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Mental disorders and medical conditions associated with causing injury or death: A population-based study

Mathilde M. Husky^{a,d,*}, Victor Alvarez Fernandez^{a,d}, Geraldine Tapia^{a,d}, Florin Oprescu^{b,d},
Fernando Navarro-Mateu^{c,d}, Viviane Kovess-Masfety^{c,d}

^a Laboratoire de Psychologie EA4139, Université de Bordeaux, Bordeaux, France

^b University of the Sunshine Coast, Queensland, Australia

^c Unidad de Docencia, Investigación y Formación en Salud Mental (UDIF-SM). Servicio Murciano de Salud. IMIB-Arrixaca. CIBER-Esp, Spain

^d Sorbonne Paris Cité, EA 4057 Université Paris Descartes, Paris, France

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ABSTRACT

The aim of the present study is to examine mental disorders and medical conditions associated with causing harm to another person in the general adult population. The sample ($n=22,138$) was drawn from a cross-sectional survey designed to characterize mental health needs in France. Twelve-month DSM-IV axis I mental disorders and medical conditions, and lifetime occurrence of potentially traumatic events were assessed with the Composite International Diagnostic Interview-SF Overall, 2% ($n=430$) of the sample reported having injured or killed someone. Causing harm was associated with male gender, lower education level, and being unemployed. The great majority (85%) of those who caused harm had experienced two or more additional potentially traumatic events. When adjusting for gender, employment status, education and number of events experienced, causing harm was associated with certain anxiety disorders, drug dependence and lifetime suicide attempt but not with major depression or post-traumatic stress disorder. Furthermore, causing harm was not associated with medical conditions in multivariate analyses. These results highlight the need for clinicians to be particularly attentive to the psychological burden that may be experienced by those who have harmed or killed someone.

1. Introduction

Previous population-based surveys have established that the majority of the adults experience at least one potentially traumatic event in their lifetime with wide differences across countries from less than 55% to more than 70%, France being among those with the highest exposure rate (Benjet et al., 2016). Exposure to shocking or frightening situations can trigger a range of physiological and psychological reactions. While most persons recover from these initial symptoms, others may develop mental disorders including Post-Traumatic Stress Disorder (PTSD) and can experience sustained functional impairment associated with re-experiencing, avoidance, arousal and reactivity, and negative cognition and mood symptoms (American Psychiatric Association, 2013).

The conditional risk of developing subsequent mental disorders including post-traumatic stress disorder, as well as disorder severity, are known to vary as a function of the type of event experienced, with events involving interpersonal violence being the associated with the highest risk (Kessler et al., 2017). Data from the National Vietnam Veterans Readjustment Study suggest that rates of PTSD increase as a

function of combat exposure (Dohrenwend et al., 2006). Additionally, being directly involved or personally responsible of atrocities increases the risk of PTSD (Fontana and Rosenheck, 1999; Fontana et al., 1992). Veterans who killed during deployment were shown to be particularly at risk for PTSD (MacNair, 2002; Maguen et al., 2010), especially if killing a non-combatant (Maguen et al., 2009) or killing in the context of anger or revenge (Maguen et al., 2013).

Killing in the context of war predicts alcohol abuse, anger, and relationship problems in Veterans even after controlling for combat exposure (Swanson et al., 1990), perceived danger, exposure to death and witnessing the killing of fellow soldiers (Maguen et al., 2011). Furthermore, veterans who had more killing experiences had twice the odds of suicidal ideation, compared to those with fewer or no killing experiences, even after adjusting for sociodemographic variables, PTSD, depression and substance use disorders (Maguen et al., 2012). The increased risk of mental disorders after killing or harming has been linked to the concept of moral injury.

Moral injury is a set of symptoms independent of a PTSD diagnosis describing the aftermath resulting from harming others, failing to

* Corresponding author at: Université de Bordeaux, Laboratoire de Psychologie EA4139, 3 ter, place de la Victoire, 33076 Bordeaux, France.

E-mail address: mathilde.husky@u-bordeaux.fr (M.M. Husky).

