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Suicidality in Australian Vietnam veterans and their partners

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ABSTRACT

Lifetime suicidality was assessed in a cohort of 448 ageing Australian Vietnam veterans and 237 female partners during in-person structured psychiatric interviews that permitted direct comparison with age-sex matched Australian population statistics. Relative risks for suicidal ideation, planning and attempts were 7.9, 9.7 and 13.8 times higher for veterans compared with the Australian population and for partners were 6.2, 3.5 and 6.0 times higher. Odds ratios between psychiatric diagnoses and suicidality were computed using multivariate logistic regression, and suicidality severity scores were assigned from ideation, planning and attempt, and analysed using ordinal regression. PTSD, depression alcohol disorders, phobia and agoraphobia were prominent predictors of ideation, attempts and suicidal severity among veterans, while depression, PTSD, social phobia and panic disorder were prominent predictors among partners. For veterans and their partners, PTSD is a risk factor for suicidality even in the presence of other psychiatric disorders, and is stronger in Vietnam veterans than their partners.

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Posttraumatic Stress Disorder (PTSD) has been reported to be a risk factor for suicide attempts (Fontana and Rosenheck, 1995) and completed suicide (Bullman and Kang, 1994) in American Vietnam veterans. A recent merging of the US Department of Veterans Affairs database with the US Centres for Disease Control National Death Index (Ilgen et al., 2010) found significant risk of suicide associated with both PTSD and depression, with older veterans more likely to complete suicide. PTSD has been linked to suicidality in meta-analyses that included military and civilian samples (Krysinska and Lester, 2010; Panagioti et al., 2012) and recent empirical studies of US veterans (Pietrzak et al., 2011; Fanning and Pietrzak, 2013).

Suicidality is any self-initiated behaviour occurring on a continuum ranging from suicidal ideations, to making a suicide plan, through to suicide attempt (O'Carroll et al., 1996). In the World Health Organization (WHO) survey of general populations in 21 countries (Nock et al., 2008, 2009) ideation, planning, and attempts

were considered separately and revealed that all DSM-IV disorders that were assessed (anxiety disorders including PTSD, mood disorders, impulse-control disorders, and substance use disorders) were predictive of ideation and attempt in both developed and developing countries. The strongest predictors of attempts in developed countries were mood disorders, while in developing countries impulse-control, substance use and PTSD were most predictive. A further analysis of the WHO survey (Borges et al., 2010) reported that virtually all of the 16 diagnostic endpoints assessed were predictive of ideation, but few predicted attempts. Risk factors for attempts included female sex, younger age, lower education and income, being unmarried, and being unemployed. These samples were of civilian populations aged 18 or older, in contrast to military populations, in particular of ageing Vietnam veterans.

Male sex and older age are established risk factors for completed suicide (WHO, 2012) which suggests that ageing Vietnam veterans may now have moved to an even higher risk era than reported in earlier studies conducted when they were younger. The higher prevalences of psychiatric disorders in Australian Vietnam veterans compared with their background population (O'Toole et al., 1996a, 1996b; O'Toole et al., 2010a) should also place them at higher risk of suicidality. Earlier Australian government research suggested there was a slightly higher risk of completed suicide in Australian

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Vietnam veterans, however the rates were not statistically significant compared to the age-sex matched Australian population (Crane et al., 1997). A later independent report commissioned by the Australian Government into suicide in the Australian ex-service community recently concluded that the risk of suicide in Australian Vietnam veterans is likely to be higher than in the general Australian population (Dunt, 2009). However, non-fatal suicidality in Australian veterans remains unresearched.

Also unresearched are the suicidality rates of veterans' partners. Evidence of poorer mental health has been reported in the partners of Vietnam veterans (O'Toole et al., 2010a, 2010b), with higher levels of psychiatric disorders than the background population. It might therefore be expected that there would be higher degrees of suicidality among partners. Moreover, veteran psychiatric conditions have been found to be associated with increased risk of psychiatric conditions in their partners (O'Toole et al., 2010a, 2010b). Given the 'contagion of suicidality' (whereby suicidal behaviour is socially or interpersonally transmitted from one to another; Joiner, 1999) may be especially prevalent in intimate relationships (Zhang and Zhou, 2011). On the other hand, being married has been reported to exert a protective effect for suicide in the general population (Denny et al., 2009; Fairweather-Schmidt et al., 2010) and in veterans (Kaplan et al., 2007; Thoresen et al., 2006) and the WHO survey found higher rates of suicidality in those who had never been married (Nock et al., 2008).

This paper reports the findings from a cohort study of Australian veterans of the Vietnam war and an associated study of their wives and partners. The aims of the study were:

- 1) To establish the prevalence of suicidality (ideation, planning, attempt) in male Australian Vietnam veterans and their female partners and compare these with the background Australian population;
- 2) To examine the concordance between veteran and partner suicidality;
- 3) To assess the degree of risk for suicidality associated with psychiatric disorders in veterans and partners;
- 4) To assess the independent contribution of PTSD to suicidality in veterans and their partners.

