

Centre for Military and Veterans' Health

# The Middle East Area of Operations (MEAO)

## Health Study:

### Census Study Summary Report

14 December 2012



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA



## CMVH Director

Professor Peter Warfe CSC

## MEAO Health Study Investigators

Membership of the **Investigators' Committee** changed over the course of the study.

- **Professor Annette Dobson AM**, The University of Queensland (First Chief Investigator from March 2011, previously committee member from the beginning of the study in 2007)
- Professor Alexander McFarlane OA, CMVH University of Adelaide (First Chief Investigator from 2007 to March 2011)
- Professor Malcolm Sim, Monash University (resigned April 2011)
- Associate Professor Susan Treloar, CMVH, The University of Queensland
- Dr Keith Horsley, Adjunct Associate Professor, CMVH, The University of Queensland
- COL Stephanie Hodson, Director of Mental Health, Department of Defence
- Professor Philip Ryan, University of Adelaide (from March 2011, previously Associate Investigator)
- Professor Harvey Whiteford, The University of Queensland (from March 2011 to March 2012)
- Dr. Ian Gardner, Defence Centre for Occupational Health (from March 2011)
- Dr. Carol Davy, CMVH, University of Adelaide (from March 2011)
- Professor Beverley Raphael (from March 2012)

## Research Team

Dr Christine McClintock (Deployment Health Surveillance Program Manager, 2005 to 2010)

Mr Michael Waller (Research Fellow, Statistics, 2007 to 2012)

Dr Wu Yi Zheng (Research Fellow, 2010 to 2012)

Dr Renée Anderson (Research Fellow, 2012)

Dr Katherine Kirk (Research Fellow, 2010)

Ms Colleen Loos (Senior Research Assistant / Project Co-ordinator, 2007 to 2012)

Mr Gore Chen (Data Manager, 2010 to 2012)

Ms Jeeva Kanesarajah (Research Assistant, Statistics, 2010 to 2012)

Ms Kara Pasmore (Senior/ Research Assistant, 2010 to 2012)

Ms Lisa Nielsen (Senior/ Research Assistant, 2006 to 2010)

Ms Nadine Mammone (Research/ Administrative Assistant, 2007 to 2012)

Ms Patricia Newman (Administrative Assistant, 2011)

Ms Ildiko Putnoki, Ms Lenora Rasmussen and Ms Lorraine Connelly (Senior Participant Liaison Officers)

## Suggested Citation

**Dobson A**, Treloar S, Zheng W, Anderson R, Bredhauer K, Kanesarajah J, Loos C, Pasmore K, Waller M 2012. *The Middle East Area of Operations (MEAO) Health Study: Census Study Summary Report*. The University of Queensland, Centre for Military and Veterans Health, Brisbane, Australia.

## Acknowledgments

We would like to thank the following people and organisations for their assistance.

### Department of Defence

- **Program Management Board:** Members past and present, chaired by BRIG Stephan Rudzki (until September, 2012)
- **Scientific Advisory Committee:** Currently chaired by Professor Michael Moore; Professor A.J. (Tony) McMichael (past Chair), Professor A. Scott Henderson (current), Associate Professor Tim Driscoll (current), Professor Helen Berry (current), Professor Neil Pearce (past), Associate Professor Emily Banks (past), Professor Louisa Jorm (past)
- **Program Management Office** staff past and present in Joint Health Command and in particular Ms Maxine Baban, for support and facilitation of the study.
- **CMVH Defence Liaison Officers:** WGCDR Marilyn White, MAJ Mathew Carroll and LCDR Steven Pullman, for co-ordination of visits to Defence bases during the MilHOP studies.

### Department of Veterans' Affairs

- Dr Eileen Wilson, Ms Peta Stevenson and Ms Leonie Mack

The **Returned and Services League of Australia** (RSL) for assistance and the **Defence Force Welfare Association** for reviewing the study.

**ComSuper** for assistance in mailing study invitations to non-contactable ex-serving and reserve members.

**Centre for Military and Veterans' Health (CMVH):** All staff who supported the day to day running of the project, especially the telephone follow up team.

Members of the **University of Adelaide** node of CMVH, the Mental Health Prevalence and Wellbeing Study team and the Data Management & Analysis Centre.

*We especially thank all Australian Defence Force members, serving and ex-serving, who participated in this study.*

## Summary table of the main findings

<b>Interpretation of the results</b>
Respondents to this study in 2010-2011 recalled aspects of their deployment to the Middle East Area of Operations (MEAO) in 2001-2009. Recall of their experience may have been affected by their mental health when they completed the survey. Therefore, it is not possible to be sure whether adverse deployment experiences led to poorer mental health or mental health problems caused people to recall their deployment experiences more negatively.
People with mental or other health problems during or after deployment may have been more inclined to separate from the ADF, so poorer health could be expected to be reported, on average, by active or inactive reserves and ex-serving members.
<b>Response and respondent characteristics</b>
Eligible population N=26239 Australian Defence Force (ADF) members who had deployed to the MEAO in 2001-2009.
The response of 53% (N=14032) compares favourably with other recent studies of military and civilian populations in Australia and elsewhere.
On their most recent deployment to the MEAO in 2001-2009, almost all respondents had been regular ADF members; 597 (4% of the total) had been reserves on continuous full-time service (CFTS).
At the start of the study (March 2010), 77% of respondents were still regular ADF members, 11% were active reserves, 7% were inactive reserves and 5% were ex-serving members.
Overall, 76% of respondents had deployed to Iraq, 62% to Afghanistan and 39% to both. For Iraq, 57% had deployed in the country (including ships in the Persian Gulf), 29% in supporting areas not in Iraq, and 14% did not report their deployment location. The corresponding percentages for Afghanistan were: 48% in the country, 29% in supporting areas, and 27% not reporting their location.
Response rates were lower among members aged under 35 years, males, Army and Navy personnel (compared to RAAF), lower ranks, and active and inactive reserves and ex-serving members. Consequently, the data were weighted for non-response based on Service, sex, rank and ADF employment category (regular, active reserve, or inactive/ex-serving) at the end of the study; this is a standard statistical procedure to reduce bias.
There was partial overlap of participants with the 2010 ADF Mental Health Prevalence and Wellbeing Study (MHPWS); data from 68% of respondents to this study were included in the MHPWS.
<b>Overview of mental and general health</b>
Prevalence of poor mental health was slightly higher than in MHPWS mainly due to inclusion of reserve and ex-serving members who were excluded from the MHPWS.
Reserves who deployed on CFTS had similar mental and general health to those who deployed as regulars, although they were more likely to report suicidal thoughts (odds ratio (OR) 1.4, 95% confidence interval (CI) 1.1 to 1.8) and less likely to be smokers, OR 0.8 (0.7, 0.9)
Prevalence of symptoms of PTSD was much higher among ex-serving members (OR 6.9), (5.6, 8.6) than among currently serving members.
Prevalence of symptoms of PTSD was also higher among members who were in the active reserve, OR 2.5 (2.1, 2.9) and inactive reserves, OR 2.4 (2.0, 2.9) than among currently serving members.
For major depressive symptoms, the results were: for ex-serving members, OR 5.6 (4.3, 7.1); for active reserves, OR 1.7 (1.4, 2.2); and for inactive reserves, OR 2.0 (1.5, 2.6) compared to currently serving members.
For alcohol misuse the results were: for ex-serving members, OR 9.5 (7.3, 12.4); for active reserves, OR 2.6 (2.0, 3.5); and for inactive reserves, OR 3.3 (2.5, 4.5) compared to currently serving members.

For suicidal thoughts in the last 12 months, the results were: for ex-serving members, OR 4.8 (3.9, 5.9); for active reserves, OR 2.2 (1.8, 2.6); and for inactive reserves, OR 2.3 (1.9, 2.8) compared to currently serving members.
Among ex-serving respondents, 23% had a most recent Medical Employment Classification (MEC) of 4 (not deployable at all) compared to 1% for active and inactive reserves (MEC was not obtained for currently serving members).
Among ex-serving and reserve members, prevalence of symptoms of PTSD was 40% for those with MEC 4, compared to 17% for MEC 3 and 7% for MEC 1 and 2.
Prevalence of PTSD symptoms was almost twice as high in Army (OR 1.9 (1.6, 2.3)) but similar in RAAF (OR 0.9 (0.7, 1.1)) compared to Navy.
Mental and general health was generally poorer among other ranks than officers and NCOs, in older members, and those who served in Iraq or Afghanistan rather than in supporting areas outside these countries.
Prevalence of poor mental health was generally highest two to three years after the most recent deployment. The prevalence of PTSD symptoms was almost 30% in ex-serving members who completed the survey two to three years after their most recent deployment.
Cigarette smoking rates, exceeding 30% for younger men, were higher than in the general population.
<b>Traumatic and combat exposures and health</b>
Symptoms of PTSD and other mental health problems were more prevalent among members who reported high levels of traumatic and combat exposures compared to those who did not have these experiences. For example, ORs for PTSD were 16.3 (9.8, 27.1) and 7.6 (2.6, 22.6) respectively for those who served in Iraq and Afghanistan and reported the highest exposures compared to those who reported the lowest exposures. Although these exposures were more common in Afghanistan than Iraq, the associations between the same level of exposure and mental health problems were not statistically significantly different for the two locations.
Personnel in Explosive Ordnance Disposal (EOD) and combat roles reported the highest levels of traumatic and combat exposures. Army and RAAF personnel in other combat and combat support roles also had high exposures while Navy had the lowest levels of exposure during Iraq and Afghanistan deployments.
<b>Deployment patterns and association with health</b>
Prevalence of mental and general health problems was not strongly or consistently associated with total time deployed or number of deployments to the MEAO in 2001-09, or duration of the most recent deployment.
More than 50% of respondents reported their military commitment had negative impacts on their marriage and children, and this increased with frequency and length of deployments.
More than one in three smokers reported smoking more than usual while on deployment, while one in four did not smoke on deployment and one in six began or re-started smoking.
<b>Environmental exposures and health</b>
Over 80% of participants reported exposure to dust storms, and more than 70% to diesel exhaust and aircraft fumes. More than half reported inhaling fine dust and fibres, fuel and smoke from fires.
Respiratory symptoms and medically diagnosed respiratory conditions were about twice as likely in members who reported high levels of exposure to smoke and dust, fumes and fuels, and chemicals. For example, ORs for asthma-like symptoms for people who reported exposure to high levels of smoke and dust were 2.4 (1.9, 3.2) and 1.6 (1.1, 2.3) in Iraq and Afghanistan respectively compared with people who served in these locations and reported the lowest exposures.
Medically diagnosed hearing loss and other hearing-related problems were about twice as prevalent among members who were exposed to loud or prolonged noise without hearing protection than those who were not exposed.
Medically diagnosed bowel disorders since deployment were associated with drinking from local taps and wells

### **Military, family and community support and health**

High unit cohesion on deployment was reported by 42% of participants and moderate cohesion by 47%, but those who reported low levels of cohesion were significantly more likely to report symptoms of PTSD (OR 4.1 (3.2, 5.2)) and other mental health problems.

Similarly, most respondents reported sufficient military support for their partner/spouse during their deployment and for themselves after deployment, but those who felt support was inadequate were three to four times more likely to report mental health problems.

Likewise, support from families and the community was reported to be very high, but respondents who did not feel as well supported were significantly more likely to report mental health problems.

Lower personal resilience, such as the ability to adapt to change or to bounce back after illness or hardship, was associated with almost 30-60 times increased likelihood of mental health problems.

### **Gender and health**

After deployment, women were more likely to have symptoms of mental health problems than men and were less likely to report feeling well-supported by the military.

However, women were less likely than men to report that their military commitment impacted negatively on their marriage and children.

While on deployment, women were less likely than men to smoke, consume caffeine drinks or take body building or energy supplements. Women were more likely to take weight loss supplements.

### **Patterns of somatic symptoms and conditions**

The nature, frequency and severity of physical and psychological symptoms reported were similar for ADF members who deployed to Iraq and Afghanistan and those reported in other military studies.

There was no evidence of patterns of symptoms specific to MEAO deployments.

Prevalence of severe chronic fatigue and severe multi-symptom illness was approximately 1%.

### **Discussion**

The large sample size, the use of standard measures, careful preparation and good response rate give confidence in the validity of the findings of this study.

The cross-sectional nature of the study only allows inferences about associations but not causality, which can best be established by longitudinal research.

To understand all the associations between deployment exposures and subsequent health, more careful analysis is needed of the wealth of data collected for this study.

## Table of contents

<b>1.</b>	<b>Introduction, background and aims .....</b>	<b>9</b>
	Interpretation of results.....	9
	Background .....	9
	Aims.....	10
<b>2.</b>	<b>Methods, measures and respondent characteristics .....</b>	<b>11</b>
	Methods .....	11
	Measures.....	11
	Overall response .....	11
	ADF employment category on the most recent deployment and at study commencement .....	14
	MEAO Census Study and the 2010 ADF Mental Health Prevalence and Wellbeing Study .....	15
<b>3.</b>	<b>Overview of the health of ADF members who deployed to the MEAO in 2001-2009.....</b>	<b>17</b>
	Comparison with the MHPWS.....	17
	Overall mental and general health of participants .....	17
	Comparison with Australian population data .....	21
<b>4.</b>	<b>Traumatic and combat exposures and health .....</b>	<b>22</b>
	Health during deployment .....	25
	Injuries on deployment and subsequent health .....	26
<b>5.</b>	<b>Deployment patterns and associations with health .....</b>	<b>27</b>
	Deployment and impact of military commitments on families .....	27
	Smoking on deployment .....	28
<b>6.</b>	<b>Environmental exposures and health.....</b>	<b>29</b>
	Respiratory conditions .....	29
	Hearing problems.....	30
	Bowel problems .....	31
<b>7.</b>	<b>Military, family and community support and health.....</b>	<b>32</b>
	Unit cohesion on deployment.....	32
	Support from the military .....	32
	Support from the family.....	33
	Support from the community .....	33
	Personal resilience .....	34
<b>8.</b>	<b>Gender and health .....</b>	<b>36</b>
	Health after deployment.....	36
	Support from the military .....	36
	Impact of military commitment on families.....	37
	Use of substances during deployment .....	37
<b>9.</b>	<b>Patterns of somatic symptoms and conditions .....</b>	<b>38</b>
	Chronic fatigue.....	38
	Multi-symptom illness.....	39
	Clusters of physical symptoms and mental health .....	39
<b>10.</b>	<b>Discussion and implications.....</b>	<b>41</b>
	Caveat for interpreting some of the results.....	41
	Comparison with other studies.....	41
	Health of participants who had separated from the ADF regular service.....	42
	Traumatic and combat exposures.....	42
	Duration of deployments .....	42
	Impact on families.....	43
	Reserves who deployed on continuous full-time service.....	43
	Somatic symptoms .....	43
	Head injury .....	43
	Environmental exposures.....	43
	Health and hygiene .....	44
	Social support.....	45
	Gender differences.....	45
	Study strengths .....	46
	Study limitations .....	46
	Need for further analysis of the data.....	46
	References.....	48

## List of Tables

Table 1	Country of deployment by “inside” and “outside” base location .....	14
Table 2	Most recent deployment location by years.....	14
Table 3	ADF Employment status at study commencement and serving status on most recent deployment to the MEAO.....	15
Table 4	Prevalence of mental health measures among all participants in the MEAO Census Study (N=14032), those who were regular serving members of the ADF when they completed the study (N=10819) and the MHPWS (N=24481) (weighted for non-response).....	17
Table 5	Odds ratios for prevalence of symptoms of PTSD by Service, rank, age-group and sex at study commencement (N=14032; results weighted for non-response and adjusted for employment status and the other variables in the table) .....	18
Table 6	Comparison of main health measures between members who deployed to the MEAO regulars and reserves on CFTS.....	18
Table 7	Prevalence of main health measures in the MEAO Census Study by ADF employment category at the start of the study (N=14,032; results weighted for non-response).....	19
Table 8	Odds ratios and 95% confidence intervals for mental health measures reported by active and inactive reserve and ex-serving members compared to regular members at the start of the study, after adjustment for sex, age, Service and rank and weighted for non-response (N=14,032).....	19
Table 9	Reserve and ex-serving members by Medical Employment Classification (MEC) at study commencement (although the most recent available MEC may have been recorded up to 10 years previously).....	20
Table 10	PTSD symptoms of active and inactive reserve and ex-serving members by MEC at study commencement (although the most recent available MEC may have been recorded up to 10 years previously).....	20
Table 11	Prevalence of symptoms of PTSD by base location during the most recent deployment to Iraq and Afghanistan (weighted for non-response).....	20
Table 12	Prevalence of symptoms of PTSD by time since most recent deployment for respondents who were regular, active reserves, inactive reserves and ex-serving members at the start of the study: numbers in each group (weighted prevalence in brackets) .....	21
Table 13	Comparisons of psychological distress by sex and age group in the MEAO Census Study and the Australian Bureau of Statistics (ABS) National Health Survey 2007-08.....	21
Table 14	Categories of traumatic and combat exposure .....	22
Table 15	Prevalence (%) of traumatic and combat exposures for respondents who served in or outside Iraq or Afghanistan .....	23
Table 16	Prevalence (%) of symptoms of PTSD among those who reported each category of traumatic and combat exposure and odds ratios (with 95% confidence intervals) for symptoms of PTSD among those exposed compared to those not exposed for members who served in Iraq or in Afghanistan.....	23
Table 17	Role <i>in</i> Iraq and frequency of traumatic and combat exposures (N=5511) .....	24
Table 18	Role <i>in</i> Afghanistan and frequency of traumatic and combat exposures (N=3875) .....	24
Table 19	Associations between symptoms of PTSD and number of traumatic and combat exposures experienced during the most recent deployment for members who served in Iraq or in Afghanistan: numbers in the group, prevalence of symptoms of PTSD (%), and odds ratios .....	25
Table 20	Reasons for sick parade attendance and days out of role during deployment to Iraq and supporting areas outside Iraq.....	25
Table 21	Reasons for sick parade attendance and days out of role during deployment to Afghanistan and supporting areas outside Afghanistan .....	26
Table 22	Associations between combat injuries on deployment and mental health reported in the survey .....	26
Table 23	Associations between total time deployed to the MEAO in 2001-09, number of deployments to the MEAO in 2001-09 and duration of most recent deployment to the MEAO and PTSD symptoms. ....	27
Table 24	Associations between patterns of deployment and negative impact of members’ military commitment on their marriage and children: numbers of respondents vary because of family structure .....	28
Table 25	Smoking patterns on MEAO deployments (N=11409, smokers only) .....	28
Table 26	Frequencies for self-reported exposure to environmental and other hazards among ADF personnel deployed in Iraq and Afghanistan and supporting areas.....	29
Table 27	Associations between respiratory exposures or Service and subsequently reported asthma-like symptoms assessed using the European Community Respiratory Health Survey (ECHRS) for members who served <i>in</i> Iraq (N=5771) or <i>in</i> Afghanistan (N=4029). ....	30

