use)

Variables	Estimate 7		Estimate 8		Estimate 9		Estimate 10	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
BZD								
BZD use in the previous month	-	-	−0.0008	< 0.0001	-	-	−0.0011	< 0.0001
Number of BZD boxes reimbursed (4 months)	0.0003	0.0001	0.0004	< 0.0001	-	-	-	-
Number of month with BZD use (4 months)	-	-	-	-	0.0003	0.0001	0.0008	< 0.0001
ALD								
Psychiatric	−0.0218	< 0.0001	−0.0218	< 0.0001	−0.0218	< 0.0001	−0.0218	< 0.0001
Other diseases	−0.0101	< 0.0001	−0.0101	< 0.0001	−0.0101	< 0.0001	−0.0101	< 0.0001
Drugs reimbursed								
Other psycholeptics	−0.0001	0.0863	−0.0002	0.0369	−0.0001	0.0863	−0.0001	0.0674
Antidepressants	0.0002	< 0.0001	0.0002	0.0003	0.0002	< 0.0001	0.0002	< 0.0001
Other drugs	0.0000	< 0.0001	0.0000	< 0.0001	0.0000	< 0.0001	0.0000	< 0.0001
Doctor consultations								
GP	−0.0029	< 0.0001	−0.0029	< 0.0001	−0.0029	< 0.0001	−0.0029	< 0.0001
Psychiatrist	−0.0001	0.0001	−0.0001	< 0.0001	−0.0001	0.0001	−0.0001	0.0001
Other specialists	−0.0022	< 0.0001	−0.0022	< 0.0001	−0.0022	< 0.0001	−0.0022	< 0.0001
Absence from work								
Compensated days off work	−0.0003	< 0.0001	−0.0003	< 0.0001	−0.0003	< 0.0001	−0.0003	< 0.0001
Hospitalization days	−0.0001	< 0.0001	−0.0001	< 0.0001	−0.0001	< 0.0001	−0.0001	< 0.0001

Field: Population having had at least one WA from 2017 to 2019 (N = 2,544,237).
Interpretation: In Estimate 7, one supplementary box of BZD reimbursed in the past 4 months is associated with an increase of 0.03 pp of WA probability.
-: the variable is not used in this specification.

Heterogeneous effects

To test the heterogeneity, analyses were repeated by stratifying the population by gender, age, and duration of work stoppage following the WA. Both gender and age are related to the risk of WA and to the use of BZD (ANSM, 2017; CNAM, 2019). Duration of work stoppage following the WA is a proxy for severity of accident. Results are presented in the Appendix.

Estimates by sex show no difference compared to estimates for the whole population (see Table A in the Appendix). However, estimates by age show a gradient (see Table B in the Appendix). For people under 45 years of age, overuse increases the risk of WA while the risk decreases with recent use and slightly increases with past use. For people aged 45 to 59 years, the effect of overuse becomes insignificant. For people aged 60 and over, overuse is associated with a lower WA risk. When

stratifying by duration of work stoppage following WA, we use only the population with a single WA within the three years of study (2,169,528 people) (see Table C in the Appendix). Overuse is not associated with a significant effect on risk of WA followed by less than 7 days of work stoppage (the 1st quartile of duration). BZD overuse is associated with an increase in risk of WA followed by 7 days or more of work stoppage, except for work stoppages longer than 168 days (9th decile of work stoppage duration for the population with a work stoppage of at least one day).

Robustness check

Past WA could affect the probability of WA at time t. WAs are not used as independent variable in the model, to avoid bias in dynamic models with fixed effects. A new analysis has been conducted on the subpopulation with a unique WA throughout the 3-years study period. Results are shown in Table D in the Appendix. Results are similar to those for the full population, except for the effect of antidepressant use that become insignificant.

In this study, employment is assimilated into a fixed-effect. This hypothesis can be debated because people may change jobs during the study period, and this information is not present in the data. To try estimating whether it could be a source of bias, estimates were repeated for the populations with fixed-term and permanent contracts. People with permanent contracts are presumed to change jobs less frequently than people with fixed-term contracts. If changing jobs is a source of bias, estimates may differ between both populations. Information about the type of employment contract is available only at the time of the accident and for very few people (when the WA results in at least 4 days off work, which is known within two days following the accident, and the variable still includes about 40% missing values). Estimates differ from the main estimate, due to the high specificity of the population. However, they do not differ between people with fixed-term and permanent contracts (see Table E in the Appendix) – except for past use, which is significant for permanent contracts but not for fixed-term contracts. This result increases our confidence in an absence of bias regarding the type of employment contract.

