CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Project Completion Report

Bougainville Health Study

Deliverable Item 7 (Phase 2)

9 April 2009

Author	**Dr Annabel McGuire, Michael Waller, Jonathan Bleier, Colleen Loos, Lisa Nielsen, Tegan Cosgrove, Dr Christine McClintock, LTCOL (Dr) Peter Nasveld, A/Prof Susan Treloar, Prof Annette Dobson**
Document Version	**Version 2.1**
Status	**Final**
Date Saved	**29/4/2009**

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Australian Government
Department of Defence
Department of Veterans' Affairs

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Charles Darwin UNIVERSITY
Innovation in Education

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\Research\DHSP\Phase 2\2. Bougainville\Deliverables\Project Completion Report\BV Project Completion Report v2.1.doc

Revision History

Date	Version	Description	Track Changes
17/2/09	V1.0	Original report submitted	No
24/2/09	V1.1	Minor corrections requested by SAC	No
23/3/09	V1.2	Corrections from SAC, PMB, PMO (Mrs Maxine Baban, Mr Tony Hewson, BRIG Anthony Gill, Associate Professor Emily Banks (SAC), (Maxine), MAJ Alison Berlioz-Nott/COL Steve Rudzki (Director Army Health))	Yes
09/04/09	V2.0	Amended final version submitted	No
29/4/09	V2.1	Minor corrections requested by PMB	No

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
A/Prof Susan Treloar	Head, Deployment Health Surveillance Program and 1st chief investigator			
Prof Annette Dobson	Chair Scientific Research Team			
Prof Michael Moore	Scientific Advisory Committee			
BRIG Tony Gill	Program Management Board			

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
SRT	9/2/09	Electronic
PMO	17/2/09	Electronic
SAC	17/2/09	Electronic

Abbreviations/Definitions

Abbreviation	Description
ADF	Australian Defence Force
ADHREC	Australian Defence Human Research Ethics Committee
AHA	Annual Health Assessment
AUDIT	Alcohol Use Disorder Identification Test
BMI	Body Mass Index (calculated as weight (kg) / [height (m)]^2)
BV	Bougainville
CDU	Charles Darwin University
CI	Confidence Interval
CIDI	Composite International Diagnostic Interview
CMR	Central Medical Record
CMVH	Centre for Military and Veterans' Health
CPHE	Comprehensive Preventive Health Examination
CRUfAD	Clinical Research Unit for Anxiety and Depression
DCO	Defence Community Organisation
DHSD	Defence Health Services Division
DHSP	Deployment Health Surveillance Program
DMAC	Data Management and Analysis Centre
DSM-IV	Diagnostic and Statistical Manual Version 4
DVA	Department of Veterans' Affairs
DVA HREC	Department of Veterans' Affairs Human Research Ethics Committee
ESO	Ex-Service Organisation
InterFET	International Force in East Timor
K10	Kessler Psychological Distress Scale
MEC	Medical Employment Classification
NCSCH	National Cancer Statistics Clearing House
NDI	National Death Index
NHMRC	National Health and Medical Research Council
OR	Odds Ratio
PCL-C	Post Traumatic Stress Disorder Check List - Civilian
PMB	Program Management Board
PMO	Program Management Office
POPS	Post Operational Psychological Screen
PRTG	Psychology Research and Technology Group
PTSD	Post Traumatic Stress Disorder
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RR	Relative Risk (ratio of risk of disease or death among the exposed to the risk among the unexposed)
RtAPS	Return to Australia Psychological Screen
SAC	Scientific Advisory Committee
SESAHA	Specialist Employment Stream Annual Health Assessment

Abbreviation	Description
SMR	Standardised Mortality Ratio ((ratio of number of deaths observed to number expected in a population with the same specific rates) x 100)
SOP	Standard Operating Procedure
SRT	Scientific Research Team
TSES-R	Traumatic Stress Exposure Scale Revised
UA	University of Adelaide
UMR	Unit Medical Record
UQ	University of Queensland
UQ BSSERC	University of Queensland Behavioural & Social Sciences Ethical Review Committee

Executive Summary

Introduction

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a series of studies that aim to research the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service overseas. It was conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program (DHSP).

Study aims

2. The aim of the Bougainville Health Study was to conduct an investigation of the health status of all ADF personnel who deployed to Bougainville between November 1997 and August 2003 as part of Operations BEL ISI I & II, relative to an appropriate comparison group who were ADF members at the time, but did not deploy on these operations.

3. The key research questions examined were:

   a. Do Bougainville veterans have different rates of negative mental health outcomes relative to an ADF comparison group who did not deploy to Bougainville?

   b. Do Bougainville veterans have different general health problems from an ADF comparison group who did not deploy to Bougainville?

   c. Do Bougainville veterans have different health behaviours relative to an ADF comparison group who did not deploy to Bougainville? For example, were there different rates of tobacco smoking and alcohol consumption?

   d. What deployment issues and hazards were reported by Bougainville veterans?

   e. Do Bougainville veterans have different rates of mortality or cancer from an ADF comparison group who did not deploy to Bougainville?

4. The first four research questions are addressed in the current report. The study is of retrospective, cross-sectional design with a comparison group matched across strata of age, gender, Service (Navy, Army and Air Force) and service type (regular or reserve). The CMVH self-report questionnaire data and the Defence Health and psychological screens were collected throughout 2008. The collection of the data was described in the Bougainville Defence Owned Data Completion Report[1] and the Bougainville Completion of Self-reported Data Collection Report[2].

5. This report is a Project Completion Report for internal Defence information. It is not intended to convey all study results and analysis is ongoing. With agreement from Joint Health Command we aim to provide an oral presentation of key findings. Further data analyses will be conducted to answer additional research questions including combined analyses of data from the Near North studies and an examination of any associations between various exposures and particular symptom groupings. The aim is for study results to be disseminated in a timely manner through peer-reviewed journal publications so that they are publicly available. A summary of

findings will be provided to participants and via media release to the general public in due course.

The study population and methods

6. A Nominal Roll of individuals who had deployed to Bougainville between November 1997 and August 2003 as part of Operations BEL ISI I & II was compiled. There were 4775 identified Bougainville veterans and these were frequency-matched to other ADF members who had not deployed to Bougainville on the basis of sex, age group, Service and service type (comparison group n= 9434). Members of both the veteran and comparison groups may have deployed to other locations as well, details of other deployments are included in Tables 1.4 and 1.5. The mortality and cancer incidence comparisons were based on the entire Nominal Roll and comparison group.

7. All individuals on the Nominal Roll and 2363 randomly selected comparison individuals were invited to complete a general health questionnaire, with the Bougainville veterans also asked to complete a questionnaire specific to their deployment to Bougainville. Consent was requested from participants to link questionnaire data to Defence Health and Psychological screening records.

8. Response to the CMVH self-report health questionnaire was obtained from 45% of the living sample. Those who had died since deployment (51 deceased) are not included in this calculation. However, 25% of the living sample could not be located and contacted in the time available. The largest proportion of those who could not be located were ex-serving. When those who could not be located are excluded from the denominator an overall response rate of 60% was achieved.

9. The Psychology Research and Technology Group (PRTG) had 648 (14%) Return to Australia Psychological Screens (RtAPS) available in their database. There were very few Post Operational Psychological Screens (POPS) available. Forty-two individuals who responded to the questionnaire consented to linkage of their self-report data with their psychological screening records and had an RtAPS containing measures used in this analysis.

10. Collection of Defence Health records from Unit Medical Records (UMRs) (or Central Medical Records (CMRs) if UMRs were not available) was intended for all Bougainville veterans and the matched comparison group. However, early difficulties in obtaining the UMRs for serving personnel led to a reduction in the sample size to 25% of serving Army members' records and 50% of serving Navy members' records. The number of Air Force UMRs collected was not reduced.

11. Data were analysed using SAS 9.2, Stata 10.0 and SPSS v17. Throughout the report percentages are imported directly from analysis output and due to rounding, may not add to exactly 100%.

Study Findings

Do Bougainville veterans have different rates of negative mental health outcomes relative to an ADF comparison group who did not deploy to Bougainville?

12. Data from the CMVH self-report questionnaire and Defence Health and Psychological screening records were used to address this research question.

13. There was no clear difference in the PCL-C scores between the Bougainville veterans and the comparison group. Similarly, there was no difference in the mean K10 scores or the proportions scoring in the highest category (30-50). However, the percentage scoring in the medium and high (16 to 50) categories was slightly, but not significantly higher for Bougainville veterans (44% v 41%).

14. Comparing matched outcomes of Bougainville veterans from the CMVH self-report questionnaire with those from the Return to Australia Psychological Screens (RtAPS), conducted immediately post-deployment, both the K10 and the PCL-C showed increased rates of distress on the self-report questionnaire. The difference in outcomes from the two sources, as measured by scores on the K10 and PCL-C, may be attributable to variety of underlying reasons including: variations in the timing of the data collections; differences in the environment in which the data are collected; changes in operational tempo; influence of other deployments, other intervening events or increased awareness mental health issues and military compensation systems.

Do Bougainville veterans have different general health problems from an ADF comparison group who did not deploy to Bougainville?

15. Data for this chapter were drawn solely from CMVH self-report data in the health questionnaire, which was completed by both Bougainville veterans and the comparison group.

16. In both study groups, 41% of respondents perceived their general health to be ‘very good’ or ‘excellent’. Forty-one percent of veterans reported that their health was good, 16% that it was fair and 2% reported ‘poor’ general health. Similarly, 38% of the comparison group reported that their health was good, 18% reported fair health and 3% reported poor health. The mean rating of general health was not significantly different between veteran and comparison groups. The majority of Bougainville veterans (65%) reported that their health was the same as one year ago, with 15% reporting improved health and 19% reporting worse health. These percentages were comparable to those in the comparison group ($p = 0.82$).

17. The most common symptoms reported by respondents were fatigue, feeling unrefreshed after sleep and sleeping difficulties, with approximately 60% of respondents recording these events. The prevalence of the top 15 symptoms was similar between the study arms. The mean total number of self-reported symptoms was the same in the study groups.

18. Overall, Bougainville veterans were not shown to have any increased negative health outcomes. There were no clear differences in the measures of general health, limitations in work and other activities as a result of physical health and social

functioning between the study groups, and the participants' perception of their own general health was similar between the veterans and the comparison group.

Do Bougainville veterans have different health behaviours relative to an ADF comparison group who did not deploy to Bougainville? For example, were there different rates of tobacco smoking and alcohol consumption?

19. Data on tobacco smoking and alcohol consumption was obtained from both CMVH self-report and Defence Health records. BMI data was sourced from Defence Health records only, where the most recently collected health assessments provided the data. Details on the collection of Defence Health data are available from the Bougainville Defence Owned Data Completion Report[1].

20. The CMVH self-report data showed no difference between Bougainville veterans and those who did not deploy in terms of smoking and alcohol consumption.

21. Defence Health records for the Bougainville study confirmed the finding from the CMVH self-report data that deployment had no effect on smoking, although the level for both study arms was around 30%, compared with less than 20% in the self-report data.

22. However, the Defence Health records show a difference in alcohol consumption ($p = 0.025$), with proportionally fewer Bougainville veterans in the highest risk category for alcohol consumption (1%, n=7) compared with the comparison group (2%, n=10).

23. Defence Health records indicated 33% of Bougainville veterans and 31% of the comparison group were in the healthy weight range. The proportion with BMI greater than 25 did not differ significantly between veterans and the comparison group (OR 0.92, 95% CI (0.75, 1.14)).

What deployment issues and hazards were reported by Bougainville veterans?

24. Data were drawn from the CMVH self-report Deployment questionnaire and from Defence Health records to address this question. This analysis was only to those deployed to Bougainville.

25. Analysis of vaccinations from the Defence Health records showed that approximately one quarter of individuals, for whom we were able to collect data, required four or more vaccinations in the three months prior to deployment. It is currently unclear whether any specific combination of vaccinations required for deployment to Bougainville has a relationship to any particular health effects.

26. Most respondents used some form of insect repellent at least daily or weekly, and over half had their clothing and tent treated with pesticide. Ninety-four percent of deployed participants reported using some form of antimalarial medication, and 69% reported taking Primaquine on return to Australia. Most of these (98%) reported good compliance with the regimen. Very few (n = 18) reported a reaction to Primaquine.

27. Sixty percent of participants reported their health was the same at the time of the survey compared with their recollection of their general health before deployment to Bougainville, and over 34% reported that it was worse now.

28. A wide variety of exposures to hazards on deployment were reported by Bougainville veterans. Most respondents reported: swimming or bathing in local lakes, rivers or the sea (89%); being bitten by a variety of insects (78%); and living in an area recently treated with pesticides (75%). Additionally, 36% of Bougainville veterans reported exposure to chemical spills or chemically contaminated sites, and 72% of these respondents reported that this exposure occurred weekly or more often.

29. The major stressors reported by Bougainville veterans included separation from family and friends (66%) and the behaviour of others (59%), but most felt that they had made a useful contribution to the local population (79%) and the military mission (95%).

Do Bougainville veterans have different rates of mortality or cancer from an ADF comparison group who did not deploy to Bougainville?

30. Both the Mortality Study and the Cancer Incidence Study (all 14210 personnel) compared the mortality/cancer rate for Bougainville veterans with that of the comparison group and with the general Australian population.

31. The all-cause death rate in the Bougainville veteran group was lower than that observed in the comparison group (Hazard Ratio 0.51, 95% CI (0.28, 0.91)). ADF personnel who deployed to Bougainville also had a lower mortality rate from external causes than the comparison group, though this difference was not significant (Hazard Ratio 0.47, 95% CI (0.21, 1.07)). Bougainville veterans and the frequency-matched comparison group both had lower all-cause mortality rates than those observed in the general population of the same age (SMRs 28.7 and 57.2 respectively).

32. The overall cancer incidence rate in the Bougainville veteran group was similar to that observed in the comparison group (Relative Rate 0.95, 95% CI (0.59, 1.48)). Bougainville veterans and the frequency-matched comparison group both had similar overall cancer incidence rates to those observed in the general population of the same age (Standardised Incidence Ratios 107.0, 95% CI (72.2, 152.8) and 107.3, 95% CI (82.6, 137.0) respectively).

33. More detail can be found in the Mortality Study Report (Annex C) and the Cancer Incidence Study Report (Annex D).

Summary

34. A higher response rate was achieved for the Bougainville Health Study than for either the East Timor or Solomon Islands studies, although, reasons for these differences are unclear. Longer follow-up times and additional alternative methods for contacting, particularly ex-serving, members have the potential to increase response rates in future studies. The data collected to date offer many further opportunities to explore questions of interest to both the Defence and scientific communities. In particular, research is planned in the areas of the impact of multiple deployments, associations between specific exposures and particular health outcomes, and comparisons of health outcomes between the different Services and the Australian public.

35. It is clear that many participants have deployed to locations other than Bougainville. Exposure measures relevant to these other deployments may need to be collected.

Chapter 1 – Introduction, Sample, Response

Background

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a research program that aims to assess the health and well-being of Australian Defence Force (ADF) veterans who have deployed on operations overseas. It was conducted by the Centre for Military and Veterans' Health (CMVH) during 2008 as part of the Deployment Health Surveillance Program (DHSP).

2. The Bougainville Health Study includes data gathered from mortality and cancer incidence registries, a comprehensive self-reported health status questionnaire, a deployment experiences questionnaire, and Health records and Psychological screening information retained by the ADF. The Bougainville Health Study is part of a health surveillance system which will provide comprehensive and longitudinal monitoring of ADF veterans to investigate any links between deployment and the subsequent development of adverse health effects.

3. This report presents data from the CMVH self-report questionnaire, Defence Health records and Defence Psychological screening records for the Bougainville Health Study. The design component of the study presented here is a retrospective and cross-sectional design.

The Bougainville Operations

4. Bougainville is an island located to the east of the main Papua New Guinea (PNG) island and north-West of the Solomon Islands[3]. According to the last census in 1980, the population of the island was 108,726, and with an annual growth rate of about 4.1%, it is estimated that by 1997 the population was around 170,000[4]. Formerly a dependency on Australia, it has been administered as a province of PNG since 1975.

5. Widespread civil unrest has been present since then, focusing mainly on the dissatisfaction by locals of the presence of a large copper mine. The Bougainville Revolutionary Army (BRA) formed in 1988 as a coalition of members who opposed the mining activities on Bougainville, perceiving that mining profits were not benefiting Bougainville and mining activities were being conducted without regard to the social or environmental impact of these operations. The BRA also sought unilateral independence from PNG, which was the start of the most bloody and destructive conflict in the South Pacific Region since World War II.

6. Peace talks were held in October 1997 in New Zealand to settle the conflict between the PNG Government and the BRA. Military and civilian teams from Australia, New Zealand, Fiji and Vanuatu were deployed to Bougainville to facilitate the peace process[5].

7. Australian Defence Force (ADF) personnel were deployed to Bougainville as part of the Truce Monitoring Group (TMG) and Peace Monitoring Group (PMG). Operation BEL ISI I, the New Zealand-led TMG, lasted from November 1997 to April 1998 and was a non-warlike service. Operation BEL ISI II, led by the Australian PMG, was also a non-warlike operation and lasted from April 1998 to August 2003.

8. Preparation of Australian military support to the TMG was on short notice, with a rushed deployment for service personnel. ADF members deployed to Bougainville were exposed to potential hostilities without their weapons, and were in an unfamiliar operational environment.

Main hazards and characteristics

9. ADF personnel were possibly exposed to a variety of environmental, operational and occupational hazards during their deployment to Bougainville.

10. Chemical exposures are of concern to Bougainville veterans, as there were a number of sites where a variety of chemicals were disposed unprotected from the defunct mining operation. Many of these sites were near to the main ADF quarters[6].

11. Malaria, pneumonia, leprosy, yaws, tuberculosis and hookworm are endemic in Bougainville, and diarrhoeic conditions are common. ADF personnel were possibly exposed to these diseases[7]. Because of the tropical climate skin conditions were also a problem, and were the most common reason for visiting medical facilities. Sports injuries were the second most common reason[8].

12. Although Bougainville was a peacekeeping operation there was the potential for ADF personnel to suffer psychological stress. The likely causes of such stress were isolation from home, ambiguity of the peacekeeping role, powerlessness to help the local community, danger of attack and boredom. In some personnel these exposures could lead to long-term mental health problems[9].

Study Aims

13. The overall aim of the Bougainville Health Study was to examine whether the health of the veterans of Operations BEL ISI I & II differs significantly from similar Defence Force personnel who were not deployed as part of Operations BEL ISI I & II. The specific research questions were:

a. Do Bougainville veterans have different rates of negative mental health outcomes relative to an ADF comparison group who did not deploy to Bougainville?

b. Do Bougainville veterans have different general health problems from an ADF comparison group who did not deploy to Bougainville?

c. Do Bougainville veterans have different health behaviours relative to an ADF comparison group who did not deploy to Bougainville? For example, were there different rates of tobacco smoking and alcohol consumption?

d. What deployment issues and hazards were reported by Bougainville veterans?

e. Do Bougainville veterans have different rates of mortality or cancer from an ADF comparison group who did not deploy to Bougainville?

14. The examination of the final research question was completed in 2007. Consequently, only a summary of this study is included in the final report. More information is provided in the Bougainville Mortality Study Report (Annex C) and the Bougainville Cancer Incidence Study Report (Annex D).

15. A secondary aim of the research was to evaluate and comment on access to, completeness and quality of the various sources of data for the Bougainville Health Study, and more generally for the purposes of epidemiological research and long-term health surveillance of Defence personnel.

16. These data sources include not only self-reported data, but also Defence Health records (Unit Medical Records) and deployment-related psychological screening data from the Psychology Research and Technology Group (PRTG) within Defence. These records are collected for clinical purposes and some components are entered into internal Defence databases maintained by various sections within Defence for internal purposes.

Ethics Approvals

17. All study protocols were approved by the Australian Defence Human Research Ethics Committee (# 476/07), the University of Queensland Behavioural and Social Sciences Ethical Review Committee (# 2007000230) and the Department of Veterans' Affairs Human Research Ethics Committee (# E07/002).

Methods

Sampling frame

18. Defence personnel were eligible for inclusion on the Bougainville Health Study Nominal Roll if they deployed to Bougainville as part of Operation BEL ISI I or II (OP BEL ISI I & II), conducted between 20 November 1997 and 26 August 2003.

19. Individuals were eligible for inclusion in the Bougainville Health Study comparison group if they had not deployed as part of OP BEL ISI I or II, were not included on the Bougainville Health Study Nominal Roll, and were a member of a Defence Service on November 20, 1997. Comparison individuals were randomly selected from the PMKeyS database, and frequency-matched to the veteran group on Service (Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 or 1977-1988).

20. The Bougainville Health Study Nominal Roll included 4775 individuals, and the comparison group 9434 individuals.

21. All 4775 from the Bougainville Health Study Nominal Roll and 2363 comparison group individuals were included in the Bougainville Health Study. Further descriptions of the sampling procedures are available in the Bougainville Sample Generation Report[10].

Data collection

CMVH Self-report

22. The CMVH self-report data component of the study involved the completion of a web-based or hard copy questionnaire by individuals in the study sample. A two-stage approach for contacting potential participants and obtaining self-reported study

data was used. The first contact (the invitation package – Appendix 1) was made via email where an address was available or otherwise by posted hard copy. The invitation provided an introduction to the study, informed individuals about the study and invited them to participate, and requested information on preferred mode of completion of the questionnaire (mail or internet) and deployment history. The second stage involved provision of the questionnaire to participants via their indicated preferred mode of delivery.

23. All individuals (excluding those known to be deceased) were asked to complete a general health questionnaire (Appendix 2). The health questionnaire asked various questions about their current health status. Those who had deployed to Bougainville as part of Operations BEL ISI I & II were additionally asked to complete a questionnaire specific to these deployments (Appendix 3). Reminder cards/emails were sent to individuals who had not responded to the invitation within a specified time frame. Follow-up calls were then made to individuals who had not yet responded, or to those who had returned their consent form but had not yet completed the questionnaire. Enhanced contact tracing was also conducted by the Department of Veterans' Affairs where individuals were unable to be contacted by CMVH.

24. In the Bougainville Health Study consent form, participants were asked to provide separate consent to several items:

a. Completing the Defence Health Study Questionnaire;

b. Being contacted periodically for follow-up studies;

c. Allowing linkage of information contained in their Defence Health records to questionnaire data provided in the study;

d. Allowing linkage of information contained in their Defence Psychological screening records to questionnaire data provided in the study.

Defence Health records

25. The Defence Health data component of the study involved the collection of information from Health and Psychological screening records owned by the Department of Defence. Selected health assessment documents — the Annual Health Assessment (AHA) (Annex H), Comprehensive Preventive Health Examination (CPHE) (Annex I), Pre-Deployment Medical Checklist (Annex K), the Post-Deployment Health Screen (Annex L), and the vaccination record (Yellow book) (Annex N) — were collected from the Unit Medical Record (UMR) (or the Central Medical Record (CMR) if the UMR was not available) for individuals in the Bougainville Health Study. All records were de-identified before the information was captured and analysed. No clinical notes were collected from the health records. The most recent AHA and the most recent CPHE were collected as this increased the likelihood that measures were taken after exposure and provided equivalent times of collection for the veteran and comparison groups. Further, the most recently available AHA and CPHE were extracted from the Health files. A detailed description of the methods used and the data extracted is available in the Bougainville Defence Owned Data Completion Report[1].

Defence Psychological screening records

26. Defence operation-related Psychological screening data included the Return to Australia Psychological Screen (RtAPS), completed on leaving theatre, and the

Post Operational Psychological Screen (POPS), completed six months after return from theatre. These were sourced from the electronic files managed by the Psychology Research and Technology Group (PRTG), who are the custodians of the electronic database containing the RtAPS and POPS data. PRTG provided the data of those participants who had consented to this process and had a relevant screen recorded in the database. Additionally, PRTG conducted analyses of relevant data for all members of the study group.

Data analysis

27. Data were analysed using SAS 9.2, Stata 10.0 and SPSS 17. Due to rounding percentages may not add to exactly 100%. Throughout the report specific analyses have been adjusted for age, gender, Service (Navy, Army or Air Force) and rank (Officer or enlisted) to account for differences in these demographics between the veteran and comparison groups when assessing the effect of the Bougainville deployment. The demographic variables adjusted for were chosen *a priori*. We chose not to adjust for service status (regular or reserve) as this is a variable that changes over time – as people leave the regular Defence Force and join the reserves. It was not clear which time point for service status would be most appropriate and accordingly it was not included.

Communications Strategy

28. A communication and media strategy was designed and implemented prior to contact with potential study participants and at various times during the recruitment and data collection process. The aim of this strategy was to alert individuals to the study to increase response rates. The communication and media strategy involved advertisements and editorials in various Defence, ex-Serving and non-Defence publications (a list is provided at Appendix 4) and media releases.

Response

29. Table 1.1 provides information on overall data collection; that is, the denominators used in various parts of the report. For Defence Health data some information, for example the measures of alcohol consumption are only available on the CPHE. Other information analysed is available from both the AHA and the CPHE, for example BMI measurements. Similarly, those in the comparison group did not complete a deployment questionnaire as, by definition, they had not deployed to Bougainville.

Table 1.1: Summary of denominators used in the report

		Veterans *n*	*Comparisons* *n*
Total Sample		4775	2363
*Defence Health data**	*AHA or CPHE*	1355	649
	CPHE	1242	606
Defence Psychology data	*RtAPS*	648	n/a
	POPS	484	n/a
Self-report data	*Health and Demographics questionnaire*	2342	860
	Deployment questionnaire	1965	n/a

*3197 medical record paper files were accessed for this study (one per person)

CMVH self-report

30. CMVH self-report data (a Health and Demographics questionnaire and/or a Deployment questionnaire) was collected from 45% (n=3202) of the study sample. Table 1.2 details the characteristics of respondents and non-respondents.

Table 1.2: Characteristics of questionnaire respondents and non-respondents at the time of the study

Characteristic		*Respondents n (%)*	*Non-respondents n (%)*	*p-value*[1]
Study arm	Veteran	2342 (73)	2433 (62)	<.001
	Comparison	860 (27)	1503 (38)	
Sex	Male	2765 (86)	3383 (86)	0.625
	Female	437 (14)	553 (14)	
Age group	20-29	249 (8)	570 (14)	<.001
	30-39	1437 (45)	2039 (52)	
	40+	1516 (47)	1327 (34)	
Service	Navy	826 (26)	1288 (33)	<.001
	Army	2227 (70)	2492 (63)	
	RAAF	149 (5)	156 (4)	
Employee status[2]	Active	2749 (86)	2457 (63)	<.001
	Ex-serving	453 (14)	1470 (37)	
Service type[2]	Regular/Permanent	1908 (60)	2391 (61)	0.328
	Reserve	1283 (40)	1533 (39)	
Rank[2]	Officer	1025 (32)	859 (22)	<.001
	Enlisted	2177 (68)	3068 (78)	

[1]Chi-square test for association
[2]These data were not obtained for all the participants
NB – In tables throughout the report percentages may not total 100% as a result of rounding to whole numbers

31. A significantly higher percentage of questionnaire respondents were in the veteran arm compared with the comparison arm, possibly reflecting increased motivation or willingness to participate by those who had deployed to Bougainville. A lower response rate by controls is not an unexpected finding in case-control studies. The significance level of this difference at least in part reflects the magnitude of the study numbers, and the consequential increase of power.

32. As in the Solomon Islands Health Study, response also differed significantly according to age group (higher response by older individuals), Service (lower response by Navy), employee status (higher by currently active members than ex-serving), and rank (higher by officers). Service type and sex were not associated with response.

Table 1.3: Characteristics of veteran and comparison group questionnaire respondents

Characteristic		*Veterans n (%)*	*Comparisons n (%)*	*p-value*[1]
Sex	Male	2031 (87)	734 (85)	0.316
	Female	311 (13)	126 (15)	
Age group	20-29	179 (8)	70 (8)	0.437
	30-39	1067 (46)	370 (43)	
	40+	1096 (47)	420 (49)	
Service	Navy	585 (25)	241 (28)	0.200
	Army	1649 (70)	578 (67)	
	RAAF	108 (5)	41 (5)	
Employee status	Active	2034 (87)	715 (83)	0.008
	Ex-serving	308 (13)	145 (17)	
Service type[2]	Regular/Permanent	1399 (60)	509 (60)	0.856
	Reserve	937 (40)	346 (40)	
Rank	Officer	790 (34)	235 (27)	<.001
	Enlisted	1552 (66)	625 (73)	

[1]Chi-square test for association
[2]These data were not obtained for all the participants

33. There were no significant differences between the responding veteran and comparison group members in sex, age group, Service or service type. Although differences were very small in magnitude, responding Bougainville veterans were significantly more likely to be active members than were the comparison group. They were also more likely to be officers than the comparison group.

Table 1.4: Self-reported number of deployments since 1997

Number of deployments	*Veterans n (%)*	*Comparisons n (%)*
0	21 (1)	226 (35)
1	613 (35)	269 (41)
2	637 (37)	92 (14)
3	326 (19)	23 (4)
4	98 (6)	7 (1)
5 or more	48 (3)	34 (5)
Not specified	420	152

34. As part of the consent process participants were asked to complete a table detailing the locations of any of their deployments. This included locations such as Afghanistan, Iraq, East Timor, Cambodia, and Vietnam. Not included in the list were

deployments such as Operation Sumatra Assist or Operation Pakistan Assist, although there was opportunity for participants to list additional deployments in the 'other, please specify' section.

35. Table 1.4 shows a rudimentary presentation of the number of deployments Bougainville veterans and the comparison group had been on since 1997. Not included in this table are deployments listed in the 'other' section, or the possibility of multiple deployments to the same location. While it is reasonable to expect that no Bougainville veterans would have indicated that they had been on no deployments, it is plausible that while the sources consulted indicated that an individual officially deployed, participants may have believed that they did not deploy for enough time or under such conditions or circumstances as to define it as a deployment. Alternatively, it is possible that there was an error in one of the data sources. For example, this might occur if an individual was scheduled for deployment but was withdrawn immediately prior to departure.

36. Examination of Table 1.4 reveals that Bougainville veterans had been on roughly one more deployment than the comparison group, which is exactly what would be expected, with the additional deployment being to Bougainville. This is an indication that the majority of the comparison group (65%) has been fit to deploy.

Table 1.5: Number of deployments by members of the Bougainville study group to MEAO, after 2001

	Veterans	*Comparisons*
Number of deployments	*n (%)*	*n (%)*
Did not deploy to MEAO	1684 (78)	639 (80)
Deployed to MEAO at least once	479 (22)	164 (20)

37. Table 1.5 shows the number of people in each arm of the study who have deployed to the Middle East Area of Operations (Iraq, Afghanistan, Persian Gulf, Kuwait, and Middle East) since 2001. Again, the table is rudimentary as it has not considered: deployments written in the 'other, please specify' section; multiple deployments; and, those who have deployed but not specified a location. What the table clearly shows is that a very similar proportion of both the Bougainville veteran group and the comparison group have deployed to the MEAO.

Defence Health records

38. Table 1.6 shows details for the Defence Health records collected.

Table 1.6: Defence Health record data collection according to characteristics of study sample

Characteristic		*File collected n (%)*	*File not collected*[3] *n (%)*	*p-value*[1]
Study arm	Veteran	1534 (67)	3232 (67)	0.707
	Comparison	771 (33)	1592 (33)	
Questionnaire	Respondent	1127 (49)	2075 (43)	<.001
	Non respondent	1178 (51)	2749 (57)	
Sex	Male	1945 (84)	4196 (87)	0.003
	Female	360 (16)	628 (13)	
Age group	20-29	310 (13)	508 (11)	<.001
	30-39	1183 (51)	2289 (47)	
	40+	812 (35)	2027 (42)	
Service	Navy	783 (34)	1327 (28)	<.001
	Army	1446 (63)	3270 (68)	
	RAAF	76 (3)	227 (5)	
Employee status	Active	1250 (54)	3956 (82)	<.001
	Ex-serving	1055 (46)	868 (18)	
Service type[2]	Regular/Permanent	1717 (75)	2582 (54)	<.001
	Reserve	584 (25)	2232 (46)	
Rank	Officer	500 (22)	1384 (29)	<.001
	Enlisted	1805 (78)	3440 (71)	

[1]Chi-square test for association
[2]These data were not obtained for all the participants
[3] See Annex F for a complete explanation of the collection of the Defence Health records

39. Table 1.6 compares those for whom the study did and did not retrieve Defence Health records. Defence Health record collection did not differ according to study arm or sex of the Defence member. Record collection did differ significantly ($p<0.001$) according to questionnaire response (higher for non-respondents), age group (higher for younger), Service (higher for RAAF), employee status (higher for active), service type (higher for regular than reserve) and rank (higher for enlisted than officers).

40. Many of these differences reflect study strategy for obtaining reduced targets of Army (25%) and Navy (50%) records for actively serving members. The most notable difference was the higher retrieval rate for ex-serving members, which reflects the central storage location of their UMRs compared with UMRs for serving members, which were situated in hundreds of different locations including at sea and on current overseas deployment.

Table 1.7: Study characteristics of veteran and comparison group members for whom Defence Health records were retrieved

Characteristic		*Veterans n (%)*	*Comparisons n (%)*	*p-value*[1]
Questionnaire	Respondent	810 (53)	317 (41)	<.001
	Non respondent	724 (47)	454 (59)	
Sex	Male	1294 (84)	651 (84)	0.960
	Female	240 (16)	120 (16)	
Age group	20-29	198 (13)	112 (15)	0.557
	30-39	791 (52)	392 (51)	
	40+	545 (36)	267 (35)	
Service	Navy	518 (34)	265 (34)	0.957
	Army	965 (63)	481 (62)	
	RAAF	51 (3)	25 (3)	
Employee status	Active	888 (58)	362 (47)	<.001
	Ex-serving	646 (42)	409 (53)	
Service type[2]	Regular/Permanent	1152 (75)	565 (73)	0.370
	Reserve	380 (25)	204 (27)	
Rank	Officer	370 (24)	130 (17)	<.001
	Enlisted	1164 (76)	641 (83)	

[1]Chi-square test for association
[2]These data were not obtained for all the participants

41. Individuals with a Defence Health record retrieved in the veteran group were more likely to be currently serving than individuals in the comparison group. Veterans with health record data were more likely than the comparison group to be officers, which may reflect longer-serving status (but not an age difference) or an increased likelihood of promotion associated with the deployment.

Table 1.8: Defence Health record (UMR or CMR) availability

	Files requested	*Files available n (%)*
Navy	2027	996 (49)
Army	2511	2073 (82)
RAAF	301	128 (43)
Total	4839	3197 (66)

42. Health records were collected for 66% of those requested. The highest rate of collection was for the Army personnel (82%).

Defence psychological screening records

43. All available Defence psychological screening records for the Bougainville deployment were analysed by PRTG. While there was a limited number of screens available in the database (648, 14%), the RtAPS process did not commence until 1999, two years after the start of the Bougainville deployments, and only standardised to its current format in 2003, close to the end of the deployment. This is discussed in greater detail in Chapter 2.

Discussion

44. The aim of the Bougainville Health Study was to conduct an investigation of the health status of all ADF personnel who deployed to Bougainville between November 1997 and August 2003 as part of Operations BEL ISI I & II, relative to an appropriate comparison group who were ADF members at the time, but did not deploy on these operations.

45. The overall response to the questionnaire was adequate (45%), but there were some potential biases identified based on differential response according to characteristics. These were adjusted for as described above.

46. The modified Defence Health record retrieval strategy aimed to collect around 50% of the total numbers of records originally planned. Figures indicate a substantial number of cases where Defence Health data will be available for those who chose not to respond to the questionnaire, which is a factor supporting its collection and potential role in health surveillance. Careful comparisons need to be made between data from the different sources in the context of non-random availability and response.

47. Apart from these limitations, and the differences in the composition of data from the two sources which have been detailed in this chapter, both sources lend weight to the preliminary findings presented in the following chapters:

a. Chapter 2 explores the mental health consequences associated with deployment.

b. Chapter 3 discusses the impact on general health problems of deployment.

c. Chapter 4 examines health behaviours—tobacco smoking, alcohol consumption and Body Mass Index.

d. Chapter 5 reports on deployment-specific exposures and hazards.

e. In Chapter 6 the findings are synthesised and conclusions drawn.

48. Further research is planned to elucidate these findings and continue to build a body of knowledge in veterans' health.

Chapter 2 – Are increased rates of negative mental health consequences associated with deployment?

Introduction

49. Research suggests that personnel involved in warlike operations and peacekeeping missions, such as Operation BEL ISI, may be at greater risk for increased symptoms of psychological distress[9, 11, 12]. Clearly, maintaining a mentally fit and healthy Australian Defence Force is essential.

50. The aim of the current chapter is to analyse, compare and report on various measures of mental health collected by CMVH and Defence during their routine post-deployment psychological screens.

Methods

Data source:

51. Data for the current chapter were drawn from the Defence Health and Psychological screening records and the CMVH self-report questionnaire.

Defence Psychological screening records

52. Analysis of Defence Psychological screening records relies on their entry into the Psychology Research and Technology Group (PRTG) database. PRTG, as part of the Defence Health Services Division (DHSD), is the custodian of the electronic database containing the Return to Australia Psychological Screen (RtAPS) and Post Operational Psychological Screen (POPS) data. While psychological briefing and/or mental health screening has been administered to ADF personnel deployed on various operations from the late 1980s, the structure of the process only began to be formalised in 1999[13]. Between 1999 and 2003 the formal psychological screening process moved through several iterations, reaching close to its present format around the end of 2002. It was then that the Post Deployment Questionnaire (PDQ) became known as the RtAPS and the Mental Health Screen (MHS) known as POPS. Both screens contain the Kessler 10 (K10) and Post-traumatic Stress Disorder Check List – Civilian (PCL-C), which are also used in CMVH's self-report questionnaire.

53. Operations in Bougainville commenced in November 1997, prior to the formal psychological screening process commencing. The end date for inclusion in this health study is 26 August 2003, a comparatively short time after the screening process stabilised into its current form.

54. Due to the number of different versions of the RtAPS and POPS screening forms used over this period, CMVH has chosen to focus on the K10 and PCL-C. These scales were used more consistently than others over the relevant period, they have standard screening cut-offs used by Defence and were able to be compared with the self-report data.

55. The data set available for potential analysis is also reduced as data entered into the database for approximately 12 months, between 1999 and 2001, excluded any operational mental health data and identifying information. This makes it impossible to establish whether data collected belongs to an individual selected as part of the study. Finally, data collected from mental health screens administered to RAN

personnel deployed on board ships between 2001 and April 2003 is not held by PRTG. Nonetheless, K10 and PCL-C data for some Defence members who deployed to Bougainville was available from the PRTG database.

56. Defence Psychological screening data were sourced from the electronic files managed by PRTG. Data were supplied to CMVH in two ways. In the study consent forms participants were asked to provide consent to several items, including permission to link information contained in their Defence Psychological screening records.

57. PRTG provided to CMVH the RtAPS and POPS data for those respondents who specifically consented to the linkage of their RtAPS and POPS with their self-report data. For those who had not provided explicit consent, including those who were unable to be contacted for this study, PRTG conducted analysis designed and requested by CMVH and provided the results of these analyses.

Description of RtAPS and POPS (current format)

58. The RtAPS is usually completed just prior to re-deployment to Australia. It is used to collect a number of demographic details including Service, rank, unit and sex and then asks a series of questions about the deployment experience. The current RtAPS questionnaire contains the following psychological scales and instruments:

a. Kessler Psychological Distress Scale – 10 (K10)

b. Post-traumatic Stress Disorder Check List – Civilian (PCL-C)

c. Traumatic Stress Exposure Scale - Revised (TSES-R)

d. Major Stressors Checklist

59. The POPS is usually completed within three to six months of return from theatre. It is also used to collect some demographic information, the K10, PCL-C and the Alcohol Use Disorder Identification Test (AUDIT) scales. Documentation of the K10 and PCL-C is detailed in the Defence Health Bulletin No 9/2003[14].

60. Some earlier iterations of RtAPS and POPS contained different psychological scales. We have chosen to analyse only screens containing at least one of the K10 or PCL-C scales. The Major Stressor Checklist and the TSES-R address exposures on deployment. These will be examined in Chapter 5.

Defence Health records

61. Some analysis reported in the current chapter is based on data from the AHA and the CPHE, which have been previously described. Some data items are contained on only the AHA or only the CPHE. The stress items relevant to the current issue are contained on both forms. Accordingly, data from the most recent of either the AHA or the CPHE were used.

CMVH self-report

62. Methods of CMVH self-report data collection have been previously described. The particular items used and their source is described below.

Items

K10 (Defence Psychological screening records and CMVH self-report questionnaire)

63. The K10 is a scale measuring non-specific psychological distress. It consists of 10 questions and aims to measure the level of anxiety and depressive symptoms a person may have experienced in the four weeks prior to questionnaire completion. The scores for each question are added to produce a score between 10 and 50.

64. A set of cut-off scores for the K10 was developed by the Clinical Research Unit for Anxiety and Depression (CRUfAD), School of Psychiatry, University of New South Wales to determine the prevalence of anxiety and depressive disorders[15].

a. People who score 10-15 report a low level of psychological distress. They have one quarter the population risk of meeting criteria for an anxiety or depressive disorder as identified by the Composite International Diagnostic Interview (CIDI)[16]. There is a remote chance of these individuals reporting a suicide attempt in their lifetime.

b. People who score 16-29 report a medium level of psychological distress. They have a one in four chance (three times the population risk) of having a current anxiety or depressive disorder. They have a 1% chance (three times the population risk) of ever having made a suicide attempt.

c. People who score 30-50 report a high level of psychological distress. They have a three out of four chance (20 times the population risk) of ever having made a suicide attempt.

PCL-C (Defence Psychological screening records and CMVH self-report questionnaire)

65. The PCL-C is a self-report rating scale for assessing the 17 Diagnostic and Statistical Manual Version 4 (DSM-IV)[17] symptoms of PTSD.

66. The PCL-C is a 17 item scale that has five response categories for each item. The total score is calculated by adding the scores on the 17 items and ranges from 17 to 85. In the Vietnam Veterans' Health Study, a cut-off of 50 on the PCL was found to be a good predictor of a PTSD diagnosis[14]. Additionally, where appropriate, we evaluated outcomes on the PCL-C using the specific definition of caseness on the PCL-C, which required subjects to report at least one intrusion symptom, three avoidance symptoms, and two hyperarousal symptoms that were categorised as the moderate level and to score at least 50[18].

Stress questions (Defence Health records, AHA/CPHE)

67. Two questions were asked on stress:

a. How often do you feel that your lifestyle is putting you under too much stress? (Frequency of stress question – response options: often; sometimes; seldom; never).

b. During the past two weeks how much stress have you experienced? (Quantity of stress question – response options: a lot; a moderate amount; relatively little; almost none at all).

Statistics

68. Associations between Bougainville deployments and high scores on the K10 and the PCL-C scales were assessed using logistic regression. Logistic regression was also used to compare the proportion of people who reported they were put under too much stress 'often' and those who reported 'a lot' of stress in the last two weeks between the study groups. Adjusted and unadjusted odds ratios associated with deployment to Bougainville were calculated. These results were similar, so only the adjusted ratios were presented. The scores on the psychological scales between RtAPS and POPS and between RtAPS and the self-report questionnaire were compared using the paired t-test. The categorical outcomes from the PCL-C and K10 scales were compared between different sources using McNemar's test and the asymptotic test for symmetry respectively.

Results

Participation

69. The data presented in this chapter include data drawn from CMVH's self-report questionnaire and Defence Health and Psychological screening records. The participation rates associated with each type of data collection have been previously described in Chapter 1.

Stress questions from the Defence Health data

Table 2.1: Stress questions from Defence Health records

		Veterans	*Comparisons*			
		n (%)	*n (%)*	*Odds Ratio*[a]	*95% CI*	*p-value*
Stress from present lifestyle	Often	136 (10)	55 (9)	1.22[b]	(0.87, 1.69)	0.243
	Sometimes	462 (35)	232 (36)			
	Seldom	509 (38)	246 (38)			
	Never	229 (17)	108 (17)			
	Not specified	19	8			
Stress in the past 2 weeks	A lot	123 (9)	61 (10)	0.96[c]	(0.69, 1.32)	0.781
	A moderate amount	392 (29)	208 (32)			
	Relatively little	499 (37)	216 (34)			
	Almost none at all	320 (24)	156 (24)			
	Not specified	21	8			

[a] Adjusted for sex, age (20-29, 30-39 and 40+), Service and rank
[b] Often v Sometimes, seldom or never
[c] A lot v A moderate amount, relatively little or almost none at all

70. Table 2.1 shows that there was little or no difference in the number of Bougainville veterans or comparison group members reporting stress from their present lifestyle as 'often' (OR 1.22, 95% CI (0.87, 1.69)) or 'a lot' in the last two weeks (OR 0.96, 95% CI (0.69, 1.32)). Overall, 45% of all personnel felt stress

'sometimes' or 'often' and the amount of stress was either 'moderate' or 'a lot' for 40% of personnel.

K10 and PCL-C from the CMVH self-report questionnaire

Table 2.2: K10 and PCL-C categories for Bougainville veterans and the comparison group (source = self-report questionnaire)

		Veterans n (%)	*Comparisons n (%)*	*Odds Ratio (95% CI)*[a]	*p-value*
K10	10-15	1224 (56)	481 (59)		
	16-29	856 (39)	278 (34)		
	30-50	121 (5)	53 (7)	0.88(0.63,1.23)[b]	0.444
	Not specified	141	48		
PCL-C~	0-49	1954 (94)	715 (92)		
	50-85	123 (6)	61 (8)	0.77(0.56,1.06)[c]	0.109
	Not specified	265	84		

[a]Adjusted for sex, age group (20-29, 30-39 and 40+), Service and rank
[b]K10 30-50 v 10-29
[c]PCL-C 50-85 v 17-49

71. The distribution of the K10 categories was marginally different between the Bougainville veterans and the comparison group ($\chi^2_2 = 5.9$, p = 0.05), although the odds of scoring in the highest K10 category (30-50) was not significantly different between the groups.

72. The proportion of respondents in the self-report questionnaire who recorded scores over 50 on the PCL-C was similar for the Bougainville veterans and the comparison group (6% and 8% respectively). After adjusting for demographic characteristics, the odds of scoring in the 50-85 category was 23% lower in the Bougainville veteran group compared with the comparison group (OR 0.77, 95% CI (0.56, 1.06)), although this difference was not significant.

73. Using the specific criteria of the PCL-C (requiring meeting symptom criteria in addition to a score of 50 or above), the percentage scoring in the highest risk category were reduced slightly to 6% in the Bougainville veterans and 7% in the comparison group, not sufficient to influence the outcomes described (OR 0.77, 95% CI (0.56, 1.08)).

74. The mean and median values of the K10 score were very similar between the veterans and the comparison group (veterans Median = 15, Mean = 16.6, SD = 6.7 and comparison group Median = 14, Mean = 16.4, SD = 6.7). A Wilcoxon-Mann-Whitney test failed to show a difference between these scores (p = 0.38). Similarly, there was little difference between the mean and median values of the PCL-C between the veterans and the comparison group (veterans Median = 23, Mean = 26.5, SD = 11.2 and comparison group Median = 22, Mean = 26.9, SD = 12.4, p = 0.55).

RtAPS data

75. RtAPS data corresponding to the Bougainville deployment were extracted for 648 of the 4775 Bougainville veterans (14%). A K10 or PCL-C score was available on 113 and 112 RtAPS records respectively.

76. Eighty-five RtAPS records (76%) had scores in the low level distress category of the K10 scale, 26 (23%) at the medium level of distress, and one (1%) in the high level distress bracket. The mean K10 total score was 13.9 (SD 4.8).

77. None of the Bougainville veterans had a PCL-C score close to or above 50. The highest PCL-C was 32, the mean being 19.8 (SD 3.7).

RtAPS and POPS

78. There were 34 Bougainville veterans who had an RtAPS record and corresponding POPS record which contained a completed K10 and 34 who had a completed PCL-C scale at both screens.

Table 2.3: K10 scores from RtAPS and from POPS matched by person

	K10 from POPS			
K10 from RTAPS	*10-15*	*16-29*	*30-50*	*Total*
	n (%)	*n (%)*	*n (%)*	
10-15	20 (59)	7 (21)	0 (0)	27
16-29	5 (15)	2 (6)	0 (0)	7
30-50	0 (0)	0 (0)	0 (0)	0
Total	25	9	0	34

79. For the people who had both an RtAPS and a POPS record containing a K10 score, the mean and median scores were very similar at both screens (RtAPS Median = 13, Mean = 13.8, SD = 3.8 and POPS Median = 12.5, Mean = 13.7, SD = 4.3). A Wilcoxon signed rank test failed to show a difference between these scores (p = 0.94). Twenty-one percent scored in a higher category on POPS than RtAPS, whereas 15% had a higher K10 score on RtAPS (Table 2.3). However, McNemar's test did not show strong evidence of a difference between the distribution of K10 categories at these two screens (p = 0.56).

Table 2.4: PCL-C scores from RtAPS and from POPS matched by person

	PCL-C from POPS		
PCL-C from RtAPS	*17-49*	*50-85*	*Total*
	n (%)	*n (%)*	
17-49	34 (100)	0 (0)	34
50-85	0 (0)	0 (0)	0
Total	34	0	34

80. All people who had a PCL-C on both the RtAPS and POPS screens scored in the 17-49 category on both occasions. The mean and median scores on the PCL-C scales were similar at both screens (Median = 18.5, Mean = 20.2, SD = 3.8 on RtAPS, and Median = 12.5, Mean = 21.2, SD = 6.5 on POPS). A Wilcoxon signed rank test did not indicate any difference between these scores (p = 0.52).

RtAPS and CMVH self-report questionnaire

Table 2.5: K10 scores from RtAPS and from self-report questionnaire matched by person

	K10 from self-report questionnaire			
K10 from RTAPS	*10-15*	*16-29*	*30-50*	*Total*
	n (%)	*n (%)*	*n (%)*	
10-15	19 (45)	11 (26)	2 (5)	32
16-29	3 (7)	7 (17)	0 (0)	10
30-50	0 (0)	0 (0)	0 (0)	0
Total	22	18	2	42

81. There were 42 Bougainville veterans who completed the CMVH self-report questionnaire, consented to linkage with their Defence Psychological screening records and who had RtAPS K10 data corresponding to a Bougainville deployment. The mean K10 score was higher on the self-report questionnaire (Mean = 16.4, SD = 6.1) than on RtAPS (Mean = 13.6 SD = 3.2). The Wilcoxon signed rank test showed a significant difference between these scores ($p = 0.002$). Thirty-one percent scored in a higher K10 category on the self-report questionnaire than at RtAPS, whereas seven percent were higher at RtAPS (Table 2.5). The test for symmetry indicated that there was some evidence of a difference in the distribution of the K10 categories collected from these different sources ($p = 0.037$).

82. The pattern of respondents recording a higher total K10 score on the self-report questionnaire is also illustrated in Figure 2.1, where the majority of data points lie above the line of equality plotted.

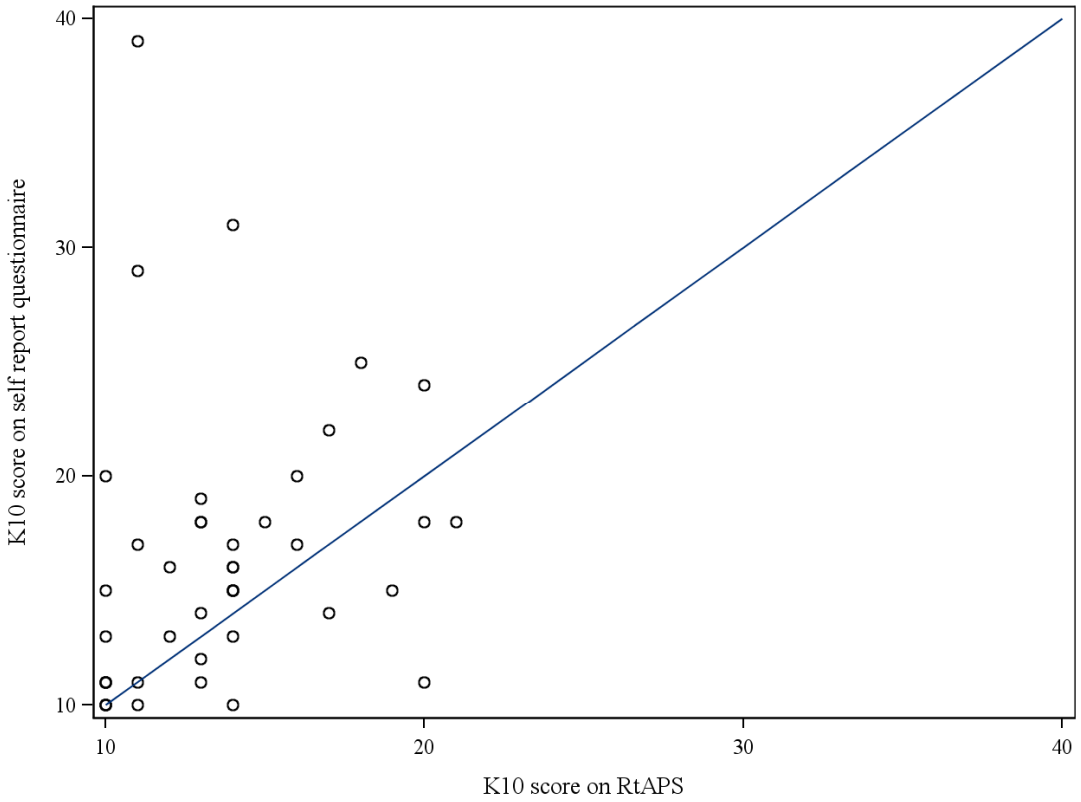


Figure 2.1: Scatterplot comparing K10 scores from the self-report questionnaire with those from the RtAPS assessment.

Table 2.6: PCL-C scores from RtAPS and from self-report questionnaire matched by person

	PCL-C from self-report questionnaire		
PCL-C from RTAPS	*17-49*	*50-85*	*Total*
	n (%)	*n (%)*	
17-49	39 (95)	2 (5)	41
50-85	0 (0)	0 (0)	0
Total	39	2	41

83. Consistent with the K10 results observed, the mean PCL-C score was higher on the self-report questionnaire (Mean = 25.8, SD = 11.1) than on the RtAPS (Mean = 20.0, SD = 3.5) (Table 2.6 and Figure 2.2). A Wilcoxon signed rank test showed a significant difference between these scores ($p < 0.001$). Ninety-five percent scored below a cut-off of 50 on category on both the self-report questionnaire and the RtAPS. McNemar's test indicated that there was little evidence of a difference in the in the number scoring in the 50-85 PCL-C categories collected from these different sources ($p = 0.16$).

84. Figure 2.2 shows that more people recorded a higher PCL-C score on the self report questionnaire, as the majority of points lie above the line of equality.

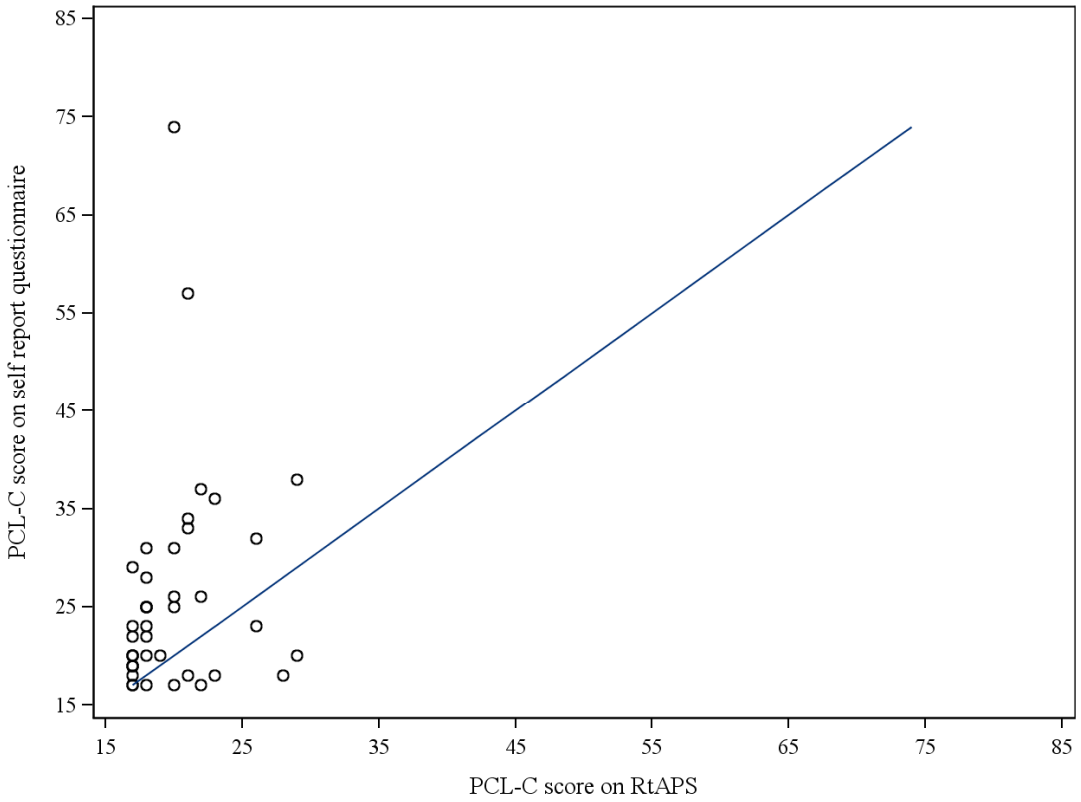


Figure 2.2: Scatterplot comparing PCL-C scores from the self-report questionnaire with those from the RtAPS assessment.

Discussion

85. Data from the Defence Health records showed that in the two weeks prior to the individuals' most recent AHA or CPHE, 45% of all Defence personnel from whom records were collected had felt stressed at least sometimes. For almost 40 % of personnel the amount of stress was moderate or more.