Table 28	Associations between various exposures or Service and subsequent medically diagnosed hearing loss for members who served <i>in</i> Iraq (N=5875) or <i>in</i> Afghanistan (N=4127) .....	31
Table 29	Associations between drinking from local taps and wells and eating local food and subsequent medically diagnosed bowel disorder for members who served <i>in</i> Iraq (N=5831) or <i>in</i> Afghanistan (N=4082) .....	31
Table 30	Perceived level of unit cohesion by Service (N = 11420) .....	32
Table 31	Associations between perceived levels of unit cohesion on deployment and symptoms of PTSD (N=11392) .....	32
Table 32	Associations between perceived military support and symptoms of PTSD .....	33
Table 33	Associations between perceived support from family and symptoms of PTSD. ....	33
Table 34	Associations between perceived community support and symptoms of PTSD. ....	34
Table 35	Workplace issues for reserves on CFTS by deployment location .....	34
Table 36	Associations between reported personal resilience and symptoms of PTSD. ....	35
Table 37	Comparison between women (N=1660) and men (N=11830) on the main health measures: prevalence of conditions and odds ratios for women compared to men. ....	36
Table 38	Perceived military support to spouse/partner during deployment .....	36
Table 39	Self-reported impact of military commitments on marriage/relationship and children.....	37
Table 40	Comparison between women (N=1645) and men (N=11660) on substances used during deployment .....	37
Table 41	Prevalence of the 15 most common symptoms reported by members who deployed to Iraq (N=5857) and Afghanistan (N=4125) .....	38
Table 42	Prevalence and severity on chronic fatigue reported since deployment to Iraq (N=5777) and Afghanistan (N=4056) .....	38
Table 43	Prevalence and severity of multi-symptom illness reported since deployment to Iraq (N=5915) and Afghanistan (N=4160) .....	39
Table 44	Association between physical symptoms and PTSD for participants deployed to the MEAO (N = 8757) .....	40

## List of Figures

Figure 1	Response to the MEAO Census Study .....	12
Figure 2	ADF employment category at the time of most recent deployment to the MEAO and at the commencement of the MEAO Census Study.....	13
Figure 3	Overlap between participants in the MEAO Census Study and the MHPWS .....	16



# 1. Introduction, background and aims

---

## Interpretation of results

In the MEAO Census Study, respondents were asked to recall aspects of their deployment to the MEAO in the period 2001-09. Many of the analyses involve associations between recalled deployment experiences and the respondent's health in 2010-11, when they participated in the study up to 10 years later. Recall of deployment experience may have been affected by the respondent's mood at the time of completing the questionnaire. There is a well-known phenomenon called 'negative reporting bias' [31], or 'effort after meaning' [6] whereby people who are depressed or experiencing other mental health problems may perceive and report their past experiences more negatively than other respondents who had the same experience but are not suffering from mental health problems. It is not possible to be sure whether adverse deployment experiences led to poorer mental health or mental health problems caused people to recall their deployment experiences more negatively.

Also people who experienced mental or other health problems during or after deployment may have been more inclined to separate from the ADF. When they participated in the study, they would have been ex-serving members or have transitioned to the active or inactive reserves; so poorer health could be expected to be reported, on average, by these groups.

## Background

The Middle East Area of Operations (MEAO) Health Study was designed to investigate the health of Australian Defence Force (ADF) members who deployed to the MEAO, with a view to identifying factors associated with poorer or better health. The study was contracted by the Department of Defence to the Centre for Military and Veterans' Health (CMVH) and was conducted by CMVH nodes at The University of Queensland and the University of Adelaide.

The **MEAO Health Study** had four components:

- The **MEAO Preliminary Study** was conducted by CMVH in 2009. The purpose was to gain stakeholder input to the development of the measurements and method of data collection for the Census and Prospective Studies. ADF units, ex-service organisations and other veterans' groups were involved in meetings and focus groups.
- The **MEAO Census Study**, which is the subject of this report, was conducted by the University of Queensland node of CMVH. This study was a retrospective, self-report survey covering health and deployment experiences of ADF members who deployed to the MEAO between 2001 and 2009.
- The **MEAO Mortality and Cancer Incidence Study** is based on record linkage to national databases. Death and cancer incidence data from the Australian Institute of Health and Welfare (AIHW) were linked with the MEAO nominal roll, and the cancer and mortality rates of MEAO veterans were compared with standardised Australian rates.
- The **MEAO Prospective Study** is a follow up study collecting pre- and post-deployment data on members deploying in 2010/11, conducted by CMVH's University of Adelaide node. Along with the self-reported survey, selected members also participated in physical and neuro-cognitive testing. The final report was delivered to the Department of Defence in November 2012.

A detailed research plan, covering the Census, Prospective, and Mortality and Cancer Incidence components of the MEAO Health Study, was developed and modified through rounds of consultations

and review between May 2007 and 2010. During all phases of the study development and conduct, there was consultation with the Department of Defence and the Department of Veterans' Affairs (DVA).

Australia's operational commitments overseas have increased substantially in the two decades since 1990. Between 1980 and 1989, there were 16 ADF operational deployments involving just over 1,000 personnel, while from 1990 to 1999, there were 82 deployments involving nearly 17,000 personnel [13]. In comparison, on 12 October 2011, approximately 3,300 ADF personnel were prepared for deployment to 11 operations overseas and within Australia [14], with a substantial commitment to humanitarian assistance operations. In this context, the Department of Defence wanted to know whether exposures associated with deployments to Iraq and Afghanistan since 2001 would result in patterns of illness similar to those reported by Gulf War veterans. It was intended that this research should commence without undue delay, in contrast to investigations into the health effects of ADF involvement in the 1990-1991 Gulf War, which was not conducted until more than 10 years after [23].

The MEAO Census Study was a cross-sectional survey of ADF members who deployed to the MEAO. It was named "census" because, instead of a random sample, everyone on the nominal roll - almost 27,000 serving regular, reserve and ex-serving ADF members - were invited to participate. Data were collected in 2010-2011.

The MEAO Census Study is the first large scale Australian study that has investigated the association between deployment exposures and health of ADF members, including reserves and ex-serving members, who deployed to Iraq, Afghanistan and supporting locations.

## Aims

The study aimed to investigate the health of ADF personnel who have deployed to the MEAO, and to identify any potential health concerns in relation to self-report data on exposures.

## 2. Methods, measures and respondent characteristics

---

The study population was the nominal roll of all 26,915 current and ex-serving ADF members who had deployed to the Middle East between 1 October 2001 and 31 December 2009.

### Methods

Data were collected using a self-reported survey which was available both online and in hard copy format. Extensive attempts were made to contact everyone on the nominal roll and invite them to participate in the survey. This involved a communication and media strategy designed with the assistance of Defence Public Affairs, letters of support from the Chief of the Defence Force and the Repatriation Commissioner. To alert serving members to the study and encourage participation, base visits were undertaken by senior Defence Officers, CMVH Defence Liaison Officers and study staff. During these visits, ADF members had the opportunity to complete a hard copy survey during working hours.

Participation was voluntary. The study was approved by the Australian Defence Human Research Ethics Committee (Protocol no. 488/07), the Department of Veterans' Affairs Human Research Ethics Committee (Protocol no. E008/026), The University of Queensland Behavioural and Social Sciences Ethical Review Committee (Protocol no. 2009001441) and the University of Adelaide Human Research Ethics Committee (Protocol no. H-065-2008).

### Measures

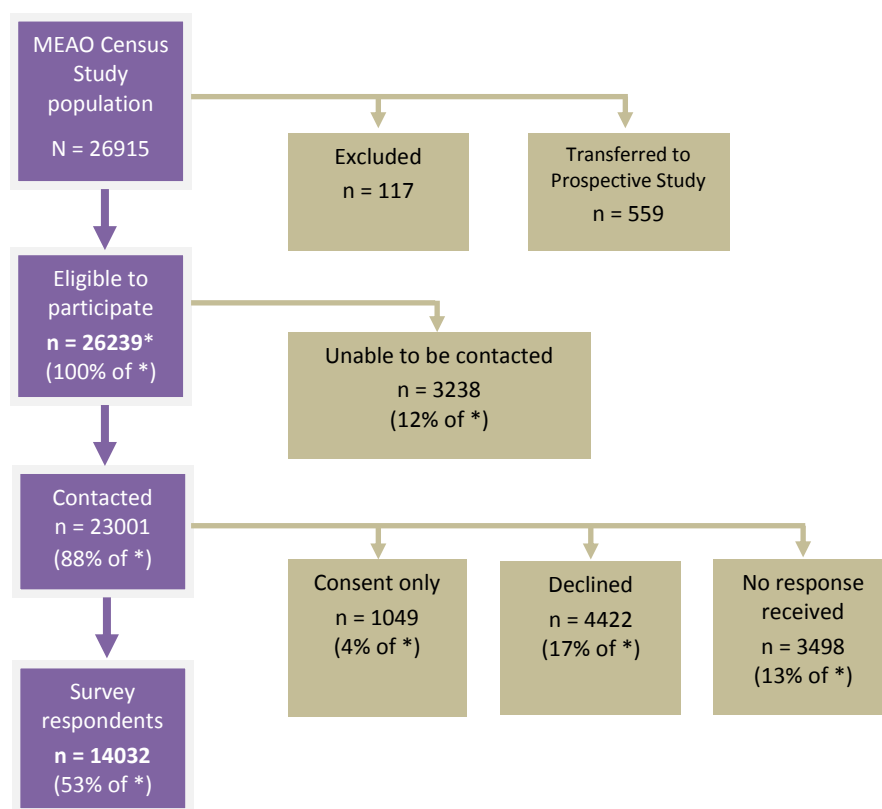
The survey had three main components:

- Brief Deployment History. Participants were asked about each of their deployments - country deployed to, operation name, year deployment started, number of times deployed in that year, and the total time deployed (in months).
- Health questionnaire. Topics were identified by literature reviews, consultation with stakeholders and focus groups with serving and ex-serving personnel. Items and scales obtained from a number of different sources, asked about current mental health, physical health, social function, and health risk factors.
- Deployment experiences questionnaire. Questions focused on perceived health hazards and threats in their most recent deployment to the MEAO. The questionnaire included separate sections for Iraq and Afghanistan. Participants who had deployed to both countries were asked to complete both sections. Questionnaire items were identified by literature reviews and review of ADF Hazard Assessment Team reports. In addition, hazards reported by serving and ex-serving personnel during the preliminary study focus groups were incorporated.

### Overall response

Details of the response are shown in Figure 1 below.

Figure 1 Response to the MEAO Census Study



Survey data were obtained from 53% of eligible members. This response compares favourably with similar studies conducted recently in Australia: 49% for the 2010 ADF Mental Health Prevalence and Well-being Study [22], 43% for the CMVH health studies of ADF deployments to East Timor, Bougainville and the Solomon Islands [10], and for studies in the UK (56%) and the USA (37%) [24]. The majority (92%) of respondents completed the survey on-line.

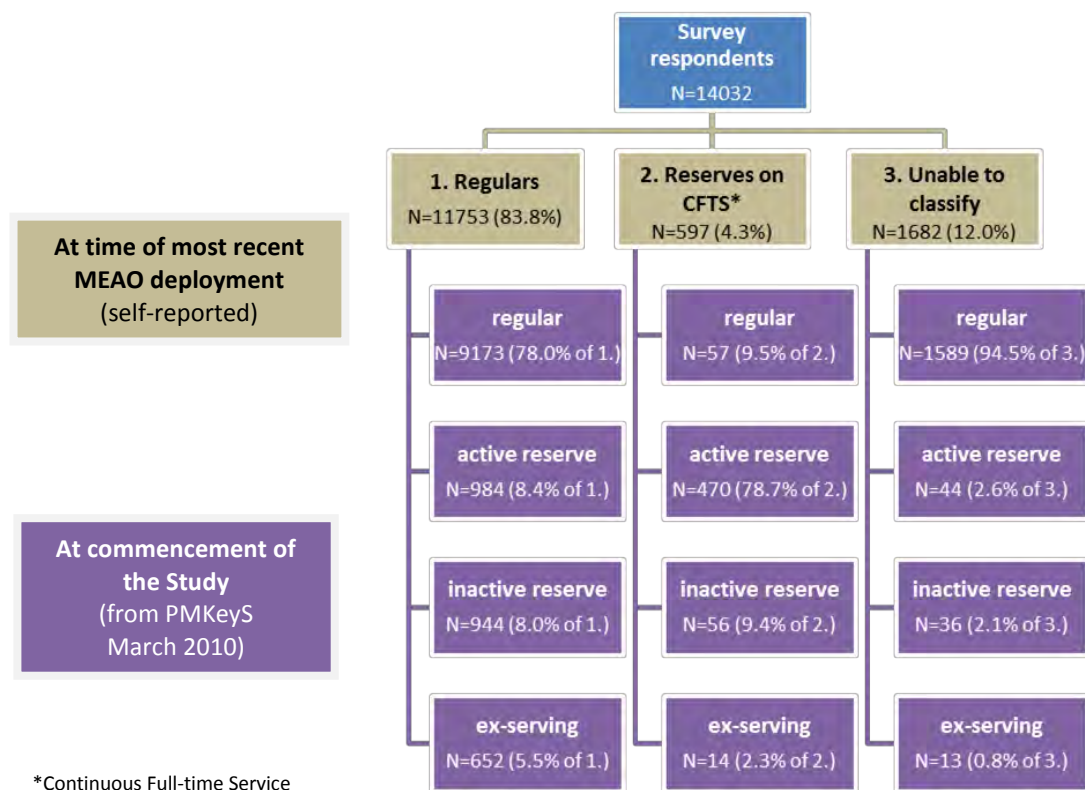
### Time frames used in this study

Some characteristics, including age, rank, Service (Navy, Army, RAAF), service type (regular / reserve) and employment status (serving / ex-serving) are subject to change from the time of the respondent's deployment to the MEAO to the date they completed the survey. Three time points have generally been used in the analysis of service and employment characteristics:

- Characteristics at the commencement of the study (from PMKeyS in March 2010). These data were available for the entire study population and so were used when comparing respondents and non-respondents.
- Characteristics at the time of the respondent's most recent deployment (2001 to 2009). These characteristics are relevant to the respondent's exposures and experiences while on their most recent deployment to Iraq and/or Afghanistan.
- Data from the most recent PMKeyS download before the close of data collection (August 2011) were used to calculate non-response weights based on sex, Service, rank and employment (regular, active reserve, inactive reserve/ex-serving) at that time.

Figure 2 shows ADF employment category at the commencement of the study, and at the time of respondents' most recent deployment to the MEAO.

Figure 2 ADF employment category at the time of most recent deployment to the MEAO and at the commencement of the MEAO Census Study



### Service characteristics and survey response

Response rates were lower among members aged under 35 years, males, Army and Navy personnel (compared to RAAF), lower ranks, and active and inactive reserves and ex-serving members.

Consequently, there is a greater chance of bias in the data from these groups who were relatively under-represented. In this report, the data were weighted for non-response based on Service, sex, rank and employment (regular, active reserve, or inactive/ex-serving) at the end of the study; this is a standard statistical procedure to reduce bias.

### Deployment location

The first question in each deployment history section of the survey asked about the geographic regions in which the respondent was mainly based. The options were:

- “Baghdad”, “Talil”, “Balad”, “Persian Gulf (ships)”, “Attachment to Foreign militaries or UN”, “Other Areas in Iraq” or “Other supporting areas NOT in Iraq (e.g. .2, .4)”;
- “Tarin Kowt”, “Kandahar”, “Other areas in Afghanistan”, “Attachment to Foreign militaries or UN” or “Other supporting areas NOT in Afghanistan”.

Respondents were asked to select all locations which applied. Where a combination of “inside” and “outside” regions was selected, the deployment was classified as “inside”.