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prevent others from being harmed or bearing witness to gross moral violations (Drescher et al., 2011; Litz et al., 2009; Maguen and Litz, 2012). Moral injury has been posited to result in the re-experiencing, emotional numbing, and avoidance symptoms of PTSD. In addition to grave suffering and guilt, these manifestations of moral injury may lead to under- or unemployment, and failed or difficult relationships with loved ones and friends (Jordan et al., 1992).

While research in this area has focused on armed forces exposed to violence in the context of their occupation, such events also affect persons in the general population and whose occupation does not necessarily confer a significant risk of exposure. In a study of the World Mental Health survey initiative covering 24 countries, 1.4% of respondents reported having accidentally killed or injured someone and 1.0% reported having purposely injured, tortured or killed (Benjet et al., 2016). Overall, 2.8% of those who reported accidental injuries or killings met criteria for PTSD, while the conditional risk of PTSD was greater among those who reported purposely injuring or killing (4.0%) (Kessler et al., 2017). In the French portion of the World Mental Health survey, 2.7% of respondents reported accidentally injuring or killing, while 0.5% reported purposely injuring or killing (Husky et al., 2015).

These estimates point to the fact that a non-negligible portion of the general population is affected by traumatic events involving causing harm to others, yet, little is known regarding the sociodemographic and clinical characteristics of those who have been directly exposed to such events. In addition, as cumulative exposure to multiple traumatic events is known to be associated with subsequent levels of psychiatric and medical morbidity (Karam et al., 2014; Ozer et al., 2003; Sledjeski et al., 2008; Turner and Lloyd, 1995), it is important to adjust for the number of traumatic events when examining any specific exposure.

The present study seeks to examine these questions among adults in the general population using data from a large population-based survey. While most studies have examined these issues among combat veterans, the present study seeks to provide an examination of the correlates of causing harm in a broader context that is not restricted to special populations defined by their occupation. The specific objectives of the present study are to (1) identify sociodemographic characteristics associated with the experience of causing injury or death in the general population, (2) to examine the other types of traumatic events experienced by those who have caused harm to others, and 3) to examine the unadjusted and adjusted associations between DSM-IV mood, anxiety and substance use disorders, medical conditions and causing harm to others.

2. Methods

2.1. Sample and procedure

A cross-sectional survey designed to characterize mental health care needs in the general population of France included 22,138 participants and was conducted across four non-neighboring regions: Ile de France, Haute-Normandie, Lorraine, and Rhone-Alpes. Data were collected by IPSOS (polling company) between April and June 2005 by trained interviewers using a computer-assisted telephone interviewing system (CATI). In each region, participants were selected using a two-stage procedure.

First, 59,836 households with landline numbers were randomly contacted. Second, one person was randomly selected within each household according to a method proposed by Kish (Kish, 1949). Landline telephone numbers listed in the directory for each region were randomly chosen. The last digit of each number was then replaced with a randomly chosen number so as to include both listed and unlisted numbers. No directory exists for cell phone numbers; however, the four-digit prefix of each number is available from the national Authority on Telecommunications Regulation (Autorité de Régulation des

Télécommunications, ART). This four-digit prefix was used to reach individuals who were not equipped with a landline, which was estimated to represent 10% of the French population at the time of the study. A random number generator was used to complete the other four digits that were attributed.

Exclusion criteria included being a non-French speaker, a minor, unable to answer the phone or complete the interview (i.e. the person was unable to hear, did not answer the questions or answered inconsistently). Eligible participants were provided with a description of the study and informed consent was obtained over the telephone. The overall response rate was 62.7%. Recruitment and consent procedures complied with the Declaration of Helsinki and were approved by the National Data Protection Authority (CNIL).