1. Method

Vietnam veterans were identified from a roll supplied to the study by the Australian Army from which a random sample of 1000 was selected (O'Toole et al., 1996a, 1996b). Two waves of veteran interviews were conducted, wave 1 between July 1990 and February 1993, an average of 21.96 years ($SD = 1.91$) after repatriation, and wave two interviews between April 2005 and November 2006, an average of 36.10 years ($SD = 1.92$). This paper reports findings from the wave 2 veteran assessment. Due to funding lag for the study of partners, interviews with partners were conducted separately between July 2006 and December 2007, with a mean veteran-partner interview interval of 62.6 weeks ($SD = 28.68$).

Deaths to 2004 were ascertained from a search of the National Death Index held by the Australian Institute of Health and Welfare (O'Toole et al., 2009). A total of 125 deaths was found in the cohort of veterans, including eight who had died in Vietnam and 13 post-war suicides. Four hundred and fifty veterans were interviewed, which was 51.4% of those not known to have died and 79.4% of those who could be located. Of the 426 veterans who had wives or partners, 56 (12.4%) refused consent to give contact details, leaving an eligible pool of 370 women of whom a total of 240 completed interviews, giving a response rate of 56.3% of known eligible wives and partners (hereafter referred to as partners) or 64.9% of partners

where the veteran had provided consent to contact. Response bias has been examined previously in this sample (O'Toole et al., 1996a; O'Toole et al., 2009; O'Toole et al., 2010a, 2010b).

Interview assessments comprised standardized questionnaire instruments selected to permit direct comparison with national population statistics and were administered by trained masters and doctoral level clinical and research interviewers. The Australian Bureau of Statistics (ABS) and the WHO Sydney Training and Reference Centre in Sydney, Australia, gave access to the computer programs used to collect interview data and supporting documentation used in gathering national statistics on the health of the Australian population at approximately corresponding times. ABS also provided the computerized Confidentialized Unit Record Files ('Curfs') from the national survey data for direct comparison of veteran and partner data with the population.

Psychiatric status was assessed using the Composite International Diagnostic Interview (CIDI; WHO, 1997), the version (2.1) used by ABS in the first Australian National Survey of Mental Health and Wellbeing (NSMHWB) 1997 (Australian Bureau of Statistics (1997); Andrews et al., 2001). This was the only national data available at the time of planning and execution of the fieldwork interviews; ABS had yet to release the second National Survey of Mental Health and Wellbeing in 2007. Questions about lifetime suicidality were part of the CIDI depression module, entered after positive responses to two screener questions (history of two weeks or more feeling sad, empty or depressed, or two weeks of loss of interest in most things like work, hobbies, things usually enjoyed). The module asked about thoughts of death and thoughts of suicide; positive responses were then followed by questions on suicide plans and suicide attempts. Combat-related PTSD in veterans was assessed using the Clinician-assessed PTSD Scale (CAPS; Weathers et al., 2001) while PTSD attributable to a civilian cause was assessed using the PTSD module of the CIDI. PTSD in partners was assessed with the PTSD module of the CIDI.

The study received ethics approval from the University of Sydney, Australian Department of Veterans Affairs, Australian Institute of Health and Welfare, and The Repatriation General Hospital, Concord (veteran component) and The Repatriation General Hospital, Concord (partner component). Written informed consent was obtained prior to interview. All interviews were computer-assisted. Interviews with veterans (average 4 h) were conducted in-person and interviews with partners (average 2.5 h) were conducted by telephone. Psychiatric conditions were coded according to the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disease, Fourth Edition (DSM-IV) (American Psychiatric Association, 1994).

1.1. Statistical analysis

Statistical analysis used SPSS V22.0 (IBM Corporation, 2011); two-sided statistical significance was set at $\alpha = .05$. In the course of analysis, mild depression bore no relationship to suicidality and was excluded and a compound depression variable combining moderate and severe single episode and recurrent major depressive disorder was computed. For comparison of data items with the Australian population, the expected number of cases in each data item category was calculated by standardizing the Australian population to the age distributions of the veterans and partners in 5-year age bands. The ratios of the observed and expected prevalences and corresponding 95% confidence intervals (95% CI) were then computed.

Associations with suicidality items were assessed using odds ratios (ORs) and 95% confidence intervals derived from logistic regression. Potential confounders of age at interview, number of years of schooling, employment status and marital status were

evaluated for their association with suicidality, and those with significant associations were adjusted for in analysis. To test the association of PTSD with each item while controlling for potential confounding and in the presence of other potentially important diagnoses, a hierarchical regression strategy was used: the first step entered the confounders, a second step entered the psychiatric diagnoses into the model, and a third step entered PTSD. This strategy assesses the additional contribution of PTSD after controlling for other factors but also permits other factors of significance to be identified. Because the models were essentially exploratory a forward stepwise procedure was used based on likelihood ratio statistics.

Veterans and partners were assigned a “suicidality score” from ideation, planning and attempt items (possible range 0–3) with higher scores indicate increasing severity of suicidality – a score of zero indicates no ideation, planning or attempt; a score of one indicates ideation only; a score of two indicates ideation and planning; a score of three indicates ideation, planning and attempt (or, in a few cases, ideation and attempt without planning). Ordinal regression using a Negative Log–log link function (Norussis, 2004; Yay and Akincil, 2009) was used to assess the associations of PTSD and other psychiatric disorders with increasing severity of suicidality. To reduce the number of variables admitted to the ordinal regression, only those that were significant in the analyses of the individual suicidality items were selected for the ordinal regression analysis.