Table 1 shows the classification of “inside” and “outside” deployments for all respondents, by each country, and also where respondents deployed to both countries. The total number who deployed to Iraq was 10646 (76%) and 8745 (62%) for Afghanistan, with 5403 (39%) having deployed to both.

Table 1 Country of deployment by “inside” and “outside” base location

Location in which the respondent was mainly based		Afghanistan				Total N <sup>e</sup>
		Not deployed	Inside <sup>c</sup>	Outside <sup>d</sup>	Base location not reported	
Iraq	Not deployed	44	2387	539	416	3386
	Inside <sup>a</sup>	3579	1031	762	673	6045
	Outside <sup>b</sup>	1142	384	1088	459	3073
	Base location not reported	522	385	162	459	1528
<b>Total N<sup>e</sup></b>		<b>5287</b>	<b>4187</b>	<b>2551</b>	<b>2007</b>	<b>14032</b>

<sup>a</sup> “Baghdad”, “Taliil”, “Balad”, “Persian Gulf (ships)”, “Attachment to Foreign militaries or UN”, “Other Areas in Iraq”

<sup>b</sup> “Other supporting areas NOT in Iraq (e.g. .2, .4)”

<sup>c</sup> “Tarin Kowt”, “Kandahar”, “Other areas in Afghanistan”, “Attachment to Foreign militaries or UN”

<sup>d</sup> “Other supporting areas NOT in Afghanistan”

<sup>e</sup> Unweighted totals

### Time of most recent deployment

The single most recent deployment was also used for some analyses. Where respondents reported deploying to both Iraq and Afghanistan in the same and most recent year, the Iraq responses were used. Table 2 shows the years in which respondents’ most recent MEAO operations occurred.

Table 2 Most recent deployment location by years

Year of most recent deployment	Iraq <sup>a</sup>		Afghanistan <sup>b</sup>	
	n <sup>c</sup>	% <sup>c</sup>	n <sup>c</sup>	% <sup>c</sup>
2001-5	3463	45.3	847	14.1
2006-7	2525	33.0	912	15.1
2008-9	1580	20.7	3019	50.1
2010	78	1.0	1248	20.7
<b>Total</b>	<b>7646</b>	<b>100</b>	<b>6026</b>	<b>100</b>
<b>Not deployed / year not reported</b> N=360				

<sup>a</sup> Iraq or areas supporting operations in Iraq

<sup>b</sup> Afghanistan or areas supporting operations in Afghanistan

<sup>c</sup> Unweighted totals and column percentages

### ADF employment category on the most recent deployment and at study commencement

Participants were classified by ADF employment category at the time of the study commencement and serving status on the most recent deployment to the MEAO using data from PMKeyS. Table 3 shows serving status at these two time points.

Regardless of their employment status at study commencement, the majority of members deployed as regular full time members. Five hundred and ninety seven (4.2%) participants reported they deployed as reserves on continuous full-time service (CFTS) at their most recent deployment (between 2001 and 2009).

At the commencement of the study (March 2010), 77.1% of participants were still regulars, 10.7% were active reserves, 7.4% were inactive reserves and 4.8% (679 individuals) were ex-serving members.

Table 3 ADF Employment status at study commencement and serving status on most recent deployment to the MEAO

Serving status on most recent deployment to MEAO	ADF employment category at study commencement				
	All (N=14032)	Regular (N=10819)	Active Reserve (N=1498)	Inactive Reserve (1036)	Ex-serving (N=679)
	Row %	77.1	10.7	7.4	4.8
	N <sup>a</sup>	% <sup>a</sup>	% <sup>a</sup>	% <sup>a</sup>	% <sup>a</sup>
Reserve on CFTS	597	0.5	31.4	5.4	2.1
Full time Member	11753	84.8	65.7	91.1	96.0
Unable to classify	1682	14.7	2.9	3.5	1.9

Unweighted totals and column percentages

## MEAO Census Study and the 2010 ADF Mental Health Prevalence and Wellbeing Study

In response to the Dunt report on mental health in the ADF [16], the Department of Defence decided in 2009 to conduct a survey to measure mental health among all regular ADF members. The MEAO Health Study was already in an advanced planning stage but the timelines for the MEAO Census Study were changed to facilitate this goal. Regular ADF members who had deployed to the MEAO in 2001-09 were surveyed in 2010. At the same time, those members who had not deployed to the MEAO were invited to participate in the “Health and Wellbeing Survey”. Combining the studies in this way enabled the ADF Directorate of Strategic Operational Mental Health to:

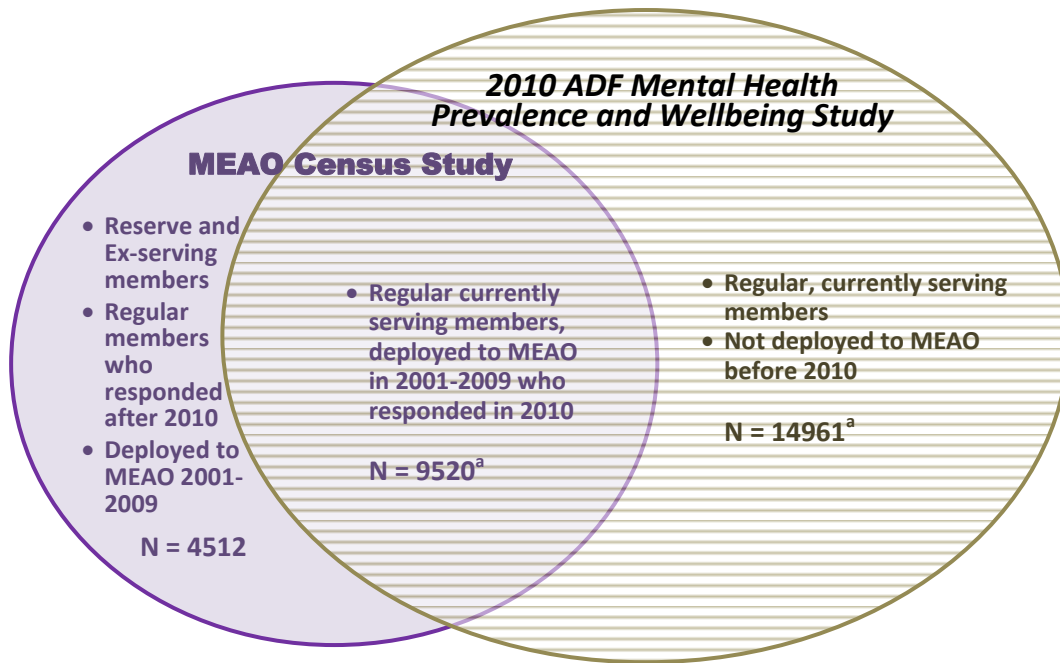
- use the same survey methods developed for the MEAO Census Study;
- launch a single marketing program to promote the studies within the ADF under the Military Health Outcomes Program (MilHOP) banner; and,
- in conjunction with the MEAO Census Study, collect mental health data across the entire currently serving regular ADF population, including data from an additional telephone interview administered to a subset of respondents. These findings have been reported as the 2010 ADF Mental Health Prevalence and Wellbeing Study (MHPWS) [22].

There is a partial overlap of participants between the MEAO Census Study and the 2010 ADF Mental Health Prevalence and Wellbeing study (MHPWS), which covered all currently serving ADF members (whether or not they deployed to the MEAO) but excluded active and inactive reserves and ex-serving members (Figure 3).

The relationships between the MEAO Census Study and the MHPWS were as follows:

- Different but complementary objectives.
- Different populations, specifically, the inclusion of ex-serving and reserve members in the MEAO Census Study.
- Different instruments:
  - The MEAO Census Study collected extensive information on experiences during and after deployment. The prevalence of a wide range of self-reported exposures, and mental and physical health symptoms, was measured.
  - A telephone administered Composite International Diagnostic Interview (CIDI) [34] was used for a selected subset of MHPWS respondents (N=1798). The prevalence of mental health disorders was reported.
- Different statistical weighting - due to differences in response rates by Service, rank and other variables, different weightings for non-response were applied in each study to improve the representativeness of results with regard to the particular population of interest (MHPWS data were also weighted for Medical Employment Classification, MEC).
- Different cut-off dates for inclusion of data from regular ADF members.

Figure 3 Overlap between participants in the MEAO Census Study and the MHPWS



<sup>a</sup> Number of respondents who had provided sufficient data at 4/02/2011 to be included in the MHPWS; the total number of MHPWS respondents was 24,481.

There were 9520 MEAO Census Study participants whose data were included in the MHPWS; this was 68% of the MEAO Census Study participants and 39% of MHPWS participants. However, the Census Study included considerably more data on the MEAO deployment experience. Therefore, this report goes beyond reporting prevalence to examining associations between participants' recall of deployment experiences and their subsequent health.



### 3. Overview of the health of ADF members who deployed to the MEAO in 2001-2009

#### Comparison with the MHPWS

The prevalence of mental disorders found in the MHPWS differs from the results in this study due to different measures (telephone administered CIDI compared to self-administered questionnaires). However, results can be compared for mental health screening instruments including: PTSD Checklist – Civilian (PCL-C) [32]; Kessler 10 Plus, a measure of general psychological distress (K10+) [19]; Patient Health Questionnaire (PHQ) anxiety and depression modules [21]; Alcohol Use Disorder Identification Test (AUDIT) [25]; and questions about suicide. The MEAO Census Study reports prevalence of symptoms not diagnoses.

The prevalence of most of the major mental health measures was consistently higher for the MEAO Census Study than the MHPWS as shown in Table 4. It is not possible from these data to determine the statistical significance of the differences due to the overlapping samples and different weights for non-response in the two studies. However, the overlapping group was mainly regular serving ADF members whose results were similar to the MHPWS participants.

Table 4 Prevalence of mental health measures among all participants in the MEAO Census Study (N=14032), those who were regular serving members of the ADF when they completed the study (N=10819) and the MHPWS (N=24481)

	Census - all %	Census - regulars %	MHPWS %
<b>PTSD symptoms</b> (PCL-C $\geq$ 50)	4.6	2.7	3.0
<b>Psychological Distress</b> (K10 $\geq$ 30)	4.2	2.7	3.6
<b>Alcohol misuse</b> (AUDIT $\geq$ 20)	2.5	1.3	1.4
<b>Suicidality</b>			
Suicidal thoughts	5.5	3.7	3.9
Suicide plans	1.4	1.0	1.1
Suicide attempts	0.4	0.4	0.4

Prevalences weighted for non-response

#### Overall mental and general health of participants

Mental and general health was generally poorer for Army and better for RAAF compared to Navy (Table 5 shows results for symptoms of PTSD, results for other measures were similar). Similarly, the health measures were poorer for other ranks compared with NCOs and officers and increased with age. There were also some differences between men and women with women reporting higher levels of psychological distress, for example. For these reasons, subsequent comparisons between groups involved adjustments for Service, rank, age group and sex, as well as ADF employment status at the study commencement and sometimes other variables, as well as weighting for non-response.

Please note that in the following tables, **statistically significant results** are shown in **bold**.

Table 5 Odds ratios for prevalence of symptoms of PTSD by Service, rank, age-group and sex at study commencement (N=14032)

Odds ratios and 95% confidence intervals for symptoms of PTSD				
<b>Service</b>	Navy (N=3150)	Army (N=6600)	RAAF (N=4282)	
	1 (Reference)	<b>1.88 (1.55, 2.28)</b>	0.86 (0.69, 1.07)	
<b>Rank</b>	Officers (N=4129)	NCOs (N=8083)	Other ranks (N=1820)	
	1 (Reference)	<b>1.80 (1.53, 2.13)</b>	<b>2.03 (1.56, 2.64)</b>	
<b>Age group</b>	18-24 (N=584)	25-34 (N=5554)	35-44 (N=5091)	45+ (N=2803)
	1 (Reference)	1.07 (0.65, 1.77)	<b>1.74 (1.04, 2.89)</b>	<b>2.57(1.54, 4.31)</b>
<b>Sex</b>	Women (N=1730)	Men (N=12302)		
	1 (Reference)	<b>0.80 (0.65, 0.99)</b>		

Weighted for non-response and adjusted for ADF employment category and the other variables in the table  
Statistically significant results shown in **bold**

### Comparison between participants who deployed as regulars and those who deployed as reserves on continuous full-time service

There were very few statistically significant differences between the health of those who deployed as reserves on CFTS and those deployed as regular full-time ADF members (see Table 6). Although the number of participants known to have deployed as reserves on CFTS was small, and so the confidence intervals for the odds ratios were wide, the prevalence estimates for the two groups were generally similar. There were, however, two exceptions. Reserve members on CFTS were more likely to report suicidal thoughts and less likely to be current smokers than regular members.

Table 6 Comparison of main health measures between members who deployed to the MEAO as regulars and as reserves on CFTS

Measure	Regular (N=11753 <sup>a</sup> ) % <sup>b</sup>	Reserve on CFTS (N=597 <sup>a</sup> ) % <sup>b</sup>	Odds ratio for reserves on CFTS compared to regulars OR(95% CI) <sup>c</sup>
<b>PTSD symptoms</b> (PCL-C≥50)	4.7	5.3	0.94(0.68, 1.31)
<b>Psychological distress</b> (K10≥30)	4.3	4.0	0.87(0.61, 1.25)
<b>Major depressive syndrome</b> (PHQ criteria)	3.6	3.7	0.90(0.62, 1.30)
<b>Suicidality</b>			
Suicidal thoughts	5.6	8.6	<b>1.38(1.07, 1.79)</b>
Suicide plan	1.5	1.4	0.81(0.42, 1.53)
Suicide attempt	0.4	0.2	0.46(0.11, 1.84)
<b>Alcohol misuse</b> (AUDIT≥20)	2.5	3.3	1.56(0.98, 2.48)
<b>Smoking</b> (Current smoker)	28.3	19.0	<b>0.78(0.66, 0.93)</b>
<b>General health</b> (SF-1: Fair/ poor)	14.7	15.6	0.99(0.82, 1.20)

<sup>a</sup> Unweighted totals

<sup>b</sup> Prevalence estimates, weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for employment, sex, age, Service and rank

Statistically significant results shown in **bold**

### ADF employment category at study commencement

ADF employment category at the start of the study was associated with significant differences for all measures of mental and general health. Poorer health was more prevalent among ex-serving members than among currently serving personnel (Table 7). Active and inactive reserve members had poorer health than regular members. The only exception was smoking, where reserve members had lower rates than regulars. The mean ages of members in the four groups did not differ markedly: 36.2 years for currently serving regular members, 41.2 years for the active reserve, 38.5 for inactive reserve, and 37.1 years for ex-serving members (unweighted means).

Ex-serving members were five to seven times more likely to report symptoms on each of the mental health measures, such as PTSD, than regular currently-serving members, and nearly 10 times more likely to report an alcohol problem (Table 8). They were also two and a half times more likely to rate their

general health as only “Fair” or “Poor” when compared with regular members. The odds of active reserve members reporting each of the mental health symptoms was generally around twice that of regular members. There was no significant difference between the health of inactive and active reserve members. However, inactive reserve members had statistically significantly better health than ex-serving members.

Table 7 Prevalence of main health measures in the MEAO Census Study by ADF employment category at the start of the study (N=14,032)

	Regulars (N=10819) %	Active Reserves (N=1498) %	Inactive Reserves (N=1036) %	Ex-serving members (N=679) %
<b>PTSD symptoms (PCL-C≥50)</b>	<b>2.7</b>	<b>6.7</b>	<b>7.2</b>	<b>16.5</b>
<b>Psychological distress (K10≥30)</b>	<b>2.7</b>	<b>5.7</b>	<b>5.3</b>	<b>15.0</b>
<b>Major depressive syndrome (PHQ criteria)</b>	<b>2.4</b>	<b>4.3</b>	<b>4.9</b>	<b>12.7</b>
<b>Alcohol misuse (AUDIT≥20)</b>	<b>1.3</b>	<b>3.2</b>	<b>4.3</b>	<b>11.4</b>
<b>Suicidality</b>				
Suicidal thoughts	<b>3.7</b>	<b>8.5</b>	<b>8.4</b>	<b>16.2</b>
Suicide plans	<b>1.0</b>	<b>1.2</b>	<b>1.7</b>	<b>5.9</b>
Suicide attempts	<b>0.4</b>	<b>0.2</b>	<b>0.3</b>	<b>0.9</b>
<b>General health (SF-1: Fair/ poor)</b>	<b>12.6</b>	<b>16.4</b>	<b>15.6</b>	<b>29.8</b>

Prevalences weighted for non-response  
Statistically significant results shown in **bold**

Table 8 Odds ratios and 95% confidence intervals for mental health measures reported by active and inactive reserve and ex-serving members compared to regular members at the start of the study (N=14,032)

	Regulars (N=10819)	Active Reserves (N=1498)	Inactive Reserves (N=1036)	Ex-serving members (N=679)
<b>PTSD symptoms</b>	1 (Reference)	<b>2.39 (1.96, 2.91)</b>	<b>2.59 (2.07, 3.24)</b>	<b>6.91 (5.58, 8.56)</b>
<b>Major depressive symptoms</b>	1 (Reference)	<b>1.74 (1.38, 2.19)</b>	<b>2.00 (1.52, 2.62)</b>	<b>5.56 (4.34, 7.13)</b>
<b>Alcohol misuse</b>	1 (Reference)	<b>2.62 (1.96, 3.49)</b>	<b>3.33 (2.47, 4.49)</b>	<b>9.51 (7.32, 12.35)</b>
<b>Suicidal thoughts</b>	1 (Reference)	<b>2.17 (1.82, 2.59)</b>	<b>2.30 (1.87, 2.82)</b>	<b>4.77 (3.88, 5.86)</b>

Odds ratios weighted for non-response and adjusted for sex, age, Service and rank  
Statistically significant results shown in **bold**

To investigate whether the high prevalence of poor mental health in ex-serving ADF members could be explained by medical discharge, historical Medical Employment Classification (MEC) data were obtained from PMKeyS for all study respondents who were ex-serving or active/inactive reserves at the commencement of the study. The MEC status of each member as close as possible to the start of the MEAO Census Study was ascertained.