The sample used in the present study compares the data from 430 persons (2.0%) who reported having caused injury or death with data from those who did not ($n = 21,708$). In order to minimize survey duration, questions regarding medical conditions were only administered to respondents who screened positive to a psychiatric screening question or screened positive for psychological distress based on the SF-36 Health Survey (Ware et al., 2000; Ware and Sherbourne, 1992) and to a random sample of one third of those who did not screen positive on any of the psychiatric diagnostic screening questions, and/or on any of the SF-36 mental health scales. Of the 22,138 respondents, 7270 screened negative on the initial mental health questions. Accordingly, one third ($n = 2381$) of these respondents were administered the full set of questions related to medical conditions. Thus, the analyses involving medical conditions were based on a total sample of 17,249 respondents. The data were weighted to account for the sampling strategy.

2.2. Survey variables

2.2.1. Sociodemographic variables

Sociodemographic information included gender, age, marital status (with the following categories: married or in a relationship, divorced or separated, widowed, single), education level (with the following categories: none, professional degree, high school diploma, 2-year college graduate, 4 year-college graduate or more), and employment status (with the following categories: employed or working, unemployed, student, retired, other/inactive).

2.2.2. Past year mental disorders

Twelve-month DSM-IV axis I mental disorders were assessed with the short form (CIDI-SF) of the World Health Organization Composite International Diagnostic Interview (– hereafter referred to as the CIDI) (Pez et al., 2010; World Health Organization, 1997). The CIDI screening section was used to detect those who may have difficulties in a certain area, those who endorsed screening items were then administered each relevant section. For each disorder, the presence or absence of symptoms was assessed as well as functional disability to determine the probable presence of the following disorders: major depressive episode, anxiety disorders including panic disorder, agoraphobia, social phobia, specific phobia, obsessive-compulsive disorder and post-traumatic stress disorder.

For substance use disorders, the CAGE (Ewing, 1984) was used to screen respondents that would continue with the CIDI if they had endorsed two of the four items regarding alcohol. One gate question was used to identify respondents who should be administered the drug disorder section. Lastly, lifetime suicide attempts were determined by asking respondents whether or not they had attempted suicide over the course of their life.

2.2.3. Psychological distress

Past month psychological distress was measured using the 5-item Mental Health (MH-5), a subscale of the 36-item Short Form Health Survey (SF-36) (Leplege et al., 1998; Ware and Sherbourne, 1992). The

SF-36 has good construct validity, high internal consistency and high test-retest reliability and is strongly correlated with the GHQ-12 (McCabe et al., 1996; Ware et al., 1994). A cut point to detect the presence of psychological distress has been established at 52 for European countries. The latter cutoff was used to determine the presence or absence of psychological distress.

2.2.4. Past year physical illness or event

The chronic conditions module adapted from the CIDI (Pez et al., 2010; World Health Organization, 1997) was used to assess past year physical illnesses or events. Participants were asked whether or not they had been diagnosed with any of 14 health problems in the previous year: arthritis or rheumatism, chronic back or neck problems, frequent or severe headaches, other chronic pain, stroke, heart attack, hypertension, cancer or leukemia, diabetes, respiratory problems (chronic obstructive bronchitis, emphysema), digestive ulcers, accident requiring medical attention, neurological problems and other serious long term diseases. The latter category was not included in the analyses due to its non-specific nature.

2.2.5. Traumatic events

Lifetime occurrence of fifteen potentially traumatic events was assessed within the CIDI described above (World Health Organization, 1997). In the screening section, respondents were asked whether they had ever experienced an event that was “terrible, frightening, horrible, that had caused them problems such as disturbing memories or dreams, the feeling of being detached from others, sleep or concentration problems or excessive nervousness” thereby combining DSM-IV criteria A1 and 2 for exposure to potentially traumatic events that had caused fright or horror. Those who endorsed this gate question were then asked about exposure to specific events including the following: being mugged or threatened with a weapon, being beaten by a close other, having personal war-related event experience, being physically assaulted at work, having life-threatening illness or injury, having been raped or sexually assaulted, having experienced a natural disaster such as fire, flood, earthquake, landslide or hurricane, toxic chemical exposure, having had the unexpected death of a loved one, having been kidnapped, tortured or held captive, witnessed someone getting seriously hurt or killed, discovering a dead body, and having injured or killed someone, which is the question that is the focus of the present study.