2. Results

Mean ages and standard deviations (SD) for veterans and partners were 60.4 (SD = 5.2) and 57.8 (SD = 5.8) respectively. The sociodemographic profiles of veterans and partners were very similar to the age–sex matched Australian population (O'Toole et al., 2009, 2010b): they were mostly married (78% of veterans, 93.3% of partners), Australian-born Caucasian (93.3% of veterans, 98.8% of partners), and predominantly mid-level secondary school educated. Veterans and their partners reported a mean relationship duration of 31.5 years (SD = 11.5 years). The majority of veterans (73.3%) were in receipt of a disability pension paid by the Australian Department of Veterans' Affairs. This is commensurate with the background Australian Vietnam veteran population: of the surviving cohort of approximately 47,100 veterans 35,735 (75.9%) were in receipt of a disability pension by June 2014 (www.dva.gov.au/).

Of the 448 veterans who completed the CIDI, 231 (51.3%) answered positively to the depression screener questions. Of those, 108 (46.8%) reported suicidal ideation (OR = 2.76, 95% CI = 2.40, 3.18). No veteran reported planning or attempt in the absence of ideation. Of the veteran ideators, 75 (69.4%) had made a plan (OR = 4.72, 95% CI = 3.50, 6.41) and 33 (30.6%) had made an attempt (OR = 2.64, 95% CI = 2.21, 3.15), of which five were unplanned. Of the veterans who passed the screener and entered the depression module, 42.0% gained a diagnosis of depression.

Of the 237 partners who completed the CIDI, 138 (58.2%) answered positively to the screener questions. Of those, 36 (26.1%) reported suicidal ideation (OR = 1.97, 95% CI = 1.72, 2.26). No partner reported planning or attempt in the absence of ideation. Of the partner ideators, 12 (33.3%) reported forming a plan (OR = 9.34, 95% CI = 6.41, 13.70) and six (16.7%) attempted suicide (OR = 9.70, 95% CI = 5.52, 10.75), of which two were unplanned. Depression was diagnosed in 42.8% of partners who passed the screener and entered the depression module.

The probability of planning given ideation for partners (33.3%) was similar to that of the WHO (33.9%; Nock et al., 2008) in contrast to that for the veterans (69.4%), but the probability of attempt given ideation for partners (16.7%) was lower than that of the veterans (30.6%) and the WHO (29.0%). However, veterans and their partners who made a plan were less likely to attempt (37.3% and 33.3% respectively) than WHO estimates (56.0%).

Table 1 shows the prevalence of suicidal ideation, planning and attempts for veterans and their partners, and the age–sex matched expected prevalence from the background Australian population. Prevalences in veterans and partners were significantly higher than the background population, with veteran relative risks exceeding partners' risks by nearly two-fold. Concordance between veterans and their partners in suicidality was assessed using Kappa statistics and Odds Ratios and revealed no concordance for suicidal ideation ($\kappa = .117, p > .05$) or for suicide plan ($\kappa = .054, p > .05$) but a weak relationship occurred for suicide attempt ($\kappa = .127, p = .020$; OR = 6.38, 95% CI = 1.09, 37.38). The veteran and partner suicidality scores were highly skewed: of veterans and partners 75.9% and 84.8% scored zero, 6.3% and 9.3% scored 1, 10.5% and 3.4% scored 2, and 7.4% and 2.5% respectively scored 3. The veteran–partner score Contingency Coefficient was .220 ($p = .210$), indicating no concordance for overall suicidality. Veteran employment status was significantly associated with ideation, planning and attempts ($\chi^2 = 9.375, df = 2, p = .009$; $\chi^2 = 13.493, df = 2, p = .001$; $\chi^2 = 16.025, df = 2, p < .0005$ respectively) but veteran marital status was associated with planning only ($\chi^2 = 12.553, df = 4, p = .014$); partner marital status and employment status were not associated with any partner suicide variable and were not considered further in analysis.

There were 143 veterans (31.8%) with a diagnosis of PTSD arising from combat-related events in Vietnam. In addition, there were 15 veterans with a diagnosis of PTSD arising from civilian events, 6 of whom also had PTSD to a combat event. The civilian triggering events included accidents, witnessing injury or death, being threatened with a weapon; there were no reports of rape, sexual molestation, child abuse, or being the victim of torture or terrorism. When these nine cases were included, the total prevalence of PTSD among the veterans rose to 33.8%. All data analyses were conducted with these additional cases included and excluded, but this resulted in very small changes to statistical parameters and no change to the overall conclusions. The analyses presented here include these additional cases.

Table 1

Observed prevalence of lifetime suicidal ideation, planning and attempts for veterans and their partners and expected prevalence and relative prevalence and 95% confidence interval comparing veterans and partners with age–sex matched Australian Bureau of Statistics National Survey of Mental Health and Wellbeing population survey.

	Prevalence		Expected prevalence		Relative prevalence	95% confidence interval
	N	%	N	%		
Veterans						
Suicidal ideation	108	24.0	13.7	3.0	7.91	6.61, 30.63
Suicide plan	75	16.7	7.7	1.7	9.73	7.72, 51.20
Suicide attempt	33	7.3	2.4	.5	13.82	9.28, 138.88
Partners						
Suicidal ideation	36	15.2	5.8	2.4	6.24	4.36, 8.12
Suicide plan	12	5.1	3.4	1.4	3.54	1.58, 5.48
Suicide attempt	6	2.5	1.0	.4	5.99	1.26, 10.73

Table 2
Prevalence of lifetime DSM-IV diagnoses in veterans, and odds ratios and 95% confidence intervals for the relationship between each lifetime diagnosis and each veteran suicidality item.