86. Data from the CMVH self-report questionnaire suggested that there were no significant differences between the Bougainville veterans and the comparison group in the mean scores or the proportions in the highest risk category on either the K10 or the PCL-C. Although, on both screens the proportion of respondents reporting in the higher (more distress) categories was greater for the comparison group.

87. There were no statistically significant differences in outcomes on the PCL-C between the Bougainville veterans or the comparison group (Table 2.2). Six percent of all respondents scored above 50 on the PCL-C, a cut-off score that is found to be a good predictor of PTSD and is the cut-off referred to in many similar international studies[18-21].

88. CMVH self-report data showed 44% of Bougainville veterans had K10 scores in the medium or high level categories and 6% scored above the cut-off of 50 on the PCL-C (Table 2.2). The outcomes from the grouped RtAPS data showed a smaller proportion of people in these higher categories (24% and 0% respectively), representing quite different proportions of people who may have been recommended for further assessment based on the guidance on follow-up in Health Bulletin No 9/2003 – Australian Defence Force Mental Health Screen [14]. It should be

remembered that the comparison group is not included in these comparisons as, by definition, they did not have the RtAPS or a POPS screens associated with deployment to Bougainville.

89. When comparing K10 scores at RtAPS with those at POPS matched by person (Table 2.3), there was no change in category scores between the two screens for 65% of those who completed both screens. Tests for symmetry indicated that the proportions of those who changed categories, either up or down, were approximately equal. The means scores on this scale were at a level that does not suggest distress.

90. Similarly, for those individuals who had records with PCL-C data in the PRTG database for both the RtAPS and POPS screens, no individual scored above 50 at either screen and the mean scores were very low, perhaps reflecting the comparatively benign nature of the deployment (Table 2.4).

91. However, when comparing K10 and PCL-C category scores from the self-report data and RtAPS, there appears to be a trend towards either lower levels of reporting during collection of data by Defence sources, or higher levels of reporting on the self-report questionnaire (Tables 2.5 and 2.6, Figures 2.1 and 2.2.)

92. When interpreting outcomes as measured by RtAPS and POPS in the military environment, there could be a bias towards the under-reporting of symptoms, particularly as the setting is one where the member is keen to get home, where identity is not anonymous, and where outcomes may be perceived as influencing later career progression. Consequently, it is difficult to establish appropriate screening cut-off points[22-24]. Further, information gained from community samples and non-occupational settings is likely to be inappropriate when used in a military setting. However, given the relatively small sample size for which completion of RtAPS and POPS is documented, it is difficult to draw any conclusions. There are also other potential factors that may contribute to overall differences between the self-report data and the Defence collected screens including:

a. Data collected as part of the RtAPS process were, by the location and circumstance of data collection, explicitly linked to the particular deployment. In responding to the self-report questionnaire, this link was more tenuous and respondents may have considered issues that caused them distress that occurred outside a military environment or attributable to other deployments.

b. The variations in the timing of the data collections and the possibility that time (e.g. opportunity for impact to develop) or events since the collection of the Defence Health data, have exacerbated (or mitigated) the outcomes.

c. The Defence environment has changed since the deployment to Bougainville commenced. For example, an increase in operational tempo may have impacted on these measures.

d. Some individuals may have changed their serving status since the Defence data were collected. Current outcomes may reflect factors associated with ex-serving rather than serving status.

e. Increasing awareness of mental health issues and the military compensation system may also influence reporting.

Strengths and limitations

93. Several limitations are associated with this evaluation of the reported levels of mental distress in current and ex-serving members of the ADF. As described earlier, changes in policy and process in the ten years since the RtAPS and POPS formally commenced have been significant. As the Bougainville deployment started before the Defence screening process was formalised and finished a comparatively short time after it stabilised, the absolute amount of screens entered into PRTG's database and available for analysis was not large. Further, choosing the K10 and PCL-C as the scales of interest resulted in an even larger number of 'missing' screens and a lack of power to detect differences between groups.

94. K10 and PCL-C were used later in the screening process and consequently screen the mental health of those who deployed later. It may be that earlier deployments to Bougainville were more arduous and this is a source of bias in the data.

95. Similarly, we know from the evaluation of demographic differences between respondents (see Chapter 1) that there are systematic differences between those who responded and those who did not. For example, it was more difficult to contact ex-serving members of the ADF and consequently a smaller proportion of these individuals participated in the study. A proportion of people who leave Defence do so for reasons of ill-health which again may bias the results. However, it would be reasonable to anticipate that those who left because of their health would be more likely to report higher levels of distress, increasing the difference between levels of mental health reported at RtAPS and reported on the self-report questionnaire.

96. Finally, within the self-report data 8% of K10 category scores and 13% of PCL-C scores were categorised as missing. If a participant had accidently neglected to answer even one question that formed part of the scale then their summary score on that scale was coded as missing. Hence, the number of missing PCL-C scores is greater than the number of K10 scores, as in order to create a summary PCL-C score the participant must respond to 17 separate items, compared with only 10 on the K10.

Further Research

97. CMVH has collected the same data (self-report and Defence psychology measures of mental health) in two other studies (the East Timor Health Study and the Solomon Islands Health Study). The general pattern of results has been similar, with an increased level of reporting of distress on the self-report questionnaire compared with the data collected at RtAPS and POPS. In the East Timor Health Study, the amount of data available from PRTG was greater, in part due to the deployment commencing two years after the deployment to Bougainville. This meant that the differences between the self-report questionnaire and the RtAPS data reached the level of significance.

98. Clearly further research exploring the reasons for these differences is warranted. Areas for exploration may include closer evaluation of all data from the Near North Area of Influence (NNAI) studies; evaluating free text comments associated with responses to the PCL-C for descriptions of events that are causing distress; and, further evaluation of data collected during the new research due to commence in 2009, the Middle East Area of Operations Health Study. In the future,

Chapter 3 – Do Bougainville veterans have different general health problems from an ADF comparison group who did not deploy to Bougainville?

Introduction

99. This chapter investigates whether there was a relationship between deployment to Bougainville and ill-health using the symptoms checklist, subscales of the SF-36 and reproductive health outcomes.

Methods

Data Source:

100. Data for this chapter were drawn exclusively from self-report data collected in the health questionnaire, which was completed by both Bougainville veterans and the comparison group. The methodology for self-report data collection was described in Chapter 1.

CMVH self-report

101. The health questionnaire included topics covering various aspects of physical health, mental health and various demographics.

Items

General Health Questions

102. The general health question is the first question of the SF-36. This question can be used to measure the respondents' perception of their general health (excellent, very good, good, fair or poor). A question was also included which asked the participant to rate their health now compared to one year ago.

Subscales of SF-36

103. Three subscales of the SF-36 were included in the health questionnaire: General Health (GH), Role Physical (RP), and Social Functioning (SF). GH assessed how general personal health is perceived by the respondent; RP assessed limitations in work and other daily activities as a result of physical health; and SF assessed interference with normal social activities caused by physical or emotional problems[25]. The responses to these questions provided a score between 0 and 100 for each subscale (where 100 represents the most positive health score on each scale).

Symptoms

104. The 67 item self-report symptom list was used to ask about the occurrence of symptoms in the past month, and whether the severity of those symptoms was "mild", "moderate", or "severe". This list of items, adapted from the Australian Gulf War Study, is an expanded version of the 50 item list used in the Op TELIC study of UK Gulf War Veterans, which was based on the Hopkins Symptom Checklist. The items are analysed by the frequency of symptoms and the total number of symptoms.

Pregnancy and Child illnesses

105. This section was included to investigate any associations between deployment exposures and attempted or actual pregnancies for female veterans or male veterans' partners. The items were used to compare presence of abnormal reproductive outcomes (live birth, miscarriage, etc) or congenital abnormalities. The

questions are adapted from King's College Op TELIC study of UK Gulf War Veterans.

106. To assess the effect of deployment to Bougainville on the number of living children and their gender distribution, events since 20 September 1998 were analysed. This date, applied to the veteran and comparison groups, was 10 months from the start date of Operation BEL ISI I. This meant that all pregnancies conceived before the start date of the first deployment to Bougainville were excluded.

Statistics

107. The average scores on the subscales of the SF-36 were compared using a t-test. The prevalence and total number of symptoms were calculated for respondents. People who did not respond to any of the symptoms questions were excluded from this comparison. The prevalence of the symptoms was compared using logistic regression and the total number of symptoms modelled using negative binomial regression, which allowed for a greater dispersion of counted values than Poisson regression. Likelihood ratio tests were used to compare the effect of deployment on a variety of measures across age, sex, Service and rank. Adjusted and unadjusted ratios associated with deployment to Bougainville were calculated. These results were similar so only the adjusted ratios were presented.

Results

108. In both study groups, 41 % of respondents perceived their general health to be 'very good' or 'excellent'. The proportion reporting 'poor' general health was 2.1% of Bougainville veterans and 3.1% of the comparison group.

Table 3.1: Perception of general health for the Bougainville study group

	Veterans	*Comparisons*
Response	*n (%)*	*n (%)*
Excellent	206 (9)	72 (9)
Very good	733 (32)	274 (32)
Good	933 (41)	320 (38)
Fair	363 (16)	153 (18)
Poor	48 (2)	26 (3)
Not specified	12	8

109. The majority of Bougainville veterans (65%) reported that their health was the same as one year ago, with 15% reporting improved health and 19% reporting worse health. These percentages were comparable to those in the comparison group ($p = 0.82$).

110. The mean scores associated with the SF-36 subscales general health, role physical and social functioning were similar between the two study groups (Table 3.2).

Table 3.2: SF-36 scales for the Bougainville study group

Scale	*Veterans (n=2295) Mean (SD)*	*Comparisons (n=853) Mean (SD)*	*Difference Δ (95% CI)*	*p-value*[1]
General Health	64.3 (21.1)	63.1 (22.1)	-1.2 (-2.9, 0.5)	0.180
Role limitation due to physical health	72.7 (35.3)	73.2 (35.8)	0.5 (-2.4, 3.3)	0.739
Social functioning	79.3 (24.0)	78.7 (24.9)	-0.6 (-2.5, 1.3)	0.543

[1]T-test for difference between means

111. The most common symptoms reported by respondents were fatigue, feeling unrefreshed after sleep and sleeping difficulties, with approximately 60% of respondents recording these events (Table 3.3). The prevalence of the top 15 symptoms was similar between the study arms, except for the symptom 'general muscle aches and pains', which was lower in Bougainville veterans (OR 0.82, 95% CI (0.70, 0.96)). The odds ratios displayed in Table 3.3 have been adjusted for sex, age group, Service (Navy, Army or RAAF) and rank.

112. Figure 3.1 shows the prevalence of all 67 symptoms was similar between Bougainville veterans and the comparison group with no clear increase associated with deployment.

Table 3.3: Top 15 symptoms reported by people in the Bougainville study group

Symptom	*Veterans n (%)*	*Comparisons n (%)*	*Odds Ratio[1] (95% CI)*
Fatigue	1463 (63)	534 (62)	1.04 (0.89, 1.23)
Feeling unrefreshed after sleep	1388 (60)	514 (60)	1.01 (0.86, 1.19)
Sleeping difficulties	1360 (59)	492 (57)	1.07 (0.91, 1.26)
Low back pain	1240 (53)	482 (56)	0.91 (0.78, 1.07)
Headaches	1192 (51)	452 (53)	0.97 (0.83, 1.14)
Irritability / outbursts of anger	1153 (50)	419 (49)	1.04 (0.89, 1.22)
General muscle aches or pains	1021 (44)	427 (50)	0.82 (0.70, 0.96)
Flatulence or burping	998 (43)	385 (45)	0.94 (0.80, 1.10)
Difficulty finding the right word	994 (43)	356 (42)	1.07 (0.91, 1.25)
Joint stiffness	952 (41)	380 (44)	0.89 (0.76, 1.04)
Forgetfulness	942 (41)	335 (39)	1.10 (0.94, 1.29)
Loss of concentration	862 (37)	307 (36)	1.08 (0.92, 1.28)
Ringing in the ears	833 (36)	325 (38)	0.94 (0.79, 1.10)
Avoiding doing things or situations	764 (33)	275 (32)	1.06 (0.89, 1.25)
Feeling distant or cut off from others	715 (31)	262 (31)	1.02 (0.86, 1.21)

[1]Adjusted for sex, age (20-29, 30-39 and 40+), Service and rank

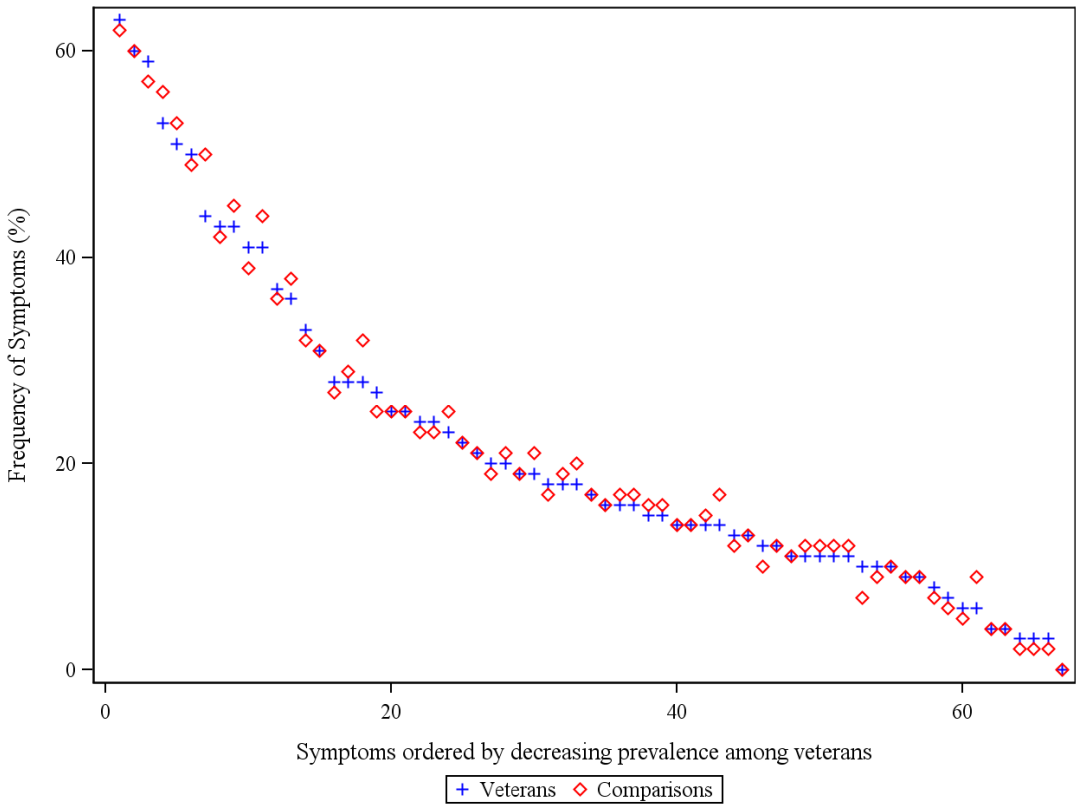


Figure 3.1: Frequency of common symptoms in Bougainville veterans and in the comparison group who did not deploy.

113. The mean total number of self-reported symptoms was the same in the study groups (Table 3.4) and the effect of deployment to Bougainville on the total number of symptoms did not vary across demographic subgroups.

Table 3.4: Association between total number of self-reported symptoms and sex, age, Service and rank

		Veterans (n=2324) Mean (SD)	*Comparisons (n=857) Mean (SD)*	*Adjusted ratio of means Ratio (95% CI)*[1]	*p-value*[2]
Total study population		14.4 (11.7)	14.5 (11.8)	1.01 (0.94,1.08)	0.780
Sex	Male	14.4 (11.9)	14.3 (11.9)	1.03 (0.95, 1.11)	0.245
	Female	14.0 (10.4)	15.9 (11.3)	0.91 (0.76, 1.10)	
Age group	20-29	13.0 (10.9)	11.7 (9.8)	1.14 (0.89, 1.45)	0.577
	30-39	13.8 (11.3)	13.9 (11.4)	1.01 (0.91, 1.13)	
	40+	15.1 (12.1)	15.6 (12.3)	0.99 (0.89, 1.09)	
Service	Navy	14.2 (11.6)	13.1 (10.9)	1.10 (0.96, 1.25)	0.238
	Army	14.6 (11.8)	15.4 (12.3)	0.97 (0.89, 1.05)	
	RAAF	12.5 (9.8)	10.7 (7.2)	1.14 (0.83, 1.57)	
Rank	Officer	12.2 (10.4)	12.5 (10.1)	0.98 (0.86, 1.11)	0.531
	Enlisted	15.5 (12.2)	15.3 (12.3)	1.02 (0.94, 1.11)	

[1]Ratios of the means were estimated using negative binomial regression with adjustment for sex, age group (20-29, 30-39 and 40+), Service and rank

[2]P-values shown for sex, age group, Service and rank result from a test of whether the ratio of the mean total number of symptoms between veterans and the comparison group are the same at each level of sex, age group, Service and rank.

114. The lifetime number of pregnancies for women respondents and partners of male respondents was similar between the study arms, with 1.6 pregnancies in the Bougainville veterans and 1.7 in the comparison group, per person (Table 3.5). The number of living children born since 20 September 1998 (10 months from the start date of OP BEL ISI I) was also 1.6 and 1.7, per person respectively, in these study groups.

115. The proportion of male offspring was slightly higher than 50% in the comparison group (53%). Accounting for families of children recorded by the same respondents, there was no evidence of a difference in the distribution of males and females born between the study groups ($p = 0.339$).

116. Approximately the same proportion (27%) of both arms of the study reported that they had not attempted to have a child. Of those who had tried to have children, the same proportion (11%) of the veteran and comparison groups were under investigation for fertility treatment.

Table 3.5: Pregnancy and children

		Veterans (n=2295)	*Comparisons (n=853)*
Number of pregnancies per person[a1]		1.6 (1.6)	1.7 (1.7)
Number of living children per person[a2]		1.6 (0.7)	1.7 (0.7)
Sex of living children[b2]	Male	616 (50)	240 (53)
	Female	618 (50)	216 (47)

[a] Mean (SD)
[b] n (%)
[1] Lifetime number of pregnancies
[2] Children born after 20 September 1998

Table 3.6: Number of people reporting adverse birth outcomes in the Bougainville study group

	Veterans n (%)	*Comparisons n (%)*
Pre-partum death (respondents[1]=2372)	65 (4)	35 (6)
Post-partum death (respondents[1]=2321)	12 (1)	6 (1)
Chromosomal or physical abnormality (respondents[1]=2259)	44 (3)	14 (2)

[1]Responded "Yes" or "No" to at least 1 question

117. Table 3.6 shows a historical tally of the number and proportion of adverse reproductive events occurring in the veteran and comparison groups prior to completing the Health Questionnaire. These events may have occurred before or after the veteran group deployed. Consequently, they are not necessarily an outcome associated with deployment to Bougainville. There appeared to be no apparent differences between the veteran and comparison groups.

118. Pre-partum deaths included termination of pregnancies due to foetal abnormalities, miscarriages, and stillbirths. Post-partum deaths referred to death of a child at some point after birth. Chromosomal abnormalities and birth defects collected respondents' free-text responses to questions about these issues. The responses encompassed a wide range of conditions such as Trisomy 21 (Down's syndrome), autism, cardiac septal defects (hole in the heart), syndactyly (webbed fingers), as well as less specific descriptions such as "learning difficulties".

Discussion

119. Bougainville veterans were not shown to have any increased negative health outcomes. There were no clear differences in the measures of general health, limitations in work and other activities as a result of physical health and social

functioning between the study groups, and the participants' perception of their own general health was similar between the veteran and comparison groups.

120. Participants deployed to Bougainville did not record symptoms from the checklist more frequently than the comparison group. A separate analysis of the most frequent symptoms and of the mean total number of symptoms recorded did not reveal any increased risk in Bougainville veterans.

121. Of interest, the three most common symptoms — fatigue, feeling unrefreshed after sleep, and sleeping difficulties — have been the same for all three Near North Area of Influence Health Studies. Further, these three symptoms appear to consistently make the top five in similar symptom checklists used in other studies such as the Australian Gulf War Study[26, 27].

122. Although there were potential occupational and environmental hazards associated with the deployment, Bougainville was essentially a successful unarmed peacekeeping mission. Therefore, some of the anticipated health effects associated with this deployment may be less than other operations such as East Timor or deployment to the Middle East Area of Operations, which included more warlike duties. The Solomon Islands deployment was also a peacekeeping mission and, like the Bougainville Health Study, also showed no differences between the veteran and comparison groups in terms of the number of symptoms.

123. The contrast between the self-reported results from both the Solomon Islands (2007) and the Bougainville (2008) Health studies and the results obtained from the analysis of the East Timor data (2008) is marked. In the East Timor Health Study, those in the deployed group reported more symptoms and recorded lower levels of health on the SF-36 subscales.

124. The symptoms results gained from the Bougainville analysis are more similar to those seen in the Solomon Islands Health Study. The symptoms data from the Solomon Islands, another non-warlike operation, did not reveal an increased risk associated with deployment[28].

125. Some reproductive outcomes could not be analysed from the reproductive health section of the health questionnaire because the sequence of deployment and reproductive events (e.g. miscarriages and stillbirths) could not be determined from the information currently available to CMVH. This section of the questionnaire should be redesigned for future studies. In addition, careful thought of how to collect corresponding data for the comparison (non-deployed) group is necessary.

126. The response rate for the self-report questionnaire was 45%, with 2342 veterans and 860 comparison group individuals participating in the study. Although currently serving personnel were well represented in the study (53% response rate), the response rate among persons no longer in the ADF was lower (24%). Some bias may result if the ex-serving group (who were over-represented in the non-respondents) were more or less healthy than those currently serving, although this bias is likely to be non-differential between the study groups (Chapter 1).

127. Another possible source of bias is the 'healthy warrior effect', as personnel who undertake operational deployments are required to be at the highest level of fitness. Those on the Nominal Roll must have been fit to deploy to Bougainville at the time of their deployment. It is not known whether the comparison group members were fit to deploy over the same time period. Defence aims for all personnel to be deployable. Medical classification was not used as a stratification variable in the

generation of the comparison group because of difficulties in obtaining data from the PMKeyS records as far back as 1997. This may be a potential confounder as the comparison group may have been 'less healthy' at the time the veterans deployed and more susceptible to negative health outcomes than the group who deployed to Bougainville. If such a difference persisted to the present, the effect of such a bias would be an underestimation of any poorer health outcomes reported by the Bougainville veterans compared to the comparison group. However, as the preliminary analysis presented in Tables 1.4 and 1.5 of Chapter 1 showed, members of the comparison group have been deployed to a variety of other locations. Bougainville veterans have deployed roughly one more time (to Bougainville) than the comparison group and the same proportions of participants in each arm of the study had deployed to the Middle East Area of Operations.

128. Comparisons with civilian populations will be made in subsequent papers.

Chapter 4 – Do Bougainville veterans have different health behaviours relative to an ADF comparison group who did not deploy to Bougainville? For example, were there different rates of tobacco smoking and alcohol consumption?

Introduction

129. Excessive or inappropriate consumption of tobacco and alcohol are established health risks[29-32]. For Defence Force personnel, increased access to cigarettes and alcohol, including reduced costs, may contribute to a greater uptake of these behaviours.

130. Excess body weight is also associated with a range of adverse health outcomes. Body Mass Index (BMI) is commonly used to assess the level of risk; however, it should be noted that BMI is only moderately correlated with fatness and very muscular individuals may have a high BMI.

131. This chapter investigates whether there was an association between deployment to Bougainville and high risk health behaviours.

Methods

Data Source:

132. Data on tobacco smoking and alcohol consumption was obtained from both self-report and Defence Health records. Measures of alcohol consumption are also collected during the Post Operational Psychological Screen (POPS). However, because POPS data is only collected for those who deploy there is no equivalent measure for the comparison group. Accordingly, only measures of alcohol consumption collected from the Defence Health records and self-report data are used.

133. BMI data were sourced from Defence Health records only.

CMVH self-report

Alcohol Use Disorders Identification Test (AUDIT)

134. The AUDIT screening test was developed by the World Health Organization (WHO) as a method of screening for hazardous and harmful alcohol use and assisting in the formulation of brief interventions.

135. The AUDIT consists of ten scored questions and two additional non-scored questions which provide an indication of readiness to change, and are designed to assist in determining the levels of intervention.

a. Questions 1-3 ask about frequency and quantity of drinking in the past year.

b. Questions 4-6 ask about impairment of control over drinking, salience of drinking and morning drinking.

c. Questions 7-10 ask about feelings of guilt, blackouts, injury and concern by others.

136. The total AUDIT score was calculated according to the instructions in the document 'The Alcohol Use Disorders Identification Test: Guidelines for use in Primary Care'[33]. The total score was calculated for each subject. If a participant responded that they 'never' have a drink containing alcohol then the total AUDIT score was set as zero. AUDIT scores were categorised into four groups with 0-7 representing low risk, scores of 8-15 representing a medium level of alcohol problems and scores above 15 representing a high level of alcohol problems. The scores above 15 have been split into 16-19 and 20+ categories, as the guidelines recommend that the 20+ category warrants further diagnostic evaluation for alcohol dependence.

Smoking

137. These questions were based on the Australian Gulf War Study. They measured smoking status (current, ex, never), pack years of smoking, and change in smoking status since deployment. Smoking status was assigned based on the following definitions:

a. Current smoker: Subject had smoked at least 100 cigarettes in their lifetime and currently smoked at least one cigarette per day or one cigar per week or one ounce of tobacco per month.

b. Former smoker: Subject had smoked at least 100 cigarettes in their life-time, did not currently smoke at least one cigarette per day or one cigarette per day or one cigar per week or one ounce of tobacco per month, but had smoked as much as this in the past.

c. Never smoker: Subject had never smoked as much as one cigarette per day or one cigar per week or one ounce of tobacco per month or the subject never smoked as much as 100 cigarettes in their lifetime.

Defence Health records

AUDIT

138. The AUDIT scale (already described in this chapter) was also sourced from the most recent CPHE. In some versions of this form the time period used in the AUDIT questions was three months rather than the standard one year. In these instances no adjustment was made to the scale.

Smoking

139. Current smoking status (Yes / No) was drawn from the most recent routine health assessment form present in the Defence Health record, either the AHA or CPHE.

BMI

140. Height and weight are used to determine Body Mass Index (BMI). Height and weight were obtained from Defence Health data as recorded at the latest routine health assessment, either the AHA or the CPHE. BMI findings should be interpreted with caution as the suitability of population-based BMI categories is questionable for muscular males.

Statistics

141. Health outcomes were defined as current smoker, high risk drinker (20-40 on AUDIT) and being overweight (BMI > 25). The prevalence of outcomes was compared using logistic regression. Adjusted and unadjusted ratios associated with

deployment to Bougainville were calculated. These results were similar so only the adjusted ratios were presented.

Results

142. All odds ratios displayed in the following tables have been adjusted for sex, age group, Service (Navy, Army or RAAF) and rank (officer or enlisted).

Self-report

143. Only 17-18% of respondents were smokers in 2008 (Table 4.1). There was no difference between veterans and the comparison group. A number of respondents who reported smoking as much as 100 cigarettes (or equivalent) in their lifetime did not respond to the question about current smoking. These people are represented in the 'not specified' category in Table 4.1.

Table 4.1: Self-report: AUDIT categories and smoking status for Bougainville veterans and the comparison group

		Veterans n (%)	*Comparisons n (%)*	*Odds Ratio (95% CI)*[a]	*p-value*
AUDIT	0-7	1479 (67)	548 (68)		
	8-15	569 (26)	188 (23)		
	16-19	81 (4)	37 (5)		
	20-40	67 (3)	28 (3)	0.90(0.57,1.41)[b]	0.650
	Not specified	146	59		
Smoking	Never/occasional smoker	1167 (58)	405 (55)		
	Former smoker	508 (25)	197 (27)		
	Current smoker	338 (17)	128 (18)	1.02(0.81,1.28)[c]	0.868
	Not specified	329	130		

[a]Adjusted for sex, age group (20-29, 30-39 and 40+), Service and rank
[b]20-40 v 0-19
[c]Current smoker v Non-current smoker

144. There was no evidence to suggest that Bougainville veterans were more likely than comparison group members to score in the highest AUDIT category (OR 0.90, 95% CI (0.57, 1.41)). The median AUDIT score was five and the proportion of respondents who scored zero on the AUDIT scale was 4%, in both exposure arms. Over 90% of all respondents had AUDIT scores of less than 16.

145. Similarly, the proportion of current, former and never smokers was very similar between Bougainville veterans and the comparison group.

Defence Health records

146. Body Mass Index (BMI) was collected from Defence Health records. Thirty-three percent of Bougainville veterans and 31% of the comparison group were in the healthy weight range of the BMI. Full details are in Table 4.2. The proportion recording a BMI greater than 25 did not differ significantly between veterans and the comparison group (OR 0.92, 95% CI (0.75, 1.14)).

Table 4.2: Defence Health records: Smoking status and AUDIT and BMI categories for Bougainville veterans and the comparison group

		Veterans n (%)	*Comparisons n (%)*	*Odds Ratio (95% CI)*[a]	*p-value*
AUDIT	0-7	990 (87)	483 (85)		
	8-15	139 (12)	64 (11)		
	16-19	8 (1)	9 (2)		
	20-40	7 (1)	10 (2)	0.32(0.12,0.87)[b]	0.025
	Not specified	98	40		
Smoking	Non-current smoker	975 (73)	461 (72)		
	Current smoker	358 (27)	179 (28)	0.99(0.79,1.22)[c]	0.900
	Not specified	22	9		
BMI	0-18.5	4 (0)	2 (0)		
	18.5-25.0	442 (33)	199 (31)		
	25.0-30.0	618 (46)	306 (48)	0.92(0.75,1.14)[d]	0.446
	30+	271 (20)	133 (21)		
	Not specified	20	9		

[a]Adjusted for sex, age group (20-29, 30-39 and 40+), Service and rank
[b]20-40 v 0-19
[c]Current smoker v Non-current smoker
[d]BMI 25+ v BMI 0-25

147. The Defence Health data (Table 4.2) showed that proportionally fewer Bougainville veterans were in the highest risk category for alcohol consumption (1%, n=7) compared with the comparison group (2%, n=10), a statistically significant difference.

148. For current smoking, Defence Health data revealed no differences associated with exposure status, but the reported level of smoking for both study groups was around 28%, compared with less than 20% in the self-reported data.

Discussion

149. The self-report data collected by CMVH shows no difference between Bougainville veterans and those who did not deploy in terms of smoking and alcohol consumption. These findings confirm those from the Solomon Islands study conducted in 2007[28].

150. By contrast, in the East Timor study, veterans did have higher levels of risky alcohol consumption than the comparison group. Similarly, East Timor veterans reported a higher level of current smoking groups. Data from the two sources are not directly comparable as the demographic composition differed (see Chapter 1 of both reports). Accordingly, more detailed analyses of these comparisons will be needed.

151. Defence Health records for the Bougainville study confirmed the finding from the self-report data that deployment had no effect on smoking. However, the

Defence Health records show a difference in alcohol consumption, with fewer Bougainville veterans in the highest risk category of AUDIT. While this difference was statistically significant, the numbers in the high risk category were small. Regardless of deployment to Bougainville, over 95% of the sample had AUDIT scores of less than 16. Other differences between the two sources included a higher proportion of current smokers according to the Defence Health data. However, the self-report and the Defence Health data may not be directly comparable because:

a. There were differences in demographic composition of data from the two sources. In particular, ex-serving personnel were over-represented in the Defence Health data (63%) and underrepresented among self-report respondents (14%). This also impacted on the age of available records—the latest health assessment for ex-ADF members may have been up to 10 years old.

b. The AHAs and CPHEs in the Defence Health data were collected at varying time points, rather than within a single period, and could potentially include times prior to the individual's deployment to Bougainville. This is particularly the case for AUDIT data, which are only available on the CPHE, which is only collected every five years.

c. The actual questions differed slightly in some instances, for example some versions of the AUDIT on the CPHE used a time scale of three months rather than the WHO version which uses a time period of one year; however, all AUDIT scores were included. In addition, skip patterns in the online questionnaire may have caused a number of current or former smokers to be classified in the 'not specified' category.

d. Differences may also be due to the clinical and occupational context in which the health assessment is conducted.

152. Despite the foregoing, and given the nature of operations in Bougainville, it is also possible that the difference in the AUDIT score is a real effect, but that it has attenuated due to elapsed time and subsequent deployments experienced in both study arms. A possible explanation for the original effect would be that personnel with alcohol problems were less likely to have deployed to Bougainville.

153. Current work by Defence to convert health records to an electronic format will improve ease of access and comparability of data. The inclusion of AUDIT, smoking history, height and weight in Defence Health data will be useful for future surveillance, particularly in prospective studies when researchers may be sure that the measurement was taken before exposure. This will also enable further research comparing health behaviours recorded in the health records with surveys and other sources.

Chapter 5 – What deployment issues and hazards were reported by Bougainville veterans?

Introduction

154. ADF personnel face a number of issues during deployment, which may affect physical and mental health outcomes. These include the use of health countermeasures such as vaccinations and pesticides, chemical and environmental exposures, exposure to traumatic events, organisational issues, and stressors experienced while on deployment, such as separation from family.

155. The aim of the current chapter is to analyse and report in brief on the issues experienced by ADF personnel while on deployment to Bougainville.

Methods

Data Source:

156. Data for the current chapter were drawn from the Deployment self-report questionnaire and from Defence Health records.

157. Participants who had deployed to Bougainville between 20 November 1997 and 26 August 2003 were asked to complete a Bougainville Deployment Questionnaire. Some vaccination data were also obtained from Defence Health records.

Health Countermeasures

Defence Health records

International Certificates of Vaccination

158. The International Certificates of Vaccination booklet, referred to as the 'yellow book', is a document used to record vaccines approved by the World Health Organization. The yellow book is only located in the member's Unit Medical Record (UMR) and provides the greatest detail on all vaccinations received by date and dose.

CMVH self-report

Vaccinations

159. Questions were used to describe vaccination history; they were modified from questions used in the Australian Gulf War Study.

Insecticides and pesticides

160. These questions asked about the use of pesticides and insecticides in the environment and in the treatment of personal items while on deployment to Bougainville.

Antimalarial medications

161. These questions asked about the type and dose of antimalarial medication taken as part of the deployment to Bougainville.

General Health

CMVH self-report

Current versus pre-deployment health

162. This question was drawn from the King's College London Deployment questionnaire and asks respondents to rate their general health now, compared to before they deployed to Bougainville.

Hazards

CMVH self-report

163. Questions included general exposures to food, water, insects and pests, and other chemical and environmental risks identified from hazard reports and the literature review as potential exposures. Additional questions on asbestos and pesticide exposure were included. The questions were modified from the Australian Gulf War Study.

Major Stressors

164. The 'Major Stressors' section in the self-report questionnaire was copied from the Defence Return to Australia Psychological Screening (RtAPS) instrument. It lists 36 potentially stressful factors. People are asked to rate each factor on a 5-point Likert scale ranging from "No Stress = 1" to "Extreme Stress = 5". Possible scores range from 0 to 144. The ADF typically reports results on the Major Stressors by listing the most frequently recorded stressful events and those which were recorded with the highest stress level.

Traumatic Stress Exposure Scale – Revised (TSES-R)

165. The TSES-R is also drawn from RtAPS and is designed to measure the frequency and severity of traumatic events. Twelve events are presented. For each event participants are asked 'How often did you experience the event?' Then people are asked 'How did it affect you at the time?' and 'How does it affect you now?' Three scales are computed from these questions[34].

166. The first of these three scales ("How much did you experience the event?") is coded by assigning the following values to each of the responses: 0 – "Never", 1 – "Rarely", 2 – "Occasionally", 3 – "Often"; and 5 – "Very Often"[34]. However, the Psychology and Research Technology Group (PRTG) have used the value 4 rather than 5 for the response of "Very Often". The second ("How did it affect you at the time?") and third ("How does it affect you now?") scales are scored as follows: 0 – "Not at all", 1 – "A little", 2 – "A moderate amount"; and 3 – "A great deal". The TSES-R score is calculated by summing the values of the three scales for each of the twelve questions, with higher scores indicating more exposure to traumatic events, more distress at the time and more distress currently.

Organisational commitment

167. This section consists of two questions asking about the perceived usefulness of tasks while on deployment and level of morale in the team during deployment. These questions were drawn from the King's College London questionnaire and the RtAPS.

Results

168. Most of the data obtained about deployment were self-reported in the Bougainville Deployment Questionnaire. This questionnaire was provided only to the veterans of the Bougainville deployments. One thousand nine hundred and nineteen participants completed the Deployment Questionnaire. The respondents reported on a mean of 1.4 (SD = 1.1) deployments to Bougainville, with a mean total time deployed of 99 days (SD = 82.2).

169. Some vaccination data were also obtained from Defence Health data via 'yellow book' records. This process was new to the program and consequently new database components and coding rules were designed for entry of yellow book data. At the beginning of April 2009 entry was ongoing.

Health Countermeasures

Vaccinations – Defence Health Data

Table 5.1: Number of vaccinations before first deployment to Bougainville

Number of vaccinations	*0-3 months before deployment n (%)*	*0-12 months before deployment n (%)*
0	64 (34)	19 (10)
1-3	73 (39)	76 (41)
4-6	32 (17)	46 (25)
7 or more	17 (9)	45 (24)

170. Of the veterans who we could access a yellow vaccination book for, nine percent had seven or more vaccinations in the three months prior to their first deployment to Bougainville (Table 5.1). Seventeen percent had between four and six vaccinations in the same interval. Only ten percent had no vaccinations recorded in their yellow book in the 12 months prior to their first Bougainville deployment.

Insecticides and Pesticides – CMVH self-report

171. Table 5.2 shows the frequency of use of insect repellent (ADF issue or respondent's own repellent) while on the deployment. The table was compiled from responses to three questions: whether repellent was used, whether it was ADF issue or the person's own repellent, and how often it was used. Most participants who responded to these items appeared to use some form of repellent at least daily or weekly. Of the 365 missing responses, 20 did not respond to the questions at all, and 345 responded that they used insect repellent but did not specify how often.

Table 5.2: Frequency of personal insect repellent use while on deployment

	Frequency
	n (%)
Daily	810 (54)
At least once a week	269 (18)
At least once a month	22 (1)
Less than monthly	7 (0)
Not at all	248 (17)
Don't know	142 (9)
Used, but frequency not specified	345
No response	20

172. Table 5.3 shows frequency of pesticide treatment of items in personal contact or the immediate environment. Participants who believed they had been exposed to pesticide reported the level of exposure ("Daily", "At least once a week", "At least once a month", and "Less than monthly"). The first three categories were combined into "At least monthly" because the recommendation was for these countermeasures to have been employed monthly. Other categories were as in the questionnaire response options.

173. Over half the respondents had their clothing or uniform, and tent or mosquito net treated with pesticide, with around 40% of these being treated at least monthly. Most (66%) did not have their sleeping bag or bivi bag treated with pesticide.

Table 5.3: Frequency of pesticide treatment of personal items during deployment

		Frequency	
		n	*(%)*
Clothing or uniform treated with pesticide	At least monthly	694	(38)
	Less than monthly	353	(19)
	No	495	(27)
	Don't know	298	(16)
	Not specified	23	
Tent or mosquito net treated with pesticide	At least monthly	751	(41)
	Less than monthly	262	(14)
	No	525	(29)
	Don't know	292	(16)
	Not specified	33	
Sleeping bag or bivi bag treated with pesticide	At least monthly	241	(13)
	Less than monthly	97	(5)
	No	1208	(66)
	Don't know	275	(15)
	Not specified	42	

Antimalarial medication – CMVH self-report

174. The use of antimalarial medication reported by Bougainville veterans is shown in Table 5.4. Most participants (94%) reported using some form of antimalarial medication, the most common type being Doxycycline (91%). Reported compliance with the drug regimen was mostly good (96% reporting complying 'all of the time' or 'most of the time'). However, due to the high non-response rate to this question, these percentages should be interpreted with caution.

Table 5.4: Self-reported use of antimalarial medication

		Frequency n	(%)
Used antimalarial medication	Yes	1767	(94)
	No	64	(3)
	Don't know	53	(3)
	Not specified	18	
Type of antimalarial medication	Doxycycline	1249	(91)
	Mefloquine	17	(1)
	Malarone	10	(1)
	Don't know	81	(6)
	Other	15	(1)
	Not specified	395	
Compliance with regimen of antimalarial medication	Good	1293	(96)
	Poor	54	(4)
	Not specified	420	

175. Table 5.5 shows reported use of Primaquine as post-exposure prophylaxis on return to Australia. Sixty-nine percent of participants reported taking Primaquine on their return to Australia, with 98% compliance ('all of the time' or 'most of the time'). Again, caution is required in interpreting the compliance results due to the low response to this question.

Table 5.5: Self-reported use of post-deployment antimalarial prophylaxis

		Frequency n	(%)
Used post-deployment antimalarial prophylaxis	Yes	1284	(69)
	No	300	(16)
	Don't know	288	(15)
	Not specified	30	
Compliance with regimen, if used	Good	943	(98)
	Poor	20	(2)
	Not specified	321	

176. Table 5.6 shows self-reported reactions to any vaccinations or medications received for deployment to Bougainville. The table includes responses from only those who specified which vaccinations or medications caused them to have a reaction. Of the 1849 people who responded to the filter question asking whether they had any reaction to either vaccinations or medications, 86% reported no reaction and 8% reported some reaction. A further 6% did not know. Not all of those reporting any reactions specified what they reacted to. Free text responses were

categorised into antimalarials and vaccinations by searching for words or parts of words to maintain consistency.

Table 5.6: Self-reported reactions to health countermeasures

		Frequency	
		n	*(%)*
Reported reaction to antimalarial		101	(100)
	Doxycycline	63	(62)
	Primaquine	18	(18)
	Unknown	11	(11)
	Mefloquine	6	(6)
	Tafenoquine	5	(5)
Reported reaction to vaccine		8	(100)
	JEV	4	(50)
	Unknown	2	(25)
	Typhoid	1	(13)
	MMR	1	(13)

* Two participants reported using both Doxycycline and Mefloquine

177. Where participants specifically nominated a reaction to in-country antimalarial prophylaxis, the majority (62%) named Doxycycline as the drug they reacted to. The most common reactions were 'doxy dreams' and sun-sensitivity. Six (6%) specifically named Mefloquine as the antimalarial causing a reaction. Two participants named more than one antimalarial medication as producing a reaction. Malaria eradication (post exposure prophylaxis) medication nominated by participants as producing adverse events included Primaquine (18%) and Tafenoqine (5%).

178. Reactions to vaccinations were reported by eight participants. The most common vaccine to which reactions were reported was to Japanese Encephalitis vaccine (JE Vax™).

General Health

179. Table 5.7 shows self-assessment of general health by respondents at the time of survey compared with their recollection of their general health after deployment to Bougainville. Sixty-six percent of participants reported their health was the same or better now i.e. at time of survey, compared with before they deployed to Bougainville.

Table 5.7: Self-assessment of general health after deployment to Bougainville

	Response	
	n	*(%)*
Much better now	47	(3)
Somewhat better now	59	(3)
About the same	1102	(60)
Somewhat worse now	512	(28)
Much worse now	102	(6)
Not specified	31	

Hazards

180. The Deployment questionnaire contained a list of 20 possible chemical and/or environmental hazards experienced during the deployment, as shown in Table 5.8. The responses are ordered by frequency of daily exposure.

Table 5.8: Hazards reported by Bougainville veterans

	Responses n=1858[a]						
Exposure	*Daily (%)*	*At least once a week (%)*	*At least once a month (%)*	*Less than once a month (%)*	*No (%)*	*Don't know (%)*	*Not specified n[b]*
Close to loud noises	50	15	3	2	28	2	13
Bitten by flies, sand flies, fleas, mosquitoes or other insects	42	26	7	3	11	12	18
Swim or bathe in local lakes, rivers or the sea	31	46	8	4	10	1	10
Solvents/degreasing agents, e.g. from cleaning, painting or hand washing	25	20	4	3	42	6	16
Live or work in an area that had been recently sprayed or fogged with a pesticide	25	38	10	2	15	10	20
Enter buildings or areas that might have contained asbestos	22	12	5	4	11	47	12
Exposed to any chemical spills/ chemically contaminated sites	19	7	6	4	37	27	28
Exposed to engine exhaust so that it irritated your eyes	15	13	5	4	58	6	16
Eat locally sourced food	14	23	11	8	28	16	9
Refuelling	13	24	8	4	49	1	16
Drink water from local taps or wells	7	5	2	2	73	10	10
In contact with or use heavy metals such as lead paints and mercury	7	4	2	2	55	31	12
High pressure sprayers	5	8	5	4	75	3	12
Tent or mosquito net treated with pesticides	5	19	18	14	29	16	28
Exposed to intense smoke e.g. from fires	4	10	8	9	66	3	14
Clothing or uniforms treated with pesticides (e.g. permethrin)	3	10	25	19	27	16	18
Sleeping bag (Bivi bag) treated with pesticides	2	6	5	5	66	15	37
Involved in the cleanup of any chemicals	2	3	5	5	80	6	16
Shower in water with fuel in it (evident by visible oil film, smell or stinging eyes)	1	1	1	2	71	24	10
Stung or bitten by spiders, scorpions or other "bugs"	1	2	2	4	78	13	17

a *Responded to at least one question*
b *Did not report the particular hazard*

181. Frequency of exposure was variable and in some cases was high. For example, a quarter (25%) of all respondents to the Deployment questionnaire reported using solvents or degreasing agents daily, and an additional 20% used them at least once a week. Analysis according to job category, trade or deployment tasks will be conducted where data are available.

182. Additional chemical hazards also showed high frequency of exposure in some instances. For example, experience of chemical spills or chemically contaminated sites was reported by 36% of respondents, but for 72% of this group it was a daily or more often than weekly experience. A high proportion of all respondents (27%) reported that they did not know whether they had been exposed. In comparison, much smaller percentages of respondents (14%) reported any experience of cleanup of chemicals, and there was also a much lower level of uncertainty (6%) regarding exposure.

183. A high percentage (31%) of Bougainville veteran respondents reported uncertainty about exposure to heavy metals such as lead paints or mercury, a much higher proportion than the percentage reporting some exposure. Numbers of individuals reported frequent actual use or contact with heavy metals (e.g. 7% respondents reported daily use or contact).

184. Asbestos exposure was the tenth most commonly endorsed hazard, being reported at some level of frequency by 43% of respondents, but frequency reported was high, being daily or more often than weekly by around 80% of these respondents

Major Stressors

185. Table 5.9 summarises the factors that Bougainville veterans reported as causing various levels of stress and the mean score associated with each stressor. Scores were: 1=no stress, 2=slight, 3=moderate, 4=a lot, 5=extreme.

186. The most common stressor was ‘separation from family and friends’ with 66% reporting stress. The ‘behaviour of others’ and ‘sorting out problems at home’ were the next most common stressors (59%). The more specific stressors of ‘risk of vehicle accidents’ and the ‘threat of danger’ were also recorded frequently (57% and 56% respectively).

187. The most common stressors tended to have the highest mean scores – that is they bothered the most people and, on average, bothered people the most. However, there were some instances where less common stressors reported mean scores higher than some of the more prevalent stressors, indicating some variability in the stress categories. These items included ‘leadership’, ‘double standards’ and ‘the Australian military hierarchy’. A score of 5 would represent extreme stress on that particular item.

Table 5.9: Stressors reported by Bougainville veterans

	Reported stress		*Score (out of 5)*	
Stressor	*n*	*(%)*	*Mean*	*(SD)*
Separation from family and friends	1168	(66)	2.0	(0.9)
Behaviour of others	1046	(59)	1.9	(0.9)
Sorting out problems at home	1037	(59)	2.0	(1.0)
Threat of danger	998	(57)	1.8	(0.8)
Risk of vehicle accidents	1004	(57)	1.8	(0.8)
Isolation from Australia	972	(55)	1.8	(0.8)
Contact with family/friends	957	(54)	1.8	(0.9)
Living conditions	932	(53)	1.7	(0.8)
Frustration generally	892	(51)	1.7	(0.8)
Leadership	858	(49)	1.8	(1.0)
Overload of work	825	(47)	1.7	(1.0)
Double standards	835	(47)	1.8	(1.1)
Living and working with the same people	821	(47)	1.6	(0.8)
Boredom	807	(46)	1.7	(0.9)
Health concerns	799	(45)	1.6	(0.8)
Personal privacy	787	(45)	1.6	(0.8)
Periods of high activity then low or no activity	775	(44)	1.6	(0.8)
Thinking about returning home	781	(44)	1.6	(0.8)
The Australian military hierarchy	766	(43)	1.7	(1.0)
Sorting out disagreements with others	744	(42)	1.6	(0.8)
The deployment's rules and regulations	689	(39)	1.6	(0.9)
ADF's lack of concern with deployed troops/sailors/ airmen	663	(38)	1.6	(0.9)
Not getting on with others	616	(35)	1.5	(0.8)
Mail service	565	(32)	1.4	(0.8)
Living in a different culture	539	(31)	1.4	(0.6)
Lack of opposite sex company	544	(31)	1.4	(0.7)
Language barriers	529	(30)	1.4	(0.6)
Completing deployment's objectives	527	(30)	1.4	(0.7)
Length of deployment	469	(27)	1.4	(0.7)
Your role in the country	451	(26)	1.4	(0.7)
The overseas organisation (eg. UN, MFO)	398	(23)	1.3	(0.7)
Working with military of other countries	356	(20)	1.3	(0.6)
Isolation from other deployed members	297	(17)	1.2	(0.6)
Taking leave back in Australia	288	(16)	1.2	(0.6)
Risk of unauthorised discharge (UD) of weapons	232	(13)	1.2	(0.5)
Taking leave other than in Australia	110	(6)	1.1	(0.4)

NB – the denominator varies slightly as some participants did not respond to all items N ≈1725

TSES-R

188. Table 5.10 summarises the scores on the Traumatic Stress Exposure Scale – Revised (TSES-R). The mean level of exposure to 12 different types of traumatic event was 3.8 (on a scale of 0 to 60). Participants did not report, on average, being greatly affected the traumatic event at the time of exposure and most participants were not affected by the events at the time of the survey. The relationship between exposure to traumatic events and later symptoms will be explored in a subsequent paper on the Near North studies.

Table 5.10: TSES-R

Scale	*Mean score*	*95% CI*
Frequency of events	3.8	(3.6, 4.0)
Effect at the time	2.5	(2.3, 2.6)
Effect now	1.2	(1.0, 1.3)

n=1796

Organisational Commitment

189. Respondents were asked to report on the usefulness of the tasks performed in Bougainville. As shown in Table 5.11, the majority felt they made a useful contribution to the local population (79%) and the military mission (95%) while on deployment in Bougainville.

Table 5.11: Perception of usefulness while deployed in Bougainville

Useful contribution	*Agree*	
	n	*(%)*
To the local population	1426	(79)
To the military mission	1701	(95)

190. Bougainville veterans were asked to rate the level of morale in their unit during deployment. As shown in Table 5.12 very few respondents (5%) rated morale on deployment as 'low' or 'very low'.

Table 5.12: Perception of the morale of the immediate workplace (or team) during deployment in Bougainville

	Frequency	
Level of morale	*n*	*(%)*
Very high	328	(18)
High	875	(48)
Average	517	(28)
Low	69	(4)
Very low	23	(1)
Not specified	41	

191. Post-deployment mental health screening has been discussed in detail in Chapter 2.

Discussion

192. Reviewing the number of vaccinations received in the lead up to deployment to Bougainville, it is evident that approximately one quarter of individuals, for whom we were able to collect data, would not have met current standards for individual readiness for deployment. It should be remembered policies surrounding readiness standards were not well developed for the early part of the deployment. Nonetheless, it is of potential concern that a relatively large proportion of individuals required four or more vaccinations in the lead up to deployment. It is currently unclear whether any specific combination of vaccinations required for deployment to Bougainville has a relationship to any particular health effects.

193. Chemical and asbestos exposures were of particular interest for this deployment cohort. Although exposure to chemical spills/chemically contaminated sites was not in the top 10 exposures endorsed, the frequency of exposure was high and the level of uncertainty about exposure also relatively high. Involvement and uncertainty about exposure through cleanup of chemicals were at lower levels. Swimming in local waters was very commonly endorsed, and possible exposures may relate to water quality reports. There was considerable uncertainty about some hazards, for example whether any showering water contained fuel. Common chemical exposures reported were also pesticide-related, for example Permethrin-treated clothing.

194. The operational deployments to Bougainville were peace-monitoring in focus. Based on the TSES-R there were few traumatic events reported by individuals and the effect of most of those experiences had declined by the time of the survey. This finding is enhanced by the findings in Chapter 2 showing no differences between veterans and the comparison group on measures of mental health.

Current limitations

195. Data on exposures to identified hazards are limited by the unavailability of objective measures of exposures to individual ADF members. Rather they were subjective, reflecting respondents' perceptions, which are nevertheless important and of interest.

Further research

196. There are many other research questions that can be answered from the data collected for this study in combination with data from the other Near North deployment health studies, including the Solomon Islands Health Study and the East Timor Health Study.

Chapter 6 – Key findings, study strengths and limitations, general discussion, comparison between Near North deployment studies, further research questions and conclusions

Overview of key findings and answers to major research questions

197. This report provides analyses of data that answer the four major research questions for the study. We also plan additional analyses for publication in the peer-reviewed scientific literature and seek participation of Defence making further use of these data to address questions of importance to the ADF.

198. The answers to the major research questions, at this stage are that there were:

- No statistically significant differences between the veterans and the comparison group in symptoms of posttraumatic stress. A slightly higher percentage of veterans scored in the medium and high categories of psychological distress.
- No clear differences in the symptoms self-reported or in measures of general health, limitations in work and other activities as a result of physical health and social functioning between the study groups.
- No statistically significant differences in smoking or alcohol consumption between the deployed and comparison groups on the CMVH self-report data. However, the most recently available Defence Health data shows that there is a slightly smaller percentage of Bougainville veterans in the highest risk category for alcohol consumption (1% vs 2% of comparison group).
- No significant difference between cancer incidence and mortality rates associated with deployment on these operations (although follow-up time is short) (the full reports can be found at Annex C and D).

Study strengths and limitations

199. This study obtained a 45% response from among those invited to complete the self-report questionnaire. With a longer follow-up time and additional methods for contacting individuals, e.g. with mailing from ComSuper as a possibility being explored (with ADHREC support), a higher response rate may have been achieved. A higher response would increase study power to detect small to modest differences between the veteran and comparison groups. Nevertheless, the response still represents 3202 individuals. Biases will be explored and proper caution exercised in the interpretation of findings.

200. Access to Defence Health data for currently serving members was limited by many factors, necessitating a reduction in target numbers of records to be retrieved from Army and Navy (25% and 50% respectively of the original numbers). Retrieval of all Air Force records was targeted. For future studies it is recommended that alternatives be found to the use of Unit Medical Records, such as retrieval of electronic records once these become established in the ADF.

201. The long period of the Bougainville operations meant that Defence protocols for data collection changed over the period. Consequently for both Health and Psychological screening data, there were limited comparable data for the veteran and

comparison groups and before and after deployment for the veteran group. This limitation requires acknowledgment in interpretation of findings.

Comparison between Near North deployment studies

202. Self-reported exposure patterns are specific to each theatre of deployment in the Near North and concerns differ. We plan to undertake comparisons of results from all the Near North studies: the Solomon Islands Health Study, the East Timor Health Study and the Bougainville Health Study.

Further research questions

203. Many additional research questions are yet to be explored using the data. For example, using data common to all Near North studies - Do measure of mental and physical health differ between the Services? Similarly, where the same measurement tool has been used in the broader Australian population and these studies - Is the Australian Defence Force healthier than the Australian public? It is also evident from the preliminary analyses that participants in both the veteran and comparison groups have deployed to other locations – Are multiple military deployments bad for your heath? Are levels of ill-health predicted by particular Near North deployment histories? It was clear from Chapter 2 that reported levels of mental health differed between the screening taken by Defence at deployment and the survey in 2008 conducted by CMVH, an issue that warrants further detailed exploration. Participants deployed to Bougainville reported exposure to a variety of perceived hazards – Does self- reported exposure to particular hazards have any association with physical and mental well being?

204. Clearly, there are many specific research questions that can and should be explored, to inform Defence, the Department of Veterans' Affairs and the wider public audience about potential consequences on mental and physical health of deployment. CMVH aims to engage Defence and Scientific Research Team members in identifying, analysing and preparing papers on these types of questions.

Conclusions

205. This is the first wave of data collection on important self-reported exposure data. Health outcome measures are short to mid-term at this wave. Further, it is clear that members of the comparison group may have deployed to locations other than Bougainville and all participants may have deployed to other and in some cases many other locations. Exposure measures relevant to these other deployment may need to be collected. Longer term follow-up is warranted on the entire cohort.