2.3. Statistical analyses

First, we examined the sociodemographic characteristics of those who reported having caused injury or death (aim 1). Chi square tests were used to identify significant differences. Second, we examined the frequency of other traumatic events in the lives of those who reported having caused injury or death. A series of logistic regression models were performed to examine the frequency of other traumatic events (aim 2), the frequency of DSM-IV mental disorders and medical conditions in the previous year (aim 3) in the lives of those who reported having caused injury or death. In the latter models, sociodemographic variables statistically associated with the odds of causing harm in Table 1 (gender, education, and employment status) as well as the number of other traumatic events were introduced as covariates. Odds ratios and their 95% confident intervals (95%CI) are presented. All analyses were performed using SPSS v. 20.

3. Results

3.1. Proportion of persons who have caused injury or death by sociodemographic characteristic

Table 1 describes the proportion of adults who have caused injury or death in the total sample by sociodemographic characteristic. Overall,

Table 1
Proportion of adults who reported having caused injury or death by socio-demographic characteristic.

	Caused injury or death		X ²	p
	n	% of total sample		
Gender			27.33	.0001
Women	192	1.5		
Men	238	2.5		
Age			5.04	.411
18–29	98	2.2		
30–39	76	1.8		
40–49	84	2.0		
50–59	66	1.7		
60–69	60	2.3		
70–99	46	1.7		
Marital status			6.28	.099
Married or in a relationship	228	1.8		
Divorced or separated	49	2.7		
Widowed	49	2.3		
Single	104	2.1		
Education level			21.22	.0001
None	51	2.0		
Professional degree	220	2.3		
High school diploma	77	1.9		
2-year College graduate	28	1.0		
4-year College graduate or more	54	1.6		
Employment status			58.62	.0001
Employed or working	206	1.7		
Unemployed	57	4.4		
Student	22	1.4		
Retired	102	2.1		
Other inactive	20	3.4		

Note. Bold signifies statistically significant at $p = .05$ or greater. Percentages are weighted.

causing harm was reported by 2% of adults and was more frequent among men (2.5%) than among women (1.5%). There were no differences in age groups or marital status between those who did or did not cause harm. There were, however, differences in education level and employment status. Those with no degree (2.0%) or a professional degree (2.3%) had a greater proportion of persons who had caused harm to others as compared to those who have some college education (1.0%) or a college degree (1.6%). Similarly, the unemployed had a greater proportion of persons who had caused harm (4.4%) as compared to persons who are employed (1.7%).

3.2. Lifetime exposure to other traumatic events by exposure status

Table 2 presents the proportion of adults who have been exposed to other traumatic events among those who have or who have not caused harm. Among those who have harmed others, the most frequently reported events included the unexpected death of a close other (84.2%), followed by witnessing injury or death (51.9%), life threatening illness or injury (35.2%) and discovering a body (31.8%). Reporting having caused injury or death significantly increased the odds of reporting two or more other events (OR = 25.78, CI = 19.76–33.63) and each individual type of event from rape or sexual assault (OR = 3.16, CI = 2.18–4.57) to unexpected death (OR = 18.54, CI = 14.32–24.03).

3.3. Past year mental disorders and psychological distress by exposure status

Table 3 details the unadjusted and adjusted odds of mental disorders in the previous 12 months. Unadjusted odds ratios for individual disorders were all significant, including for major depressive disorder (OR = 3.03, CI = 2.42–3.80), anxiety disorders (OR = 3.56, CI = 2.93–4.42), substance use disorders (4.05, CI = 3.16–5.20), two or more comorbid disorders (OR = 4.31, CI = 3.51–5.29), lifetime suicide attempt (OR = 3.73, CI = 2.84–4.88) and psychological distress

Table 2
Lifetime exposure to other potentially traumatic events among those who reported having caused injury or death.

