



**HAL**  
open science

## Association between the experience of sexual violence and insomnia in a national sample of French adults

Eve Reynaud, Cécile Vuillermoz, Christophe Léon, Noémie Roland, Fabienne  
El Khoury

► **To cite this version:**

Eve Reynaud, Cécile Vuillermoz, Christophe Léon, Noémie Roland, Fabienne El Khoury. Association between the experience of sexual violence and insomnia in a national sample of French adults. *Sleep Medicine*, 2022, 101, pp.228-232. 10.1016/j.sleep.2022.11.002 . inserm-03880650

**HAL Id: inserm-03880650**

**<https://inserm.hal.science/inserm-03880650>**

Submitted on 1 Dec 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Association between the experience of sexual violence and insomnia in a national sample of French adults

---

**Eve Reynaud<sup>1</sup>, Cécile Vuillermoz<sup>2</sup>, Christophe Léon<sup>3</sup>, Noémie Roland<sup>4</sup>, Fabienne El Khoury<sup>2</sup>**

1 CNRS UPR 3212, Institut des Neurosciences Cellulaires et Intégratives, Strasbourg, France

2 Sorbonne Université, INSERM, Institut Pierre Louis d'Epidémiologie et de Santé Publique, F75012, Paris, France

3 Santé publique France, French National Public Health Agency, Saint-Maurice, France

<sup>4</sup> La Maison des femmes, Centre Hospitalier de Saint Denis, Saint-Denis, France

## Abstract

### Purpose

The experience of sexual violence has been associated with sleeping disorders; however, few studies have examined this association using a large sample of the general population. This study investigates whether lifetime experience of sexual violence and childhood experience of sexual violence are associated with insomnia.

### Methods

Our study is based on data from the 2017 French Health Barometer, a general population phone cross-sectional survey, which included 25,319 adults aged 18 to 75 years in 2017. Questions regarding sleep quality were asked to 12 560 participants, and insomnia was defined according

to the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V). We conducted adjusted Log-binomial regressions to examine the association between the experience of sexual violence and insomnia by calculating adjusted Prevalence Ratios (PRa; 95% CI).

## Results

The weighted prevalence of insomnia was 13.5%, with women more affected than men (17.9% vs 9.6%). The prevalence of lifetime experience of sexual violence was around 3 times higher among those who suffer from insomnia (12.3%) compared to those who do not (4.5%). The adjusted associations between lifetime experience of sexual violence and insomnia, as well as between childhood experience of sexual violence and insomnia were both statistically significant (PRa=1.79 ; 95% CI: 1.59–2.02 ; and PRa=1.42 ; 95% CI: 1.23 – 1.64 respectively).

## Conclusions

Sexual violence could explain the substantial sex-difference in insomnia. Our findings reiterate the importance of systematically screening for sexual violence among patients suffering from sleep disorders to propose adequate trauma-informed interventions.

## Keywords:

Sleep disorders, insomnia, sex-differences, sexual violence, childhood sexual violence.

# 1 Introduction

Sexual violence could be defined as any sexual act to which the victim did not consent, could not consent, or was coerced or manipulated into consenting. The experience of sexual violence is widespread, especially among females, with the WHO reporting prevalence rates of 7–36% for girls and women.[1] A 2013 EU-wide survey, found that 11% of women living in the EU had experienced some form of sexual violence. Boys are also at risk of sexual violence, especially in childhood. A recent nationally-representative study showed that among the estimated 5.4 million victims of childhood sexual abuse between 1950 and 2020 in France, 1.5 million are males.[2]

The experience of this traumatic event has been associated with a host of physical and mental health outcomes.[3] It is a significant predictor of Posttraumatic Stress Disorder (PTSD),[4] whose most common symptom is sleep disturbance.[6]. In fact, the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) lists nightmares and problems falling or staying asleep as core symptoms of PTSD.[7].

Even independently of PTSD, victims of sexual assault and rape are at higher risk of suffering from sleep disturbance such as trouble falling asleep and regularly waking during the night, [8] since the experience of trauma may disrupt the normal sleep-wake regulatory mechanism.[9] Prospective studies have also shown that sleep disturbances are not only a symptom of PTSD but could be a risk factor for the development of PTSD following a traumatic event.[10].

