

Word count abstract: 233
Word count manuscript: 4711
Word count references: 1750
Number of tables: 4

**Title: Suicidality Risk and (Repeat) Disaster Exposure:
Findings from a Nationally Representative Population Survey**

Short title: **Repeat Disaster Exposure and Suicidality**

Lennart Reifels, Matthew J. Spittal, Michel L.A. Dückers, Katherine Mills, Jane Pirkis¹

¹ *Lennart Reifels, Ph.D.*, is affiliated with the Centre for Mental Health, Melbourne School of Population and Global Health, The University of Melbourne, Australia, and the Disaster Research Unit, Department of Political and Social Sciences, Free University of Berlin, Germany. *Jane Pirkis, Ph.D.*, and *Matthew J. Spittal, Ph.D.*, are affiliated with the Centre for Mental Health, Melbourne School of Population and Global Health, The University of Melbourne, Australia. *Michel L.A. Dückers, Ph.D.*, is affiliated with Impact – National Knowledge and Advice Centre for Psychosocial Care Concerning Critical Incidents, the Netherlands and NIVEL – Netherlands Institute for Health Services Research. *Katherine Mills, Ph.D.*, is affiliated with the NHMRC Centre of Research Excellence in Mental Health and Substance Use, National Drug and Alcohol Research Centre, University of New South Wales, Australia.

Address correspondence to: Lennart Reifels, Centre for Mental Health, Melbourne School of Population and Global Health, The University of Melbourne, Carlton, 3010 Victoria, Australia. E-mail: l.reifels@unimelb.edu.au

Suicidality Risk and (Repeat) Disaster Exposure: Findings from a Nationally Representative Population Survey

Abstract

Objective: Despite growing awareness of adverse disaster mental health consequences, the scarce existing evidence on the link of disaster exposure and suicidality has remained inconclusive, and the differential suicidality risk associated with distinct levels of natural and man-made disaster exposure is unknown. We therefore investigated the lifetime prevalence and risk of suicidal behaviour associated with natural and man-made disaster exposure in Australia.

Method: We utilised data from a nationally representative mental health survey ($n=8,841$). Univariate and multivariate logistic regression analyses examined the lifetime risk of suicidal thoughts, plans and attempts associated with varied types and levels of disaster exposure. We focussed explicitly on natural and man-made disasters, while controlling for other types of trauma exposure, including established risk factors for suicidality.

Results: Multivariate analyses indicated that those exposed to multiple natural (AOR 2.21, 95% CI [1.04, 4.71], $p<.05$) or man-made disasters (AOR 3.4, 95% CI [1.20, 9.58] $p<.05$) were at significantly greater risk of making suicide attempts, whereas single natural or man-made disaster exposure was not associated with an increased risk of suicidal behaviour.

Conclusions: Our study findings establish the differential suicidality risk associated with natural and man-made disaster exposure in Australia, and highlight the critical role of repeat disaster exposure across distinct disaster types. Suicidal behaviour may warrant increasing attention in psychosocial recovery schemes, particularly in the context of disaster-prone areas and for population groups at elevated risk of repeat disaster exposure.

Introduction

Natural and man-made disasters represent globally increasing public health concerns that can have a significant impact on the mental health of affected populations (Norris et al., 2002). While the nature and extent of the adverse mental health consequences of disasters have been increasingly well documented over recent decades (Bonde et al., 2016; Galea, Nandi, & Vlahov, 2005; Yzermans, Van Der Berg, & Dirkzwager, 2009), the scarce existing evidence on the impact of such disaster events on population suicidality has remained largely inconclusive to date, and also been the subject of considerable debate.

Systematic reviews of epidemiological research on suicide in disaster contexts, which have primarily focussed on natural disasters, have established considerable variability in the direction of suicide mortality trends among varied study populations (Kölvés, Kölvés, & De Leo, 2013; Rezaeian, 2008). Lacking comparability of findings from event-specific studies focussing on disasters of varying types and scale is often further compounded by methodological differences in study design (involving varied control groups, or time periods) and by the existence of confounding factors such as broader cultural factors or economic trends, which can impact on suicide trends (Rezaeian, 2008). Trends in suicide mortality rates in natural disaster contexts have therefore variously been found to point upward (Basagana et al., 2011; He, 1997; Nicholls, Butler, & Hanigan, 2006; Yip, 2009), downward (Shioiri, Nishimura, Nushida, Tatsuno, & Tang, 1999; Shoaf, Sauter, Bourque, Giangreco, & Weiss, 2004), or to remain largely unchanged (Krug et al., 1999; Rodrigo, McQuillin, & Pimm, 2009).

The overall picture regarding the research evidence on non-fatal suicidal behaviour in natural disaster contexts is slightly less varied. A recent systematic review (Kölvés et al., 2013) identified a tendency towards an initial drop in suicidal behaviour in the immediate post-disaster period (Kessler, Galea, Jones, & Parker, 2006; Yu et al., 2010), while other studies identified a delayed increase in suicidality further down the track (Chou et al., 2007; Kessler et al., 2008).

Despite the lack of systematic reviews of suicide research in man-made disaster contexts, the relatively few existing studies, which mainly investigated suicide trends in relation to the September 11, 2001 terrorist attacks in the United States, indicated no significant changes in overall suicide mortality rates (Mezuk et al., 2009; Pridemore, Trahan, & Chamlin, 2009), and only short-lived initial increases (de Lange & Neeleman, 2004) or decreases (Salib, 2003) in post 9/11 suicide rates overseas. Studies investigating non-fatal suicidal behaviour following 9/11 have shown increases in suicide attempts requiring medical admission (Starkman, 2006) and longer term suicidal ideation in primary care (Neria et al., 2013), whilst also identifying an immediate but short-lived decrease in suicide attempts abroad (Detsky, Sivilotti, Kopp, Austin, & Juurlink, 2005).

Risk factors for suicidality investigated in disaster contexts thus far are largely the same as those examined in the general population and include amongst others, female sex, younger age, lower education and income, unmarried status, unemployment, and previous or existing mental disorders (Borges et al., 2010; Johnston, Pirkis, & Burgess, 2009), as well as varied adversities which are typically encountered in disaster contexts, such as physical injury or property damage (Kölves et al., 2013).

Despite the increasing global significance and societal impacts of disasters, representative national data on the prevalence and risk of suicidality associated with natural and man-made disaster exposure is lacking. Moreover, while man-made disasters have frequently been shown to have more adverse mental health consequences than natural disasters (Norris & Elrod, 2006), little is known about the differential suicidality risk associated with varying levels of exposure to distinct disaster types. This knowledge gap in turn poses a significant barrier to effective disaster mental health response planning and to identifying and optimally assisting those who are likely to be most at risk in the wake of disaster.