Events	Caused injury or death n = 430		Did not n = 21,708		Odds of exposure to each event	
	%		%		OR	95%CI
Unexpected sudden death of close other	84.2		22.3		18.54	14.32–24.03
Witnessing injury or death	51.9		6.2		16.42	13.51–19.97
Life threatening illness or injury	35.2		6.6		7.75	6.32–9.50
Discovered a body	31.8		3.4		13.42	10.83–16.63
Mugged or threatened with a weapon	27.5		4.5		7.97	6.40–9.93
War-related event	22.4		3.9		7.04	5.57–8.90
Undisclosed other event	22.5		6.3		4.30	3.41–5.41
Beaten by a close other	18.7		3.8		5.84	4.55–7.50
Physical assault at work	18.5		2.6		8.57	6.64–11.07
Fire or flood	13.0		2.0		7.45	5.55–10.00
Hurricane	8.0		1.5		5.73	4.00–8.23
Rape or sexual assault	7.3		2.4		3.16	2.18–4.57
Exposed to radiation or toxic substance	6.3		1.2		5.54	3.68–8.33
Kidnapped, tortured, kept in captivity	5.9		0.5		12.09	7.80–18.71
Two or more other events	85.2		18.2		25.78	19.76–33.63

Note. Bold signifies statistically significant at $p = .05$ or greater. Percentages are weighted.

(OR = 2.94, CI = 2.42–3.58).

When adjusting for gender, employment status, education and number of other potentially traumatic events experienced, the associations between having harmed someone and mental disorders was substantially weaker. Those who had caused harm were more likely to have two or more disorders (OR = 1.35, CI = 1.07–1.71), more likely to suffer from anxiety disorders (OR = 1.44, CI = 1.16–1.79), substance use disorders (OR = 1.52, CI = 1.14–2.03), and lifetime suicide attempt (OR = 1.42, CI = 1.05–1.91). However, they were not significantly more likely to experience major depression (OR = 1.14, CI = 0.89–1.47), or psychological distress (OR = 1.23, CI = 0.99–1.53), and a number of specific anxiety and substance use disorders.

3.4. Past year physical health conditions by exposure status

Table 4 presents the unadjusted and adjusted odds of physical health conditions in the previous 12 months. Causing harm significantly increased the odds of presenting each of the medical conditions examined with the exception of strokes (OR = 1.91, CI = 0.89–4.11). Chronic pain-related conditions were frequent among those who reported causing harm, and the risk of cardiovascular disease was notable. When adjusting for gender, employment status, education and

number of other traumatic events experienced, the associations between causing and medical conditions lost their significance.

4. Discussion

The present study aimed to identify sociodemographic characteristics associated with causing harm to others in a general population sample, to describe the traumatic events commonly experienced by this group and to determine whether these adults are at increased risk of presenting with psychiatric and medical conditions when adjusting for relevant variables including exposure to additional traumatic events. The results suggest that those who have caused harm are more likely to be male, unemployed, and to have a lower education level. Second, the great majority of adults who have caused harm to have also experienced additional traumatic events. Finally, while unadjusted associations with mental disorders and medical conditions are strong and pervasive, when adjusting for key variables including number of traumatic events experienced, increased risk for mental disorders was limited to certain psychiatric conditions and increased risk for medical conditions was not significant.

Overall, 2% of the sample reported having caused injury or death, an estimate that is similar to what was reported in the French WMH

Table 3
Past year mental disorders and psychological distress by exposure status.