Child sexual abuse and interpersonal violence (which includes sexual violence) have been consistently linked with an increased risk of developing sleep disorders.[11,12] However, research on the relationship between sexual trauma and sleep problems based on large nationally-representative samples is scant These types of studies tend to lump together sexual

violence with other interpersonal violence,[11] or only examine the association between childhood sexual abuse and sleep disorders.[12] A published systematic review on sleep disturbances in sexual abuse victims did not include a single nationally-representative study which recruited adults.[13] However, specific data on the association between sexual violence and sleep disorders from a large nation-wide sample is essential to understanding the extent and impact of the problem, and to developing adequate interventions. This is especially important given that sleep disturbances are associated with multiple disorders such as chronic diseases, cancer and mental health disorders, and can significantly reduce the quality of life.[14]

The purpose of this study is thereby to characterize the link between exposure to sexual violence and sleep disturbance in a large and representative sample of French adults (Baromètre Santé, i.e. 'Health barometer').

## 2 Material and methods

### 2.1 Data source

Data were obtained from the “Health Barometer” (Baromètre Santé) a cross-sectional phone survey of health and health-related behaviour among people living in Mainland France, currently managed by *Santé Publique France* (the National public Health agency) and conducted since 1992 using the same methodology (Richard et al., 2018).[15] The 2017 survey was carried out by a polling institute (Ipsos). A two-stage random sampling methodology (telephone household, respondent) was used to recruit a nationally-representative sample of 25 319 adults aged 18 to 75 years.

A computer-assisted telephone interviewing (CATI) system allowed to call participants up to 40 times using randomly-generated mobile and landline phone number lists. The Kish method was used to randomly select one participant among members of a household reached by landline.[16] Phone interviews lasted around 30 minutes on average, and the participation rate was 48.5%.

### 2.2 Ethics

The study protocol for the Health Barometer surveys was registered in the French Commission on Information Technologies and Liberties (Commission Nationale Informatique et Libertés) platform.

### 2.3 Measures

#### 2.3.1 Experience of sexual violence

All participants were asked whether they had ever been the victim of sexual violence, by answering the following question: “During your lifetime, have you ever been forced to perform

or receive sexual acts (“touching”), or have you ever been forced to have sex against your will?”. Participants who reported having experienced sexual violence were asked about their age at the time of the first sexual assault.

### **2.3.2 Insomnia**

Insomnia was defined according to the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V),[17] as a complaint of dissatisfaction with sleep marked with at least one of the following symptoms occurring at least 3 nights per week for at least 3 months despite adequate opportunity for sleep: difficulty initiating sleep, difficulty maintaining sleep (characterized by frequent awakenings or trouble returning to sleep after awakenings), and early-morning awakening with an inability to return to sleep.

Questions regarding sleep quality were asked to only half of the study population, chosen randomly by the CATI system.

## **2.4 Statistical analyses**

Descriptive analyses were weighted based on the probability of being solicited through the Kish method (the ratio of the number of eligible individuals to the number of telephone lines in a household),[16] and to match the structure of the French population (INSEE) of 2016 on the following variables : sex crossed with age in ten-year increments, region of residency, urban unit size, household size, and education level. [18].

To examine adjusted associations between the experience of sexual violence and insomnia, we used Log-binomial regressions with a logarithmic link function based on complete cases. Two different models were carried out: in the first model our independent variable was lifetime experience of sexual violence, whereas in the second model it was the experience of sexual violence during childhood (<18 years). We adjusted both models for known risk factors for

sleep disorders: sex, age, education level, employment status, chronic illness, living situation, as well as other childhood trauma (death or severe sickness of a parent, and/or divorce or serious disputes or violence between parents).[8,19] Therefore we were able to estimate adjusted prevalence ratios (PRa) with their 95% confidence interval. We limited collider bias by not adjusting for variables that are likely causally influenced by lifetime sexual violence or sleep disorders,[20] and variables on the pathway(s) between sexual violence and sleep disorders such as mental health problems and substance use.

#### 2.4.1 Stratified analysis

In supplementary analyses, we repeated the multivariable log-binomial regression models stratifying by sex. This was done because the prevalence of sexual victimisation and insomnia differ significantly between men and women,[21,22] and the manifestation of sexual victimisation is likely to differ according to sex.

All statistical analyses were conducted using SAS version 9.4 (SAS Institute Inc), and statistical significance was set to .05.

## 3 Results

The main characteristics of our weighted study population are presented in **Table 1**.

### 3.1 Prevalence of lifetime experience of sexual violence and insomnia

More than 99.9% of participants (n= 25 230) agreed to answer questions about sexual violence, and of these, 5.8% (weighted percentage) reported a lifetime experience of sexual violence.