Appendices

Appendix 1 – Bougainville Invitation Package

Appendix 2 – Health Questionnaire

Appendix 3 – Bougainville Deployment Questionnaire

Appendix 4 – Media summary

Annexes

Annex A – BV Literature Review (Deliverable Item SP4, Phase 1b)

Annex B – BV Sample Generation Report (Deliverable Item 1, Phase 2)

Annex C – BV Mortality Study Report (Deliverable Item 2, Phase 2)

Annex D – BV Cancer Incidence Study Report (Deliverable Item 2, Phase 2)

Annex E – BV Completion of Self-reported Data Collection – Final Report (Deliverable Item 5, Phase 2)

Annex F – BV Defence Owned Data Completion Report (Deliverable Item 6, Phase 2)

Annex G – Process for the management and transfer of relevant RtAPS and POPS data

Annex H – Annual Health Assessment (AHA)

Annex I – Five Yearly Comprehensive Preventive Health Examination (CPHE)

Annex J – Specialist Employment Stream Annual Health Assessment (SESAHA)

Annex K – Pre-deployment Medical Checklist

Annex L – Post-deployment Health Screen

Annex M – Health/Medical Insert Slips

Annex N – Yellow Vaccination Booklet

Annex O – Medical Board (MB)

Annex P – Supplementary Health Assessment

Annex Q – Health Assessment

Annex R – Medical Examination Board

References

1. Centre for Military and Veterans' Health. Bougainville Health Study Defence Owned Data Completion Report (Deliverable Item 6 Phase 2). Brisbane; 2008 10 December.
2. Centre for Military and Veterans' Health. Bougainville Health Study Completion of Self-reported Data Collection - Final Report (Deliverable Item 5 Phase 2). Brisbane; 2008 17 November.
3. McDougall D. Conflicts in the Southwest Pacific: The relevance of New Security perspectives. Contemporary Security Policy. 2004;25(2):339-59.
4. Sharp N. Bougainville - Blood on our Hands. 1997 [cited 2006 21/03/2006]; Available from: http://www.aidwatch.org.au/index.php?current=24&display=aw00005&display_item=1
5. Elmes M, Bennet S, Nasveld P. Malaria in the Australian Defence Force: the Bougainville experience. ADF Health. 2004 September 2004;5(2):69-72.
6. Wood WB. Chemical Assessment and Hazard Audit; 1999.
7. Connel J. Health in Papua New Guinea: a Decline in Development. Australian Geographical studies. 1997;35(3):271-93.
8. Department of Defence. Australian Defence Force Health Status Report. Canberra: Department of Defence; 2000.
9. Bartone PT, Adler AB, Vaitkus MA. Dimensions of psychological stress in peacekeeping operations. Mil Med. 1998 Sep;163(9):587-93.
10. Centre for Military and Veterans' Health. Bougainville Health Study Sample Generation Report (Deliverable Item 1 Phase 2). Brisbane; 2007 15 May.
11. Riddle JR, Smith TC, Smith B, Corbeil TE, Engel CC, Wells TS, et al. Millennium Cohort: the 2001-2003 baseline prevalence of mental disorders in the U.S. military. J Clin Epidemiol. 2007 Feb;60(2):192-201.
12. Shigemura J, Nomura S. Mental health issues of peacekeeping workers. Psychiatry Clin Neurosci. 2002 Oct;56(5):483-91.
13. Steele N, Goodman M. Technical Brief 4/2006: History of ADF Mental Health Screening:1999-2005. Canberra: Department of Defence; 2006.
14. Department of Defence. Health Bulletin No 9/2003 - Australian Defence Force Mental Health Screen 2003.
15. Department of Defence. Health Directive 222. Health requirements for deployed Australian Defence Force personnel; 2005 18 May 2005.
16. World Health Organization. Composite International Diagnostic Interview - Version 1.1. 1993 [cited; Available from: http://www.hcp.med.harvard.edu/wmhcidi/instruments_papi.php
17. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (4th edition). Washington, DC: APA; 1994.
18. Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. N Engl J Med. 2004 Jul 1;351(1):13-22.
19. Hotopf M, Hull L, Fear NT, Browne T, Horn O, Iversen A, et al. The health of UK military personnel who deployed to the 2003 Iraq war: a cohort study. Lancet. 2006 May 27;367(9524):1731-41.

20. Ryan MA, Smith TC, Smith B, Amoroso P, Boyko EJ, Gray GC, et al. Millennium Cohort: enrollment begins a 21-year contribution to understanding the impact of military service. J Clin Epidemiol. 2007 Feb;60(2):181-91.
21. Smith TC, Ryan MA, Wingard DL, Slymen DJ, Sallis JF, Kritz-Silverstein D. New onset and persistent symptoms of post-traumatic stress disorder self reported after deployment and combat exposures: prospective population based US military cohort study. BMJ. 2008 Feb 16;336(7640):366-71.
22. Dobie DJ, Kivlahan DR, Maynard C, Bush KR, McFall M, Epler AJ, et al. Screening for post-traumatic stress disorder in female Veteran's Affairs patients: validation of the PTSD checklist. General Hospital Psychiatry. 2002 Nov-Dec;24(6):367-74.
23. Lang AJ, Laffaye C, Satz LE, Dresselhaus TR, Stein MB. Sensitivity and specificity of the PTSD checklist in detecting PTSD in female veterans in primary care. Journal of Traumatic Stress. 2003 Jun;16(3):257-64.
24. Walker EA, Newman E, Dobie DJ, Ciechanowski P, Katon W. Validation of the PTSD checklist in an HMO sample of women. General Hospital Psychiatry. 2002 Nov-Dec;24(6):375-80.
25. Ware JE, Jr., Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992 Jun;30(6):473-83.
26. Kelsall HL, Sim MR, Forbes AB, Glass DC, McKenzie DP, Ikin JF, et al. Symptoms and medical conditions in Australian veterans of the 1991 Gulf War: relation to immunisations and other Gulf War exposures. Occup Environ Med. 2004 Dec;61(12):1006-13.
27. Unwin C, Blatchley N, Coker W, Ferry S, Hotopf M, Hull L, et al. Health of UK servicemen who served in Persian Gulf War. Lancet. 1999 Jan 16;353(9148):169-78.
28. Centre for Military and Veterans' Health. Solomon Islands Health Study Final Report. Brisbane; 2008.
29. Doll R, Hill AB. Smoking and carcinoma of the lung; preliminary report. Br Med J. 1950 Sep 30;2(4682):739-48.
30. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med. 2006 November 2006;3(11):e442.
31. Collins DJ, H.M. L. The costs of tobacco, alcohol and illicit drug abuse to Australian society in 2004/2005. Canberra: Commonwealth of Australia. ; 2008.
32. National Health and Medical Research Council. Australian Alcohol Guidelines - Health risks and benefits. Canberra: Commonwealth of Australia; 2001.
33. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT: The alcohol use disorders identification test. Guidelines for use in primary care. Geneva: World Health Organization; 2001.
34. Swann J, Hodson S. A psychometric analysis of the traumatic stress exposure scale - revised. Canberra: Department of Defence; 2004 August

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Bougainville Health Study
Project Completion Report

Appendices

April 2009

Centre for Military and Veterans' Health
The University of Queensland

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Australian Government
Department of Defence
Department of Veterans' Affairs

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Charles Darwin
UNIVERSITY
Innovation in Education

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

Table of Contents

Page

Letter of Invitation

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

The Centre for Military and Veterans' Health

Dear

You are invited to participate in the Defence Health Study - Bougainville

This study aims to compare the health of Australian Defence Force (ADF) members who have **deployed** to Bougainville with those who **did not deploy**. The Study is being undertaken by health researchers at the University of Queensland and is funded by the Department of Defence. This study forms part of a program that will examine deployments to the Solomon Islands, Bougainville, East Timor and the Middle East Area of Operations.

Your name has been randomly selected from a list of current and past ADF members who may or may not have been deployed to these locations. In brief, participation in the Study involves completing a questionnaire about your health and your Service experiences. If you have deployed to Bougainville you will also be asked to complete a questionnaire specific to this deployment. The questionnaire can be mailed to you, completed on the internet, or a researcher can talk to you about alternative methods of completion: whichever you prefer.

This package contains:

- Letter of support from the Chief of Defence Force and the Repatriation Commissioner,
- An Information Sheet explaining the procedures and requirements related to participation in the Study, and
- A Reply Forms booklet, which includes your Study Consent Form that outlines your rights as a Study participant and the obligations of the Study Investigators.

Please read the enclosed information, particularly the Information Sheet and the Consent Form. If you would like to ask any further questions, defer your participation or register your refusal please phone the Study Contact and Recruitment team on **1800 886 567.** If you would like to participate please sign the consent form, fill in the Contact Details and Deployment forms, and return the documents in the prepaid envelope provided.

Thank you for your consideration of this invitation. This study provides a rare opportunity to understand more fully the activities, experiences and associated health impacts of Australia's valued Veterans and Service personnel. We look forward to including your experience soon.

Thank you

S. A. Treloar

Associate Professor Susan Treloar
Centre for Military and Veterans' Health
University of Queensland

Australian Government
Department of Defence

Australian Government
Department of Veterans' Affairs

Dear Participant

We are writing to strongly encourage you to participate in a Health Study of ADF personnel who deployed to East Timor and Bougainville.

The health of members and ex-members of the Australian Defence Force (ADF) is of great importance to both the ADF and the Department of Veterans' Affairs (DVA). It is vital that the ADF possesses the best deployment health information available so that it can effectively monitor, prepare for and lessen any adverse effects of operational deployments on its people.

In order to gather this sort of information, the ADF has commissioned a study of the long-term health and future well-being of ADF personnel who have taken part in recent deployments in the Near North Area of Influence and the Middle East Area of Operations. The plan is to compare the health of ADF personnel who **deployed** with the health of those who **did not deploy** to these locations. This stage of the study will focus on the effects of the deployment to East Timor and Bougainville.

You and more than 12,000 other serving and ex-serving personnel are invited to participate in this Health Study. Your support will assist the ADF in understanding the various health effects of operational deployments, now and into the future. With that knowledge, the ADF will be able to better protect the health of ADF members preparing for and undertaking future deployments. Clearly, the greater the response rate to the study survey, the more useful the results for us all.

The study will be run by the Centre for Military and Veterans' Health, part of a consortium jointly supported by Defence and DVA and led by the University of Queensland. The study is aimed at members and ex-members who took part in Operations FABER, SPITFIRE, WARDEN, TANAGER, CITADEL, SPIRE, BEL ISI I, and/or BEL ISI II and, as a **comparison group**, members who were eligible to go to East Timor and/or Bougainville but did not deploy there.

Study participants' information will be used only for the purposes of the deployment studies and will be protected under the provisions of the Privacy Act 1988. Your response will not in any way affect your current status or future prospects within the ADF, or any pension, benefits or health services you are entitled to receive from the Department of Veterans' Affairs. Serving ADF members are encouraged to complete the survey within work time.

Thank you for your consideration of this important study.

Yours sincerely

Angus Houston, AO, AFC
Air Chief Marshal
Chief of the Defence Force

14 September 2007

Bill Rolfe
Brigadier (Rtd)
Repatriation Commissioner

14 September 2007

STUDY INVESTIGATORS:

Associate Professor Susan Treloar
CMVH, University of Queensland
Ph: (07) 3346 4904
Email: s.treloar@uq.edu.au

Dr Annabel McGuire
CMVH, University of Queensland
Ph: (07) 3346 4902
Email: a.mcguire@uq.edu.au

Professor Cate D'Este
CMVH, University of Queensland (based in Newcastle)
Ph: (02) 4913 8147
Email: catherine.deste@newcastle.edu.au

LT COL Peter Nasveld
CMVH, University of Queensland
Ph: (07) 3346 4953
Email: p.nasveld@uq.edu.au

Professor Annette Dobson
CMVH, University of Queensland
Ph: (07) 3365 5346
Email: a.dobson@sph.uq.edu.au

Professor Phil Ryan
Data Management and Analysis Centre, University of Adelaide
Ph: (08) 8303 3570
Email: philip.ryan@adelaide.edu.au

Professor Alexander McFarlane
CMVH, University of Adelaide
Ph: (08) 8303 5200
Email: alexander.mcfarlane@adelaide.edu.au

Associate Professor Bradley McCall
CMVH, University of Queensland
Ph: (07) 3346 4951
Email: b.mccall@uq.edu.au

Australian Government

GUIDELINES FOR VOLUNTEERS

AUSTRALIAN DEFENCE HUMAN RESEARCH ETHICS

COMMITTEE

Thank you for taking part in Defence Research. Your involvement is much appreciated. This pamphlet explains your rights as a volunteer.

What is ADHREC?

- ADHREC is the Australian Defence Human Research Ethics Committee. It was established in 1988, to make sure that Defence complied with accepted guidelines for research involving human beings.
- After World War II (WWII), there was concern around the world about human experimentation. The Declaration of Helsinki was made in 1964, which provided the basic principles to be followed wherever humans were used in research projects.
- The National Health and Medical Research Council (NHMRC) in Australia published the *National Statement on Ethical Conduct in Research involving Humans* in 1999. This Statement describes how human research should be carried out.
- ADHREC follows both the Declaration of Helsinki and the NHMRC Statement.

What Australian Defence Human Research Ethics Committee approval means

- If you are told that the project has ADHREC approval, what that means is that ADHREC has reviewed the research proposal and has agreed that the research is ethical.
- ADHREC approval does not imply any obligation on commanders to order or encourage their service personnel to participate, or to release troops from their usual workplace to participate. Obviously, the use of any particular personnel must have clearance from their commanders but commanders should not use ADHREC approval to pressure personnel into volunteering.

Voluntary participation

- As you are a volunteer for this research project, you are under **no obligation** to participate or continue to participate. You may withdraw from the project **at any time** without detriment to your military career or to your medical care.
- At no time must you feel pressured to participate or to continue if you do not wish to do so.
- If you do not wish to continue, it would be useful to the researcher to know why, but you are under no obligation to give reasons for not wanting to continue.

Informed consent

- Before commencing the project you will have been given an information sheet which explains the project, your role in it and any risks to which you may be exposed.
- You must be sure that you understand the information given to you and that you ask the researchers about anything of which you are not sure.
- If you are satisfied that you understand the information sheet and agree to participate, you should initial every page of the information sheet and keep a copy.
- Before you participate in the project you should also have been given a consent form to sign. You must be happy that the consent form is easy to understand and spells out what you are agreeing to. Again, you should keep a copy of the signed consent form.

Tracing of research participants

- Media reports of human experimentation during times of conflict, eg WWII, Vietnam War, have raised the issue of being able to trace study participants, some time in the future, should any problems arise that may be related to the research conducted.
- To facilitate this, ADHREC requires that the researcher provide a nominal roll of study participants for safekeeping

by ADHREC, where the study is a clinical trial (eg. When the researchers are trialling a new treatment or device). For trials conducted by large Defence institutions like the Defence Science and Technology Organisation (DSTO), the School of Underwater Medicine (SUMU), the Army Malaria Institute (AMI), the Institute of Aviation Medicine (AVMED), or the Centre for Military and Veterans' Health (CMVH), this role is kept by them on ADHREC's behalf. We need to know who you are, only so that we can find you in the future, if there is any suggestion that the research may have been associated with the development of any health problems. Please note that a health study is not a clinical trial, and as such does not require the researcher to provide ADHREC with a nominal roll.

• This is consistent with current Occupational Health and Safety and Health Surveillance practices, and is encouraged under the NHMRC Guidelines.

• All ADHREC protocol files are secured in a locked filing cabinet and only the Secretariat has access to these. ADHREC will not pass your contact information to a third party without your permission.

• These records will not be used to consider your medical employment standard or for compensation purposes.

Complaints

• If at any time during your participation in the project you are worried about how the project is being run or how you are being treated, then you should speak to the researchers.

• If you don't feel comfortable doing this, you can contact the Executive Secretary of ADHREC. Contact details are:

> Executive Secretary Australian Defence Human Research Ethics Committee CP2–7–124 Department of Defence CANBERRA ACT 2600 Telephone: (02) 6266 3837 Facsimile: (02) 6266 4068 Email: ADHREC@defence.gov.au

More information

• If you would like to read more about ADHREC, you can look up the following references:

Internet: http://www.defence.gov.au/dpe/dhs/research/adhrec/i-adhrec.htm

Intranet: http://defweb2.cbr.defence.gov.au/dpedhs/infocentre/research/adhrec/default.htm

Your study number is:

If you **wish to participate**, please **complete and return the attached booklet** in the envelope provided (please **retain this sheet**, the **participant copy of the consent form** and the **information sheet** for your records).

You will be asked to separately consent to:

a. completion of a Defence Health Study questionnaire;
b. being contacted in the future so that the questionnaire can be mailed to you if follow-up studies are undertaken;
c. linkage of your Defence medical records to your questionnaire data;
d. linkage of your Defence psychological records to your questionnaire data.

You will also be asked to indicate how would prefer to complete the questionnaire. If you want us to mail it to you we will send the questionnaire to you and include a reply paid envelope so that you can return it to the Deployment Health Study Team at the University of Queensland.

If you would prefer to complete the questionnaire on the internet, you can log in to the website shown below, using the unique username and password provided:

Website address: https://www.dmac.adelaide.edu.au/mvhsp

Your username:
Your password:

If you wish to defer your participation, or do not wish to participate, you may register this by either:

- Calling **1800 886 567** (freecall; don't forget to quote your study number), or
- Completing the "Defer Participation or Register your Refusal" form in this booklet and returning it in the prepaid envelope provided.

We will then know that you have received the Study information package, and we will flag your record to prevent you receiving reminder notices about participation. This saves you aggravation, and saves us lots of time.

Bougainville and East Timor Defence Health Study

Please detach and retain for your records

CONSENT FORM

I ……..give my consent to (please tick all parts
(name of participant)
of the study you wish to consent to):

- ☐ *Completing the Defence Health Study Questionnaire;*
- ☐ *Being contacted periodically for follow-up studies;*
- ☐ *Allow linkage of information contained in my Defence medical records with the questionnaire data obtained in this study. These records are my Annual Health Assessments, five Yearly Comprehensive Preventative Health Assessments, Pre-deployment medical checklists, Post-deployment health screens, and vaccination records.*
- ☐ *Allow linkage of information contained in my Defence psychological records with the questionnaire data obtained in this study. These records are my Return to Australia Psychological Screen (RTAPS) and my Post Operation Psychological Screen (POPS).*

My consent is provided on the following basis:

- I have read the information sheet provided to me about the aims of this research, how it will be conducted and my role in it.
- I understand the risks involved as described above.
- I am cooperating in this project on condition that:
  - The information I provide will be kept confidential
  - The information will be used only for the Defence Health Studies.
- I can discuss my participation at any time with the Principal Investigator, a Research Assistant or a representative of one of the relevant Ethics Committees.

I understand that:

- There is no obligation to take part in this study.
- If I choose not to participate there will be no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- I am free to withdraw from the study at any time with no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- My answers will be completely confidential and any personal details, which may identify me in any way, will not be passed to the Department of Veterans' Affairs or the Department of Defence. My answers will not in any way affect my pension, benefits or any health services I am entitled to from DVA. If I wish, I can discontinue my participation in this study at any time.

I have kept a copy of the information / consent sheet, signed by me for my records.
I have also been given a copy of Australian Defence Health Research Ethics Committee's (ADHREC) *Guidelines for Volunteers.*

The study report will be made available to me at my request and any published reports of this study will preserve my anonymity.

☐ Please forward the report to my Email address
☐ Please mail the report to my home address

_____ _____
Signature of Participant Date

Bougainville and East Timor Defence Health Study

Please sign and return

CONSENT FORM

I ……give my consent to (please tick all parts
(name of participant)
of the study you wish to consent to):

- ☐ *Completing the Defence Health Study Questionnaire;*
- ☐ *Being contacted periodically for follow-up studies;*
- ☐ *Allow linkage of information contained in my Defence medical records with the questionnaire data obtained in this study. These records are my Annual Health Assessments, five Yearly Comprehensive Preventative Health Assessments, Pre-deployment medical checklists, Post-deployment health screens, and vaccination records.*
- ☐ *Allow linkage of information contained in my Defence psychological records with the questionnaire data obtained in this study. These records are my Return to Australia Psychological Screen (RTAPS) and my Post Operation Psychological Screen (POPS).*

My consent is provided on the following basis:

- I have read the information sheet provided to me about the aims of this research, how it will be conducted and my role in it.
- I understand the risks involved as described above.
- I am cooperating in this project on condition that:
  - The information I provide will be kept confidential
  - The information will be used only for the Defence Health Studies.
- I can discuss my participation at any time with the Principal Investigator, a Research Assistant or a representative of one of the relevant Ethics Committees

I understand that:

- There is no obligation to take part in this study
- If I choose not to participate there will be no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- I am free to withdraw from the study at any time with no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- My answers will be completely confidential and any personal details, which may identify me in any way, will not be passed to the Department of Veterans' Affairs or the Department of Defence. My answers will not in any way affect my pension, benefits or any health services I am entitled to from DVA. If I wish, I can discontinue my participation in this study at any time.

I have kept a copy of the information / consent sheet, signed by me for my records.
I have also been given a copy of Australian Defence Health Research Ethics Committee's (ADHREC) *Guidelines for Volunteers.*

The study report will be made available to me at my request and any published reports of this study will preserve my anonymity.

☐ Please forward the report to my Email address
☐ Please mail the report to my home address

_____ _____
Signature of Participant Date

Bougainville and East Timor Defence Health Study

To Defer Participation or Register Your Refusal

If you would like to defer your participation, please tick the box below and provide details on when you would like to be re-contacted. Please note you can defer participation up until April 2008.

☐ **I would like to defer my participation in the Bougainville and East Timor Defence Health Study until:**

Date: _____

Please contact me then on Ph (mobile preferred): _____

If you do not wish to participate, please register your voluntary refusal by ticking the box below, detaching and returning this page in the envelope provided. No other information is required from you to register your refusal.

☐ **I DO NOT wish to participate in the Bougainville and East Timor Defence Health Study**

YOUR CONTACT DETAILS

To ensure that we have your current contact details, please provide your current residential address. Note: to ensure confidentiality of your information, these pages will be removed by the Study team and stored separately from the rest of the questionnaire. Your questionnaire will be identified by a unique study number only, which will be linked by a code stored securely and separately to the information.

Please fill in details of your current name

Surname

All given names

Your PMKeyS Number

Your Service Number (if applicable)

If you have changed your name, please provide details here

Previous surname

Given names if different

Years used (start / end)

Please give your current address, contact numbers and email address

Street number or PO Box _____

Street _____

Suburb / Town _____

State _____ Postcode _____

Mobile phone _____

Home phone _____ Work phone _____

Email _____

I would prefer to complete the study questionnaire by (please tick preferred option):

☐ Mail, to the address provided above
☐ Internet

ALTERNATIVE CONTACT DETAILS (OPTIONAL)

In case you move and we lose contact with you, please give us the names of up to two relatives or friends who may be able to tell us where you are. These should be people who are at long term addresses but who are not living with you. We would only use these alternative contacts in the event that we could not contact you at the address you have provided on the previous page.

Contact 1

Surname

All given names

Street number or P O Box _____

Street _____

Suburb / Town _____

State _____ Postcode _____

Mobile phone _____

Home phone _____ Work phone _____

Email _____

Contact 2

Surname

All given names

Street number or P O Box _____

Street _____

Suburb / Town _____

State _____ Postcode _____

Mobile phone _____

Home phone _____ Work phone _____

Email _____

DEPLOYMENTS

Have you been on an ADF operational deployment (war-like, peacekeeping, peace-monitoring or humanitarian support)?

☐ YES ☐ NO

If you have ever been deployed, please indicate where you were actively deployed in the table below.

INSTRUCTIONS: *From this list please mark the YES box for those active deployments which apply to you. Then, please write the year in which you were deployed, the approximate duration of your participation in that deployment and indicate the extent to which you wanted to deploy.*

Were you deployed to:	Yes	Year First Deployed	Duration (Choose the nearest period) (If you went more than once show the total time)				I wanted to deploy				
			Less than one week	One week to less than one month	One month to less than 6 months	More than 6 months	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Afghanistan 1991-, 2003 -	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Balkans 1947-,	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Bougainville 1997-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Cambodia 1993 -1999	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
East Timor 1999-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Former Rep of Yugoslavia 1997-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Gulf of Oman 1999	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Iraq 2003-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Korea 1953	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Kuwait 1998	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Middle East 1956-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Mozambique 1994 - 2002	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Namibia 1989 - 1990	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Persian Gulf 1990-1991	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Persian Gulf Excluding 1990-1991	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐

Were you deployed to:	Yes	Year First Deployed	Duration (Choose the nearest period) (If you went more than once show the total time)				I wanted to deploy				
			Less than one week	One week to less than one month	One month to less than 6 months	More than 6 months	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Rwanda 1994 -	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Sinai 1982-1986, 1993-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Solomon Islands 2000-, 2003-	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Somalia 1992-1994	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Special Forces	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Vietnam 1962-1975	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐
Western Sahara 1991 -	☐		☐	☐	☐	☐	☐	☐	☐	☐	☐

Have you been on any other deployments overseas, including deployments with other nations? Please specify destination(s) below. Do not include training exercises or goodwill visits (flying the flag).

Where did you deploy?	Who did you deploy with?	Year Deployed	Duration (Choose the nearest period) (If you went more than once show the total time)				I wanted to deploy				
			Less than one week	One week to less than one month	One month to less than 6 months	More than 6 months	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
			☐	☐	☐	☐	☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐	☐	☐	☐	☐
			☐	☐	☐	☐	☐	☐	☐	☐	☐

Information about the Defence Health Study

The aim of this study is to better understand the long term health of ADF personnel who have deployed on operations.

We are comparing the health of those who deployed to East Timor and/or Bougainville with the health of those who did not deploy to these locations. More than 12,000 people are being invited to take part.

This is the first step in a long term program of scientific research which stems from the 1999 announcement, by the Minister for Veterans' Affairs and Minister Assisting the Minister for Defence, of the Government's commitment to conduct health reviews on future overseas deployments.

Your participation is just as important to us regardless of whether you:

- ***have deployed or not deployed***
- ***are a current or ex-serving member***
- ***are a regular or a reservist***
- ***have any health problems or are well***

Who is conducting the study?

The **Centre for Military and Veterans' Health** (CMVH) is a collaborative centre of the University of Queensland, University of Adelaide and Charles Darwin University. CMVH has been contracted by the Australian Defence Force Defence Health Services to conduct this study.

What's involved?

You may choose which parts of the study you wish to participate in by ticking the appropriate box on the Consent Form. There will be no cost to you to be involved in the study. There are two main components:

1. **A questionnaire asking you about your health and your service experiences**.

   If you consent to this part of the study, you have a choice of completing the questionnaire by mail or internet. It is anticipated that it will take you approximately **30 minutes to one hour** to complete the study questionnaire. If you have deployed to East Timor or Bougainville, you will also receive a questionnaire specific to these deployments. The amount of time taken will depend on how many of the relevant operations you have deployed on.

   Responses will be collated and analysed to determine whether the health of service personnel differs with regards to aspects of their military careers, in particular related to their deployments and the nature of those deployments.

2. **Linking your questionnaire data to some of your Defence health and psychology records.**

   This will allow us to better understand the relationship between your health now and your experiences during your service career.

   With your consent, we will link your questionnaire data with information obtained from your regular ADF health assessments and vaccinations and antimalarial drug records

   If you have been deployed, we will also request access to your Return to Australia Psychological Screen (RtAPS) and your Post Operation Psychological Screen (POPS).

Separate follow-up studies may also be undertaken. You may choose to undertake all aspects of the study, or you may choose to complete the questionnaire component of the study, but not provide consent for linkage to your Defence medical or psychological records, or for participation in follow-up studies.

- Participation in the Study is entirely **voluntary**.
- If you do choose to participate, you may withdraw from the study at any time.
- If you are still serving in the Defence Force, or are in receipt of a Service-related pension, a decision not to participate, or to withdraw, will **not** lead to any detriment to your career or future health care
- If you have a claim for compensation or are in receipt of a pension from the Department of Veterans' Affairs, a decision not to participate will not **in any way** affect your pension or compensation.
- Your participation or non-participation will **not** be notified to the Department of Defence or the Department of Veterans' Affairs.

Your privacy

Your contact details have been obtained from the Department of Defence. Your details will not be forwarded to any other individual or agency or used for the conduct of any other study unless you expressly consent to being contacted again for future health studies by the University of Queensland.

To ensure your privacy you have been given a study number. All information provided by you will be treated confidentially. The information will not be passed to the Departments of Defence or Veterans' Affairs.
Any reports or published articles resulting from the study will not include any personally identifying information and will preserve your anonymity. Any personal data will be used for the Deployment Health Studies conducted by CMVH and no other, without your express permission. Data are accessed only by authorised personnel and will be stored on password protected computers and in secure storage facilities at CMVH.

Benefits and Risks of Participating

Your information will contribute to increased knowledge about Service-related health and ill-health. It may also assist the ADF in developing the most appropriate supportive and protective measures against future health threats. We cannot predict how the results of this study will impact to the advantage or disadvantage of veterans collectively; such as in any future unknown context where issues of service-related ill health might arise.

There is a theoretical risk to the confidentiality of the information from your questionnaire, however we have many stringent processes in place to guard against this risk (see under "Your Privacy").

Study findings

The results of the study will be published in the scientific literature and will also be available on the Internet. Alternatively if you wish we can email or mail you a copy. Progress and results of the study, as well as information on future studies will also be available in Service and Ex-service journals and magazines.

There may be questions you find distressing. Should you feel distressed, you may wish to discuss this with someone. A list of services is provided on the next page.

Counselling / support services:

All-hours Support Line

ADF Mental Health Strategy All-hours Support Line (ASL). The ASL is a confidential telephone triage support service for ADF members and their families that is available 24 hours a day, 7 days a week.

CALL 1800 628 036
(Outside Australia +61 2 9425 3878)

Lifeline

"Lifeline offers 24-hour telephone counselling services, by calling **13 11 14** for the cost of local call. There are also 42 Lifeline Centres across Australia, which can assist with face-to-face counselling services."

"Lifeline also has a "Just Ask" service on **1300 131114** for the cost of a local call. This is for people with mental health difficulties or friends, relatives, professionals, carers and others who look after people with mental health difficulties. "

Veterans' Affairs Network (VAN)

Phone **1300 55 1918** to call the nearest VAN office.

General inquiries number - **133 254** (which connects callers to the nearest DVA office switchboard)

1800 555 254 connects non-metropolitan callers to the nearest DVA office

1300 13 1945 connects callers to any DVA office by using voice prompts.

The directory for the DVA state offices can be found at... http://www.dva.gov.au/contacts/van.htm

Department of Veterans' Affairs

General inquiries **133 254** (which connects callers to their nearest DVA state office)

National office for the Military Compensation and Rehabilitation Service

1300 550 461

Veterans and Veterans' Families Counselling Service

Call the Veterans' Line - **1800 011 046** from anywhere in Australia

A copy of the Australian Defence Health Research Ethics Committee's Guidelines for Volunteers can be found on the study website for information regarding your rights in providing consent to volunteer.

For any questions, problems or concerns about the study please contact:

The Study Team:

The Centre for Military and Veterans' Health,
Mayne Medical School Building,
University of Queensland, Herston Qld 4006
Freecall: **1800 886 567**
Email: dhsp@cmvh.uq.edu.au

Principal Investigator:

Associate Professor Susan Treloar

CMVH, University of Queensland
Ph: (07) 3346 4904
Email: s.treloar@uq.edu.au

If you prefer to speak to an independent person, please contact any of the following:

Human Research Ethics Committees:

The Australian Defence Human Research Ethics Committee:

Executive Secretary
Australian Defence Human Research Ethics Committee
CP2-7-66
Department of Defence
CANBERRA ACT 2600
Telephone: 02 6266 3837
Facsimile: 02 6266 4982
Email: ADHREC@defence.gov.au

The University of Queensland Behavioural & Social Sciences Ethical Review Committee (BSSERC):

Executive Secretary
University of Queensland Behavioural & Social Sciences Ethical Review Committee
Office of Research and Post-graduate studies,
Cumbrae-Stewart Building
Research Rd.
University of Queensland
St. Lucia QLD 4072
T: 07 336 53924
Email: humanethics@research.uq.edu.au

The Department of Veterans' Affairs Human Research Ethics Committee:

HREC Coordinator
Department of Veterans' Affairs Human Research Ethics Committee
Department of Veterans' Affairs
PO Box 21
Woden ACT 2606
T: 02 6289 6102
Email: ethics.committee@dva.gov.au

The Centre for Military and Veterans' Health

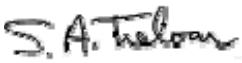
Defence Health Questionnaire

Thank you for agreeing to participate in the Defence Health Study.

This Study aims to determine whether the health status of Australia's Veterans differs from that of Australian Defence Force personnel who were not deployed. The Study is being undertaken by medical researchers at the Centre for Military and Veterans' Health at the University of Queensland. If you have any questions about this study, or would like to talk with someone you can call our toll-free number **1800 886 567.**

There may be questions you find distressing. Should you feel distressed, you may wish to discuss this with someone. A list of contacts is provided on the next page. If there are some questions you do not wish to answer, please leave them out. There is no obligation to answer all of the questions.

Thank you for your participation.



Associate Professor Susan Treloar
Centre for Military and Veterans' Health
University of Queensland

Support Organisations

There may be some questions in the survey which you find distressing. Should you feel distressed, you may wish to discuss this with someone. A list of organisations to contact is provided below.

All-hours Support Line
ADF Mental Health Strategy All-hours Support Line (ASL). The ASL is a confidential telephone triage support service for ADF members and their families that is available 24 hours a day, 7 days per week.

CALL 1800 628 036
(Outside Australia +61 2 9425 3878)

Defweb Address: defweb2.defence.gov.au/dpedhs
Internet Address: www.defence.gov.au/dpe/dhs
Email: ADF.MHS@defence.gov.au

Lifeline

"Lifeline offers 24-hour telephone counselling services, by calling 13 11 14 for the cost of local call. There are also 42 Lifeline Centres across Australia, which can assist with face-to-face counselling services."

"Lifeline also has a "Just Ask" service on 1300 131 114 for the cost of a local call. This is for people with mental health difficulties or friends, relatives, professionals, carers and others who look after people with mental health difficulties. "

Veterans' Affairs Network (VAN)

Phone 1300 55 1918 to call the nearest VAN office.
General inquiries number - 133 254 (which connects callers to the nearest DVA office switchboard)
1800 555 254 connects non-metropolitan callers to the nearest DVA office
1300 13 1945 connects callers to any DVA office by using voice prompts.

The directory for the DVA state offices can be found at...
http://www.dva.gov.au/contacts/van.htm

Department of Veterans' Affairs

General inquiries 133 254 (which connects callers to their nearest DVA state office)

National office for the Military Compensation and Rehabilitation Service

Phone 1300 550 461

Veterans and Veterans' Families Counselling Service

Call the Veterans' Line - 1800 011 046 from anywhere in Australia

Date you started this questionnaire: / /

INTRODUCTION: This questionnaire is divided into several sections. The first section deals with your recent health.

RECENT HEALTH SYMPTOMS

1. We would like to know about your health in the PAST MONTH. Please indicate whether or not you have suffered any of the following symptoms in the PAST MONTH, and if so, please indicate whether your symptoms were mild, moderate or severe in nature.

In the past month have you suffered from	**No** Not at all	**Yes** Mild	**Yes** Moderate	**Yes** Severe
Chest pain	☐	☐	☐	☐
Headaches	☐	☐	☐	☐
Rapid heartbeat	☐	☐	☐	☐
Irritability / outbursts of anger	☐	☐	☐	☐
Unable to breathe deeply enough	☐	☐	☐	☐
Faster breathing than normal	☐	☐	☐	☐
Feeling short of breath at rest	☐	☐	☐	☐
Wheezing	☐	☐	☐	☐
Sleeping difficulties	☐	☐	☐	☐
Feeling jumpy / easily startled	☐	☐	☐	☐
Feeling unrefreshed after sleep	☐	☐	☐	☐
Fatigue	☐	☐	☐	☐
Double vision	☐	☐	☐	☐
Intolerance to alcohol	☐	☐	☐	☐
Itchy or painful eyes	☐	☐	☐	☐
Rash or skin irritation	☐	☐	☐	☐
Skin infections e.g. boils	☐	☐	☐	☐
Skin ulcers	☐	☐	☐	☐
Shaking	☐	☐	☐	☐
Tingling in fingers and arms	☐	☐	☐	☐
Tingling in legs and toes	☐	☐	☐	☐
Numbness in fingers/toes	☐	☐	☐	☐
Feeling distant or cut off from others	☐	☐	☐	☐
Constipation	☐	☐	☐	☐
Flatulence or burping	☐	☐	☐	☐
Stomach cramps	☐	☐	☐	☐

In the past month have you suffered from	**No** Not at all	**Yes** Mild	**Yes** Moderate	**Yes** Severe
Diarrhoea	☐	☐	☐	☐
Indigestion	☐	☐	☐	☐
Dry mouth	☐	☐	☐	☐
Pain in the face, jaw, in front of the ear, or in the ear	☐	☐	☐	☐
Persistent cough	☐	☐	☐	☐
Lump in throat	☐	☐	☐	☐
Sore throat	☐	☐	☐	☐
Forgetfulness	☐	☐	☐	☐
Dizziness, fainting or blackouts	☐	☐	☐	☐
Seizures or convulsions	☐	☐	☐	☐
Feeling disorientated	☐	☐	☐	☐
Loss of concentration	☐	☐	☐	☐
Difficulty finding the right word	☐	☐	☐	☐
Pain on passing urine	☐	☐	☐	☐
Passing urine more often	☐	☐	☐	☐
Burning sensation in the sex organs	☐	☐	☐	☐
Loss of interest in sex	☐	☐	☐	☐
Problems with sexual functioning	☐	☐	☐	☐
Increased sensitivity to noise	☐	☐	☐	☐
Increased sensitivity to light	☐	☐	☐	☐
Increased sensitivity to smells or odours	☐	☐	☐	☐
Ringing in the ears	☐	☐	☐	☐
Avoiding doing things or situations	☐	☐	☐	☐
Pain, without swelling or redness, in several joints	☐	☐	☐	☐
oint stiffness	☐	☐	☐	☐
Feeling that your bowel movement is not finished	☐	☐	☐	☐
Changeable bowel function (mixture of diarrhoea/constipation	☐	☐	☐	☐
General muscle aches or pains	☐	☐	☐	☐
Loss of balance or coordination	☐	☐	☐	☐
Difficulty speaking	☐	☐	☐	☐
Low back pain	☐	☐	☐	☐
Night sweats which soak the bed sheets	☐	☐	☐	☐
Feeling feverish	☐	☐	☐	☐

In the past month have you suffered from	**No** Not at all	**Yes** Mild	**Yes** Moderate	**Yes** Severe
Tender or painful swelling of lymph glands in neck, armpit or groin	☐	☐	☐	☐
Loss of, or decrease in, appetite	☐	☐	☐	☐
Nausea	☐	☐	☐	☐
Vomiting	☐	☐	☐	☐
Distressing dreams	☐	☐	☐	☐
Stomach bloating	☐	☐	☐	☐
Unintended weight gain greater than 4kg	☐	☐	☐	☐
Unintended weight loss greater than 4kg	☐	☐	☐	☐

2. In the last 5 (five) years, have you had any serious accidents (e.g. been taken to Emergency at the hospital or similar)?

☐ Yes ☐ No ***(If NO, go to Question 3)***

2 a) If yes, were these caused by: (Tick all that apply).

☐ Road traffic accident
☐ A sport/leisure activity
☐ An accident at home
☐ An event outside your control (e.g. flood)
☐ Work-related
☐ Drink-related
☐ Military training
☐ Military operations
☐ Fights/assaults
☐ Other (Please specify)

The following questions are about your health NOW.

3. In general, would you say your health is?

☐ Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor

4. Compared to one year ago, how would you rate your health in general NOW?

Much better now ☐
Somewhat better now ☐
About the same ☐
Somewhat worse now ☐
Much worse now ☐

5. In the past 4 (four) weeks, to what extent has your physical health or any emotional problems interfered with your normal social activities with family, friends, neighbours, or groups? (Please tick ONE box).

- Not at all ☐
- Slightly ☐
- Moderately ☐
- Quite a bit ☐
- Extremely ☐

6. In the past 4 (four) weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? (Please tick ONE box on each line).

	Yes	No
a) Cut down on the amount of time you spent on work or other activities	☐	☐
b) Accomplished less than you would like	☐	☐
c) Were limited in the kind of work or other activities	☐	☐
d) Had difficulty performing the work or other activities (e.g. it took extra effort)	☐	☐

7. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a) I seem to get ill more easily than other people	☐	☐	☐	☐	☐
b) I expect my health to get worse	☐	☐	☐	☐	☐
c) I am as healthy as anybody I know	☐	☐	☐	☐	☐
d) My health is excellent	☐	☐	☐	☐	☐

8. During the past 4 (four) weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐	☐	☐	☐	☐

YOUR CHILDREN'S HEALTH AND YOUR PREGNANCY HISTORY
(Including your partner's)

You will be aware that in the past some Service personnel have expressed concern about reproductive health. We would be grateful if you would answer the following questions.

If you have **NEVER** fathered/had a pregnancy and have **NEVER** had fertility problems please tick the box and go to **Question 12**.

☐

9. For each of your biological LIVING children, please write their year of birth and circle their sex in the table below.

	Birth Month/Year	Male / Female
Child 1	/	Male Female
Child 2	/	Male Female
Child 3	/	Male Female
Child 4	/	Male Female
Child 5	/	Male Female
Child 6	/	Male Female
Child 7	/	Male Female
Child 8	/	Male Female
Child 9	/	Male Female
Child 10	/	Male Female

10. Have you fathered / had any pregnancies ending in the following outcomes? Please give the number of pregnancies if you answer YES to any question.

	No	Yes	Number
a) Child born alive but who died within one week of life	☐	☐	
b) Child born alive but who died after one week of life	☐	☐	
c) Miscarriage (less than 24 weeks gestation)	☐	☐	
d) Stillbirth (24 weeks or more gestation)	☐	☐	
e) Termination (abortion) because something was wrong with the baby	☐	☐	
f) Termination (abortion) for other reasons	☐	☐	
g) Ectopic pregnancy	☐	☐	
h) Other outcome (Please specify)	☐	☐	
i) Presence of a birth defect (Please specify)	☐	☐	
j) Presence of chromosomal abnormality (Please specify)	☐	☐	

11. Have you ever been investigated by a doctor (or are currently awaiting investigation) for infertility?

☐ Yes ☐ No

SMOKING

12. Over your lifetime, would you have smoked as much as 100 cigarettes or a similar amount of tobacco?

☐ Yes ☐ No

If YES, go to question 13 ***If NO, go to question 16***

13. Do you currently smoke as much as one cigarette per day (or 1 cigar per week or 1 gram of tobacco per month)?

☐ Yes ☐ No ***(If NO, go to question 14)***

If YES:

a. How old were you when you started smoking as much as one cigarette per day (or 1 cigar per week or 1 gram of tobacco per month)?

☐ Age in years

b. What is the average number of cigarettes per day, grams of tobacco per day and/or number of cigars per week that you currently smoke?

☐ Cigarettes per day

☐ Grams of tobacco per day (do not include tobacco from cigarettes or cigars)

☐ Cigars per week

Go to question 15.

14. Have you ever smoked as much as one cigarette per day (or 1 cigar per week or 1 gram of tobacco per month)?

☐ Yes ☐ No ***(If No, go to question 15)***

If YES:

a. How old were you when you started smoking as much as one cigarette per day (or 1 cigar per week or 1 gram of tobacco per month)?

☐ Age in years

b. How old were you when you stopped smoking as much as one cigarette per day (or 1 cigar per week or 1 gram of tobacco per month)?

☐ Age in years

c. What was the average number of cigarettes per day, grams of tobacco per day and/or number of cigars per week that you smoked?

☐ Cigarettes per day

☐ Grams of tobacco per day (don't include tobacco from cigarettes or cigars)

☐ Cigars per week

15. IF you have deployed was your smoking pattern different while on deployment compared with before you deployed?

☐ I have **not** deployed

☐ I did **not** smoke on deployment

☐ I smoked **more** than usual while on deployment

☐ I smoked the **same** amount on deployment as when not deployed

☐ I smoked **less** than usual while on deployment

If your smoking pattern changed during your deployment, what was the main reason? (Please specify).

ALCOHOL

16. How often do you have a drink containing alcohol?

Never	Monthly or less	2 to 4 times a month	2 to 3 times a week	4 or more times a week
☐	☐	☐	☐	☐

If NEVER, go to question 26.

In answering the following questions, please remember that a standard drink contains 10g of pure alcohol.

17. How many 'standard' drinks (see above) containing alcohol do you have on a typical day when you are drinking?

1 or 2	3 or 4	5 or 6	7 to 9	10 to 14	15 or more
☐	☐	☐	☐	☐	☐

18. How often do you have six or more 'standard' drinks on one occasion?

Never	Less than once a month	Monthly	Weekly	Daily or almost daily
☐	☐	☐	☐	☐

19. How often during the last year have you found that you were not able to stop drinking once you had started?

Never	Less than once a month	Monthly	Weekly	Daily or almost daily
☐	☐	☐	☐	☐

20. How often during the last year have you failed to do what was normally expected from you because of drinking?

Never	Less than once a month	Monthly	Weekly	Daily or almost daily
☐	☐	☐	☐	☐

21. How often during the last year have you needed a drink in the morning to get yourself going after a heavy drinking session?

Never	Less than once a month	Monthly	Weekly	Daily or almost daily
☐	☐	☐	☐	☐

22. How often during the last year have you had a feeling of guilt or remorse after drinking?

Never	Less than once a month	Monthly	Weekly	Daily or almost daily
☐	☐	☐	☐	☐

23. How often during the last year have you been unable to remember what happened the night before because you had been drinking?

Never	Less than once a month	Monthly	Weekly	Daily or almost daily
☐	☐	☐	☐	☐

24. Have you or someone else been injured as a result of your drinking?

No	Yes, but not in the last year	Yes, during the last year
☐	☐	☐

25. Has a relative, a friend, a doctor or other health professional been concerned about your drinking or suggested you cut down?

No	Yes, but not in the last year	Yes, during the last year
☐	☐	☐

Remember, the Study team is available on 1800 886 567 if you are unsure about how to complete any section of this questionnaire. Please call any time Monday to Friday during business hours.

LIFE EXPERIENCES

	Never	One time	Two times	Three or four times	Five or more times
26. How often over the last month did you get angry at someone and yell or shout at them?	☐	☐	☐	☐	☐
27. How often over the last month did you get angry with someone and kick or smash something, slam the door, punch the wall, etc.?	☐	☐	☐	☐	☐
28. How often over the last month did you get into a fight with someone and hit the person?	☐	☐	☐	☐	☐
29. How often over the last month did you threaten someone with physical violence?	☐	☐	☐	☐	☐
	All of the time	**Most of the time**	**Some of the time**	**A little of the time**	**None of the time**
30. In the past four (4) weeks, about how often did you feel tired for no good reason?	☐	☐	☐	☐	☐
31. In the past four (4) weeks, about how often did you feel nervous?	☐	☐	☐	☐	☐
32. In the past four (4) weeks, about how often did you feel so nervous that nothing could calm you down?	☐	☐	☐	☐	☐
33. In the past four (4) weeks, about how often did you feel hopeless?	☐	☐	☐	☐	☐
34. In the past four (4) weeks, about how often did you feel restless or fidgety?	☐	☐	☐	☐	☐
35. In the past four (4) weeks, about how often did you feel so restless that you could not sit still?	☐	☐	☐	☐	☐
36. In the past four (4) weeks, about how often did you feel depressed?	☐	☐	☐	☐	☐
37. In the past four (4) weeks, about how often did you feel that everything was an effort?	☐	☐	☐	☐	☐
38. In the past four (4) weeks, about how often did you feel so sad that nothing could cheer you up?	☐	☐	☐	☐	☐
39. In the past four (4) weeks, about how often did you feel worthless?	☐	☐	☐	☐	☐

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences.

*Please consider the event or group of events, military or non-military, in your life that you found <u>most</u> stressing. Read the list of problems and complaints below and indicate <u>how much you have been bothered by that problem or complaint</u> **<u>in the past month</u>**.*

40. a. The event, or group of events you experienced was:

While deployed? ☐ Yes ☐ No

Event: _____

_____

_____

Year: ☐

40 b. *How much have you been bothered by the following in the past month?*	**Not at all**	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**
Repeated, disturbing *memories, thoughts or images* of a stressful experience from the past?	☐	☐	☐	☐	☐
Repeated, disturbing *dreams* of a stressful experience from the past?	☐	☐	☐	☐	☐
Suddenly *acting or feeling* as if a stressful experience were happening again (as if you were reliving it)?	☐	☐	☐	☐	☐
Feeling *very upset* when *something reminded* you of a stressful experience from the past?	☐	☐	☐	☐	☐
Having *physical reactions* (eg heart pounding, trouble breathing, sweating) when *something reminded* you of a stressful experience from the past?	☐	☐	☐	☐	☐
Avoiding *thinking about* or *talking about* a stressful experience from the past or avoiding *having feelings* related to it?	☐	☐	☐	☐	☐
Avoiding *activities* or *situations* because *they reminded* you of a stressful experience from the past?	☐	☐	☐	☐	☐
Trouble *remembering important parts* of a stressful experience from the past?	☐	☐	☐	☐	☐

40 b. ***How much have you been bothered by the following in the past month?***	**Not at all**	**A little bit**	**Moderately**	**Quite a bit**	**Extremely**
Loss of *interest* in activities that you used to enjoy?	☐	☐	☐	☐	☐
Feeling *distant* or *cut off* from other people?	☐	☐	☐	☐	☐
Feeling *emotionally numb* or being unable to have loving feelings for those close to you?	☐	☐	☐	☐	☐
Feeling as if your *future* somehow will be *cut short*?	☐	☐	☐	☐	☐
Trouble *falling* or *staying* asleep?	☐	☐	☐	☐	☐
Feeling *irritable* or having *angry* outbursts?	☐	☐	☐	☐	☐
Having *difficulty concentrating*?	☐	☐	☐	☐	☐
Being *"super alert"* or watchful or on guard?	☐	☐	☐	☐	☐
Feeling *jumpy* or easily startled?	☐	☐	☐	☐	☐

40 c. Is there any other event that has caused you to have similar reactions?

☐ No

☐ Yes - while deployed

☐ Yes - while NOT deployed

If you responded Yes to 40c, the event, or group of events, you experienced was:

Event: _____

_____

_____

Year: ☐

BACKGROUND AND ACTIVITIES

YOUR BACKGROUND

People come to the military from a variety of different backgrounds. We are interested to see if and how experiences before you joined the Defence Forces affect your health and well-being.

	True	False
41. I come from a close family.	☐	☐
42. I used to get shouted at a lot at home.	☐	☐
43. I often used to play truant from school.	☐	☐
44. I felt valued by my family.	☐	☐
45. I regularly used to see or hear physical fighting or verbal abuse between my parents.	☐	☐
46. In my family there was at least one member I could talk to about things that were important to me.	☐	☐
47. I used to be hit / hurt by a parent or caregiver regularly.	☐	☐
48. One or more of my parents had problems with drugs or alcohol.	☐	☐
49. My family used to do things together.	☐	☐
50. I spent some time (any time) in Local Authority Care / Social Services.	☐	☐
51. I had one special teacher / youth worker / family friend who looked out for me.	☐	☐
52. I often used to get into physical fights at school.	☐	☐
53. There was at least one thing / activity that I did that made me feel special or proud.	☐	☐
54. I was suspended / expelled from school (ever).	☐	☐
55. I had problems with reading or writing at school and needed extra help.	☐	☐
56. I did things that should have got me (or did get me) into trouble with the police.	☐	☐

RECREATION AND SOCIAL ACTIVITIES

Please answer the following questions regarding your recreation and social activities.

57. Do you commemorate significant military-related occasions such as attending ANZAC day services, participate in marches or attend dawn services?

☐ No ☐ Yes

58. Do you know of other service veterans living near you?

☐ No ☐ Yes

59. Are any of your close relatives (parents, siblings) military veterans?

☐ No ☐ Yes

Please answer the following questions about your participation in social and recreational activities.

60. How often do you …	**Every day**	**Several times per week**	**Weekly or fortnightly**	**Monthly**	**Rarely or on special occasions**	**Never**
Have contact with an ex-service organisation?	☐	☐	☐	☐	☐	☐
Have social contact with other veterans?	☐	☐	☐	☐	☐	☐
Have contact with friends or relatives?	☐	☐	☐	☐	☐	☐
Attend social activities such as watching sport, eat meals or watch movies?	☐	☐	☐	☐	☐	☐
Play sport (golf, fishing, exercise)?	☐	☐	☐	☐	☐	☐
Set aside time to do a hobby (wood work, craft, music)?	☐	☐	☐	☐	☐	☐
Set aside time to relax (watch TV, read, listen to music)?	☐	☐	☐	☐	☐	☐
Do voluntary work?	☐	☐	☐	☐	☐	☐

BACKGROUND DETAILS

Now we have some general questions.

1. Are you male or female?

☐ Male ☐ Female

2. What is your date of birth? [/ /19] (day/ month/ year)

3. Do you regard yourself as being of Aboriginal or Torres Strait Islander origin?
(If you are both Aboriginal and Torres Strait Islander origin, mark both "yes" boxes).

☐ No

☐ Yes - Aboriginal

☐ Yes – Torres Strait Islander

4. What is your current marital status? Choose one.

☐ Married

☐ De facto relationship (ADF recognised)

☐ De facto relationship

☐ Separated

☐ Divorced

☐ Widowed

☐ Single, never married

☐ Other, please specify [ ]

5. What was your marital status ONE YEAR AGO? Choose one.

☐ Married

☐ De facto relationship (ADF recognised)

☐ De facto relationship

☐ Separated

☐ Divorced

☐ Widowed

☐ Single, never married

☐ Other, please specify [ ]

6. How satisfied are you with your marriage/relationship?

- ☐ Extremely satisfied
- ☐ Satisfied
- ☐ Neither satisfied or dissatisfied
- ☐ Dissatisfied
- ☐ Extremely dissatisfied
- ☐ Not applicable

7. Have you or your spouse/partner ever seriously suggested the idea of divorce or permanent separation within the LAST YEAR?

☐ Yes ☐ No ☐ Not applicable

8. Overall, what impact have your military commitments (now, or in the past if you have left the military) had on your:

a) Marriage/relationship?

- ☐ No impact
- ☐ Positive impact
- ☐ Negative impact
- ☐ Not applicable

b) Children?

- ☐ No impact
- ☐ Positive impact
- ☐ Negative impact
- ☐ Not applicable

9. Which category best describes the highest educational qualification you have completed? Choose one.

- ☐ Primary school
- ☐ Secondary school up to grade 10
- ☐ Secondary school grades 11-12
- ☐ Certificate (trade, apprenticeship, technicians etc)
- ☐ Diploma (associate, undergraduate)
- ☐ Bachelor degree
- ☐ Post-graduate qualification
- ☐ Other

10. What is your current occupational status?

- ☐ Paid employment full-time
- ☐ Paid employed part-time/casual
- ☐ Volunteer/community work
- ☐ Student
- ☐ Home duties
- ☐ Retired
- ☐ Not working due to ill-health / TPI
- ☐ Unemployed
- ☐ Other, please specify ☐

11. How many hours per week do you normally work? ☐ hours

12. If you have separated from the ADF, have you had a period of unemployment greater than 3 months?

☐ Yes ☐ No ☐ Not applicable

Was this period of unemployment primarily due to health problems?

☐ Yes ☐ No

*If **YES**, please specify type* ☐

13. What is your <u>main</u> source of income now? Choose one.

☐ Wage or salary

☐ Own business or share in a partnership

☐ Age Service pension

☐ Invalidity Service Pension

☐ Compensation benefit

Under the: ☐ VEA

☐ SRCA

☐ MRCA

☐ Other government pension / allowance / benefit

☐ Child allowance

☐ Superannuation / annuity

☐ Dividends / interest / income from investments

☐ Other, please specify ☐

14. Are you in receipt of any type of pension?

☐ Yes ☐ No

15. Please indicate your current service status.

- ☐ Australian Army
- ☐ Australian Army Reserve – Active / General
- ☐ Australian Army Reserve – Stand-by / Inactive
- ☐ Royal Australian Navy
- ☐ Royal Australian Navy Reserves – Active
- ☐ Royal Australian Navy Reserves – Stand-by
- ☐ Royal Australian Air Force
- ☐ RAAF Reserve - Active
- ☐ RAAF Reserve – Stand-by / General
- ☐ RAAF Reserve – Specialist
- ☐ Ready Reserve (Navy)
- ☐ Ready Reserve (Army)
- ☐ Ready Reserve (Air Force)
- ☐ Civilian employed by Dept of Defence
- ☐ Civilian contracted by Dept of Defence
- ☐ Foreign armed services
- ☐ Not in any service or Defence Force

16. To the nearest year, how long have you served:

a) As a regular ☐ years or ☐ Not applicable

b) As a volunteer reservist ☐ years or ☐ Not applicable

17. What is your CUURENT rank or what WAS your rank when you left the military?

- ☐ Senior Commissioned Officer (CMDR /LTCOL /WGCDR and above)
- ☐ Commissioned Officer (LCDR /MAJ /SQNLDR and below)
- ☐ Senior Non-Commissioned Officer (PO /SGT and above)
- ☐ Junior Non-Commissioned Officer (LS /CPL and below)
- ☐ Other ranks (AB/ SMN /PTE /LAC /AC or equivalent)

18. In the past THREE YEARS, roughly how many months in total have you been away on deployment?

☐ months

19. Do you intend to stay in the military?

☐ Yes ☐ No ☐ Already discharged

Thank for you completing this questionnaire.

Your participation is appreciated.

The Centre for Military and Veterans' Health

Bougainville Deployment Questionnaire

This questionnaire is about your deployment to Bougainville.

Date you started this questionnaire: / /

DEPLOYMENT TO BOUGAINVILLE

We would like to know some specific details about your deployment to Bougainville.

1. What were your MAIN duties during your deployment to Bougainville? (Please tick all boxes that apply).

- ☐ Medical
- ☐ Welfare
- ☐ Maritime operations – above deck
- ☐ Maritime operations – between deck
- ☐ Intelligence
- ☐ Military police
- ☐ Musician
- ☐ Driver
- ☐ Force Protection
- ☐ Peacekeeping
- ☐ Other, please specify

- ☐ Logistics / supply
- ☐ Training Local Police/Army
- ☐ Air crew
- ☐ Engineering
- ☐ Catering
- ☐ Administrative
- ☐ Communications
- ☐ Flight operations
- ☐ Headquarters
- ☐ CIMIC (Civil Military Co-operation)

2. What was your rank when you were FIRST deployed to Bougainville?

- ☐ Senior Commissioned Officer (CMDR /LTCOL /WGCDR and above)
- ☐ Commissioned Officer (LCDR /MAJ /SQNLDR and below)
- ☐ Senior Non-Commissioned Officer (PO /SGT and above)
- ☐ Junior Non-Commissioned Officer (LS /CPL and below)
- ☐ Other ranks (AB/ SMN /PTE /LAC /AC or equivalent)

3. Please indicate your service status during this deployment.

- ☐ Reservist on Full Time Service
- ☐ Full time member
- ☐ Other, please specify

4. Were you given a medical waiver in order to deploy to Bougainville?

☐ Yes ☐ No ☐ Don't know

5. Were you given an administrative waiver in order to deploy to Bougainville?

☐ Yes ☐ No ☐ Don't know

6. How many times did you deploy to Bougainville? ☐

7. How long in total were you deployed to Bougainville? ☐ / (months/weeks)

8. When did your FIRST deployment to Bougainville begin? ☐ / (month/year)
Please include the month and year if you can recall them.