	Caused injury or death N = 430		Did not N = 21,708		OR	95%CI	AOR*	95%CI
	N	%	N	%				
Major depressive disorder	98	23.4	2070	9.2	3.03	2.42–3.80	1.14	.89–1.47
Anxiety disorders	172	41.0	3607	16.3	3.56	2.93–4.32	1.44	1.16–1.79
Panic disorder	37	9.2	544	2.3	4.27	3.03–6.00	1.63	1.15–2.37
Agoraphobia	47	10.1	658	3.0	3.68	2.67–5.08	1.43	1.01–2.04
Generalized anxiety disorder	48	10.1	885	3.8	2.86	2.07–3.95	1.04	.73–1.47
Social phobia	57	13.2	1122	5.3	2.72	2.04–3.61	1.27	.93–1.73
Specific phobia	67	16.5	1610	7.5	2.45	1.89–3.18	1.17	.88–1.55
OCD	54	13.6	579	2.8	5.47	4.11–7.28	1.92	1.39–2.64
PTSD	91	21.1	1055	4.5	5.65	4.43–7.20	1.32	.99–1.76
Substance use disorders	81	18.5	1118	5.3	4.05	3.16–5.20	1.52	1.14–2.03
Alcohol abuse	18	4.4	304	1.5	3.11	1.94–5.00	1.43	.85–2.43
Alcohol dependence	32	6.7	368	1.8	3.95	2.68–5.84	1.09	.71–1.70
Drug abuse	21	4.6	318	1.5	3.12	1.97–4.95	1.56	.93–2.62
Drug dependence	22	6.0	255	1.2	5.14	3.40–7.79	1.78	1.11–2.85
Number of comorbid disorders								
2 or more	146	34.8	2393	11.0	4.31	3.51–5.29	1.35	1.07–1.71
Lifetime suicide attempt	65	15.1	1051	4.6	3.73	2.84–4.88	1.42	1.05–1.91
Psychological distress	168	38.9	4130	17.8	2.94	2.42–3.58	1.23	.99–1.53

Note. Bold signifies statistically significant at $p = .05$ or greater. Percentages are weighted.

* Adjusted odds ratios: persons who reported having caused injury or death are compared to those who did not. Odds are adjusted for gender, employment status, education, and number of other traumatic events experienced.

Table 4
Past year medical conditions by exposure status.

	Caused injury or death <i>N</i> = 429		Did not <i>N</i> = 16,774		OR	95%CI	AOR*	95%CI
	<i>n</i>	%	<i>n</i>	%				
Past year medical conditions*								
Arthritis or rheumatism	151	35.2	4681	27.9	1.40	1.15–1.72	1.06	0.84–1.33
Chronic back or neck problems	210	49.0	6802	40.5	1.41	1.16–1.71	0.93	0.76–1.14
Frequent or severe headaches	117	27.2	3547	21.1	1.40	1.13–1.73	1.09	0.87–1.37
Other chronic pain	118	27.4	2780	16.5	1.91	1.54–2.37	1.08	0.86–1.36
Stroke	7	1.6	144	0.9	1.91	0.89–4.11	0.86	0.38–1.92
Heart attack	9	2.1	130	0.8	2.74	1.39–5.43	1.61	0.77–3.39
Hypertension	82	19.3	2547	15.2	1.34	1.05–1.71	1.05	0.80–1.37
Digestive ulcers	44	10.3	748	4.5	2.45	1.78–3.38	1.32	0.94–1.86
Respiratory problems	39	9.1	900	5.4	1.76	1.26–2.47	0.91	0.64–1.31
Diabetes	31	7.2	721	4.3	1.73	1.19–2.52	1.23	0.83–1.84
Cancer or leukemia	19	4.4	278	1.7	2.75	1.71–4.42	1.58	0.95–2.63
Neurological problems	41	9.6	567	3.4	3.02	2.16–4.21	1.40	0.97–2.01
Serious accident	51	11.9	905	5.4	2.36	1.75–3.19	1.27	0.92–1.76

Note. Percentages are weighted. Bold signifies statistically significant chi square tests at $p = .05$ or greater. Adjusted odds ratios: persons who reported having caused injury or death are compared to those who did not. Odds are adjusted for gender, employment status, education, and number of other traumatic events experienced.

* Past year medical conditions were available for 16,774 cases who did not harm others and for 429 of cases who did.

survey, with 2.7% of respondents reported accidentally injuring or killing, and 0.5% reported doing so purposely (Husky et al., 2015), and to the figures reported globally in WMH data pooling 24 countries with 1.4% of respondents reported having accidentally killed or injured someone and 1.0% reported having purposely injured or killed (Benjet et al., 2016). As the current study did not differentiate whether causing harm to others was intentional or not, the proportion of deliberate assaults, homicides or violent acts committed in the context of armed conflicts is unknown.