Women were around 5 times more likely to have reported lifetime experience of sexual violence compared to men (weighted percentages: 9.50% vs 2.0%). Questions regarding sleep quality were asked to 12 560 participants, the weighted prevalence of insomnia among this sample was

13.5%. The prevalence of the experience of sexual violence was around 3 times higher among those who suffer from insomnia (12.3%) compared to those who do not (4.5%,  $p < 0.0001$ ).

Table 1: Characteristics of participants in the Health Barometer survey (weighted %). France, 2017. Unweighted  $n = 25319$

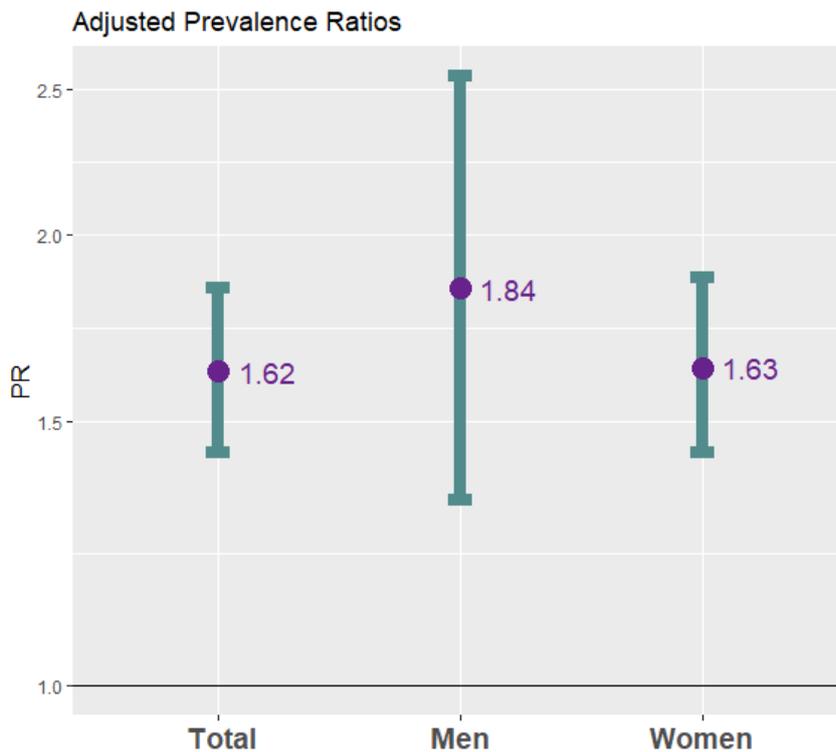
Variable (unweighted n)		Total sample: unweighted N (unweighted %)	Men (unweighted $n = 11\ 596$ ): weighted%	Women (unweighted $n = 13\ 723$ ): weighted%
Age	18-34	5994 (23.7%)	28.8%	27.9%
	35-54	9407 (37.2%)	38.3%	37.5%
	55-75	9918 (39.2%)	32.8%	34.6%
Education	Primary education	9609 (38%)	49.7%	47.8%
	Secondary education (French Baccalaureate)	5422 (21.5%)	19.8%	20.9%
	Undergraduate or graduate degree	10227 (40.5%)	30.5%	31.3%
Living situation	Does not live in a couple	9750 (38.5%)	35.3%	37.2%
	Lives in a couple	15569 (61.5%)	64.7%	62.8%
Employment status	Not employed	14731 (58.2%)	39.2%	46.3%
	Employed	10588 (41.8%)	60.8%	53.7%
Has a chronic disease	No	15807 (62.4%)	65.4%	61.8%
	Yes	9512 (37.6%)	34.6%	38.2%
Other childhood trauma	No	14817 (58.5%)	58.6%	52.9%
	Yes	10502 (41.5%)	41.4%	47.1%
Experience of sexual violence	No	23751 (94.1%)	98%	90.5%
	Yes	1479 (5.9%)	2%	9.5%
Experience of sexual violence before the age of 18	No	24100 (95.5%)	98.3%	92.9%
	Yes	1129 (4.5%)	1.7%	7.1%
Insomnia	No	10861 (86.5%)	90.4%	82.1%
	Yes	1699 (13.5%)	9.6%	17.9%

### 3.2 Association between the experience of sexual violence and insomnia

Results of multivariable log-binomial regression analyses examining the association between the experience of lifetime sexual violence and insomnia are presented in figure 1. The experience of lifetime sexual violence was significantly associated with insomnia among the study sample (Adjusted prevalence ratio (PRA): 1.79 ; 95% CI: 1.59–2.02). This association was also significant

among men and women separately, in stratified analysis.