Lifetime diagnoses ^a	Prevalence		Suicidal ideation		Suicide plan		Suicide attempt	
	N	%	OR	95% CI	OR	95% CI	OR	95% CI
	309.81 PTSD***	152	33.9	3.95	2.51, 6.21***	3.48	2.09, 5.81***	4.39
303.90 Alcohol Dependence***	92	20.4	5.38	3.28, 8.82***	4.50	2.64, 7.68***	7.32	3.49, 15.41***
305.00 Alcohol Abuse	145	32.2	.71	.44, 1.15	.78	.45, 1.35	.54	.23, 1.28
305.20 Cannabis Abuse***	15	3.3	3.81	1.35, 10.75**	3.52	1.21, 10.20*	.90	.14, 7.03
296.21 Depression Single Mild	26	5.8	1.43	.60, 3.39	1.53	.60, 3.96	1.05	.24, 4.66
296.22 Depression Single Moderate**	22	4.9	5.03	2.01, 12.13***	3.06	1.24, 7.58*	2.08	.58, 7.44
296.23 Depression Single Severe***	25	5.6	15.23	5.56, 41.72***	16.51	6.60, 41.29***	2.59	.83, 8.04
296.31 Depression Recurrent Mild*	40	8.9	2.58	1.32, 5.03**	1.27	.56, 2.88	3.80	1.60, 9.18**
296.32 Depression Recurrent Moderate**	26	5.8	4.07	1.82, 9.10***	2.86	1.22, 6.68*	1.70	.48, 6.00
296.33 Depression Recurrent Severe***	24	5.4	14.03	5.20, 39.37***	6.90	2.96, 16.10***	6.30	2.40, 16.55***
Depression (Moderate + Severe) Lifetime	97	21.6	15.66	9.18, 26.74***	11.76	6.72, 20.56***	4.49	2.16, 9.19***
300.4 Dysthymia	13	2.9	1.42	.43, 4.69	.90	.20, 4.15	2.37	.50, 11.17
300.02 Generalised Anxiety Disorder	55	12.2	2.84	1.59, 5.11***	2.58	1.37, 4.88**	1.66	.65, 4.22
300.3 Obsessive Compulsive Disorder*	10	2.2	4.94	1.37, 17.85*	3.44	.95, 12.52	1.41	.17, 11.48
300.22 Agoraphobia without Panic	19	4.2	2.39	.94, 6.11	1.35	.43, 4.17	3.68	1.15, 11.80*
300.01 Panic without Agoraphobia**	11	2.4	3.94	1.18, 13.18*	4.37	1.30, 14.71*	(no cases)	
300.21 Panic with Agoraphobia**	4	.9	9.69	1.00, 94.10	5.08	.71, 36.66	13.32	1.81, 97.82*
300.23 Social Phobia**	26	5.8	4.07	1.82, 9.10***	2.36	.98, 5.64	4.39	1.63, 11.84**
300.29 Situational Phobia**	28	6.2	2.97	1.36, 6.45**	4.25	1.92, 9.41***	3.97	1.49, 10.61**

p* < .05, *p* < .01, ****p* < .001.

^a Asterisks indicate a significant relationship with suicidality (0–3) scale.

Bivariate unadjusted odds ratios and 95% confidence intervals were computed for the association of each psychiatric diagnosis with each of the suicidality items for veterans (Table 2) and partners (Table 3). Asterisks indicate level of statistical significance; those in the left hand column indicate a significant relationship with the suicidality scale. The prevalence of psychiatric disorders of veterans and partners is mostly higher than the background Australian population (O'Toole et al., 2009; O'Toole et al., 2010a, 2010b) with PTSD, alcohol dependence, depression and generalised anxiety disorder most frequent among veterans, and depression, generalised anxiety disorder and PTSD most frequent among partners. Almost all diagnoses were significantly related to aspects of suicidality for veterans except alcohol harmful use. Where there were cases, all diagnoses were also related to aspects of suicidality

for partners. Compared with the WHO results (Nock et al., 2009), the patterns of covariation with the DSM-IV diagnoses are very different: for veterans there is a stronger association with PTSD, alcohol, depression and phobias especially agoraphobia and no association with dysthymia, while for partners there are stronger associations with PTSD, alcohol, generalized anxiety disorder and panic, and weaker association with dysthymia. The relationship between suicidality and depression was very different for veterans and partners: For veterans, 38.9% of ideators had no depression, as did 36.0% of planners and 48.5% of attempters; for partners, 13.9% of ideators had no depression, as did 8.3% of planners and 16.7% of attempters. Therefore, the importance of mood disorders, as reported by WHO (Nock et al., 2008) is less salient to veterans than to their partners.

Table 3
Prevalence of lifetime DSM-IV diagnoses in partners, and odds ratios and 95% confidence intervals for the relationship between each lifetime diagnosis and each partner suicidality item.