The study data further suggest that causing harm to others is more frequent among men than among women. This may be explained by the higher proportion of men having occupations associated with the use of force, and the higher proportion of men implicated in motor vehicle accidents involving injuries and fatalities due to a combination of more time spent on the road, risk taking behaviors, traffic violations, and alcohol and drug use (González-Iglesias et al., 2012; Hanna et al., 2006; Peden et al., 2004; WHO, 2013). Finally, physical assaults leading to injury or death are more often perpetrated by men both in the context of domestic violence, sexual violence, and when others outside the home are involved (European Union Agency for Fundamental Rights, 2014; Van Kesteren et al., 2000). Taken together, these patterns may account for the gender differences observed in reports of having harmed or killed others in the general population of France.

The findings further indicate that those who have reported harming others were more likely to be unemployed and to have lower levels of education. This may reflect difficulties to secure civilian employment post-deployment among former military (Harvey et al., 2011), difficulties encountered by those with aggressive or hostile behavior in securing employment (Glancy et al., 1992; Virtanen et al., 2005), or may be more directly related to the psychiatric and medical morbidity experienced following exposure to a traumatic event (Kessler, 2000). It may also be the case that these findings reflect the fact that lower levels of education are associated with increased risk of exposure to such traumatic events including events involving deliberate violence against others (Corrigan and Watson, 2005; Douglas et al., 2013; Elbogen et al., 2014; Heilbrun, 2009; Macmanus et al., 2013; Monahan and Steadman, 2001), and events involving motor vehicle injuries and fatalities (Ansari-Moghaddam et al., 2016; World Health Organization, 2015). Whereas the present study showed a tendency for those who caused harm to be divorced or separated, a previous study demonstrated that separation and divorce are associated with a 2.9-fold increase risk of serious motor vehicle accidents (Lagarde et al., 2004).

Nearly all adults who reported having caused harm also reported exposure to other types of traumatic events, and the majority reported having experienced the unexpected death of a loved one. As the survey

was not designed to decipher whether individual events occurred on the same day, it may be the case that for some, multiple events reflect a constellation of events that could be related. For instance, the unexpected death of a loved one, discovering a body or witnessing harm are events that might co-occur with killing or injuring someone in the context of one broader event such as a motor vehicle accident. That being said, prior exposure to traumatic events also confers increased risk for subsequent exposure due to the existing vulnerability to exposure (Cougale et al., 2009; Stein et al., 2002) as well as risks associated with occupational choices or sustained engagement in high-risk behavior (Killgore et al., 2008). In turn, stressful events have also been found to be associated with road rage incidents and motor vehicle accidents (Holt, 1981; Li et al., 2004). In addition, the number of traumatic event exposures is known to be an important factor in subsequent levels of psychiatric and medical morbidity (Karam et al., 2014; Ozer et al., 2003; Sledjeski et al., 2008; Turner and Lloyd, 1995). In the present study, the number of traumatic events was controlled for in multivariate analyses to address this issue.

Overall, one in four adults who have caused harm met criteria for major depression and one in five for PTSD. While causing harm multiplied the risk of presenting with each psychiatric diagnosis examined three to over five-fold, the adjusted analyses revealed a more moderate association. When adjusting for sociodemographic factors and for the number of traumatic events experienced, causing harm moderately increased the odds of panic disorder, agoraphobia, OCD, a lifetime suicide attempt and drug dependence. These findings are consistent with studies describing the burden of such events among military personnel (Fontana et al., 1992; Maguen et al., 2010, 2012, 2009). However, causing harm did not significantly increase the odds of either depression or PTSD.

Traumatic events have been linked to elevated risk for a host of mental health disorders, including PTSD and major depression (Helzer et al., 1987; Hoge et al., 2004; Jordan et al., 1991), but also high rates of substance abuse, poor psychosocial adjustment, and medical conditions (Beckham et al., 1998; Husky et al., 2018; Prigerson et al., 2002; Schwartz et al., 1997). These findings could be due to the strength of the number of traumatic events as a predictor of psychiatric conditions, as exposure to a traumatic event, the number of traumatic experiences and chronic stress have also been shown to be associated with psychiatric disorders and to a wide array of medical conditions (Pietrzak et al., 2011; Sledjeski et al., 2008; Westphal et al., 2011).