9. When did your LAST deployment to Bougainville end? ☐ / (month/year)
Please include the month and year if you can recall them.

10. When you first deployed to Bougainville did you know how long you would be deploying for?

☐ Yes ☐ No ☐ Don't know

11. What would have been your preferred length of deployment to Bougainville?

☐ 1 month
☐ 3 months
☐ 4 months
☐ 6 months
☐ Other, please specify ☐

12. Why did you leave Bougainville? Please tick all that apply.

☐ End of the deployment
☐ Returned to Australia because of injury or illness
☐ Compassionate reasons or problems with family
☐ To attend a professional / military training course
☐ A routine posting to another unit
☐ To return to civilian employment (Reserve or Specialist forces only)
☐ Disciplinary reasons
☐ Administrative reasons (please specify) ☐
☐ Other reason (please specify) ☐

INSTRUCTIONS *Use the map below to identify where you were on land or sea in or around Bougainville. If you went to six or more locations please identify the* ***five*** *locations in which you spent the most time.*

13. Which ground locations did you serve at or visit and how long were you there?

		Length of Time		
	Location	Days	Weeks	Months
1st location				
2nd location				
3rd location				
4th location				
5th location				

VACCINATIONS & MEDICATIONS

INSTRUCTIONS *We would like to know about any vaccinations and medications you received as part of your deployment. If you do not have your 'yellow book', please still complete this section to the best of your ability.*

14. Did you take tablets to protect you against malaria on your deployment to Bougainville?

☐ No ☐ Yes ☐ Don't know

If Yes,

a. Which antimalarial did you use mostly?

☐ Doxycycline (Doxy) ☐ Mefloquine (Lariam)

☐ Malarone ☐ Other ☐

☐ Don't Know

b. Did you change antimalarial drug?

☐ Yes ☐ No

If yes, what to?

☐ Doxycycline (Doxy) ☐ Mefloquine (Lariam)

☐ Malarone ☐ Other ☐

☐ Don't Know

c. Did you take your antimalarial drugs?

☐ All the time

☐ Most of the time

☐ Some of the time

☐ Rarely or never

15. Did you use primaquine on return to Australia (post exposure antimalarial drug)?

☐ No ☐ Yes ☐ Don't know

If Yes,

a. How often were you directed to take primaquine?

☐ Two times per day

☐ Three times per day

b. Did you take your primaquine…?

☐ As directed

☐ Most of the time

☐ Some of the time

☐ Rarely or never

16. Did you take any other prescription medications (not prescribed within the military system or otherwise) during your time in Bougainville (e.g. asthma medications)?

☐ No ☐ Yes ☐ Don't know

If Yes, please specify ☐

17. Did you have a significant reaction to any vaccinations or medications that you received for your deployment to Bougainville?

☐ No ☐ Yes ☐ Don't know

If Yes,

a. Which vaccination(s) or medication(s) did you react to?

Please specify ☐

b. Did you seek medical advice for this reaction?

☐ Yes ☐ No

CHEMICAL & ENVIRONMENTAL EXPOSURES

We would like to know about chemical or environmental contaminants that you may have been exposed to during your deployment to Bougainville.

INSTRUCTIONS: *Please indicate whether or not you have experienced any of the activities and items, given below, during your deployment to Bougainville.*

18. During your deployment to Bougainville…	**No**	**Don't know**	**Yes**			
			How often?			
			Daily	At least once a week	At least once a month	Less than monthly
Did you enter buildings or areas that might have contained asbestos?	☐	☐	☐	☐	☐	☐
Were you close to loud noises?	☐	☐	☐	☐	☐	☐
Did you use high pressure sprayers?	☐	☐	☐	☐	☐	☐
Were you in contact with or did you use heavy metals such as lead paints and mercury?	☐	☐	☐	☐	☐	☐
Did you eat locally sourced food?	☐	☐	☐	☐	☐	☐
Did you drink water from local taps or wells?	☐	☐	☐	☐	☐	☐
Did you swim or bathe in local lakes, rivers or the sea?	☐	☐	☐	☐	☐	☐
Did you shower in water with fuel in it (evident by visible oil film, smell or stinging eyes)?	☐	☐	☐	☐	☐	☐
Were you exposed to intense smoke e.g. from fires?	☐	☐	☐	☐	☐	☐
Did you do any refuelling?	☐	☐	☐	☐	☐	☐
Did you use solvents/degreasing agents, e.g. from cleaning, painting or hand washing?	☐	☐	☐	☐	☐	☐
Were you exposed to engine exhaust so that it irritated your eyes?	☐	☐	☐	☐	☐	☐
Were you bitten by flies, sand flies, fleas, mosquitoes or other insects?	☐	☐	☐	☐	☐	☐
Were you stung or bitten by spiders, scorpions or other "bugs"?	☐	☐	☐	☐	☐	☐
Was your clothing or uniforms treated with pesticides (e.g. permethrin)?	☐	☐	☐	☐	☐	☐
Was your tent or mosquito net treated with pesticides?	☐	☐	☐	☐	☐	☐
Was your sleeping bag (Bivi bag) treated with pesticides?	☐	☐	☐	☐	☐	☐
Did you live or work in an area that had been recently sprayed or fogged with a pesticide?	☐	☐	☐	☐	☐	☐
Were you exposed to any chemical spills/ chemically contaminated sites?	☐	☐	☐	☐	☐	☐
Were you involved in the cleanup of any chemicals?	☐	☐	☐	☐	☐	☐

19. During your deployment to Bougainville did you ever use a personal insect repellent?

☐ No ☐ Yes ☐ Don't know

If Yes, please fill in the following table.

Please name the type of repellent you used and how often you used it.

What was the personal insect repellent?	**No**	**Don't know**	**Yes**			
			How often was it used?			
			Daily	At least once a week	At least once a month	Less than monthly
ADF issue repellent	☐	☐	☐	☐	☐	☐
Your own repellent (please specify) ☐	☐	☐	☐	☐	☐	☐

20. During your deployment to Bougainville, did you ever apply pesticides including insecticides (but not including personal repellents) e.g. by spraying, fogging, laying bait etc?

☐ No ☐ Yes ☐ Don't know

If Yes, please answer the following:

a. Did you wear protective clothing while applying pesticides by spraying, fogging or laying bait?

☐ No ☐ Yes

b. What type of pesticide or insecticide did you apply by spraying, fogging or laying bait etc.? (Tick all those that apply).

☐ Permethrin based

☐ Baygon (Propoxur, Aprocarb)

☐ Bendicarb (Ficam)

☐ Diazinon

☐ Temephos (Abate)

☐ Malathion (Maldison)

☐ Other, unknown type

☐ Other, please specify ☐

c. Please complete the following table about applying pesticides.

Did you ever?	No	Don't know	Yes			
			How often did you do it?			
			Daily	At least once a week	At least once a month	Less than monthly
Spray/fog an outdoor area e.g. for mosquitoes?	☐	☐	☐	☐	☐	☐
Spray/fog an indoor area?	☐	☐	☐	☐	☐	☐
Spray your body (with pesticides, not personal repellents)?	☐	☐	☐	☐	☐	☐
Spray your uniform or bedding?	☐	☐	☐	☐	☐	☐
Lay bait as a solid or liquid e.g. rat poison?	☐	☐	☐	☐	☐	☐

YOUR HEALTH DURING YOUR DEPLOYMENT

The following questions are about your health DURING your deployment to Bougainville.

21. How many times did you report sick during this deployment? ☐ times

22. Did you spend one or more nights under medical care during this deployment?

☐ Yes ☐ No

If yes, please explain why:

23. Did you have diarrhoea and/or vomiting during deployment to Bougainville?

☐ Yes ☐ No ***(if no, go to question 26)***

24. Did the symptoms of diarrhoea and/or vomiting prevent you from carrying out your duties?

☐ Yes ☐ No

25. Did you need intravenous fluids (a drip) as a result of diarrhoea and/or vomiting?

☐ Yes ☐ No

YOUR HEALTH AFTER YOUR DEPLOYMENT

The following question is about your health AFTER your deployment to Bougainville.

26. Compared to your health BEFORE you deployed to Bougainville, how would you rate your health in general NOW?

- Much better now ☐
- Somewhat better now ☐
- About the same ☐
- Somewhat worse now ☐
- Much worse now ☐

YOUR WORK ON DEPLOYMENT

The following questions are about your work ON deployment.

27. Did you feel that the work asked of you in theatre generally matched your trade experiences and ability?

- ☐ Yes
- ☐ No, work was generally **above** my trade experience and ability
- ☐ No, work was generally **beneath** my trade experience and ability

28. Thinking of one very difficult experience on this deployment, do you feel that:

a) your colleagues did what was expected of them Yes ☐ No ☐

b) you did what was expected of you Yes ☐ No ☐

29. During your deployment, did you:	Never	Occasionally	Frequently	Do you think this benefited the local community?	
				Yes	No
a) Work with the National Police/Army	☐	☐	☐	☐	☐
b) Assist in the building of infrastructure e.g. wells/roads, train local police/army	☐	☐	☐	☐	☐
c) Take part in Hearts and Minds campaigns e.g. interacted with the community	☐	☐	☐	☐	☐
d) Work with DFAT*/AusAID/NGOs** to assist the locals	☐	☐	☐	☐	☐

* DFAT =Department of Foreign Affairs and Trade
** NGO = Non-Government Organisation

30. Do you think the tasks you did whilst on deployment made a useful contribution to:

a) The local population? Yes ☐ No ☐

b) The military mission as a whole? Yes ☐ No ☐

31. In your opinion what was the level of morale in your immediate workplace/work team during the deployment?

☐ Very Low

☐ Low

☐ Average

☐ High

☐ Very High

32. During the deployment, what do you consider to have been the major POSITIVE experiences?

33. During the deployment, what do you consider to have been the major NEGATIVE experiences?

34. What were your career intentions PRIOR to the deployment?

- ☐ Long term service career
- ☐ Serve out current engagement / ROSO
- ☐ Seek TOC/TOB/Corps Transfer/Remuster/Specialisation Transfer
- ☐ Seek discharge within the next 12 months
- ☐ Seek discharge immediately
- ☐ Other, please state ☐

35. What are your CURRENT career intentions?

- ☐ Long term service career
- ☐ Serve out current engagement / ROSO
- ☐ Seek TOC/TOB/Corps Transfer/Remuster/Specialisation Transfer
- ☐ Seek discharge within the next 12 months
- ☐ Seek discharge immediately
- ☐ Discharged from / transferred within the ADF
- ☐ Other, please state ☐

36. Prior to your return to Australia, did you ANTICIPATE that you would have any difficulties on your return home?

☐ No ☐ Yes ☐ Uncertain

If Yes,
In which area did you anticipate that you would have difficulties? (e.g. family, work)?

37. Overall, how would you describe your deployment experience?

- ☐ Very Negative
- ☐ Negative
- ☐ Neither Negative or Positive
- ☐ Positive
- ☐ Very Positive

The web site http://www.defence.gov.au/health/DMH/SelfHelp/i-dmh_Trauma.htm suggests that following a traumatic event, one way to "help restore emotional and psychological well-being" may be to keep a diary. We are interested in evaluating whether diary keeping is beneficial. We are interested in evaluating whether keeping a diary during deployments may be beneficial.

38. Do you normally keep a diary?

☐ Yes ☐ No

39. Did you keep a diary while on deployment to Bougainville?

☐ Yes ☐ No

If you kept a diary while on deployment to Bougainville please indicate your level of agreement with the following statement:

39a. I found keeping a diary or journal a useful activity.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

EVENTS

40. INSTRUCTIONS: *The following questionnaire asks you about events that may have occurred during your deployment. Please read each event statement carefully and then indicate, by marking the square, how often you experienced the event, how it affected you at the time and how it affects you now.*

NOTE: Some of this material may have the capacity to cause distress to some participants. You are free to omit answering any material which you find upsets you. If you do become distressed, contact telephone numbers where assistance or advice can be obtained are provided with this package.

It is important that you mark a response in each of the three columns.

How often did the following occur…?	How often did you experience the event?					How did it affect you at the time? (felt fear, horror, or helplessness)				How does it affect you now? (feelings of fear, horror or helplessness)			
	Never	Rarely	On occasion (x2-5)	Often (x6-10)	Very often (x11+)	Not at all	A little	A moderate amount	A great deal	Not at all	A little	A moderate amount	A great deal
You were in danger of being killed e.g. combat, motor vehicle accident (MVA), assault, sexual assault, natural disaster, hostage situation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You were in danger of being injured e.g. combat, MVA, assault, sexual assault, natural disaster, hostage situation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You had to handle dead bodies e.g. disaster situation, temporary morgue, mass graves including any form of human remains	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You saw dead bodies e.g. disaster situation, temporary morgue, mass graves including any form of human remains	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You heard of a close friend or co-worker who had been injured or killed e.g. combat, MVA, disaster situation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You were present when a close friend or co-worker was injured or killed e.g. combat, MVA, disaster situation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You feared that you had been exposed to a contagious disease, toxic agent or injury e.g. radioactivity, HIV, chemical warfare	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

How often did the following occur…?	How often did you experience the event?					How did it affect you at the time? (felt fear, horror, or helplessness)				How does it affect you now? (feelings of fear, horror or helplessness)			
	Never	Rarely	On occasion (x2-5)	Often (x6-10)	Very often (x11+)	Not at all	A little	A moderate amount	A great deal	Not at all	A little	A moderate amount	A great deal
You were witness to human degradation and misery on a large scale e.g. refugee camps, starvation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You heard of a loved one who had been injured or killed	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You were present when a loved one was injured or killed	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You believe your action or inaction resulted in someone being seriously injured e.g. in combat or as a result of rules of engagement or UN restrictions not allowing you to act	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
You believe your actions or inaction resulted in someone being killed e.g. in combat or as a result of rules of engagement or UN restrictions not allowing you to act	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

41. Were there any events that you found to be traumatic but that are not listed above?
Please specify below:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

42. Below is a list of factors that some people may find stressful. Please read each factor carefully, and then indicate, by filling in the box, the response that best describes how much stress that factor caused you DURING your deployment.

	No stress	Slight stress	Moderate stress	A lot of stress	Extreme stress
Risk of unauthorised discharge (UD) of weapons	☐	☐	☐	☐	☐
Risk of vehicle accidents	☐	☐	☐	☐	☐
Living conditions	☐	☐	☐	☐	☐
Isolation from Australia	☐	☐	☐	☐	☐
Isolation from other deployed members	☐	☐	☐	☐	☐
Personal privacy	☐	☐	☐	☐	☐
Sorting out problems at home	☐	☐	☐	☐	☐
Boredom	☐	☐	☐	☐	☐
Living and working with the same people	☐	☐	☐	☐	☐
Overload of work	☐	☐	☐	☐	☐
Periods of high activity then low or no activity	☐	☐	☐	☐	☐
Health concerns	☐	☐	☐	☐	☐
Behaviour of others	☐	☐	☐	☐	☐
Living in a different culture	☐	☐	☐	☐	☐
Separation from family and friends	☐	☐	☐	☐	☐
Threat of danger	☐	☐	☐	☐	☐
Not getting on with others	☐	☐	☐	☐	☐
Lack of opposite sex company	☐	☐	☐	☐	☐
Language barriers	☐	☐	☐	☐	☐
Sorting out disagreements with others	☐	☐	☐	☐	☐
Frustration generally	☐	☐	☐	☐	☐
Thinking about returning home	☐	☐	☐	☐	☐
The overseas organisation (eg. UN, MFO)	☐	☐	☐	☐	☐
Your role in the country	☐	☐	☐	☐	☐
Completing deployment's objectives	☐	☐	☐	☐	☐
ADF's lack of concern with deployed troops/sailors/ airmen	☐	☐	☐	☐	☐
The Australian military hierarchy	☐	☐	☐	☐	☐
Leadership	☐	☐	☐	☐	☐

	No stress	Slight stress	Moderate stress	A lot of stress	Extreme stress
The deployment's rules and regulations	☐	☐	☐	☐	☐
Double standards	☐	☐	☐	☐	☐
Contact with family/friends	☐	☐	☐	☐	☐
Taking leave back in Australia	☐	☐	☐	☐	☐
Taking leave other than in Australia	☐	☐	☐	☐	☐
Mail service	☐	☐	☐	☐	☐
Working with military of other countries	☐	☐	☐	☐	☐
Length of deployment	☐	☐	☐	☐	☐
Please list any other stressful experiences and fill in which best describes how much stress it caused					
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

RETURN TO AUSTRALIA PROCESSING

Now some questions about your Return to Australia Processing (RTA).

43. What did you do during this time? *Please tick all that apply.*

- ☐ Relocated from main location occupied during the deployment to a staging area to prepare for RTA
- ☐ Travel (by air / sea / other) – *Please specify how long* ☐
- ☐ Preparation for RTA in main peacekeeping location
- ☐ Other, please specify ☐

44. What did you do in the two weeks immediately after you returned home?

- ☐ Went on leave for the entire time
- ☐ Returned to work for a few days before going on leave
- ☐ Went on short leave and returned to work. Deferred leave until much later
- ☐ Was sick or injured requiring hospitalisation or convalescence leave
- ☐ Returned straight back to work
- ☐ Other, please specify ☐

45. Were you posted out of the Unit you served with in Bougainville within six months of your return to Australia?

☐ No ☐ Yes

If Yes,

a. Was the posting or transfer from the Unit you served with at your request?

☐ No ☐ Yes

POST DEPLOYMENT EXPERIENCES

We would like to know about some of the experiences you may have had after returning from your deployment to Bougainville.

INSTRUCTIONS: *Please indicate whether you have experienced any of the items listed below as a result of your deployment to Bougainville. If YES, please estimate, for each section, whether you experienced the item a little, somewhat or a lot.*

46. As a result of your deployment to Bougainville, have you experienced or felt any of the following?	**No**	**Yes**		
		How much?		
		A Little	Some	A lot
Greater self-pride?	☐	☐	☐	☐
Rewarded for a job well done?	☐	☐	☐	☐
A greater appreciation for your country?	☐	☐	☐	☐
Jealousy or resentfulness from other Defence Force members?	☐	☐	☐	☐
Lack of recognition for your efforts during your deployment by the Australian Government?	☐	☐	☐	☐
Lack of recognition for your efforts during your deployment by the ADF?	☐	☐	☐	☐
Lack of recognition for your efforts during your deployment by the Australian people?	☐	☐	☐	☐
Inadequately debriefed following your deployment activities?	☐	☐	☐	☐
Improved as a leader?	☐	☐	☐	☐
Tougher, more confident or more self assured?	☐	☐	☐	☐
More knowledgeable of world issues?	☐	☐	☐	☐
Disillusioned by the scenes that you witnessed?	☐	☐	☐	☐
Valued and respected for your deployment activities?	☐	☐	☐	☐
More appreciative of being alive?	☐	☐	☐	☐
More respectful of other Australian and allied veterans?	☐	☐	☐	☐
Well looked after by the ADF or the Australian Government?	☐	☐	☐	☐
Stronger bonds with the members of your ship/unit/squadron?	☐	☐	☐	☐
Proud to be an Australian veteran?	☐	☐	☐	☐

47. Since your return from your deployment to Bougainville, has your marital status changed?

Tick all that apply. Since my deployment I have:

- ☐ Not changed my marital status
- ☐ Married, or started living with a partner
- ☐ Separated from a partner
- ☐ Divorced from a partner
- ☐ Been widowed
- ☐ Other, please specify ☐

FINAL QUESTIONS

As a check of our coverage in this questionnaire, please answer these final questions.

48. Are there other important military experiences or exposures we have not asked you about?

☐ No ☐ Yes

If Yes, please give details in the space provided here.

49. Are there other important health concerns we have not asked you about?

☐ No ☐ Yes

If Yes, please give details in the space provided here.

50. Do you have any additional comments you would like to add?

☐ No ☐ Yes

If Yes, please give details in the space provided here or on additional pages.

Thank you for completing this questionnaire.

Your participation is appreciated.

Media Summary for Bougainville Health Study: Defence, ex-Serving and non-Defence Publications

Publication	Date Published
Advertisements	
Australian Peacekeepers and Peacemakers Veterans' Association (APPVA) Magazine	Sept 07 Feb 08 June 08
Service Newspapers (Army, Navy and Airforce News)	21 Feb 08 6 Mar 08 20 Mar 08 (Inserts) 17 April 08 10 July 08
Journal of Military and Veterans' Health	Apr 08 July 08 Oct 08
The Chronicle (Canberra)	22 Apr 08
City West News (Amberley)	21 Apr 08
Fremantle Gazette	22 Apr 08
Penrith Press (Richmond)	22 Apr 08
North West News	16 Apr 08
Townsville Sun	16 Apr 08
Liverpool Leader	23 Apr 08
Editorials	
Australian Peacekeepers and Peacemakers Veterans' Association (APPVA) magazine	Feb 08 Sep 08
Penrith Press	22 Feb 08
Stand To (RSL National)	1 Mar 08
Vetaffairs	1 Mar 08
UQ News	1 Apr 08
Townsville Sun	16 Apr 08
NT News	28 Apr 08
Cairns Sun	28 May 08
Canberra Times	3 Oct 08
Townsville Bulletin	8 Oct 08
Townsville Sun	8 Oct 08
Queensland Times	9 Oct 08

Project Completion Report - Annexes

Bougainville Health Study

Deliverable Item 7 (Phase 2)

9 April 2009

Author	**Dr Annabel McGuire, Michael Waller, Jonathan Bleier, Colleen Loos, Lisa Nielsen, Tegan Cosgrove, Dr Christine McClintock, LTCOL (Dr) Peter Nasveld, A/Prof Susan Treloar, Prof Annette Dobson**
Document Version	**Version 2.0**
Status	**Final**
Date Saved	**9/4/2009**

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Table of Contents

Page

ANNEX A

Literature Review

Bougainville Health Study

Deliverable Item SP4 (Phase 1b)

1 May 2006

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Author	**Nuno Gaspar, Adrian Barnett**
Document Version	**Version 1.1**
Status	**Final**
Date Saved	**16/04/2008**

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\Research\DHSP\Phase 1\2. Bougainville\Literature Review\Bougainville Literature Review Final.doc

Revision History

Date	Version	Description	Track Changes
18/04/06	0.1	Sent to CMVH SRT members for comment	
26/04/06	1.0	Comments from CMVH SRT	No
08/05/06	1.1	Comments from DHSPO & SAC	Yes
17/04/08	1.1	Final Copy provided to PMO	No

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
CMVH SRT				
SAC				

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
CMVH SRT	18/04/06	Electronic
DHSPO & CMVH SRT	26/04/06	Electronic
PMO	17/04/08	Electronic and Paper

Glossary of Acronyms

ABCA	America, Britain, Canada and Australia
ADF	Australian Defence Force
AUSAID	Australian Aid Agency
ARF	Acute Renal Failure
AFEB	Armed Forces Epidemiological Board
BRA	Bougainville Revolutionary Army
CRA	Conzinc RioTinto Australia
DEET	N,N Diethyl-m-toluamide
DE	Diesel Emissions
DEP	Diesel Emission Particles
DHSB	Defence Health Service Branch
DIC	Disseminated Intravascular Coagulation
DVA	Department of Veterans' Affairs
FEV1	Forced Expiratory Volume in one second
FEF50	Forced Expiratory Flow rate at 50 percent of the capacity
FEF25	Forced Expiratory Flow rate at 25 percent of the capacity
FEV	Forced Expiratory Volume in 1 second
ICD	International Classification of Disease
NATO	North Atlantic Treaty Organization
NZDFR	New Zealand Defence Force Report
PMG	Peace Monitoring Group
PCB	Polychlorinated Biphenyls
PNGDF	Papua New Guinea Defence Force
PEFR	Peak Expiratory Flow Rate
ppm	Parts Per Million
RAP	Regimental Aid Post
RMA	Repatriation Medical Authority
TMG	Truce Monitoring Group
TLC	Total Lung Capacity
UNDP	United Nations Development Program
UNICEF	United Nations International Children's Fund
WHO	World Health Organization

Executive summary

1. The aims of this literature review are:
    a) To document the environmental, occupational and operational health hazards encountered in operations BEL ISI I & II.
    b) Based on these hazards, to search the literature and summarise the current best available knowledge on possible associations with acute and chronic health conditions.

2. The sources of information used were:
    a) The databases: Google, Pubmed, Medline, Centre for Disease Control and prevention, WHO, The United Nations, Cambridge scientific abstracts illumina (http://www.csa.com/);
    b) The Australian Defence Force (ADF) web site and defence sites of other countries (USA, Canada, Britain and Japan);
    c) Local Australian media such as 'The Australian';
    d) Television programmes by SBS and ABC;
    e) The United Nations Development Program;
    f) The World Bank;
    g) The Australian Agency for International Development;
    h) Interviews with Bougainville veterans.

3. Neither author had restricted security clearance; this may cause gaps in the review. Specifically, there may be information available on the defence restricted network, such as hazard incident reports (AC563).

4. ADF personnel were possibly exposed to a variety of environmental, operational and occupational hazards during their deployment to Bougainville. A number of mitigating factors were in place during the period of deployment, including the use of personal health countermeasures, deployment of preventive personnel, and the application of engineering and logistical interventions to protect against chemical exposure.

5. Chemical exposures are of concern to Bougainville veterans, as there were a number of sites where chemicals from the defunct mining operation had been dumped. Many of these sites were near to the main quarters in Loloho. The hazards associated with these sites were evaluated in an audit performed at Loloho on the 4 January 1999. For all the chemicals found in the audit this review examines the short- and long-term health outcomes associated with exposure.

6. Malaria and other communicable diseases are the major cause of morbidity and mortality in Bougainville. Malaria, pneumonia, leprosy, yaws, tuberculosis and hookworm are endemic, and diarrhoeic conditions are common. ADF personnel were possibly exposed to these diseases, particularly when they mixed with the local population during operations. Sixty-four cases of malaria have been diagnosed in Bougainville veterans. Because of the tropical climate skin conditions were also a problem, and were the most common reason for visiting medical facilities. Sports injuries were the second most common reason. This literature review examines the possible long-term sequelae of these operational health hazards.

7. Although Bougainville was a peacekeeping operation there was the potential for ADF personnel to suffer psychological stress. The likely causes of such stress were isolation from home, ambiguity of the peacekeeping role, powerless to help the local community, danger of attack and boredom. In some personnel these exposures could lead to long-term mental health problems. This review examines the possible causes of psychological stresses in Bougainville and the associated long-term problems.

1 Introduction

1. In 1999 the Minister for Defence, Science and Personnel, announced that health reviews would be conducted for all future overseas deployments of the Australian Defence Force (ADF).

2. The first meeting of the Defence Health Studies Program Management Board on 17 July 2005 highlighted that the strategic intent of the Program is to design a system for the prospective long-term health surveillance of deployed personnel. The system will be capable of detecting emerging health issues in veterans of overseas deployments and generating data which allow investigation of identified research questions.

3. Australia deployed Defence personnel as part of the Truce Monitoring Group (TMG) and Peace Monitoring Group (PMG) to Bougainville. These operations were entitled OP BEL ISI I and OP BEL ISI II respectively. These operations resulted from peace talks that were held in New Zealand in October 1997 to settle the conflict between the Papua New Guinea Government and the Bougainville Revolutionary Army (BRA). The BRA initially formed as a coalition of members who opposed mining activities on Bougainville. Local landowners perceived that mining profits were not benefiting Bougainville and that mining activities were being conducted without regard to the social or environmental impact of these operations. Later the BRA also sought unilateral independence from Papua New Guinea (PNG).

4. Preliminary peace talks took place in New Zealand in July 1997. In October 1997 the Burnham II Agreement was signed, signalling the formation of a New Zealand led unarmed Truce Monitoring Group. Preparation of Australian military support to the TMG was on short notice, with a rushed deployment for service personnel. In contrast to other deployments, Australian service personnel were required to adapt from a military force protection function to instead focus on political outcomes. ADF members deployed to Bougainville were exposed to potential hostilities without their weapons, and were in an unfamiliar operational environment.

5. Australian troops were possibly exposed to chemical and environmental hazards during their deployment to Bougainville. Potential hazards from chemicals abandoned following the closure of mining operations in 1989 were raised in the Australian Parliament in 1999. Investigations into these hazards were hindered due to security concerns and access issues regarding the Panguna mine site. A thorough investigation of the chemical, environmental and radiological hazards in Bougainville and their potential long-term health impact is essential to adequately assess the impact of service on Operations BEL ISI I & II. Information obtained by systematic surveillance of the health status of veterans of this operation will inform and advise health planners tasked to provide ongoing health care for serving and ex-serving members of the ADF.

6. The Defence Deployed Bougainville Health Study project aims to conduct a cross-sectional study of personnel who have returned from service on Operations BEL ISI I and BEL ISI II. This may become a longitudinal health study, with the health status of the veterans being revisited over time. The initial cross-sectional study will

provide a significant part of the information that will inform such a decision and act as a baseline in any longitudinal study of OP BEL ISI veterans.

2 Bougainville Operations

7. The operations in Bougainville were named Operations BEL ISI I and II. Operation BEL ISI I, which was a New Zealand led Truce Monitoring Group (TMG), lasted from November 1997 to April 1998 and was a non-warlike service. Operation BEL ISI II, which was led by the Australian Peace Monitoring Group (PMG), was also a non-warlike operation and lasted from April 1998 to June 2003.

3 Research Questions

8. The research questions for the Bougainville Health Study are:

   a) Was the health of ADF personnel adversely affected by their deployment to Bougainville?
   b) What were the major acute health problems during deployment?
   c) What potential health exposures can be identified? Are the exposures associated with adverse health outcomes?

4 Literature Review Methods

9. The aims of this literature review are to:
   a) Document the environmental, occupational and operational health hazards encountered;
   b) Based on the above hazards, search the literature and summarise the current best available knowledge on possible associations with acute and chronic health conditions.
10. For this literature review the sources of information were:
   a) The databases: Google, Pubmed, Medline, Centre for Disease Control and prevention (CDC) and WHO for health information. Searches were made using the words (and combination of words): “Bougainville”, “Health and Bougainville” and “malaria and Bougainville”, and each of the potential health hazards;
   b) The Australian Defence Force Web site and defence sites of other countries (USA, Canada, British and Japanese);
   c) Local Australian media such as ‘The Australian’ (for information about the Bougainville conflict and peace process);
   d) Television programmes from Bougainville by SBS and ABC;
   e) The United Nations site;
   f) United Nations Development Program;
   g) The World Bank;
   h) Australian Agency for International Development (AUSAID);
   i) Cambridge scientific abstracts illumina – in this social sciences database, a large body of work is available in relation to Bougainville and therefore extremely important for the understanding and conceptualisation of the conflict. For this database the combination of the words: “Bougainville”

and “Conflict and Bougainville”, were used, and a number of important articles were found; and,

j) Interviews with Bougainville veterans.

11. One important caveat of the literature search process is that there was little literature available for Bougainville in terms of health, or occupational and environmental data. Much of the general information about Bougainville was only available anecdotally or on general web sites. For example, a search for general health status information on the WHO site gave no information specific to Bougainville. This lack of information has caused some gaps in the literature review in potentially important areas.

4.1 Background

4.1.1 South Pacific Islands and Bougainville

12. The area of the South West Pacific, excluding Australia and New Zealand, is composed of a group of independent island states, called the Pacific Islands Countries (PIC). These countries are Papua New Guinea (PNG), Fiji, the Solomon Islands and Vanuatu[1]. New Caledonia, another of the islands, is under French Sovereignty. In 2002 it was estimated that the population varied from 5.6 million in PNG to 190,000 in Vanuatu[2]. The economy of these small independent countries is basically one of subsistence, with a modern component which is mainly dependent on agriculture and mineral exports[1].

13. Bougainville, which is part of the PIC, is an island located to the east of the main Papua New Guinea Island and to the north-west of the group of islands that compose the Solomon Islands. It is the largest island of the North Solomons Province of Papua New Guinea[3]. It includes a smaller island named Buka, which is separated from the main island by the narrow Buka passage (approximately 800 metres wide), and a smaller group of islands nearby (see Figure 1). Although the capital of the island was Arawa before the conflict, currently Buka is accepted as the capital[4].

14. According to the last census in 1980, the population of the island was 108,726. Despite the conflict the population has an annual growth rate of about 4.1%, hence it is estimated that by 1997 the population was around 170,000[4].

15. Similarly to the other islands in the region, the majority of Bougainvilleans are farmers, mainly growing crops such as taro, sweet potato and breadfruit. Trade crops are usually cocoa and copra, although the production of these crops has dramatically decreased because of the conflict[4].

Figure 1: Map of Bougainville-Buka Island

16. At the end of the 19th century during the colonial era, when boundaries were established in this area, Bougainville was made part of German New Guinea[5]. Although separated from Papua New Guinea (PNG) by about 800 kilometres, the group of islands formed the North Solomon Province of Papua New Guinea. However, although politically part of PNG, the people of Bougainville related themselves culturally to their closer neighbours in the Solomon Islands[1]. This was mainly because of the similar dark skin complexion which is a common feature for Solomon Islanders, as opposed to the lighter skin complexion of the inhabitants of PNG.

4.1.2 A glance at the conflict

17. In countries that are highly dependent on export of natural resources, the chance for instability and conflict is very high[6].

18. Australia took control of Bougainville and PNG after World War I. In 1942 Japan invaded Bougainville during World War II, and Australians had to be evacuated from the island. During 1944 to 1945 Australia recaptured the island from Japan.

19. Whilst under Australian administration, one of the richest copper mines in the world was discovered in Bougainville (the Panguna mine). Using an Australian high court ruling as an authority, Australia claimed anything below the surface of the land (minerals included), and declared that the current titleholders did not have any right to their land[4]. As a result, CRA (Conzinc RioTinto Australia), an Australian and British owned company, offered the exploration of the mine to Bougainville Copper Ltd (BCL) which was its subsidiary. As a result of the instalment of the mine, major

infrastructures, such as roads and schools, were developed in Bougainville. Because the mine was very profitable, it provided about 40% of PNG's national export and 17% of its Gross Domestic Product (GDP)[4]. Although the mine brought development to the island it also caused major environmental, social and economic damage. These damages fuelled previous existing resentments concerning the ownership of the land by Australia and PNG.

20. In 1987 a group of the traditional landowners, led by Peptua Serero and Francis Ona, demanded greater compensation from BCL. A failure to reach any compromise led to Ona's group sabotaging mining, to the extent that it closed in 1989. Ona's group became the Bougainville Revolutionary Army (BRA). This was the start of the most bloody and destructive conflict in the South Pacific region since World War II.

4.1.3 Health situation in Bougainville

21. After the conflict started PNG imposed a complete blockade of Bougainville. This blockade included access by journalists, aid agencies and churches. Hence the real conditions of the island during the conflict were difficult to assess[4]. By 1997 no aid agencies were present in Bougainville. It was estimated that approximately 10,000 people had died due to the blockade and that about 3000 had died of malnutrition and preventable diseases[4].

22. As a way of maintaining security and restoring order, care centres were established in the island (mostly in the south) by the Papua New Guinea Defence Force (PNGDF). By 1994 it was estimated that between 42,000-50,000 Bougainvilleans lived in care centres[4].

23. Although the conflict has now ceased, accurate information about Bougainville's infrastructure and health situation is difficult to obtain. However, according to information drawn from the Australian Parliamentary Delegation's 1994 report, health facilities were very poor and only two hospitals remained open on the island[4]. According to the report, there were about 10 health centres, 22 sub-health centres and 84 aid posts on the island. Immunisation programs had declined significantly and drugs were only available intermittently. There was an acute lack of health professionals. As a result health conditions were very poor.

4.1.4 Why is veterans' health important?

24. More and more the health of veterans has become a concern for the Department of Defence. Veterans' health is important mainly because[7]:

a) The costs that long-term effects may pose to the Commonwealth in terms of compensations claimed;
b) The possibility of influence of compensation arrangements in recruiting new personnel, particularly where there is an impression that the welfare of veterans is not properly taken care of;
c) The aspects of improving the knowledge in terms of prevention of health issues that affect veterans, therefore the information would be used as basis for health policy decisions that would result in better health in a

short, medium and long term period. Moreover, indirectly, it would positively impact on the reduction of Commonwealth costs.

4.1.5 The health situation of peacekeeping personnel during the operation

25. The Defence Health Service Branch (DHSB) of the ADF has developed a policy in order to establish a health surveillance system that allows the collection of health information for ADF personnel during peacekeeping and other operations[7]. The surveillance system, known as EPINATO, was pilot tested in Bougainville from the 30 November 1998 to the 6 February 2000 (434 days)[7].

26. EPINATO is an international method of collecting epidemiological morbidity data on medical presentations adopted by NATO in 1996 and subsequently adopted by the ABCA countries (America, Britain, Canada and Australia) with the objective of optimising inter-operability with health operations data collection and health surveillance. With this system all of the illnesses and injuries are coded at primary health care facilities, initiating at Regimental Aid Post (RAP). Daily occurrences are coded and recorded according to the International Classification of Disease (ICD) 10 system of coding.

27. According to the EPINATO system, a total of 1847 visits to medical treatment facilities in Bougainville were recorded during the period (an average of 4.3 per day). The most frequently reported conditions were (in order of frequency):

a) dermatological conditions;
b) sport injuries;
c) intestinal infectious diseases;
d) upper respiratory tract conditions; and,
e) vector-borne diseases / unexplained fever.

28. These categories combined accounted for about 46% of all medical attendances[7]. Malaria incidence in Bougainville was negligible with virtually all cases developing post-deployment in Australia, probably due to a failure to comply with the preventive treatment on return. In terms of vector borne disease prevention Operation BEL ISI was considered an enormous success[7].

29. Injuries accounted for about 10 to 20% of all non-battle casualties, with sports injuries accounting for 10% of all the attendances to medical facilities and with a 1% weekly incidence. Sport injury was the leading cause of admission; the admission rate was 1 per week.

5 Review of the Literature of Relevance to the Bougainville Study

30. The hazards that the service personnel were potentially exposed to can be described using the categories: occupational, operational and environmental. For each group of hazards there were contributing and mitigating factors. The principal contributing factors for the hazards were (in no particular order):

a) The total collapse of Bougainville's infrastructure in terms of roads, health facilities and public health programs, and waste disposal and treatment systems. Poor road conditions, driving and pedestrian behaviour were an important hazard;
b) The tropical climate, terrain and monsoonal season;
c) Proliferation of vectors for diseases (such as malaria) which are a considerable problem in the area;
d) Presence of insects, plants and animals that could be potentially harmful;
e) Potentially risky encounters with locals. For example assisting victims of domestic violence (a common occurrence);
f) The violent behaviour of locals after alcohol intake. Such behaviour was witnessed occasionally by the service personnel while on assistance operations in the villages;
g) Potential psychological stress for fear of being harmed. This was possibly exacerbated by the fact that service personnel were unarmed;
h) The presence of large amounts of different chemicals that were used during the exploration of the mine, which were abandoned near the main personnel base; and,
i) Isolation from family for long periods of time.

31. The principal mitigating factors were:

a) Using personal health countermeasures: vaccination, chemoprophylaxis, use of mosquito repellents including dipping of uniforms in permethrin and wearing long sleeve clothing, sleeping under treated bed nets and fogging;
b) Deployment of preventive personnel;
c) Briefings of the service personnel concerning the most important hazards and protective measures; and,
d) The application of engineering and logistical interventions to protect the service personnel against chemical exposures, particularly during operation BEL ISI II.

5.1 Possible exposures to the service personnel in Bougainville

5.1.1 Environmental exposures

32. The most important environmental exposures in Bougainville were:

a) The chemicals scattered around Loloho and in the abandoned power station;
b) Biological hazards caused by exposure to infectious disease agents including biting insects;

c) Consumption of contaminated food and water, and consumption of locally sourced food; and,
d) Climate, fauna and flora.

These exposures will be discussed in turn.

5.1.1.1 *Chemical exposures*

33. Chemical exposures are a highly specialised field, and a more thorough review of the exposures in Bougainville may need to be undertaken by an expert. This review identifies the major exposures and possible health consequences.

34. In Loloho, the primary area where the personnel of the PMG and TMG groups were stationed and operating, a variety of chemicals were disposed unprotected. On the 4 January 1999 a chemical assessment and a hazard audit was performed at Loloho –Arawa[8], with the objectives of:

a) Assessing the content and the physical condition of a number of nominated sites and assess the range and condition of the chemical materials contained on each site and,
b) Carrying out a hazard audit of the level of risk that members of the PMG.[8]

35. The PMG commander requested two additional tasks and these were to:

a) Determine the suitability of the Anewa Bay water for recreational use and,
b) Undertake a survey of all facilities and localities accessible to the PMG in the Loloho/Arawa region to determine the presence of radioactive sources.[8]

36. The Hazard audit team inspected each of the identified sites using the New Zealand Defence Force Report (NZDFR) of April 1998 as the base reference for location and contents of chemical sites. The team collected samples of soil, air and water for analysis.

37. The air in the Loloho wharf area was sampled continuously for 24 hours in the ore concentrate building named the “Opera house” (that was used as accommodation barracks), and at the west and east end of the wharf. The results demonstrated that there was no threat due to the air quality at the wharf.

38. About ten fish from the wharf were analysed for metal content. The results indicated that there was no threat to the health of the service personnel from consuming fish from the wharf.

39. Water samples were taken from and analysed for metals, PCBs and total petroleum hydrocarbons. Samples were collected from near the chemical sites and from the ocean and Anewa Bay. The analyses found that there was no threat to the service personnel from using the water. For biological testing, two samples were taken from the Arawa reticulation and from the water treatment plant (water treated by the personnel). The analyses found some ambient contamination in the reticulated water and no contamination in the treated water.

40. The results of the hazard audits took into account the real and potential health effects (both acute and chronic) to service personnel potentially exposed to toxic materials. In order of importance, the major chemical hazards concerns were:

a) Chlorine gas and Hexamine (potential to catch fire and the release of formaldehyde gas);
b) Chromium Trioxide (Chromium VI which is much more toxic than III and IV) carcinogenic effects;
c) SIPX (Sodium Isopropylxanthate) and PAX (Potassium Amyl Xanthate) which both emit toxic carbon disulfide and hydrogen sulfyde when exposed to heat;
d) Bunker C low sulphur fuel oil (burning and toxic smoke);
e) PCBs (Polychlorinated Byphenyls) in the power station;
f) Asbestos in the power station; and,
g) PCBs and Hydrocarbons in the drying shed.

41. After August 1998 administrative and engineering measures of control of chemicals were put in place. Hence most of the exposures were assumed by the hazard audit team as very low or low risk. Previous to August 1998 the hazard team could not assure with certainty the degree of exposure that service personnel might have had. They therefore attributed a moderate risk of exposure for this period. It is important to note that to be at risk personnel had to get very close to the chemical sites.

42. Exposure to DEET and Permethrin were not considered by the hazard audit team but are described in this literature review.

The individual chemical hazards will now be discussed in more detail.

Chlorine gas

Chlorine in Loloho

43. About seventeen cylinders of 70 kilograms of chlorine gas was stored in the remains of a shed near the entrance of Loloho wharf, at approximately 170 metres west of the warehouse building and 360 metres west of the Opera House[8]. Because most of the shed cladding had been removed, the cylinders were exposed to the sun for most of the day. Although gas alarm monitors were installed to monitor leakage the risk of exposure to the gas prior to August 1998 was assessed as moderate.

Properties of chlorine

44. Chlorine, which is a greyish-yellow gas, has been known of for more then a century. In the U.S. it is estimated that about 15 million tons of chlorine are produced annually. In Europe, about 12 million tons are produced annually with about 90% of it being consumed locally[9]. The chemical and its bleaching quality were first discovered in 1773 by Carl Whilleln Scheele, a Swedish pharmacist, but it was not until 1799 that the powdered presentation of the chemical was available as calcium hypochlorite[9]. From the early 1990s it was used as bleach for wood pulp and newsprint, and later for

the chlorination of water supplies. Currently chlorine is used for: plastic production as PVC (Polyvinylchloride), pulp and paper production as a bleaching product, in metalworking, dry cleaning and electronics as a chlorinated solvent, for water purification and the pharmaceutical industry[9].

Mechanism of toxicity of chlorine gas

45. "The toxicity of an irritant gas is a function of water solubility of the gas, concentration of the gas, duration of exposure, minute ventilation of the exposed individual and individual host characteristics, such as cigarette smoking"[9]. Chlorine has intermediate water solubility and can cause upper or lower airway damage[9]. In contact with water vapour (as when in the airways) it is converted to hydrochloric and hypochlorous acids. Initially it was thought that the toxicity of chlorine gas was due to the direct effects of these acids. However, experiences in animals by Barret L et al (1977) showed that chlorine gas is 35 times more toxic than hydrochloric acid fumes. The extra toxic effect was due to a reaction between hypochlorous acid with nitrite as a product of nitric oxide. Although airway levels of nitric oxide are normally low, the aggression of chlorine to the mucosa induces the recruitment of macrophages and neutrophils that will produce considerable quantities of nitrite which react with hypochlorous gas and can cause severe damage to the airways[9].

Health effects of Chlorine gas

46. The toxic effect of chlorine gas may vary from just a nasal irritation to lung oedema. According to experiments the most affected area by inhaling or nasal breathing is the upper airways[10]. However, these findings were somewhat biased by the fact that the subjects were all young, non-smokers, exposed to constant puffs of chlorine, which is not the case in real life accidents.

47. It is important to distinguish between the effects of acute exposures to chlorine gas (as in cases of accidents), from the long-term low dose exposures. Also the effect of the exposure in subjects with hyperreactivity of the airways (e.g. asthma) is different to individuals with normal reactivity. Although it was suggested that the acute effects of chlorine are reflected mainly in the upper airways[10,11]. Studies have found that exposures of 1 ppm (part per million) for about 4 hours affected lung function. As a result it was concluded that although exposure to low doses of chlorine does not produce serious subjective symptoms, it may transiently affect lung function with alteration of the following parameters: force expiratory volume in one second (FEV1), peak expiratory flow rate (PEFR), forced expiratory flow rate at 50 percent of the capacity in adults (FEF50), forced expiratory flow rate at 25 percent of the capacity in adults (FEF25), total lung capacity (TLC), and the difference in nitrogen[11]. A specific syndrome was described: "irritant-induced asthma developing in previously healthy individuals after a single exposure to an irritating gas or fumes, which they labelled Reactive Airways Dysfunction Syndrome or RADS"[12]. There is some evidence of an association between chlorine exposure and RADS. Studies suggested that individual characteristics influence responses to chlorine exposure, with smokers and asthmatics the most susceptible group[13].

48. In summary, the outcomes of exposure to chlorine are highly dependent on the intensity of exposure, minute ventilation and individual characteristics such as hyper

reactivity syndromes (e.g asthma or smoking history). Acute exposures to chlorine gas may induce clinical presentations that vary from nasal irritation to lung oedema (all of them reversible). Long-term low-dose exposure may result in the development of obstructive airway disease[9].

Chromium Trioxide (Chromium VI)

49. Chromium trioxide was located in a protected shed adjacent to the Loloho wharf entrance area access road, about 40 metres west of the chlorine shed. Some of the chemical leaked into the soil, although the spilled material was covered with sand. The audit team concluded that the risk of exposure after the implementation of the protective measures was very low. However, previous to implementation of the measures it was assumed as moderate, because there was opportunity for a curious individual to come into contact.

Properties of Chromium Trioxide

50. Chromium is considered one of the most hazardous chemicals available[14]. It is a metallic element with oxidation ranges from Chromium II to Chromium VI and it is most frequently found in nature as Chromium (0), trivalent III and hexavalent (chromium VI). The most toxic form is Chromium VI.

51. Chromium III occurs naturally in the environment and is an essential element for the human body. On the other hand, Chromium (0) and IV are the result of industrial processes. These chemicals are used mainly for chrome plating, production of dyes and pigments, leather tanning, and wood preserving, and smaller quantities are used as rust and corrosion inhibitors, drilling muds, textiles and toner for printing machines[15].

52. Chromium III and IV enter the environment, air, water and soil, mainly as a result of natural processes and human activities. In the air chromium compounds are present usually as fine dust particles that eventually settle in the soil and water after a maximum of ten days[15].

53. Humans can be exposed to chromium compounds through: breathing, contaminated food and drink, and contact with the skin.

Health effects of Chromium trioxide

54. The health effects due to exposure to chromium trioxide are well described[15]. Chromium trioxide (IV) is more toxic then Chromium (III). Effects of exposure to high doses may vary from upper respiratory problems such as runny nose, sneezing, and ulcers with perforated nasal septum, to more severe problems in the lower respiratory tract such as asthma attacks and lung cancer. It is currently accepted that chromium compounds are carcinogenic and may be an important cause of occupational lung cancer[15]. Studies in animals have shown that by far the most important health effect of chromium IV is carcinogenicity[16]. Studies on affection of other systems such as gastrointestinal, haematological, hepatic, renal, and endocrine and other effects have not yielded strong evidence.

Sodium Isopropylxanthate (SIPX) and Potassium Amyl Xanthate (PAX)

SIPX and PAX in Loloho

55. SIPX containers were found in a pile on the remains of a shed. The product was contained inside yellow plastic liners, packed inside a metal drum. Previous to the arrival of the audit team many of the drums were taken, probably by locals. Most of the individual liner bags were split and therefore the contents exposed. A stockpile of the remains of what was believed to be drums containing PAX were found near the containers.

Properties of the products of SIPX and PAX (carbon disulfide and hydrogen sulphide)

56. SIPX and PAX emit toxic material, the most important being, carbon disulfide and hydrogen sulphide.

Carbon Disulfide

57. Pure carbon disulfide is a colourless liquid with a pleasant sweet smell. The impure form, which is often used in industrial processes, is yellowish with an unpleasant odour[17]. At room temperature, it evaporates; the resulting vapour is twice as heavy as air[17] and is highly volatile. It is found in nature released from erupting volcanos or over marshes. It is used in industry for the production of rayon, cellophane and carbon tetrachloride. Other uses of the chemical are for dissolving rubber for the production of tyres, or as the raw material for the production of some pesticides. Much of much of the chemical that exists in nature is a result of industrial production[17]

58. As stated previously, carbon disulfide evaporates easily in contact with the environment. Being heavier than air its particles stay closer to the soil breaking down to finer components in approximately 12 days[17]. When released accidentally to soil it evaporates very quickly. Because it does not bind to the soil some may flow via the soil into ground water. Despite not staying in the water for a long period of time (as it evaporates quickly) a small amount may dissolve in water where it remains stable. Despite this, animals in the water usually do not ingest significant amounts of the product[17].

Routes of exposure

59. The chemical can penetrate the human body through breathing, consumption of water and food, or in contact with contaminated soil and water[17]. Several manufacturing processes may produce small amounts of the gas, and the most frequently exposed are workers in plants that use the product. The main route of exposure is firstly through breathing and lastly through skin contact.

60. After entering the body, it is rapidly absorbed and expelled through the lungs. Ten to 30% of the inhaled product is excreted through the lungs, about 1% through the urine, and about 70 to 90% is also excreted through the urine as metabolic

products of the original chemical [17]. Small amounts are excreted through saliva and body sweat.

Health effects of carbon disulfide

61. At very high concentrations, 10,000 ppm for example, it can become a serious hazard to health, with consequent affection of the nervous system. However, exposure to the different doses of disulfide may affect health in a wide array of forms, varying from headaches, tiredness, trouble sleeping, to chest pain[17]. Studies in animals have shown varied effects of intoxication, including affections of the normal functions of the brain, liver and heart. The current safe level of exposure in the workplace to the chemical is 20 ppm over an 8-hour day and a 5-day work week[17]. Little information is available on the effects of disulfide after consumption of contaminated food and water. However, feeding animals with disulfide has resulted in birth defects and neonatal death[17]. The dermatological effect of exposure to the chemical is a burn mainly reflected as blisters in the area of contact.

Hydrogen sulphide (H2S)

Properties of hydrogen sulphide

62. It is a poisonous, colourless, flammable gas with an odour of rotten eggs. People can smell the gas at very small concentrations; however at higher concentrations people lose the ability to smell the gas and therefore it becomes extremely dangerous. This gas exists in natural and derived forms (human made processes). Industrial sources of the gas are generally natural gas plants, petroleum refineries, food processing plants and tanneries.

Hydrogen sulphide and the environment

63. When released into the air, it can last about 18 hours in the air locally. During this period in the atmosphere it may convert in sulphuric acid and sulphur dioxide.

Health effects of hydrogen sulphide

64. Humans can be exposed to the chemical both via endogenous and exogenous routes. Endogenous production is usually by metabolism of intestinal and mouth bacteria, and exogenous, through environmental exposure[18]. Usually the population most exposed to the gas are those living near industrial sites such as pulp and paper mills, gas refineries, and geothermal power plants. Because it is a gas, hydrogen sulphide penetrates the human body through breathing and through the skin. It is then absorbed into the blood stream and distributed throughout the body. After spreading it is converted in sulphate and excreted in the urine[18]. According to various studies, the respiratory tract and the nervous system are the most sensitive targets in humans[18].

Respiratory effects

65. Exposure to high concentrations of the gas can produce respiratory arrest and/or pulmonary oedema. People living close to industries that release the gas, report

various symptoms, varying from nasal irritation, cough, and consequently regular visits to the hospital. However, no evidence of permanent damage to lung function has been found. Studies in animals suggest that chronic exposure may lead to permanent damage of the olfactory epithelium with consequent decrease sense of smell[18].

Nervous system

66. Brief exposure to high concentrations of the gas, both in humans and animals can result in unconsciousness with subsequent full recovery after termination of exposure[18]. However, the threshold for such an effect in humans is not clearly established. Neurobehavioral effects due to the exposure have also been reported in both humans and animals. Balance, reaction time, verbal recall and visual field are amongst the most frequently reported both for acute and chronic exposure. The severity of symptoms was related to the concentration and duration of exposure[18].

67. Although the respiratory tract and the nervous system are the main targets for the gas, transient cardiovascular effects have been reported after acute exposure: sinus tachycardia[19, 20], supraventricular tachycardia and left bundle block[21].

68. An intoxication surveillance report, gives a glance at the prevalence of the condition in the U.S. in 1995. Data in 1995 from 67 centres illustrated 1407 exposures, all of whom recovered with about 37% being attended in a health care facility[22].

Polychlorinated Biphenyl (PCB)

PCBs in Loloho

69. PCBs were found in Morgan's Crossing, which lies approximately 12 kilometres west of Loloho on the road to the Panguna mine.

Properties of PCBs

70. PCBs are a group of 209 chlorinated chemicals known as congeners that can be made into oily liquids or solids varying from colourless to yellow. There are not known in natural sources [23]. In the U.S. many of the commercial presentations of PCBs are known as Aroclor.

71. PCBs are used mainly as lubricants and coolants in electric material such as transformers and capacitors for their hard to burn and insulating properties[23]. In 1977 the production of the product was stopped in the U.S. because of some evidence of harmful environmental effects. However, previously to 1977 in the U.S. the most common products that had PCBs were old fluorescent lights, old microscopes and hydraulic oils [23].

PCBs and the environment

72. PCBs are usually found in the soil due to leaks from materials, such as old transformers or through the illegal disposal of chemical products. It penetrates and strongly binds with the soil, remaining for long periods of time. Released to the air it can travel long distances. In water, it dissolves very well and can be absorbed by fish and may lead to higher concentrations accumulating in predator animals[23].

Health effects of PCBs

73. The most frequent effects of exposure to large quantities of PCBs are skin affections such as acne and rashes[23]. In animals exposed for a long period of time to PCBs various conditions were observed from acne like conditions, anaemia, and injuries, to problems with the thyroid gland, liver and stomach. Effects on the immune system, behaviour alterations and reproductive problems were also observed[23]. In humans, exposure in the general population is not related to health problems, however liver damage was observed in some workers exposed to the products liver damage was observed. A few studies have suggested an association between PCBs and cancer in humans, mainly cancer of the liver and biliary tract[23]. As a result, the International Agency for Research on Cancer (IARC) has determined that PCBs are probably carcinogenic for humans.

74. Studies in women that were exposed to PCBs (either at work or by consuming contaminated fish) revealed that they delivered babies with lower birth weight than women that were not exposed. Moreover, children from exposed mothers showed varied degrees of behavioural impairment such as motor-skill problems and memory impairment that lasted for years[23]. It is believed that mothers transmit the chemical to their children through breastfeeding and via the placenta. A study suggested a relationship between high levels of PCBs in the blood of women and the onset of endometriosis[24].

Asbestos

Asbestos in Loloho

75. In the derelict power station near the wharf there were a number of pipes that carried steam and condensate which were lagged with asbestos to retain heat[8]. Because it was not possible to assess if any personnel had accessed the power station the audit team determined the risk of exposure to asbestos in the power station as low to moderate.

Properties of Asbestos

76. Asbestos is the name given to a number of naturally occurring silicate minerals[25]. The three most common type of asbestos are chrysotile, amosite and crocidolite.

77. Because asbestos fibres are very strong it is commonly used as an acoustic and thermal insulator, or for fire proofing[25].

Health Effects of Asbestos

78. Asbestos is not always an immediate hazard. It becomes dangerous when manipulated or destroyed and its fibres are released into air[25]. Although the acute health effects of exposure to asbestos are not well identified, the long-term effects of exposure are well documented. Long-term exposure to Asbestos can result in both non-cancerous (Pneumoconiosis) and cancerous conditions. The most important non-cancerous effect of exposure to asbestos is asbestosis which is a diffuse fibrous scarring of the lungs, with important symptoms such as shortness of breath, difficulty breathing and coughing that can lead to death[26].