Among the ex-serving, 22.6% were classified as “not deployable at all”, compared with around 1% of active/inactive reserves (Table 9). Table 10 shows the association between MEC status and symptoms of PTSD among ex-serving and active/inactive reserve members. Forty percent of those classified as “not deployable at all” met screening criteria for PTSD.

Table 9 Reserve and ex-serving members by Medical Employment Classification (MEC) at study commencement (although the most recent available MEC may have been recorded up to 10 years previously)

Medical Employment Classification (MEC)	Active Reserve (N=1470) % <sup>a</sup>	Inactive Reserve (N=1030) % <sup>a</sup>	Ex-serving (N=672) % <sup>a</sup>	Total (N=3172) % <sup>a</sup>
Fit for deployment (MEC 1 or 2) (N=2595)	80.1	94.2	66.5	81.8
Temporarily not deployable (MEC 3) (N=140)	2.5	3.9	9.4	4.4
Not deployable at all (MEC 4) (N=174)	1.2	0.7	22.6	5.5
Other (N=263)	16.3	1.3	1.5	8.3

<sup>a</sup> Unweighted totals and column percentages

Table 10 PTSD symptoms of active and inactive reserve and ex-serving members by MEC at study commencement (although the most recent available MEC may have been recorded up to 10 years previously)

Medical Employment Classification (MEC)	PTSD Symptoms	
	PCL-C <50 (N=2713) % <sup>a</sup>	PCL-C ≥50 (N=264) % <sup>a</sup>
Fit for deployment (MEC 1 or 2) (N=2595)	93.1	6.9
Temporarily not deployable (MEC 3) (N=140)	83.2	16.8
Not deployable at all (MEC 4) (N=174)	60.0	40.0
Other (N=263)	95.7	4.2

<sup>a</sup> Unweighted totals and row percentages

Total N differs from previous table due to missing data for PCL-C

### Most recent deployment

About one third of members who deployed to the MEAO did not serve in Iraq or Afghanistan but provided support from other locations. Members who were mainly based in “Other supporting areas NOT in [Iraq/Afghanistan]” on their most recent deployment generally reported better health than those who were based *inside* the country, as illustrated in Table 11 for symptoms of PTSD. Also, deployment to Afghanistan was associated with better health than deployment to Iraq. The prevalence of PTSD symptoms for those who served outside Iraq or Afghanistan was similar to that found in the MHPWS (3.0%).

Table 11 Prevalence of symptoms of PTSD by base location during the most recent deployment to Iraq and Afghanistan

	Iraq		Afghanistan	
	Inside <sup>a</sup> (N=6021)	Outside <sup>b</sup> (N=3062)	Inside <sup>c</sup> (N=4167)	Outside <sup>d</sup> (N=2548)
<b>PTSD symptoms (PCL-C≥50)</b>	<b>6.0</b>	<b>2.5</b>	<b>4.4</b>	<b>3.2</b>

<sup>a</sup> “Baghdad”, “Talil”, “Balad”, “Persian Gulf (ships)”, “Attachment to Foreign militaries or UN”, “Other Areas in Iraq”.

<sup>b</sup> “Other supporting areas NOT in Iraq (e.g. .2, .4)”.

<sup>c</sup> “Tarin Kowt”, “Kandahar”, “Other areas in Afghanistan”, “Attachment to Foreign militaries or UN”.

<sup>d</sup> “Other supporting areas NOT in Afghanistan”.

Prevalences weighted for non-response

Statistically significant results shown in **bold**

Prevalence of symptoms of PTSD was high two to three years after the most recent deployment, especially for ex-serving members (Table 12). Beyond that time, prevalence did not increase further. This pattern was apparent when each Service was considered separately and also for all other measures of mental and general health. However, most of the regulars had deployed within the last 3 years whereas most reserves (especially inactive reserves) and ex-serving members had deployed more than 5 years ago. More detailed analysis of these data would be necessary to ensure they are interpreted correctly.

Table 12 Prevalence of symptoms of PTSD by time since most recent deployment for respondents who were regular, active reserves, inactive reserves and ex-serving members at the start of the study

	PTSD symptoms (PCL-C $\geq$ 50) - years after deployment							
	0-1 year		2-3 years		4-5 years		6-10 years	
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	N <sup>a</sup> in group	PTSD % <sup>b</sup>	N <sup>a</sup> in group	PTSD % <sup>b</sup>	N <sup>a</sup> in group	PTSD % <sup>b</sup>
Regulars	2879	<b>1.7</b>	3413	<b>3.2</b>	1900	<b>3.0</b>	1776	<b>3.0</b>
Active reserves	57	<b>1.5</b>	264	<b>6.2</b>	377	<b>5.8</b>	679	<b>7.7</b>
Inactive Reserves	3	0.0	76	10.0	247	5.3	614	6.7
Ex-serving	1	<b>0.0</b>	24	<b>29.4</b>	129	<b>25.4</b>	457	<b>13.8</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Weighted for non-response; includes locations inside and outside Iraq and Afghanistan

Data missing for PCL-C or time since most recent deployment for N=1136

Statistically significant results shown in **bold**

## Comparison with Australian population data

The prevalence of psychological distress (K10  $\geq$  30) found in the Australian Bureau of Statistics (ABS) National Health Survey 2007-08 [1] was 4.1% for women and 2.8% for men (Table 13). This is comparable to the prevalence for regular full-time ADF members in the study. The prevalence of suicide attempts in the 12 months prior to the survey among MEAO veterans was very similar to that in the Australian community [2]. However, a greater proportion of MEAO study members had thought about, or planned, suicide.

Cigarette smoking rates reported by participants in the MEAO Census Study were considerably higher than the rate found by the ABS [4], for both men and women in the age group 18-24 years.

The proportion of Australian women who rated their health as “fair” or “poor” was the same as the population estimate for women in the MEAO Census Study (13.5%). For men, the proportions were 15.5% (ABS) and 14.7% (MEAO Census Study) [3]. As the MEAO Census population included a higher proportion of younger persons, a lower prevalence of fair/poor health would be expected in this group than for Australian men and women generally.

Table 13 Comparisons of psychological distress by sex and age group in the MEAO Census Study and the Australian Bureau of Statistics (ABS) National Health Survey 2007-08<sup>a</sup>

	Age group	All		Women		Men	
		ABS <sup>a</sup> %	Census <sup>b</sup> %	ABS <sup>a</sup> %	Census <sup>b</sup> %	ABS <sup>a</sup> %	Census <sup>b</sup> %
Psychological distress (K10 $\geq$ 30)	18-24	2.7	3.4	4.3	3.1	1.2	3.5
	25-34	3.4	3.8	4.2	4.9	2.7	3.6
	35-44	3.4	4.3	4.0	6.8	2.7	4.1
	45+ <sup>c</sup>	4.3	4.9	4.9	8.8	3.7	4.6
	All participants	3.5	4.2	4.1	5.8	2.8	4.0
Suicidality	Suicidal thoughts	2.3	5.5	2.7	6.4	1.8	5.4
	Suicide plans	0.6	1.4	0.7	1.4	0.4	1.5
	Suicide attempts	0.4	0.4	0.5	0.5	0.3	0.4
Smoking Prevalence	18-24	23.1	33.7	21.9	28.8	24.2	34.4
	25-34	27.6	30.9	22.3	23.2	32.8	32.2
	35-44	25.1	27.0	22.2	18.9	28.2	27.9
	45+ <sup>c</sup>	20.2	23.2	19.8	17.4	20.6	23.5
	All participants	20.8	28.2	18.7	21.6	22.9	29.0
General health (SF1)	All participants	14.5	14.5	13.5	13.5	15.5	14.7

<sup>a</sup> ABS National Health Survey (NHS) 2007-08

<sup>b</sup> Weighted for sex, Service, rank and employment category (regular, reserve, ex-serving)

<sup>c</sup> The 45-64 years age group from the NHS has been used for comparison.

## 4. Traumatic and combat exposures and health

Data in this section refer only to members who served in Iraq or in Afghanistan.

There were 26 questions about specific traumatic or combat exposures that participants experienced on their most recent deployment. These were drawn or adapted from the Deployment Risk and Resilience Inventory [20], the King's College Gulf War Survey (Phase II) [30] and the Traumatic Stressors Exposure Scale (TSES-R) used in the ADF [29].

These 26 items were grouped into nine broader categories of exposures (Table 14) that were considered to be similar in nature based on work by Wilk and colleagues [33].

Table 14 Categories of traumatic and combat exposure

Category	Items in the survey
Potential for exposure	Seriously fear you would encounter an IED
	Go on combat patrols or missions
	Participate in support convoys (e.g. re-supply, VIP escort)
	Concerned about yourself or others (including allies) having an unauthorised discharge of a weapon
	Clear / search buildings
	Clear / search caves*
Coming under fire	Come under small arms or anti-aircraft fire
	Come under guided or directed mortar / artillery fire
	Experience in-direct fire (e.g. rocket attack)
	Experience an IED/EOD that detonated
	Experience a suicide bombing
	Experience a landmine strike
In danger of being injured or killed	Encounter small arms fire from an unknown enemy combatant
	In danger of being killed
Casualties among people close to you	In danger of being injured
	Heard of a close friend or co-worker who had been injured or killed
	Were present when a close friend was injured or killed
	Heard of a loved one who was injured or killed
Handling/seeing dead bodies	Were present when a loved one was injured or killed
	Handled dead bodies
Threatening situation, unable to respond	Saw dead bodies
	Experience a threatening situation where you were unable to respond due to the rules of engagement
Witness to human degradation and misery	Witness to human degradation and misery on a large scale
Discharging own weapon	Discharge your own weapon in direct combat
Own action/inaction result in injury or death	Believe your action or inaction resulted in someone being seriously injured
	Believe your action or inaction resulted in someone being killed

\* Afghanistan only; this item was not included in the combat and traumatic exposures scale score

Prevalence of all of these exposures was much more common for respondents who served in Iraq or Afghanistan than for those who served in supporting roles outside, as expected (Table 15). Those who served in supporting roles outside Iraq generally reported more exposure than those who served in supporting roles outside Afghanistan. In contrast, those who served in the main areas in Afghanistan were generally more likely to report exposures than those who served in Iraq.

Table 15 Prevalence (%) of traumatic and combat exposures for respondents who served in or outside Iraq or Afghanistan

Category	Iraq		Afghanistan	
	Outside (N=2964)	Inside (N=5840)	Outside (N=2351)	Inside (N=4099)
Coming under fire	17.3	59.9	12.5	85.4
Discharging own weapon	0.6	4.3	0.2	17.2
Unable to respond in a threatening situation	1.5	16.2	4.7	15.3
Vulnerable situations or fear of events	37.4	69.1	30.6	73.7
In danger of being killed/injured	19.1	40.0	15.5	49.9
Seeing/handling dead bodies	10.4	27.4	7.3	41.0
Casualties among those close to you	13.2	31.3	10.2	52.6
Human degradation	1.7	10.8	2.4	13.1
Actions/inactions resulting injury or death	2.1	4.4	1.0	7.7

Unweighted totals

Estimated prevalence, weighted for non-response

Amounts of missing data for combat/trauma items varied for each question

Table 16 shows the prevalence of symptoms of PTSD among those exposed to each type of traumatic exposure for those who served in Iraq or Afghanistan and the odds ratios for those who were exposed compared to those not reporting the exposure. The prevalence of symptoms of PTSD was higher among those who deployed to Iraq than those who deployed to Afghanistan, possibly reflecting the greater time since deployment and differences in ADF employment status. Many of these exposures were statistically significantly associated with subsequent reporting of poorer mental health. In particular, “experience a threatening situation where you were unable to respond due to the rules of engagement”, “seeing or handling dead bodies” and “witnessing human degradation” were consistently associated with increased risk of symptoms of PTSD and psychological distress, and odds ratios were similar for Iraq and Afghanistan.

Table 16 Prevalence (%) of symptoms of PTSD among those who reported each category of traumatic and combat exposure and odds ratios (with 95% confidence intervals) for symptoms of PTSD among those exposed compared to those not exposed for members who served in Iraq or in Afghanistan

Category	In Iraq (N=5475)		In Afghanistan (N=3893)	
	%	OR (95%CI)	%	OR (95%CI)
Coming under fire	7.7	1.50 (0.99, 2.27)	4.7	0.82 (0.47, 1.45)
Discharging own weapon	18.4	1.50 (0.97, 2.31)	8.7	0.91 (0.60, 1.38)
Unable to respond in a threatening situation	15.7	<b>2.40 (1.84, 3.15)</b>	11.6	<b>2.11 (1.44, 3.10)</b>
Vulnerable situations or fear of events	7.4	<b>1.72 (1.17, 2.53)</b>	5.5	1.59 (0.83, 3.04)
In danger of being killed/injured	9.8	<b>1.50 (1.15, 1.97)</b>	6.6	1.11 (0.70, 1.75)
Seeing/handling dead bodies	11.0	<b>1.37 (1.03, 1.82)</b>	8.0	<b>2.66 (1.74, 4.07)</b>
Casualties among those close to you	10.8	<b>1.67 (1.27, 2.19)</b>	6.1	1.26 (0.85, 1.86)
Human degradation	15.2	<b>1.68 (1.26, 2.25)</b>	12.3	<b>2.52 (1.77, 3.57)</b>
Actions/inactions resulting injury or death	14.5	1.20 (0.77, 1.86)	10.5	1.54 (1.00, 2.39)

Weighted for non-response and adjusted for Service, rank, age and gender

Statistically significant results shown in **bold**

A composite measure of the traumatic and combat exposures was used to assess the strength of association between multiple exposures and subsequent health. A total score based on the 26 traumatic and combat items was calculated using the following scores for frequency of exposure to each item: ‘Never’=0, ‘Once’=1, ‘2-4 times’=2, ‘5-9 times’=3, and ‘10+’=4 (based on the scoring used for TSES-R). This total score was split up by quartiles to categorise people by the frequency of exposure: 0 (none), 1-5 (low), 6-15 (medium), and 16 or more (high).

To investigate which participants were at greatest risk of traumatic and combat exposures, roles on deployment were categorised using information about duties, location and service. Participants were asked about their main duties on their most recent MEAO deployment and these were categorised into 15 deployment role groups. Tables 17 and 18 show the levels of traumatic and combat exposure for each of the deployment role groups for Iraq and Afghanistan respectively. The groups experiencing the highest levels of exposure were those whose main duty was combat (almost exclusively Army), and explosive ordnance disposal (EOD).

Table 17 Role in Iraq and frequency of traumatic and combat exposures (N=5511)

Role (In Iraq)	N	Traumatic and combat exposures			
		0 %	1-5 %	6-15 %	16+ %
EOD (Bomb disposal, IED technician)	58	1.8	6.8	12.7	78.7
Combat (e.g. infantry, artillery etc)	1041	1.3	3.8	13.4	81.5
Other combat - Navy	946	34.7	35.7	22.0	7.6
Other combat – Army	357	1.2	8.2	31.7	58.9
Other combat – RAAF	61	2.0	18.1	32.2	47.6
Combat support – Navy	410	51.0	34.7	10.4	3.8
Combat support – Army	471	4.6	27.4	34.4	33.6
Combat support – RAAF	185	7.3	30.7	43.1	18.9
Aircrew (all services combined)	215	15.4	22.4	32.6	29.6
Health (all services combined)	247	60.2	28.7	10.6	0.6
Logistics (Navy)	168	55.6	25.7	12.9	5.8
Logistics (Army)	445	4.9	20.1	35.2	39.8
Logistics (RAAF)	129	18.7	34.4	32.1	14.8
Maritime operations (all services combined)	100	33.8	29.2	23.5	13.4
Administration + Other (all services combined)	678	15.5	26.4	29.7	28.3

Unweighted totals

Percentages weighted for non-response

Table 18 Role in Afghanistan and frequency of traumatic and combat exposures (N=3875)

Role (In Afghanistan)	N	Traumatic and combat exposures			
		0 %	1-5 %	6-15 %	16+ %
EOD (Bomb disposal, IED technician)	96	0	3.7	12.5	83.8
Combat (e.g. infantry, artillery etc)	1076	0.2	1.3	7.0	91.4
Other combat - Navy	27	25.7	35.8	20.3	18.2
Other combat – Army	153	1.4	17.1	33.4	48.1
Other combat – RAAF	41	4.4	20.7	52.8	22.2
Combat support – Navy	30	30.8	11.7	25.5	32.0
Combat support – Army	627	5.1	30.1	35.4	29.4
Combat support – RAAF	235	11.3	40.5	36.0	12.2
Aircrew (all services combined)	172	3.9	19.1	45.0	32.0
Health (all services combined)	9	9.5	34.2	31.1	25.3
Logistics (Navy)	10	66.3	19.5	7.8	6.4
Logistics (Army)	595	6.7	33.0	40.0	20.2
Logistics (RAAF)	109	15.3	42.6	33.8	8.3
Maritime operations (all services combined)	144	9.5	34.2	31.1	25.3
Administration + Other (all services combined)	551	13.3	30.0	36.7	20.0

Unweighted totals

Percentages weighted for non-response

The risk of symptoms of PTSD increased with increasing numbers of traumatic and combat exposures experienced during the most recent deployment (Table 19). The results were generally similar for the other major mental health measures (including alcohol misuse), and for increasing numbers of different types of exposures but with higher odds ratios for deployments to Iraq than Afghanistan. These results provide clear evidence that the more traumatic and combat exposures experienced, the greater the probability of reporting mental health problems.