In other adjusted analysis, the experience of sexual violence before the age of 18 was also significantly associated with insomnia in the overall sample (PRa=1.42; 95% CI: 1.23 – 1.64), as well as in stratified analysis (among women: PRa = 1.42; 95% CI: 1.21 – 1.65) ; among men : PRa=1.61; 95% CI:1.11 – 2.33).



F

Figure 1: Adjusted prevalence ratio (PRa) of the association between the experience of lifetime sexual violence and insomnia. Health barometer survey 2017, n total = 13 723; n men= 5 749; n women= 6 739. Models are adjusted for age, education, living situation, employment status, chronic disease, and other childhood trauma. The first model (total population) is also adjusted for sex.

## 4 Discussion

Results of this nationally representative survey indicate that nearly one in 8 French adults has insomnia, and it is significantly linked with the experience of sexual violence. Compared to men, women were more likely to have experienced sexual violence (9.5% vs 2.0%), and more likely to report insomnia (17.9% vs 9.6%). Our findings imply that the experience of sexual

violence could – at least partly - explain the increased prevalence of insomnia among women in the general population.

#### 4.1 Interpretation

Results of the current study are consistent with previous research linking the experience of traumatic event, and sexual abuse, with sleep difficulties and insomnia.[13,23] However, our study – based on a nationally-representative sample – highlights the relatively high prevalence of both sexual violence and sleep disorders in the general population, and the importance of systematically screen for sexual violence among individuals with sleep disorders, especially among women.

Traumatic events - such as the experience of sexual violence – likely cause general circadian dysregulation and thereby disrupt sleep regulation by inducing a state of heightened arousal.[24] The experience of sexual violence has been linked with an alteration in the levels of corticotropin-releasing hormone (CRH),[25] a critical component for maintaining and regulating the stability of arousal.[26]. Elevated CRH and subsequent hypothalamic–pituitary–adrenal axis hyperactivity are also associated with diminished sleep.[27]

An additional mechanism to explain the relationship between sexual violence and sleep outcomes in some individuals involves the development of a mood disorder due to traumatic stress. Most of victims of sexual violence experienced the first victimization during childhood or adolescence, which are periods of rapid brain development. Traumatic experiences during this developmental stage may interfere with normal brain development and increase the risk of difficulties in emotional and behavioural regulation and atypical responsiveness to stressors in later life.[28–30]

Inadequate sleep can, in turn, lead to further amplification of stress and arousal, and to an

increase in the risk of developing PTSD after experience of traumatic event in a vicious circle.[31] However, there is evidence that trauma-induced insomnia could exist independently of PTSD, as well as among individuals with remitted PTSD,[32] which highlights the need for targeting sleep disturbance in trauma-informed prevention and treatment interventions such as the ones based on cognitive behavioral therapy.[33]

## 4.2 Limitations

The results of this study are based on cross-sectional data, which limits causal inferences.

However, more than 75% of victims in our study reported being minors at the time of their first experience of sexual violence (median age = 12), which adds plausibility to the assumption that a previous experience of sexual violence could have an effect on current sleep disorders.

Moreover, the measures of sexual violence and sleep outcomes are self-reported, which might lead to reporting biases, especially among men who face more important stigma related to sexual victimisation. We also did not have data on shift workers who are usually more at risk of sleep disorders, nor on specific conditions which might affect sleep such as sleep-related breathing disorders. However all our multivariable models are adjusted for the presence of chronic disease. Also, adjusting for mental health variables would have introduced collider bias.

## Clinical implications

Our results underscores the relatively high prevalence of insomnia in the general population, especially among women, which supports the need for more public health measures to improve diagnosis and treatment. Our results also highlight the need to systematically screen for sexual victimisation among patients suffering from sleep disorders to propose adequate trauma-informed interventions. Future research should examine the effect of sexual violence on mental health and sleep disorders prospectively.

