



## Research report

## Major depression and depressive symptoms in Australian Gulf War veterans 20 years after the Gulf War

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## ABSTRACT

**Background:** Risk of major depression (depression) was elevated in Australia's Gulf War veterans in a 2000–2002 (baseline) study. A follow up study has measured the Gulf War-related risk factors for depression, also the current prevalence and severity of depression, use of anti-depressant medication, and persistence, remittance or incidence of depression since baseline in Gulf War veterans and a military comparison group.

**Methods:** Participants completed the Composite International Diagnostic Interview v.2.1, the 9-item Patient Health Questionnaire and the Military Service Experience Questionnaire, and consented to Repatriation Pharmaceutical Benefits Scheme (RPBS) and PBS linkage.

**Results:** Prevalence of depression (9.7% Gulf War veterans and 7.7% comparison group; adj RR=1.2, 95% CI 0.8–1.7), and pattern of persistence, remittance and incidence of depression since baseline, were similar in the two groups, however veterans reported slightly more severe symptoms (adj median difference 1, 95% CI 0.26–1.74) and were more likely to have been dispensed anti-depressant medication (adj RR=1.56, 95% CI 1.05–2.32). Depression amongst veterans was associated with self-reported Gulf War-related stressors in a dose-response relationship (adj RR 1.06, 95% CI 1.02–1.09).

**Limitations:** Lower participation rates at follow up resulted in reduced statistical power compared with baseline, Gulf War related stressor data collected at baseline was at risk of recall bias, and RPBS and PBS databases do not capture all dispensed Nervous System medications.

**Conclusions:** More than 20 years after the Gulf War, veterans are experiencing slightly more severe depressive symptoms than a military comparison group, and depression continues to be associated with Gulf War-related stressors.

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## 1. Introduction

The development and predictors of combat-related mental health issues, such as depression, are a key area of concern for defence and veterans' organisations. Mental health problems can have a substantial impact on combat readiness, service retention and health care requirements for serving personnel, as well as contributing to

long-term disability after military careers have ended (Creamer et al., 2006; Hoge et al., 2005; Ikin et al., 2010). Most research and treatment in the field of combat-related psychiatric illness has focussed on posttraumatic stress disorder (PTSD), however there are a number of arguments for why combat-related depression warrants increased attention. Not only is war exposure an established risk factor for depression (Gadermann et al., 2012; Prigerson et al., 2002) but some studies show depression to be more prevalent in military groups than PTSD (Ikin et al., 2004; Iversen et al., 2005). Also the difference between military and civilian populations in prevalence of mental disorders has been shown to be greater for depression than for PTSD (McFarlane et al., 2011) and depression has been shown to be associated with greater disability worldwide than anxiety disorders (Vos et al., 2012).

Our 2000–2002 baseline study of Australia's Gulf War veterans, about ten years after the Gulf War, indicated that the majority of

**Abbreviations:** ADF, Australian Defence Force; CO, Commissioned Officer; NCO, Non-commissioned Officer; MSEQ, Military Service Experience Questionnaire; PBS, Pharmaceutical Benefits Scheme; RPBS, Repatriation Pharmaceutical Benefits Scheme

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veterans experienced good mental health with almost 80% having no DSM-IV psychological disorder (Ikin et al., 2004). Of the 21% meeting criteria for a 12 month psychological disorder, however, almost half (9%) met criteria for major depression whilst about 5% met criteria for PTSD. This prevalence of depression in the Gulf War veterans was significantly higher (adj OR 1.7, 95% CI 1.2–2.3) than the 5.5% prevalence of 12 month major depression in a randomly selected and frequency matched military comparison group. In 2011–2012, about 20 years after the Gulf War, the baseline study veteran and comparison group participants were invited to take part in a follow up study investigating current physical and mental health. The aims of the analyses reported in this paper were to investigate the longer term prevalence and severity of major depression, any association between current depression and Gulf War-related factors, and the course of major depression through exploration of persistent, remitted, and new cases.

## 2. Method

### 2.1. Ethics

All aspects of the study protocol were approved by the Human Research Ethics Committees representing Monash University, the Australian Government Department of Veterans Affairs and the Australian Government Department of Defence. All participants received a detailed Explanatory Statement and signed a Consent Form.