Table 19 Associations between symptoms of PTSD and number of traumatic and combat exposures experienced during the most recent deployment for members who served in Iraq or in Afghanistan

Traumatic/combat exposures	PTSD symptoms (PCL-C≥50)					
	Iraq (N=5543)			Afghanistan (N=3950)		
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
0	1061	1.7	1 (Reference)	250	1.3	1 (Reference)
1-5	1280	3.4	<b>2.52 (1.50, 4.24)</b>	896	1.0	0.89 (0.26, 3.10)
6-15	1323	3.4	<b>3.40 (1.94, 5.96)</b>	1114	3.3	<b>3.10 (1.01, 9.49)</b>
16+	1879	11.2	<b>16.3 (9.79, 27.1)</b>	1690	7.2	<b>7.62 (2.57, 22.6)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Prevalences weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, rank, Service, and sex  
Statistically significant results shown in **bold**

## Health during deployment

The main health problems experienced on deployment are shown in the sick parade data in Tables 20 and 21 (the list of possible reasons did not include any mental health items). The most commonly reported reasons for sick parade attendance were respiratory illness, diarrhoea and/or vomiting and musculoskeletal injuries not related to combat (including injuries sustained performing job/role other than in combat, during training, or recreation). Non-combat injuries caused the most days out of role.

Table 20 Reasons for sick parade attendance and days out of role during deployment to Iraq and supporting areas outside Iraq

Reason	In Iraq (N = 5485) <sup>a</sup>			Supporting Iraq (N = 2823) <sup>a</sup>		
	n <sup>a</sup> (%) <sup>b</sup>	Days out of role		n <sup>a</sup> (%) <sup>b</sup>	Days out of role	
		Mean <sup>c</sup>	Median (IQR) <sup>c</sup>		Mean <sup>c</sup>	Median (IQR) <sup>c</sup>
<b>Injury</b>						
Motor vehicle accident	64 (1.2)	4.2	0.6 (0, 2.1)	18 (0.7)	4.3	0.3 (0, 0.7)
Combat	66 (1.4)	4.4	1.2 (0, 4.5)	7 (0.3)	3.4	0 (0, 3.2)
<b>Musculoskeletal injury</b>						
Job/role (not combat)	910 (16.7)	3.8	0.6 (0, 1.9)	325 (11.8)	7.1	0.5 (0, 1.1)
During training	222 (4.4)	6.2	0.4 (0, 1.3)	77 (2.8)	1.3	0.5 (0, 1.0)
Recreation or sport	391 (7.0)	6.3	0.6 (0.03, 1.6)	281 (9.9)	6.8	0.5 (0.02, 1.0)
<b>Head injury/ concussion</b>	103 (2.1)	3.4	0.5 (0.004, 1.1)	22 (0.8)	1.2	0.7 (0.3, 1.1)
<b>Heat stress</b>	299 (5.8)	1.7	0.6 (0.1, 1.2)	106 (3.9)	1.1	0.4 (0.001, 0.9)
<b>Cold Exposure</b>	110 (2.0)	1.2	0.5 (0.06, 1.0)	31 (1.1)	1.2	0.6 (0.1, 1.1)
<b>Respiratory illness</b>	1109 (19.6)	1.8	0.7 (0.1, 1.6)	559 (19.6)	1.8	0.8 (0.2, 1.6)
<b>Dental problems</b>	237 (4.4)	1.4	0.4 (0.005, 0.9)	77 (2.8)	1.0	0.4 (0, 0.8)
<b>Skin rashes/irritations</b>	558 (10.2)	1.6	0.3 (0, 0.8)	266 (9.4)	0.8	0.3 (0, 0.7)
<b>Diarrhoea and/or vomiting</b>	822 (15.4)	2.2	0.9 (0.3, 2.1)	297 (10.4)	2.6	0.8 (0.3, 1.7)
<b>Other</b>	571 (11.2)	6.0	0.7 (0.01, 2.2)	355 (13.4)	1.9	0.6 (0.1, 1.1)

<sup>a</sup> Unweighted totals

<sup>b</sup> Prevalences weighted for non-response

<sup>c</sup> Estimates are weighted for non-response

Statistically significant results shown in **bold**

Table 21 Reasons for sick parade attendance and days out of role during deployment to Afghanistan and supporting areas outside Afghanistan

Reason	In Afghanistan (N = 3886) <sup>a</sup>			Supporting Afghanistan (N = 2252) <sup>a</sup>		
	n <sup>a</sup> (%) <sup>b</sup>	Mean <sup>c</sup>	Median (IQR) <sup>c</sup>	n <sup>a</sup> (%) <sup>b</sup>	Mean <sup>c</sup>	Median (IQR) <sup>c</sup>
<b>Injury</b>						
Motor vehicle accident	46 (1.2)	4.7	0.5 (0, 1.9)	8 (0.4)	1.4	1.1 (0, 1.8)
Combat	106 (3.1)	17.3	2.0 (0.4, 6.9)	1 (0.04)	N/A	N/A
<b>Musculoskeletal injury</b>						
Job/role (not combat)	633 (16.8)	5.8	0.7 (0.1, 2.7)	229 (10.5)	4.1	0.7 (0.2, 1.6)
During training	146 (3.9)	2.7	0.7 (0.1, 1.9)	55 (2.4)	1.3	0.4 (0, 0.9)
Recreation or sport	218 (5.4)	13.2	0.6 (0.03, 1.4)	173 (7.4)	3.6	0.4 (0, 0.9)
<b>Head injury / concussion</b>	62 (1.8)	2.8	0.8 (0.1, 4.2)	18 (0.8)	0.8	0 (0, 0.7)
<b>Heat stress</b>	122 (3.5)	1.5	0.7 (0.2, 1.6)	74 (3.5)	1.1	0.5 (0.1, 0.9)
<b>Cold exposure</b>	80 (2.2)	1.0	0.4 (0, 0.9)	27 (1.3)	0.9	0.4 (0, 1.0)
<b>Respiratory illness</b>	754 (19.2)	5.5	0.8 (0.2, 1.8)	360 (15.6)	1.6	0.7 (0.2, 1.4)
<b>Dental problems</b>	112 (3.0)	1.3	0.4 (0.1, 0.8)	59 (2.6)	1.3	0.3 (0, 0.8)
<b>Skin rashes/irritations</b>	363 (9.4)	8.6	0.4 (0, 0.9)	160 (7.0)	0.8	0.2 (0, 0.7)
<b>Diarrhoea and/or vomiting</b>	943 (25.2)	4.9	1.4 (0.5, 2.8)	222 (9.4)	1.9	0.8 (0.2, 1.7)
<b>Other</b>	393 (11.0)	5.8	0.7 (0.1, 2.0)	198 (9.1)	4.5	0.7 (0.1, 1.8)

<sup>a</sup> Unweighted totals

<sup>b</sup> Prevalences weighted for non-response

<sup>c</sup> Estimates are weighted for non-response

NB: N/A = not applicable because only 1 person reported a combat injury from supporting areas outside Afghanistan

Statistically significant results shown in **bold**

## Injuries on deployment and subsequent health

Fewer than 2% of respondents reported either combat injuries or head injuries/concussion on deployment, but those who did were significantly more likely to report symptoms of PTSD when they completed the survey (Table 22).

Table 22 Associations between combat injuries on deployment and mental health reported in the survey

	Symptoms of PTSD (PCL-C ≥ 50)		
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Combat injuries on deployment</b>			
No	11460	4.0	1(Reference)
Yes	179	20.7	<b>4.93 (3.53, 6.90)</b>
<b>Head injury/concussion</b>			
No	11415	4.1	1(Reference)
Yes	200	13.0	<b>3.10 (2.10, 4.55)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, rank, Service, and sex

Statistically significant results shown in **bold**

The deployment questionnaire was not designed to measure whether the self-reported mild traumatic brain injury (mTBI) was sustained whilst on deployment, or if participants had previously experienced multiple mTBIs. More than 10% reported mTBI at any time in their lives. Therefore, it was not feasible to investigate possible effects of repeated exposures to this type of injury. It is difficult to conduct a thorough investigation of the effects of head injury and concussion on deployment against a background of relatively high pre-deployment prevalence of such injuries and the possibility of negative reporting bias. This is an area which requires more targeted research.

## 5. Deployment patterns and associations with health

Deployment patterns were summarised in three ways:

- Total time on deployment to the MEAO in the period 2001-9 (categorised as 6 months or less, 7-12 months, and more than 12 months);
- Number of deployments to the MEAO (categorised as once, twice and three or more times);
- Duration of most recent deployment to the MEAO (categorised as 4 months or less, 5-7 months and 8 months or more).

Symptoms of PTSD increased with total time on deployment in 2001-9 (Table 23). However, the effect size was small and the effect was only statistically significant for the group who deployed to the MEAO for 7-12 months in total. Symptoms of PTSD also increased significantly with duration of most recent deployment to the MEAO. No statistically significant associations were found with number of deployments to the MEAO or between deployment patterns and most of the other mental health measures.

Table 23 Associations between total time deployed to the MEAO in 2001-09, number of deployments to the MEAO in 2001-09 and duration of most recent deployment to the MEAO and PTSD symptoms.

	PTSD symptoms		
	Number in group <sup>a</sup>	% <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Total months deployed to the MEAO</b>			
≤ 6	5998	4.0	1 (Reference)
7 - 12	4350	5.2	<b>1.29 (1.09,1.40)</b>
≥ 13	2042	4.2	1.12 (0.90,1.40)
<b>Number of deployments to the MEAO</b>			
1	5933	4.6	1 (Reference)
2	3426	4.7	1.10 (0.92,1.31)
≥ 3	2776	3.9	1.02 (0.82,1.25)
<b>Duration of most recent deployment (months)</b>			
≤ 4	5262	3.9	1 (Reference)
5 - 7	6110	4.7	<b>1.24 (1.05,1.45)</b>
≥ 8	915	5.1	<b>1.41 (1.08,1.87)</b>

a Unweighted totals

b Estimated prevalence, weighted for non-response

c Adjusted for age, sex, Service and rank, estimated odds ratios, weighted for non-response

Statistically significant results shown in **bold**

### Deployment and impact of military commitments on families

Respondents were asked about the impact of their military commitment on their marriage and children. More than half reported negative impacts, with the associations increasing with the total time deployed, the number of times deployed, and the duration of the most recent deployment (Table 24).

Table 24 Associations between patterns of deployment and negative impact of members' military commitment on their marriage and children

	Marriage			Children		
	N in group	Negative impact %	OR (95%CI)	N in group	Negative impact %	OR (95% CI)
<b>Total months deployed to the MEAO</b>						
≤ 6	5836	57.4	1 (Reference)	3812	54.7	1 (Reference)
7 - 12	4289	63.8	<b>1.28 (1.20, 1.37)</b>	2792	62.4	<b>1.37 (1.25, 1.50)</b>
≥ 13	2037	67.0	<b>1.45 (1.43, 1.58)</b>	1302	65.7	<b>1.51 ( 1.35, 1.69)</b>
<b>Number of deployments to the MEAO</b>						
1	5750	59.1	1 (Reference)	3682	56.1	1 (Reference)
2	3401	62.2	<b>1.17 (1.09,1.26)</b>	2240	60.8	<b>1.23 (1.12, 1.25)</b>
≥ 3	2760	64.9	<b>1.34 (1.25,1.45)</b>	1813	63.7	<b>1.36 (1.23, 1.51)</b>
<b>Duration of most recent deployment (months)</b>						
≤ 4	5181	58.7	1 (Reference)	3451	56.5	1 (Reference)
5 - 7	5992	61.9	1.01 (0.95, 1.07)	3837	60.2	<b>1.09 (1.00, 1.19)</b>
≥ 8	878	67.8	<b>1.30 (1.15, 1.48)</b>	557	65.6	<b>1.42 (1.20, 1.69)</b>

Unweighted totals

Percentages weighted for non-response

Odds ratios, weighted for non-response and adjusted for age, rank, Service, and sex

Numbers of respondents vary because of family structure

Statistically significant results shown in **bold**

## Smoking on deployment

Participants were asked about cigarette smoking while on deployment. Just under half of the respondents reported smoking at least 100 cigarettes in their lifetime and in this group more than one in three smoked more than usual on deployment, while about a quarter did not smoke and one in six reported taking up or restarting smoking (see Table 25).

Table 25 Smoking patterns on MEAO deployments (N=5818, smokers only)

Smoking pattern on deployment	%
Smoked more than usual	37.4
Did not smoke on deployment	24.3
Began/restarted smoking on deployment	17.2
Smoked the same amount on deployment as when not deployed	16.6
Smoked less than usual	4.5

Prevalences weighted for non-response

The increases in smoking during deployment together with the high smoking rates reported above suggest that ADF members who deployed to the MEAO are at increased risk of smoking related conditions now and in the future.

## 6. Environmental exposures and health

Participants were asked about their exposures to various environmental hazards including respiratory irritants, local food and water supplies, loud noises without hearing protection, and sources of non-ionising radiation. The extent of these perceived exposures is shown in Table 26. They were also asked about exposure to ionising radiation or radioactive materials, depleted uranium shell casings, biological or chemical weapons and the use of nuclear, biological and chemical (NBC) protective suits (except for training) but fewer than 5% reported experiencing these exposures.

Table 26 Frequencies for self-reported exposure to environmental and other hazards among ADF personnel deployed in Iraq and Afghanistan and supporting areas

Exposure	Iraq		Afghanistan	
	Out (N=3012) %	In (N=5915) %	Out (N=2530) %	In (N=4160) %
Smoke from fires/waste incineration/oil fire	29.1	58.9	23.7	79.1
Dust storms	90.6	87.3	72.2	90.1
Inhalation of fine dust or fibres	72.1	68.7	49.5	87.2
Others' cigarette smoke	43.1	58.2	38.9	62.9
Diesel exhaust	71.5	83.5	69.6	88.0
Aviation/marine/automotive fuels	65.1	69.0	63.2	68.5
Aircraft fumes	82.8	76.7	72.0	83.1
Toxic industrial chemicals	24.2	35.5	23.4	33.7
Solvents	33.2	52.3	38.7	45.0
Living area sprayed/fogged with chemicals	17.5	33.7	9.8	36.2
Close to sources of non-ionising radiation	37.9	64.2	37.2	66.7
Ate local food	74.2	60.6	61.9	55.0
Drank from local taps or wells	6.3	9.6	6.7	9.0
Close to loud noises without hearing protection	39.0	65.8	32.8	78.2
Noise for extended periods without hearing protection	45.4	59.0	40.3	66.9

Prevalences weighted for non-response

Numbers vary between categories due to incomplete data from some respondents

As exposures were higher among members who deployed in Iraq or in Afghanistan, rather than in supporting roles outside these countries, data in this section refer only to members who served in Iraq or in Afghanistan.

### Respiratory conditions

The questionnaire included the European Community Respiratory Health Survey (ECRHS) [7] which was used to identify asthma-like and other respiratory symptoms. It also included a list of 23 medically diagnosed conditions since deployment and a checklist of recent health symptoms. The physical conditions reported here refer to participants' health when they completed the survey rather than when they were deployed.

Exposures to smoke and dust, fumes and fuels, and chemicals in Iraq and Afghanistan were associated with subsequent asthma-like symptoms according to the ECRHS criteria (Table 27). Associations were found between these exposures and medically diagnosed asthma and bronchitis, sinus problems and hay fever, although the results were not statistically significant in all cases. These results were largely consistent with finding from the US Millennium Cohort Study [27]. The prevalence of asthma-like symptoms in each deployment location was similar across services. In Iraq, Army respondents more commonly reported having experienced asthma like symptoms, while in Afghanistan, it was more commonly reported by Navy respondents. Further more detailed analysis is required to fully understand

associations between environmental exposures on deployment and respiratory health of MEAO veterans.

Table 27 Associations between respiratory exposures or Service and subsequently reported asthma-like symptoms assessed using the European Community Respiratory Health Survey (ECHRS) for members who served *in Iraq* (N=5771) or *in Afghanistan* (N=4029).