## 5 References

- [1] World Health Organization. Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence. World Health Organization; 2013.
- [2] Nathalie Bajos, Julie Ancian, Josselin Tricou, Axelle Valendru. Sociologie des violences sexuelles au sein de l'Église catholique en France (1950-2020) – Septembre 2021 · Inserm, La science pour la santé 2021.
- [3] Jina R, Thomas LS. Health consequences of sexual violence against women. *Best Pract Res Clin Obstet Gynaecol* 2013;27:15–26. <https://doi.org/10.1016/j.bpobgyn.2012.08.012>.
- [4] Scott KM, Koenen KC, King A, Petukhova MV, Alonso J, Bromet EJ, et al. Post-traumatic stress disorder associated with sexual assault among women in the WHO World Mental Health Surveys. *Psychol Med* 2018;48:155–67. <https://doi.org/10.1017/S0033291717001593>.
- [5] Shalev A, Liberzon I, Marmar C. Post-Traumatic Stress Disorder. *N Engl J Med* 2017;376:2459–69. <https://doi.org/10.1056/NEJMra1612499>.
- [6] Richards A, Kanady JC, Neylan TC. Sleep disturbance in PTSD and other anxiety-related disorders: an updated review of clinical features, physiological characteristics, and psychological and neurobiological mechanisms. *Neuropsychopharmacology* 2020;45:55–73. <https://doi.org/10.1038/s41386-019-0486-5>.
- [7] Center for Substance Abuse Treatment (US). Exhibit 1.3-4, DSM-5 Diagnostic Criteria for PTSD 2014.
- [8] Hall Brown TS, Belcher HME, Accardo J, Minhas R, Briggs EC. Trauma exposure and sleep disturbance in a sample of youth from the National Child Traumatic Stress Network Core Data Set. *Sleep Health* 2016;2:123–8. <https://doi.org/10.1016/j.sleh.2016.03.001>.
- [9] Sinha SS. Trauma-induced insomnia: A novel model for trauma and sleep research. *Sleep Med Rev* 2016;25:74–83. <https://doi.org/10.1016/j.smr.2015.01.008>.
- [10] Pace-Schott EF, Germain A, Milad MR. Sleep and REM sleep disturbance in the pathophysiology of PTSD: the role of extinction memory. *Biol Mood Anxiety Disord* 2015;5:3. <https://doi.org/10.1186/s13587-015-0018-9>.
- [11] Gallegos AM, Trabold N, Cerulli C, Pigeon WR. Sleep and Interpersonal Violence: A Systematic Review. *Trauma Violence Abuse* 2021;22:359–69. <https://doi.org/10.1177/1524838019852633>.
- [12] Langevin R, Kenny S, Kern A, Kingsland E, Pennestri M-H. Sexual abuse and sleep in children and adolescents: A systematic review. *Sleep Med Rev* 2022;64:101628. <https://doi.org/10.1016/j.smr.2022.101628>.
- [13] Steine IM, Harvey AG, Krystal JH, Milde AM, Grønli J, Bjorvatn B, et al. Sleep disturbances in sexual abuse victims: A systematic review. *Sleep Med Rev* 2012;16:15–25. <https://doi.org/10.1016/j.smr.2011.01.006>.
- [14] Filip I, Tidman M, Saheba N, Bennett H, Wick B, Rouse N, et al. Public health burden of sleep disorders: underreported problem. *J Public Health* 2017;25:243–8. <https://doi.org/10.1007/s10389-016-0781-0>.
- [15] Richard JB, Andler R, Guignard R, Cogordan C, Léon C, Robert M. Objectifs, contexte de mise en place et protocole du Baromètre santé 2017. *St-Maurice Santé Publique Fr* 2018;10.
- [16] Kish L. A Procedure for Objective Respondent Selection within the Household. *J Am Stat Assoc* 1949;44:380–7. <https://doi.org/10.1080/01621459.1949.10483314>.
- [17] DSM-5 American Psychiatric Association. Diagnostic and statistical manual of mental disorders. Arlington Am Psychiatr Publ 2013.