79. Asbestos is well recognised as a long-term cause of lung cancer and mesothelioma (a form of pleural cancer). These conditions are recognised as having a long latency period of about 10-40 years[26].

5.1.1.2 *Biological exposures*

80. Biological hazards are caused by exposure to infectious disease agents including biting insects, consumption of contaminated food and water and consumption of locally sourced food.

Situation in Bougainville

81. A thorough search for health information about Bougainville was performed; however, literature about the health status of Bougainville is scarce. Because there is not a clear empirical source of information about the health conditions and the epidemiological profile of Bougainville, the health status of the North Solomons Province of PNG (of which Bougainville is part) is used as baseline health information.

82. In PNG, communicable diseases remain the major cause of morbidity and mortality in all age groups accounting for about 50% of all mortality[27]. The disease profile of the region is typical of other tropical areas. Diseases like pneumonia, leprosy, yaws, malaria, tuberculosis and hookworm are endemic[28]. Diarrhoeic conditions are also common. The most common communicable diseases are malaria and pneumonia, accounting for about one third of all the mortality. In Table 1 the five leading causes of morbidity and mortality in PNG are illustrated.

Table 1: Five leading causes of morbidity and Mortality in PNG (2000)

Morbidity (rate per 100 000 population)		Mortality (rate per 100 000 population)	
Normal deliveries	4648.00	Pneumonia	18.00
Pneumonia	608.00	Perinatal conditions	16.00
Malaria	587.00	Malaria	12.00
Perinatal conditions	164.00	Tuberculosis	10.00
Direct obstetric causes	688.00	Meningitis	8.00

83. The principal causes of outpatients' visits to hospitals are dermatological diseases or manifestations, malaria and respiratory tract infections.

Malaria

84. Malaria is the most common disease that affects peacekeeping personal while in operations in tropical and subtropical areas, particularly in Africa, South America and South Asia[29] Malaria is hyperendemic in Bougainville and is the main cause of illness in the area[30].

85. Malaria is an infectious disease, transmitted to humans by the bite of mosquitoes of the genus anopheles. Different mosquito species populate different parts of the world. The most common malaria vectors in Bougainville are *Anopheles farauti s.s* in the main island and in Buka, *An. Punctulatus* [31].

86. According to the Army Malaria Institute Central Malarial registry[30], a total of 64 cases of Malaria were diagnosed in 50 Service personnel during the period from December 1997 to December 2003. The first case was diagnosed on 11 March 1998, approximately four months after the operation commenced, and the last case was diagnosed on 12 December 2003 approximately six months after return from Bougainville[30]. Five cases of malaria occurred in Bougainville (three *P.Falciparum* and two *P.Vivax*); 58 cases after return to Australia, 1 case occurred overseas as a relapse of an unidentified species. Of the cases diagnosed on return to Australia, forty-five were primary presentations, eight a first relapse, three a second relapse and two a third relapse. Most of the cases were diagnosed in Australia and were probably due to a failure to continue prophylaxis upon return to Australia in the period post-deployment.

Prophylactic measures in service personnel

87. According to the ADF guidelines at the time, all personnel had to start taking doxycycline (100 mg) two days before departing to Bougainville for prophylaxis, and continue for two weeks after returning to Australia. Additionally personnel were to take primaquine (7.5 mg three times a day for 14 days) after leaving Bougainville in order to eliminate latent forms of the malaria parasite[30]. Later, at the end of 2000, the dose of primaquine was increased to 15 mg twice daily as a result of increased rates of *P.vivax* in personnel on return to Australia.

88. During the period of the operation, research activities were performed in Bougainville by the Army Malarial Institute (AMI) and these were:

a) A study of the tolerability and effectiveness of malarone as a substitute for doxycycline;
b) A trial of tafenoquine (Etaquine) for post-exposure prophylaxis;
c) Vector sampling; and,
d) Bed net protection.

89. The results of the malarone trial suggested that it was a safe antimalarial and with lesser side effects then doxycycline. However, the higher price of the medicine mitigated against its general introduction.

90. In summary, most of the cases of malaria occurred upon return to Australia by the *P.vivax* strain of the parasite indicating the effectiveness of doxycycline in preventing the clinical manifestations of the disease whilst in Bougainville[30]. The attack rate of malaria decreased when the dose of primaquine was increased.

Other Health Conditions

91. As previously discussed, the most frequently reported conditions according to the pilot surveillance system EPINATO were: dermatological conditions, sport injuries, intestinal infectious diseases, upper respiratory tract conditions and vector borne diseases / unexplained fever (in this order of frequency). Combined, these categories accounted for about 46% of all medical attendances[7]. Although Dengue, another vector borne disease, is very common in the Solomon Islands and Papua New Guinea there are no records of cases of dengue in the veterans of Bougainville.

Dermatological conditions

92. As Bougainville is a tropical environment, dermatological conditions were expected to be a frequent problem. Other dermatological conditions such as tinea, sunburn, blisters, prickly heat, seborrhoeic dermatitis, excluding eczematous skin conditions, accounted for about 15 to 20% of initial medical attendances[7]. Some of the reasons appointed for these incidences were: the hot and humid tropical climate; failure to adequately wash uniforms and underwear, poor personal hygiene, contact with poisonous plants and failure to apply sunscreen.

Upper respiratory tract infections

93. According to the EPINATO system, upper respiratory tract infections accounted for about 8 to 10 percent of the initial medical attendances and this condition ranked as one of the most frequent health problems. Flu-like illnesses and outbreaks of viral infections were frequently reported. The reasons proposed were the conditions of living (i.e. close living quarters with other troops), inadequate personal hygiene (such as deficient hand washing) and exposure to local populations while in military and training operations.

Intestinal infectious diseases

94. Intestinal conditions were associated with only 2.8 percent of the initial medical attendances. The low incidence rates of intestinal infectious diseases were assumed to reflect adequate management of critical logistical systems such as water treatment, waste disposal and rations.

Short- and long-term outcomes of diseases

95. Most of the conditions that were reported by the Service personnel were of acute origin as by asserted by the EPINATO system used in Bougainville. Disability pensions have been given to 26 veterans for chronic conditions in 2004/05 as illustrated by Table 2[32].

Table 2: Top 14 accepted disabilities using Repatriation Medical Authority (RMA) covered by the Statement of Principles (SoPs) – Bougainville veterans 2004/2005

SoP title	***No. of disabilities accepted***	***Acceptance rate (%)***
Lumbar spondylosis	5	71
Sensorineural hearing loss	4	100
Tinnitus	3	100
Acute sprains and acute strains	2	40
Psoriasis	2	67
Solar keratosis	2	100
Intervertebral disc prolapse	1	20
Rotator cuff syndrome	1	20
Internal derangement of the knee	1	25
Osteoarthrosis	1	50
Unknown	1	100
Irritable bowel syndrome	1	100
Post traumatic stress disorder	1	100
Non melanotic malignant neoplasm of the skin	1	100

Source: Department of Veterans' Affairs [32]

96. From July 1997 to June 1998 about 30,067 veterans (all veterans) compensation claims were accepted by the Department of Veterans' Affairs[7]. Of these claims, the leading causes were, according to the ICD coding, diseases of the nervous system and sense organs (28.3% of the claims), diseases of the circulatory system (14.5%), mental disorders (11.9%), diseases of the musculoskeletal system and connective tissue (9.6 percent), neoplasms (7.8%) and diseases of the skin and subcutaneous tissue (7.1%).

5.1.1.3 *Climate, Flora and Fauna*

Bougainville's Climate

97. Bougainville has a climate which is wet-tropical or tropical-rainfall type that is constant each year with a mean annual temperature of about 26.7°C[33]. The average temperature at sea level varies within a range of 10.6°C. At higher regions, temperatures are lower but never reach frosting. The average rainfall at sea level is 3353 millimetres per annum in the south and 2667 millimetres per annum in the north. During the months of December to April almost all parts of the island receives the same amount of rainfall. During the months of May to December the higher rainfall is in the south and Buka[33], and the rest of the northern part of Bougainville, undergoes a relatively dry season. The longest recorded period without rain anywhere in the island was of only sixteen days[33]. In terms of humidity the mean monthly recordings have been between 75 and 86%.

98. Service personnel while in operations are sometimes submitted to extreme weather conditions at both ends of the temperature scale[34]. Because humans are

homeothermic the body attempts to maintain constant body temperature. However, when exposed to the outer limits of temperature, negative health effects may result.

99. In general physiological terms, the mechanisms of temperature regulation according to the laws of thermodynamics, are basically that heat is transferred from high temperatures to lower temperatures. Therefore, the body loses temperature when exposed to low temperatures and it increases when exposed to high temperatures[34]. This model of transfer is highly dependent on other factors such as the environment, particularly humidity, air temperature, wind speed and radiation, as well as individual factors, such as age, gender, work-load, pre-existing medical conditions, clothing and metabolic rate[34]. The normal physiological temperature range is from 36-38°C and the limits for thermal regulation when exposed to hot climates is 35–40ºC [34].

100. The amount of kilocalories (kcal) produced in different conditions varies. Walking produces approximately 250–300 kcal/hr. Exercise may increase the metabolic rate by approximately 70 to 100 percent. If the heat produced is not dissipated this could induce serious harm to health. The body temperature, during heat stress and exercise may reach temperatures of about 40-42°C[35]. As previously cited, other factors such as hot environmental temperature and humidity will contribute to the storage of excess temperature with consequent core temperature increase[34].

101. Some people are more susceptible to heat stress than others[35]. These usually are infants[36], the elderly[37], those with chronic diseases and those socially isolated[38].

Heat stress syndromes

102. The rapid mobilisation for Operation BEL ISI would have greatly limited the opportunity for acclimatisation. Personnel not acclimatised are susceptible to heat exposure related disorders[39].

103. The effects of heat stress are usually short-term and can be classified as heat stroke, heat exhaustion, heat cramps and tetany, heat syncope and finally heat oedema[34]. The most severe form of heat stress, which may be fatal, is heat stroke. Heat stroke is described as a sudden collapse of body temperature regulation that leads to an increase in the body core temperature[40]. However, heat stress as a result of exposure to extreme hot temperatures results in increased temperature, heart rate and sweating. Heat stress can be minimised by the gradual introduction of the individuals to the climate[34].

104. Types of heat stress include:

a) Heat oedema: results when cutaneous vasodilatation and pooling of increased interstitial fluid in dependent extremities lead to swelling of the hands and feet; it is self-limited and rarely lasts more than a few weeks[41];

b) Heat syncope: results from volume depletion, peripheral vasodilatation, and decreased vasomotor tone and occurs most commonly in elderly and poorly acclimatised individuals[41];

c) Heat cramps: characterised by painful muscle spasms, especially in the voluntary muscles of the calves, thighs, and shoulders, which most often occur several hours after vigorous exertion and begin during rest or showering[41];
d) Heat exhaustion: the most common heat-related illness, it is characterised by water and salt depletion that develops in conditions of heat stress; individuals present with systemic complaints including fatigue, weakness, dizziness, headache, nausea, vomiting, and muscle cramps; on examination, these patients usually have core temperatures of less than 40°C and will not have signs of severe central nervous system damage[41]; and,

e) Heat stroke: exertional heat stroke is mainly seen in poorly acclimatised persons involved in strenuous physical activity in a hot environment; patients typically have a core temperature of 40°C or more and central nervous system dysfunction manifesting as seizures, delirium, or coma; in addition, patients may present with profuse sweating, tachycardia, hypotension, and tachypnoea (rapid breathing); vomiting and diarrhoea are common, while 25% of patients may develop acute renal failure (ARF); patients can also develop hemorrhagic diathesis as a result of disseminated intravascular coagulation (DIC)[41].

105. Heat stress causes damage to an organism by way of at least three mechanisms[41]:

a) Heat is directly toxic to cells. An increase in cellular temperature results in protein denaturation and interrupts critical cellular processes, resulting in apoptosis and cell death. Temperatures above 41.6°C to 42°C are considered to be above the critical thermal maximum for humans and can be expected to produce injury over even a few hours;

b) Heat stress results in release of inflammatory mediators; and,

c) Heat results in injury to vascular endothelium, resulting in enhanced vascular permeability, activation of the coagulation cascade, and disseminated intravascular coagulation (DIC).

106. In this respect, severe heat illness can be seen as a combination of direct cytotoxicity and a severe systemic inflammatory response in which encephalopathy predominates early in the course of the disease. If left unchecked, renal failure, coagulopathy, hepatic dysfunction and multiple organ dysfunction system will result[41].

107. Most patients who have heat injuries have good outcomes if they are treated promptly. In patients who have heat stroke, mortality should be less than 10% with adequate treatment and supportive care. Poor prognostic factors include hypotension, the need for endotracheal intubation in the emergency department, altered coagulation profile in the emergency department, and advanced age[41].

108. The vast majority of patients who have exertional heat stroke will recover without sequelae. Long-term effects for heat stroke survivors are rare with adequate treatment. In a case–control study of 21 young patients suffering exertional heat stroke followed up for 6 months and tested for heat tolerance and psychological sequelae, none were found to have any abnormal findings[41]. However a few long-term effects of heat exposure have been suggested by some researchers. These are certain kidney, liver, heart, digestive system, central nervous system and skin illnesses[42]. Moreover, chronic heat exhaustion, sleep disturbances and susceptibility to minor injuries and sickness have also been attributed to heat exposure[42].

Heat in the Military

109. Service personnel are often exposed to different environments and therefore different ranges of temperature. Because it is physically demanding work, many studies have been performed on the military in relation to exposure to different environmental conditions. The largest study on heat exertion, performed in U.S. Army personnel[43], showed that, in general, heat illness risk was higher for women in comparison to men and that African Americans and Hispanic Americans were at lower risk of heat illness disorder.

110. The dangers of heat to ADF personnel were tragically exemplified by the death of a trooper in November 2004 in the Mount Bundy training area south of Darwin due to heat stroke.

Flora and Fauna

111. The most important hazards present in Bougainville regarding the fauna were mainly vector borne diseases from mosquito bites. Another group of hazards were dangerous invertebrates such as centipedes, scorpions and spiders. Flora hazards were mainly contact irritants from different poisonous plants.

5.1.2 Operational/Occupational exposures

112. Occupational exposures are related to the work that service personnel executed in the area. The group of occupational exposures evident in Bougainville are: psychological stressors (such as isolation, loneliness and stress), mosquito control measures (such as use of DEET, permethrin, and exposure to fogging particularly diesel), and physical injury (such as sporting accidents). These exposures are now discussed in detail.

5.1.2.1 *Psychological exposures*

Background

113. According to the WHO, “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”[44]. Mental health is extremely important for service personnel as a member can be healthy in other aspects but not mentally, and this could have a negative effect on their ability to perform duties, and also in the way they are able to operate in physically and

psychological stressful conditions[7]. The importance of mental health is reflected it being given the top national health priority area in Australia[45].

Mental health in the Military

114. Exposure to combat and other war-time experiences can have variable short-term and long-term harmful psychological effects on Service personnel[46]. In 1999 and 2001, suicide was the leading cause of death in the Australian army and navy and the fourth leading cause in the air force[7]. Moreover, about 2 to 8 percent of service personnel deployed to combat operations, peacekeeping tasks and humanitarian and disaster relief operations will present with one or more stress disorders within three years of deployment[47]. A study of Norwegian peacekeepers found a moderate increase in risk of suicide among peacekeepers compared to the general population. However, as it was described, they stated that other factors, such as a lower marriage rate among peacekeepers, may confound the association[48].

115. The most common mental health disorders, for which claims for disability compensation were accepted by the Department of Veterans' Affairs (DVA), were: Post Traumatic Stress Disorder (PTSD), psychoactive substance abuse or disorder, generalised anxiety disorder and affective psychosis[7].

116. Since 1999 the ADF has been monitoring alcohol intake in service personnel three months after operational deployment and the results illustrate that 30 percent of the personnel report hazardous drinking and about 10 percent report dependency on alcohol.

A review on stressors in peacekeeping operations

117. Peacekeeping operations, because of their nature, may pose different types of psychological hazards to service personnel. The factors that determine the different types of psychological exposures are: the degree of enforcement, the length of the mission, amount of chaos, the acceptance by local people and the possible attacks from local forces[49]. These stressors can act prior to deployment as well as during deployment.

Pre-deployment stressors

118. Studies suggest that the pre-deployment phase can be more stressful than the deployment, and that a certain degree of relief may actually be achieved after deployment[49]. For instance, a survey of 81 U.S. army soldiers in an intensive two week training period prior to an operation in Yugoslavia illustrated that the most important stressful aspects were the uncertainty in relation to getting to know peers and commanders, and time pressure related to pre-deployment[50]. These findings were corroborated by another study in the Japanese self defence forces [51].

Deployment stressors

119. Five dimensions of stressors have been described[50]. These dimensions are: isolation, ambiguity, powerlessness, boredom and threat/danger, as illustrated in Table 3.

Table 3: The five dimensions of psychological stressors that act on deployed personnel in peacekeeping operations

Isolation	Away from home, limited communication Feelings of being forgotten
Ambiguity	Ambiguity of operations: mission purpose, length of stay Is peacekeeping an appropriate work for warriors?
Powerlessness	Severity of the local area: risk of secondary traumatization Limited things that can be done to improve the situation
Danger	Attacks by local troops and civilians Limited use of weapons Risk of infectious diseases
Boredom	Simple and repetitive routine jobs Lack of opportunity to demonstrate professional work

Source: Bartone PT and Adler AB [50]

Isolation

120. The fact that most peacekeeping missions occur in remote and austere environments where communications are difficult, will be reflected as a feeling of physical isolation. Sometimes media coverage is low or nonexistent for such operations and this will further contribute to the feeling of "being forgotten"[49].

Ambiguity

121. Peacekeeping operations can be perceived as ambiguous by personnel. This may be because these operations have both political and tension easing functions, in which the use of force must be kept at the minimum necessary. The fact that these missions usually occur in places where armed conflict persists further confuses the mission personnel. Also the command structure may be confusing because of the different countries that participate in the contingent[49].

Powerlessness

122. Many peacekeeping operations take place in areas where there is extreme poverty. Witnessing poor living conditions can be stressful due to the feeling of powerlessness to resolve the situation. Cultural and language differences may present a barrier to communication and further contribute to the feeling of not being able to help.

Danger

123. Since 1948 to 1998 there have been about 1559 deaths in United Nations Peacekeeping Operations[52]. There is no doubt that peacekeeping operations pose a threat to the Service personnel. Occasionally soldiers are sometimes fired upon, there are land mines disposed of in an uncontrolled way, and there might even be rejection and hostility from the local Government troops and civilians. Moreover the fear of infectious disease (from vector-borne disease or poor living standards) is also present.

Boredom

124. Research has illustrated that boredom is an important aspect of peacekeeping deployment[53]**.** Because much of the work in these types of operations is routine, simple, repetitive and monotonous, service personnel tend to become bored, mainly due to the lack of entertainment. However, the real context of the boredom experienced is the lack of meaningful and relevant work to do[49]. Because the personnel are trained professionals, the lack of meaningful and relevant activities may be perceived as deteriorating their job skills through inactivity.

Post-Deployment stressors

125. Any mental health problems, particularly stress related problems, are expected to disappear as soon as the personnel return from the mission. This is not always the case and studies suggest that effects from stressful situations may persist for years[47].

126. One factor that is a major influence on the mental health of the service personnel post-deployment is the quick return to home soon after deployment[54]. Historically soldiers would return home by ship, allowing for an adequate and timely debriefing. With current air travel, personnel are returned home very quickly without having closure on the deployment issues before returning to regular social life. The adaptation process can therefore be stressful and result in the so called 'post-deployment stress syndrome'[54]. This syndrome comprises physical, emotional, cognitive and behavioural components that can persist for months after deployment.

Psychological stressors in Bougainville

127. The peacekeeping personnel were unarmed during the BEL ISI operations. The proliferation of weapons in an uncontrolled way, and the presence of BRA personnel, worsened by an anarchic environment, could contribute as psychological stressors. Another group of probable psychological stressors are: isolation and separation from the family (veterans reported being able to only contact home for one hour a week),

poor living conditions with little privacy or social outlets, a polluted environment and the fear of chemical contamination, and the exposure to violent situations such as witnessing victims of violent domestic disputes. However, according to the report on questionnaires applied to service personnel on return from different peacekeeping and peace monitoring missions[55], the personnel deployed to Bougainville scored low in terms of stress measures used, suggesting that deployment to Bougainville involved few traumatic stressors. However the author stated that the scores used did not take into account the non-traumatic stressors such as extended periods away from home.

128. According to the Department of Veterans' Affairs, in the year of 2004/05 one claim for PTSD was accepted for a Bougainville veteran (Table 2).

A brief description of the most common stress syndromes

129. The most common stress syndromes are: Post Traumatic Stress Disorder (PTSD), complex PTSD, alcohol and drug abuse, somatisation syndrome, chronic fatigue syndrome (sometimes termed myalgic encephalomyelopathy syndrome), Stockholm syndrome, survivor's guilt syndrome, lifestyle and cultural change syndrome, and Gulf War syndrome[56].

PTSD

130. PTSD is a syndrome that can occur after exposure to a traumatic event and manifest through a group of symptoms that can be classified as intrusive, avoidance and arousal symptoms[57]. Intrusive symptoms reflect the grade to which memories and images of the traumatic event may be intrusive to an individual's life, and can occur during daytime or night time to the extent that the individual assumes that the memories from the past are dominating the present. Arousal symptoms are characterised by the fact that individuals exposed to severe trauma may feel at risk further traumatisation and therefore become easily startled and extreme watchful. Mood and sleep disorders are a common related complaint. Avoidance symptoms occur when people avoid situations, people or events that remind them of the traumatic event and in extreme situations, become isolated and withdraw into themselves in order to ease painful memories and feelings.

Somatisation syndrome

131. Somatisation is the most common cause of people in general seeking medical care[58]. It is characterised by multiple physical symptoms without a satisfactory medical explanation and the most common symptoms are dizziness, palpitation, back pain, abdominal pain/discomfort/bloating. Co-morbid mental health conditions are very common.

Chronic fatigue Syndrome

132. "The chronic fatigue syndrome is a clinically defined condition characterised by severe disabling fatigue and a combination of symptoms that prominently features self-reported impairments in concentration and short-term memory, sleep disturbances, and musculoskeletal pain"[59].

5.1.2.2 *Mosquito control measures*

133. Mosquito control is achieved through control of larval and adult forms of mosquitoes. Larval control is achieved by eliminating breeding sites. Adult control is usually achieved through a combination of individual and community measures[60].

134. In Loloho the main mosquito control measures applied were regular fogging (with a mixture of pyrethroids and diesel; approximately weekly), impregnation of uniforms with permethrin and the use of insecticide treated nets.

135. Fogging, also called thermal fogging, involves applying a mixture of insecticide and diesel fuel to a warm manifold and then to a stream of air. This produces a dense grey fog of microscopic droplets that lingers near the ground, penetrating the area inhabited by adult mosquitoes. The insecticide enters the mosquito through the exoskeleton or through the breathing system. Thermal fogging can reduce biting activity for several hours to several days depending on the environmental conditions, the size of the mosquito population, and the active ingredient chosen. Mosquitoes must be in a fairly dense fog for a minimum of 20 to 30 seconds to be killed; if the fog is intermittent and the mosquitoes are exposed to it for a lesser period of time, they are likely to survive. Fogging is most effective when conducted during the evening or early morning hours. At this time a temperature inversion may occur, causing the warm fog containing the insecticide to stay near the ground, which is desirable. During the heat of the day, fogs tend to rise and are dispersed too rapidly. An additional advantage to fogging during the evening is that, the greatest numbers of mosquitoes are starting to move from their resting places and are thus more likely to be contacted by fog[61].

N,N Diethyl-m-toluamide (DEET)

136. In tropical and sub-tropical areas throughout the world, malaria and dengue are a constant threat to human health. Because the main vectors for malaria and dengue are mosquitoes, particular measures that include vector control through fogging with insecticides and personal measures such as the use of repellents are the main interventions for population and individual protection. However, with the increase of these diseases, an increase in use of these protective chemicals has brought a great concern about the health effects on humans[62].

137. DEET was first discovered in 1950 as an insect repellent and since then it has been extensively used in the USA and Europe[62]. According to commercial estimates, about 30% of the population in the U.S. and 20% in the UK use DEET at least once a year[62]. It is the only pesticide that can be applied to human skin and its mechanism of action, although not completely clear, is thought to affect insects' ability to locate animals to feed on[63].

Formulations and use

138. An estimated 200 million persons worldwide use DEET repellents each year[64]. A variety of DEET mosquito repellent formulations are used in Australia, ranging from 7 to 80 percent concentrations and supplied as either gels or lotions (see Table 4)[65].

Table 4: DEET mosquito repellent formulations used in Australia

Product Type	*Packaging*	*Concentration of DEET*	*Manufacturer*
Bushman Gel	75g	80%	North Queensland Laboratories
ADF Gel	75 mL	35%	Colbar Laboratories
Aerogard Lotion	125 mL	17%	Reckitt Benckiser
RID Lotion	125 mL	16%	Thorley Laboratories
Skintastic Lotion	125 mL	7%	S C Johnson

Source: Frances S and Cooper R [65]

139. In the ADF, a 35% DEET gel formulation was placed into service in 1992. It was designed to allow more DEET to remain on the treated skin for longer than ethanol formulations, with less intradermal absorption. This gel has been shown to be effective in protecting people against mosquitoes in PNG and Australia. Despite this, the gel has been poorly accepted by ADF personnel because many soldiers complained that it did not feel good on the skin and had been seen to melt plastic. As an alternative, ADF often used commercial products containing DEET[65].

140. The largest test for toxicity of DEET was performed in the U.S. by analysing 3098 exposures reported by the public from 1990 to 1998. This included oral ingestion, topical application, inhalation and accidental eye contamination. Only 44 cases resulted in hospital admission and 5 of these with severe adverse effects [62]. The most severe reaction was following eye contact and inhalation and was not related to concentration of DEET in the preparation. In the UK about 25 cases were identified, mostly related to accidental ingestion in children. Ingestion of high doses of DEET is very rare, but has shown adverse health effects such as hypotension, central nervous system affection, respiratory depression and even death[66]. Toxicity following topical application in adults has been reported in only two cases, resulting in psychosis[67] and cardiovascular complications[68].

141. Lesser adverse reactions such as skin irritation, contact dermatitis and urticaria have been reported. Furthermore, there are reports of bullous eruptions in soldiers that had applied the product in the antecubital fossa area[69], probably due to the fact that the product was applied before going to sleep in an airtight area. Nervous system effects due to the application of DEET have also been discussed in the literature, although the causality is not clearly established. Another effect of DEET on health that has been suggested is Gulf War Syndrome, although once more the evidence is yet to be produced[70].

142. In summary, although the toxicity levels and adverse effects of DEET have not clearly been established, precaution is advised by the application of the lowest effective dose of 30 percent[62].

Diesel

143. Because numerous epidemiological studies have shown an association between air pollutants and different health outcomes, such as mortality, asthma, chronic bronchitis and respiratory tract infection, the current levels of air pollution have increasingly become a concern for health authorities' internationally[71]. The United Nations Environmental Program identified particulate matter pollution as the most serious air pollution problem in cities[72].

144. Diesel emissions (DE) (from diesel fuel in engines) are a complex mixture of hundreds of organic and inorganic particulate and gaseous compounds[73]. Some of the components of DE are: carbon monoxide (CO), nitric oxides (NO, NO_2), sulphur dioxide (SO_2), hydrocarbons, formaldehydes, transition metals and carbon particles[71].

145. Of the pollutants generated by vehicles, diesel emissions and particularly diesel emission particles (DEP) account for a high percentage of particulates emitted in many towns and cities[71]. In terms of morphology, diesel emission particles (DEP) "consist of particulate matter composed of several hundred compounds adsorbed to the surface of the particles and an elemental carbon core that possesses volatile fractions composed of numerous organic and inorganic compounds"[73]. Most of the particles are between 0.02-0.5 µm in size.

146. Complete combustion of diesel fuel results in water and carbon dioxide. However, the use of diesel in motor engines results in incomplete combustion and the formation of various gases, liquids and solid particles. Diesel engines produce great amounts of nitrogen oxides and aldehydes, which can cause irritation to the respiratory tract.

147. Submicron soot particles are also produced and are thought to be responsible for some adverse health effects.

Health effects

148. The health effects of DE are difficult to assess because the emissions are highly complex mixtures. For instance, combustion of other type of materials such as tobacco and fossil fuels generate the same type of components of diesel. Because no single constituent of diesel can be used as a marker of exposure, scientists are currently using the levels of elemental carbon particles as a proxy for exposure levels[74].

149. Ultrafine particles (diameter less than 0.05-0.10 µm) are suggested to be the most hazardous to health because they are highly reactive and are present in high concentrations in the environment. These particles can penetrate the lung epithelium and enter the blood stream and therefore account for some of the systemic effects of DEPs[71]. Some of the health effects attributed to these particles are cancer[75], precursors of autoimmune disorders, and cardiovascular and blood coagulability disorders[76].

150. In general, the health effects of DE can be classified as neoplastic and non-neoplastic[62].

Neoplastic effects

151. The association between diesel emissions and lung cancer has been frequently suggested, despite the confounding effect of smoking. According to the epidemiologic studies in railroad workers and truck drivers exposed to DE[77], there was a 20% to 40% higher incidence of lung cancers, although the confounding effects of smoking cannot be excluded. Another study in Sweden (involving 695 bus garage workers and mechanics), a strong association was found between diesel exposure and lung cancer, compared with other occupationally active man[78]. However, to illustrate the difficulty of determining the causal relationship between diesel emissions and lung cancer, another study showed no association between Swedish heavy equipment workers exposed to diesel emissions and lung cancer onset[79].

152. In animal studies, rats exposed to inhalation of the gaseous phase of DE (not the particle component), did not develop cancer. However, long-term exposure at particle concentrations of 2 mg/mm³ or more was shown to induce carcinogenicity in rats[73]. As a result of these studies, the carcinogenicity of DE is assumed to be due to particle overload in the lung, due to prolonged exposure to high concentration. Hence, the importance of reducing the emission of carbon from diesel exhausts[73].

153. Exposure to DE has also been suggested to cause cancer of the larynx, pancreas, bladder and kidney[80]. The evidence is stronger for bladder cancer, as the metabolites polycyclic and nitro-polycyclic hydrocarbons are accumulated in high concentrations in the urine and may interact with the bladder epithelium[80]. Some confounding effects such as smoking and urination frequency cannot be excluded.

Non-Neoplastic effects

154. Exposure to DE can lead to acute and chronic effects. Some of the acute effects have been suggested as being irritation of the eyes and nose, lung function changes, respiratory changes, headache, fatigue and nausea[71]. Some of the suggested chronic health effects are, cough, sputum production, lung function decrements and profound inflammatory effects in the lung epithelium that can be more pronounced in asthmatics[71]. Another suggested health effect of DE is the potential for inducing allergy. Various experiments where DEPs were introduced via different routes, (intranasally, intraperitoneally or intratracheally) have shown that these particles may act as adjuvants to other allergens and potentiate allergy. There have also been reports from animal experiments suggesting an association between diesel particles and asthma, chronic bronchitis and pollinosis[73]. The evidence of a relationship between particle effects and asthma is strong[71]. Cardiovascular diseases are another group of conditions that have been associated with exposure to diesel. The association between carbon black particles (a component of diesel emissions) and coronary artery endothelium damage, and potential risk for coronary heart disease has been described[81].

155. Exposure to diesel has been associated with a number of adverse health effects in humans. Much of the strongest evidence comes from studies in animals. Strong associations have been shown between short-term adverse effects (respiratory and cardiovascular) and diesel combustants (NO_2 and CO) in humans. There is some evidence of long-term damage to the lung.

Permethrin (Pyrethroid)

156. Use of bed nets treated with an insecticide can be an effective barrier against biting mosquitoes, although nets are only effective while the person is under them. As such, uniforms are also often treated to reduce the number of mosquito bites. A common and effective insecticide used for these purposes is permethrin[65].

157. Permethrin acts by exciting an insects' nervous system which increases the responses of insects to sensorial inputs[82]. The LD50 of the chemical, a common measure of toxicity which is the lethal dose concentration that results from a single and limited exposure resulting in the death of 50% of the exposed animals, varied from 430 milligrams per kilogram of body weight (mg/kg) to over 4,000 mg/kg.

Health effects

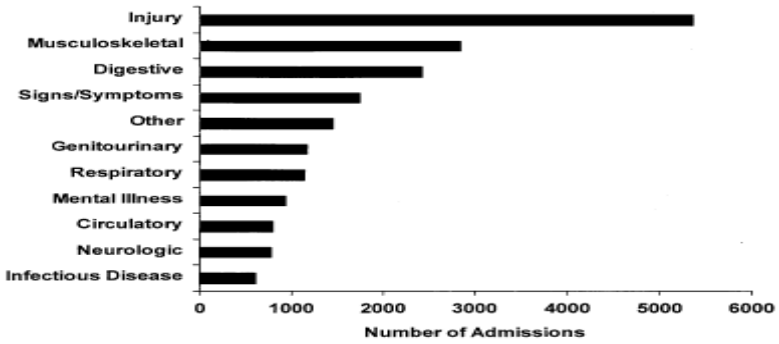
158. In mammals permethrin affects different systems such as the central nervous system, and the immune, skin and reproductive system. The effects of the chemical in mammals' neurological system, includes tremors, incoordination, hyperactivity, paralysis, and an increase in body temperature. These can last as long as three days. Permethrin can be also irritating for both skin and eyes. Eye effects can vary from moderate irritation to tearing, swelling and blurred vision. Skin irritation can vary from redness, swelling and possible blistering[82]. Effects on the immune system of animals have also been described and the main feature has been described as the reduction of the ability of immune system cells called T-lymphocytes to recognise and respond to foreign proteins[82]. Further research in animals has shown an effect on the reproductive system of both male and female mice by permethrin. In males it has been associated with reduced testicle weight and in females, loss of embryos in pregnant mice[82]. Permethrin has also been suggested as being carcinogenic by the U.S. Environmental Protection Agency (EPA) through studies in mice. The most frequent cancers associated observed in these experiments were liver and lung cancer[82].

5.1.2.3 *Physical exposures*

159. Injuries are a common occurrence in military service. These can be either due to battle or non-battle situations. Injuries are extremely important as they may affect the injured person's ability to perform duties and can lead to costs associated with treatment, rehabilitation, and future compensations. With the mechanisation of the army (that is, the use of vehicles) and better disease control methods, the importance of non-battle injuries have increased [82] and this can be seen by historically examining previous conflicts. During World War I non-battle injuries (NBI) were the fourth leading cause of hospitalisation. During World War II NBIs ranked the third leading

cause[62]. During the Vietnam War NBIs were ranked as the leading cause of hospitalisations.

160. Injuries are currently the leading health problem in the U.S. military services[83]. In an attempt to describe the epidemiology of injuries in deployed personnel, four deployments of the U.S. army were studied encompassing combat, humanitarian service and exercise[84]. During the Persian Gulf War, non-battle injuries ranked first as the leading cause for hospitalisations, as illustrated in Figure 2. Injuries related to transportation were the leading cause, followed by musculoskeletal problems.



Source: Writer JV et al [84]

Figure 2: Leading hospitalisation diagnostic categories for U.S. army troops during the Persian Gulf War

161. In three other U.S. army operations in Somalia, Haiti and the Egypt, NBIs again ranked as the leading causes for both hospitalisations and outpatient visits[84].

Basic definitions

162. Musculoskeletal injuries can be divided into traumatic injuries, e.g. sprains and fractures, and overuse injuries, such as tendonitis, bursitis and stress fractures.

Epidemiology of injuries in the military

163. Extensive studying has been performed on injuries in the military, mainly during basic training, where the physical demands are higher. As a result, about 60% to 80% of the injuries in basic training in the U.S. military are overuse injuries[85] such as achilles tendinitis, patelo-femoral syndrome, plantar fasciitis and stress fractures. Of these injuries about 80% to 90% occur in the lower extremities[86, 87 88].

164. Musculoskeletal injuries are an important contributor to the overall injury burden. A study performed on training injuries, in both military and athletics population in the U.S. army, found that musculoskeletal overuse injuries were the leading cause of injuries in trainees[89]. Furthermore, the majority of injuries occurred at or below the knee.

Risk Factors

165. Because injuries present an important burden on service personnel, extensive research has been performed into risk factors for this problem. In general, as

illustrated in Table 5, risk factors for injuries can be divided into intrinsic and extrinsic. Intrinsic factors relate to the individual characteristics of the person, such as gender and age. Extrinsic risk factors are the ones that influence the onset of injuries such as parameters of training (duration, frequency and intensity) and the physical environment in which exercise takes place [85].

Table 5: Risk factors for musculoskeletal injuries associated with weight-bearing exercise and activities

Extrinsic factors
Training parameters (excessive or rapid increase)
Duration
Frequency
Intensity
Environmental conditions (extremes or irregular)
Terrain
Surfacing
Weather
Equipment (e.g., footwear)
Intrinsic factors
Sex
Age (extremes)
Previous injury
Behavioral factors
Smoking
Alcohol use
Previous physical activity/lifestyle (sedentary)
Physical fitness
Aerobic endurance (low)
Muscle endurance (low)
Strength (low or imbalanced)
Flexibility (extremes or imbalanced)
Body composition (extremes)
Anatomic abnormalities
High arches
Bowed legs
Leg-length discrepancies
Musculoskeletal disease
Osteoporosis
Arthritis

*Source: Jones BH, Reynolds KL, Rock PB, Moore MP. Exercise-related musculoskeletal injuries: risks, prevention, and care. In: Durstine JL, King AC, Painter PL, Roitman JL, Zwiren LD, Kenny WL, eds. Resource manual for guidelines for exercise testing and prescription. 2nd ed. Philadelphia, PA: Lea & Febiger, 1993:378–93.

Gender and injuries in the military

166. In the military four U.S. studies have suggested that women are at higher risk of sustaining injuries then men. A study highlighted the differences in the incidence of injuries between male and female U.S. army basic trainees[90]. In this study, women experienced twice as many injuries then men. The study further suggested that the most important risk factor for injuries was the level of physical fitness in particular cardiovascular fitness. In another study in the U.S. army[86], gender and low aerobic fitness were risk factors for injuries. The higher risk of injuries in women was further illustrated in the study where U.S. air force female recruits were injured twice as often as male recruits with no significant difference between genders in terms of the site of the injuries[91]. These findings are consistent with another study where it was suggested that female U.S. soldiers are more likely to be injured then their male counterparts[92].

Other risk factors

167. It has been suggested that low fitness level (lower aerobic capacity) and smoking are also important risk factors for injuries in service personnel[93]. Also considered as risk factors for injuries are: past physical activity, low levels of previous occupational and leisure time physical activity, previous injury history, high running mileage, high amount of weekly exercise, age and biomechanical factors[94]. It is

important to clarify that smoking and aerobic capacity were independent risk factors in a multivariate analysis. In a particular study young smokers and non-smokers had the similar aerobic capacities, but older cigarette smokers had a generally lower aerobic capacity than younger non-smokers[94].

Long-term effects of injuries

168. Although the immediate impacts of injuries are significant, reflected in the fact that the individual is unable to perform duties, the long-term effects of injuries are also important. In the U.S. army, musculoskeletal (orthopaedic) conditions are the leading cause of disability, as illustrated in Table 6[95].

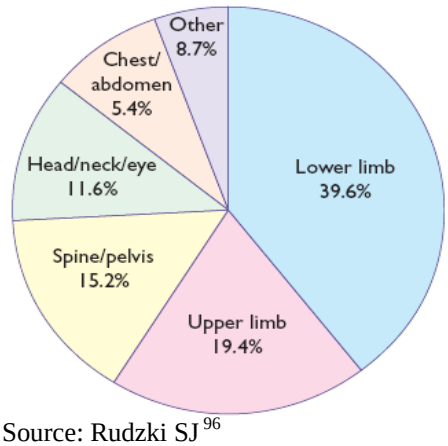
Table 6: Musculoskeletal injuries and disability in different branches of the U.S. army

Disability	Army	Navy and Marine Corps	Air Force
Musculoskeletal (Orthopedic) Conditions (VASRD Codes 5000-5300)	• Musculoskeletal (orthopedic) conditions account for 53% of all disabilities.	• Musculoskeletal (orthopedic) conditions account for 63% of all disabilities.	• Musculoskeletal (orthopedic) conditions account for 22% of all disabilities.
Mental Disorders (VASRD Codes 9200-9500)	• Mental disorders are the second leading cause of disability, accounting for 14% of all disabilities.	• Mental disorders are the second leading cause of disability, accounting for 10% of all disabilities.	• Mental disorders are the second leading cause of disability, accounting for 21% of all disabilities.
Ratio	• Musculoskeletal (orthopedic) conditions occur almost 4 times as often as mental disorders, the second leading cause of disability.	• Musculoskeletal (orthopedic) conditions occur more than 6 times as often as mental disorders, the second leading cause of disability.	• Musculoskeletal (orthopedic) conditions occur slightly more often as mental disorders, the second leading cause of disability.

Source: Atlas Chapter 4, tables 4-3 and 4-9.

Injuries in the ADF

169. A study of injuries in the Australian army from 1987 to 1991 showed that the average report rate of injuries for 1991 was 191 per 1000 soldiers per year[96]. Lower limb injury was the most common injury, with a rate of 60.1 per 1000 soldiers per year (Figure 3). In 1992 14% of the Australian army were not fully fit for duty.



Source: Rudzki SJ[96]

Figure 3: Percentage of reported injuries in the ADF from 1987 to 1991

Sports Injuries

170. Although the majority of injuries in operations are due to training and occupational exposures, sports injuries are also an important problem. In an attempt to evaluate the extent to which injuries affect personnel, the U.S. Armed Forces Epidemiological Board (AFEB) found that the leading cause of injury for service personnel was sports[97]. Moreover, it was the leading cause for hospitalisations in Operations Desert Storm and Desert Shield (3.6 per 1000 persons-years). A study of the British Services from 1969 to 1980 found a rate of 6.5 per 1000 person-years of sport injuries [98].

171. A U.S. army database review[83] of active duty army personnel admissions from 1989 to 1994 showed that:

a) For the period there were 13,861 admissions due to injuries reported both from sports and training;
b) 94% (13,020) of the injuries were in men and 6% (841) in women;
c) 82% of all of the injuries were acute musculoskeletal injuries such as fractures, sprains/strains and dislocations;
d) For both men and women physical training was the most common cause for lumbosacral strains; and,
e) Injuries accounted for about 29,436 lost duty days each year and an average of 13 days per injury for men and 11 days per injury for women.

Sports injuries in Bougainville

172. In Bougainville, about 10 to 20 percent of all non-battle casualties were due to injuries of all types. During the period between 30 November 1998 and 6 February 2000, sports injuries were the leading injury category and accounted for about 10 percent of medical attendances with a weekly incidence of about one percent. Moreover, as suggested in the report, injuries were the leading cause of both working days lost and hospital admissions[7].

Motor vehicle accidents

173. In 2002, it was estimated that about 1.2 million people died and 50 million were injured in vehicle accidents worldwide[99], and the cost to the communities throughout the world has been estimated at US$518 billion[100]. If there is no adequate intervention, road-traffic injuries are expected to escalate from ninth place in terms of burden of disease in 1990 to third place in 2020[101].

Risk factors

174. According to Peden et al[102], risk in road traffic is a function of four elements, namely, the exposure – the amount of movement or travel within the system by different users or a given population density; the underlying probability of a crash, given a particular exposure; the probability of injury, given a crash; and the outcome of injury, as Table 7 illustrates.

Table 7: Risk in road traffic accidents

The main risk factors for road traffic injuries

Factors influencing exposure to risk
- Economic factors, including social deprivation
- Demographic factors
- Land use planning practices which influence the length of a trip or travel mode choice
- Mixture of high-speed motorized traffic with vulnerable road users
- Insufficient attention to integration of road function with decisions about speed limits, road layout and design

Risk factors influencing crash involvement
- Inappropriate or excessive speed
- Presence of alcohol, medicinal or recreational drugs
- Fatigue
- Being a young male
- Being a vulnerable road user in urban and residential areas
- Travelling in darkness
- Vehicle factors – such as braking, handling and maintenance
- Defects in road design, layout and maintenance which can also lead to unsafe road user behaviour
- Inadequate visibility due to environmental factors (making it hard to detect vehicles and other road users)
- Poor road user eyesight

Risk factors influencing crash severity
- Human tolerance factors
- Inappropriate or excessive speed
- Seat-belts and child restraints not used
- Crash helmets not worn by users of two-wheeled vehicles
- Roadside objects not crash protective
- Insufficient vehicle crash protection for occupants and for those hit by vehicles
- Presence of alcohol and other drugs

Risk factors influencing severity of post-crash injuries
- Delay in detecting crash
- Presence of fire resulting from collision
- Leakage of hazardous materials
- Presence of alcohol and other drugs
- Difficulty rescuing and extracting people from vehicles
- Difficulty evacuating people from buses and coaches involved in crash
- Lack of appropriate pre-hospital care
- Lack of appropriate care in the hospital emergency rooms

Source: Pedden et al (2004)

175. Bell et al[103] state that the most common risk factors for higher frequency and severity of motor-vehicle accidents are: alcohol use, smoking, speeding, failure to wear a safety belt, young age, and male gender. Injury due to road accidents occur mainly because human physical tolerance to physical forces is limited and it is related to the amount of kinetic energy that the body is exposed to[102].

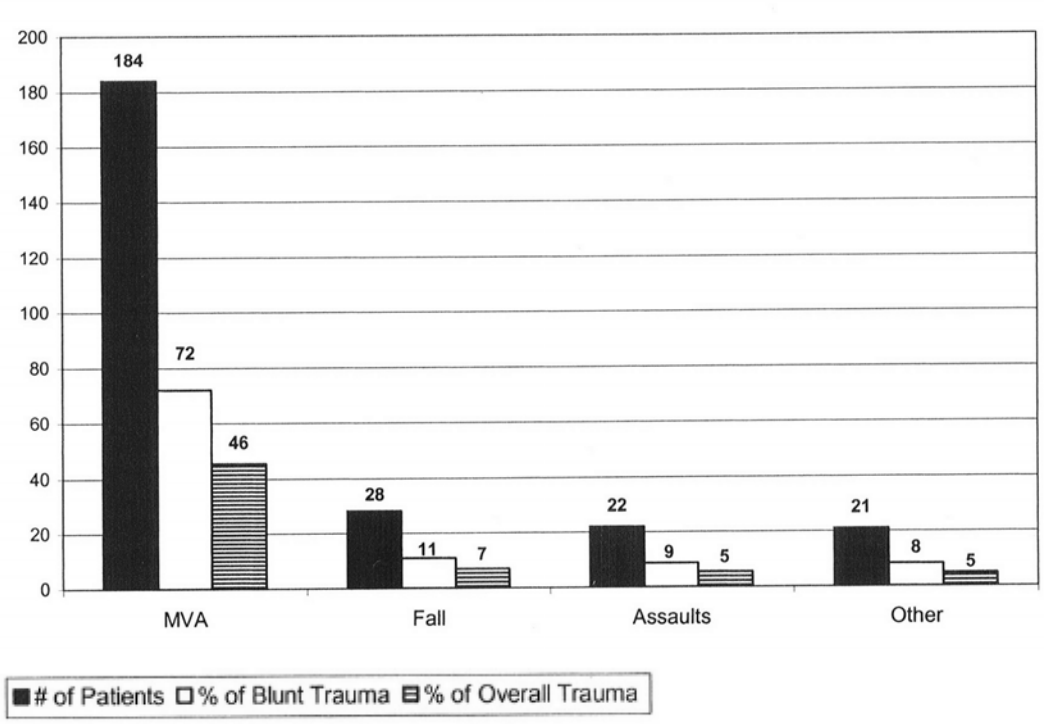
Motor vehicle accidents in the army

176. In the Army, motor vehicle accidents are an increasing concern. In the U.S. Army, for instance, motor vehicle accidents are a leading cause of death and disability[103] and in 1992, the case rate for motor vehicle accidents hospitalisations was 2.5 per 1000 person-years, and in the Air Force was 1.5 per 1000 person-years[103]. Studies looking at risk factors for motor vehicle accidents in military personnel found that although personnel are generally younger and physically fitter than the general population, they are more likely to smoke and drink heavily and therefore at higher

risk for accidents[103]. For instance, in a study in the U.S. in 1990, where death certificates of Air Force personnel due to vehicle accident injuries were reviewed, 23 percent of all deaths could be related directly to alcohol use[103].

177. An interesting finding in the U.S. Persian Gulf Veterans study[104] was that veterans had a slightly higher risk of death due to external causes, such as motor vehicle accidents, than non-Gulf veterans, though it was not statistically significant. Some of the reasons proposed by Kang and Bullman[104] are that survivors of war perceive risk in a different way, and therefore are more likely to engage in risky behaviours.

178. In a study that reviewed in an 18 month period the mechanisms and patterns of injuries in the peacekeeping operation in Kosovo of 404 trauma patients[105], motor vehicle accidents (MVA) accounted for approximately 72 percent of blunt traumas and 46 percent of all traumas (Figure 4). Some of the reasons suggested by the study are: small and poorly maintained roads, lack of traffic control and non-use of seat-belts.



Source: Appenxeler, G (2004)

Figure 4: Mechanism of injury in a study during a peacekeeping operation in Kosovo

Health and Social impacts

179. Injuries sustained from road traffic accidents are variable in type and severity[106]. The type and severity of the injuries is important as it will influence the outcome of the injured individual in terms of either being fatal or producing short, middle and long term complications[106]. Table 8 illustrates the most common injuries sustained in road traffic accidents in order of frequency and the top leading injury worldwide is brain injury.

Table 8: The 20 leading non-fatal injuries sustained as a result of road traffic collisions in the world in 2002

The 20 leading non-fatal injuries sustained[a] as a result of road traffic collisions, world, 2002

Type of injury sustained	Rate per 100 000 population	Proportion of all traffic injuries
Intracranial injury[b] (short-term[c])	85.3	24.6
Open wound	35.6	10.3
Fractured patella, tibia or fibula	26.9	7.8
Fractured femur (short-term[c])	26.1	7.5
Internal injuries	21.9	6.3
Fractured ulna or radius	19.2	5.5
Fractured clavicle, scapula or humerus	16.7	4.8
Fractured facial bones	11.4	3.3
Fractured rib or sternum	11.1	3.2
Fractured ankle	10.8	3.1
Fractured vertebral column	9.4	2.7
Fractured pelvis	8.8	2.6
Sprains	8.3	2.4
Fractured skull (short-term[c])	7.9	2.3
Fractured foot bones	7.2	2.1
Fractured hand bones	6.8	2.0
Spinal cord injury (long-term[d])	4.9	1.4
Fractured femur (long-term[d])	4.3	1.3
Intracranial injury[b] (long-term[d])	4.3	1.2
Other dislocation	3.4	1.0

[a] Requiring admission to a health facility.
[b] Traumatic brain injury.
[c] Short-term = lasts only a matter of weeks.
[d] Long-term = lasts until death, with some complications resulting in reduced life expectancy.

180. A study in the general population in the U.S.[107], identified that by 2000, 5.27 million people had suffered non-fatal injuries in road traffic accidents, about 87 percent of which were 'minor'. However, as the research illustrates, these injuries accounted for medical costs of about US$ 31.7 billion which represented an enormous burden on the health system. The complications as a result of road traffic accidents injuries cannot be underestimated. As discussed by Blincoe et al[107], the physical and emotional pains that injured people feel are beyond compensation. "Permanent disability, such as paraplegia, quadriplegia, loss of eyesight, or brain damage, can deprive an individual of the ability to achieve even minor goals and result in

dependence on others for economic support and routine physical care"[107]. Less serious injuries such as burns, and injured ankles and knees can limit physical activity for an undetermined amount of time.

Motor vehicle accidents in Bougainville

181. According to the ADF report, road traffic accidents (RTA) accounted for an incidence of about 0.1 cases per 100 per week during operation BEL ISI[108].

Non-Ionising Radiation

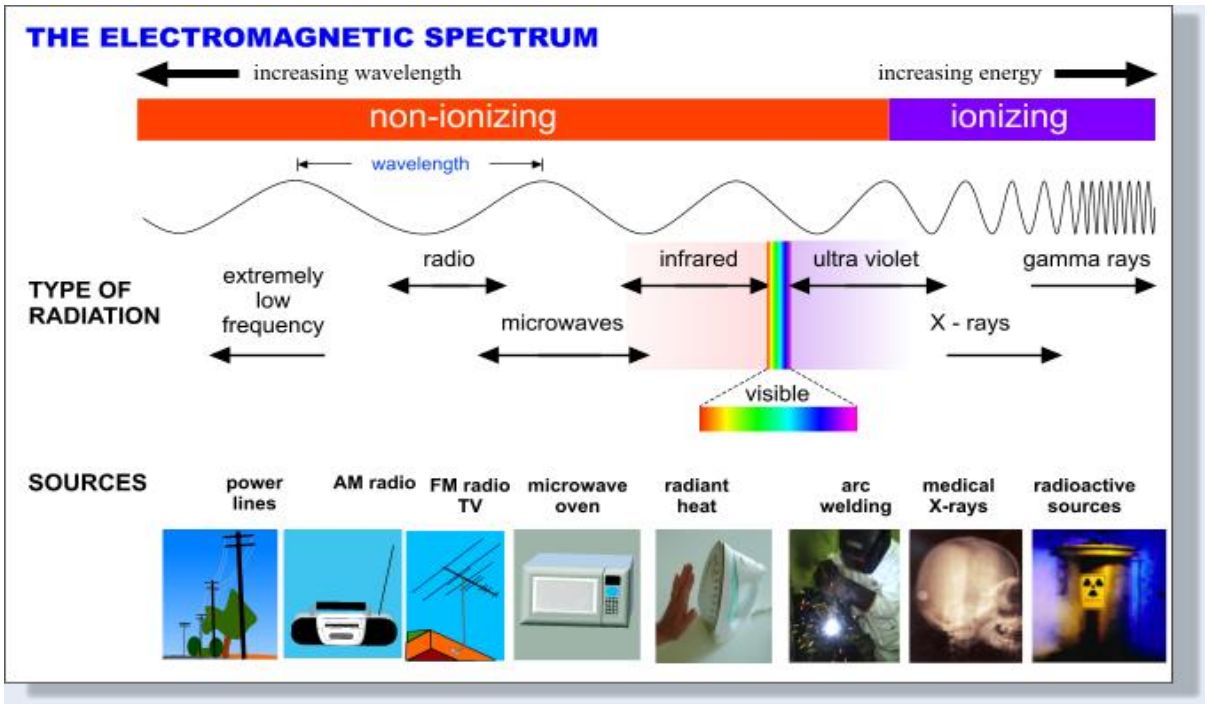
182. Energy that is released from any source is commonly known as radiation[109]. Throughout existence, humans have been exposed to different types of radiation. However, the majority of the exposure was from natural sources such as the sun, the earth's fields and fields from human beings. In the past 120 years, with the advent of industrialisation and the use of electricity for power, heating and lighting, exposure has increased[110]. This has triggered major concerns regarding the health effects of exposure to radiation.

183. As described by the Australian Radiation Protection and Nuclear Safety Agency[111], "Radiation is energy travelling as waves or particles". The electromagnetic spectrum of energy (radiation) is comprised of radio waves, microwaves, infrared rays, light rays, ultra violet rays, x-rays and gamma rays, as shown in Figure 5. These different types of electromagnetic radiation vary in terms of their wavelength and the amount of energy that they transfer[112]. These differences are important for distinguishing the two major types of radiation: ionising (IR) and non-ionising radiation (NIR).

184. Ionising radiation is on one extreme of the spectrum and is characterized by high frequency and short wave lengths. The major kinds of ionizing radiation are alpha, beta and gamma, and x-ray particles[112]. This type of radiation, because of its high frequency, is highly energetic and able to break chemical bonds of molecules, and it is the type of energy most commonly known as 'radiation'.

185. At the other extreme of the spectrum is the non-ionizing group of radiation. Non-ionising radiation is, "radiation that has enough energy to move atoms in a molecule around or cause them to vibrate, but not enough to remove electrons"[113]. This group of radiation is characterised by lower frequency and longer wavelengths, hence these waves cause atoms in a molecule to vibrate and produce energy. The most important types of NIR are sound waves, visible light, and microwaves. As illustrated in Figure 5, the most common anthropogenic sources of exposure to NIR are electromagnetic fields (EMF) from powerlines, microwaves, mobile-phones, sound devices, sunlight and radiant heat[112].

186. "Radiofrequencies have wavelengths of between 1 and 100 metres and frequencies in the range of 1 million to 100 million hertz. Microwaves that we use to heat food have wavelengths that are about 1 hundredth of a metre long and have frequencies of about 10 billion hertz" [112].



Source: Australian Radiation Protection and Nuclear Safety Agency (2004)

Figure 5: The electromagnetic spectrum

Non-ionising radiation and health: Electromagnetic fields (EMF) from power lines

187. The initial concern about the health effects of electromagnetic fields from electricity sources were raised initially in an epidemiological report released in 1979 from Denver that was focused on childhood cancer[110]. Initially it was assumed that EMF energy (time-varying electric and/or magnetic fields <300 Hz) was harmless as it does not carry enough energy to break DNA and is therefore not able to be a precursor for cancer[110]. However, the report by Wertheimer and Leeper[114] found a relationship between leukaemia in children and exposure to EMF from power lines. Although childhood cancer was the main focus of research, effects in adults due to occupational exposure have also been researched, particularly on cancer, cardiovascular and neurological/psychological effects[110].

188. Three major problems in terms of ascertaining relationships between exposures and outcomes regarding EMF have been recurrently discussed in the literature and these are: “the exposure of interest is imperceptible, ubiquitous, originates from

multiple sources, and can vary greatly over time and over relatively short distances; the relevant exposure period, for cancers at least, is before the date at which measurements can realistically be obtained and is of unknown duration and induction period; the appropriate exposure metric is unknown, and there is no substantiated biological mechanism or animal model from which to impute it. Therefore, significant cause – effect cannot be determined for this exposure[110].