Due to the dichotomous nature of the explained variable, the natural choice for estimates should have been a logit estimation. Because of the large dataset, the logit is too computer intensive. Instead, we used a linear probability model. To test the influence of this estimation choice, other estimate has been made for a subpopulation (randomly restricted to one-tenth of the total population) using logit instead of linear model. Results are presented in Table F in the Appendix. These results are not directly comparable with main results because odds ratio are provided (vs. marginal effects), but we can see that signs and significance are coherent with the main estimate, except for two control variables that become insignificant (antidepressant use and number of psychiatrist consultations).

Discussion

Discussion of results

Compared to others studies on the impact of psychotropic drug use on the risk of WA (Kaestner & Grossman, 1998; Palmer et al., 2016), this study is the first, at our knowledge, to examine specifically the influence of duration and treatment status (active or not) of a particular medication, and therefore to allow distinguishing effects between recommended use and overuse. Moreover, we rely on an administrative database, which allow avoiding the declarative bias, which is known to be high in the case of psychotropic drug use (and even more for overuse), and misclassification of drugs (Glintborg et al., 2008; Murray et al., 1981; Rockett et al., 2006).

We observe a decrease in WA risk when people use BZD the preceding month. Regarding the adverse effects of BZDs (such as psycho-motor impairments that lead to motor vehicle accidents, falls, and fractures (Brandt & Leong, 2017)), the expected consequence of BZD use was instead an increase in WAs the month following use. Some hypotheses can be put forward to explain this result. First, improved health may minimize accident risk. Because BZDs are recommended for treating numerous diseases and – when used in accordance with medical guidelines – their use is expected to improve

patient health, they could decrease WA risk (Vorspan et al., 2018). Second, behavioral changes: workers can anticipate the risk of accident and, if possible, try to minimize their exposure. For example, because the adverse effects of BZDs are well known, the prescribing doctor may remind and warn patients about the risks, especially those whose professions make them highly exposed. Neves et al. (2019) have shown a good knowledge of adverse effects of BZD among family doctors in Portugal. Furthermore, the government and employers conduct prevention campaigns against the use of psychoactive substances in the workplace (France Stratégie, 2019), and a pictogram strongly advising against driving is present on all BZD packaging. Another hypothesis is put forward by Montastruc et al. (1992), for whom the knowledge of risk may lead to avoid BZD consumption. In France, doctors are financially incentivized to reduce their BZD prescriptions (Michel-Lepage & Ventelou, 2016), so they could choose to avoid BZD prescription for patient more exposed to WA risk. Last, an omitted variable may act on BZD use and WA probability. For example, a worker exposed to job-related anxiety could want to decrease their time at work and increase their BZD consumption.

WA risk increases with past BZD use, i.e. in the 4^{th} to 2^{nd} preceding months but not in the last. After a first period of decrease in exposure when the treatment started, an employee may try to catch up on delayed work. A medical explanation can also be put forward, as treatment stoppage is known to lead to a rebound effect (Gudex, 1991), i.e., anxiety or insomnia may become worse than prior to treatment. After only a few weeks of treatment, withdrawal symptoms may even occur in the form of irritability, increased stress, anxiety, panic attacks, difficulty in concentration, muscular pain, and stiffness, among others (Pétursson, 1994).

BZD overuse (BZD reimbursed in the 4 preceding months) is not associated with any significant effect in the whole population. Considering the large study population, this is probably not due to any lack of power. The beneficial effect of BZD use quickly declines after 2 weeks of treatment for hypnotic BZDs and after 4 weeks for anxiolytics (Lader, 1999). If their effectiveness is proven for short

treatment, long-term use is controversial (adverse effect could progressively overlap the therapeutic effect) (Revet et al., 2018). This hypothesis is strengthened by the estimates that include intensity of BZD use. Regardless of the previous month's BZD use, WA risk is positively related to the number of BZD boxes consumed and the number of months with BZD consumption (in the past 4 months). Moreover, when stratifying the population, BZD overuse is associated with an increased WA risk for people aged 45 years and below. One explanation could be that above age 45, precautions regarding prescribing and re-exposure to risk at work are higher. For the whole population, BZD overuse is associated with an over-risk of WA leading to work stoppages of between 7 and 168 days.

We decided to include other mental health-related variables (chronical psychiatric disease, psychiatrist consultation, antidepressant and other psycholeptic treatment) in the regression to control, as far as possible, for confounding factor associated to BZD reimbursement and to allow identifying the proper effect of BZD use.

Limitations

The database provides us with information only on reimbursed care, and thus our hypothesis equates reimbursement to use. The risk exists only for medication reimbursement, if a drug is bought and not used, and mainly for a single box drug delivery.