### 2.2. Recruitment

The baseline cohort included all 1871 Australian veterans of the Gulf War, defined as Australian Defence Force (ADF) members deployed in support of the Gulf War during the period 2 August 1990 to 4 September 1991. The Gulf War veterans included 1579 members of the Royal Australian Navy (Navy; 84%), 123 members of the Australian Army (Army; 7%) and 169 members of the Royal Australian Air Force (Air Force; 9%). The Australian Gulf War deployment included 38 women (2%). Comparison group members for the baseline cohort ( $n=2924$ ) were randomly drawn from 26 411 ADF personnel who were in operational units at the time of the Gulf War but not deployed to that conflict. The comparison group was, further, frequency matched to the Gulf War veterans by sex, 3-year age band, service branch, two rank categories for Army personnel ('Officer' versus 'Other ranks'), and two task categories for Air Force personnel ('Aircrew' versus 'Non-Aircrew'). The eligible follow up study cohort comprised the 1456 Gulf War veterans and 1588 comparison group members ( $N=3044$ ) who participated in the baseline health study (Ikin et al., 2004). They represented 80.5% and 56.8% of the baseline cohort veterans and comparison group members, respectively. Recruitment for the follow up study was via mailed invitation, followed by up-to three mailed reminders to non-responders and additional contact attempts via phone and/or email.

### 2.3. Data collection

At both baseline and follow up, version 2.1 of the Composite International Diagnostic Interview (CIDI) (World Health Organization Collaborating Centre for Mental Health and Substance Abuse, 1997) was used to evaluate participants for any history of major depression using DSM-IV criteria (American Psychiatric Association, 1994). This is a structured interview of demonstrated reliability and validity for research purposes (Andrews and Peters, 1998; Robins et al., 1988). Interviewers were initially blinded to

each participant's study group, although this may have been surmised on the basis of responses during the interview. The CIDI output was used to categorise individuals with, and without, 12 month major depression defined as any DSM-IV major depression single episode or major depression recurrent disorder present in the 12 months prior to the interview. The interviews were conducted face-to-face with participants at baseline, and over-the-phone at follow up.

The 9-item Patient Health Questionnaire (PHQ-9) (Kroenke et al., 2001), a brief depression severity measure which includes the nine criteria upon which DSM-IV depressive disorders are based (American Psychiatric Association, 1994), was administered by self-report questionnaire at follow up only. Scoring has been described by Kroenke et al. (2001) who reported the instrument to be a reliable and valid measure of depression severity, and to have excellent internal reliability, criterion validity and external validity for making criteria-based diagnoses of depressive disorders. Current demographic variables were collected by self-report questionnaire at follow up. Military service-related variables were collected at baseline and/or follow up from a combination of self-report and Department of Veterans' Affairs (DVA) or ADF data sources. Gulf War deployment-related psychological stressors were measured using the Military Service Experience Questionnaire (MSEQ) (Ikin et al., 2004) data collected at baseline. The MSEQ has been shown to demonstrate good internal consistency both in relation to Gulf War service ( $\alpha=0.83$ ) and other military service ( $\alpha=0.85$ ) (Ikin et al., 2005) however other psychometric properties have not been measured. Gulf War veterans' were categorised in to three *deployment era* groups based on their deployment start and end-dates relative to the Gulf War combat period; air attacks against Iraqi forces began on the 16th January 1991, followed by the launch of a ground attack on the 24th February 1991, which ended in the ceasefire as few as four days later. The deployment era categories were *before combat* (deployment ended before 16 January); *during combat* (deployment included any of 16 January–28 February); and *after combat* (deployment commenced after 28 February).

Where participant consent was provided at follow up for linkage to the national Pharmaceutical Benefits Scheme (PBS) and Repatriation PBS databases, those who had been dispensed at least one medication under the Anatomical Therapeutic Chemical (ATC) code N06A for anti-depressants (WHO Collaborating Centre for Drug Statistics Methodology, 2013), in the 12 month period prior to the follow up study, were identified.

### 2.4. Statistical analysis

Statistical analyses were performed using Stata 13 (StataCorp, 2013) software.

Differences in demographic variables between the Gulf War and comparison groups are presented using Pearson chi-squared tests for categorical measures and *t*-tests for continuous measures.

Differences between groups at follow up in prevalence of 12 month major depression, the proportion of participants dispensed an anti-depressant medication, and the association between 12 month major depression in veterans and Gulf-War deployment characteristics, are presented as Risk Ratios (RR) and accompanying 95% CIs calculated using robust Poisson regression (Armitage et al., 2002). Poisson regression was also used to measure the difference in 12 month major depression prevalence between baseline and follow up for each group, and to determine whether the change over time was different between the two groups.

Robust ordinal logistic regression (Armitage et al., 2002) was used to establish whether the category of depression symptom severity, derived from the PHQ-9, differed by study group. The

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