The burden associated with exposure to an event involving causing harm or death was also clear when medical conditions were examined. Indeed, those who reported such an event were significantly more likely

to experience each of the 14 medical conditions assessed in univariate analyses. Half of those who have caused harm report chronic neck or back pain, and one in three reports other chronic pain conditions including arthritis or frequent or severe headaches. These findings are consistent with results linking PTSD to a wide array of medical conditions (Husky et al., 2018; Kimerling, 2004; Pietrzak et al., 2011; Sareen et al., 2007; Sledjeski et al., 2008; Weisberg et al., 2002). When adjusting for sociodemographic variables and for the number of traumatic events experienced, however, none of the medical conditions were significantly associated with causing harm. These results are consistent with the notion that exposure to multiple traumatic events overrides the association of PTSD with medical conditions and reflects the cumulative effect of trauma exposure on a person's health (Sledjeski et al., 2008).

This study has several strengths that should be mentioned: the large sample is representative of the general population of four large regions of France and interviews were performed by trained interviewers with a structured diagnostic instrument. Nevertheless, several limitations should be considered when interpreting the findings. The present study examined causing injury or death but did not inquire about the accidental or intentional nature of the event. Thus, it was not possible to determine how deliberate actions and accidents with serious consequences differed in terms of psychiatric and medical morbidity. Second, when multiple events were reported, it was not possible to determine whether they were part of a single event, that is one that occurred on the same day. As a result, the proportion of events that refers to a single rather than multiple exposures is unknown and may have contributed to an overestimate in the number of unique events individuals were exposed to. That being said, the manner in which events were accounted for does reflect the person's report of exposure to specific events, and analyses were adjusted for the number of traumatic events reported. Third, the assessment of traumatic events was done using a gate question that may have limited the reporting of events that were not associated with significant distress, and focused on direct exposure only. Fourth, physical conditions might have been under-reported as their assessment were retrospectively explored based on a list of health problems. Finally, caution should be taken to generalize the results to other regions of France as the sample was not designed to be nationally representative.

The present study examined factors associated with causing injury or death in the general population, a topic more often examined in the context of specific populations such as the military or law enforcement. The study further illuminates the factors associated with causing harm in the general population and attendant psychiatric and medical comorbidities. Results show that causing harm is more frequently reported among men, the unemployed, and those with lower education levels. The findings also highlight the fact that the burden associated with medical conditions may not be specific to this type of event but may reflect the toll of exposure to multiple traumatic experiences. After controlling for other events causing harm as an independent variable remained associated with increased odds of certain psychiatric conditions including panic disorder, agoraphobia, OCD, drug dependence and lifetime suicide attempt, highlighting the need for clinicians to be particularly attentive to such events and to recognize that these events may also have a significant impact in the general population.

Further research is needed for a better understanding of the burden associated with causing harm to others based on the deliberate or accidental nature of the event. Importantly, such work should involve a more thorough examination of the perceived responsibility for the event as cognitive styles, guilt and prior history are likely to influence one's self-reported role in causing harm to others (Bryant and Guthrie, 2007; Litz et al., 2009). Furthermore, as secondary prevention efforts are in place in large companies involved in public transportation to handle train or bus drivers who have struck a pedestrian or who have been involved in a serious accident causing bodily harm, it may be important to consider similar protocols to address the risks among

citizens who were involved in a serious accident outside the context of their occupation.

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CRediT authorship contribution statement

Mathilde M. Husky: Conceptualization, Writing - original draft, Methodology, Formal analysis. **Victor Alvarez Fernandez:** Writing - original draft. **Geraldine Tapia:** Writing - review & editing. **Florin Oprescu:** Writing - review & editing. **Fernando Navarro-Mateu:** Writing - review & editing. **Viviane Kovess-Masfety:** Investigation, Project administration, Methodology, Writing - review & editing.

Declaration of Competing Interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.psychres.2020.112899](https://doi.org/10.1016/j.psychres.2020.112899).

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