189. Current studies have evolved and improved, and have allowed for estimations and proposed health effects. In this context the extensive review of literature on health effects of EMF by Alhbom et al[110] showed that the major effects that could be epidemiological ascertained are childhood cancers, particularly leukaemia, brain and nervous-system tumours and lymphomas. In terms of adult cancer, overall, a slightly positive association between EMF and Leukaemia has been suggested[110].

190. There has been a great amount of research on the effects of non-ionising radiation, in particular in relation to microwaves and radiofrequency (RF). RF are a main focus of research due to the fact that about 200 million people worldwide use wireless phones which are a major source of these types of waves[115]. However, findings remain equivocal of whether adverse health outcomes are to be expected as a result of these exposures[115].

6 References

1. Macdowell D. Conflicts in the Southwest Pacific: The relevance of new Security perspectives. Contemporary Security Policy 2004; 25(2):339-359.

2. Australian Department of Foreign Affairs. Accessed 2 March 2006 [cited Accessed 2 March 2006]; Available from: http://www.dfat.gov.au/geo/png/bougainville/peace_process.html

3. Bridgewater F, Harris M, Rahdon R, Bohnstedt. Provision of emergency surgical care in a unique Geopolitical setting. Australia New Zealand Journal of Surgery 2001; 71:606-609.

4. Sharp N. Bougainville - Blood on our Hands. 1997 [cited 2006 21/03/2006]; Available: from: http://www.aidwatch.org.au/index.php?current=24&display=aw00005&display_item=1

5. Rolfe J. Peacekeeping the Pacific Way in Bougainville. International Peacekeeping, 2001; 8(4):41.

6. Collier P, Hoeffler A. Aid, policy and peace. Washington DC; 2000. p168-183.

7. Australian Defence Force - Defence Health service Branch. ADF Health Status Report. Report: Department of Defence; 2000.

8. Wood W B. Chemical Assessment and Hazard Audit; 1999.

9. Evans R B. Chlorine: State of the Art. Lung 2004; 183:151-167.

10. Nodelman V, Uttelman JS. Longitudinal distribution of chlorine absorption in human airways: a comparison of nasal and oral quiet breathing. Journal of applied Physiology 1999; 86:1984-1993.

11. Rotman HH, Fliegelman MJ, Moore T. Effects of low concentrations of chlorine on pulmonary function in humans. Journal of Applied Physiology 1983; 54:1120–1124.

12. Brooks SM, Weiss MA, Bernstein IL. Reactive airways dysfunction syndrome (RADS). Persistent asthma syndrome after high level irritant exposures. Chest 1985; 88:376–384.

13. Schwartz DA, Smith DD, Lakshminaryan S. The pulmonary sequelae associated with accidental inhalation of chlorine gas. Chest 1990; 97:820–825.

14. Heyes R B. Biological and Environmental Aspects of Chromium. In: Press EB, editor. Amsterdam; 1982. p 221-247.

15. Agency for Toxic Substances and Disease Registry. Toxicological profile for Chromium.2000[cited 2006 20/03/2006]; Available from:

http://www.atsdr.cdc.gov/toxprofiles/tp7.html

16. Langard S. Chromium Carcinogenicity: a review of experimental Animal data. The Science of the Total Environment 1988; 71:341-350.

17. Agency for Toxic Substances and Disease Registry. Toxicological profile for Carbon Disulfide. Atlanta, Georgia: U.S. Department of Health and Human Services; 1996 8/2006.

18. Agency for Toxic Substances and Disease Registry. Toxicological profile for Hydrogen Sulfide. Atlanta - Georgia: U.S. Department of Health and Human Services; 2004 September 2001.

19. Peters JW. Hydrogen sulfide poisoning in a hospital setting. JAMA 1981; 246:1588-1589.

20. Ravizza AG, Carugo D, Cerchiari EL. The treatment of hydrogen sulfide intoxication: Oxygen versus nitrites. Vet Hum Toxico 1982; 24:241-242.

21. Stine RJ, Slosberg B, Beacham BE. Hydrogen sulfide intoxication: A case report and discussion of treatment. Ann Intern Med 1976; 85:756-758.

22. Litovitz T, Felberg L, White S et al. 1995 annual report of the American Association of Poison Control Centres Toxic Exposure Surveillance System. American Journal of Emergency Medicine 1996; 14:487-494,521.

23. Agency for Toxic Substances and Disease Registry. Polychlorinated Biphenyls (PCBs). 2001 [cited 2001 19/03/2006]; Available from: http://www.atsdr.cdc.gov/tfacts17.html

24. Reddy BS, Rozati R, Reddy S, Kodampur S, Reddy P, Reddy R. High plasma concentrations of poluchlorinated biphenyls and phthalate esters in women with endometriosis: a prospective case control study. Fertility and Sterility 2006;85(3):775-779.

25. U.S.Environmental protection Agency. Asbestos. 2006 [cited 2006 21/03/2006]; Available from: http://www.epa.gov/asbestos/pubs/help.html

26. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Asbestos (Draft). Atlanta, GA; 1989.

27. World Health Organization. PNG: Political and Economic situation. 2005 [cited 2006 23/03/2006]; Available from: http://www.wpro.who.int/countries/05png/political_and_socioeconomic_situation.htm

28. Connel J. Health in Papua New Guinea: a Decline in Development. Australian Geographical studies 1997; 35(3):271-293.

29. United Nations. Medical Support Manual for United Nations Peacekeeping Operations: United Nations; 1999.

30. Elmes M J, Bennet S M, Nasveld P E. Malaria in the Australian Defence Force: the Bougainville experience. Infectious disease 2004(5):69-72.

31. Cooper R D, Frances S P. Malaria vectors on Buka and Bougainville Islands, Papua New Guinea. Journal of the American Mosquito Control Association 2002; 18(2):100-106.

32. Department of Veterans' Affairs. Department of Veterans' Affairs Annual Report 2004/5. Canberra: Commonwealth of Australia; 2005.

33. Oliver D. Bougainville: A personal History. Melbourne: Melbourne University Press; 1973.

34. Keim S M, Guisto J A, JB JS. Environmental Thermal Stress. Ann Agric Environ Med 2002; 9:1-15.

35. Krueger-Kalinski MA, Schriger DL, Friedman L, Votey S. Identification of risk factors for exertional heat-related illnesses in long distance cyclists: Experience from the California AIDS Ride. Wilderness Environ Med 2001; 12:81-85.

36. Armstrong LE, Maresh CM. Exercise-heat tolerance of children and adolescents. Pediatr Exerc Sci 1995; 7:239-252.

37. Lind AR, Humphreys PW, Collins KJ, Foster K, KF. S. Influence of age and daily duration of exposure on responses of men to work in heat. J Appl Physiol; 1970; 28:50-56.

38. Reuler JB. Hypothermia. Pathophysiology, clinical settings and management. Ann Int Med 1978(89):519.

39. Commander Joint Operations Intelligence Centre. Solomon Islands Handbook. In: Joint Operations Intelligence Centre A. 2005.

40. Rodahl K. Occupational Health Conditions in Extreme Environments. Ann. occup. Hyg. 2002; 47(3):241-252.

41. Lugo-Amador NM, Rothenhaus T, Moyer P. Heat-related illness. Emerg Med Clin North Am 2004; 22(2):315-27, viii.

42. Canadian Centre for Occupational Health and Safety. Hot Environments - Health Effects. 2001 [Available from: http://www.ccohs.ca/].

43. Carter R, Cheuvront SN, Williams JO, Kolka M A, Stephenson LA, Sawka MN, et al. Epidemiology of Hospitali sations and Deaths from Heat Illness in Soldiers. Medicine & Science in Sports & Exercise 2005.

44. World Health Organisation. WHO definition of health. 2003 [cited; Available from: http://www.who.int/about/definition/en/

45. Australian Institute of Health and Welfare (AIHW). Australia's Health; 1998.

46. Stimpson N J, Thomas H V, Weightmen A L, Dunstan F, Lewis G. Psychiatric disorder in veterans of the Persian Gulf War of 1991. Bristish Journal of Psychiatry 2003; 18 2:391-403.

47. Pearn J. Traumatic stress disorders: A classification with implications for prevention and management. Mil. Med. 2000; 165:434-440.

48. Thoresen S, Mehlum L, Moller B. Suicide in peacekeepers. Soc Psychiatry Psychiatr Epidemiol 2003; 38:605-610.

49. Shigemura J, Nomura S. Mental health issues of peacekeeping workers. Psychiatry and Clinical Neurosciences 2002; 56:483-491.

50. Bartone PT, Adler AB. Dimensions of psychological stress in peacekeeping operations. 1998; 163:587-589.

51. Kodama Y, Nomura S. Psychological changes of Japan Self-Defense Forces personnel during selection and training for the peacekeeping mission in the Golan Heights. Mil. Med. 2000; 165:653-655.

52. Seet B, Burnham GM. Fatality trends in United Nations peacekeeping operations. Journal of the American Medical Association 2000; 248:508-603.

53. Pearn J. A classification with implications for prevention and management. Millitary Medicine 2000; 165:434-440.

54. Rosebush PA. Psychological intervention with military personnel in Rwanda. Millitary Medicine 1998; 163:559-553.

55. Deans C. The Psychological Impact of Peacekeeping Deployments - Analysis of Questionnaire Data 1999-2001. Canberra: The Australian Defence Force 2002.

56. Pearn J. Traumatic stress disorders: A classification with implications for prevention and management. Military Medicine 2000.

57. Australian Centre for Posttraumatic Mental Health. The Symptoms of Posttraumatic Stress Disorder (PTSD) 2003 [cited 2006 5/04/2006]; Available from: http://www.acpmh.unimelb.edu.au/mentalhealth/symptoms.html

58. Rief W, Aner C. Is somatisation a habituation disorder? Physiological reactivity in somatisation syndrome Psychiatry Research 2001; 101(1).

59. Fukuda K, Straus SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff AL. Chronic Fatigue Syndrome. Annals of Internal Medicine 1994; 121(12):953-959.

60. American Mosquito Control Association. Control. 2005 [cited; Available from: http://www.mosquito.org/mosquito-information/control.aspx

61. Nova Scotia Department of Environment & Labour Pesticide Working Group. Class IV Mosquito & Biting Fly Manual.

62. Goodyear L, Behrens RH. Short report: the safety and toxicity of insect repellents. American Journal of Tropical Medicine and Hygiene 1998; 59(2):323 -324.

63. National Pesticides Telecomunications Network. DEET. 2000 [cited 2006 14/03]; Available from: http://npic.orst.edu/factsheets/DEETgen.pdf

64. Brown M, Hebert AA. Insect repellents: an overview. J Am Acad Dermatol 1997; 36(2 Pt 1):243-9.

65. Frances S, Cooper R. Personal protection measures against mosquitoes A brief history and current use of repellents by the Australian Defence Force. ADF Health 2002(3):58-63.

66. Tenenbein M. Review of toxic reactions and death following the ingestion of DEET containing insect repellents. 1987; 258:1509-1511.

67. Snyder JW Poe RO, Stubbins JF, Garrettson LK. Acute manic psychosis following the dermal application of DEET in an adult. Journal Toxicol Clin Toxicol 1986; 24:429-439.

68. Clem JR, Havemann DF, Raebel MA. Insect repellent (DEET) cardiovascular toxicity in an adult. Ann Pharmacother 1993; 27:289-293.

69. Reuveni H, P Y. Diethyltoluamide-containing insect repellents: adverse effects in worldwide use. Archives of Dermatology 1992; 118:582-583.

70. Abou-Donia M, Willmarth K, Jense KF, Dehme FW, Kurt TL. Neurotoxicity resulting from coexposure to pyridostigmine,DEET and permethrin: implication of gulf war chemical exposure. J Toxicol Environ Health 1996; 48:35-56.

71. Sydbom A, Blomberg A, Pamia S, Stenfors N, Sandstrom T, Dahlen SE. Health effects of diesel exhaust emissions. European Respiratory Journal 2001; 17:733-746.

72. United Nations Environment Program. Air pollution in the world's megacities. Environment 1994; 36:5-37.

73. Kagawa J. Health effects of diesel exhaust emissions - a mixture of airpollutants of worldwide concern. Toxicology 2002; 181-182:349-353.

74. DieselNet Technical Report. Diesel Exhaust: A Critical Analysis of Emissions, Exposure, and Health Effects. Cambridge: Health Effects Institute (HEI); 1997.

75. Cammer P, Perschagen G, Ahlborg U, Ljungvist S, Victorin K. Health effects of diesel exhaust emissions. Stockholm; 1988.

76. Schwartz J, Dockery DW, Neas LM. Is daily mortality associated specifically with fine particles? Journal of Air Waste Management Association 1996; 46:927-939.

77. World Health Organisation. Diesel fuel and exhaust emissions. Geneva - Switzerland; 1996.

78. Gustavsson P, Plato N, Lidstrom E B, Hogsted C. Lung cancer and exposure to diesel exhaust among bus garage workers. Scandinavian Journal of Work and Environmental Health 1990; 16(5):348-354.

79. Jarvholm B, Silverman D. Lung cancer in heavy equipment operators truck drivers with diesel exhaust exposure in construction industry. Occupational Environmental Medicine 2003; 60:516-520.

80. Boffeta P, Silverman D T. A Meta-Analysis of Bladder Cancer and Diesel Exhaust Exposure. Epidemiology 2001; 12(1):125-130.

81. Yamawaki H, Iwai N. Mechanisms Underlying Nano-Sized Air-Pollution-Mediated Progression of Atherosclerosis Carbon Black Causes Cytotoxic Injury/Inflammation and Inhibits Cell Growth in Vascular Endothelial Cells. Circulation Journal 2006; 70:129-140.

82. Cox C. Permethrin. Journal of Pesticide Reform 1998; 18(214).

83. Lauder TD, Baker SP, smith GS, Lincoln AE. Sports and Physical Training Injury Hospitalizations in the Army. Am J Prev Med 2000; 18(3S):118-128.

84. Writer J V, DeFraites R F, Keep L W. Non-Battle Injury Casualties during the Persian Gulf War and Other Deployments. American Journal of Preventive Medicine 2000; 18(3S).

85. Center for Disease Control and Prevention. Exercise-Related Injuries among Women: Strategies for Prevention from Civilian and Military Studies Morbidity and Mortality Weekly Report 2000; 49(RR02):13-33.

86. Jones BH, Bovee MH, Harris JM 3rd, Coan DN. Intrinsic risk factors for exercise-related injuries among male and female army trainees. American Journal of Sports Medicine 1993; 21(5):705-710.

87. Jones BH, Cowen DN, Tomlinson JP, Ronbinson JR, Polly DW. Epidemiology of injuries associated with physical training among young men in the Army. Medical Science Sports Exercise 1993; 25:197-203.

88. Deuster PA, Jones B A, Moore J. Patterns and risk factors for exercise-related injuries in women: a military perspective Mil Medicine 1997; 162:649-655.

89. Kaufman K, Brodine S, Shaffer R. Military Training-Related Injuries Surveillance, Research, and Prevention. American Journal of Preventive Medicine 2000; 18(3S):54-63.

90. Bell NS, Mangione TW, Hemenway DA, P J, Jones BH. High Injury Rates among Female Army Trainees a function of Gender? American Journal of Preventive Medicine 2000; 18(3S):141-146.

91. Snedecor MR, Boudreau CF, Ellis BE, Schulman J, Hite M, Chambers B. U.S. Air Force Recruit Injury and Health Study. Journal of Preventive Medicine 2000; 18(3S):129-140.

92. Strowbridge NF. Musculoskeletal injuries in female soldiers: analysis of cause and type of injury. 2002; 148(3):256-258.

93. Knapik JJ, Sharp MA, Canham-Chervak M, Hauret K, Patton JF, Jones BH. Risk factors for training-related injuries among men and women in basic combat training. Medicine & Science in Sports & Exercise 2001.

94. Kaufman KR, Brodine S, Shaffer R. Military Training-Related Injuries Surveillance, Research, and Prevention. American Journal of Preventive Medicine 2000; 18(3S):54-63.

95. Department of Defense Injury Surveillance and Prevention Work Group. Atlas of Injuries in the U.S. Armed Forces. Suplement to Military Medicine 1999; 164(8).

96. Rudzki SJ. The number, rate and site of reported injuries in the Australian Army, 1987–1991. ADF Health 2000; 1:54-57.

97. Jones BH, Hansen BC. Injuries in the military: a hidden epidemic. U.S. army Centre for Health Promotion and Preventive Medicine. Aberdeen Proving Ground. 1997. Report No.: (Tech. Rep. 29 HA 4844 9).

98. Tointon JA. Sports injuries in the services 1969–1980. J R Army Med Corps 1984; 130:193-197.

99. Ameratunga S, Hijar M, Norton R. Road-traffic injuries: confronting disparities to address a global-health problem. The Lancet. 2006; 367:1533–40.

100. Peden M, Scurfield R, Sleet D. World report on road traffic injury prevention. Geneva: World Health Organization; 2004.

101. Murray C, Lopez A. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge: Harvard School of Public Health on behalf of the

102. World Health Organization and the World Bank; 1996.

103. Peden M, Scurfield R, Sleet D. Risk factors. In: Peden M SR, Sleet D, editor. World report on road traffic injury prevention. Geneva World Health Organization; 2004.

104. Bell N, Amoroso P, Yore M, Smith G, Jones B. Self-Reported Risk-Taking Behaviors and Hospitalization for Motor Vehicle Injury Among Active Duty Army Personnel. American Journal of Preventive Medicine. 2000;18(3S):85-95.

105. Kang H, Bullman T. Mortality among U.S. veterans of the Persian Gulf war. New England Journal of Medicine. 1996;335(20):1498-504.

106. Appenxeller G. Injury Patterns in Peacekeeping Missions: The Kosovo Experience. Military Medicine. 2004;169(3):187.

107. Peden M, Scurfield R, Sleet D. Global impact. Geneva, World Health Organisation; 2004.

108. Blincoe L et al. The economic impact of motor vehicle crashes. Washington: National Highway Traffic Safety Administration; 2002. Report No.: DOT HS-809-446.

109. Department of Defence. Australian Defence Force Health Status Report. Report. Canberra: Department of Defence; 2000.

110. World Health Organisation. What is Ionizing radiation? 2006 [cited 2006 15/05/06]; Available from: http://www.who.int/ionizing_radiation/about/what_is_ir/en/

111. Ahlbom IC, Cardis E, Green A, Linet M, Savitz D, Swerdlow A. Review of the epidemiologic literature on EMF and Health. Environ Health Perspect. 2001 Dec; 109 Suppl 6:911-33.

112. Australian Radiation Protection and Nuclear Safety Agency. Understanding radiation. 2004 [cited 2006 21/05/06]; Available from:

113. Australian Radiation Protection and Nuclear Safety Agency. Ionising and Non-Ionising Radiation. 2004 [cited 2006 21/05/06]; Available from: http://www.arpansa.gov.au/basics/ion_nonion.htm

114. United States Environmental Protection Agency. Ionising & Non-Ionising Radiation 2006 [cited 2006 21/05/2006]; Available from: http://www.epa.gov/radiation/understand/ionize_nonionize.htm

115. Wertheimer N, Leeper E. Electrical wiring configurations and childhood cancer. American Journal of Epidemiology. 1979; 109 273–84.

116. Masley M, HabbicK B, Spitzer W, Stuchly M. Are wireless phones safe? A review of the issue. Canadian Journal of Public Health. 1999;90(5):325-9.

Annex A: Summary table of exposures and possibly associated short- and long-term health outcomes and any important mediators

EXPOSURE	POSSIBLE SHORT-TERM HEALTH PROBLEMS	POSSIBLE LONG-TERM HEALTH PROBLEMS	IMPORTANT MEDIATORS
Environmental			
Chlorine gas	Nasal irritation to lung oedema	Obstructive airway disease	Smoking, Asthma
Chromium trioxide	**Respiratory tract** Runny nose, sneezing, and ulcers with perforated nasal septum	**Respiratory tract** Asthma and lung cancer **Other** Gastrointestinal, haematological, hepatic, renal, and endocrine (no strong evidence)	None described
Carbon disulfide	**Central nervous system** Headaches, tiredness, trouble sleeping, chest pain **Dermatological** Burns and blisters **Other** Affections of the normal function of liver and heart	**Reproductive system** Birth defects and neonatal death (animals)	None described

EXPOSURE	POSSIBLE SHORT-TERM HEALTH PROBLEMS	POSSIBLE LONG-TERM HEALTH PROBLEMS	IMPORTANT MEDIATORS
Hydrogen sulphide	**Respiratory tract** Nasal irritation, cough, respiratory arrest and/or pulmonary oedema **Central nervous system** Unconsciousness, effects on balance, reaction time, verbal recall and visual field both for acute and chronic exposure **Cardiovascular effects** Sinus tachycardia, supraventricular tachycardia, left bundle block and EKG arrhythmias	**Sensorial** Damage to olfactory epithelium with consequent decrease sense of smell	None described
PCB	**Dermatological** Acne-like conditions **Other** Liver damage	**Neoplastic** Cancer of the liver and biliary tract **Neurologic** Behavioural impairment in children of exposed mothers (in humans) **Reproductive** Babies with lower birth weight and endometriosis **Other** Anemia	None described
Asbestos	Not well defined	**Neoplastic** Lung cancer, mesothelioma **Other** Asbestosis	Possibly length of exposure

EXPOSURE	POSSIBLE SHORT-TERM HEALTH PROBLEMS	POSSIBLE LONG-TERM HEALTH PROBLEMS	IMPORTANT MEDIATORS
Occupational/Operational			
Psychological stressors		Post Traumatic Stress Disorder (PTSD), complex PTSD, alcohol and drug abuse, somatisation syndrome, and chronic fatigue syndrome, Stockholm syndrome, survivor's guilt syndrome, lifestyle and cultural change syndrome, and Gulf War syndrome	Quick return soon after deployment, left-handedness, previous traumatic event
Non-battle injuries	Fractures, sprains/strains (lumbosacral strain as the most common) and dislocations	Overuse injuries (achilles tendinitis, pattelar-femoral syndrome, plantar fasciitis) and stress fractures	Lower aerobic capacity, smoking past physical activity, low levels of previous physical activity, previous injury history, high running mileage, high amount of weekly exercise, age, gender (females at higher risk) and biomechanical factors
DEET	**Dermatological** Skin irritation, contact dermatitis, urticaria and bullous eruptions **Central Nervous System** Respiratory depression and even death (after ingestion of large amounts), psychosis **Cardiovascular** Cardiovascular complications **Other** Gulf War Syndrome (suggested)	None Known	None known

EXPOSURE	POSSIBLE SHORT-TERM HEALTH PROBLEMS	POSSIBLE LONG-TERM HEALTH PROBLEMS	IMPORTANT MEDIATORS
Permethrin	**Central nervous system** Tremors, incoordination, hyperactivity, paralysis, and an increase in body temperature **Dermatological** Eye affection varying from moderate irritation to tearing, swelling and blurred vision. Skin irritation varying from redness, swelling and possible blistering	Reduction of the ability of immune system to recognise and respond to foreign proteins)	None known
Diesel	**Non-neoplastic** Eyes and nose, lung function changes, respiratory changes, headache, fatigue and nausea, pollinosis	**Neoplastic** Lung cancer, larynx, pancreas, bladder and kidney **Non-neoplastic effects** Cough, sputum production, lung function decrements and profound inflammatory effects in the lung epithelium, chronic bronchitis and asthma, coronary heart disease	Asthma, age, co-morbid conditions
Heat	Volume depletion, peripheral vasodilatation, decreased vasomotor tone, heat syncope, painful muscle spasms, fatigue, dizziness, nausea, vomiting, seizures, delirium, coma, tachycardia, hypotension, tachypnoea, diarrhoea, acute renal failure, hemorrhagic diathesis	Illnesses of the: kidney, liver, heart, digestive system, central nervous system and skin. Chronic heat exhaustion, sleep disturbances and susceptibility to minor injuries and sickness	Age, co-morbid conditions, acclimatisation time

Annex B: Potential exposures in Bougainville/Loloho and respective study reference numbers

Exposure	*Study reference numbers*
Environmental	
Chlorine gas	9,10,11,12,13
Chromium trioxide	14,15,16
Carbon disulfide	17
Hydrogen sulfyde	18,19,20,21
PCB	23,24
Asbestos	25,26
Occupational/Operational	
Psychological stressors	46,47,48,49,50,51,54,55,56,57,58,59
Non-battle injuries	83,84,85,86,87,88,89,90,91,92,93,94,96
DEET	61,62,63,64,65,66,67,68,69,70
Permethrin	82
Diesel	71,72,73,74,75,76,77,78,79,80
Heat	34,35,36,37,38,40,41,42,43,44

ANNEX B

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Sample Generation Report

Bougainville Health Study

Deliverable Item 1 (Phase 2)

15 May 2007

PEACE MONITORING GROUP

Author	**Mr Michael Waller, A/Prof Cate D'Este, Ms Lisa Nielsen, CPL Anthony Hopcraft, A/Prof Susan Treloar, Dr Ben Stute, Dr Christine McClintock**
Document Version	**2.0**
Status	**FINAL**
Date Saved	**27/6/2007**

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3347 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Australian Government
Department of Defence
Department of Veterans' Affairs

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Charles Darwin UNIVERSITY
Innovation in Education

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\cmvh\DHSU\NNAI Phase 2\2. Bougainville\Deliverables\Sample Frame Generation\Sample Generation Product\BV Sample Generation Report Final.doc

Revision History

Date	Version	Description	Track Changes
	1.0	Draft to SRT	
15/05/07	1.0	Draft submitted	
28/6/07	2.0	Final submitted	

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
A/Prof Susan Treloar	First Chief Investigator			
Prof Annette Dobson	Chair Scientific Research Team			
Prof Tony McMichael	Scientific Advisory Committee			

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
SRT	15/5/07	electronic
SRT and PMO	15/5/07	electronic
PMO	27/6/07	Electronic & hard copy

Acknowledgements

The generation of the sample for the Bougainville Health Study has been made possible by the contributions of staff from both the Department of Defence and the University of Queensland. The authors would like to particularly thank the following people for their assistance:

Department of Defence

PMKeyS	Deborah Pollard, Helen White, Lyle Smith Russell Philbey and Contractors
ADF Pay	Steven Cheah, Kerel Gardiner, Rachel Kubitzky
Program Management Office	Matt Gately, John Maguire, Natasha Murphy, Sue Stacey,
Service Conditions	Derek Cox

University of Queensland

School of Population Health	Dr Adrian Barnett,
CMVH	CMDR Sonya Bennett, LTCOL Peter Nasveld

DEFENCE DEPLOYED BOUGAINVILLE HEALTH STUDY

Deliverable Item 1 (Phase2)

Sample Generation

Due Date: 15 May 2007

Description of Deliverable from Defence Deployed Bougainville Health Study Statement of Works

Deliverable item 1 (Sample Frame Generation) The agreed methodology has been developed in conjunction with the Scientific Advisory Committee (SAC) (refer teleconference 5 June 2005). The Sample Frame Generation will be based on:

- *a. the Nominal Roll, as developed utilising source documents provided by the Program Management Office (PMO); and*
- *b. definition and selection of an appropriate comparison group*
- *c. 2000 personnel from the comparison group and 4000 Veterans (across all Projects) as derived from the Nominal Roll.*
- *d. a Summary of Activities undertaken to achieve this deliverable will be submitted and will include:*
    1. *the size of the project Nominal Roll and overlap between sources of data for the project Nominal Roll*
    2. *a description of the overlap between the Bougainville project Nominal Roll and the Solomon Islands and East Timor project Nominal Rolls and*
    3. *a summary of any issues with the data used to generate the project nominal rolls.*

Executive Summary

1. Based on the problems with the InterFET Pilot Project Nominal Roll, which was based only on data obtained from PMKeyS, a new procedure was developed for generation of the Bougainville Health Study Nominal Roll. This process involved the use of data from two sources: PMKeyS, the system used by the Department of Defence for all aspects of personnel management; and ADFPAY, which is the Australian Defence Force Pay System and is responsible for salary payment for Service personnel. A variety of other potential sources of data were identified and investigated, but were not considered relevant for generation of the Bougainville Nominal Roll. Individuals were included in the data files if they hade been allocated a relevant code or descriptor indicating that they had deployed as part of Operation BEL ISI I or II.

2. Defence personnel were eligible for inclusion on the Bougainville Health Study Nominal Roll if they deployed to Bougainville as part of Operation BEL ISI I (OP BEL ISI I), conducted between November 20th 1997 and April 1998, or Operation BEL ISI II (OP BEL ISI II) conducted between April 1998 and August 26th 2003. In order to be inclusive, individuals whose deployment start date was prior to November 20th 1997 were retained, as it is standard practice for some individuals to deploy early to prepare for the operation. Individuals were included on the Project Nominal Roll if they were identified in either PMKeyS or ADFPAY data as having been deployed as part of OP BEL ISI I or II.

3. Individuals were eligible for inclusion in the Bougainville Health Study Comparison Group if they had not deployed as part of OP BEL ISI I or II, were not included on the Bougainville Health Study Nominal Roll, and were a member of a Defence Service on November 20, 1997. Comparison individuals were randomly selected from the PMKeyS database, and frequency matched to the veteran group on service (Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 or 1977-1988).

4. The Bougainville Health Study Nominal Roll included of 4776 individuals: with 1115 identified in both PMKeyS and ADFPAY data; 3633 identified in ADFPAY only and 28 identified in PMKeyS only. Capture-recapture methods estimated the total size of the Project Nominal Roll as 4859.

5. Only 23% of individuals on the Bougainville Nominal Roll were identified in both PMKeyS and ADFPAY, and 76% were identified from ADFPAY but not PMKeyS. This is due to the timing of the Bougainville Operations, which occurred prior to the implementation of PMKeyS. While capture-recapture methods indicated that ascertainment was reasonably high (with 83 personnel estimated to be missing from the Roll), the actual validity and reliability of the Nominal Roll is still unknown. However this can be assessed to some degree by comparison of the deployment history obtained from the Bougainville, Solomon Islands and East Timor Nominal Rolls with self-reported deployment history obtained from participants.

6. Up-to-date address data should be obtained prior to mail-out of the invitation package.

7. Any problems highlighted during contact with potential study participants, or based on information provided by participants, should be incorporated into SOPs for generation of future Nominal Rolls.

Introduction

8. The Bougainville Health Study forms part of a series of studies that aim to research the health and well-being of veterans who have deployed on active service overseas. It is being conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program.

9. Traditionally post-deployment health studies have been retrospective studies examining health issues which have arisen from veterans' concerns on return from deployment or hypotheses generated in descriptive studies of veterans' health. The CMVH Deployment Health Surveillance Program aims to replace that approach with a prospective, analytic system for longitudinal surveillance of the health of Australian Defence Force (ADF) personnel who have been deployed on specific operations.

10. The purpose of the Bougainville Health Study is to conduct a cross-sectional study of the health status of Australian service personnel who deployed to Bougainville between November 1997 and August, 2003 as part of OPERATION BEL ISI I & II (OP BELISI I & II). The first stage of this study is the selection of the study samples, involving identification and selection of the appropriate veteran and comparison individuals for inclusion in the study. This requires the development of a Project Nominal Roll, followed by selection of an appropriate comparison group.

11. This report is the first Deliverable for the Bougainville Health Study and documents the development of the Project Nominal Roll, generation of the comparison groups, and selection of the sample for inclusion in the study.

Methods

Project Nominal Roll

12. The Bougainville Health Study Nominal Roll, or Project Nominal Roll, is a list of Service personnel identified as having deployed to Bougainville as part of OP BEL ISI I or II between November 1997 and August 2003.

Lessons learned from InterFET Pilot Project

13. The InterFET Pilot Project has provided valuable information on generation of the Project Nominal Roll which has been incorporated into the Bougainville Project Nominal Roll methodology.

14. The Nominal Roll for InterFET was generated by Defence from PMKeyS, which is the system used by the Department of Defence for all aspects of personnel management. The Nominal Roll for the InterFET Pilot Project was found to have errors in both ascertainment and in content, as outlined below.

15. Errors of ascertainment refer to errors where Service personnel who should have been included on the roll were not, or personnel were included on the roll but did not actually deploy to the specified operations and were thus ineligible for this study.

a) It has been estimated, based on expert knowledge of the number and size of deployments and on post-activity reports, that at least 7000 individuals had been deployed as part of InterFET. Only 4124 individuals were on the Nominal Roll provided by Defence.
b) In addition the Royal Australian Navy and Royal Australian Air Force were under-represented as the number of individuals from these services who were included on the Nominal Roll was substantially less than the minimum number known to have been deployed.
c) Individuals known to have been deployed were not included on the Roll.
d) It is possible that individuals were included on the Nominal Roll but were not actually deployed; although there is currently no evidence of this and it is likely to be a minor problem.
e) Thus it is possible that between 25% and 50% of the true InterFET deployment population may not have been included on the InterFET Nominal Roll.

16. Errors in content of data included on the Nominal Roll are errors of omission or inaccuracy of data provided as part of the Nominal Roll.

a) Details of service were incorrect for some records (e.g. stated as Navy when were actually Army).
b) Date of entry into service was after date of deployment.
c) It was found that 29% of details of current address were not correct, particularly since the Nominal Roll was obtained prior to the most recent posting cycle, and given that a posting cycle is 2-3 years, it is estimated that about one third of Defence Personnel are transferred at each posting cycle.
d) Errors in content of data of the comparison group also occurred whereby persons initially deemed as eligible for inclusion in the comparison group were later found to have deployed to InterFET.

17. The information on problems with the InterFET Nominal Roll has been incorporated into a new Standard Operating Procedure (SOP) for generation of the Bougainville Health Study Nominal Roll and provision of the Project Nominal Roll to the Research Coordination Unit (RCU) of CMVH. Primarily this has involved exploration of other sources of data for generation of the Project Nominal Roll. The problem of errors in content of the Project Nominal Roll is unlikely to be resolved in the short term, thus these are likely to persist for the Bougainville Health Study.

Data Sources

18. There are multiple sources of information identifying Service personnel who have been deployed on military operations. Based on the experience of the InterFET Pilot Project, and following discussions with the Defence Health Surveillance Program Office, record keepers and military personnel, it is evident that no one source of information can be verified to be a complete and accurate record of personnel

deployed on any operation. Thus two sources of data are used in generation of the Bougainville Project Nominal Roll: PMKeyS and ADFPAY.

19. **PMKeyS** is the system used by the Department of Defence for all aspects of personnel management. It includes information on postings and deployments, including a code of the operation on which individuals were deployed, as well as demographic information. PMKeyS was implemented for the Navy in August 2001, the RAAF in February 2002 and the Army in July 2002.

20. **ADFPAY** is the Australian Defence Force Pay System, which is responsible for salary payment for Service personnel. Service personnel who are on deployment may be eligible to receive additional financial remuneration, which depends on the operation. Since each operation is identified in the ADFPAY database, this allows identification of personnel deployed on the Bougainville Operations. ADFPAY is linked to PMKeyS.

21. Thus searching on operation code and/or description in either PMKeyS or ADFPAY should identify all Service personnel who have been on a particular deployment. However this is not necessarily the case. Since membership on the deployment lists and operation orders may change over time, different versions of these may be generated and different information provided to the recipients of these data. Changes in membership could be due to last minute changes in circumstances of individuals or operational needs. It is also possible that details of all personnel deployed are not entered into PMKeyS and ADFPAY. If an individual is eligible for deployment pay supplements and does not receive these, he/she has the opportunity to correct this. There is no similar "check" of deployment identification for PMKeyS. Thus there may be some variation in the individuals identified through the PMKeyS and ADFPAY. Data from both PMKeyS and ADFPAY will be included in the generation of the Project Nominal Roll.

22. Other data sources, such as **allotment certificates**, whilst useful in some studies, are not appropriate for the Bougainville Health Study Project Nominal Roll. Allotment certificates are provided to serving members of the Australian Defence Force deployed on a war-like operation, for the purposes of Veterans' Affairs, taxation and Defence home loans. Since the Bougainville Operations were not war-like, the allotment lists are not a relevant source of data for the Project Nominal Roll for this deployment.

23. Names of individuals who have been deployed could potentially be obtained from secondary data sources. While all of these sources have been deemed to be infeasible, a brief outline of the sources and the reasons why it is not possible or appropriate to obtain these data is included below.

24. ***Honours and awards***. This is a list of all personnel receiving honours or awards while serving with Australian Defence Forces during a variety of warlike and non-warlike operations. Personnel will be included on this list if their name appeared on the allotment certificate list or if they applied for an honour or award and were deemed eligible, and then had this information appropriately recorded. The managers of this database were approached by the Defence Health Program Management Office (PMO) for access to the Honours and Awards data. However the data were considered

to be very unreliable by the managers. Many eligible individuals have not yet applied for awards, and the database was not up-to-date, with time lags between eligibility and application of up to 2 years. While in the past the Governor General's Office has had a copy of the honours and awards list for each deployment, this source is not currently an option.

25. ***The National Welfare Coordination Centre (NWCC)*** is a unit which is responsible for provision of information, support and referral to other family support agencies for families of deployed Service personnel. This unit was founded in 1999 to provide support for families of Service personnel deployed to East Timor. Since that time, the Centre has been expanded to provide assistance for all deployments. Individuals are included in this database if they completed a specific handwritten form prior to deployment. Approximately 27,000 names are on this list. Details of the operation on which individuals have been deployed may be retained for up to 12 months following completion of the operation. After this time no information is available to link personnel to individual operations, thus it is not a feasible or valid method of identifying individuals for the Bougainville Health Study Nominal Roll.

26. ***Next-of-Kin Lists.*** Prior to any deployment all Service personnel are required to provide details of their next-of-kin so that relevant information can be provided to families. Separate lists are generated for each deployment, and these are archived after completion of the operation. Information from next-of-kin lists is 'in-confidence' and cannot be accessed. In addition the lists do not necessarily include correct details of service personnel but may include contact information of a relative or even a post office. Once personnel have returned from deployment they may have a new posting and thus the previous address may not be correct. Next-of-Kin lists are generated as part of the NWCC activities.

27. ***The Australian Taxation Office (ATO).*** Members of the Australian Defence Forces and employees of the Department of Defence who had been deployed to the Bougainville Operations are exempt from income tax for the period of the deployment under section 23AG of the ITAA 1936 (Class Ruling CR 2003/94). Therefore the ATO may be a source of information on the Bougainville Operations. The ATO were contacted by PMO, and it became evident that it was not feasible to access this information. Tax concessions could be obtained concurrently, during the time of deployment, or retrospectively at some period following completion of the deployment. Some individuals, particularly if their marriage was unstable, did not apply for their tax rebate for up to 4 years following deployment. In addition the ATO was unable to appropriately identify deployed individuals, thus it is not a feasible source of data for the Project Nominal Roll.

28. ***Deployed Forces Support Unit (DFSU).*** This was a unit established to do the 'sign off' of preparation of Service personnel for deployment. They checked medical and dental fitness, gave some vaccinations and ensured that persons deploying were administratively and medically prepared. Thus a list is available of individuals who have passed through the DFSU; however not all individuals went through this unit prior to deployment. In addition, on completion of the operation the DFSU database is closed down and all data is rolled into the NWCC.

29. ***Single Service Lists*** are lists held by each service on members who have been deployed. These lists are based on the Unit Roll Books and Ships' Logs. However this system is no longer in use and Single Services rely on PMKeyS information.

Generation of the Project Nominal Roll

30. Service personnel were included on the Bougainville Health Study Nominal Roll if they appeared in either PMKeyS or ADFPAY as having been deployed as part of OP BEL ISI I or II between November 1997 and August 2003. Following meetings with PMKeyS and ADFPAY personnel, a list of items to be provided from each data source was generated.

31. The PMO provided CMVH Research Coordination Unit (RCU) with separate EXCEL (Microsoft Corporation, Redmond WA, USA) files which included all Service personnel identified through PMKeyS or ADFPAY. These files were merged into a single file with one record for each individual, removing the duplicate records. This process was managed by CMVH RCU staff, who were cleared to at least 'Restricted', with statistical and programming input from the Project Statistician and the First Chief Investigator of the Defence Deployed Solomon Islands Health Study.

32. As not all required information was available on ADFPAY data, a list of individuals identified from ADFPAY but not PMKeyS was sent to PMKeyS staff, who then provided all the necessary data on these individuals to the RCU for addition to the Project Nominal Roll.

Data Management and Analysis

33. All data files from each source were appended to obtain one PMKeyS dataset and one ADFPAY dataset. Records with duplicate combinations of service number (or PMKeyS number if no service number), service (NAVY, ARMY, RAAF), deployment location, deployment start date and deployment end date were deleted. Data were then sorted by service number (or PMKeyS number), service, deployment location and deployment start date, and only the first deployment (within each deployment location) for each individual retained: further deployments to OP BEL ISI I or II were deleted. This then produced a file for each of PMKeyS and ADFPAY data with only one record per individual for each deployment location. These files were merged by service number (or PMKeyS number if no service number), service and deployment location, to produce a Nominal Roll for each of the Solomon Islands, Bougainville and East Timor Health Studies. As service number is not unique across services this was used in conjunction with service as the unique identifier for individuals.

34. A table providing details of the total number of individuals identified for the Project Nominal Roll, as well as the number of individuals identified from each source, was produced. This information was then used to estimate the number of individuals likely to be missed from the Project Nominal Roll using capture-recapture

methods. Annex 1 provides a description of this method, including appropriate assumptions.

35. A deployment Profile Analysis was undertaken to determine the deployment history, based on the Nominal Rolls for the three Near North Area of Influence Studies, for all individuals on these Rolls. This involved merging of data for each of the three Project Nominal Rolls by service number (or PMKeyS number if no service number was available) and service and determining on which combination of Project Nominal Rolls individuals were included. A table was produced which showed the number of individuals with deployments to all three locations, to each individual location only, and to all other possible combinations of deployments.

36. Individuals on the Bougainville Health Study Nominal Roll were stratified according to service (Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 or 1977-1988). Birth year was considered to be a more logical variable than current age, or age at commencement of the deployment, as this would vary between deployments and studies. A table was generated with the strata definition, the number of deployed personnel and the number of comparison individuals to be selected in each stratum and provided to PMKeyS staff for selection of the comparison group.

37. Analyses were undertaken using the SAS (SAS institute Inc. NC, USA) statistical analysis program and STATA (StataCorp, Texas, USA).

Comparison Group

38. The comparison group for the Bougainville Health Study includes Service personnel who were not deployed to any of the Bougainville Operations, but were potentially eligible for deployment. For scientific rigour and to reduce the effect of confounding as much as possible, it was important that the Bougainville Health Study comparison group was as similar to the deployed group as possible on all potential confounding factors except for deployment. To ensure this similarity, the comparison group has been selected to reflect the characteristics of the deployed group, using frequency matching.

39. For security reasons, the comparison group was selected from PMKeyS by Defence personnel with security clearances commensurate with access to such data, using the protocol prescribed by the Bougainville Health Study Research Team. The comparison group was frequency matched to the deployment group on service (AirForce, Army, Navy), status (permanent or reserve), gender and birth year (1937-1966, 1967-1976 and 1977-1988).

40. All individuals who are included on the PMKeyS database who did not have an OP BEL ISI I or II code, or who were not included on the Bougainville Health Study Nominal Roll, and were a member of a Defence Service in November 1997 – the date of commencement of the Bougainville Operations - were eligible for inclusion in the study comparison group.

41. Service personnel who have been deployed as part of any military operation apart from the Bougainville Operations were eligible for inclusion in the comparison group if they were a member of any Service in November 1997, the data of commencement of the Bougainville Operations. Reservists and permanent personnel were both included.

42. PMO organised for a file for comparison individuals that included names, addresses and other variables required for recruitment of participants to be sent to the CMVH RCU. This file was merged with the Bougainville Health Study Nominal Roll to produce a study sample file.

Sampling

43. All personnel who deployed to Bougainville between November 1997 and August 2003 as part of the Bougainville Operations were selected to be part of the Veteran group (Project Nominal Roll). A comparison group double the size of the Nominal Roll was generated using frequency matching. This number was required for the Mortality and Cancer Incidence components of the Bougainville Health Study, where a ratio of comparison to veteran individuals of 2:1 was determined to be optimum for statistical power.

44. From this comparison list stratified random sampling, with stratification by service, status, gender and birth year, was used to select 1 in 4 of the participants who did not deploy to Bougainville to create a comparison sample of 2399. Proportional allocation was used to determine the number of individuals selected for each stratum. A random number was generated for each comparison individual, and the observations sorted by service, service type, gender, year of birth category and random number. Within each stratum the required number of observations was selected in order of increasing random number. These individuals then constituted the comparison sample for inclusion in the Bougainville Health Study.

45. Health and exposure data in this comparison sample of 2399 will be evaluated against the same measures in the full list of veterans on the Bougainville Nominal Roll.

Overlap between deployments

46. For a given health study, it is expected that members of both the veteran and the comparison groups will include Service personnel who have been deployed to locations other than those relevant to that study, and thus eligible for inclusion in more than one study. The Bougainville Health Study forms part of a series of three studies looking at the health effects of deployment to the Near North Area of Influence, with the other two studies investigating deployments to the Solomon Islands and East Timor. Therefore, there will be some overlap between individuals deployed to these three operations. This is described in more detail in Annex 2.

47. Once the veteran and comparison groups for the three studies were selected, a "Deployment Profile Analysis" was undertaken, which documents the overlap of the veterans and comparisons sampled for the studies. This will inform the contact strategy for the three Deployment Health Studies, so that individuals are not contacted for more than one study. In addition it will allow management of resources for the studies. Individuals who are eligible for inclusion in the Bougainville Health Study who have also been selected for either the Solomon Islands or East Timor Studies may be approached (and therefore funded) as part of the sampling for these studies. While study data will be obtained once for each individual, individuals may be included in more than one set of statistical analysis. For example an individual deployed to Bougainville may be included as a veteran for the Bougainville Health Study, but may also be in the comparison group for the Solomon Islands Health Study. This "sharing" of study participants is an epidemiologically and statistically valid approach.

48. While the process of independently sampling for each of the three Deployment Health Studies (and then examining the overlap) may seem like a convoluted approach, it is necessary to ensure scientific rigour of the studies. If, for example, the comparison group for the Bougainville Health Study is selected excluding Service personnel who have been deployed to the Solomon Islands, then the comparison group will be biased relative to the veteran group (some of whom will have deployed to the Solomon Islands). This is particularly an issue as multiple deployments may have a greater impact on health outcomes than a single deployment. The analysis strategy for the Deployment Health Studies will allow for examination of this potential "dose-response" effect.

49. A Deployment Profile Analysis, similar to that described above for the Project Nominal Roll was also obtained for the comparison group, to determine deployment history to the Solomon Islands and East Timor for this group, and to check whether any of the comparisons had also potentially been deployed as part of OP BEL ISI I or II. Details of individuals selected for inclusion in the comparison group were merged with the file obtained for the Deployment Analysis Profile for the Veteran group, described above.

Ethical Approval

50. Formal ethics approval was obtained for generation of the Project Nominal Roll, generation of the Comparison Group and selection of the study sample from the Australian Defence Health Research Ethics Committee (ADHREC), and from the University of Queensland: Behavioural & Social Sciences Ethical Review Committee (BSSERC). Copies of these approval letters are shown in Annexes 3 and 4.

Results

Bougainville Health Study Project Nominal Roll

Source Data Files

51. Files provided by PMKeyS and ADFPAY included data for all deployments relevant to the three Near North Area of Influence Deployment Health Studies. Due to the size of some of the data files from PMKeyS and ADFPAY, they were separated into multiple parts of appropriate size to allow files to be emailed to CMVH RCU over the Defence Restricted Network. A description of the names and size of files is provided in Annex 5, with details of file formats provided in Annex 6.

52. Data were provided to CMVH RCU in EXCEL format, and each file was converted to tab delimited format to enable reading by SAS.

53. For PMKeyS data there were two sets of files. The first included all deployment information, while the second included details of all discharge and rehire information for individuals in the deployment files. The status of individuals (i.e. permanent or reserve) on the deployment files was as at the time of deployment. As individuals can be discharged and rehired for a specific time period, then discharged and rehired again, there can be multiple occurrences of discharge and rehire for individuals. The most recent information on discharge and rehire was required to specify the most recent status of individuals. While status at the time of deployment was used to select the appropriate comparison group, the most recent status will be used to determine whether the study documentation will be mailed to the individual's home or work address.

54. ADFPAY data on individuals who are no longer in Defence are periodically archived (approximately every 12-24 months). ADFPAY data files therefore included deployment data for individuals on active status, as well as archived deployment data.

Preliminary Data Checks

55. There were seven files for each of PMKeyS deployment and discharge/rehire data files types: five files for Army deployments (because of the number of Army deployments and thus the size of the files), one for Navy and one for Air Force deployments.

56. The format of PMKeyS data was consistent for each file type (i.e. within deployment data and within discharge/rehire data), with one exception. For the NAVY file, cell R66 (sex variable) was located after the medical category code description; for all other files it was included after the "former name" variable.

57. There was one error in the PMKeyS deployment data: one date of birth was in a format which could not be read in. This resulted in missing date of birth and thus missing age for this individual. There were 11 errors in the date of discharge or rehire: eight of these could be appropriately corrected, while the remaining three were uninterpretable and were thus classified as missing data.

58. There were 10 files for ADFPAY deployment data, four of which included previously archived data. The format of the data files was not consistent, with variation in the row at which the data commenced. The first row of data commenced on row 5 (4 data files), 6 (5 data files) or 7 (1 data file). One file had an extra non-empty row at the end of the file. This row did not contain any data, but included the words "security classification restricted". Apart from these issues, the format of data within the files appeared to be consistent, and no obvious errors were encountered by SAS on reading of data.

Generation of Project Nominal Roll

59. The PMKeyS and ADFPAY data files all included service number and service identifiers. PMKeyS data also included PMKeyS number (called EMPLID) in addition to service number. Both numbers were not available for all individuals. Service personnel who enlisted after the introduction of PMKeyS will not have been allocated a Service number, and are thus only identifiable by PMKeyS number. Service number was used as the primary identification key in combination with service (as service number is not unique across the services; i.e. the same service number could be used for all three services), with PMKeyS number used when there was no service number. PMKeyS number is a unique identifier, and is not duplicated across services.

60. In total there were 1165 deployments for OP BEL ISI II identified via PMKeyS (Opcode H03). Of these, two had missing end date. No deployments for BEL ISI I were identified through PMKeyS.

61. A total of 980 OP BELISI I and 6391 OP BELISI II deployments were identified from ADFPAY data. None of these had commenced after the study end date (August 26, 2003). There were 7371 eligible deployments records (which may not necessarily equate to actual deployments) undertaken by 4748 individuals.

62. Merging of PMKeyS and ADFPAY data resulted in a Bougainville Health Study Project Nominal Roll of 4776 individuals (initially 4884 individuals were identified, with 8 of these later found to be duplicates). The majority of individuals (76%) were identified in ADFPAY but not PMKeyS, with 0.6% identified in PMKeyS but not ADFPAY, and 23% identified in both PMKeyS and ADFPAY only (see Table 1). Using the capture-recapture method outlined in Annex 1, the estimated "true" size of the Project Nominal Roll is 4859 – i.e. 83 larger than that actually obtained.

Table 1: Number of individuals on the Bougainville Nominal Roll by source of data - generated by CMVH May 2007

	Bougainville	
Data Source	**n**	**%**
PMKeyS & ADFPAY	1115	23
ADFPAY only	3633	76
PMKeyS only	28	0.6
Total	**4776**	**100.0**

NB: Excludes 8 duplicate records

Characteristics of OP BEL ISI I or II Veterans

63. Table 2 shows the characteristics of OP BEL ISI I or II Veterans used for selection of the comparison group: service, status, gender and birth year. Only 14% of eligible Bougainville Health Study veterans were female, and 48% were born between 1967 and 1976 (inclusive). Note that date of birth was missing for 2 individuals, and 1 record had missing gender. More than half of the Nominal Roll individuals were in the Army (66%), and the majority (91%) were in the permanent Defence Force (rather in the Reserves).

Table 2: Characteristics of OP BEL ISI I or II **veterans eligible for Bougainville Health Study**

Characteristic		**Frequency**	**Percent**
Sex	Female	660	14
	Male	4123	86
	Missing	1	0.2
Birth group	1937-1966	1710	36
	1967-1976	2309	48
	1977-1988	763	16
	Missing	2	0.4
Service	Army	3169	66
	Navy	1443	30
	RAAF	172	4
Service Type	Permanent	4347	91
	Reserve	437	9

NB includes 8 records later found to be duplicates

Comparison Group Selection

64. The number of OP BEL ISI veterans in each of the strata of the Nominal Roll used for selection of comparison is shown in Table 3. The final numbers required in each stratum of the comparison group, provided to PMKeyS for selection of the comparison group are shown in Annex 7.

Table 3: Number in Strata of the Nominal Roll used for selection of the Comparison Group

		Sex						
		F			M			
		Birth group			Birth group			
		1937-1966	1967-1976	1977-1988	1937-1966	1967-1976	1977-1988	Total
Service	**Type**							
Army	Permanent	73	185	54	966	1299	234	2811
	Reserve	40	31	9	192	75	11	358
Navy	Permanent	16	113	100	306	535	346	1416
	Reserve	1	1	-	24	-	1	27
RAAF	Permanent	3	23	2	44	42	6	120
	Reserve	4	5	-	43	-	-	52
Total		137	358	165	1575	1951	598	4784

NB. The participant with a missing gender code and the two participants with unknown age have been allocated strata based the most frequent age and gender categories of participants with the same strata characteristics. Includes 8 records later found to be duplicates

65. PMKeys generated the required sample using a random number to sort records within sampling strata and then select the required number of observations. The sample were created using a normal random number generator (mean = 0, standard deviation = 1 and random seed = 7). Initially PMKeyS were unable to fill the strata completely for the certain subgroups because of difficulties extracting data from 1997 on the PMKeyS database. After consultation with PMKeyS and the DHSP team it was agreed to allow personnel to be included in the comparison arm if they were members of Defence between the November 10 1997 and December 31 2000 (approximate midpoint of the deployment). PMKeyS experienced further difficulties filling the Navy strata so in order to facilitate the completion these strata the eligibility window was extended by a further year. Therefore for the Navy strata ADF personnel could potentially be recruited if they were a member of defence between November 10 1997 and December 31 2001.

66. The data were provided to CMVH RCU over the Defence Restricted Network in ZIP archives which contained the EXCEL files, with data for each strata provided in a separate EXCEL page. This then required manipulation to obtain one comprehensive data file.

67. The comparison group selected by PMKeyS included 133 people already included on the Bougainville nominal roll. These records were excluded from the comparison group. The characteristics of the modified comparison group are presented in Table 4.

Table 4: Number in Strata used for the selection of the comparison group after the exclusion of personnel on the Bougainville nominal roll.

		Sex						
		F			M			
		Birth group			Birth group			
		1937-1966	1967-1976	1977-1988	1937-1966	1967-1976	1977-1988	Total
Service	**Type**							
Army	Permanent	146	370	106	1933	2599	468	5622
	Reserve	80	62	18	384	150	22	716
Navy	Permanent	29	220	193	587	1011	659	2699
	Reserve	2	2	-	48	-	-	52
RAAF	Permanent	6	46	4	87	84	12	239
	Reserve	8	10	-	86	2	-	106
Total		271	710	321	3125	3846	1161	9434

Sampling

68. The number of veteran and comparison individuals in each stratum selected for inclusion in the Bougainville Health Study is shown in Table 4. Due to rounding error in the calculation of numbers in each stratum, this sample had a total of 2399.

Table 5: Number of individuals in the comparison group study sample: by strata.

		Sex						
		F			M			
		Birth group			Birth group			
		1937-1966	1967-1976	1977-1988	1937-1966	1967-1976	1977-1988	Total
Service	**Type**							
Army	Permanent	37	93	27	483	650	117	1407
	Reserve	20	16	5	96	38	6	181
Navy	Permanent	7	55	48	147	253	165	675
	Reserve	1	1	-	12	0	-	14
RAAF	Permanent	2	12	1	22	21	3	61
	Reserve	2	3	-	22	0	-	27
Total		69	180	81	782	962	291	2365

NB. The total number of participants in the table is 2365 (as opposed to 2359). This difference is due to rounding.

Overlap between deployments

69. Table 6 shows the number of individuals with various combinations of deployment locations. The table also includes multiple deployment location data obtained by the PMO using manual searching.

Table 6: Preliminary data on multiple operations of deployment for Near North Area of Operations[1].

Operation/s	Provided by DHSPO 21 July 2006	Generated by CMVH May 2007
Solomon Islands Only	1310	2446
Bougainville Only	1327	2464
East Timor Only	13700	16465
Solomon Islands and Bougainville	129	238
Solomon Islands and East Timor	1465	1171
Bougainville and East Timor	1564	1840
Solomon Islands and Bougainville and East Timor	274	234
Total	**19769**	**24858**
Total for Solomon Islands	3178	4089
Total for Bougainville	3294	4776
Total for East Timor	17003	19710

[1] ***Note that these numbers represent the approximate number of individuals, not the number of deployments.***

Table 7 below shows the Deployment Profile Analysis for the overall comparison group (n=9434) as well as for each of the 2399 comparison individuals selected for inclusion in the Bougainville Health Study sample. Note that there are no individuals in the comparison sample who have deployed to the Bougainville (as this is one of the eligibility criteria for the Bougainville Nominal Roll). The self-reported deployment history of the individuals in the study will be used to check these data (if individuals respond to the study invitation package).

Table 7: Preliminary data on multiple operations of deployment for Near North Area of Operations for comparison group and study sample

Operation/s	All Comparison individuals for mortality and cancer incidence study (n=9567)	Study sample Comparison group for health study (n=2399)
Solomon Islands Only	229	64
Bougainville Only	0	0
East Timor Only	2847	692
Solomon Islands and Bougainville	0	0
Solomon Islands and East Timor	185	48
Bougainville and East Timor	0	0
Solomon Islands and Bougainville and East Timor	0	0
No deployments	6173	1561
Total	**9434**	**2365**

Discussion

Data Management

70. Generation of the Project Nominal Roll and the comparison group required a substantial amount of data management and manipulation. This was in part due to the large size of the source data files provided from PMKeyS and ADFPAY for generation of the Project Nominal Roll. In order for these files to be able to be emailed over the Defence Restricted Network, the data were provided in multiple files. Each file needed to be checked for structure and format, and then saved in a tab delimited format for input to SAS (the program used to manipulate and check the data).