Lifetime diagnoses ^a	Prevalence		Suicidal ideation		Suicide plan		Suicide attempt	
	N	%	OR	95% CI	OR	95% CI	OR	95% CI
	309.81 PTSD***	25	10.5	4.77	1.94, 11.72***	7.32	2.13, 25.20***	1.73
303.90 Alcohol Dependence***	3	1.3	11.77	1.04, 133.35*	10.14	.85, 120.51	(no cases)	
305.00 Alcohol Abuse	8	3.4	3.56	.81, 15.63	7.30	1.31, 40.82**	18.75	2.86, 123.01***
305.20 Cannabis Abuse	0	0	(no cases)		(no cases)		(no cases)	
296.21 Depression Single Mild	17	7.2	(no cases)		(no cases)		(no cases)	
296.22 Depression Single Moderate**	18	7.6	5.46	1.99, 15.00***	4.67	1.14, 19.07*	14.40	2.67, 77.55***
296.23 Depression Single Severe***	14	5.9	4.83	1.57, 14.88**	10.75	2.77, 41.78***	9.13	1.52, 54.88**
296.31 Depression Recurrent Mild	17	7.2	.73	.16, 3.34	(no cases)		(no cases)	
296.32 Depression Recurrent Moderate***	12	5.1	22.00	5.61, 86.33***	13.56	3.37, 54.58***	(no cases)	
296.33 Depression Recurrent Severe***	15	6.3	7.92	2.67, 23.53***	(no cases)		(no cases)	
Depression (Moderate + Severe) Lifetime	59	24.9	38.97	13.98, 108.65***	41.25	5.20, 327.64***	16.67	1.91, 145.75***
300.4 Dysthymia*	8	1.8	1.91	.37, 9.87	7.30	1.31, 40.82**	6.40	.66, 62.26
300.02 Generalised Anxiety Disorder***	31	13.1	4.86	1.99, 11.84***	4.88	1.25, 19.05*	2.76	.31, 24.39
300.3 Obsessive Compulsive Disorder*	3	1.3	(no cases)		(no cases)		(no cases)	
300.22 Agoraphobia without Panic	1	.4	(no cases)		(no cases)		(no cases)	
300.01 Panic without Agoraphobia**	5	2.1	9.05	1.46, 56.20**	5.02	.52, 48.78	11.35	1.07, 120.65*
300.21 Panic with Agoraphobia	1	.4	(no cases)		(no cases)		(no cases)	
300.23 Social Phobia***	19	8.0	8.21	3.05, 22.07***	10.77	3.03, 38.29***	13.44	2.51, 72.03***
300.29 Situational Phobia	13	5.5	.45	.06, 3.57	(no cases)		(no cases)	

p* < .05, *p* < .01, ****p* < .001.

^a Asterisks indicate significant relationship with suicidality (0–3) scale.

Multivariate analysis using hierarchical regression tested the additional contribution of PTSD to suicidality after controlling for potentially confounding variables and other psychiatric diagnoses. Table 4 shows the results: For veterans, more years of schooling was associated with a significantly lower risk of planning and attempt, but not ideation. Alcohol abuse and dependence was related to ideation, planning and attempt, social phobia was related to ideation and attempt, while depression was related to all aspects of suicidality. PTSD was significant for ideation and attempt but not planning.

In the partner analysis, depression was the only significant variable in the final model for ideation, depression and dysthymia were significant for planning, while alcohol disorders and social phobia were significant in the final model for attempt. Given the prominence of depression among partners, an exploratory analysis that excluded it from modelling revealed that PTSD, social phobia and panic were associated with ideation; social phobia alone was significant for planning, and social phobia and alcohol disorder were significant for attempts.

The veteran and partner suicidality scores were analysed using ordinal regression to examine the effects of predictor variables in a scale of increasing severity. The analyses included the significant variables from the individual item analyses above. For veterans and partners, tests of the full model against the constant only were statistically significant ($p < .0005$) and Nagelkerke pseudo R^2 of .356 for veterans and .200 for partners indicated a moderate relationship between suicidality and the fitted models. For veterans, PTSD was significantly associated with suicidality score (OR = 1.91, 95% CI = 1.16, 3.16; $p = .008$). Also significant were alcohol abuse or dependence (OR = 1.84, 95% CI = 1.14, 2.97; $p = .013$), depression (OR = 5.62, 95% CI = 3.58, 8.84, $p < .0005$), phobia (OR = 2.81, 95% CI = 1.55, 5.08, $p = .001$), and agoraphobia (OR = 2.66, 95% CI = 1.25, 5.67, $p = .001$). For partners, depression was again predominant (OR = 22.22, 95% CI = 8.29, 59.55, $p < .0005$), accompanied by panic disorder (OR = 4.38, 95% CI = 1.13, 16.95, $p = .033$) with no other significant contributor. In repeating the analysis excluding depression, PTSD was significantly associated with partner suicidality score (OR = 2.99, 95% CI = 1.22, 7.31, $p = .016$) as was panic disorder (OR = 8.32, 95% CI = 2.42, 28.61, $p < .001$) and social phobia (OR = 2.91, 95% CI = 1.26, 8.14, $p = .014$).