The current study therefore drew on data from a nationally representative population survey in order to examine the prevalence of disaster exposure and differential suicidality risk associated with distinct types and levels of disaster exposure in Australia.

Method

Setting

Australia's disaster risk profile includes a range of natural and man-made hazards. Natural hazards which are also common to other world regions include floods, bushfires, cyclones, severe storms, droughts, heatwaves and to a lesser extent earthquakes and tsunamis. The most recent World Risk Report rated Australia at a 'high' risk of natural hazards exposure, similar to New Zealand, and above the 'medium' risk encountered in the United States and 'low' to 'very low' risk in many European countries (Welle & Birkmann, 2016). Simultaneously, Australia is subject to a wide range of man-made hazards, which include technological accidents, such as fires, explosions and structural collapses; chemical, biological and radiological hazards; transport accidents; mass shootings; and acts of terrorism. All of these have been encountered by Australians both at home and overseas. Recent comparative estimates of the likelihood of man-made disaster exposure in Australia placed the country at a slightly lower risk than the United States and several Western European countries (Benjet et al., 2016).

Sample

We utilised data from a nationally representative Australian population survey, the National Survey of Mental Health and Wellbeing (NSMHWB), which was conducted by the Australian Bureau of Statistics (ABS) in 2007 (Australian Bureau of Statistics, 2009). This cross-sectional survey employed random-stratified, multistage area probability sampling of persons aged 16 to 85 years who were the usual residents of private dwellings in order to derive a nationally representative sample. A total of 8,841 respondents completed the full survey, representing an overall response rate of 60% and a total target population of 16,015,345 adult Australians (Slade, Johnston, Oakley Browne, Andrews, & Whiteford, 2009).

Survey instrument

The Composite International Diagnostic Interview version 3.0 of the World Health Organization's World Mental Health Survey Initiative (WMH-CIDI 3.0) (Kessler & Üstün, 2004) was utilised to assess key variables of relevance to this study, including: a) the lifetime prevalence of suicidal thoughts, suicide plans and suicide attempts, b) lifetime exposure to potentially traumatic events (including natural and man-made disasters), and c) sociodemographic characteristics (i.e., age, gender, country of birth, marital status, qualification, labour force status, relative socio-economic disadvantage, and household location). The WMH-CIDI 3.0 assessed the type and level (or frequency) of lifetime disaster exposure by way of asking each survey respondent the questions: "Were you ever involved in a major natural disaster, like a devastating flood, cyclone, or earthquake?", "Were you ever in a man-made disaster, like a fire started by a cigarette, or a bomb explosion?" and "How many times (did that happen in your life)?" for each of those events.

Outcome variables

Our key outcome variables were three binary variables representing the presence (coded yes = 1) or absence (coded no = 0) of lifetime suicidal thoughts, plans, and attempts. The lifetime presence or absence of these experiences was assessed by asking each survey respondent whether any of the experiences referred to in the following statements had ever happened to them: "You seriously thought about committing suicide" (lifetime suicidal thoughts), "You made a plan for committing suicide" (lifetime suicide plans), and "You attempted suicide" (lifetime suicide attempts).

Exposure variables

Our exposure variables included two binary variables representing the type of disaster the respondent had been exposed to: man-made (coded yes = 1 or no = 0) and natural (also coded yes = 1 or no = 0). In addition, two categorical variables represented the level (or frequency) of respondent exposure to each respective disaster type over their lifetime: man-made (coded 0, 1, '2

or more') and natural (coded 0, 1, '2 or more'). We refer to the former binary variables as 'types' of disaster exposure and to the latter categorical variables as 'levels' of disaster exposure. This coding meant that we could identify respondents who had not been exposed to any disasters and those who had experienced one disaster, or two or more disasters of each respective disaster type.

Other risk factors

In order to control for exposure to other types of traumatic life events, we created a binary variable 'exposure to any other type of traumatic event', which reflected either the presence (coded yes = 1) or absence (coded no = 0) of respondent lifetime exposure to at least one of 27 'other' potentially traumatic events that are routinely assessed within the WMH-CIDI 3.0, irrespective of man-made or natural disaster exposure (Benjet et al., 2016; Mills et al., 2011). In addition, a categorical variable was created to control for 'levels' of exposure to other types of traumatic events (coded as 0, 1, '2 or more'), irrespective of natural or man-made disaster exposure.

Other suicidality risk factors considered in this study included: any lifetime DSM-IV mental disorder (without diagnostic hierarchy rule applied), any lifetime DSM-IV affective disorder (without hierarchy), any lifetime DSM-IV substance use disorder (including substance abuse and/or dependence, without hierarchy), lifetime DSM-IV alcohol use disorder (including alcohol abuse and/or dependence), and lifetime DSM-IV posttraumatic stress disorder. Each variable was coded yes = 1 and no = 0 to indicate the presence or absence of respective lifetime disorders.

Analyses

We performed descriptive analyses to estimate the lifetime prevalence of disaster exposure in the Australian population. Univariate and multivariate logistic regression analyses were used to examine the differential lifetime risk of suicidality (i.e., suicidal thoughts, plans and attempts) associated with various types and levels of disaster exposure.

Univariate regression analyses initially explored the risk of lifetime suicidal thoughts, plans and attempts (in terms of the three binary outcome variables) associated with respective 'types' and 'levels' of natural or man-made disaster exposure, with results presented as Crude Odds Ratios (ORs).

Multivariate regression analyses (Model 1) first examined the risk of lifetime suicidal thoughts, plans and attempts associated with different 'types' of disaster exposure (i.e., natural or man-made). These analyses controlled for both types of disaster exposure, all relevant sociodemographic variables listed above, and for exposure to any other traumatic event.

Subsequent multivariate regression analyses (Model 2) examined the differential risk of lifetime suicidal thoughts, plans and attempts associated with varying 'levels' of natural or man-made disaster exposure. These analyses controlled for respective levels of natural and man-made disaster exposure, sociodemographic variables, and exposure to any other traumatic event. Results of all multivariate analyses are presented as Adjusted Odd Ratios (AORs).

Additional univariate analyses were carried out to examine possible underpinning differences in the likelihood of other suicidality risk factors among those exposed to 1 or '2 or more' disasters (of each disaster type). These risk factors included each of the above lifetime DSM-IV mental disorder categories and 'exposure to any other type of traumatic event'. For these additional regression analyses respective disaster exposure base levels were set to '1' (instead of '0') to explore differences between those exposed to 1 and '2 or more' disaster events.