71. The "Restricted" security classification of the source data required a complex process for generation of the Project Nominal Roll. Generally this process would be undertaken by a statistician. However the statistician was not security cleared to access the data, and it is not appropriate for Study Chief Investigators to access or view any named data prior to individuals consenting to participate in the study. All data had been sent to the RCU over the Defence Restricted Network. It was not possible to load the statistical software required for analysis on to the computer which allowed access to the DRN. Thus a laptop capable of processing "Restricted"

information was obtained and the SAS statistical software program then installed. The RCU generated a "dummy" dataset for each different type of data. The dummy datasets had the same format as the original dataset, but with "notional" names and addresses. The statistician then wrote the programming code required to read in and merge the data from the various files, and tested this code on the dummy datasets. Once it had been verified that the programming code was valid for the dummy datasets, the SAS code was then transferred to the "Restricted" laptop and used to read in the "real" data. This was done by the RCU and the First Chief Investigator of the Solomon Islands Health Study (who was familiar with the SAS program), who made any required modifications to the program, with advice from the statistician. Any checking required on the original datasets was undertaken by the RCU.

72. For the PMKeyS and ADFPAY data there were multiple records per individual (each representing a different deployment, or in some cases duplicates of the same deployment). Each file was initially examined separately and duplicates removed. Files were then merged to provide a more comprehensive list of deployed personnel and determine the overlap between files.

Validity and Reliability

73. It is still unclear how comprehensive the Project Nominal Roll is, and what the true number of Service personnel deployed as part of OP BELISI I & II is. The estimated size of the Nominal Roll, using capture-recapture is larger as it includes 83 more records. Although it is unclear how appropriate the assumptions are for this method, there is a reasonable level of confidence that the ascertainment is high.

74. Because of the classified nature of their work, deployment details of Special Forces (SF) personnel may not be included in the Defence databases. They might still receive deployment allowances, however they will not necessarily be identified as SF.

75. Following implementation of the PMKeyS Personnel Management system in 2001-2002, new enlistments into the Defence Force have been allocated a PMKeyS number for purposes of identification, and individuals have been deployed using this identification system. Individuals who had enlisted since 1996 (or who were still in Defence since 1996) but prior to PMKeyS have also been allocated a PMKeyS number in addition to their service number, which was previously used for identification and deployment. Databases should include, where relevant, both identification numbers as these will differ for the same individual. The different identification numbers used adds another level of complexity to management and analysis of the data. Service Number was used as the primary identification key, however if this was missing then PMKeyS number was used. Records in ADFPAY data were identified by one variable, called "Service Number", which was actually Service Number (if the individual had been allocated one) or PMKeyS number otherwise.

76. While the Project Nominal Rolls have not yet been completed for East Timor, preliminary estimates indicate slightly higher numbers to those obtained by DHSPO

but of the same order of magnitude. The Deployment Profile Analysis will be repeated when the East Timor Nominal Rolls have been finalised.

77. Further estimates of validity and reliability of the Project Nominal Roll and comparison group selection will be obtained when data from the invitation package are received. As part of the first stage of the study, participants are requested to provide details of all of their recent deployments. These data will then be compared to the deployment history of individuals obtained as part of the Deployment Profile Analysis.

78. Changes in postings can have an impact on the validity of both home and work address data for Service personnel. It was found in the InterFET Pilot Project that 29% of individuals had a change in address details between receipt of the original Project Nominal Roll and mail-out of the survey. This will mean that, because invitation packages will not be mailed to individuals until 2007 (after a new posting round), address details will need to be obtained again from PMKeyS prior to mail-out.

79. While the process for generation of the Bougainville Health Study Project Nominal Roll appears to have improved based on the modification implemented after the InterFET Pilot Project and Solomon Islands, the East Timor study will present further challenges due to the size of the Nominal Roll and the use of allotment certificates in generation of the Roll.

Recommendations

80. The following recommendations, based on the experience of generating the Bougainville Health Study Nominal Roll should be considered for the conduct of the health study, and for generation of future Project Nominal Rolls:

- Where possible, the validity and reliability of the Project Nominal Roll should be checked with data provided by individuals on their deployment history.

- Up-to-date address data should be obtained prior to mail-out of the invitation package.

- For future studies, it is important that data be provided by PMKeyS and ADFPAY in a consistent format, and that the format of all data files should be checked by the RCU prior to any analysis being conducted.

- Any problems highlighted during contact with potential study participants, or based on information provided by participants, should be incorporated into SOPs for generation of future Nominal Rolls.

Annex 1 – Description of Capture-recapture Method

Capture-recapture methods are used to estimate the number of individuals in a closed population. They were initially developed by zoologists to count wildlife populations. In human studies these methods are useful to count numbers with specific characteristics, usually a disease or condition of interest, when there are multiple sources or lists, none of which is comprehensive. Capture-recapture methods have been used to estimate numbers of people with birth defects, infectious diseases, drug use and injuries, so that estimates of prevalence and/or incidence may be obtained. Firstly the sources or lists must be identified. These can include hospital databases, disease registers, support group membership, general practice records, etc. Individuals need to be identified from the lists and a unique identifier must be available so that the overlap between lists can be determined, i.e. the number of people appearing on each list only and the numbers appearing on all combinations of lists need to be obtained. In animal studies animals are usually 'captured', tagged and then released and can therefore be identified during a different capture (recapture). The number missing from the lists can then be estimated.
For capture-recapture with 2 lists or data sources, the number of people in either or both of the lists can be counted and this then used to estimate the number in neither of the lists (the missing number). Data can be arranged in a 2 x 2 contingency table

Table 1.2 Format for 2X2 table for capture-recapture method

	In List B		
In List A	**Yes**	**No**	**Total**
Yes	m		M
No		*	
Total	n		

* missing data – to be estimated

The total population, N, can then be estimated using the formula:

$$N = \frac{(M+1)(n+1)}{(m+1)} - 1$$

When three or more lists are to be used, the method is slightly more complicated and log-linear models can be used to estimate the missing number.
The assumptions for capture-recapture methods are:

The study population is a closed population
Lists are independent of one another
All members of the population have the same probability of being captured
All identified elements are members of the population

Annex 2 – Description of Overlap in Deployments

Figure 1. Venn diagram of the overlap between individuals deployed to the Solomon Island (SI), Bougainville (BV) and East Timor (EM), and how selection of the veteran and comparison groups for the three Health Studies will be managed.

Figure 1a.
Sampling for the Defence Deployment Solomon Islands Health Study.

Randomly selected comparison individuals

All individuals who deployed to the Solomon Islands

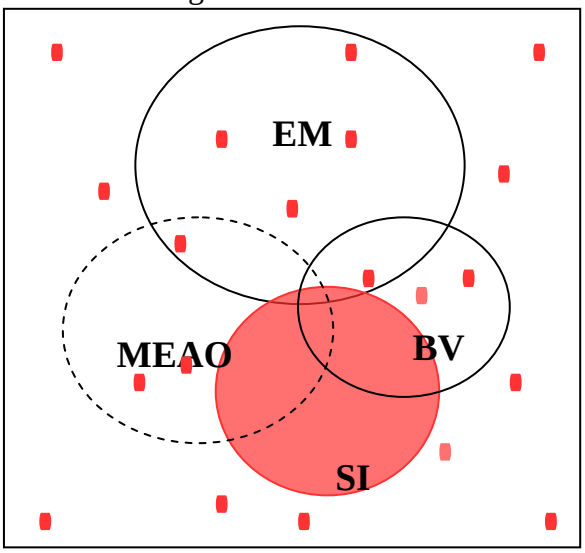


Figure 1b.
Sampling for the Defence Deployment Bougainville Health Study.

Randomly selected comparison individuals

All individuals who deployed to Bougainville

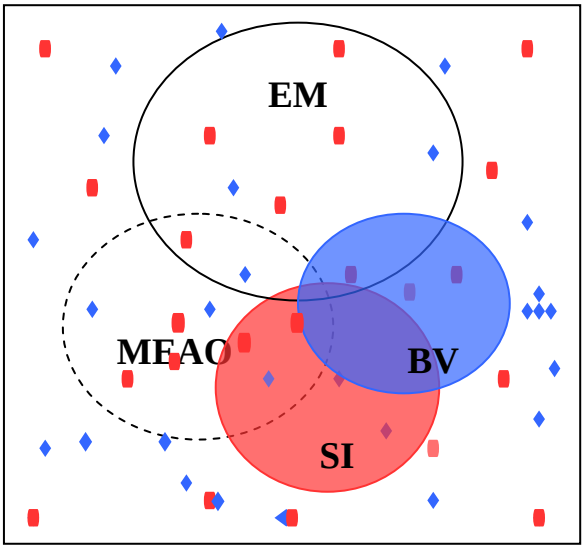
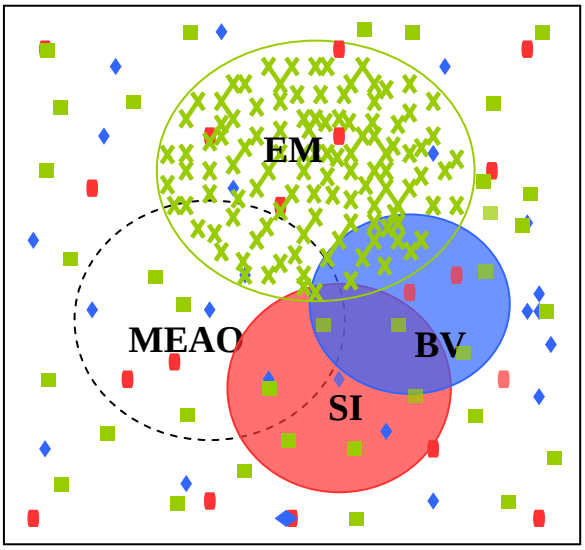


Figure 1c.
Sampling for the Defence Deployment East Timor Health Study.

Randomly selected comparison individuals

Sample of individuals who deployed to East Timor



Annex 3 - Australian Defence Health Research Ethics Committee (ADHREC) letter of approval

Australian Government
Department of Defence
Defence Support Group

DEFENCE HEALTH SERVICES
CP2-7-068
Campbell Park
CANBERRA ACT 2600

2006/1091530
ADHREC 449/06
DCP/OUT/2006/134

Doctor Catherine D'Este
Associate Professor
Centre for Military and Veterans Health
Deployment Health Serveillance Unit University of Queensland
Level 2 Mayne Medical School Herston Road
HERSTON QLD 4006

Dear **Doctor D'Este**

AUSTRALIAN DEFENCE HUMAN RESEARCH ETHICS COMMITTEE (ADHREC) PROTOCOL 449/06: DEPLOYMENT HEALTH SURVEILLANCE PROGRAM: SAMPLE GENERATION AND MORTALITY AND CANCER INCIDENCE STUDIES

1. ADHREC has considered your protocol and has cleared your project to proceed. Please note that ethical clearance from ADHREC does not automatically confer access to ADF personnel; this will have to be sought from the relevant military commanders.

2. Your protocol has been allocated **ADHREC Protocol Number 449/06, and this number should be quoted in all correspondence**. Your protocol has been approved for a period of three years. If your research is to continue over the three year approval time, ADHREC approval for an extension is to be sought in writing.

3. ADHREC requires you to provide six-monthly progress reports. The first report is due on **23 January 2007**. As part of your report would you please include a narrative describing the progress to date, and any events of significance occurring in the conduct of the protocol, in particular any adverse outcomes are to be described. Could you please also comment on the following, where applicable:

   a. Outcome in the case of completed research,
   b. Maintenance and security of your records,
   c. Compliance with the approved protocol,
   d. Any amendments or modifications to the protocol, and
   e. Compliance with any other special conditions that ADHREC may have required

4. **If your protocol requires any modification, ADHREC approval must be sought in writing, detailing all modifications required.**

Defending Australia and its National Interests

5. For Clinical trials, ADHREC is to be notified in writing of all **Serious Adverse Events within 72 hours of the event occurring.**

6. For completeness, would you please sign and initial the enclosed Researcher's Agreement and return it to me at your convenience. I have also enclosed ADHREC's Guidelines for Volunteers, a copy of which is to be given to each study participant.

7. The Committee wishes you well with your research. Please contact me if I can be of any assistance.

Yours sincerely,

Doctor Rosemary A. Landy
Executive Secretary
Australian Defence Human Research Ethics Committee
CP2-7-068
Campbell Park Offices
CANBERRA ACT 2600

Tel (02) 62663837
Fax (02) 62664982
E-mail: ADHREC@defence.gov.au

10 July 2006

Attachment:
A. ADHREC *Researchers Agreement*
B. ADHREC *Guidelines for Volunteers*

Annex 4 - University of Queensland: Behavioural & Social Sciences Ethical Review Committee (BSSERC) letter of approval.

THE UNIVERSITY OF QUEENSLAND
Institutional Approval Form For Experiments On Humans Including Behavioural Research

Chief Investigator:	Associate Professor Cate D'Este
Project Title:	Deployment Health Surveillance Program: Sample Generation
Supervisor:	None
Co-Investigator(s)	Associate Professor Scott Kitchener, Professor Sandy McFarlane, Dr Sonya Bennett, Professor Annette Dobson, Dr Ben Stute
Department(s):	Centre for Military and Veterans' Health
Project Number:	2006000478
Granting Agency/Degree:	Department of Defence
Duration:	31st October 2007

Comments:

Approval is for Stage I of current project (compiling list of eligible participants – nominal roll).

(The Committee advises that the investigator should consult with appropriate organisations concerned with the welfare of specific vulnerable groups (e.g. Armed Force Federation of Australia in cases of service personnel; Aboriginal and Torres Strait Islander Studies Unit for indigenous service personnel) for subsequent stages to progress.)

Name of responsible Committee:-
Behavioural & Social Sciences Ethical Review Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Research Involving Humans* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:-
Dr Jack Broerse
Chairperson
Behavioural & Social Sciences Ethical Review Committee

Date 18/08/06 Signature

Annex 5 – Data files provided by PMKeyS and ADFPAY

Filename	Row at which data commences	Column at which data commences	Number of data records	Description
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 1 - ARMY	2	1	4999	PMKeyS deployment data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 2- ARMY	2	1	5000	PMKeyS deployment data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 3- ARMY	2	1	5000	PMKeyS deployment data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 4- ARMY	2	1	5000	PMKeyS deployment data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 5- ARMY	2	1	3783	PMKeyS deployment data for ARMY part 1 of 5
PMKEYS nominal rolls data IN62825 NAVY CMVH 290806 NAVY.xls	2	1	1256	PMKeyS deployment data for NAVY
PMKEYS nominal rolls data IN62825 RAAF CMVH 290806 RAAF.xls	2	1	1038	PMKeyS deployment data for RAAF
Total number of records			26076	
20060717 ADFPAY nominal roll raw data DHSD1 Part 1.xls	6	1	10000	ADFPAY deployment data file 1 part 1 of 5
20061717 ADFPAY nominal roll raw data DHSD1 Part 2.xls	6	1	10000	ADFPAY deployment data file 1 part 2 of 5
20061717 ADFPAY nominal roll raw data DHSD1 Part 3.xls	6	1	10000	ADFPAY deployment data file 1 part 3 of 5
20061717 ADFPAY nominal roll raw data DHSD1 Part 4.xls	6	1	10000	ADFPAY deployment data file 1 part 4 of 5
20060717 ADFPAY nominal roll raw data DHSD1 Part 5.xls	6	1	14626	ADFPAY deployment data file 1 part 5 of 5
File 2 - 20060618 ADFPAY nominal roll raw data DHSD2.xls	7	1	217	ADFPAY deployment data file 2
File 3 - 20063107 ADFPAY nominal roll raw data Batch-Wipe-2000.xls	5	1	170	ADFPAY deployment data archived in 2000
File 4 - 20063107 ADFPAY nominal roll raw data Batch-Wipe-2002.xls	5	1	3542	ADFPAY deployment data archived in 2002
File 5 - 20063107 ADFPAY nominal roll raw data Batch-Wipe-2005.xls	5	1	7826	ADFPAY deployment data archived in 2005
File 6 - 20063107 ADFPAY nominal roll raw data Onlie-Wipe-2000-2007.xls	5	1	4163	ADFPAY deployment data archived from 2000-2007
Total number of records			***70545***	

Filename	Row at which data commences	Column at which data commences	Number of data records	Description
File 7 - original - alltoment certificate - Op Tanager.xls	2	2	17281	Allotment certificate data for Op Tanager
File 8 - original - allotment certs - Op Stabilse ARMY.xls	4	1	323	Allotment certificate data for Op Stabilise - ARMY
File 8 - original - allotment certs - Op Stabilse NAVY.xls	4	1	3907	Allotment certificate data for Op Stabilise - NAVY
File 8 - original - allotment certs - Op Stabilse RAAF.xls	4	1	5	Allotment certificate data for Op Stabilise - RAAF
File 8 - original - allotment certs - Op Warden ARMY.xls	4	1	6285	Allotment certificate data for Op Warden - ARMY
File 8 - original - allotment certs - Op Warden NAVY.xls	4	1	88	Allotment certificate data for Op Warden - NAVY
File 8 - original - allotment certs - Op Warden RAAF.xls	4	1	740	Allotment certificate data for Op Warden - RAAF
File 9 - original – Supp allotment certificate Op Tanager for HMA Ships.xls	3	1	118	Allotment certificate data for Op Tanager - data from ships
Total number of records			***28747***	
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 1 REH_TER	2	1	7999	PMKeyS discharge and rehire data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 2 REH_TER	2	1	8000	PMKeyS discharge and rehire data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 3 REH_TER	2	1	8000	PMKeyS discharge and rehire data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 4 REH_TER	2	1	8000	PMKeyS discharge and rehire data for ARMY part 1 of 5
PMKEYS nominal rolls data - IN62825 ARMY CMVH 290806 - Part 5 REH_TER	2	1	10312	PMKeyS discharge and rehire data for ARMY part 1 of 5
PMKEYS nominal rolls data IN62825 NAVY CMVH 290806 REH_TERM	2	1	2034	PMKeyS discharge and rehire data for NAVY
PMKEYS nominal rolls data IN62825 RAAF CMVH 290806 REH_TER	2	1	1741	PMKeyS discharge and rehire data for RAAF
Total number of records			***46086***	

Annex 6 – Description of variables provided by PMKeyS and ADFPAY

Data Source	content of file	variable name	variable description	Variable codes
PMKeyS	***deployment data***	service	service	ARMY, NAVY, RAAF
		stype	service type - regular or reserve	CFT, REG, RES
		EmplID	employee number - PMKeyS number	
		sno	Service number	
		rank	rank code	
		rankd	rank description	
		empls	employment status	A=active, D=discharged
		sname	surname	
		gname1	given name 1	
		gname2	given name 2	
		fname	firstname	
		sex	sex	
		opscode	operation code	
		opsd	operation description	
		sdate	date of start of deployment	
		edate	date of end of deployment	
		mcode	medical employment category code	
		mdescr	medical employment category description	
		bdate	date of birth	
		ddate	date of death	
		mstatus	marital status	
		haddr1	home address field 1	
		haddr2	home address field 2	
		haddr3	home address field 3	
		city	home address city	
		state	home address state	
		pcode	home address postcode	
		cntry	home address country	
		unitid	most recent unit - identification number	
		unitd	most recent unit - description	
		location	most recent unit - location	
		uaddr1	most recent unit - address (line 1)	
		uaddr2	most recent unit - address (line 2)	
		uaddr3	most recent unit - address (line 3)	
		uaddr4	most recent unit - address (line 4)	
		ucity	most recent unit - city	
		ustate	most recent unit - state	
		upcode	most recent unit - postcode	
		ucntry	most recent unit - country	

Data Source	content of file	variable name	variable description	Variable codes
PMKeyS	***deployment data discharge & rehire data***	service	service	ARMY, NAVY, RAAF
		service	service	ARMY, NAVY, RAAF
		stype	type of service	CFTS, REG, RES-A, RES-ES, RES-HRR, RES-1
		EMPLID	PMKeyS id number	
		effdate	date of discharge or rehire	
		action	whether discharged or rehired	HIR, MTR, REH, TER
		reason	reason for discharge of rehire	
		descr		
		status		
		comments		
ADFPAY		si	service indicator	1=ARMY, 2=RAAF, 3=NAVY
		sno	service number	
		sname1	first surname	allows for up to 6 different surnames
		sname2	second surname	
		sname3	third surname	
		sname4	fourth surname	
		sname5	fifth surname	
		sname6	sixth surname	
		gnames	given names	all given names in the same field
		dob	date of birth	
		endate	date of enlistment	
		acode	deployment allowance code	
		adescr	deployment allowance description	
		sdate	date of start of deployment	
		edate	date of end of deployment	
		rcode	rank code	
		pstation	pay station	5 digit code
		ppoint	pay point	2 digit code - sub-unit of pay station
		paddress	pay address	
		disdate	date of discharge	
		disreas	reason for discharge	
		stype	service type	P = permanent, R=reserve
		mstatus	marital status	
Allotment Certificates		sno	service number	
		rank	rank at time of deployment	
		initials	initials	
		sname	surname	
		sdate	date of start of deployment	
		edate	date of end of deployment	

Annex 7 - Numbers for Bougainville Comparison Group

Service	Service Type	Gender	Birth year	number
ARMY	Regular/permanent	Female	1937-66	146
ARMY	Regular/permanent	Female	1967-76	370
ARMY	Regular/permanent	Female	1977-88	108
ARMY	Regular/permanent	Male	1937-66	1932
ARMY	Regular/permanent	Male	1967-76	2598
ARMY	Regular/permanent	Male	1977-88	468
ARMY	Reserve (and CFT)	Female	1937-66	80
ARMY	Reserve (and CFT)	Female	1967-76	62
ARMY	Reserve (and CFT)	Female	1977-88	18
ARMY	Reserve (and CFT)	Male	1937-66	384
ARMY	Reserve (and CFT)	Male	1967-76	150
ARMY	Reserve (and CFT)	Male	1977-88	22
NAVY	Regular/permanent	Female	1937-66	32
NAVY	Regular/permanent	Female	1967-76	226
NAVY	Regular/permanent	Female	1977-88	200
NAVY	Regular/permanent	Male	1937-66	612
NAVY	Regular/permanent	Male	1967-76	1070
NAVY	Regular/permanent	Male	1977-88	692
NAVY	Reserve (and CFT)	Female	1937-66	2
NAVY	Reserve (and CFT)	Female	1967-76	2
NAVY	Reserve (and CFT)	Male	1937-66	48
NAVY	Reserve (and CFT)	Male	1977-88	2
RAAF	Regular/permanent	Female	1937-66	6
RAAF	Regular/permanent	Female	1967-76	46
RAAF	Regular/permanent	Female	1977-88	4
RAAF	Regular/permanent	Male	1937-66	88
RAAF	Regular/permanent	Male	1967-76	84
RAAF	Regular/permanent	Male	1977-88	12
RAAF	Reserve (and CFT)	Female	1937-66	8
RAAF	Reserve (and CFT)	Female	1967-76	10
RAAF	Reserve (and CFT)	Male	1937-66	86
			Total	9568

ANNEX C

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Mortality Study Report

Bougainville Health Study

Deliverable Item 2 (Phase 2)

31 July 2007

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Author	**Mr Michael Waller, Ms Lisa Nielsen, Prof Cate D'Este**
Document Version	**2.0**
Status	**Final**
Date Saved	**26/11/07**

Australian Government
Department of Defence
Department of Veterans' Affairs

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Charles Darwin UNIVERSITY
Innovation in Education

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\Research\DHSP\Phase 2\2. Bougainville\Deliverables\Mortality & Cancer Study Report\Mortality Study\BV Mortality Study Report v2.0.doc

Revision History

Date	Version	Description	Track Changes
31/07/07	1.0	Initial Draft	
26/11/07	2.0	Updated based on comments from the SAC	

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
A/Prof Susan Treloar	First Chief Investigator			
Prof Annette Dobson	Chair Scientific Research Team			
Prof Tony McMichael	Scientific Advisory Committee			

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
DHSP SRT	26/07/07	electronic
PMO	31/07/07	electronic

DEFENCE DEPLOYED BOUGAINVILLE HEALTH STUDY

Deliverable Item 2 (Phase2)

Mortality Study Report

Due Date: 31 July 2007

Executive Summary

1. The Defence Deployed Bougainville Health Study is part of a series of studies being conducted by the Centre for Military and Veterans' Health to investigate the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service to Bougainville.

2. This is an updated report of the Bougainville mortality study. Information on date of enlistment is now utilised in the person-years calculations, and the suggestions received from the Scientific Advisory Committee (SAC) have been built into the document.

3. This report presents the mortality component of the Bougainville Health Study. One of the main questions of interest in veterans' health is whether veterans are at an increased risk of dying compared to their Australian contemporaries. Deployment may increase the risk of death in a number of ways. A psychological trauma may lead to later suicide; a physical trauma may lead to a chronic disease that reduces life expectancy; exposure to known or unknown environmental toxins may lead to cancer and death.

4. The aims of the study were:
    - To compare the mortality rate for veterans of Operations BEL ISI I and II to a comparison group of Defence personnel who did not deploy as part of Operations BEL ISI I and II.
    - To compare the mortality rate for veterans of Operations BEL ISI I and II to the general Australian population.

5. A Project Nominal Roll was generated from two sources of data: PMKeyS, the system used by the Department of Defence for all aspects of personnel management; and ADFPAY, which is the Australian Defence Force Pay System and is responsible for salary payment for Service personnel. Defence personnel deployed to Bougainville as part of Operations BEL ISI I and II between November 20th 1997 and August 26th 2003 were eligible for inclusion on the Nominal Roll. The comparison group was selected from Defence personnel who were serving in the same period and were frequency matched to the deployed

group on service (Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 and 1977-1988).

6. The mortality comparison was based on the entire Nominal Roll (n = 4776) and comparison group (n= 9434). The risk of death in each group was calculated as the total number of deaths divided by the total person years of follow-up to time of death or end of the study period. Hazard Ratios and 95% confidence intervals were obtained for the veteran group relative to the comparison group.

7. The Standardised Mortality Ratios (SMRs) compared death rates in the veteran and comparison groups to Australian norms. The number of observed deaths were divided by the number of expected deaths for the various age strata and multiplied by 100 to provide the SMRs.

8. The NDI linkage identified 14 deaths in the Bougainville veterans and 57 deaths in the non-deployed comparison group between the start of follow-up and 31 December 2005.

9. The all-cause death rate in the Bougainville veteran group was lower than that observed in the comparison group (HR 0.51 95% CI (0.28, 0.91)). ADF personnel who deployed to Bougainville also had a lower mortality rate from external causes than the comparison group (HR 0.47 95% CI (0.21, 1.07)).

10. Bougainville veterans and the frequency matched comparisons both had lower all-cause mortality rates than those observed in the general population of the same age (SMRs 28.7 and 57.2 respectively).

11. It is not currently known whether the lower death rate in the Bougainville veterans relative to the comparisons is a chance finding, possibly due to differences in length of observation between veterans and comparisons, or due to a real difference between the cohorts. Further follow-up of the Bougainville study population will increase the power and robustness of the statistical comparisons made.

1 Introduction

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a series of studies that aim to research the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service overseas. It is being conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program (DHSP).

2. This report presents the mortality component of the Bougainville Health Study, hereafter to be entitled the Bougainville Mortality Study.

3. One of the main questions of interest in veterans' health is whether veterans are at an increased risk of dying compared to their Australian contemporaries. Deployment may increase the risk of death in a number of ways. A psychological trauma may lead to later suicide; a physical trauma may lead to a chronic disease that reduces life expectancy; exposure to known or unknown environmental toxins may lead to cancer and death.

1.1 Deployment Health Surveillance Program

4. The Centre for Military and Veterans' Health (CMVH) is a consortium of The University of Queensland, University of Adelaide and Charles Darwin University, which is dedicated to innovatively seeking solutions to military and veterans' health issues through research, education, e-health and public debate. CMVH is conducting a series of studies examining the long-term health issues of deployed Australian Defence personnel, as part of its Deployment Health Surveillance Program (DHSP). The program will look at the health of troops deployed to the Solomon Islands, Bougainville, East Timor and the Middle East Area of Operations (MEAO).

5. The studies to be conducted by CMVH as part of the Deployment Health Surveillance Program aim to eventually develop a prospective, analytic system for longitudinal surveillance of health of ADF personnel who are deployed on specific operations. The core of the Deployment Health Surveillance Program is the formation of an integrated data system which will be established at the CMVH consortium of Universities. The Deployment Health Surveillance Program build on previous and current national and international studies, and is a critical step in establishing best practice surveillance methodologies and providing a baseline for monitoring the future health of Veterans of ADF operations to these regions.

6. In recent times ADF personnel have deployed on active service overseas in a variety of war-like and non war-like roles. Post deployment health concerns have followed wars since at least the United States Civil War (Hyams et al, 1996) and the Boer war (Jones et al, 2002). Focus on the psychological and physical ill health of veterans in the United States became acute following the Vietnam conflict, when the first five years after separating from the military was associated with an increased risk of dying from motor vehicle accidents, suicide, homicide and accidental poisoning (The Centers for Disease Control Vietnam Experience Study, 1987).

7. In Australia there has been evidence of higher mortality in both Korean and Vietnam Veterans. Korean War veterans have a 21% increase in overall mortality compared with the Australian male population, and an increase in cancer mortality of 31% (Harrex et al, 2003). For Vietnam veterans, the mortality rate is 6% lower than expected compared to the Australian male population, but 23% higher than the mortality of serving non-veterans who did not serve in Vietnam (Wilson et al, 2005).

1.2 The Bougainville Deployment

8. Bougainville is an island located to the east of the main Papua New Guinea (PNG) island and north-West of the Solomon Islands, and forms part of a group of independent island states called the Pacific Islands Countries (PIC) (Macdowell, 2004). It is the largest island of the North Solomons Province (Bridgewater, 2001). According to the last census in 1980, the population of the island was 108,726, and with an annual growth rate of about 4.1%, it is estimated that by 1997 the population was around 170,000 (Sharp, 1997).

9. One of the richest copper mines in the world was discovered in Bougainville, which led to major infrastructures such as roads and schools being developed. Although the mine brought development to the island, it also caused major environmental, social and economic damage. These damages fuelled previous existing resentments concerning the ownership of the land by Australia and PNG. This led to a group of traditional landowners sabotaging the mine til its closure in 1989, and the formation of the Bougainville Revolutionary Army (BRA). This was the start of the most bloody and destructive conflict in the South Pacific region since World War II.

10. Peace talks were held in New Zealand in October 1997 to settle the conflict between the Papua New Guinea Government and the Bougainville Revolutionary Army (BRA).

11. Australia deployed Defence personnel to Bougainville as part of the Truce Monitoring Group (TMG) and Peace Monitoring Group (PMG). These operations, entitled Operation BEL ISI I (OP BEL ISI I) and Operation BEL ISI II (OP BEL ISI II) respectively, were both non-warlike. OP BEL ISI I lasted from November 1997 to April 1998, and OP BEL ISI II lasted from April 1998 to June 2003.

12. Australian troops were potentially exposed to a variety of environmental, occupational and operational hazards during their deployment to Bougainville. Environmental exposures included chemicals that were disposed unprotected, consumption of contaminated food and water, climate and fauna. Operational and occupational exposures included psychological stressors (such as isolation, loneliness and stress), mosquito control measures (such as use of DEET, permethrin and exposure to fogging) and physical injury (such as sporting accidents).

2 Aims and Objectives

13. The purpose of the Bougainville Mortality Study is to determine whether deployment to Bougainville as part of Operations BEL ISI I & II was associated with increased mortality. The specific aims of the Study are:

- To compare the mortality rate for veterans of Operations BEL ISI I & II to a comparison group of Defence personnel who did not deploy as part of Operations BEL ISI I & II.
- To compare the mortality rate for veterans of Operations BEL ISI I & II to the general Australian population.

14. In order to address the above aims, the objectives of the Bougainville Mortality Study are:

- To formulate the methodology for making comparisons, specifically:
  - The process for matching files with the NDI
  - The required statistical analysis
- To run the analysis for the veterans listed on the Bougainville Health Study Nominal Roll, and identify areas of possible improvement for future deployment health studies.
- To collect information on cause of death and compare deaths from different causes between the comparison groups.

3 Methods

3.1 Study design

15. The Bougainville Mortality Study is a Retrospective Cohort Study. The mortality of veterans who deployed to the Bougainville was compared to that of a comparison group of Defence personnel who did not deploy as part of Operations BEL ISI I & II, as well as to the general Australian population. Information on mortality was obtained from linkage with the National Death Index (NDI) held by the Australian Institute of Health and Welfare (AIHW). The AIHW is provided with data on vital status from all State and Territory Registries of Births, Deaths and Marriages, as it is a legal requirement to register all deaths in Australia.

16. Comparison of mortality rates of veterans of Operations BEL ISI I & II with the Australian population provides an estimate of the mortality of the deployed group relative to the population; however it may result in systematic bias. The Healthy Worker Effect, which was first described in 1885 (Ogle, 1885), is an effect whereby individuals who are in the workforce are healthier than the average population: the "sicker" or "unhealthier" components of the population are unable to work. Thus comparison of mortality for an occupational group relative to the general Australian population may demonstrate the appearance of reduced mortality in the group of workers. This phenomenon has been extended to the "Healthy Soldier Effect", where, because of recruitment processes and enlistment requirements, members of the

Australian Defence Force are "healthier" than other workers (Wen et al, 1983). More recently in relation to studies conducted in veterans of the first Gulf War, the "Healthy Warrior Effect" has been identified (Haley, 1998). This refers to the fact that Defence personnel who undertake operational deployments are required to be at the highest level of fitness, and have undergone another level of health screening beyond those not deployed.

17. Therefore for the Bougainville Mortality Study, comparisons were made between deployed personnel and a comparison group of Defence personnel who were not deployed to Bougainville as part of Operations BEL ISI I & II, as well as comparisons with the Australian population.

3.2 Study population

18. The list of Defence personnel deployed to Bougainville as part of Operations BEL ISI I & II who are eligible for inclusion in the Bougainville Health Study is termed the Bougainville Health Study Nominal Roll. Based on the pilot work undertaken as part of the DHSP, a procedure was developed for generation of the Bougainville Health Study Nominal Roll from Department of Defence data. This process involved the use of data from two sources: PMKeyS, the system used by the Department of Defence for all aspects of personnel management; and ADFPAY, which is the Australian Defence Force Pay System and is responsible for salary payment for Service personnel. A variety of other potential sources of data were identified and investigated, but were not considered relevant for generation of the Bougainville Nominal Roll. Individuals were included in the data files if they had been allocated a relevant code or descriptor indicating that they had deployed as part of Operations BEL ISI I & II.

19. Defence personnel were eligible for inclusion on the Bougainville Health Study Nominal Roll if they deployed to Bougainville as part of OP BEL ISI I, conducted between November 20th 1997 and April 1998, or OP BEL ISI II conducted between April 1998 and August 26th 2003. In order to be inclusive, individuals whose deployment start date was prior to November 20th 1997 were retained, as it is standard practice for some individuals to deploy early to prepare for the operation. Individuals were included on the Project Nominal Roll if they were identified in either PMKeyS or ADFPAY data as having been deployed as part of OP BEL ISI I or II.

20. The comparison group for the Bougainville Health Study includes Service personnel who were not deployed to Bougainville as part of Operations BEL ISI I & II, but were potentially eligible for deployment. For scientific rigour and to reduce the effect of confounding as much as possible, it was important that the Bougainville Health Study comparison group was as similar to the deployed group as possible on all potential confounding factors except for deployment. To ensure this similarity, the comparison group was selected to reflect the characteristics of the deployed group, using frequency matching.

21. Individuals were eligible for inclusion in the Bougainville Health Study Comparison Group if they had not deployed as part of OP BEL ISI I or II, were not

included on the Bougainville Health Study Nominal Roll, and were a member of a Defence Service between November 20 1997 and December 31 2001. Comparison individuals were randomly selected from the PMKeyS database, and frequency matched to the veteran group on service (Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 or 1977-1988).

22. The Bougainville Health Study Nominal Roll included 4776 individuals and the comparison group included 9434 current or past Defence personnel.

23. More detailed information on the Bougainville Health Study Nominal Roll can be obtained in the Defence Deployed Bougainville Health Study Sample Generation Document (Deliverable 1 of Phase 2 of the Bougainville Health Study).

3.3 Data Collection

24. Details (full name, gender and date of birth) were extracted for individuals on the Bougainville Health Study Nominal Roll and the comparison group and were forwarded to AIHW for linkage with the National Death Index.

25. Information on the underlying cause of death was available from AIHW for deaths registered up to 31 December 2005. Cause of death (where available) was provided by AIHW using ICD10 codes.

26. While coded cause of death was available up to the end of 2005, AIHW was still able to provide notifications of date of death (without the cause of death code) through the NDI beyond this date.

27. The receipt of NDI output was managed through the recorded delivery of a zipped password protected file. The password for the file was sent separately by email. This was considered appropriate given the confidential nature of the information. The AIHW provided an output of the National Death Index comparison in multiple files, with different files obtained from different matching strategies, and thus generally reflecting varying probabilities of "true" matches.

3.3.1 Validating the death data from AIHW

28. The matching process was undertaken by AIHW in June 2007 using a probabilistic matching program. This is necessary because details on the death records and in the project nominal roll may not be completely accurate. For example a birth day may be entered as '1' in one source and '7' in another due to handwriting, misreading or even random error.

29. The AIHW program compares several variables in the health study data file, including names and date of birth, with these variables in the NDI data. The matching process will provide some "exact" matches, where names, date of birth and sex are exactly the same in both files. There will usually be many more "possible" matches – some of which may be very likely and others highly unlikely. Therefore as part of the

process of determining whether the individual has died, some examination of all of the possible matches is required. All possible matches are provided, in various files, so that the user can undertake an appropriate check to identify acceptable matches. Because the number of potential matches can be very high, it is not feasible to examine all possible individual matches. Thus a set of rules has been developed to facilitate this process and identify only likely matches for manual checking (Annex 1).

30. Additional information from a variety of sources was used to check the validity of information obtained from the NDI. A Google search (http://www.google.com.au), as well as searches on the Australian Defence website (http://www.defence.gov.au/index.htm) and the Australian Broadcasting Corporation news website (http://www.abc.net.au/news/) were undertaken on names in the "possibly dead" groups in an effort to confirm vital status.

31. Information in the date of death field from the PMKeyS records was also used as a cross-check of the NDI data.

32. The above checks allowed some individuals in the group of "possibly dead" to be allocated to the "definitely dead" or "definitely alive" groups, with the vital status of some individuals remaining uncertain.

3.4 Statistical Methods

33. This section outlines the statistical methods undertaken for the Bougainville Mortality Study.

34. Because AIHW do not have good coverage of deaths in the most recent three months, the follow-up date is typically actually three months less than the date of request. Thus the end of the follow-up period for assessing mortality in this analysis was 31 December 2005, as cause of death was available for notification up to the end of 2005. However, a sensitivity analysis was also performed looking at deaths notified up to 20 March 2007.

35. For the purposes of statistical analyses, only individuals with date of death on or before 31 December 2005 who were identified as "exact" matches from the NDI linkage, or "possible" matches with verification of death through clerical check or an alternate source of information were classified as having died and were defined as "verified deaths". All other individuals were classified as alive.

36. There are two main comparisons to the analysis of the mortality data: comparison of the validated deaths for veterans with the number of deaths amongst the comparison group of service personnel; and comparison with the expected deaths based on Australian population data. Comparing observed death rates to the general Australian population may be biased because ADF personnel are generally fitter and healthier than the general population. This is called the "healthy soldier effect" and will bias true adverse associations towards the null hypothesis of no effect (Haley, 1998). To somewhat overcome this problem the observed number of deaths can also be compared to a non-deployed comparison group.

3.4.1 Mortality Relative to Comparison Group

37. Examining mortality in the Bougainville Health Study veteran group relative to the comparison group involved firstly determining the risk of death in each group. This is defined as the number of deaths divided by the total person-years of follow-up for each group.

38. Person-years is defined as the period of observation and hence covers the time when the subject could have possibly died. Subjects commenced contributing person years from the most recent date of the OP BEL ISI I start date (20th November 1997) or the date of a participant's enlistment into the ADF. Follow-up continued until 31st December 2005 or to the date of death, whichever came sooner.

39. Relative risk was then calculated as the risk of mortality in the veteran group divided by the risk of mortality in the comparison group. The 95% confidence intervals give the range of values we would expect to find the measure of effect, with a probability of 95%. If the confidence interval does not include 1, the risks are statistically significantly different for the two groups.

40. Relative risks and 95% confidence intervals were obtained for subgroups based on specific causes of death where numbers permitted.

41. Hazard ratios were calculated using Cox regression (Cleves, 2002). These results adjusted for differences in service, service type (permanent or reserve), sex and age between the Bougainville veteran and comparison groups. These are the estimates presented in Table 2 of the results section.

3.4.2 Mortality Relative to the Australian Population

42. Comparison of mortality in the study groups with the Australian population involves comparing the actual or observed number of deaths with the number of deaths we would expect if the death rates were similar between the study sample and the population.

43. The expected number of deaths was based on population and mortality data from the Australian Institute of Health and Welfare (AIHW) for the years 1997 to 2005. The expected number of deaths in the population was calculated by multiplying the number of person years in each 5-year age and sex group for each calendar year by the mortality rate for that age / sex group and year.

44. The Standardised Mortality Ratio (SMR) was used to compare deaths rates in the veteran population to Australian norms. It is defined as:

$$SMR = 100 \times (\text{Observed number of deaths} / \text{Expected number of deaths}).$$

45. An SMR equal to 100 indicates no difference between the observed and expected number of cancers. An SMR above 100 means that the observed number of cases was higher than expected, and an SMR below 100 indicates that the number of cases was lower than the expected number. An overall SMR (across sex and all age

groups) was calculated using the direct method (dos Santos Silva, 1999). Statistical p-values for the difference between the observed number of deaths and the expected number based on Australian population data was calculated using Fisher's exact method (Rothman, 1979).

46. The 95% confidence intervals give the range of values we would expect to find the measure of effect, with a probability of 95%. For the SMR results, if the confidence interval does not include 100, mortality is statistically significantly difference between the two populations.

47. SMRs and 95% confidence intervals were obtained for subgroups based on specific causes of death where numbers permitted.

3.5 Sample size

48. The Bougainville Mortality Study was performed on the full Nominal Roll and comparison group of double the size as opposed to a sample of deployed personnel to maximise power of statistical comparisons.

3.6 Ethics

49. Ethical clearance was received from the Australian Institute of Health and Welfare (AIHW) Ethics Committee (protocol no 06/542), the University of Queensland Behavioural & Social Sciences Ethical Review Committee (UQBSSERC) (protocol no 2006000886) and the Australian Defence Human Research Ethics Committee (ADHREC) (protocol no 449/06), to conduct the Mortality Studies.

4 Results

4.1 *Characteristics of Sample*

50. As expected, because of the method of selecting the comparison group, the demographic characteristics of the exposed and unexposed groups were similar.

51. The mean age on the commencement of follow-up was 29.4 years (SD 8.2) in the veteran group and 29.2 (SD 8.0) in the comparison groups. A breakdown of the baseline characteristics distribution of the nominal roll and comparison group is presented in Table 1. Even though broad age cohorts (1937-1966, 1967-1976 and 1977-1988) were used in the frequency matching of the comparison group to the Nominal Roll, the age distribution is similar between the two study groups. The distributions of service and service type (Permanent or Reserve) and sex were also well balanced between the nominal roll and comparison group (Table 1).

Table 1: Demographic characteristics of Defence personnel in the Bougainville Mortality Study

	Bougainville Veterans n = 4776		**Comparison group** n = 9,434*	
Age	n	%	n	%
<25	1,680	35.1	3,557	37.7
25-34	2,070	43.4	3,749	39.7
35-44	814	17.1	1,645	17.4
45-54	190	4.0	475	5.0
55-64	20	0.4	8	0.1
Missing date of birth	2			
Sex				
Male	4,116	86.2	8,132	86.2
Female	660	13.8	1,302	13.8
Service				
Navy	1,443	30.2	2,751	29.2
Army	3,161	66.2	6,338	67.2
Air force	172	3.6	345	3.7
Service type				
Regular/Permanent	4,339	90.9	8,560	90.7
Reserve	437	9.1	874	9.3

* Two participants with a date of death before 20th November 1997 were excluded from the comparison group

4.2 Mortality

52. There were 71 deaths identified through the linkage with NDI data before the end of follow-up 31 December 2005. There was one death record identified before this cut-off date on the PMKeyS database that was not picked up on the NDI linkage. Primary analyses were undertaken using the 71 deaths identified through the NDI linkage, as there may be differential bias in reporting and coding of death data on PMKeyS between the veteran and comparison groups.

53. There were 14 deaths in 36411 person-years in the Bougainville veterans and 57 deaths in 72996 person-years among the comparisons. Therefore the death rates in the veterans and comparisons were 0.38 per 1000 person-years and 0.78 per 1000 person-years respectively.

Table 2: Mortality from different causes in the Bougainville veteran group and the comparison group up to 31 December 2005

	Number of deaths		Hazard Ratio*	95% CI	p–value[#]
	Bougainville Veterans	**Bougainville Comparisons**			
	Pyrs = 36411	**Pyrs** = 72996			
All Causes	14	57	0.51	(0.28, 0.91)	0.023
Cancer C00-C97	2	11			
Diseases of the circulatory system I00-I99	3	8			
All external causes V01-Y89	7	30	0.47	(0.21, 1.07)	0.074
Intentional self harm X60-X84	4	15			
Motor vehicle accidents V01-V79	1	6			

** Hazard ratio adjusted for differences in age, sex, service and service type*
 # p-value from Cox proportional hazards model

54. The all-cause death rate in the Bougainville veteran group was lower (HR 0.51 95% CI (0.28, 0.91)) than that observed in the comparison group (Table 2). A lower mortality rate in the Bougainville veterans relative to the comparisons was also observed in the deaths from external causes (HR 0.47 95% CI (0.21, 1.07)). The Hazard Ratios associated with comparisons of deaths from more specific causes have not been presented because they are based on a small number of events.

55. The hazard ratios presented in Table 2 did not differ from the crude relative risks calculated for the same outcomes. This finding was expected because the study arms were well balanced with respect to age, sex, service and service type (Table 1).

56. AIHW provided notifications of death beyond 2005 without the corresponding cause of death. Because AIHW do not have good coverage of deaths in the most recent three months, the follow-up date for this calculation was three months less than the date of request. The relative risk of all-cause mortality was therefore calculated for an extended follow-up period using data up to 20 March 2007. In this extended follow-up period there were 21 deaths identified in the veteran group and 67 deaths in the comparisons. The person-years of follow-up were 42197 and 84388 in the veterans and the comparison group respectively. Using this data the unadjusted Relative Risk of all-cause mortality in Bougainville veterans relative to the comparison group was 0.63 (95% CI (0.36, 1.04)).

57. The all-cause death rates observed in the general population were compared to the Bougainville veterans and the Bougainville comparison group. These results are presented in Table 3. The mortality of the Bougainville veterans was lower than that expected in the general population (SMR 28.7 95% CI (15.7, 48.1)). The mortality of Bougainville comparisons was also significantly lower than the rate seen in the general population (SMR 57.2 95% CI (43.3, 74.1)).

Table 3: All-cause standardised mortality ratio in the Bougainville veteran and comparison groups up to 31 December 2005

	Person-years	Observed deaths	Expected deaths	SMR	95% CI	p - value[#]
Bougainville veterans	36411	14	48.8	28.7	(15.7, 48.1)	<0.001
Bougainville comparisons	72996	57	99.7	57.2	(43.3, 74.1)	<0.001

SMR=Standardised Mortality Ratio
 # p-value based on the chi-squared statistic

58. Thirty seven out of the 81 deaths identified through the NDI before 31 December 2005 were from external causes. The rates of death from external causes in the Bougainville cohorts were compared to the death rates in the general population using Standardised Mortality Ratios (Table 4).

Table 4: All external cause standardised mortality ratio in the Bougainville veteran and comparison groups up to 31 December 2005

	Person-years	Observed deaths	Expected deaths	SMR	95% CI	p - value[#]
Bougainville veterans	36411	7	23.6	29.6	(11.9, 61.0)	<0.001
Bougainville comparisons	72996	30	48.6	61.8	(41.7, 88.2)	<0.001

SMR=Standardised Mortality Ratio
 # p-value based on the chi-squared statistic

59. The rates of mortality from external causes in Bougainville veterans (SMR 23.6 95% CI (11.9, 61.0)) and comparisons (SMR 61.8 95% CI (41.7, 88.2)) were lower than the rates expected in the general population of the same age. The magnitude of these effects was consistent with the all-cause SMRs observed in Table 3.

5 Discussion

60. A statistically significant lower rate of deaths among Bougainville veterans compared to the Australian population was evident. The same pattern of lower mortality in the comparison group who did not deploy to the Bougainville compared to the Australian population was also observed.

61. The finding that Bougainville veterans had a significantly lower mortality rate than the comparison group was surprising. The rate of mortality among Bougainville veterans was approximately half that of the Bougainville comparisons (HR 0.51). This result, based on 7.7 years of follow-up, was statistically significant at the 5% level.

62. When the follow-up period was extended beyond 2005 to include the more recent notifications of death, the Relative Risk of death in the Bougainville veterans relative to the controls rose to 0.63 and borderline statistical significance.

63. It is important to consider the potential sources of bias in this and future mortality studies.

64. A 'Healthy Warrior effect' may occur as Defence personnel who undertake operational deployments are required to be at the highest level of fitness. Those on the Nominal Roll must have been fit to deploy to Bougainville at the time of their deployment. The comparison group were not required to be fit to deploy over the same time period. Medical classification was not used as a stratification variable in the generation of the comparison group because of difficulties in migrating the data from the PMKeyS records as far back as 1997. This may be a potential confounder as the comparison group may be 'less healthy' and more susceptible to negative health outcomes than the group who deployed to Bougainville. Nevertheless, in this study the personnel in the Bougainville comparison group had a statistically significant lower death rate than that observed in the general population (SMR 57.2).

65. It may be possible to assess potential differences in the health status at the time of deployment between the veterans who deployed to Bougainville and the comparison group in the planned analysis of Defence medical records in a sample of those included in the mortality study.

66. A possible reason for the deficit of deaths in the comparison group is that the comparison group who did not deploy to Bougainville were more likely to have been deployed in other more high risk operations, which could have had a negative impact on their health. However, the nominal roll data of deployments to the Near North Area does not support this hypothesis. Contrasting the number of other Near North Deployments between the Bougainville veterans and the comparisons, 48% of the Bougainville veterans had also deployed to East Timor or the Solomon Islands, whereas only 35% of the Bougainville comparisons had been one of these other deployments.

67. The all-cause mortality rate in the Bougainville comparisons who deployed to other Near North Operations was 3.5 per 10000 person-years, whereas the same rate in the Bougainville comparisons who had not deployed on these operations was 10 per 10000 person-years. Comparing the Bougainville veterans to the subset of the comparison group who had not deployed to the NNAI (6,171 persons), the adjusted hazard ratio fell to 0.37 (95% CI (0.20, 0.67)).

68. There may be other reasons why the Bougainville veterans were shown to have a lower mortality than the randomly selected comparisons who did not deploy to Bougainville. In the absence of competing deployments at the start of the Bougainville operation, if those who initially deployed to Bougainville were chosen on the basis that they were among the most able, willing and healthy employees then this may have resulted in an additional 'healthy warrior effect'. However, given the nature of the Bougainville operation, one might expect a higher proportion of non-combat forces to have been deployed (such as medical transport signals and logistics) which could contradict the above hypothesis. The nature of the selection process for the Bougainville deployment is unknown to the authors of this report.

69. It is unknown whether the reduction in mortality observed in the Bougainville veterans relative the comparisons is a chance finding or due to a real difference

between the cohorts. Although numbers for specific causes of death are small, it appears that the lower mortality in the veteran group is consistent for external causes of death and potentially for cancer. It will be interesting to observe whether the relative risk of all cause mortality tends back towards 1 (no effect of deployment to Bougainville) over an increased follow-up period, and whether any mortality differences are confined to specific causes of death.

70. That being said the Bougainville operation was by all accounts a successful unarmed peacekeeping mission and there are various positive testimonies regarding the deployment experiences (Monitoring Peace in Bougainville Seminar). Positive aspects of the deployments mentioned by veterans include working as part a culturally diverse Peace Monitoring Group with Fijians, New Zealanders and Ni-Vanuatuans (Breen, Monitoring Peace in Bougainville Seminar). It will be beneficial to explore whether the results of the questionnaire distributed to a sample of those on the Bougainville Health Study show relative positive health effects and experiences in the Bougainville veterans.

71. Further follow-up will increase the power of the comparisons made in this report. The age at entry into the Bougainville Mortality study was 29 years and the average length of follow-up of a participant in this analysis is up to 31 December 2005 is 7.7 years.

72. To detect a 20% increase in all cause mortality (RR 1.2) with 80% power, 965 deaths would need to have been observed over the study period (365 deaths in the Bougainville veterans versus 600 deaths in the Bougainville comparisons). Based on death rates for Australian males (AIHW 2007) and assuming death rates remain at the 2005 level beyond 2005 it is estimated that this number of deaths will be accrued by 2022.

73. Similarly to detect a 30% increase in mortality among the Bougainville veterans (RR 1.3) at 80% power, a total of 798 events are required (198 in the Bougainville veterans versus 600 in the Bougainville comparisons). Based on the same assumptions 80% power may be achieved by including all deaths up to the end of 2014.

74. If we consider a large relative increase in mortality of 50% (RR 1.5); to achieve 80%, power 120 deaths in the Bougainville comparison group and 91 deaths in the Bougainville veterans are required (total of 211). These methods based on population death rates predict that this number of deaths may be achieved by the end of 2005. However, in this report the total number of deaths in the Bougainville comparison group was only 57.

75. These calculations of the years when 80% power may be achieved are likely to be underestimates. The estimates are based on male death rates for all participants in the study. 14% of the study population are women, and the mortality in this group is likely to be lower than that assumed. Population death rates have been falling over time as life expectancy increases and no adjustment was made for this in the calculations presented. In addition, the death rates of the personnel in the Bougainville mortality study are most probably going to be lower than the death rate

in the Australian population due to the Healthy Soldier effect. For these reasons the anticipated time required to achieve 80% power should be interpreted cautiously.

76. It is also important to factor in the time lag between the events occurrence and when the data is available from AIHW. Presently for mortality studies this is a 2 year interval and for cancer incidence 4 years.

6 Summary, Conclusions and Recommendations

77. The death rates of the Bougainville veterans and comparisons are lower than those observed in the Australian population of the same age. These results are consistent with those been observed in the Solomon Islands and East Timor mortality analyses and suggest the presence of a Healthy Soldier effect.

78. The mortality rate among Bougainville veterans was significantly lower than that observed in the frequency matched comparison group HR 0.51 95% CI (0.28, 0.91). Extending follow-up to include more recent death notifications (without cause-specific information), the rate ratio increases to 0.63 and is no longer statistically significant at the 5% level. Further analysis of this cohort is recommended at a later time point to assess whether these reductions in mortality are maintained. Analysis of this cohort at a later time point will also allow for a comparison of more specific causes of death.

79. Planned analysis of data from the Defence health records of Bougainville veterans and a sample of comparisons will assess whether there were true differences in the baseline health of the Bougainville veterans and comparisons. Likewise, through the responses from the DHSP Bougainville Health questionnaire, positive exposures, experiences and health outcomes related to the Bougainville deployment will be assessed further.

7 References

Australian Institute of Health and Welfare (AIHW) 2007. GRIM (General Record of Incidence of Mortality) Books. AIHW: Canberra.

Breen B. Australian Defence Force. Monitoring Peace in Bougainville Seminar. The Australian National University. State Society and Governance in Melanesia. Research School of Pacific and Asian Studies. http://rspas.anu.edu.au/papers/melanesia/conference_papers/1999/breen.htm

Bridgewater F, Harris M, Rahdon R, Bohnstedt. Provision of emergency surgical care in a unique Geopolitical setting. Australia New Zealand Journal of Surgery 2001;71:606-609.

The Centers for Disease Control Vietnam Experience Study. Postservice mortality among Vietnam veterans. J Amer Med Assoc 1987; 257: 790-795.

Cleves MA, Gould WW, Gutierrez RG. An introduction to survival analysis using STATA. Stata Press. 2002;113-178.

Crane PJ, Barnard DL, Horsley KD, Adena MA. Mortality of Vietnam veterans: the veteran cohort study. A report of the 1996 retrospective cohort study of Australian Vietnam veterans. Canberra: Department of Veterans' Affairs, 1997.

dos Santos Silva I. Cancer Epidemiology: Principles and Methods. International Agency for Research on Cancer. World Health Organisation. Lyon France 1999. Pages 72-73.

Monitoring Peace in Bougainville Seminar. Monitoring Peace in Bougainville Seminar. The Australian National University. State Society and Governance in Melanesia. Research. School of Pacific and Asian Studies. http://rspas.anu.edu.au/papers/melanesia/conference_papers/1999/bougpapers.htm

Haley RW. Point: Bias from the "Healthy-Warrior Effect" and Unequal Follow-up in Three Government Studies of Health Effects of the Gulf War. Am. J. Epidemiol 1998;148: 315-323.

Harrex WK, Horsley KW, Jelfs P, van der Hoek R, Wilson EJ. Mortality of Korean War veterans: the veteran cohort study. A report of the 2002 retrospective cohort study of Australian veterans of the Korean War. Canberra: Department of Veterans' Affairs, 2003.

Hyams KC, Wignall FS, Roswell R. War Syndromes and their evaluation: from the US Civil War to the Persian Gulf War. Ann Intern Med 1996; 125: 398-405.