3. Discussion

This research makes a unique contribution to the complex area of veteran trauma and suicidality as it is the first research to date

that has compared the risk of suicidal behaviour among veterans and their female partners with that of their background population and examined individual psychiatric contributions to suicidality in each group. Both Australian Vietnam veterans and their partners had significantly higher rates of suicidal ideation, suicide planning, and attempting suicide than the age- and sex-matched general population. These results are in contrast to research indicating United States veterans are no more at risk of suicidal ideation, suicide planning, or suicide attempts than non-veterans (White et al., 2011, p.557) although no such comparison exists for the partners of veterans. The expected prevalences for the Australian age-sex matched population are low and differ from the WHO averaged estimates (Nock et al., 2008), possibly due to the narrower ages of the veterans and partners, but they are within ranges reported of developed and developing countries.

The observed prevalences for veterans and partners are high, which calls for focus on methodology. Measurement issues were addressed by using the same measures and instruments used by the Australian Bureau of Statistics. Nevertheless, comparisons of veterans' self-reports with self-reports from the Australian population (ABS) data may still be subject to interviewer effects, as all interviewers in the veteran and partner study were master's-level clinicians or experienced doctoral-level researchers, which would not characterize ABS professional interviewers. Another methodological consideration concerns the fact that only people who passed the screening items for the CIDI depression module were asked the questions on suicide. This also applies to the ABS data, and is a function of the programmed CIDI. Thus there is a potential for confounding of suicidality with depression. However, not all of those who entered the module were accorded a diagnosis of depression, and not all those who had a diagnosis of depression reported being suicidal, although this was more prominent among veterans than partners.

The current study also advances previous research as it used a large, non-treatment seeking, community sample of Australian Vietnam veterans and their partners. It considered ideation, planning and attempt separately as well as in scaled combination and used multivariate analyses to discover salient predictors. In veterans, PTSD, alcohol disorders, phobia, and depression predicted ideation, and alcohol disorders, phobia and depression predicted planning but PTSD, phobia, agoraphobia and depression predicted attempts. PTSD remained prominent in the scale analysis. Interpretation of these findings is tempered by the progression from ideation to planning to attempt in veterans: the probability of planning given ideation was very high, but the probability of

Table 4
Hierarchical regression models of suicidal ideation, planning and attempt for veterans and partners, showing odds ratios and 95% confidence intervals.

	Suicidal ideation	Suicide plan	Suicide attempt
Veterans			
Years of schooling	.91 (.83, 1.00)	.86 (.76, .97)*	.74 (.61, .88)**
Alcohol abuse and dependence	1.98 (1.12, 3.50)*	2.02 (1.08, 3.77)*	–
Phobia	3.49 (1.81, 6.73)***	3.05 (1.56, 5.98)**	3.39 (1.50, 7.68)**
Agoraphobia	–	–	3.68 (1.01, 13.44)*
Depression	13.51 (7.60, 23.99)***	11.27 (6.25, 20.36)***	3.71 (1.68, 8.21)**
PTSD	1.90 (1.08, 3.83)*	–	2.67 (1.18, 6.05)*
Partners			
Depression (moderate & severe)	38.31 (13.74, 106.82)***	56.32 (5.67, 559.75)**	–
Dysthymia	–	20.32 (1.40, 295.07)*	–
Social phobia	–	–	10.91 (1.82, 65.32)**
Alcohol abuse and dependence	–	–	13.81 (1.71, 111.76)*
<i>Alternative partner model without depression</i>			
PTSD	3.38 (1.23, 9.26)*	–	–
Panic disorder	14.34 (2.26, 91.12)**	–	–
Social phobia	6.46 (2.23, 18.70)**	12.32 (3.34, 45.41)***	10.91 (1.82, 65.32)**
Alcohol abuse and dependence	–	–	13.81 (1.71, 111.76)*

* $p < .05$, ** $p < .01$, *** $p < .001$.

attempt given ideation or planning was not vastly different from the general WHO findings. While suicidality among the veterans was higher than the background civilian population, veterans seem more likely to reach for a plan, given the thought of suicide, but not necessarily more likely to act on it. This is in contrast to their partners, who are just as likely to make a plan as the general (WHO) population, but much less likely to attempt, given the thought of suicide.

For partners, apart from depression, PTSD, panic and social phobia were predictors of ideation but only social phobia and alcohol disorders predicted attempts. In the presence of depression, no other diagnoses predicted ideation, and depression and dysthymia predicted planning while alcohol disorders and social phobia were predominant for attempts. PTSD, panic and social phobia were significant in the suicidality score analysis.

Interpretation of the discrepant findings for veterans and partners is complicated by the low prevalences in partners, and may represent a 'floor effect'. Sex differences could also be due to higher levels of PTSD and depression in the veterans compared with partners, or to different sources of trauma. All traumatic incidents for partners were civilian in nature and source, while traumatic incidents for veterans were dominated by war-related events. In addition, PTSD was assessed using different instruments – the CIDI was used to enable direct comparison with the background population for partners, but veterans were assessed more intensively with the CAPS which approaches the symptom assessment differently from the CIDI. The veteran and partner differences therefore may be influenced by differences in these measurement instruments.

Consistent with the WHO results, other psychiatric diagnoses bore significant associations with ideation, planning, attempt and overall suicidality for both veterans and partners, but most were not significant in final models. The significance of PTSD in suicidality found here for veterans and in developing countries in the WHO study may point to higher levels of trauma in those countries, many of which may be war-torn.