Some variables highlighted in the literature review are absent from the control variables (such as socioeconomic and professional characteristics), due to data limitations. The fixed-effect model allows dealing with the time-constant heterogeneity. We assume that most of the variables involved in the risk of WA (and not used in the model) are fixed through the study period, such as education, blue/white collar workers, business line, and urban/rural residence. Nevertheless, time-varying variables acting on both BZD use and WA risk can be source of bias. In particular, a change of employment during the study period could lead to a change in exposition, in size of enterprise, in work environment, and in satisfaction at work. Although not controllable with our data, we tried to estimate the risk a bias by comparing estimates of people with fixed-term and permanent contracts

at the time of accident, which led to very slight differences. These results are related to a very particular subpopulation, but they increase our confidence that contract type and job change are not a major source of bias. The findings of this study cannot be applied to the whole population, as it analyzes only victims of at least one WA and this population is dissimilar to the whole population due to having more men, being in better health, employed, and other factors.

Conclusion

BZDs are broadly used to treat various diseases, mainly anxiety and insomnia. They have adverse effects (psychomotor and cognitive) that one may reasonably expect could lead to an over-risk of WA. This study shows that the resulting effect is not trivial, and it varies according the duration of treatment.

Short-term BZD treatment (1 month) is associated with WA risk decreasing in the following month. This effect can come from a healing effect or from compensatory mechanisms linked to knowledge of risks (avoidance of treatment or taking extra precautions). Treatment stoppage is associated with a small over-risk of WA that might come from rebound effect and catch-up effect. The harmful effect of overuse (4 months of BZD use) neutralizes any protective effect of short-term treatment. This harmful effect is clearly evident among people below 45 years of age and for accidents leading to work stoppages of between 7 and 169 days. Moreover, the risk of WA is positively related to intensity of treatment (measured by the number of months in which BZD was used in the 4 previous months and by the number of reimbursed boxes).

These results should help improve medical guidelines and constitute useful information about the therapeutic benefits and adverse effects of BZDs. In particular, prescribers and BZD users should be aware of the increased risks of WA after BZD use, not only at treatment initiation, but also after months of use and after treatment stoppage. The population under 45 years of age seems to be particularly vulnerable. This study provides more evidence on the need to limit the duration and

intensity of BZD treatments. Prevention related to psychoactive substance use in companies could take better account of the post-treatment period.

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Appendix

Table A: Estimations of WA risk by sex

Variables	Men		Women	
	Estimate	p-value	Estimate	p-value
BZD				
Overuse	0.0008	0.0781	0.0005	0.2507
Recent use	−0.0018	< 0.0001	−0.0021	< 0.0001
Past use	0.0010	< 0.0001	0.0008	< 0.0001
ALD				
Psychiatric	−0.0178	< 0.0001	−0.0248	< 0.0001
Other diseases	−0.0070	< 0.0001	−0.0137	< 0.0001
Drugs reimbursed				
Other psycholeptics	0.0000	0.6429	0.0000	0.0341
Antidepressants	0.0000	0.4079	0.0000	0.0278
Other drugs	0.0000	0.2138	0.0000	0.5753
Doctor consultations				
GP	−0.0028	< 0.0001	−0.0029	< 0.0001
Psychiatrist	0.0000	0.5558	−0.0002	< 0.0001
Other specialists	−0.0022	< 0.0001	−0.0022	< 0.0001
Absence from work				
Compensated days off work	−0.0004	< 0.0001	−0.0003	< 0.0001
Hospitalization days	−0.0001	< 0.0001	−0.0001	< 0.0001
N	1,480,165		1,063,763	

Field: Population having had at least one WA from 2017 to 2019 (N = 2,544,237).
Interpretation: For men, BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is not significantly (at a 5% threshold) associated with WA probability at month t.