Finally, we tested if there was effect modification between labour force status, relative socio-economic disadvantage and household location and our disaster exposure measures. We did this by testing a series of models where we fit an interaction between each potential modification variable and the disaster exposure variable. For example, one model tested an interaction between labour force status and exposure to natural disasters. In all, we fit 18 different models to the data,

representing the three potential modification variables (labour force status relative socio-economic disadvantage and household location), the two disaster exposure variables (natural and man-made) and the three outcome variables (lifetime suicidal thoughts, plan and attempts). We assessed the strength of the evidence for these interactions using the joint-Wald test.

All prevalence estimates and measures of association were weighted to conform to independent population estimates of national census data. This involved the application of 60 ABS provided person-level replicate weights to account for the inverse probability of an individual being sampled and differential response patterns in the population. Standard errors for population estimates were calculated using the delete-a-group jack-knife variance technique. All analyses were undertaken using STATA 13.1 (StataCorp, College Station, Texas).

Results

Lifetime Prevalence and Frequency of Disaster Exposure

Descriptive analyses showed that 8.4% of Australians had been exposed to at least one natural disaster and 4.8% to at least one man-made disaster in their lifetime. The mean lifetime frequency of natural disaster exposure was 0.2 in the total population (and 2.7 among those exposed to natural disasters). By contrast, the mean lifetime frequency of man-made disaster exposure was 0.4 in the total population (and 7.7 among those exposed to man-made disasters). Among those exposed to natural disasters, 67.5% had experienced one, and 32.5% '2 or more' natural disasters. Of those exposed to man-made disasters, 64.4% had experienced one, and 35.6% '2 or more' man-made disasters.

Significant differences in the lifetime prevalence of natural disaster exposure based on Chi-Square analysis (Table 1) were noted for various population subgroups in terms of age, gender, country of birth, marital status, and qualification ($p < .05$). The same demographic variables also accounted for significant differences in the prevalence of man-made disaster exposure ($p < .05$).

Insert Table 1 about here

Lifetime Prevalence and Risk of Suicidality Associated with Disaster Exposure

Table 2 outlines population estimates of the lifetime prevalence and risk of suicidal thoughts, plans and attempts associated with varying types and levels of disaster exposure. The lifetime prevalence of suicidal thoughts, plans and attempts was 16.3%, 4.9%, and 4.6% respectively, for those exposed to natural disaster (contrasting with 13%, 3.9% and 3.1% for those not exposed). Respective lifetime suicidality prevalence estimates for those exposed to man-made disaster were 20.3%, 6.4% and 6.9% (compared with 12.9%, 3.8% and 3.1% for those not exposed). The lifetime prevalence of suicidal behaviour tended to be increased among groups with greater levels of disaster exposure, and also among those exposed to man-made versus natural disaster.

Univariate logistic regression analyses, which examined the associations of disaster exposure type and level with suicidality risk (Table 2), showed that only man-made disaster exposure was associated with a significantly greater lifetime risk of suicidal thoughts (OR 1.72, 95% CI [1.11, 2.67], $p=.016$), plans (OR 1.71, 95% CI [1.04, 2.83], $p=.036$) and attempts (OR 2.34, 95% CI [1.17, 4.70], $p=.017$). Level of disaster exposure was associated with an increased lifetime risk of suicide attempts only for those exposed to either '2 or more' natural (OR 2.83, 95% CI [1.24, 6.44], $p=.014$) or man-made (OR 3.82, 95% CI [1.22, 11.98], $p=.022$) disasters, with the latter group also more likely to have suicide plans (OR 2.75, 95% CI [1.40, 5.38], $p=.004$).

Insert Table 2 about here

Multivariate logistic regression analyses were conducted to examine the association of disaster exposure 'type' and lifetime risk of suicidality (Table 3, Model 1). After controlling for sociodemographic variables, natural and man-made disaster exposure, and exposure to any other potentially traumatic event, results indicated that only those exposed to man-made disaster(s) were at significantly greater risk of making a suicide attempt (AOR 2.25, 95% CI [1.15, 4.40], $p=.019$). Natural disaster exposure did not appear to result in significant changes to lifetime risk of suicidality.

Insert Table 3 about here

Multivariate logistic regression analyses were conducted to examine the association of repeated disaster exposure and lifetime suicidality risk (Table 4, Model 2). After controlling for demographic variables, respective 'levels' of natural and man-made disaster exposure, and for exposure to any other potentially traumatic event, results showed that those exposed to '2 or more' natural (AOR 2.21, 95% CI [1.04, 4.71], $p=.039$) or man-made (AOR 3.40, 95% CI [1.20, 9.58], $p=.022$) disasters were at significantly greater lifetime risk of making a suicide attempt, with the latter group also being more likely to have made suicide plans (AOR 2.33, 95% CI [1.17, 4.64], $p=.017$). Exposure to a single natural or man-made disaster did not result in significant changes to lifetime suicidality risk.

Model 2 was subsequently amended to account for varying 'levels' of exposure to 'any other traumatic event' (by using a categorical instead of a dichotomous predictor variable, coded as exposure to 0, 1 or '2 or more' other traumatic events; irrespective of natural or man-made disaster exposure). Subsequent regression results indicated that only multiple man-made (AOR 2.78, 95% CI [1.01, 7.63] $p=.047$) but not multiple natural disaster exposure (AOR 2.06, 95% CI [0.97, 4.36] $p=.058$) was associated with an increased risk of suicide attempts. Previous findings on the heightened risk of suicide plans in multiple man-made disaster contexts were no longer significant (AOR 1.88, 95% CI [0.96, 3.66] $p=.064$).