Exposure	Asthma-like symptoms (ECHRS)					
	In Iraq			In Afghanistan		
	N in group <sup>a</sup>	Asthma % <sup>b</sup>	OR (95%CI) <sup>c</sup>	N in group <sup>a</sup>	Asthma % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Smoke and dust</b>						
Minimal	1611	7.7	1 (Reference)	496	6.8	1 (Reference)
Low	1163	10.8	<b>1.52 (1.19, 1.95)</b>	694	8.7	1.25 (0.83, 1.90)
Moderate	1143	11.3	<b>1.76 (1.35, 2.29)</b>	949	6.9	0.94 (0.62, 1.42)
High	1724	14.4	<b>2.43 (1.87, 3.15)</b>	1836	12.3	<b>1.61 (1.10, 2.34)</b>
<b>Fumes and fuels</b>						
Minimal	1028	6.6	1 (Reference)	565	6.7	1 (Reference)
Low	1389	10.3	<b>1.54 (1.16, 2.04)</b>	994	9.1	1.23 (0.84, 1.78)
Moderate	1824	10.7	<b>1.49 (1.13, 1.97)</b>	1319	8.0	1.03 (0.71, 1.49)
High	1436	15.6	<b>2.32 (1.77, 3.05)</b>	1097	13.7	<b>1.73 (1.20, 2.48)</b>
<b>Chemicals</b>						
None	1953	7.0	1 (Reference)	1660	6.4	1 (Reference)
Minimal	211	10.9	<b>1.59 (1.03, 2.46)</b>	161	11.0	1.68 (0.99, 2.85)
Moderate	1057	10.8	<b>1.46 (1.15, 1.87)</b>	645	10.8	<b>1.59 (1.16, 2.17)</b>
High	2379	14.1	<b>1.97 (1.60, 2.41)</b>	1460	12.2	<b>1.80 (1.40, 2.31)</b>
<b>Service</b>						
Navy	2238	10.8	1 (Reference)	139	11.3	1 (Reference)
Army	2842	11.6	0.78 (0.63, 0.97)	3157	10.0	1.03(0.52, 0.24)
RAAF	691	9.5	0.64 (0.47, 0.87)	733	8.0	0.94 (0.45, 1.94)

<sup>a</sup> Unweighted totals

<sup>b</sup> Prevalences, weighted for non-response

<sup>c</sup> Weighted for non-response and adjusted for age, rank, gender, Service (except for last part of the table), current smoker (yes, no) and exposure to others' cigarette smoking on deployment (yes, no)

Statistically significant results shown in **bold**

## Hearing problems

Self-reported hearing loss was strongly associated with perceived exposure to both loud and prolonged noise without hearing protection. Hearing loss was also strongly associated with perceived exposure to sources of non-ionising radiation (which would mainly have come from communication equipment, radar and counter improvised explosive device (IED) measures) (Table 28). Hearing loss was less commonly reported by RAAF members. Exposures to noise without hearing protection were also consistently and strongly associated with increased sensitivity to noise, ringing in the ears, loss of balance, and previous, current or planned compensation for hearing loss.

Associations with other chemical, biological, radiation and environmental hazards were difficult to assess due to low frequencies of exposure.

Table 28 Associations between various exposures or Service and subsequent medically diagnosed hearing loss for members who served *in* Iraq (N=5875) or *in* Afghanistan (N=4127)

Exposure	Medically diagnosed hearing loss					
	In Iraq			In Afghanistan		
	N in group <sup>a</sup>	Hearing loss % <sup>b</sup>	OR (95%CI) <sup>c</sup>	N in group <sup>a</sup>	Hearing loss % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Close to loud noises without hearing protection</b>						
Never	2035	8.4	1 (Reference)	955	6.5	1 (Reference)
Once	307	11.5	<b>1.47 (1.02, 2.11)</b>	205	10.1	1.42 (0.89, 2.27)
2-4 times	1210	15.3	<b>1.63 (1.31, 2.04)</b>	781	10.2	1.38 (0.97, 1.96)
5-9 times	552	18.7	<b>1.64 (1.25, 2.16)</b>	473	12.7	<b>1.68 (1.14, 2.48)</b>
10 + times	1685	23.9	<b>2.06 (1.65, 2.56)</b>	1654	17.0	<b>2.10 (1.52, 2.90)</b>
<b>Exposed to noise for extended periods of time without hearing protection</b>						
Never	2474	7.6	1 (Reference)	1411	6.5	1 (Reference)
Once	295	16.0	<b>1.77 (1.27, 2.47)</b>	220	13.4	<b>2.09 (1.39, 3.16)</b>
2-4 times	923	16.3	<b>1.82 (1.44, 2.29)</b>	742	11.8	<b>1.63 (1.19, 2.24)</b>
5-9 times	453	25.5	<b>2.90 (2.25, 3.74)</b>	298	16.0	<b>2.06 (1.39, 3.06)</b>
10 + times	1653	23.4	<b>2.72 (2.22, 3.33)</b>	1406	17.8	<b>2.26 (1.71, 3.00)</b>
<b>Non-ionising radiation</b>						
Never	2157	11.3	1 (Reference)	1423	9.5	1 (Reference)
1-9 times	998	17.9	<b>1.69 (1.39, 2.06)</b>	693	13.0	<b>1.42 (1.08, 1.86)</b>
10 + times	2630	18.0	<b>1.86 (1.58, 2.18)</b>	1961	14.5	<b>1.76 (1.43, 2.18)</b>
<b>Service</b>						
Navy	2269	15.1	1 (Reference)	144	13.0	1 (Reference)
Army	2905	16.8	<b>0.82 (0.71, 0.96)</b>	3235	13.0	0.77 (0.47, 1.26)
RAAF	701	13.1	<b>0.64 (0.49, 0.82)</b>	748	9.5	<b>0.51 (0.30, 0.88)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Weighted for non-response and adjusted for age, rank, gender, Service (except for last part of the table)

Statistically significant results shown in **bold**

## Bowel problems

Medically diagnosed bowel disorders since deployment were associated with drinking from local taps or wells, and eating local food in Iraq (Table 29).

Table 29 Associations between drinking from local taps and wells and eating local food and subsequent medically diagnosed bowel disorder for members who served *in* Iraq (N=5831) or *in* Afghanistan (N=4082).

Exposure	Medically diagnosed bowel disorder					
	In Iraq			In Afghanistan		
	N in group <sup>a</sup>	Bowel disorder % <sup>b</sup>	OR (95%CI) <sup>c</sup>	N in group <sup>a</sup>	Bowel disorder % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Drank from local taps or wells</b>						
Never	5275	11.1	1 (Reference)	3727	8.0	1 (Reference)
At least once	556	19.7	<b>1.98 (1.61, 2.45)</b>	355	11.6	<b>1.60 (1.14, 2.24)</b>
<b>Ate local food</b>						
Never	2321	10.4	1 (Reference)	1907	8.9	1 (Reference)
Once	325	14.0	<b>1.40 (1.01, 1.94)</b>	283	8.1	0.97 (0.63, 1.50)
2-4 times	1168	11.0	1.10 (0.89, 1.36)	766	6.3	0.74 (0.54, 1.01)
5-9 times	600	12.6	<b>1.30 (1.01, 1.70)</b>	398	8.8	1.09 (0.76, 1.56)
10 + times	1411	14.5	<b>1.54 (1.27, 1.86)</b>	728	8.9	1.10 (0.82, 1.47)

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Weighted for non-response and adjusted for age, rank, gender and Service (except for last part of the table)

Statistically significant results shown in **bold**

## 7. Military, family and community support and health

Perceptions of military, family and community support during and after deployment to the MEAO may be affected by participants' mood when they completed the survey. It is possible that results reported in this section are more susceptible to 'negative reporting bias' [31] because they are more subjective than aspects of deployment reported in other sections.

### Unit cohesion on deployment

In total, 42% of participants reported high unit cohesion on deployment, 47% reported moderate unit cohesion and 11% reported low unit cohesion. The proportions were similar for all three Services (Table 30). Please note that numbers presented in Table 30 are weighted for non-response.

Table 30 Perceived level of unit cohesion by Service (N = 11420)

Service	Level of Unit Cohesion			
	N in group <sup>a</sup>	Low % <sup>b</sup>	Moderate % <sup>b</sup>	High % <sup>b</sup>
Navy	2340	11.6	50.1	38.3
Army	5487	10.6	45.8	43.6
RAAF	3593	10.8	47.7	41.5
<b>Total</b>	<b>11420</b>	<b>10.8</b>	<b>47.3</b>	<b>41.9</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

Statistically significant results shown in **bold**

Lower levels of unit cohesion were strongly associated with higher prevalence of PTSD symptoms (Table 31). Similar results were obtained for the other mental health measures including major depressive symptoms, alcohol misuse and suicidality.

Table 31 Associations between perceived levels of unit cohesion on deployment and symptoms of PTSD (N=11392)

Level of unit cohesion	Symptoms of PTSD (PCL-C ≥ 50)		
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
High	4877	2.9	1 (Reference)
Moderate	5325	4.0	<b>1.44 (1.17, 1.77)</b>
Low	1190	11.7	<b>4.10 (3.24, 5.20)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, sex rank, Service, ADF employment category (currently serving, reservists or ex-serving), most recent deployment location to the MEAO, education level and relationship status.

Statistically significant results shown in **bold**

### Support from the military

While less than half of the participants reported sufficient military support in the form of reassurance and support for their partner or spouse during their deployment, 80% reported that they felt well supported by the military themselves after deployment. Those who reported support to their partner or spouse as inadequate were about three times more likely to report poorer mental health (Table 32). Please note that numbers presented in Table 32 may differ slightly from numbers presented in text and in chapter 7 of the main report due to missing data on the PCL-C.



Table 32 Associations between perceived military support and symptoms of PTSD

	Symptoms of PTSD (PCL-C ≥ 50)		
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Military support to partner/spouse during deployment (N=9062)</b>			
Yes, and sufficient	4442	2.3	1 (Reference)
Yes, but not sufficient	1714	7.0	<b>3.02 (2.30, 3.95)</b>
No	2906	6.8	<b>2.97 (2.33, 3.89)</b>
<b>Military support for themselves after deployment (N=11298)</b>			
Agree	9118	2.7	1 (Reference)
Disagree	2180	11.1	<b>3.89 (3.27, 4.64)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, sex rank, Service, ADF employment category (currently serving, reservists or ex-serving), most recent deployment location to the MEAO, education level and relationship status. Statistically significant results shown in **bold**

## Support from the family

Most participants (91%) reported receiving enough support from their family during deployment. They were less likely to report mental health problems later (Table 33). Those who reported feeling let down by someone who they thought would stand by them after returning home from deployment (14%), or who reported a lack of satisfaction with their relationship or marriage post-deployment (10%), were more likely to report mental health problems. Please note that numbers presented in Table 33 may differ slightly from numbers presented in text and in chapter 7 of the main report due to missing data on the PCL-C.

Table 33 Associations between perceived support from family and symptoms of PTSD.

	Symptoms of PTSD (PCL-C ≥ 50)		
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Received enough support from family during deployment (N=10134)</b>			
Agree	9283	3.7	1 (Reference)
Disagree	851	12.4	<b>3.18 (2.50, 4.06)</b>
<b>Feeling let down by someone close to you after returning home (N=11295)</b>			
Disagree	9901	2.3	1 (Reference)
Agree	1394	17.8	<b>7.53 (6.27, 9.05)</b>
<b>Satisfaction with relationship/marriage post-deployment (N=10921)</b>			
Extremely satisfied	6380	3.0	1 (Reference)
Satisfied	3442	4.7	<b>1.59 (1.29, 1.96)</b>
Neither satisfied or dissatisfied	681	10.5	<b>3.61 (2.73, 4.77)</b>
Dissatisfied	418	12.0	<b>3.87 (2.72, 5.51)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, sex rank, Service, ADF employment category (currently serving, reservists or ex-serving), most recent deployment location to the MEAO, education level and relationship status. Statistically significant results shown in **bold**

## Support from the community

In total, 81% of participants felt that the Australian public were supportive of the mission to the MEAO during their most recent deployment. Half reported that people understood what they had been through when they returned, and only 18% reported they had been 'given a hard time' because of their deployment. However, those who perceived the lack of community support were more likely to report symptoms of PTSD (Table 34) and other mental health problems including psychological distress and major depressive symptoms. Please note that numbers presented in Table 34 may differ slightly from numbers presented in text and in chapter 7 of the main report due to missing data on the PCL-C.

Table 34 Associations between perceived community support and symptoms of PTSD.

Symptoms of PTSD (PCL-C ≥ 50)			
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Community support during deployment (N=11263)</b>			
Yes	9245	3.4	1 (Reference)
No	2018	8.7	<b>2.47 (2.05, 2.98)</b>
<b>People did not understand deployment experience (N=11292)</b>			
Disagree	5931	1.2	1 (Reference)
Agree	5361	7.7	<b>5.60 (4.46, 7.03)</b>
<b>Given a hard time because of deployment (N=11300)</b>			
No	9432	2.8	1 (Reference)
Yes	1868	11.8	<b>4.17 (3.49, 4.99)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Estimated prevalence, weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, sex rank, Service, ADF employment category (currently serving, reservists or ex-serving), most recent deployment location to the MEAO, education level and relationship status. Statistically significant results shown in **bold**

Members who served as reserves were asked about the impact of deployment on their work as civilians. About 20% said the questions were not applicable to their situation. More than three quarters of the remainder reported no loss of seniority, loss of income or resentment from co-workers (Table 35). Generally, those who deployed to Afghanistan were more likely to report problems than those who deployed to Iraq.

Table 35 Workplace issues for reserves on CFTS by deployment location

Workplace issue	Iraq (N = 327) n <sup>a</sup> (% <sup>b</sup> )	Afghanistan (N = 271) n <sup>a</sup> (% <sup>b</sup> )
<b>Loss of seniority, promotion opportunity or responsibility in civilian job</b>		
Yes	32 (10%)	41 (15%)
No	228 (70%)	167 (62%)
Not applicable	67 (20%)	63 (23%)
<b>Loss of income during call up</b>		
Yes	41 (13%)	49 (18%)
No	219 (67%)	165 (61%)
Not applicable	67 (20%)	57 (21%)
<b>Resentment from co-workers</b>		
Yes	43 (13%)	43 (16%)
No	221 (68%)	170 (63%)
Not applicable	63 (19%)	58 (21%)

<sup>a</sup> Unweighted totals

<sup>b</sup> Prevalences weighted for non-response

## Personal resilience

Personal characteristics of resilience were among the strongest protective factors against reporting adverse mental health following deployment. However, most respondents believed they could adapt to change (51% reporting they could do this 'nearly all the time' and 35% 'often') and 'bounce back after illness or hardship' (54% 'nearly all the time' and 35% 'often'). Table 36 shows very strong associations between low levels of such resilience and symptoms of PTSD. Similarly strong negative associations were found between lower resilience and the other mental health symptoms. Please note that numbers presented in Table 36 may differ slightly from numbers presented in text and in chapter 7 of the main report due to missing data on the PCL-C.

Table 36 Associations between reported personal resilience and symptoms of PTSD

	Symptoms of PTSD (PCL-C ≥ 50)		
	N <sup>a</sup> in group	PTSD % <sup>b</sup>	OR (95%CI) <sup>c</sup>
<b>Ability to adapt to change (N=13137)</b>			
True nearly all the time	6873	1.1	1 (Reference)
Often true	4546	3.9	<b>3.60 (2.78, 4.66)</b>
Sometimes true	1156	16.9	<b>16.11 (12.34, 21.03)</b>
Rarely/not at all true	562	24.3	<b>29.03 (21.88, 38.53)</b>
<b>Ability to bounce back after illness or hardship (N=13096)</b>			
True nearly all the time	7216	1.1	1 (Reference)
Often true	4513	3.9	<b>3.68 (2.86 4.73)</b>
Sometimes true	1081	19.1	<b>18.76 (14.50, 24.28)</b>
Rarely/not at all true	286	41.0	<b>55.53 (40.98, 75.24)</b>

<sup>a</sup> Unweighted totals

<sup>b</sup> Percentages weighted for non-response

<sup>c</sup> Estimated odds ratios, weighted for non-response and adjusted for age, sex rank, Service, ADF employment category (currently serving, reservists or ex-serving), most recent deployment location to the MEAO, education level and relationship status.

Statistically significant results shown in **bold**

## 8. Gender and health

The roles that women and men undertook during deployment and the locations where they deployed were substantially different. Therefore, it was not possible to compare exposures to trauma and combat, or many of the physical environmental factors, even in groups matched for deployment, Service and role. Hence, the focus of this section is on the deployment experience more generally.

### Health after deployment

In general, women tended to report poorer mental health than men, and men were more likely to report medically diagnosed hearing loss and high blood pressure (Table 37).

Table 37 Comparison between women (N=1660) and men (N=11830) on the main health measures: prevalence of conditions and odds ratios for women compared to men.

	Women % <sup>a</sup>	Men % <sup>a</sup>	OR (95% CI) <sup>b</sup>
<b>PTSD symptoms (PCL-C ≥ 50)</b>	4.4	4.6	<b>1.28(1.04,1.57)</b>
<b>Psychological Distress (K10 ≥ 30)</b>	5.8	4.0	<b>1.83(1.52,2.19)</b>
<b>Major depressive syndrome (PHQ)</b>	4.7	3.4	<b>1.71(1.38,2.11)</b>
<b>Alcohol misuse (AUDIT ≥ 20)</b>	1.8	1.4	0.82(0.59,1.13)
<b>Suicidality</b>			
Suicidal thoughts	6.4	5.4	<b>1.35(1.14,1.60)</b>
Suicide plans	1.4	1.1	1.15(0.83,1.59)
Suicide attempts	0.5	0.4	1.22(0.71,2.08)
<b>General Health Fair/Poor</b>	13.5	14.7	1.08(0.96,1.21)
<b>Medically diagnosed sinus problems since deployment</b>	15.2	9.7	<b>1.73(1.54,1.93)</b>
<b>Medically diagnosed migraines since deployment</b>	11.4	5.2	<b>2.44(2.14,2.79)</b>
<b>Medically diagnosed hearing loss since deployment</b>	6.9	14.2	<b>0.55(0.48,0.64)</b>
<b>Medically diagnosed high blood pressure since deployment</b>	5.2	12.8	<b>0.43(0.37,0.52)</b>

<sup>a</sup> Prevalences weighted for non-response

<sup>b</sup> Odds ratios for women compared to men, i.e. men were the reference group; adjusted for age, Service, rank; weighted for non-response. Statistically significant results shown in **bold**

### Support from the military

Women were less likely than men to report that they felt that the military supported their partner sufficiently during deployment or themselves well after deployment (Table 38).