Table B: Estimations of WA risk by age

Variables	< 30 years old		29-44 years old		45-59 years old		> 59 years old	
	Estimate	p-value	Estimate	p-value	Estimate	p-value	Estimate	p-value
BZD								
Overuse	0.0025	0.0238	0.0021	0.0001	-0.0002	0.7222	-0.0045	0.0011
Recent use	-0.0022	< 0.0001	-0.0023	< 0.0001	-0.0018	< 0.0001	-0.0024	0.0018
Past use	0.0017	< 0.0001	0.0008	< 0.0001	0.0006	0.0010	-0.0011	0.0981
ALD								
Psychiatric	-0.0133	< 0.0001	-0.0203	< 0.0001	-0.0264	< 0.0001	-0.0396	< 0.0001
Other diseases	-0.0222	< 0.0001	-0.0089	< 0.0001	-0.0067	< 0.0001	-0.0201	< 0.0001
Drugs reimbursed								
Other psycholeptics	0.0000	0.1277	0.0000	0.0407	0.0000	0.0004	0.0000	0.8128
Antidepressants	0.0001	< 0.0001	0.0000	0.0307	0.0000	0.2133	0.0000	0.4668
Other drugs	0.0000	0.0015	0.0000	0.3872	0.0000	0.0007	0.0000	0.0119
Doctor consultations and visit								
GP	-0.0022	< 0.0001	-0.0029	< 0.0001	-0.0034	< 0.0001	-0.0031	< 0.0001
Psychiatrist	0.0001	0.3033	-0.0001	0.0817	-0.0002	0.0002	-0.0004	0.0353
Other specialists	-0.0019	< 0.0001	-0.0021	< 0.0001	-0.0023	< 0.0001	-0.0022	< 0.0001
Absence from work								
Compensated days off work	-0.0004	< 0.0001	-0.0003	< 0.0001	-0.0003	< 0.0001	-0.0002	< 0.0001
Hospitalization days	-0.0001	< 0.0001	-0.0001	< 0.0001	-0.0001	< 0.0001	-0.0001	< 0.0001
N	822,972		895,504		763,799		61,653	

Field: Population having had at least one WA from 2017 to 2019 (N = 2,544,237).
Interpretation: For people under 30 years old, BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is associated with a 0.3 pp increase in WA probability at month t.

Table C-1: Estimations of WA risk by duration of work stoppage following the WA

Variables	0 day		1-3 days		4-6 days		7-16 days	
	Estimate	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**
BZD								
Overuse	0.0003	0.6004	−0.0002	0.8745	−0.0010	0.4715	0.0020	0.0206
Recent use	−0.0006	0.0096	−0.0021	0.0049	−0.0016	0.0122	−0.0018	< 0.0001
Past use	0.0003	0.1037	0.0005	0.4160	−0.0004	0.4567	0.0007	0.0245
ALD								
Psychiatric	−0.0087	< 0.0001	−0.0141	< 0.0001	−0.0197	< 0.0001	−0.0199	< 0.0001
Other diseases	−0.0173	< 0.0001	−0.0050	0.0013	−0.0071	< 0.0001	−0.0036	< 0.0001
Drugs reimbursed								
Other psycholeptics	0.0000	0.4056	0.0000	0.9537	0.0000	0.0138	0.0000	0.7540
Antidepressants	0.0000	0.2452	0.0000	0.1743	0.0000	0.7243	0.0001	0.0002
Other drugs	0.0000	0.7186	0.0000	0.6568	0.0000	0.0305	0.0000	0.0430
Doctor consultations and visit								
GP	−0.0018	< 0.0001	−0.0028	< 0.0001	−0.0034	< 0.0001	−0.0033	< 0.0001
Psychiatrist	−0.0002	0.0006	−0.0002	0.3033	0.0001	0.5383	0.0001	0.3226
Other specialists	−0.0015	< 0.0001	−0.0019	< 0.0001	−0.0016	< 0.0001	−0.0015	< 0.0001
Absence from work								
Compensated days off work	0.0000	< 0.0001	−0.0002	< 0.0001	−0.0003	< 0.0001	−0.0003	< 0.0001
Hospitalization days	−0.0001	< 0.0001	−0.0002	< 0.0001	−0.0002	< 0.0001	−0.0001	< 0.0001
N	773,069		125,477		162,557		395,584	

Field: Population having had a single WA from 2017 to 2019 (N = 2,169,528).
Interpretation: For people whose WA did not lead to a work stoppage, BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is not significantly associated with WA probability at month t.