Insert Table 4 about here

Additional analyses of survey data explored the likelihood of the presence of other risk factors for suicidality (i.e., any lifetime DSM-IV mental disorder - without hierarchy, any lifetime DSM-IV affective disorder - without hierarchy, any lifetime DSM-IV substance use disorder - without hierarchy, lifetime DSM-IV alcohol use disorder, lifetime DSM-IV posttraumatic stress disorder, and lifetime exposure to 'any other potentially traumatic event') in those exposed to 1 or '2 or more' disasters. These univariate analyses showed no statistically significant differences in the likelihood of these risk factors between groups exposed to 1 and '2 or more' (natural or man-made) disasters ($p>.05$). This indicates that cumulative exposure to multiple disasters (compared to single disaster exposure) was not associated with significant increases in the likelihood of these conditions (Reifels, Mills, Dücker, & O'Donnell, Forthcoming). Nevertheless, cumulative natural (but not man-made) disaster exposure was associated with a near significant increase in the likelihood of exposure to 'any other potentially traumatic event' (OR 2.00, 95% CI [0.99, 4.05], $p=.055$), thus highlighting exposure to other traumatic events as a potential driver of increased suicidality risk in natural disaster contexts. This latter finding was confirmed by multivariate regression analysis of general suicidality risk in the Australian population (Table 4, Model 2), which in controlling for this particular and other mentioned variables, indicated a significantly increased lifetime risk of suicidal thoughts

(AOR 3.73, 95% CI [2.75, 5.06], $p=.000$), plans (AOR 8.29, 95% CI [4.77, 14.42], $p=.000$) and attempts (AOR 5.41, 95% CI [1.57, 18.64], $p=.008$) for those who had experienced 'any other potentially traumatic event' versus those who had not.

Finally, we tested our Model 2 outcomes for possible effect modification in terms of the interactions of labour force status, relative socio-economic disadvantage, and household location with varying levels of exposure to natural or man-made disaster for each of the outcomes. No significant interaction effects were found in any of the 18 models that we tested.

Discussion

Our study findings establish the differential suicidality risk associated with natural and man-made disaster exposure in a nationally representative population sample, and highlight the critical role of repeat exposure across distinct disaster types. Only cumulative exposure to multiple natural disasters was associated with an increased lifetime suicidality risk (of making a suicide attempt), while cumulative exposure to multiple man-made disasters was associated with an even greater lifetime risk of suicidal behaviour (in terms of suicide plans and attempts).

These national-level findings partly corroborate existing insights from a cross-national study of other world mental health survey countries (Stein et al., 2010), which had indicated an elevated risk of suicidal ideation and attempts following man-made disaster exposure (with respective reported ORs of 1.3 and AORs of 1.4). Yet, despite underpinning differences in study methodology and samples considered, our study also extends previous research insights by explicitly examining the role of multiple exposure to specific disaster types (whereas previous research has tended to either subsume disaster exposure within broader traumatic event categories, or not differentiated single from multiple disaster exposure). Our findings regarding the heightened risk of suicidal behaviour in multiple natural disaster contexts further concur with insights from an earlier US study (Krug et al., 1999), which had noted a 15% increase in 2-year post-disaster suicide rates in counties exposed to two natural disasters (compared with non-significant changes observed in counties exposed to one such event).

Taken together, these findings extend our understanding of the relatively greater potency of man-made (versus natural) disasters to produce adverse mental health outcomes (Bromet et al., 2017; Norris & Elrod, 2006) in terms of the associated decreased will to live, and shed further light on the differential (and hitherto unclear) relationship of natural disaster exposure and human suicidality. Crucially, these findings suggest that exposure to a single natural disaster alone may not necessarily

increase lifetime suicidality risk. However, repeat exposure to natural (or man-made) disasters, significantly increases the risk of suicidal behaviours.

While individual mental health outcomes following repeat disaster exposure vary, these population level findings would speak against the protective 'inoculation effect' that initial disaster involvement could be hypothesised to have on suicidality during subsequent disasters (Knight, Gatz, Heller, & Bengtson, 2000; Norris & Murrell, 1988; Shrira, Palgi, Hamama-Raz, Goodwin, & Ben-Ezra, 2014). On the contrary, it would appear that repeat exposure to natural or man-made disasters significantly increases the risk of suicidality in the population. Similarly, care should be taken not to interpret the neutral risk of single natural disaster exposure as 'immunising' against individual suicidality risk, since natural disaster events can differ dramatically in terms of intensity and scope, and individual and societal impacts. Both specific individual and broader risk and protective factors need to be taken into consideration when determining who is at risk of suicidality in the wake of disaster (Bonanno, Brewin, Kaniasty, & La Greca, 2010; Borges et al., 2010; Johnston et al., 2009).

Universally greater odds of lifetime suicidality risk associated with man-made disaster exposure identified in all regression models concur with the findings from a recent factor analysis, which examined exposure to the full range of traumatic events across world mental health survey countries (Benjet et al., 2016). This analysis indicated that while natural disasters were not only categorised under and found to primarily load on traumatic events in the 'accident/injuries' cluster (which are typically seen as less intentional, and therefore also less susceptible to conspiracy), man-made disasters (classified under 'other traumas') loaded on two principal factor clusters, namely 'accident/injuries' and 'collective violence'. These factor loadings simultaneously suggest that repeat disaster exposure as a driver of increased suicidality risk in the current context may be linked to other types of traumatic event exposure. Earlier studies based on world mental health survey data confirmed that exposure to different types of traumatic events is accompanied by a higher prevalence of different types of mental disorders, in particular of mood and posttraumatic stress

disorders (Dückers, Alisic, & Brewin, 2016; Dücker & Brewin, 2016). Nevertheless, our study findings regarding the effects of repeat disaster exposure held true even when controlling for the likelihood of exposure to any other type of traumatic event and for the presence or absence of these commonly associated lifetime mental disorders. This suggests that the theoretical distinction between man-made and natural disasters, which appeared empirically distinctive in the factor analysis by Benjet and colleagues (2016), is an important explanatory factor for variation in suicidality. In view of Hobfoll's conservation of resources theory of traumatic stress (Hobfoll, 1989), it is further conceivable that recurrent setbacks and multiple adversities encountered in repeat disaster contexts, man-made more than natural, can threaten to deplete vital existing resources and may therefore be experienced by some individuals as particularly demoralising, which in turn may lead them to 'give up' and to plan or even attempt suicide.

Study Strengths and Limitations

Our findings need to be interpreted in light of several study strengths and limitations. Study strengths included the use of data from a nationally representative population survey, which enabled extrapolation from sample characteristics to broader population parameters. The study focussed on non-fatal suicidal behaviour (not on suicide). Whilst accounting for varied socio-demographic variables, and exposure to other traumatic events, the study did not control for other contributing factors of suicidality (such as economic conditions). The NSMHWB involved cross-sectional retrospective survey data and a relatively crude disaster exposure measure, which classified disaster events by primary source or agent, and which did not permit differentiating more specific disaster characteristics such as type, scope, intensity, location, or degree of individual disaster exposure. Unlike expert-based classification of disaster type on the basis of scientific typologies, lay classification of natural or man-made disaster type is inevitably more likely to be guided by subjective interpretations and by the material content of interview questions. The 2007 NSMHWB data did not reflect more recent major Australian disasters, such as the 2009 Victorian

Black Saturday Bushfires and the 2010-11 Queensland Floods. Despite the CIDI's established sound psychometric properties and strong concordance with standardised clinical assessments (Andrews & Peters, 1998; Haro et al., 2006), the sensitivity and specificity of its suicidality module remain unknown. While cross-sectional survey data enabled the examination of key variable associations at population level, our analysis did not permit definitive causal or temporal inferences in regard to the direction of effects or the chronology of events over time. Resulting lifetime suicidality estimates are therefore likely to reflect inflated estimates of the true prevalence of post-disaster suicidality.