Table 38 Perceived military support to spouse/partner during deployment

	Women % <sup>a</sup>	Men % <sup>a</sup>	OR (95% CI) <sup>b</sup>
<b>Military provided reassurance/support to spouse/partner during deployment</b>			
	<i>n</i> =920	<i>n</i> =8164	
Yes, sufficient	46.3	48.8	1 (Reference)
Yes, but not sufficient	12.3	20.1	<b>0.66(0.54,0.79)</b>
No	41.3	31.1	<b>1.40(1.23,1.58)</b>
<b>Well supported by military in weeks after coming home</b>			
	<i>n</i> =1327	<i>n</i> =9998	
Agree	77.1	80.2	1 (Reference)
Disagree	22.8	19.8	<b>1.24(1.11,1.38)</b>

<sup>a</sup> Estimated prevalence, weighted for non-response

<sup>b</sup> Weighted for non-response. Women compared to men, i.e. men were the reference group. Adjusted for age, Service, rank. Statistically significant results shown in **bold**

## Impact of military commitment on families

Women were more likely than men to report that their military commitments had no impact on their marriages and less likely to report negative impacts on their children (Table 39).

Table 39 Self-reported impact of military commitments on marriage/relationship and children.

	Women % <sup>a</sup>	Men % <sup>a</sup>	OR (95% CI) <sup>b</sup>
<b>Impact on marriage/relationship</b>	<b>n =1544</b>	<b>n=11423</b>	
Positive	12.5	14.7	1 (Reference)
No impact	29.9	23.8	<b>1.30 (1.14,1.49)</b>
Negative impact	57.6	61.6	0.94 (0.83,1.06)
<b>Impact on children</b>	<b>n =676</b>	<b>n=7719</b>	
Positive	15.2	13.9	1 (Reference)
No impact	33.8	26.4	0.95 (0.75,1.19)
Negative impact	51.0	59.7	<b>0.68 (0.55,0.83)</b>

<sup>a</sup> Estimated prevalence, weighted for non-response

<sup>b</sup> Weighted for non-response. Women compared to men, i.e. men were the reference group. Adjusted for age, Service, rank. Statistically significant results shown in **bold**

## Use of substances during deployment

Women were less likely than men to report smoking, drinking more than two caffeine drinks per day, taking energy or body building supplements while on deployment but they were more likely to take weight loss supplements (Table 40).

Table 40 Comparison between women (N=1645) and men (N=11660) on substances used during deployment

	Women N=1645 % <sup>a</sup>	Men N=11660 % <sup>a</sup>	OR (95% CI) <sup>b</sup>
<b>Cigarette smoking</b>	21.6	29.0	<b>0.72 (0.65,0.79)</b>
<b>Caffeine drinks</b>			
None	14.4	11.4	1 (Reference)
1-2 per day	55.4	47.5	0.95 (0.84,1.06)
3-5 per day	26.3	34.8	<b>0.68 (0.60,0.77)</b>
6 or more per day	3.8	6.4	<b>0.60 (0.48,0.75)</b>
<b>Body building supplement use</b>	6.4	19.0	<b>0.25 (0.22,0.29)</b>
<b>Energy supplements use</b>	20.6	24.9	<b>0.73 (0.66,0.80)</b>
<b>Weight loss supplements use</b>	12.1	7.0	<b>1.84 (1.62,2.09)</b>

<sup>a</sup> Estimated prevalence, weighted for non-response

<sup>b</sup> Weighted for non-response. Women compared to men, i.e. men were the reference group. Adjusted for age, Service, rank. Statistically significant results shown in **bold**

## 9. Patterns of somatic symptoms and conditions

Participants completed a checklist of 67 items about their physical and mental health symptoms in the last four weeks and the severity of each item (none, mild, moderate or severe) [15]. These items were summed to compare the total number of symptoms reported between demographic groups. This checklist was also used to identify clusters of symptoms. The most common symptoms reported by ADF members who had deployed to Iraq and Afghanistan are shown in Table 41. The prevalence and order of physical and psychological symptoms reported by MEAO veterans are broadly consistent with those reported by Australian and UK veterans deployed in the 1990-91 Gulf War [26, 30] and more recent studies of Australian veterans deployed to the Solomon Islands, Bougainville and East Timor [9-11].

Table 41 Prevalence of the 15 most common symptoms reported by members who deployed to Iraq (N=5857) and Afghanistan (N=4125)

Iraq symptoms	%	Afghanistan symptoms	%
Fatigue	59.8	Sleeping difficulties	55.7
Sleeping difficulties	58.6	Fatigue	54.6
Feel unrefreshed after sleep	57.1	Feeling unrefreshed after sleep	52.8
Irritability/outbursts of anger	51.6	Irritability/outbursts of anger	49.6
Headaches	49.8	Headaches	45.2
Low back pain	46.1	Low back pain	44.2
General muscle aches and pains	41.0	General muscle aches and pains	37.8
Forgetfulness	40.3	Forgetfulness	37.1
Difficulty finding the right word	38.0	Difficulty finding the right word	35.1
Loss of concentration	36.8	Loss of concentration	33.4
Joint stiffness	35.3	Feel distant/cut-off from others	32.2
Feel distant/cut-off from others	34.7	Joint stiffness	31.8
Ringing in ears	33.5	Ringing in ears	31.3
Flatulence or burping	31.6	Flatulence or burping	27.5
Avoid doing things/situations	31.0	Feeling jumpy/easily startled	26.8

Weighted for non-response

### Chronic fatigue

Symptoms of chronic fatigue were assessed using the checklist items: headaches, feeling unrefreshed after sleep, fatigue, sore throat, forgetfulness, loss of concentration, pain without swelling or redness in several joints, general muscle aches and pains, and tender or painful swelling of lymph glands in neck, armpit or groin. If a person reported four or more of these symptoms, they were coded as having symptoms characteristic of chronic fatigue. The US Centers for Disease Control (CDC) definition of chronic fatigue requires symptoms to have persisted or recurred during six or more consecutive months [8]. As data obtained in this study cover only four weeks, the prevalence and severity of chronic fatigue will be over-estimated. Nevertheless, Table 42 shows the prevalence of severe chronic fatigue was approximately 1%.

Table 42 Prevalence and severity on chronic fatigue reported since deployment to Iraq (N=5777) and Afghanistan (N=4056).

Level of severity	Chronic fatigue	
	In Iraq %	In Afghanistan %
Any	42.6	37.9
Moderate or severe	9.7	8.2
Severe	1.1	0.8

Prevalences weighted for non-response

## Multi-symptom illness

Replicating Blanchards' model of multi-symptom illness [5], three symptom clusters were defined. Cluster A included the fatigue item from the symptoms checklist. Cluster B was comprised of items on depression and anxiety from the PHQ, and 'loss of concentration', 'sleeping difficulties' and 'irritability / outbursts of anger' from the symptoms checklist. Cluster C included the items 'pain, without swelling or redness, in several joints' and 'general muscle aches and pains'. Responses to these items were scored on severity.

Chronic multi-symptom illness was defined by one or more symptoms from at least two of the clusters (A, B or C). Likewise, severe chronic multi-symptom illness was recorded if a person reported at least one severe symptom in each cluster. The CDC definition requires symptoms to be present for 6 months or longer [8]. However, as the scores in this study were based on symptoms in the past month or four weeks, the prevalence and severity of multi-symptom illness will be over-estimated. Nevertheless, the frequencies shown in Table 43 for severe multi-symptom illness were clearly lower than those reported by US personnel deployed to the 1990-91 Gulf war [18].

Table 43 Prevalence and severity of multi-symptom illness reported since deployment to Iraq (N=5915) and Afghanistan (N=4160).

Level of severity	Multi-symptom illness	
	In Iraq %	In Afghanistan %
Any	64.0	58.8
Severe	1.0	0.7

Prevalences weighted for non-response

## Clusters of physical symptoms and mental health

The items in the symptoms checklist were categorised into four groups based on correlations between items. These were:

- Psychological factor (14 items)
- Psychosomatic factor (12 items)
- Digestive factor (8 items)
- Muscles and joints factor (7 items)

The score from the 'muscles and joints' group was split into quartiles. For the other three groups, the top quartile (the 25% who reported the most symptoms in that factor) was compared to the other three quartiles combined. This is because approximately 75% of participants reported a very small number of symptoms in each of these groups.

There was a very strong association between the number of symptoms reported in each of the physical symptom factors and PTSD symptoms. Having adjusted for each of the other groups, participants who reported more digestive, psychosomatic, and muscular symptoms were likely to score higher on PTSD symptoms (Table 44). Similar strong associations were also found for the other mental health measures.

Table 44 Association between physical symptoms and PTSD for participants deployed to the MEAO (N = 8757)

	PTSD symptoms	
	% <sup>a</sup>	OR (95%CI) <sup>b</sup>
<b>Digestive symptoms</b>		
Quartiles 1-3 (0-2): Low	2.5	1 (Reference)
Quartile 4 (3-10): High	15.3	<b>2.07 (1.67,2.58)</b>
<b>Psychosomatic symptoms</b>		
Quartiles 1-3 (0-1): Low	1.1	1 (Reference)
Quartile 4 (2-12): High	17.9	<b>9.44 (7.16, 12.45)</b>
<b>Muscle and joint symptoms</b>		
Quartile 1 (0): None	1.3	1 (Reference)
Quartile 2 (1): Mild	1.4	0.72 (0.43, 1.18)
Quartile 3 (2-3): Moderate	4.9	<b>1.51 (1.02, 2.23)</b>
Quartile 4 (4-7): Severe	16.1	<b>2.68 (1.83, 3.91)</b>

<sup>a</sup>Prevalences weighted for non-reponse

<sup>b</sup>Odds ratios weighted for non-response and adjusted for age, rank, sex and other factor categories in the model  
Statistically significant results shown in **bold**

These associations between the number of physical symptoms reported in each group and measures of psychological health need to be interpreted with care. Participants with mental health problems may have been more likely to experience deterioration in their physical health or those who were depressed or anxious may have been more likely to have a poorer view of their physical health [31]. Alternatively, participants who are physically unwell may be more susceptible to psychological problems. Due to the cross-sectional design of this study, it is not possible to determine the direction of this effect, but the association between the physical symptoms and mental health was strong.

Over all, the current analysis found no evidence of a pattern of symptoms specific to the MEAO deployments.



## 10. Discussion and implications

---

The MEAO Census Study was one of a suite of studies commissioned by the Department of Defence during 2010-12. It included all currently serving regular ADF members, reserves and ex-serving personnel who had deployed to the MEAO in 2001-09. Standard questions that have been used in studies of military populations in Australia and other countries were used wherever possible to ensure the results could be compared.

### Caveat for interpreting some of the results

In interpreting the results, it is important to acknowledge that recall of deployment experiences may be affected by the respondent's mood at the time of completing the questionnaire. There is a well-known phenomenon called 'negative reporting bias' [31], or 'effort after meaning' [6] whereby people who are depressed or experiencing other mental health problems may perceive and report their past experiences more negatively than other respondents who had the same experience but are not suffering from mental health problems. The design of the MEAO Census Study means that it is not possible to be sure whether adverse deployment experiences led to poorer mental health or mental health problems caused people to recall their deployment experiences more negatively.

### Comparison with other studies

In the MEAO Census Study, the prevalence of PTSD symptoms (less than 5%), general psychological distress (4%), alcohol misuse (less than 3%) and suicidal thoughts (less than 6%) was slightly and consistently higher than in the MHPWS. This was due to the inclusion of participants who were reserves or ex-serving members at the commencement of the study. Prevalence of health problems was generally similar to or slightly higher than the levels in the general community, despite a possible 'healthy warrior' effect [17]. In comparison with previous Deployment Health Surveillance Program Studies conducted by CMVH, mental and general health was slightly better, possibly due to higher proportions of ex-serving members in studies on the East Timor and Bougainville deployments. The prevalence of symptoms was also slightly lower than in the comparison group in the Australian Gulf War Study [23] and in UK studies of the 1990-91 Gulf War [18].

### Cigarette smoking

Compared with data from the general population (for example, the Australian National Health Survey [4]), the MEAO Census Study showed that smoking rates, close to 30%, were particularly high among younger members in the Army and Navy. There was also evidence of increasing smoking while on deployment to the MEAO.

High smoking rates are likely to have long-term health consequences for physical fitness and future chronic disease. For these reasons, Defence should adopt the elimination of smoking as an important health improvement target. There are well-established methods of tobacco control. These include banning smoking in the workplace, limiting ready access to cigarettes, increasing health education about the health damage caused by tobacco, and providing pharmacological or behavioural treatments to help smokers to quit.

## Health of participants who had separated from the ADF regular service

On all the measures of mental and general health, currently serving members scored better than ex-serving members. Also, among currently serving ADF personnel, regular members reported better health than reserves. These results were to be expected. Ex-serving members may have separated from the ADF as a result of poorer health. Similarly, members who were reserves at the start of the study may have ceased permanent ADF service due to health problems. Among ex-serving respondents, 23% had a most recent Medical Employment Classification (MEC) of 4 (not deployable at all) compared to 1% for active and inactive reserves (MEC was not obtained for currently serving members).

Poor mental health associated with deployment, and possibly with transition to reserves or separation from the ADF after deployment, could be ameliorated by targeted pre-deployment training through programs like the ADF's BattleSMART initiative [12] and improved post-deployment follow-up (Strategic Objective 5). Reserves and ex-serving members do not have access to Defence health and support services. Defence needs to consider how best to follow up members who transition to reserves or separate from the ADF, and improve their pathways to care. Extending the transition process and period may be called for, particularly if members separate shortly after deployment. Ongoing health surveillance and access to services for those separating from the ADF may improve their long term health.

The implication for DVA of the significantly poorer mental and general health of ex-serving members is that they are likely to require considerable support possibly for many years. Prevalence of PTSD symptoms, suicidal thoughts and alcohol misuse among ex-serving members suggest that there will be on-going need for psychological and psychiatric treatment. Additionally, some mental health consequences of deployment may be delayed, so prevalence is likely to increase further in this group over time. The Department of Veterans' Affairs (DVA) cannot contact these people until they lodge a claim. Therefore, Defence and DVA need to work together to provide continuity of service and opportunities for longer term support for members after separation.

## Traumatic and combat exposures

Significant increases in mental health problems were found with increasing traumatic and combat exposure, with the adjusted risk for some problems increasing five to fifteen fold. These findings covered PTSD symptoms, major depressive syndrome, panic and other anxiety syndromes, and alcohol misuse. The findings were consistent for combat in Iraq and Afghanistan, even though the nature and frequency of exposures differed somewhat between locations. The association between mental health and individual types of exposures (e.g. handling or seeing dead bodies), the number of types of exposure reported, and the cumulative number of traumatic exposures (of any type) were assessed. Of these, the association was most pronounced for the cumulative number of exposures. The magnitude and consistency of the effect suggests that it is unlikely to be due only to negative reporting bias and that greater combat exposure does lead to greater risk of subsequent mental health problems, including PTSD. Further, more detailed analysis of the data are needed to identify which types of hazards or deployment patterns are associated with the greatest risk of mental health problems before any recommendations could be made for changes to ADF policy or practice.

## Duration of deployments

The total time spent on deployment to the MEAO, the number of deployments to the MEAO in 2001-09, and the duration of the most recent deployment were not strongly or consistently associated with mental or general health. However, the time since the most recent deployment was strongly associated with poorer mental health, especially among ex-serving members. More detailed analysis of the data are needed to gain further understanding of this phenomenon.

## Impact on families

More than 60% of respondents (especially men) reported that their military commitments had a negative impact on their marriage and children. Both greater numbers of deployments and greater total time on deployment were associated with negative impacts on marriages and children.

## Reserves who deployed on continuous full-time service

There was little evidence that the patterns of deployment affected reserves on CFTS differently from regular full-time ADF members, but the number who deployed as reserves on CFTS was small and the results may not be statistically reliable. It was not possible within the time available for this report to undertake detailed comparisons of members who deployed as reserves and regular ADF members. Likewise, it was not possible to conduct separate analyses for participants who deployed as regulars but were reserves or ex-serving members when the study was conducted.

## Somatic symptoms

Symptoms of fatigue were reported by about half of the participants, with about 40% reporting four or more fatigue-related symptoms and 9% reporting moderate or severe fatigue symptoms. The patterns of symptoms were similar for deployments to Iraq and Afghanistan. Less than 1% of study participants reported severe symptoms consistent with chronic multi-symptom illness (defined by symptoms across two or more defined clusters of different types of symptoms) [5].