Table C-2: Estimations of WA risk by duration of work stoppage following the WA

Variables	17-52 days		53-168 days		> 168 days	
	Estimate	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**
BZD						
Overuse	0.0022	0.0085	0.0024	0.0151	−0.0038	< 0.0001
Recent use	−0.0004	0.2760	−0.0006	0.2494	−0.0047	< 0.0001
Past use	0.0017	< 0.0001	0.0023	< 0.0001	−0.0009	0.0322
ALD						
Psychiatric	−0.0239	< 0.0001	−0.0300	< 0.0001	−0.0320	< 0.0001
Other diseases	−0.0055	< 0.0001	−0.0073	< 0.0001	−0.0105	< 0.0001
Drugs reimbursed						
Other psycholeptics	0.0000	0.6876	0.0000	0.0497	0.0000	< 0.0001
Antidepressants	0.0001	< 0.0001	0.0000	0.1578	−0.0002	< 0.0001
Other drugs	0.0000	0.2872	0.0000	< 0.0001	0.0000	< 0.0001
Doctor consultations and visit						
GP	−0.0027	< 0.0001	−0.0016	< 0.0001	−0.0026	< 0.0001
Psychiatrist	0.0000	0.7466	−0.0001	0.1856	−0.0006	< 0.0001
Other specialists	−0.0024	< 0.0001	−0.0029	< 0.0001	−0.0039	< 0.0001
Absence from work						
Compensated days off work	−0.0004	< 0.0001	−0.0003	< 0.0001	−0.0003	< 0.0001
Hospitalization days	−0.0001	< 0.0001	−0.0001	< 0.0001	−0.0001	< 0.0001
N	361,319		211,723		139,799	

Field: Population having had a single WA from 2017 to 2019 (N = 2,169,528).
Interpretation: For people whose WA led to a work stoppage of between 17 and 52 days, BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is associated with a 0.2 pp increase in WA probability at month t.

Table D: Estimation of WA risk for the population with one single WA throughout the study period

Variables	Estimate	p-value
BZD		
Overuse	0.0004	0.1705
Recent use	-0.0014	<.0001
Past use	0.0007	<.0001
ALD		
Psychiatric	-0.0204	<.0001
Other diseases	-0.0105	<.0001
Drugs reimbursed		
Other psycholeptics	0.0000	0.3272
Antidepressants	0.0000	0.9992
Other drugs	0.0000	0.1789
Doctor consultations		
GP	-0.0025	<.0001
Psychiatrist	-0.0001	0.0019
Other specialists	-0.0021	<.0001
Absence from work		
Compensated days off work	-0.0003	<.0001
Hospitalization days	-0.0001	<.0001
N	2,170,144	

Field: Population having had one single WA from 2017 to 2019 (N = 2,170,144).
Interpretation: BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is not significantly (at a 5% threshold) associated with WA probability at month t.

Table E: Estimations of WA risk by type of employment contract

Variables	Permanent contract		Fixed-term contract	
	Estimate	p-value	Estimate	p-value
BZD				
Overuse	−0.0040	< 0.0001	−0.0050	< 0.0001
Recent use	−0.0030	< 0.0001	−0.0038	< 0.0001
Past use	−0.0003	0.1913	−0.0015	0.0039
ALD				
Psychiatric	−0.0554	< 0.0001	−0.0515	< 0.0001
Other diseases	−0.0453	< 0.0001	−0.0485	< 0.0001
Drugs reimbursed				
Other psycholeptics	0.0000	0.0087	0.0000	0.7695
Antidepressants	0.0000	0.8515	0.0000	0.8529
Other drugs	0.0000	< 0.0001	0.0000	< 0.0001
Doctor consultations and visit				
GP	−0.0017	< 0.0001	−0.0020	< 0.0001
Psychiatrist	−0.0001	0.1416	0.0001	0.3270
Other specialists	−0.0012	< 0.0001	−0.0019	< 0.0001
Absence from work				
Compensated days off work	−0.0003	< 0.0001	−0.0003	< 0.0001
Hospitalization days	0.0000	< 0.0001	−0.0001	< 0.0001
N	312,733		98,578	

Field: Population having had a single WA from 2017 to 2019, resulting in at least a 4-day work stoppage, and for whom the information is available (N = 565,817).
Interpretation: For people with a permanent contract at the time of WA, BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is associated with a 0.7 pp decrease in WA probability at month t.

Table F: Estimate of WA risk for the full population using logit

Variables	Odds ratio estimate	p-value
BZD		
Overuse	1.009	0.7092
Recent use	0.972	0.0229
Past use	1.046	0.0001
ALD		
Psychiatric	0.476	<.0001
Other diseases	0.774	<.0001
Drugs reimbursed		
Other psycholeptics	1.000	0.9083
Antidepressants	1.001	0.0751
Other drugs	1.000	0.8766
Doctor consultations		
GP	0.918	<.0001
Psychiatrist	0.992	0.1573
Other specialists	0.941	<.0001
Absence from work		
Compensated days off work	0.977	<.0001
Hospitalization days	0.985	<.0001
N	2,170,144	

Field: Population having had one single WA from 2017 to 2019 (N = 2,544,237).
Interpretation: BZD overuse (compared to no BZD use, calculated for months t-4 to t-1) is associated with an increase of 0,009% of WA probability at month t, but not significantly at a 5% threshold.