Implications

Key study findings regarding the distinctive empirical relationship of multiple disaster exposure and suicidality risk may benefit from further replication in nationally representative population samples and prospective cohort studies. Future research should therefore adopt appropriate measures and sufficiently large timeframes to capture the degree and level of exposure to distinct disaster types, while controlling for other types of traumatic event exposure. Future studies may further benefit from exploring the extent to which exposure to 'other traumatic events' mediates (or moderates) the relationship of disaster exposure and suicidality.

Pursuant to confirmation of this distinctive relationship, our findings have practical implications for disaster mental health. Since non-fatal suicidal behaviours are among the strongest predictors of suicide (Nock et al., 2008), our study findings may have significant implications for population groups in disaster-prone areas and others at elevated risk of repeat disaster exposure. The study highlights the need for an all-hazards approach to disaster mental health response planning and population health surveillance that incorporates explicit provisions for screening for suicidality and associated risk factors, which importantly include (but are not limited to) previous or repeat disaster exposure. This approach can facilitate the identification of high-risk individuals in disaster-affected populations and optimise the targeting of appropriate mental health support. In ascertaining heightened levels of suicidality risk, special consideration should further be given to exposure to a range of other

traumatic life events, which although not necessarily always directly linked to disasters, are also increasingly likely to occur during the disaster impact and often prolonged disaster recovery phases (Garfin, Silver, Ugalde, Linn, & Inostroza, 2014; Kessler, McLaughlin, Koenen, Petukhova, & Hill, 2012; Lock et al., 2012). Post-disaster psychosocial support should therefore explicitly consider suicidality in disaster contexts to incorporate effective strategies to address suicide thoughts, plans and attempts, especially in those contexts where repeat disaster exposure and exposure to range of other traumatic events are evident or highly likely. Previous research on the temporal aspects of disaster suicidality further indicates that it is critical not to limit this attention to the immediate disaster aftermath, since increases in population suicidality are often delayed and perhaps even more likely to occur further down the track (Kölves et al., 2013).

Apart from increasing attention to suicidality in post-disaster psychosocial support strategies, it is vital that efforts be made to address the underpinning reasons that give rise to increasing disaster exposure and additional or prolonged suicidal stressors in disaster contexts (such as via effective rebuilding, recovery and insurance schemes, which can restore livelihoods and ameliorate property damage). Globally increasing disaster risks, including projected increases in frequency and intensity of extreme climatic events (Intergovernmental Panel on Climate Change, 2012) and prevalence of man-made disasters (Coleman, 2006), further highlight the need for effective and more proactive approaches to disaster risk management, which can reduce the risk of population exposure and existing vulnerability to disasters, in the first place, and thereby mitigate adverse disaster impacts and health consequences (Aitsi-Selmi & Murray, 2016). Our study findings clearly highlight the likely benefits of such approach to disaster risk reduction for population mental health.

Conclusion

Study findings extend existing insights into the relatively greater potency of man-made (versus natural) disasters to produce adverse mental health consequences in terms of the associated increased risk of suicidality, and establish the critical role of repeat disaster exposure across distinct disaster types. Repeat (but not single) exposure to natural or man-made disasters was found to be associated with an increased risk of suicidal behaviour in the population. Suicidality may therefore warrant increasing attention in psychosocial recovery schemes, particularly in the context of disaster-prone areas and for population groups at elevated risk of repeat disaster exposure.

References

- Aitsi-Selmi, A., & Murray, V. (2016). Protecting the health and well-being of populations from disasters: Health and health care in the Sendai Framework for Disaster Risk Reduction 2015-2030. *Prehospital and Disaster Medicine, 31*(1), 74-78. doi:10.1017/S1049023X15005531
- Andrews, G., & Peters, L. (1998). The psychometric properties of the Composite International Diagnostic Interview. *Social Psychiatry and Psychiatric Epidemiology, 33*(2), 80-88.
- Australian Bureau of Statistics. (2009). *2007 National Survey of Mental Health and Wellbeing: Users' guide, Cat. No. 4327.0*. Canberra: Australian Bureau of Statistics.
- Basagana, X., Sartini, C., Barrera-Gomez, J., Davdand, P., Cunillera, J., Ostro, B., . . . Medina-Ramon, M. (2011). Heat waves and cause-specific mortality at all ages. *Epidemiology, 22*(6), 765-772. doi:10.1097/EDE.0b013e31823031c5
- Benjet, C., Bromet, E., Karam, E. G., Kessler, R. C., McLaughlin, K. A., Ruscio, A. M., . . . Koenen, K. C. (2016). The epidemiology of traumatic event exposure worldwide: results from the World Mental Health Survey Consortium. *Psychological Medicine, 46*(2), 327-343. doi:10.1017/S0033291715001981
- Bonanno, G. A., Brewin, C. R., Kaniasty, K., & La Greca, A. M. (2010). Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. *Psychological Science in the Public Interest, 11*(1), 1-49. doi:10.1177/1529100610387086
- Bonde, J. P., Utzon-Frank, N., Bertelsen, M., Borritz, M., Eller, N. H., Nordentoft, M., . . . Rugulies, R. (2016). Risk of depressive disorder following disasters and military deployment: systematic review with meta-analysis. *British Journal of Psychiatry, 208*(4), 330-336. doi:10.1192/bjp.bp.114.157859
- Borges, G., Nock, M. K., Abad, J. M. H., Hwang, I., Sampson, N. A., Alonso, J., . . . Kessler, R. C. (2010). Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. *Journal of Clinical Psychiatry, 71*(12), 1617-1628.
- Bromet, E. J., Atwoli, L., Kawakami, N., Navarro-Mateu, F., Piotrowski, P., King, A. J., . . . Kessler, R. C. (2017). Post-traumatic stress disorder associated with natural and human-made disasters in the World Mental Health Surveys. *Psychological Medicine, 47*(2), 227-241. doi:10.1017/S0033291716002026
- Chou, F. H.-C., Wu, H.-C., Chou, P., Su, C.-Y., Tsai, K.-Y., Chao, S.-S., . . . Ou-Yang, W.-C. (2007). Epidemiologic psychiatric studies on post-disaster impact among Chi-Chi earthquake survivors in Yu-Chi, Taiwan. *Psychiatry and Clinical Neurosciences, 61*(4), 370-378.
- Coleman, L. (2006). Frequency of man-made disasters in the 20th century. *Journal of Contingencies & Crisis Management, 14*(1), 3-11. doi:10.1111/j.1468-5973.2006.00476.x
- de Lange, A. W., & Neeleman, J. (2004). The effect of the September 11 terrorist attacks on suicide and deliberate self-harm: a time trend study. *Suicide and Life-Threatening Behavior*(4), 439.
- Detsky, M. E., Sivilotti, M. L. A., Kopp, A., Austin, P. C., & Juurlink, D. N. (2005). Deliberate self-poisoning in Ontario following the terrorist attacks of September 11, 2001. *Journal of the American Medical Association, 294*(15), 1900-1901. doi:10.1001/jama.294.15.1900
- Dückers, M. L. A., Alisic, E., & Brewin, C. R. (2016). A vulnerability paradox in the cross-national prevalence of post-traumatic stress disorder. *British Journal of Psychiatry, 209*(4), 300-305. doi:10.1192/bjp.bp.115.176628
- Dückers, M. L. A., & Brewin, C. R. (2016). A paradox in individual versus national mental health vulnerability: Are higher resource levels associated with higher disorder prevalence? *Journal of Traumatic Stress, 29*(6), 572-576. doi:10.1002/jts.22144
- Galea, S., Nandi, A., & Vlahov, D. (2005). The epidemiology of post-traumatic stress disorder after disasters. *Epidemiologic Reviews, 27*(1), 78-91. doi:10.1093/epirev/mxi003
- Garfin, D. R., Silver, R. C., Ugalde, F. J., Linn, H., & Inostroza, M. (2014). Exposure to rapid succession disasters: A study of residents at the epicenter of the Chilean Bio Bio earthquake. *Journal of Abnormal Psychology, 123*(3), 545-556. doi:10.1037/a0037374