From a list of more than 60 symptoms, related conditions were categorised into the following groups: psychological, psychosomatic, digestive and muscles / joints. These groupings were similar for Iraq and Afghanistan and are broadly comparable with UK findings [30]. There were strong associations between each group of physical symptoms and mental health symptoms. These results may be interpreted as somatic manifestations of psychological morbidity or as shared vulnerability to both. A clinical implication of these findings is that when veterans report physical symptoms, the possibility of underlying psychological problems should be investigated.

## Head injury

Less than 2% of participants reported head injury or concussion on deployments to Iraq or Afghanistan and these injuries were associated with increased risk of PTSD symptoms and other mental health problems. The study also included screening questions for mild traumatic brain injury (mTBI). These referred to injury over the lifetime and more than 10% of participants screened positive.

These results illustrate the difficulty of understanding the effects of head injury and concussion on deployment against a background of relatively high pre-deployment prevalence of such injuries and the possibility of negative reporting bias. This is an area which requires much more targeted research; it is possible that some of the measurements being made for the MEAO Prospective study of ADF personnel both before and after deployment to Afghanistan may shed light on these issues. Current research by DSTO and allies in the US may also provide guidance about effective ways to reduce the effects of blast injuries on mTBI.

## Environmental exposures

Exposure to some respiratory irritants during deployments to Iraq differed from those during deployments to Afghanistan (e.g., smoke from fires, waste incineration and oil fires were more commonly reported for Afghanistan). Exposure to other hazards, such as diesel exhaust, dust storms and passive smoking was common to both locations. Army personnel were more likely to report

experiencing more respiratory irritants, although exposure to aviation fuel was more common for RAAF members. High levels of exposure to any of these hazards were associated with increased risk of respiratory symptoms such as asthma, bronchitis, sinus problems and hay fever. These findings are consistent with the US Millenium Cohort Study which found higher rates of newly reported respiratory symptoms in 'deployers' compared to 'non-deployers' [27]. However, a more recent paper from this group found no association between exposure to burn pits and respiratory outcomes [28].

Among the chemical and other hazards investigated, only perceived exposure to non-ionising radiation was common (reported by more than 50% of respondents, compared with less than 5% for other hazards). Non-ionising radiation (e.g., from communication equipment, radar and counter IED measures) was associated with increased PTSD symptoms, migraines, asthma, hearing loss and ringing in ears, and poorer general health. The risk increased with increasing exposure up to about a doubling of risk. Exposure to ionising radiation or radioactive materials (reported by about 4% of respondents) was associated with increased risk of PTSD symptoms, migraines, hearing loss, tinnitus, asthma and poorer general health. The wide range of health conditions associated with these exposures made identifying plausible biological mechanisms difficult. The alternative explanation of negative reporting bias is also possible.

Exposure to 'loud noises without hearing protection', often for extended periods, was reported by more than half the respondents during deployments to both Iraq and Afghanistan. These exposures were associated with risks of hearing loss, increased sensitivity to noise, ringing in the ears, and loss of balance. They were also associated with previous, current or planned claims of compensation for hearing loss.

The extent of environmental exposures reported, especially respiratory irritants, and the association with health conditions have implications for Defence in terms of occupational hygiene. There may be a case for increasing emphasis on using personal protective devices (such as masks and hearing protection) even under 'usual' working conditions involving diesel exhaust, aviation fuel and noise. However a more realistic approach is for Defence to engineer out these hazards at source or by design of equipment.

These common environmental exposures (particularly to fuels, fumes and noise) also have implications for DVA. Already, claims for hearing loss are among the most common reasons for compensation and these data suggest that such claims will increase as a result of MEAO deployments. Respiratory problems associated with exposure to diesel exhaust, aviation fuel and passive smoking are likely to lead to claims for respiratory conditions (which would then need to be assessed according to the statements of principles used by the Repatriation Medical Authority). These occupational hazards, common to many industrial occupations, were reported much more frequently than exposures to military chemical, biological and other hazardous materials. Strict implementations of civilian standards of occupational hygiene and safety may be impractical on deployments. However, the US has developed Military Exposure Guidelines based on civilian standards but modified for a fit, trained and well protected force. If similar standards were to be developed for Australia and implemented, this could reduce future claims to the DVA.

## Health and hygiene

Eating local food was commonly reported in Iraq and Afghanistan while drinking water from local taps and wells was much less common. Risk of gastrointestinal symptoms was associated with such exposures and was responsible for about 12% of sick parade attendances in Iraq and about 18% in Afghanistan deployments. There were also associations with medically diagnosed bowel disorders reported after deployment, suggesting that local food and water consumption may have longer term impacts.

While on deployment, respondents reported high levels of caffeine use (more than two drinks per day), especially among men. About 25% of men and 21% of women reported using energy supplements. Nineteen percent of men reported using body building supplements and around 12% of women reported using weight loss supplements.

These results suggest possible lack of awareness or lack of adequate attention to dietary matters among deploying personnel. Health education and promotion about diet may be beneficial to all ADF personnel and could reduce time lost due to gastrointestinal and other health problems. In the UK and the US, there has been a recent focus on reducing access to and use of supplements.

## Social support

There were strong and consistent associations between all measures of social support and all self-reported mental health. The measures of social support included unit cohesion, sufficient support from the military to the family during deployment, military support after deployment, support from family during and after deployment, and overall community support. Participants who reported high levels of such social support had lower prevalence of PTSD symptoms, psychological distress, major depressive symptoms, panic or other anxiety symptoms, alcohol misuse, and suicide ideation, and they had better general health. Similar results were found for those who reported post-deployment satisfaction with their relationship or partner. Resilience, assessed as the ability to adapt to change and to bounce back after hardship, was also associated with better mental and general health post-deployment. These results were consistent for deployments to Iraq and Afghanistan.

The strength and consistency of these results suggest that perceptions of positive social and organisational support during and after deployment may act as protective factors against mental health problems (although negative reporting bias is also likely to provide at least part of the explanation). Defence policies and practices that promote good communication and cohesion within the unit during deployment are likely to have long-term benefits for morale as well as operational value. Results show that social support for families is important. Defence outreach programs to support families have the potential to mitigate adverse effects of deployment.

Good post-deployment workplace support for reserves was reported with about two thirds reporting no loss of income, seniority or opportunity for promotion, or resentment by co-workers; this proportion was 80-90% among those who stated the questions were relevant to them. However, around 10% did report problems. These results suggest that stronger reintegration support for reserves may be needed, both for members who deployed as reserves on CFTS and those who left the regular forces and joined the reserves after deployment.

## Gender differences

The roles undertaken by men and women on deployment are so different that it was difficult to make valid comparisons. Men were more likely to be in the Army and to have combat roles whereas women were more likely to be in the Navy or RAAF and work in health or administration. Even when we attempted to match for deployment locations, Service and role, men were more likely to be older and to have had combat exposure during the deployment. In the future, this may change with the ADF policy of “Women in Non-traditional Roles” and work on physical employment standards being undertaken at the University of Wollongong and DSTO.

From the data analysed so far, there was little evidence of gender differences in general health measures, although women tended to report more medically diagnosed conditions since deployment than men. There was also some evidence that women were more likely to report psychological distress and other mental health problems.

## Study strengths

This was a large study which documented the deployment experiences of ADF members deployed to both Iraq and Afghanistan. The response was high compared to other Australian studies and military epidemiological studies elsewhere, and weighting for non-response was used to control for potential response bias. Standard, validated instruments were used which allows comparison with other military and civilian studies. A preliminary study was conducted to assess its validity at face value for the intended participants and to pilot test the draft questionnaire. At all stages of the design and implementation, there was input from senior Defence health staff and Veterans' Affairs representatives. All these features provide confidence in the validity of the findings.

## Study limitations

The associations between self-reported deployment experiences and health could be affected by 'negative reporting bias' [31]. It is also important to acknowledge that the cross-sectional nature of the data prevents statements about causality, which can best be established by longitudinal research. The length of time between deployment and completion of the survey may have influenced the reporting of symptoms and exposures. For example, a long time between deployment and survey completion may mean that some symptoms dissipated, such as psychological distress, and some symptoms may have become more evident, such as delayed onset of PTSD. Also the length of time between deployment and survey may have impacted on the type of symptoms reported. All data were self-reported rather than validated objective measures or records. This study did not involve a non-deployed comparison group from the same era because, due to the operational tempo, it was unlikely that members who did not deploy would be comparable to those who did.

## Need for further analysis of the data

The MEAO Census Study involved the collection of a wealth of data. It was not possible in the time available to analyse the data in sufficient depth to understand adequately all the associations between deployment experiences and health.

In particular more detailed analysis is needed to address the following:

1. Why did respondents who were ex-serving members or reserves at the time of the study report poorer mental health than regulars?
2. Do the adverse effects of traumatic and combat exposure accumulate or dissipate over time?
3. Why do mental health problems increase with age in this ADF population when they usually decrease in the general population [1]?
4. How did the experiences during deployment and on return to Australia differ between those who served as reserves and regulars? How did the deployment experiences of the reserves impact on their subsequent health, family and working lives?
5. To what extent did the deployment experience impact differently on women and men? Also, were there any adverse effects on their fertility, pregnancy outcomes or children's health? Were the gender differences for medically diagnosed conditions reflective of the general Australian population? (Note that comparable ABS data have not been published to date).
6. Did respondents identify mental health problems in "other reasons" for attending sick parade while on deployment?
7. To what extent are exposures to smoke, dust, and fumes associated with respiratory symptoms?
8. Which exposures, or combinations of exposures, are associated with hearing loss?
9. Is it possible to distinguish between effects of multiple deployments and total time deployed?

Data from the MEAO Health Study are a valuable resource with the potential to provide evidence to inform policy and practice for the Departments of Defence and Veterans' Affairs. With further more detailed and focused analysis, this goal could be achieved.

CMVH has completed cross-sectional surveys of ADF members who deployed to the MEAO and Australia's Near North Area of Influence and, in the process, has successfully recruited large numbers of serving and ex-serving members. It would be very valuable to maintain contact with these people and repeat data collection at least every five years. Stronger causal associations can be identified by analyses of longitudinal data collected from the same individuals at multiple time points. A longitudinal health surveillance program would provide an evidence base for the ADF comparable with international military research programs, such as the King's Centre for Military Health Research Cohort in the UK and the US Millennium Cohort.

## References

---

1. Australian Bureau of Statistics (2008) 2007 National Survey Of Mental Health And Wellbeing: Summary Of Results. Cat. no. 4326.0. ABS, Canberra 23/10/2008
2. Australian Bureau of Statistics (2008) 'Table 9: 12-month mental disorders, by Selected physical and mental health characteristics' in National Survey of Mental Health and Wellbeing: Summary of Results, 2007 (Excel spreadsheet). Cat. no. 4326DO001\_2007. ABS, Canberra 23/10/2008
3. Australian Bureau of Statistics (2011) 'Table 1.1 Selected health characteristics by measured Body Mass Index' in Overweight and Obesity in Adults in Australia: A Snapshot 2007 (Excel spreadsheet). Cat. no. 4842.0.55.001. ABS, Canberra 27/05/2011
4. Australian Bureau of Statistics (2011) 'Table 1.5 Persons aged 18 years and over, Smoker status by age and sex' in Health at a glance (Excel spreadsheet). Cat. no. 4841.0. ABS, Canberra 11/03/2011
5. Blanchard MS, Eisen SA, Alpern R, Karlinsky J, Toomey R, Reda DJ, Murphy FM, Jackson LW, Kang HK (2006) Chronic multisymptom illness complex in Gulf War I veterans 10 years later. *American Journal of Epidemiology* 163:66-75
6. Brown GW (1974) Meaning, measurement, and stress of life events. In: Dohrenwend BS, Dohrenwend BP (eds) *Stressful Life Events: Their Nature and Effects*. Wiley, New York, pp 217-243
7. Burney PG, Luczynska C, Chinn S, Jarvis D (1994) The European Community Respiratory Health Survey. *The European Respiratory Journal* 7:954-960
8. Centers for Disease Control and Prevention (2010) Chronic Fatigue Syndrome (CFS). <http://www.cdc.gov/cfs/case-definition/index.html> Accessed: 5/06/2012
9. Centre for Military and Veterans' Health (2008) Solomon Islands Health Study Final Report. Centre for Military and Veterans' Health, Brisbane
10. Centre for Military and Veterans' Health (2009) East Timor Health Study Project Completion Report. Centre for Military and Veterans' Health, Brisbane
11. Centre for Military and Veterans' Health (2009) Bougainville Health Study Project Completion Report. Centre for Military and Veterans' Health, Brisbane
12. Commonwealth of Australia (2011) Capability through mental fitness: 2011 ADF Mental Health and Wellbeing Strategy. Canberra
13. Department of Defence (2007) Deployment Health Surveillance Program: Project Management Board Mandate. Canberra, p 26
14. Department of Defence (2011) Global Operations. <http://www.defence.gov.au/op/index.htm> Accessed: 12/10/2011
15. Derogatis LR, Lipman RS, Rickels K, Uhlenhuth EH, Covi L (1974) The Hopkins Symptom Checklist (HSCL): A Self-Report Symptom Inventory. *Behav Sci* 19:1-13
16. Dunt D (2009) Review of Mental Health Care in the ADF and Transition through Discharge. Commonwealth Department of Defence, Canberra
17. Haley RW (1998) Point: Bias from the "Healthy-Warrior Effect" and Unequal Follow-up in Three Government Studies of Health Effects of the Gulf War. *American journal of epidemiology* 148:315-323
18. Ismail K, Lewis G (2006) Multi-symptom illnesses, unexplained illness and Gulf War Syndrome. *Philosophical Transactions of the Royal Society of London Series B, Biological sciences* 361:543-551
19. Kessler R, Mroczek D (1994) Final Versions of our Non-Specific Psychological Distress Scale. In: Survey Research Centre of the Institute for Social Research. University of Michigan (ed), Ann Arbor
20. King LA, King DW, Vogt DS, Knight J, Samper RE (2006) Deployment Risk and Resilience Inventory: A Collection of Measures for Studying Deployment-Related Experiences of Military Personnel and Veterans. *Military Psychology* 18:89-120
21. Kroenke K, Spitzer RL, Williams JBW (2001) Validation and Utility of a Self-report Version of PRIME-MD The PHQ Primary Care Study. *J Gen Intern Med* 16:606-613
22. McFarlane A, Hodson S, Van Hooff M, Davies C (2011) Mental health in the Australian Defence Force: 2010 ADF Mental Health and Wellbeing Study: Full report. Department of Defence, Canberra
23. Monash University, Health Services Australia (2003) Australian Gulf War Veterans' Health Study: Executive Summary. Affairs DoV, Canberra
24. Pinder RJ, Greenberg N, Boyko EJ, Gackstetter GD, Hooper TI, Murphy D, Ryan MAK, Smith TC, Wells TS, Wessely S (2012) Profile of two cohorts: UK and US prospective studies of military health. *International Journal of Epidemiology*:1-11



25. Saunders JB, Aasland OG, Babor TF, Delafuente JR, Grant M (1993) Development of the Alcohol-Use Disorders Identification Test (Audit) - Who Collaborative Project on Early Detection of Persons with Harmful Alcohol-Consumption .2. *Addiction* 88:791-804
26. Sim M, Forbes A, Glass D, Ikin J, Ittak P, Kelsall H, Leder K, McKenzie D, McNeil J (2003) Australian Gulf War Veterans' Health Study. Melbourne, Australia
27. Smith B, Wong CA, Smith TC, Boyko EJ, Gackstetter GD, Margaret AKRftMCST (2009) Newly reported respiratory symptoms and conditions among military personnel deployed to Iraq and Afghanistan: a prospective population-based study. *American Journal of Epidemiology* 170:1433-1442
28. Smith B, Wong CA, Boyko EJ, Phillips CJ, Gackstetter GD, Ryan MA, Smith TC, for the Millennium Cohort Study T (2012) The effects of exposure to documented open-air burn pits on respiratory health among deployers of the Millennium Cohort Study. *J Occup Environ Med* 54:708-716
29. Swann J, Hodson SE (2004) A psychometric analysis of the TSES-R. Commonwealth Department of Defence, Canberra
30. Unwin C, Blatchley N, Coker W, Ferry S, Hotopf M, Hull L, Ismail K, Palmer I, David A, Wessely S (1999) Health of UK servicemen who served in Persian Gulf War. *The Lancet* 353:169-178
31. Watson D, Pennebaker JW (1989) Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychol Rev* 96:234-254
32. Weathers FW, Litz BT, Herman DS, Huska JA, Keane TM (1993) The PTSD checklist: reliability, validity, & diagnostic utility. Annual Meeting of the International Society for Traumatic Stress Studies, San Antonio
33. Wilk JE, Bliese PD, Kim PY, Thomas JL, McGurk D, Hoge CW (2010) Relationship of combat experiences to alcohol misuse among U.S. soldiers returning from the Iraq war. *Drug Alcohol Depend* 108:115-121
34. World Health Organization (1990) Composite International Diagnostic Interview (CIDI), Version 1.0. Geneva



**The Centre for Military and Veterans' Health**

The University of Queensland

Mayne Medical School HERSTON QLD 4006

Phone: +61 7 3346 4873

Fax: +61 7 3346 4878

Email: [cmvh.enquiries@uq.edu.au](mailto:cmvh.enquiries@uq.edu.au)

[www.uq.edu.au/cmvh](http://www.uq.edu.au/cmvh)



**THE UNIVERSITY  
OF QUEENSLAND**  
AUSTRALIA