- [18] INSEE. La population totale en 2016 – Activité, emploi et chômage en 2016 2016. <https://www.insee.fr/fr/statistiques/2841321?sommaire=2841366> (accessed December 7, 2018).
- [19] Rani R, Arokiasamy P, Selvamani Y, Sikarwar A. Gender differences in self-reported sleep problems among older adults in six middle-income countries: a cross-sectional study. *J Women Aging* 2021;1–17. <https://doi.org/10.1080/08952841.2021.1965425>.
- [20] Richiardi L, Bellocco R, Zugna D. Mediation analysis in epidemiology: methods, interpretation and bias. *Int J Epidemiol* 2013;42:1511–9. <https://doi.org/10.1093/ije/dyt127>.
- [21] Abrahams N, Devries K, Watts C, Pallitto C, Petzold M, Shamu S, et al. Worldwide prevalence of non-partner sexual violence: a systematic review. *The Lancet* 2014;383:1648–54. [https://doi.org/10.1016/S0140-6736\(13\)62243-6](https://doi.org/10.1016/S0140-6736(13)62243-6).
- [22] Zeng L-N, Zong Q-Q, Yang Y, Zhang L, Xiang Y-F, Ng CH, et al. Gender Difference in the Prevalence of Insomnia: A Meta-Analysis of Observational Studies. *Front Psychiatry* 2020;11:577429. <https://doi.org/10.3389/fpsy.2020.577429>.
- [23] Hall Brown TS, Akeeb A, Mellman TA. The Role of Trauma Type in the Risk for Insomnia. *J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med* 2015;11:735–9. <https://doi.org/10.5664/jcsm.4846>.
- [24] Germain A, McKeon AB, Campbell RL. Sleep in PTSD: Conceptual model and novel directions in brain-based research and interventions. *Curr Opin Psychol* 2017;14:84–9. <https://doi.org/10.1016/j.copsyc.2016.12.004>.
- [25] Shrivastava AK, Karia SB, Sonavane SS, De Sousa AA. Child sexual abuse and the development of psychiatric disorders: a neurobiological trajectory of pathogenesis. *Ind Psychiatry J* 2017;26:4–12. [https://doi.org/10.4103/ipj.ipj\\_38\\_15](https://doi.org/10.4103/ipj.ipj_38_15).
- [26] Winsky-Sommerer R, Boutrel B, de Lecea L. Stress and arousal: the corticotrophin-releasing factor/hypocretin circuitry. *Mol Neurobiol* 2005;32:285–94. <https://doi.org/10.1385/MN:32:3:285>.
- [27] van Dalsen JH, Markus CR. The influence of sleep on human hypothalamic–pituitary–adrenal (HPA) axis reactivity: A systematic review. *Sleep Med Rev* 2018;39:187–94. <https://doi.org/10.1016/j.smr.2017.10.002>.
- [28] Fagundes CP, Glaser R, Kiecolt-Glaser JK. Stressful early life experiences and immune dysregulation across the lifespan. *Brain Behav Immun* 2013;27:8–12. <https://doi.org/10.1016/j.bbi.2012.06.014>.
- [29] Berens AE, Jensen SKG, Nelson CA. Biological embedding of childhood adversity: from physiological mechanisms to clinical implications. *BMC Med* 2017;15:135. <https://doi.org/10.1186/s12916-017-0895-4>.
- [30] McCrory E, De Brito SA, Viding E. The link between child abuse and psychopathology: A review of neurobiological and genetic research. *J R Soc Med* 2012;105:151–6. <https://doi.org/10.1258/jrsm.2011.110222>.
- [31] Hidalgo RB, Davidson JR. Posttraumatic stress disorder: epidemiology and health-related considerations. *J Clin Psychiatry* 2000;61:5–13.
- [32] Cox RC, Tuck BM, Olatunji BO. Sleep Disturbance in Posttraumatic Stress Disorder: Epiphenomenon or Causal Factor? *Curr Psychiatry Rep* 2017;19:22. <https://doi.org/10.1007/s11920-017-0773-y>.
- [33] Talbot LS, Maguen S, Metzler TJ, Schmitz M, McCaslin SE, Richards A, et al. Cognitive Behavioral Therapy for Insomnia in Posttraumatic Stress Disorder: A Randomized Controlled Trial. *Sleep* 2014;37:327–41. <https://doi.org/10.5665/sleep.3408>.

## Funding

Data came from the 2017 “Baromètre santé”, a study conducted and funded by the French Public Health Agency (Santé Publique France).

## Conflict of Interest:

The authors declare that they have no conflict of interest.

## Statement of human rights

This study uses data collected in a repeated cross-sectional survey for official statistics

([inpes.santepubliquefrance.fr/Barometres/index.asp](https://inpes.santepubliquefrance.fr/Barometres/index.asp)).

All procedures performed in the study involving human participants were in accordance with the ethical standards of the national ethics committee “Commission Nationale de l’Informatique et des Libertés” (CNIL; National commission for liberty and informatics), and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The original data collection protocol for the repeated surveys and the questionnaire were approved by the CNIL : N°1,179,915.

## Informed consent

Informed oral consent was obtained from all individual participants included in the study