- Haro, J. M., Arbabzadeh-Bouchez, S., Brugha, T. S., De Girolamo, G., Guyer, M. E., Jin, R., . . . Kessler, R. C. (2006). Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health Surveys. *International Journal of Methods in Psychiatric Research*, *15*(4), 167-180. doi:10.1002/mpr.196
- He, Z.-X. (1997). A suicide belt in China: The Yangtze basin. *Archives of Suicide Research*, *4*(3), 287-289. doi:10.1080/13811119808258303
- Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*, *44*(3), 513- 524.
- Intergovernmental Panel on Climate Change. (2012). *Special report on managing the risks of extreme events and disasters to advance climate change adaptation: Summary for policymakers*. Geneva: IPCC.
- Johnston, A. K., Pirkis, J. E., & Burgess, P. M. (2009). Suicidal thoughts and behaviours among Australian adults: findings from the 2007 National Survey of Mental Health and Wellbeing. *Australian and New Zealand Journal of Psychiatry*, *43*(7), 635-643. doi:10.1080/00048670902970874
- Kessler, R. C., Galea, S., Gruber, M. J., Sampson, N. A., Ursano, R. J., & Wessely, S. (2008). Trends in mental illness and suicidality after Hurricane Katrina. *Molecular Psychiatry*, *13*(4), 374-384. doi:10.1038/sj.mp.4002119
- Kessler, R. C., Galea, S., Jones, R. T., & Parker, H. A. (2006). Mental illness and suicidality after Hurricane Katrina. *Bulletin of the World Health Organization*, *84*(12), 930-939.
- Kessler, R. C., McLaughlin, K. A., Koenen, K. C., Petukhova, M., & Hill, E. D. (2012). The importance of secondary trauma exposure for post-disaster mental disorder. *Epidemiology and Psychiatric Sciences*, *21*(1), 35-45.
- Kessler, R. C., & Üstün, T. B. (2004). The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *International Journal of Methods in Psychiatric Research*, *13*(2), 93-121.
- Knight, B. G., Gatz, M., Heller, K., & Bengtson, V. L. (2000). Age and emotional response to the Northridge earthquake: a longitudinal analysis. *Psychology and Aging*, *15*(4), 627-634.
- Kölves, K., Kölves, K. E., & De Leo, D. (2013). Natural disasters and suicidal behaviours: A systematic literature review. *Journal of Affective Disorders*, *146*(1), 1-14. doi:10.1016/j.jad.2012.07.037
- Krug, E. G., Kresnow, M., Peddicord, J. P., Dahlberg, L. L., Powell, K. E., Crosby, A. E., & Anest, J. L. (1999). "Suicide after natural disasters": Retraction. *New England Journal of Medicine*, *340*(2), 148-149. doi:10.1056/NEJM199901143400213
- Lock, S., Rubin, G. J., Murray, V., Rogers, M. B., Amlôt, R., & Williams, R. (2012). Secondary stressors and extreme events and disasters: A systematic review of primary research from 2010-2011. *PLoS Currents Disasters*. doi:10.1371/currents.dis.a9b76fed1b2dd5c5bfcfc13c87a2f24f
- Mezuk, B., Larkin, G. L., Prescott, M. R., Tracy, M., Vlahov, D., Tardiff, K., & Galea, S. (2009). The influence of a major disaster on suicide risk in the population. *Journal of Traumatic Stress*, *22*(6), 481-488. doi:10.1002/jts.20473
- Mills, K. L., McFarlane, A. C., Slade, T., Creamer, M., Silove, D., Teesson, M., & Bryant, R. (2011). Assessing the prevalence of trauma exposure in epidemiological surveys. *Australian and New Zealand Journal of Psychiatry*, *45*(5), 407-415. doi:10.3109/00048674.2010.543654
- Neria, Y., Wickramaratne, P., Olfson, M., Gameroff, M. J., Pilowsky, D. J., Lantigua, R., . . . Weissman, M. M. (2013). Mental and physical health consequences of the September 11, 2001 (9/11) attacks in primary care: A longitudinal study. *Journal of Traumatic Stress*, *26*(1), 45-55.
- Nicholls, N., Butler, C. D., & Hanigan, I. (2006). Inter-annual rainfall variations and suicide in New South Wales, Australia, 1964– 2001. *International Journal of Biometeorology*, *50*(3), 139-143. doi:10.1007/s00484-005-0002-y
- Nock, M. K., Borges, G., Bromet, E. J., Cha, C. B., Kessler, R. C., & Lee, S. (2008). Suicide and suicidal behavior. *Epidemiologic Reviews*, *30*(1), 133-154. doi:10.1093/epirev/mxn002