The study also confirmed that there are robust associations between depression and suicidality in both sexes, and that PTSD was associated with increasing severity of suicidality in veterans and in partners. In this present study, age and marital status were not generally predictive, but the age bands in the present study were narrow, which may have obscured an age effect, and the mostly married status of the veterans and partners may have also obscured an effect of marital status. Moreover, the significant association of PTSD with suicidality in the presence of depression serves to strengthen the notion of PTSD as an independent risk factor for suicidality, particularly in war veterans.

A higher education reduced the risk in veterans but not in partners. In a study of Australian Vietnam and Vietnam-Era National Servicemen, education level (and intelligence) was found to be predictive of completed suicide (O'Toole and Kantor, 1995). This implies that suicide prevention measures must pay special attention to the needs of less educated veterans in post-war veteran rehabilitation. The finding that phobia and agoraphobia as well as depression and PTSD were predictors of suicidality in veterans, also points to a need to pay special attention to veterans who are fearful, avoid social interaction, and are probably house-bound and limited in their social connectedness. The prominence of social phobia in the partner regressions implies this may also apply to their partners.

The findings confirm that there is a role for PTSD in the manifestation of suicidality, both for the male Vietnam veterans and their female partners. The current study advances previous research as the participants were a large, non-treatment seeking, community sample of Australian Vietnam veterans and their partners. This increases the generalizability of the findings to all Vietnam veterans and partners compared with other study samples drawn from help-

seeking veterans and partners whereby the results may be biased toward more severely symptomatic and affected individuals. Therefore, practitioners treating any Australian Vietnam veteran, or any partner of a veteran, should be aware of their higher risk of suicidality, be particularly sensitive to the presence of PTSD, and whether there is a lack of social connectedness.

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Contribution

Dr O'Toole was responsible for the design and analysis of the study and preparation of text draft; Ms Orreal-Scarborough and Ms Johnston contributed to data analysis and provided text for the article; Professor Catts and Associate Professor Outram contributed to study design and text.

Conflict of interest

Dr O'Toole has acted as a consultant to the Vietnam Veterans Federation of Australia in reviewing the term 'malevolent environment' for their submission to the Australian Repatriation Medical Authority in 2011. No other conflicts of interest are declared.

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References

- Australian Bureau of Statistics. National survey of mental health and wellbeing: profile of Adults, Australia. ABS Cat No. 4327.0. Canberra, ACT: Australian Bureau of Statistics; 1997.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington, DC: American Psychiatric Association; 1994.
- Andrews GA, Henderson S, Hall W. Prevalence, comorbidity, disability and service utilisation. Overview of the Australian National Mental Health Survey. *Br J Psychiatry* 2001;178:145–53. <http://dx.doi.org/10.1192/bjp.178.2.145>.
- Borges G, Nock MK, Haro Abad JM, Hwang I, Sampson NA, Alonso J, et al. Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. *J Clin Psychiatry* 2010;71(12):1617–28. <http://dx.doi.org/10.4088/JCP.08m04967blu>.
- Bullman TA, Kang HK. Posttraumatic stress disorder and the risk of traumatic deaths among Vietnam veterans. *J Nerv Ment Dis* 1994;182(11):604–10. <http://dx.doi.org/10.1097/00005053-199411000-00002>.
- Crane PJ, Barnard DL, Horsley KWA, Adena MA. Mortality of Vietnam veterans: the veteran cohort study. A report of the 1996 retrospective cohort study of Australian Vietnam veterans. Canberra: Department of Veterans Affairs; 1997. Retrieved June, 2014, from http://www.dva.gov.au/aboutDVA/publications/health_research/vietnam_vets/Pages/mortality.aspx.
- Denney JT, Rogers RG, Krueger PM, Wadsworth T. Adult suicide mortality in the United States: marital status, family size, socioeconomic status, and differences by sex. *Soc Sci Q* 2009;90(5):1167–85. <http://dx.doi.org/10.1111/j.1540-6237.2009.00652.x>.
- Dunt D. Independent study into suicide in the ex-service community. Canberra: Australian Department of Veterans Affairs; 2009. Retrieved from http://www.dva.gov.au/health_and_wellbeing/research/Pages/suicide%20study.aspx.
- Fairweather-Schmidt AK, Anstey KJ, Salim A, Rodgers B. Baseline factors predictive of serious suicidality at follow-up: findings focussing on age and gender from a community-based study. *BMC Psychiatry* 2010;10(1):41–50. <http://dx.doi.org/10.1186/1471-244x-10-41>.