- Norris, F. H., & Elrod, C. (2006). Psychosocial consequences of disaster: A review of past research. In F. H. Norris, S. Galea, M. Friedman, & P. Watson (Eds.), *Methods for disaster mental health research* (pp. 20-44). New York: Guilford.
- Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E., & Kaniasty, K. (2002). 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001. *Psychiatry*, *65*(3), 207-239. doi:10.1521/psyc.65.3.207.20173
- Norris, F. H., & Murrell, S. A. (1988). Prior experience as a moderator of disaster impact on anxiety symptoms in older adults. *American Journal of Community Psychology*, *16*(5), 665-683.
- Pridemore, W. A., Trahan, A., & Chamlin, M. B. (2009). No evidence of suicide increase following terrorist attacks in the United States: An interrupted time-series analysis of September 11 and Oklahoma City. *Suicide and Life-Threatening Behavior*, *39*(6), 659-670. doi:10.1521/suli.2009.39.6.659
- Reifels, L., Mills, K., Dückers, M. L. A., & O'Donnell, M. (Forthcoming). Psychiatric epidemiology and disaster exposure in Australia.
- Rezaeian, M. (2008). Epidemiology of suicide after natural disasters: A review on the literature and a methodological framework for future studies. *American Journal of Disaster Medicine*, *3*(1), 52-56.
- Rodrigo, A., McQuillin, A., & Pimm, J. (2009). Effect of the 2004 tsunami on suicide rates in Sri Lanka. *Psychiatric Bulletin*, *33*(5), 179-180. doi:10.1192/pb.bp.108.020743
- Salib, E. (2003). Effect of 11 September 2001 on suicide and homicide in England and Wales. *British Journal of Psychiatry*, *183*(3), 207-212. doi:10.1192/bjp.183.3.207
- Shioiri, T., Nishimura, A., Nushida, H., Tatsuno, Y., & Tang, S. W. (1999). The Kobe earthquake and reduced suicide rate in Japanese males. *Archives of General Psychiatry*, *56*(3), 282-283.
- Shoaf, K. I., Sauter, C., Bourque, L. B., Giangreco, C., & Weiss, B. (2004). Suicides in Los Angeles County in relation to the Northridge earthquake. *Prehospital and Disaster Medicine*, *19*(4), 307-310.
- Shrira, A., Palgi, Y., Hamama-Raz, Y., Goodwin, R., & Ben-Ezra, M. (2014). Previous exposure to the World Trade Center terrorist attack and posttraumatic symptoms among older adults following Hurricane Sandy. *Psychiatry: Interpersonal & Biological Processes*, *77*(4), 374-385. doi:10.1521/psyc.2014.77.4.374
- Slade, T., Johnston, A., Oakley Browne, M. A., Andrews, G., & Whiteford, H. (2009). 2007 National Survey of Mental Health and Wellbeing: Methods and key findings. *Australian and New Zealand Journal of Psychiatry*, *43*(7), 594-605. doi:10.1080/00048670902970882
- Starkman, M. N. (2006). The terrorist attacks of September 11, 2001, as psychological toxin: increase in suicide attempts. *Journal of Nervous and Mental Disease*, *194*(7), 547-550.
- Stein, D. J., Chiu, W. T., Hwang, I., Kessler, R. C., Sampson, N., Alonso, J., . . . Nock, M. K. (2010). Cross-national analysis of the associations between traumatic events and suicidal behavior: findings from the WHO World Mental Health Surveys. *PLoS One*, *5*(5), e10574-e10574. doi:10.1371/journal.pone.0010574
- Welle, T., & Birkmann, J. (2016). The World Risk Index 2016. In *World Risk Report 2016* (pp. 42-51). Berlin, Germany: Alliance Development Works.
- Yip, P. (2009). Effects of an earthquake on suicide rates in Nantou, Taiwan. *British Journal of Psychiatry*, *194*(2), 190-190. doi:10.1192/bjp.194.2.190
- Yu, X.-N., Lau, J. T. F., Zhang, J., Mak, W. W. S., Choi, K. C., Lui, W. W. S., . . . Chan, E. Y. Y. (2010). Posttraumatic growth and reduced suicidal ideation among adolescents at month 1 after the Sichuan Earthquake. *Journal of Affective Disorders*, *123*(1-3), 327-331.
- Yzermans, C. J., Van Der Berg, B., & Dirkzwager, A. J. E. (2009). Physical health problems after disasters. In Y. Neria, S. Galea, & F. H. Norris (Eds.), *Mental health and disasters* (pp. 67-93). New York: Cambridge University Press.

TABLE 1. Lifetime Prevalence and Mean Frequency of Disaster Exposure in the Australian Population

Population group	Sample count (unweighted)	ND exposed (Pop) ^a	MD exposed (Pop) ^a	Mean freq. ND exposure (ND exposed) ^a	Mean freq. MD exposure (MD exposed) ^a
	<i>n</i>	%	%	μ	μ
Age		***	**		
16-29	2031	5.06	2.75	4.55	6.60
30-49	3000	9.44	4.79	2.49	3.98
50-64	1905	9.76	6.00	2.25	10.44
≥65	1905	9.40	6.38	2.06	12.13
Gender		**	***		
Male	4027	9.77	6.74	2.65	9.18
Female	4814	7.14	2.93	2.66	4.58
Country of Birth		*	*		
Australia	6530	7.52	4.28	2.57	8.79
Main English speaking ^b	1032	9.64	7.10	3.29	5.10
Other	1279	11.86	5.70	2.52	5.87
Marital status		***	**		
Never married	2894	6.30	3.26	3.85	7.77
Previously married	1945	9.33	6.85	2.46	3.99
Married	4002	9.52	5.22	2.22	9.04
Non-school qualification^c		***	**		
No	3917	6.44	3.86	1.63	8.17
Yes	4924	10.10	5.61	3.20	7.46
Labour force status					
Employed	5499	8.12	4.82	3.15	5.25
Unemployed	216	7.91	3.35	2.59	1.23
Not in labour force	3126	9.14	4.94	1.76	12.92
Index of relative socio-economic disadvantage^d					
1 st Quintile	1529	9.46	5.38	1.78	6.68
2 nd Quintile	1756	8.86	5.35	4.85	10.67
3 rd Quintile	1793	8.10	4.06	2.40	9.95
4 th Quintile	1854	8.22	5.72	2.31	4.94
5 th Quintile	1909	7.88	3.80	2.00	7.81
Location^e					
Major urban	5683	8.22	4.53	1.94	8.35
Other urban	2054	9.02	5.28	3.21	6.18
Other	1104	8.67	5.55	5.32	7.67
Total	8841	8.44	4.82	2.66	7.72

Abbreviations: ND, Natural disaster; MD, Man-made disaster; Pop, Population.

^a Weighted population estimates. ^b Main English speaking countries include Canada, Ireland, New Zealand, South Africa, UK and USA. ^c Holding a qualification or degree above school-level. ^d The Index of Relative Socio-

economic Disadvantage (IRSD) is derived from ABS census data and forms part of the Socio-Economic Indexes for Areas (SEIFA), 2006; 1st Quintile (most disadvantaged), 5th Quintile (least disadvantaged). ^e Household location based on classification of census collection districts; with 'major urban' (>100000 population), 'other urban' (1000 to 99999), and 'other' incorporating 'bounded localities' (200 to 999) and the 'rural balance'. Significance level (based on Qui-Square analysis): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 2. Lifetime Suicidality Prevalence and Risk Associated with Disaster Exposure (Univariate Binary Logistic Regression Analyses)

Predictor	Lifetime thoughts ^a			Lifetime plans ^a			Lifetime attempts ^a		
	%	OR	95% CI	%	OR	95% CI	%	OR	95% CI
ND exposure									
No	12.97	1.00		3.86	1.00		3.13	1.00	
Yes	16.34	1.31	[0.95, 1.81]	4.91	1.29	[0.73, 2.28]	4.59	1.49	[0.79, 2.79]
0	12.97	1.00		3.86	1.00		3.13	1.00	
1	15.49	1.23	[0.81, 1.87]	3.72	0.96	[0.47, 1.98]	2.79	0.89	[0.39, 2.03]
2 or more	18.22	1.50	[0.90, 2.50]	7.42	1.99	[0.86, 4.63]	8.36	2.83*	[1.24, 6.44]
MD exposure									
No	12.89	1.00		3.83	1.00		3.06	1.00	
Yes	20.31	1.72*	[1.11, 2.67]	6.38	1.71*	[1.04, 2.83]	6.89	2.34*	[1.17, 4.70]
0	12.89	1.00		3.83	1.00		3.06	1.00	
1	21.84	1.89*	[1.11, 3.21]	4.78	1.26	[0.69, 2.30]	5.12	1.71	[0.82, 3.54]
2 or more	18.67	1.55	[0.78, 3.08]	9.85	2.75**	[1.40, 5.38]	10.77	3.82*	[1.22, 11.98]

Abbreviations: ND, Natural disaster; MD, Man-made disaster; OR, Odds ratio; CI, Confidence interval.

^a Weighted population estimates.

Significance level: * $p < 0.05$; ** $p < 0.01$.

TABLE 3. Predictors of Lifetime Suicidality Risk in Australia (Multivariate Binary Logistic Regression - Model 1)

Predictor	Lifetime thoughts ^a		Lifetime plans ^a		Lifetime attempts ^a	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
ND exposure						
No	1.00		1.00		1.00	
Yes	1.15	[0.82, 1.60]	1.15	[0.62, 2.14]	1.26	[0.63, 2.54]
MD exposure						
No	1.00		1.00		1.00	
Yes	1.54	[0.99, 2.39]	1.54	[0.93, 2.55]	2.25*	[1.15, 4.40]

Abbreviations: ND, Natural disaster; MD, Man-made disaster; AOR, Adjusted odds ratio; CI, Confidence interval.

^a Weighted population estimates. Regressions controlled for age, gender, country of birth, marital status, qualification, labour force status, relative socio-economic disadvantage, household location, natural and man-made disaster exposure, exposure to any other traumatic event (defined as lifetime exposure to at least one of 27 'other' potentially traumatic events that are routinely assessed within the WMH-CIDI 3.0, irrespective of MD and ND exposure). A collinearity test which examined the conditioning of the above matrix of predictors in the sample (using STATA 'coldiag' command) produced a matrix condition number = 10.87, which is well below the suggested cut-off score of '30 or larger' that would otherwise be indicative of collinearity problems (Belsley et al. 1980).

Significance level: * $p < 0.05$.

TABLE 4. Predictors of Lifetime Suicidality Risk in Australia (Multivariate Binary Logistic Regression - Model 2)

Predictor	Lifetime thoughts ^a		Lifetime plans ^a		Lifetime attempts ^a	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
ND exposure level						
0	1.00		1.00		1.00	
1	1.12	[0.73, 1.71]	0.89	[0.40, 1.95]	0.75	[0.27, 2.04]
2 or more	1.26	[0.76, 2.09]	1.56	[0.62, 3.92]	2.21*	[1.04, 4.71]
MD exposure level						
0	1.00		1.00		1.00	
1	1.73	[0.96, 3.09]	1.14	[0.62, 2.11]	1.62	[0.77, 3.40]
2 or more	1.29	[0.67, 2.47]	2.33*	[1.17, 4.64]	3.40*	[1.20, 9.58]

Abbreviations: ND, Natural disaster; MD, Man-made disaster; AOR, Adjusted odds ratio; CI, Confidence interval.

^a Weighted population estimates. Regressions controlled for age, gender, country of birth, marital status, qualification, labour force status, relative socio-economic disadvantage, household location, natural and man-made disaster exposure levels, and exposure to any other traumatic event (defined as lifetime exposure to at least one of 27 'other' potentially traumatic events that are routinely assessed within the WMH-CIDI 3.0, irrespective of MD and ND exposure). A collinearity test which examined the conditioning of the above matrix of predictors in the sample (using STATA 'coldiag' command) produced Matrix condition number = 10.85, which is well below the suggested cut-off score of '30 or larger' that would otherwise be indicative of collinearity problems (Belsley et al. 1980).

Significance level: * $p < 0.05$.



Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Reifels, L; Spittal, MJ; Dückers, MLA; Mills, K; Pirkis, J

Title:

Suicidality Risk and (Repeat) Disaster Exposure: Findings From a Nationally Representative Population Survey

Date:

2018

Citation:

Reifels, L., Spittal, M. J., Dückers, M. L. A., Mills, K. & Pirkis, J. (2018). Suicidality Risk and (Repeat) Disaster Exposure: Findings From a Nationally Representative Population Survey. *Psychiatry: Interpersonal and Biological Processes*, 81 (2), pp.158-172.
<https://doi.org/10.1080/00332747.2017.1385049>.

Persistent Link:

<http://hdl.handle.net/11343/240408>

File Description:

Accepted version