- Fanning JR, Pietrzak RH. Suicidality among older male veterans in the United States: results from a national health and resilience in veterans study. *J Psychiatr Res* 2013;47:1766–75.
- Fontana A, Rosenheck RA. Attempted suicide among Vietnam veterans: a model of etiology in a community sample. *Am J Psychiatry* 1995;152:102–9.
- IBM Corporation. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corporation; 2011.
- Ilgel MA, Bohnert AB, Ignacio RV, McCarthy JF, Valenstein MM, Kim HM, et al. Psychiatric diagnoses and risk of suicide in veterans. *Arch Gen Psychiatry* 2010;67(11):1152–8. <http://dx.doi.org/10.1001/archgenpsychiatry.2010.129>.
- Joiner Jr TE. The clustering and contagion of suicide. *Curr Direct Psychol Sci* 1999;8(3):89–92. <http://dx.doi.org/10.1111/1467-8721.00021>.
- Kaplan MS, Huguot N, McFarland BH, Newsom JT. Suicide among male veterans: a prospective population-based study. *J Epidemiol Community Health* 2007;61(7):619–24. <http://dx.doi.org/10.1136/jech.2006.054346>.
- Krysinska K, Lester D. Post-traumatic stress disorder and suicide risk: a systematic review. *Arch Suicide Res* 2010;14:1–23. <http://dx.doi.org/10.1080/13811110903478997>.
- Nock MK, Borges G, Bromet EJ, Alonso J, Angermeyer M, Beautrais A, et al. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br J Psychiatry* 2008;192:95–105. <http://dx.doi.org/10.1192/bjp.bp.107.040113>.
- Nock MK, Hwang I, Sampson N, Kessler RC, Angermeyer M, Beautrais A, et al. Cross-national analysis of the associations among mental disorders and suicidal behavior: findings from the WHO World Mental Health Surveys. *PLoS Med* 2009;6(8):1–17. <http://dx.doi.org/10.1371/journal.pmed.1000123>.
- Norussis M. SPSS 13.0 advanced statistical procedures companion. Upper Saddle-River, N.J.: Prentice Hall Inc; 2004.
- O'Carroll PW, Berman A, Maris RW, Moscicki EK, Tanney BL, Silverman MM. Beyond the tower of Babel: a nomenclature for suicidology. *Suicide Life Threat Behav* 1996;26(3):237–52. http://dx.doi.org/10.1007/0-306-47150-7_7.
- O'Toole BI, Cantor C. Risk factors for suicide in Vietnam-era Australian National Servicemen. *Suicide Life Threat Behav* 1995;24:474–87.
- O'Toole BI, Marshall RP, Grayson DA, Schureck RJ, Dobson M, Pulvertaft B, et al. The Australian Vietnam veterans health study. I. Study design and response bias. *Int J Epidemiol* 1996a;25:307–18. PMID: 9119556.
- O'Toole BI, Marshall RP, Grayson DA, Schureck RJ, Dobson M, Ffrench ML, et al. The Australian Vietnam veterans health study. III. Psychosocial health status and relation to combat. *Int J Epidemiol* 1996b;25:331–40. PMID: 9119558.
- O'Toole BI, Catts SV, Outram S, Pierse KR, Cockburn J. The physical and mental health of Australian Vietnam veterans three decades after the war and its relation to military service, combat and PTSD. *Am J Epidemiol* 2009;170(3):318–30. PMID: 9119558.
- O'Toole BI, Catts SV, Outram S, Pierse KR, Cockburn J. Factors associated with civilian mortality in Australian Vietnam veterans three decades after the war. *Mil Med* 2010a;175(2):88–95.
- O'Toole BI, Outram S, Catts SV, Pierse KR, Cockburn J. The mental health of wives and partners of Australian Vietnam veterans three decades after the war and its relation to veteran combat and PTSD. *J Nerv Ment Dis* 2010b;198(11):841–5. <http://dx.doi.org/10.1097/NMD.0b013e3181f98037>.
- Panagioti M, Gooding PA, Tarrier N. A meta-analysis of the association between post-traumatic stress disorder and suicidality: the role of comorbid depression. *Compr Psychiatry* 2012;53:915–30. <http://dx.doi.org/10.1016/j.comppsych.2012.02.009>.
- Pietrzak RH, Russo A, Ling Q, Southwick S. Suicidal ideation in treatment-seeking veterans of operations Enduring Freedom and Iraqi Freedom: the role of coping strategies, resilience, and social support. *J Psychiatr Res* 2011;45:720–6. <http://dx.doi.org/10.1016/j.psychres.2010.11.015>.
- Thoresen S, Mehlum L, Roysamb E, Tonnesen A. Risk factors for completed suicide in veterans of peacekeeping: repatriation, negative life events, and marital status. *Arch Suicide Res* 2006;10(4):353–63. <http://dx.doi.org/10.1080/13811110600791106>.
- Weathers FW, Keane TM, Davidson JRT. Clinician-administered PTSD Scale: a review of the first ten years of research. *Depress Anxiety* 2001;13:132–56. <http://dx.doi.org/10.1002/da.1029>.
- White R, Barber C, Azrael D, Mukamal KJ, Miller M. History of military service and the risk of suicidal ideation: findings from the 2008 National Survey on Drug Use and Health. *Suicide Life Threat Behav* 2011;41(5):554–61. <http://dx.doi.org/10.1111/j.1943-278X.2011.00053.x>.
- World Health Organisation. Composite international diagnostic interview. CIDI-auto 2.1. Administrator's guide and reference. Geneva: WHO; 1997.
- World Health Organisation. Suicide prevention (SUPRE). 2012. http://www.who.int/mental_health/prevention/suicide/suicideprevention/en/.
- Yay M, Akincil CD. Application of ordinal logistic regression and artificial neural networks in a study of student satisfaction. *Cypriot J Educ Sci* 2009;4:58–69.
- Zhang J, Zhou L. Suicidal ideation, plans, and attempts among rural young Chinese: the effect of suicide death by a family member or friend. *Community Ment Health J* 2011;47(5):506–12. <http://dx.doi.org/10.1007/s10597-010-9332-2>.