Jones E, Hodgins-Vermaas R, McCartney H, Everitt B, Beech C, Poynter D, Palmer I, Hyams KC, Wessely S. Post-combat syndromes from the Boer war to the Gulf war: a cluster analysis of their nature and attribution. Brit Med J 2002; 324(7333):321-324.

Macdowell D. Conflicts in the Southwest Pacific: The relevance of new Security perspectives. Contemporary Security Policy 2004;25(2):339-359.

Ogle W. Supplement to the 45th Annual Report of the Registrar General of Births, Deaths, and Marriages, in England 1885.

Rothman KJ, Boice JD. Epidemiologic analysis with a programmable calculator. Washington DC: US Government Printing Office, NIH publication. 1979;79-1649.

Sharp N. Bougainville - Blood on our Hands. 1997 [cited 2006 21/03/2006]; Available: from: http://www.aidwatch.org.au/index.php?current=24&display=aw00005&display_item=1

Wen CP, Tsai SP, Gibson RL. Anatomy of the healthy worker effect: a critical review. J Occup Med. 1983; 25(4): 283-9.

Wilson EJ, Horsley KW, van der Hoek R. Australian National Service Vietnam Veterans Mortality Study 2005. Canberra: Department of Veterans' Affairs, 2005.

Annex 1

Rules for actioning matches from the National Death Index by pass number, weight and sex

Pass	**Quality**
g1ex	All matches are of the highest quality possible.
g4dmy	Very high quality matches at top of file. Anything with a weight above 20 is a likely true match. Dubious matches may start appearing at a weight of around 16. Very few true matches below 10, though some may be found even below 5.
g2ay, g3sy, g5dy, g7my, g9dm	Any match with a weight above 30 is a good candidate for a true match. Below 30 and down to 20 there will be many plausible-looking matches but how many of them are true is up for debate. It really depends on your own judgement and the strictness you wish to apply to your study. Accepting matches with a weight below 20 is entering dangerous territory. Note that g7my and g9dm will have more true matches than the others, presumably because these kinds of errors in the birth date are more common.
g6a, g8s, g10y, g11d, g12m	All matches are dubious. You might accept a match if the weight is particularly high, say above 35, and the two birth dates are "close", e.g. 12/03/1934 and 11/03/1935.
g13n	All matches are highly dubious. You should only accept a match if its weight is extremely high, say above 40, and there are other compelling reasons.
b1y	Remember: even if the NDI record has a full date of birth you should ignore it because it is, or is likely to be, a dummy. Only consider the year. With this in mind, these matches are difficult to resolve. How many people might share the same name and the same birth year? As a rough guide, if you accept all matches with a weight of above 25 and reject those below, you might be about right in terms of overall numbers of true matches. You will probably have accepted some false matches but these may be approximately cancelled out by the true matches below 25 that you rejected.
b2n	You can apply similar rules to whatever you used for pass b1y but be more wary. If you used a straight cutoff rule like that suggested above then you should probably raise the cutoff for this pass by, say, 3.

ANNEX D

Cancer Incidence Study Report

Bougainville Health Study

Deliverable Item 2 (Phase 2)

28 September 2007

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

Author	**Mr Michael Waller, Ms Lisa Nielsen, Prof Cate D'Este, A/Prof Susan Treloar**
Document Version	**2.0**
Status	**Final**
Date Saved	**26/11/07**

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\Research\DHSP\Phase 2\2. Bougainville\Deliverables\Mortality & Cancer Study Report\Cancer Incidence Study\BV Cancer Incidence Study Report v2.0.doc

Revision History

Date	Version	Description	Track Changes
25/09/07	V1	Initial Draft	
26/11/07	V2	Updated based on comments from the SAC	

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
A/Prof Susan Treloar	First Chief Investigator			
Prof Annette Dobson	Chair Scientific Research Team			
Prof Tony McMichael	Scientific Advisory Committee			

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
SRT	25/09/07	Electronic
PMO	28/09/07	Electronic

DEFENCE DEPLOYED BOUGAINVILLE HEALTH STUDY

Deliverable Item 2 (Phase2)

Cancer Incidence Study Report

Due Date: 28 September 2007

Executive Summary

1. The Defence Deployed Bougainville Health Study is part of a series of studies being conducted by the Centre for Military and Veterans' Health to investigate the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service to Bougainville.

2. In addition the suggestions received from the Scientific Advisory Committee (SAC) have been incorporated into the report.

3. This report presents the cancer incidence component of the Bougainville Health Study. One of the main questions of interest in veterans' health is whether veterans are at an increased risk of cancer compared to their Australian contemporaries. Deployment may increase the risk of cancer in a number of ways. Exposure to known or unknown environmental toxins may lead to cancer and death. Differences in diet and in the prevalence of smoking and alcohol consumption whilst on deployment may also lead to an increased risk of cancer.

4. The aims of the study were:
    - To compare cancer incidence for veterans of Operations BEL ISI I & BEL ISI II to a comparison group of Defence personnel who did not deploy as part of the BEL ISI Operations.
    - To compare cancer incidence for veterans of Operations BEL ISI I & BEL ISI II to the general Australian population.

5. A Project Nominal Roll was generated from two sources of data: PMKeyS, the system used by the Department of Defence for all aspects of personnel management; and ADFPAY, which is the Australian Defence Force Pay System and is responsible for salary payment for Service personnel. Defence personnel deployed to Bougainville as part of Operations BEL ISI I & II between November 20, 1997 and August 26, 2003 were eligible for inclusion on the Nominal Roll. The comparison group was selected from Defence personnel who were serving in the same period and were frequency matched to the deployed group on service

(Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 and 1977-1988).

6. The cancer incidence comparison was based on the entire Nominal Roll (n = 4776) and comparison group (n= 9434). The risk of cancer in each group was calculated as the total number of cancers divided by the total person-years of follow-up to time of death or end of the study period. Rate Ratios and 95% confidence intervals were obtained for the veteran group relative to the comparison group.

7. The Standardised Incidence Ratios (SIRs) compared cancer incidence rates in the veteran and comparison groups to Australian norms. The number of observed cancers was divided by the number of expected cancers for the various age strata and multiplied by 100 to provide the SIRs and relevant 95% Confidence Intervals.

8. The linkage with the National Cancer Statistics Clearing House identified 30 cancers in the Bougainville veterans and 64 cancers in the non-deployed comparison group between the start of follow-up and 31 December 2003.

9. The overall cancer incidence rate in the Bougainville veteran group was similar to that observed in the comparison group (RR 0.95 95% CI (0.59, 1.48)).

10. Bougainville veterans and the frequency matched comparisons both had similar overall cancer incidence rates to those observed in the general population of the same age (SIRs 107.0 95% CI (72.2, 152.8) and107.3 95% CI (82.6, 137.0) respectively).

11. Further follow-up of the Bougainville study population will increase the statistical power of the study and allow comparisons of specific cancer sites to be compared. Although the veteran and comparison groups were well matched in terms of age, gender, service and service type (permanent or reserve), biases may have occurred because of difference in mobility, fitness, length of enlistment in the ADF and deployment history between the veteran and comparison groups.

1 Introduction

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a series of studies that aim to research the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service overseas. It is being conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program (DHSP).

2. This report presents the cancer incidence component of the Bougainville Health Study, hereafter to be entitled the Bougainville Cancer Incidence Study.

3. Deployment may increase certain behaviours and lifestyle factors such as smoking and alcohol consumption which can lead to an increased risk of cancer. A UK study of smoking rates of British armed forces in the second Gulf War indicated that the prevalence of smoking increased whilst on deployment (Boos et al, 2004).

4. In recent times ADF personnel have deployed on active service overseas in a variety of war-like and non war-like roles. Post deployment health concerns have followed wars since at least the United States Civil War (Hyams et al, 1996) and the Boer War (Jones et al, 2002).

5. In Australia there has been evidence of higher cancer incidence in both Korean and Vietnam veterans, compared to the general population. Australian veterans of the Korean War have been found to have a significantly greater overall cancer risk than the Australian community, with an excess of between 13% and 23% (AIHW, 2003). Australian Vietnam veterans have also been found to have a significant elevated overall cancer incidence rate, 15% higher than expected compared to the Australian male population (Wilson et al, 2005).

1.1 Deployment Health Surveillance Program

6. The Centre for Military and Veterans' Health (CMVH) is a consortium of The University of Queensland, University of Adelaide and Charles Darwin University, which is dedicated to innovatively seeking solutions to military and veterans' health issues through research, education, e-health and public debate. CMVH is conducting a series of studies examining the long-term health issues of deployed Australian Defence personnel, as part of its Deployment Health Surveillance Program (DHSP). The program will look at the health of troops deployed to the Solomon Islands, Bougainville and East Timor.

7. The studies to be conducted by CMVH as part of the Deployment Health Surveillance Program aim to eventually develop a prospective, analytic system for longitudinal surveillance of health of ADF personnel who are deployed on specific operations. The core of the Deployment Health Surveillance Program is the formation of an integrated data system which will be established at the CMVH consortium of

Universities. The Deployment Health Surveillance Program builds on previous and current national and international studies, and is a critical step in establishing best practice surveillance methodologies and providing a baseline for monitoring the future health of veterans of ADF operations to these regions.

1.2 The Bougainville Deployment

8. Bougainville is an island located to the east of the main Papua New Guinea (PNG) island and north-West of the Solomon Islands, and forms part of a group of independent island states called the Pacific Islands Countries (PIC) (Macdowell, 2004). It is the largest island of the North Solomons Province (Bridgewater, 2001). According to the last census in 1980, the population of the island was 108,726, and with an annual growth rate of about 4.1%, it is estimated that by 1997 the population was around 170,000 (Sharp, 1997).

9. One of the richest copper mines in the world was discovered in Bougainville, which led to major infrastructures such as roads and schools being developed. Although the mine brought development to the island, it also caused major environmental, social and economic damage. These damages fuelled previous existing resentments concerning the ownership of the land by Australia and PNG. This led to a group of traditional landowners sabotaging the mine til its closure in 1989, and the formation of the Bougainville Revolutionary Army (BRA). This was the start of the most bloody and destructive conflict in the South Pacific region since World War II.

10. Peace talks were held in New Zealand in October 1997 to settle the conflict between the Papua New Guinea Government and the Bougainville Revolutionary Army.

11. Australia deployed Defence personnel to Bougainville as part of the Truce Monitoring Group (TMG) and Peace Monitoring Group (PMG). These operations, entitled OP BEL ISI I and OP BEL ISI II respectively, were both non-warlike. Operation BEL ISI I lasted from November 1997 to April 1998, and Operation BEL ISI II lasted from April 1998 to August 2003.

12. Australian troops were potentially exposed to a variety of environmental, occupational and operational hazards during their deployment to Bougainville. Environmental exposures included chemicals that were disposed unprotected, consumption of contaminated food and water, climate and fauna. Operational and occupational exposures included psychological stressors (such as isolation, loneliness and stress), mosquito control measures (such as use of DEET, permethrin and exposure to fogging) and physical injury (such as sporting accidents).

13. The Bougainville Literature Review identified possible exposure to chemicals as a specific risk factor on the Bougainville deployment (Gaspar and Barnett, 2006). In addition to undertaking disposal of chemicals without adequate personal protection, a chemical assessment and a hazard audit determined that there may have been exposure to Chromium trioxide (Chromium VI), Polychlorinated Biphenyl (PCB) and asbestos. It is currently accepted that chromium compounds are carcinogenic and may

be an important cause of occupational lung cancer (Agency for Toxic Substances and Disease Registry (ATSDR), 2000). A few studies have suggested an association between PCBs and cancer in humans, mainly cancer of the liver and biliary tract (ATSDR, 2001). As a result, the International Agency for Research on Cancer (IARC) has determined that PCBs are probably carcinogenic for humans. Long-term exposure to asbestos can result in both non-cancerous (Pneumoconiosis) and cancerous conditions. Asbestos is well recognised as a long-term cause of lung cancer and mesothelioma (a form of pleural cancer). These conditions are recognised as having a long latency period of about 10-40 years (ATSDR, 1989).

2 Aims and Objectives

14. The purpose of the Bougainville Cancer Incidence Study is to determine whether deployment to Bougainville as part of Operations BEL ISI I & II was associated with increased cancer incidence. The specific aims of the Study are:

- To compare cancer incidence for veterans of Operations BEL ISI I & II to a comparison group of Defence personnel who did not deploy as part of Operations BEL ISI I & II.
- To compare cancer incidence for veterans of Operations BEL ISI I & II to the general Australian population.

15. In order to address the above aims, the objectives of the Bougainville Cancer Incidence Study are:

- To formulate the methodology for making comparisons, specifically:
  - The process for matching files with the National Cancer Statistics Clearing House and the Victorian Cancer Registry.
  - The required statistical analysis.
- To run the analysis for the veterans listed on the Bougainville Health Study Nominal Roll, and identify areas of possible improvement for future deployment health studies.
- To collect information on type of cancer and compare cancers from different causes between the comparison groups.

3 Methods

3.1 Study design

16. The Bougainville Cancer Incidence Study is a Cohort Study. The cancer incidence of veterans who deployed to Bougainville was compared to that of a comparison group of Defence personnel who did not deploy as part of Operations BEL ISI I & II, as well as to the general Australian population. Information on cancer incidence was obtained from linkage with the National Cancer Statistics Clearing House (NCSCH) held by the Australian Institute of Health and Welfare (AIHW) and the Victorian Cancer Registry. AIHW is provided with data on cancer from all State

and Territory Cancer Registries with the exception of Victoria, as the Victorian Cancer Registry undertake their own record linkage. It is a legal requirement to register all cancers, except for non-melanocytic skin cancer, in Australia.

17. Comparison of cancer rates of veterans of Operations BEL ISI I & II with the Australian population provides an estimate of the cancer incidence of the deployed group relative to the population; however it may result in systematic bias. The Healthy Worker Effect, which was first described in 1885 (Ogle, 1885), is an effect whereby individuals who are in the workforce are healthier than the average population: the "sicker" or "unhealthier" components of the population are unable to work. Thus comparison of mortality for an occupational group relative to the general Australian population may demonstrate the appearance of reduced mortality in the group of workers. This phenomenon has been extended to the "Healthy Soldier Effect", where, because of recruitment processes and enlistment requirements, members of the Australian Defence Force are "healthier" than other workers (Wen et al, 1983). More recently in relation to studies conducted in veterans of the first Gulf War, the "Healthy Warrior Effect" has been identified (Haley, 1998). This refers to the fact that Defence personnel who undertake operational deployments are required to be at the highest level of fitness, and have undergone another level of health screening beyond those not deployed.

18. Therefore for the Bougainville Cancer Incidence Study, comparisons were made between deployed personnel and a comparison group of Defence personnel who were not deployed to Bougainville as part of Operations BEL ISI I & II, as well as comparisons with the Australian population.

3.2 Study population

19. The list of Defence personnel deployed to Bougainville as part of Operations BEL ISI I & II who are eligible for inclusion in the Bougainville Health Study is termed the Bougainville Health Study Nominal Roll. Based on the pilot work undertaken as part of the DHSP, a procedure was developed for generation of the Bougainville Health Study Nominal Roll from Department of Defence data. This process involved the use of data from two sources: PMKeyS, the system used by the Department of Defence for all aspects of personnel management; and ADFPAY, which is the Australian Defence Force Pay System and is responsible for salary payment for Service personnel. A variety of other potential sources of data were identified and investigated, but were not considered relevant for generation of the Bougainville Health Study Nominal Roll. Individuals were included in the data files if they had been allocated a relevant code or descriptor indicating that they had deployed as part of Operations BEL ISI I & II.

20. Defence personnel were eligible for inclusion on the Bougainville Health Study Nominal Roll if they deployed to Bougainville as part of Operations BEL ISI I & II between November 20, 1997 and August 26, 2003 (defined as the end of the study period). Individuals deployed as part of this Operation after August 26, 2003 were ineligible for inclusion. In order to be inclusive, individuals whose deployment start date was prior to November 20, 1997 were retained, as it is standard practice for some

individuals to deploy early to prepare for the operation. Individuals were included on the Project Nominal Roll if they were identified in either PMKeyS or ADFPAY data as having been deployed as part of Operations BEL ISI I & II.

21. The comparison group for the Bougainville Health Study includes Service personnel who were not deployed to Bougainville as part of Operations BEL ISI I & II, but were potentially eligible for deployment. For scientific rigour and to reduce the effect of confounding as much as possible, it was important that the Bougainville Health Study comparison group was as similar to the deployed group as possible on all potential confounding factors except for deployment. To ensure this similarity, the comparison group was selected to reflect the characteristics of the deployed group, using frequency matching.

22. Individuals were eligible for inclusion in the Bougainville Health Study comparison group if they had not deployed as part of Operations BEL ISI I & II and were a member of a Defence Service at some point in the period November 20, 1997 to August 26, 2003. Comparison individuals were randomly selected from the PMKeyS database (after excluding individuals on the Bougainville Health Study Nominal Roll), and frequency matched to the veteran group on service (Navy, Army or Air Force), service type (Permanent or Reserve), sex and birth year (1937-1966, 1967-1976 or 1977-1988).

23. The Bougainville Health Study Nominal Roll included 4776 individuals and the comparison group included 9434 current or past Defence personnel.

24. More detailed information on the Bougainville Health Study Nominal Roll can be obtained in the Defence Deployed Bougainville Health Study Sample Generation Document (Deliverable 1 of Phase 2 of the Bougainville Health Study).

3.3 Data Collection

25. Details (full name, gender and date of birth) were extracted for individuals on the Bougainville Health Study Nominal Roll and the comparison group and were forwarded to AIHW for linkage with the National Cancer Statistics Clearing House (NCSCH).

26. The format of the data required by AIHW was the same as that required for linkage with the National Death Index (NDI). The format has been detailed in Annex 1. The results of the Cancer Incidence linkage with the NCSCH were to be given in de-identified form. For this reason it was necessary to supply AIHW with the study group of each participant as an additional field.

27. In addition AIHW was also provided a ‘date of entry into the cohort’ for each study participant. This enabled the staff at AIHW to correctly classify incident cancers as baseline or follow-up events.

28. After discussion with the Victorian Cancer Registry, AIHW was permitted to link the data supplied by DHSP with the cancer records from Victoria as well as the

other Australian States and Territories. This ensured that the same cancers were not notified twice in two separate linkages.

29. The receipt of NCSCH output from AIHW was managed through the recorded delivery of a zipped password protected file. The password for the file was sent separately by email. This was considered appropriate given the confidential nature of the information. Due to small numbers and because individual consent from each participant was not obtained, the results provided by AIHW were in de-identified, tabular form. AIHW provided an output of the cancer linkage in an Excel file with the headings: group (study arm), sex, birth date range (5-year intervals), year of diagnosis and International Classification of Disease summary code (ICD-10). The results were split by those diagnosed before the 'date of entry into the cohort' and those diagnosed after this date.

30. If a subject had more than one cancer then AIHW returned this output in a separate table. This would allow the primary analysis to focus on the person's first cancer diagnosis.

3.4 Statistical Methods

31. This section outlines the statistical methods undertaken for the Bougainville Cancer Incidence Study.

32. Because the AIHW records were current up to the end of 2003, all participants were followed up from November 20, 1997 or from the date of enlistment to Defence if the subject joined after this date. Follow-up continued to December 31, 2003. Participants who died before December 31, 2003 were censored at date of death.

33. There are two main comparisons to the analysis of the cancer data: comparison of the number of cancers for veterans with the number of cancers amongst the comparison group of service personnel; and comparison with the expected cancer incidence based on Australian population data. Comparing observed cancer rates to the general Australian population may be biased because ADF personnel are generally fitter and healthier than the general population. This is called the "healthy soldier effect" and will bias true associations towards the null hypothesis of no effect (Haley, 1998). To somewhat overcome this problem the observed number of cancers can also be compared to a non-deployed comparison group.

34. Non-melanocytic skin cancers were not included in any of the comparisons presented since not all registries collect information on this type of cancer. These cancers are indexed as 'C44 Other malignant neoplasms of skin' in ICD-10.

3.4.1 Cancer incidence Relative to Comparison Group

35. Examining cancer incidence in the Bougainville Health Study veteran group relative to the comparison group involved firstly determining the risk of cancer in

each group. This is defined as the number of cancers divided by the total person-years of follow-up for each group.

36. The cancer incidence analysis performed included subjects' first primary cancers diagnosed after date of entry to the study cohort as opposed to all cancers diagnosed. Patients were not censored at diagnosis of cancer because the exact date of diagnosis was not known. All participants who had a cancer before the date of entry into the cohort were eligible for inclusion in the study and were included in the statistical analysis, but cancers diagnosed prior to the deployment start date were not included in the follow-up analyses.

37. Person-years are defined by the period of observation, and hence cover the time when the subject could have possibly been diagnosed with cancer. In this study an individual's person-years of exposure spans from the 20 November 1997 or the date of enlistment into the ADF, whichever was later, to the date of death or follow-up date (31 December 2003). Because the cancer incidence data was returned to CMVH in de-identified form the person-years of risk was based on time to death or end of study follow-up as opposed to time to first cancer.

38. The Relative Risk was calculated as the risk of cancer in the veteran group divided by the risk of cancer in the comparison group. Rate Ratios with associated 95% confidence intervals were obtained. The confidence intervals and corresponding p – values were calculated using the 'exact' method using STATA (StataCorp, Texas).

39. To avoid unstable results based on small numbers, relative risks were only calculated for comparisons where the total number of events was greater than 20.

3.4.2 Cancer Incidence Relative to the Australian Population

40. Comparison of cancer incidence in the study groups with the Australian population involves comparing the actual or observed number of cancers with the number of cancers we would expect if the cancer rates were similar between the study sample and the population.

41. The expected number of cancers was based on population and cancer incidence data from the AIHW Cancer Cubes and General Records of Incidence and Mortality for the years 1997 to 2003 (AIHW, 2007). The expected number of deaths in the population was calculated by multiplying the number of person-years in each 5-year age and sex group for each calendar year by the mortality rate for that age / sex group and year.

42. The Standardised Incidence Ratio (SIR) was used to compare deaths rates in the veteran population to Australian norms. It is defined as:

$$SIR = 100 \times (\text{Observed number of cancers} / \text{Expected number of cancers}).$$

43. An SIR equal to 100 indicates no difference between the observed and expected number of cancers. An SIR above 100 means that the observed number of cases was higher than expected, and an SIR below 100 indicates that the number of cases was lower than the expected number. An overall SIR (across sex and all age groups) was calculated using the direct method (dos Santos Silva, 1999). Statistical p-values for the difference between the observed number of deaths and the expected number based on Australian population data was calculated using Fisher's exact method (Rothman, 1979).

44. The 95% confidence intervals give the range of values we would expect to find the measure of effect, with a probability of 95%. For the SIR results, if the confidence interval does not include 100, cancer incidence is statistically significantly different between the two populations.

3.5 Sample size

45. The Bougainville cancer incidence analysis was performed on the full Nominal Roll and a comparison group of double the size, as opposed to a sample of deployed personnel, to maximise power of statistical comparisons.

3.6 Ethics

46. Ethical clearance was received from the Australian Institute of Health and Welfare (AIHW) Ethics Committee (protocol no 06/542), the University of Queensland Behavioural & Social Sciences Ethical Review Committee (UQBSSERC) (protocol no 2006000886) and the Australian Defence Human Research Ethics Committee (ADHREC) (protocol no 449/06), to conduct the Cancer Incidence Studies. Separate ethics approvals were gained from each of the Australian State and Territory Cancer Registries.

4 Results

4.1 Characteristics of Sample

47. As expected, because of the method of selecting the comparison group, the demographic characteristics of the exposed and unexposed groups were similar.

48. The mean age of Bougainville veteran and comparison groups on the commencement of follow-up was very similar {29.4 (SD 7.5) versus 29.2 (SD 8.0) years respectively}. A breakdown of the age-sex distribution of the veteran and comparison groups is presented in Table 1. Even though broad age cohorts (1937-1966, 1967-1976 and 1977-1988) were used in the frequency matching of the comparison group to the Nominal Roll, the age distribution is very similar between the two study groups.

Table 1: Demographic characteristics of Defence personnel in the Bougainville Cancer Incidence Study

	Bougainville Veterans n = 4776		**Comparison group** n = 9,434*	
Age	n	%	n	%
<25	1,622	34	3,389	36
25-34	2,082	44	3,895	41
35-44	823	17	1,661	18
45-54	214	4.5	481	5.1
55-64	33	0.7	8	0.1
Missing date of birth	2			
Sex				
Male	4,116	86	8,132	86
Female	660	14	1,302	14
Service				
Navy	1,443	30	2,751	29
Army	3,161	66	6,338	67
Air force	172	3.6	345	3.7
Service type				
Regular/Permanent	4,339	91	8,560	91
Reserve	437	9.1	874	9.3

* Two participants with a date of death before 20 November 1997 were excluded from the comparison group

49. The distribution of sex, service and service type (Permanent or Reserve) was also well balanced between the Nominal Roll and comparison group (Table 1). The mean length of follow-up for personnel in the Cancer Incidence Study was 5.7 years.

4.2 Cancer Incidence

50. Sixty-eight of the cancers identified through the linkage were diagnosed before the start of the Bougainville deployment. These data give some indication of the baseline characteristics of the veteran and comparison groups. A breakdown of the cancers diagnosed before the date of entry into the cohort is presented in Table 2.

Table 2: Baseline table of cancers diagnosed before commencement of follow-up.

Cancers	Veterans n = 4776	Comparisons n = 9,434
Malignant neoplasm of digestive organs (C15-C26)	0	2
Malignant melanoma of skin (C43)	10	17
Malignant neoplasm of the male genital organs (C60-C63)	5	6
Malignant neoplasm of lymphoid haematopoietic and related tissue (C81-C96)	3	10
Other malignant neoplasms	3	12
Total malignant neoplasms	21	47

51. In both the veteran and comparison groups, malignant melanoma of the skin was the most common cancer. Table 2 indicates that there may be a slightly higher rate of malignant neoplasms in the comparison group relative to the veteran group in the period before deployment to Bougainville; however numbers are too small to draw any valid conclusions.

52. Cancer incidence rates from the date of commencement of follow-up in the Bougainville veteran group and the comparison group are presented in Table 3. Two members of the comparison group who died before November 20, 1997 were not included in the cancer incidence analysis.

53. Four participants in the comparison group joined the ADF after December 31, 2003 (the end of follow-up date). These participants did not contribute any person-years in this cancer incidence analysis.

Table 3: Cancer incidence by type in the Bougainville veteran and comparison groups from commencement of follow-up up to 31 December 2003

	Number of cancers		Rate Ratio*	95% CI	p–value #
Cancers	**Bougainville Veterans** **Pyrs** = 26876 **n** = 4776	**Bougainville Comparisons** **Pyrs** = 54224 **n** = 9434			
Malignant neoplasm of digestive organs (C15-C26)	4	8			
Malignant melanoma of skin (C43)	7	22	0.64	(0.23, 1.56)	0.31
Malignant neoplasm of the male genital organs (C60-C63)	7	10			
Malignant neoplasm of lymphoid haematopoietic and related tissue (C81-C96)	3	10			
Other malignant neoplasms	9	14			
Total malignant neoplasms	30	64	0.95	(0.59, 1.48)	0.81

 # Exact p-value
** Relative risks are presented when more than 20 events have occurred.*

54. Malignant melanoma of the skin was the most common cancer to occur in the follow-up period. There was a slightly lower rate of malignant melanoma in the Bougainville veterans than the comparison group; however this was not statistically significant, possibly due to the small numbers and low power. Overall the rates of cancers of all types were very similar between the Bougainville veterans and comparisons (RR 0.95, 95% CI (0.59, 1.48)).

55. In the category ‘cancers of the male genital organs’, 16 of the 17 diagnoses were Malignant neoplasms of testis (C62). This result is broadly consistent with the young age distribution of the study participants.

56. The cancer incidence rates observed in the general population were compared to the Bougainville veterans and the comparison group. These results are presented in Table 4. The incidence of cancer in the Bougainville veterans was approximately equal to that expected in the general population (SIR 107.0 95% CI (72.2, 152.8)). Similarly the incidence of cancer in the Bougainville comparisons was similar to the corresponding rate seen in the general population (SIR 107.3 (82.6, 137.0)).

Table 4: Standardised incidence ratio of all cancers in the Bougainville veteran and comparison groups up to 31 December 2003

	Person-years	Observed cancers	Expected cancers	SIR	95% CI	p - value[#]
Bougainville veterans	26876	30	28.0	107.0	(72.2, 152.8)	0.71
Bougainville comparisons	54224	64	59.6	107.3	(82.6, 137.0)	0.57

SIR=Standardised Incidence Ratio
 # p-value based on the chi-squared statistic

5 Discussion

57. There was no clear difference in the overall rate of cancer incidence between the Bougainville veterans and comparisons (RR 0.95 CI (0.59, 1.48)).

58. The rates of cancer incidence observed in the Bougainville veterans and comparisons were very similar to the rates of cancer expected in the general population of the same age and sex demographic over the same time period.

59. These results show a different pattern to the mortality results from the same study cohorts up to 31 December 2005 (Bougainville Mortality Report, 2007). The mortality results showed a lower all-cause death rate in the Bougainville veterans relative to the comparisons (Hazard Ratio 0.51 95% CI (0.28, 0.91)). This pattern of improved health outcomes in the Bougainville veterans compared to the comparisons is not clearly observed in the cancer incidence results.

60. The mortality of the Bougainville cohort was also lower than rates of mortality expected in the general population (SMR 28.7 and 57.2 in the veteran and comparison groups respectively). In contrast the rates of cancer incidence were similar to the rates one would expect in the Australian population of the same age (SIR 107 in both veterans and comparisons).

61. The lower all-cause mortality observed in the study cohort compared to the general population may be attributable in part to the healthy soldier effect. The absence of a similar reduction in the cancer incidence relative to the Australian population may be owing to a combination of factors (flagged in points 62 to 64):

62. Regular health checks and screening in the military population may temporarily increase the incidence of specific cancers by advancing the time of diagnosis so that cancers are detected and treated earlier.

63. The incidence of specific cancers (such as melanomas) may be more influenced by early life exposures. If these early life exposures were similar between the study

cohort and the general population then for this group of cancers one would expect the rates observed in the study and the Australian population to be similar.

64. The lower death rate in the Bougainville veterans and comparisons relative to the general population may in part be a consequence of fewer deaths from external causes in the ADF than differences in physical health between the ADF and the general Australian population. The deaths from external causes in the Bougainville veterans and comparisons were both clearly lower than the numbers expected in the Australian population (SMRs 29.6 and 51.8 respectively).

65. The cancers identified as potential risks associated with exposure to specific chemicals present in Bougainville (lung cancer, liver cancer and cancer of the biliary tract) were not observed as common events in this cancer incidence analysis. However, the latency period for cancers of this type is likely to be longer than the average of 5.7 years of follow-up this cancer incidence study has accrued so far.

66. The average age at entry for the Bougainville Health Study was 29.3 years. Typically cancer incidence for many sites of cancer increases with age, with many more cancers presenting in the age group 40 to 59 than between 20 to 39 years.

67. To detect a large hypothesised difference of 50% (RR 1.5) in cancer incidence with 80% power, a total of 211 cancers are required (120 cancers in the Bougainville veterans and 91 cancers in the Bougainville comparison group). Based on cancer incidence rates for Australian males (AIHW 2007) and assuming death rates and cancer incidence rates stay at the 2005 and 2003 levels respectively, 80 cancers in the comparison group may be achieved by 2007.

68. To detect a 30% increase in cancer incidence (RR 1.3) with 80% power, 498 cancers would need to have been observed over the study period (198 events in the Bougainville veterans versus 300 events in the Bougainville comparisons). Using the same technique, it is estimated that this number of cancers will be accrued by 2014.

69. Similarly to detect a 20% increase in cancer incidence among the Bougainville veterans (RR 1.2) at 80% power, a total of 965 events are required (365 in the Bougainville veterans versus 600 in the Bougainville comparisons). Based on the same assumptions 80% power may be achieved by including all cancers up to the end of 2021.

70. If cancer incidence rates fall for the age cohorts included in this study or the level of cancer incidence in the military is lower than that observed in the general population then both these calculations are likely to underestimate the time taken to achieve 80% power. For these reasons the anticipated time required to achieve 80% power should be interpreted cautiously.

71. The cancer incidence data available at any point in time are not as current as the mortality data. At the time of this report's preparation, cause of mortality information was available from AIHW for deaths registered up to 2005 whilst cancer incidence data were current for cancers registered up to 2003. This lag in the availability of cancer incidence data should be taken into account in future cancer incidence studies.

72. It is important to consider the potential sources of bias in this and future cancer incidence studies.

73. Follow-up of study personnel began on 20 November 1997 (the start date of Operation BELISI I) or the date of enlistment into Defence if the subject joined after this date. Individual dates of deployment to Bougainville were not used as start dates of follow-up because there were no corresponding values in the comparison group. It is possible that a small number of cancers in the veteran group were diagnosed before a person's deployment to Bougainville. Because the data were returned to CMVH in de-identified form we cannot check for occurrences of this type.

74. The rates of cancer incidence based on the mortality person-years would be lower than the rates calculated if person years ended at the time of the first diagnosis of cancer. Because cancer incidence data was not available at the level of the individual (de-identified form) the person-years calculations were based on time to death as opposed to time to first cancer. This described bias would be non-differential between the veteran and comparison cohorts, however the SIRs will be slightly underestimated in this analysis.

75. The grouped cancer incidence data did not facilitate the fitting of Cox proportional hazards models with cancer incidence as the outcome of interest. This report presents crude rate ratios between the two groups. The difference between the crude rate ratios and those adjusted for differences in demographics between the groups is likely to be small because the veteran and comparison groups were frequency matched on age, sex, service and service type.

76. The Bougainville Health Study Nominal Roll was generated from two sources, ADFPAY and the PMKeyS database. It is estimated that the Nominal Roll is 98% complete (Bougainville Sample Frame Generation Report, 2007). Therefore it is expected that the potential bias resulting from the completeness of the Bougainville Nominal Roll is minimal.

77. One potential confounder is the health status (Medical classification) of those on the Bougainville Nominal Roll compared to the comparison group. Those on the Nominal Roll would have all been fit to deploy to Bougainville at the time of their deployment. The comparison group were not required to be fit to deploy over the same interval. This is a potential confounder as the comparison group may be 'less healthy' and more susceptible to negative health outcomes than the group who deployed to Bougainville.

6 Summary, Conclusions and Recommendations

78. The cancer incidence rates of the Bougainville veterans and comparisons are similar to those observed in the Australian population of the same age. These results are consistent with those observed in the East Timor cancer analysis. It is interesting to note that the healthy soldier effect which is evident in the corresponding mortality analyses does not appear present in these cancer results presented.

79. The rates of cancer incidence in the Bougainville veterans are currently shown to be very similar to the cancer incidence rates in the frequency matched comparisons. Follow-up over an extended period of time will be able to determine more whether differences in cancers of long latency between the Bougainville veterans and comparisons become apparent or whether the rates will remain similar in the two groups. Increased follow-up will also facilitate comparisons of the incidence of more specific cancer sites (such as lung cancer) which are currently too few to adequately analyse.

7 References

Agency for Toxic Substances and Disease Registry (ATSDR). Polychlorinated Biphenyls (PCBs). 2001 [cited 2001 19/03/2006]; Available from: http://www.atsdr.cdc.gov/tfacts17.html

Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Asbestos (Draft). Atlanta, GA; 1989.

Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological profile for Chromium.2000[cited 2006 20/03/2006]; Available from: http://www.atsdr.cdc.gov/toxprofiles/tp7.html

Australian Institute of Health and Welfare (AIHW) 2007. Cancer Incidence data cubes. AIHW: Canberra.

Australian Institute of Health and Welfare (AIHW) 2003. Cancer Incidence Study: Australian veterans of the Korean War; Available from: http://www.aihw.gov.au/publications/phe/cis03/cis03.pdf

Australian Institute of Health and Welfare (AIHW) 2007. GRIM (General Record of Incidence of Mortality) Books. AIHW: Canberra.

Boos CJ, Croft AM. Smoking rates in the staff of a military field hospital before and after wartime deployment. J. R. Soc. Med. 97(1): 20-2.

Bridgewater F, Harris M, Rahdon R, Bohnstedt. Provision of emergency surgical care in a unique Geopolitical setting. Australia New Zealand Journal of Surgery 2001;71:606-609.

dos Santos Silva I. Cancer Epidemiology: Principles and Methods. International Agency for Research on Cancer. World Health Organisation. Lyon France 1999. Pages 72-73.

Gaspar N, Barnett A**.** Literature Review. Defence Deployment Bougainville Health Study. Detailed Research Plan (Phase 1b). Deliverable Item SP4. 01 May 2006**.**

Haley RW. Point: Bias from the "Healthy-Warrior Effect" and Unequal Follow-up in Three Government Studies of Health Effects of the Gulf War. Am. J. Epidemiol 1998;148: 315-323.

Hyams KC, Wignall FS, Roswell R. War Syndromes and their evaluation: from the US Civil War to the Persian Gulf War. Ann Intern Med 1996; 125: 398-405.

Jones E, Hodgins-Vermaas R, McCartney H, Everitt B, Beech C, Poynter D, Palmer I, Hyams KC, Wessely S. Post-combat syndromes from the Boer war to the Gulf war: a cluster analysis of their nature and attribution. Brit Med J 2002; 324(7333):321-324.

Macdowell D. Conflicts in the Southwest Pacific: The relevance of new Security perspectives. Contemporary Security Policy 2004;25(2):339-359.

Ogle W. Supplement to the 45th Annual Report of the Registrar General of Births, Deaths, and Marriages, in England 1885.

Rothman KJ, Boice JD. Epidemiologic analysis with a programmable calculator. Washington DC: US Government Printing Office, NIH publication. 1979;79-1649.

Sharp N. Bougainville - Blood on our Hands. 1997 [cited 2006 21/03/2006]; Available: from: http://www.aidwatch.org.au/index.php?current=24&display=aw00005&display_item=1

US Environmental protection Agency. Asbestos. 2006 [cited 2006 21/03/2006]; Available from: http://www.epa.gov/asbestos/pubs/help.html

Waller M, D'Este C, Treloar S, Nielsen L, Hopcraft A. Sample generation report. Bougainville Health Study, Deliverable Item 1 (Phase 2), 15 May 2007

Waller M, Nielsen L, D'Este C. Mortality study report. Bougainville Health Study, Deliverable Item 2 (Phase 2), 31 July 2007

Wen CP, Tsai SP, Gibson RL. Anatomy of the healthy worker effect: a critical review. J Occup Med. 1983; 25(4): 283-9.

Wilson EJ, Horsley KW, van der Hoek R. Australian National Service Vietnam Veterans Mortality Study 2005. Canberra: Department of Veterans' Affairs, 2005.

Wood W B. Chemical Assessment and Hazard Audit; 1999.

8 Annexes

8.1 Annex 1

Fields required by AIHW for cancer linkage with the NCSCH

The AIHW required the data to be in a particular format. This format required the following information in separate fields:

1. ID number
2. Surname
3. First given name
4. Second given name
5. Third given name
6. Sex
7. Date of birth
8. Date of last contact
9. State of residence at last contact
10. Date of death if known
11. Study arm (Veteran or Comparison)

AIHW required all names in UPPER CASE and all dates in the format YYYYMMDD. The date of last contact for all participants was set as 20 November 1997.

ANNEX E

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Completion of Self-reported Data Collection – Final Report

Bougainville Health Study

Deliverable Item 5 (Phase 2)

17 November 2008

PEACE MONITORING GROUP

Author	**Colleen Loos, Lisa Nielsen, Michael Waller Annabel McGuire, Tegan Cosgrove, Nadine Mammone, Christine McClintock, Susan Treloar**
Document Version	**Version 1.0**
Status	**Draft**
Date Saved	**17/11/2008**

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\Research\DHSP\Phase 2\2. Bougainville\Deliverables\Complete Data Collection Stage\Completion Self-Reported Data Collection\Final Report (Nov 08)\BV Complete Self Report Data Collection v1.doc

Revision History

Date	Version	Description	Track Changes
17/11/08	V1.0	Original report submitted	Nil

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
A/Prof Susan Treloar	Head, Deployment Health Surveillance Program and 1st chief investigator			
Prof Annette Dobson	Chair Scientific Research Team			
Prof Michael Moore	Scientific Advisory Committee			
BRIG Tony Gill	Program Management Board			

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
SRT	12/11/08	Electronic
PMO	17/11/08	Electronic
SAC	17/11/08	Electronic

DEFENCE DEPLOYED BOUGAINVILLE HEALTH STUDY

Deliverable Item 5 (Phase2)

Completion of Self Reported Data Collection Stage

Due Date: 17 November 2008

Extract from Statement of Works - Bougainville Health Study

"The proposed methodology has been developed using two stages of contact:

a. Questionnaire Stage 1 contact will provide selected individuals with:
    1. invitation to participate;
    2. study background and information;
    3. study consent form;
    4. letter of support from a Senior Defence Representative and/or Repatriation Commissioner;
    5. preferred mode of completion of Study Questionnaire; (Internet, mail); and
    6. section requesting specification of the individual's deployment history.

b. Questionnaire Stage 2 contact will provide participants with:
    1. Study Questionnaires relevant to the deployments specified in Stage 1; and
    2. Study Questionnaire in their preferred mode of delivery.

c. A Summary of Activities undertaken to achieve this deliverable will be submitted and will contain descriptive statistics on data collection including:
    1. response rates for self report questionnaire; and
    2. preferred modes of delivery for the self report questionnaire."

Executive Summary

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a series of studies that aim to research the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service overseas. It is being conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program (DHSP).

2. The aim of the Bougainville Health Study is to conduct an investigation of the health status of all ADF personnel who deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II, relative to an appropriate comparison group who were ADF members at the time, but did not deploy on these Operations.

3. This document reports on the process of collection of self-report data for the Bougainville Health Study. Study response rates and participant characteristics are presented; however, the report does not provide results of any analysis of the self-reported data. This will be the subject of a further report.

4. All 4775 ADF personnel who deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II were included in the Bougainville Health Study. A frequency-matched comparison group who were eligible to deploy to Bougainville, but did not, were also invited. The total sample was 7138 individuals, of whom 66 were excluded from the study. The final number of potential participants was 7072.

5. Study methods were modified from those described in the initial Statement of Works to learn from experience in conducting the Defence Deployed Solomon Islands Health Study in 2007.

6. The study methods included contacting all potential invitees by email or mail and inviting them to complete a self-report health questionnaire. In addition, the Bougainville veterans were invited to complete a deployment questionnaire. Questionnaires could be completed online or in hard copy and returned by post. Emailing invitations was an innovation in this study. This study also allowed consent to be given online for the first time. The study allowed for collection of information by telephone interview, under specific conditions.

7. A total of 7031 individuals were invited to complete questionnaires. Two thirds of the invitations were emailed and one third were mailed. After telephone follow-up of invitees the participation rate was 43%. Eighty-six percent of participants completed the questionnaire online. The refusal rate was 14%. Individuals who did not respond and were not contactable are retained in the denominator for calculating these rates.

8. The Department of Veterans' Affairs (DVA) conducted enhanced contact tracing. DVA found new addresses for 57% of individuals unable to be contacted by CMVH. DVA mailed the invitations, and where necessary, reminders, to these individuals.

9. Emailing of invitations proved to be an efficient strategy for serving ADF personnel. Contacting ex-serving individuals remains a challenge. Strategies to maintain regular contact with program participants in the future are proposed.

1 Introduction

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a series of studies that aim to research the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service overseas. It is being conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program (DHSP).

2. The aim of the Bougainville Health Study is to conduct an investigation of the health status of ADF personnel who deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II, relative to an appropriate comparison group who did not deploy on these Operations.

3. The Bougainville Health Study includes the analysis of data gathered from mortality and cancer incidence registries, a comprehensive self-reported questionnaire, and ADF health and psychological screening records.

4. This document reports on the process of collection of self-report data for the Bougainville Health Study. Study response rates and participant characteristics are presented; however the report does not provide results of any analysis of the self-reported data; this will be the subject of a further report.

5. For the purposes of this report, **"response/respondent"** refers to individuals who replied to the study invitation and includes individuals who refused to participate, while "**participation/participant**", refers only to those individuals who provided self-reported questionnaire data.

2 Methods of Data Collection

6. All 4775 ADF personnel who deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II were included in the Bougainville Health Study. A comparison group of 2363 individuals who were eligible to deploy to Bougainville, but did not, were also included. Sixty-six persons were excluded from the sample (51 persons are known to be deceased, 11 to have left the ADF and permanently emigrated, and four to be incapable of completing questionnaires due to health or other reasons). Hence, there were 7072 potential invitees.

7. Individuals were sent an invitation to participate in the study either by email or mail. Emails were sent to all individuals with an email address, as provided by PMKeyS. This was an innovation introduced following experience in the Solomon Islands Health Study. Defence email addresses were used in the first instance, and if a Defence email address was not available the personal email address was used. (Persons residing overseas were only excluded from the sample if they had left the ADF and email contact was not possible. Where postal addresses were available for overseas residents, invitations were not posted unless requested by the respondent, as reply paid envelopes could not be provided.)

8. Process piloting took place in early November 2007 by emailing approximately 300 individuals. Online responses were hindered during November and December 2007 by technical problems, including password and screen problems, especially where the web site was accessed over the Defence Restricted Network. These were resolved by liaison with the Data Management and Analysis Centre (DMAC) at the University of Adelaide, who have developed the Study web interface and database.

9. Emails were then sent in batches between 17 and 19 December 2007 and between 7 and 10 January 2008.

10. The email invitation consisted of a personally addressed letter from the Chief Investigator inviting the individual to participate, along with a link to the website containing the online questionnaire and consent forms, and their login details for the questionnaire. The website also contained links to:

- Letter of Support from the Chief of the Defence Force and Repatriation Commissioner
- ADHREC Guidelines for Volunteers
- Information sheet explaining the procedures and requirements related to participation in the study

11. Individuals could participate in the study by clicking on the web link and completing the questionnaire online, or by emailing the DHSP account and requesting a mail package (consisting of invitation pack and questionnaires) be sent to a nominated address.

12. Individuals could refuse participation in the study by email, putting 'Refusal' in the subject line, by logging onto the questionnaire website and clicking 'Refuse' on the relevant page, or by calling the free call number 1800 886 567.

13. Individuals who had not responded to the email invitation within one month were sent a reminder email. If there was still no response within another month of this email, a telephone call was made to confirm contact details. Telephone calls were made at a variety of times during the day and evening in order to maximise contact opportunities. Up to ten attempts were made to contact individuals. Calls were made by appropriately trained interviewers, hired as casual staff by CMVH.

14. If a delivery failure occurred on an email contact, the follow-up telephone protocol described above was followed immediately as this suggested that both the email and mail contact details obtained from PMKeyS were outdated.

15. The mailing of invitation packages was delayed due to problems getting the materials proofed and printed. Invitations were mailed in late April 2008 in cases where email addresses were lacking. Mailing addresses were provided by PMKeyS. Envelopes were marked "Addressee Only: Please Forward". For ex-serving personnel or reservists, the residential address was used while invitations for currently serving personnel were sent to Defence addresses. Any subsequent printing of invitation materials for mail outs conducted by DVA was handled by a different printing contractor.

16. The mailed invitation package included:

- Letter of invitation:
    - Personally addressed letter from the Chief Investigator
    - Letter of Support from the Chief of the Defence Force and the Repatriation Commissioner
    - Contact details of the study investigators
    - ADHREC Guidelines for Volunteers
- Information sheet: a brochure containing information about the study, what is involved in participating, and contact information for support networks
- Reply forms booklet:
    - Login details for online questionnaire
    - Consent forms (one copy for participant to keep)
    - Defer participation/register refusal sheet
    - Contact details form
    - Preference of mode of completion of the questionnaire (i.e. web or mail)
    - Alternative contact details form (optional)
    - Deployment history form
- Reply paid envelope

17. A 1800 (free-call) number was also provided to participants in the information sheet. Potential participants could telephone this number to register a refusal or to seek clarification about any aspect of the study. This telephone number was manned by a member of the study team, and had voicemail facility so that messages could be left.

18. Participants returned the relevant sections of the reply forms booklet, and a questionnaire was mailed to the nominated address if the participant indicated mail as their preferred mode of completion.

19. Those who preferred to complete the questionnaire online were provided with their login details in the invitation package.

20. Reminder cards were sent to non-respondents via post. If no reply was received within two to four weeks of the reminder card, a telephone call was placed to confirm contact details. These calls followed the same protocol as those made to email non-respondents, described earlier.

21. Where persons were unable to be contacted by telephone, address details were obtained by regular updates from PMKeyS. The Department of Veterans' Affairs (DVA) also provided an enhanced contact tracing service, electronically matching DHSP requests to their own in-house databases in the first instance and then to the Australian Electoral Roll.

22. All participants were asked to complete a General Health Questionnaire, and those who had deployed to Bougainville were also asked to complete a Bougainville Deployment Questionnaire. Both of these questionnaires were available online.

23. Participants who had also deployed to East Timor and were selected as a veteran in the East Timor Health Study were asked to complete an additional questionnaire on this deployment. This negated the need to recruit them again for the East Timor Health Study. This questionnaire was also available online.

24. Fifty persons who participated in the Solomon Islands study, which was conducted by CMVH in 2007, had either deployed to Bougainville or were selected in the comparison group for the Bougainville study. They were asked to complete the relevant questionnaires at that time, so that it would not be necessary to approach them again in 2008. Another 59 members of the Bougainville sample either did not respond or declined to take part in the Solomon Islands study. They were approached again, the invitations being sent in May 2008 to maximise the time between approaches.

25. The Department of Veterans' Affairs (DVA) conducted enhanced contact tracing. CMVH forwarded lists of persons unable to be contacted. DVA searched for new addresses in their own internal databases in the first instance, and then on the Australian Electoral Roll. Due to privacy laws, DVA mailed the invitations, and where necessary, reminders, to these individuals. Consequently, CMVH was unable to conduct any further telephone follow-up unless invitees contacted CMVH directly. Seven hundred and eighty-seven invitations were mailed by DVA and a further 409 will be mailed in early November.

26. Questionnaire reminders were emailed or mailed in the following circumstances:

- a mailed questionnaire was not returned;
- a consent form indicating a preference for web mode of delivery was received or the consent form was completed online but the questionnaire was outstanding.

DVA also mailed reminders, where required.

27. Mail out and receipt of documents was conducted in-house, with printing of study documents sourced externally. Completed hard copies of questionnaires were entered directly into the online database by DMAC.

28. A communication and media strategy was designed and implemented prior to contact with potential study participants and at various times during the recruitment and data collection process. The aims of this were to alert individuals to the study and potentially increase response rates. The communication and media strategy involved advertisements and editorials in Defence and ex-Serving publications (such as Service newspapers and Australian Peacekeepers and Peacemakers Veterans' Association magazine) as well as advertisements in non-Defence media (such as the Chronicle, City West News, Fremantle Gazette and Penrith Press) and media releases.

29. Ethics approval was granted by the Australian Defence Human Research Ethics Committee (ADHREC) (Protocol no. 476/07), the Department of Veterans' Affairs Human Research Ethics Committee (DVA HREC) (Protocol no. E07/002) and the University of Queensland Behavioural and Social Sciences Ethical Review Committee (UQ BSSERC) (Protocol no. 2007000230).

30. The UQ BSSERC requested a strict protocol in that CMVH interviewers could not directly suggest a telephone interview to initial non-respondents as a means of participation. This had implications for the success of telephone contact in this study.

3 Results

3.1 Response rates for self-report questionnaire

31. Table 1 provides details of response, refusal and contact rates for the Bougainville Health Study. Figures for the East Timor study are also shown for comparison, as the studies were conducted concurrently and there was some overlap between the samples.

32. A total of 7031 individuals were invited to complete a choice of online or paper questionnaires (an additional 41 individuals for whom contact details could not be found were unable to be approached). Two-thirds of the invitations were emailed and one third were mailed. After telephone follow-up of invitees the participation rate was 43%. Eighty-six percent of participants completed the questionnaire online. The refusal rate was 14%. Individuals who did not respond and were not contactable are retained in the denominator for calculating these rates. Bougainville study participants include 50 persons who had already submitted data during the Solomon Islands study in 2007, obviating the need to contact them again.

33. Persons who declined to take part were not asked for a reason; however, reasons which were volunteered for non-participation included:

- lack of time or other more pressing priorities
- lack of access to a computer to complete the online questionnaire
- lack of relevance of the study as they either did not deploy to Bougainville or did not experience any problems during their deployment
- lack of relevance of the study questions to their situation
- inability to access the online questionnaire
- disinclination to revisit aspects of their deployment
- disaffection with the ADF or DVA.

Wherever possible, CMVH enquiry staff explained that it was important for all members of the study sample to participate, and, where appropriate offered assistance with alternative methods of submitting data.

34. After the initial pilot phase in late 2007, there were still a number of persons who reported difficulty in accessing or using the online questionnaire. These difficulties included log on problems and data disappearing or not saving. Such cases were reported to DMAC and in some cases solutions were available; however, for many no explanation could be found, suggesting a user-end problem. In all such cases which came to DHSP attention, telephone or hard copy methods were offered. However, several persons refused as a result, and it is likely that there were other people who had such difficulties but did not report them.

35. Survey fatigue was another problem mentioned by respondents. CMVH were aware of several other concurrent studies among the same population. This caused confusion with a number of persons stating, when contacted by telephone, that they had already completed the questionnaire.

Table 1: Summary of response and participation for self-report data collection

		a **Bougainville sample (BV)**		b **East Timor sample (EM)**		c **Overlap** (Individuals in both samples)		(a+b)-c **Total individuals** (net)	
		n	%	n	%	n	%	n	%
1	Total sample	7138		6499		799		12838	
2	Excluded (deceased / emigrated / incapacity)	66		41		6		101	
3	**Potential invitees** (1-2)	**7072**		**6458**		**793**		**12737**	
4	Invitations unable to be sent (contact details unavailable)	41		9		0		50	
	Invitations sent:								
5	Email (as % of invitees, i.e. 5/3 x 100)	4706	66.5	4577	70.9	626	78.9	8657	68.0
6	Paper (as % of invitees i.e. 6/3 x 100)	2325	32.9	1872	29.0	167	21.1	4030	31.6
7	**Total** (as % of invitees, i.e. 6/3 x 100)	**7031**	100.0	**6449**	100.0	**793**	100.0	**12687**	100.0
	Undeliverable invitations*:								
8	Email (as % of sent i.e. 8/5 x 100)	244	5.2	153	3.3	21	3.4	376	4.3
9	Paper (as % of invitees i.e. 9/6 x 100)	505	21.7	361	19.3	39	23.4	827	20.5
	Questionnaire response:								
10	**Refusals (** i.e. 10/7 x 100)	1008	14.3	1067	16.5	109	13.7	1966	15.5
11	Online (i.e. 11/7 x 100)	2595	36.9	2264	35.1	389	49.1	4470	35.2
12	Paper (i.e. 12/7 x 100)	396	5.6	315	4.9	68	8.6	643	5.1
13	Telephone interview (i.e. 13/7 x 100)	17	0.2	23	0.4	2	0.3	38	0.3
14	**Participation** (i.e. (11+12+13)/7 x 100)	3008	42.8	2602	40.3	459	57.9	5151	40.6
15	**Response** (i.e. (10+14)/7)	**4016**	57.1	**3669**	56.9	**568**	71.6	**7117**	56.1

***** Some of these individuals have since responded as a result of telephone follow up or contact tracing

Note: percentage totals may not add up due to rounding

36. Table 2 shows the contactability of non-respondents. Twenty-eight percent of potential invitees were unable to be contacted by telephone during the study to confirm whether they had received their invitations. Among those able to be contacted who did not either take part or explicitly refuse, in 66 cases it was established by contact with a family member or work colleague that the individual was unavailable during the study period, due to deployment or other reasons. The remaining 1039 individuals who were able to be contacted by phone did not submit data or explicitly refuse.

Table 2: Contact with non-respondents

Contactability	n	n	% of Non-respondents (N=3057)	% of Potential invitees (N=7072)
Contacted by phone:				
- unavailable: on deployment	38			
- unavailable: other / unknown reason	28	66	2.2	0.9
- other		1039	34.0	14.7
		1105	36.1	15.6
Unable to be contacted by phone		1952	63.9	27.6
Total		3057	100.0	43.2

3.2 Participant characteristics

37. Table 3 below shows participation for people according to their demographic characteristics. It was found that:

- Participation in the Bougainville veterans was higher than that in the comparison group (47% versus 35%)
- Participation among men and women were similar
- Participation increased with age group
- Participation was similar in the Army (46%) and RAAF (43%), but lower in the Navy (36%)
- Participation among those who had left the ADF was substantially lower than among those currently serving. Only 21% of ex-serving members in the sample participated in the study, compared to 51% of serving members
- Permanent members of the Defence Force had a similar participation as reservists (43% and 42% respectively)
- Participation differed between States, with the highest rate in ACT, SA, and NT and the lowest in WA.

Table 3: Participation by demographic characteristics

Characteristic	Total N=7072	Questionnaire submitted N=3008		Test Statistic		
	N	n	%	X^2	df	P
Exposure						
Veteran	4736	2201	*46.5*			
Comparison	2336	807	*34.5*	91	1	<0.001
Sex						
Male	6089	2605	*42.8*			
Female	983	403	*41.0*	1.1	1	0.29
Age group						
≤30	1102	322	*29.2*			
31-35	1792	643	*35.9*			
36-40	1626	709	*43.6*			
41-45	1192	587	*49.2*			
≥46	1360	747	*54.9*	221	4	<0.001
Service						
ARMY	4667	2127	*45.6*			
NAVY	2102	750	*35.7*			
RAAF	303	131	*43.2*	58	2	<0.001
Employee status						
Currently serving	5189	2621	*50.5*			
Ex-serving	1872	385	*20.6*	505	1	<0.001
missing	11	2	*18.2*			
Service Type						
Regular/Permanent	4354	1862	*42.8*			
Reserve	2709	1146	*42.3*	0.15	1	0.70
missing	9	0	*0.0*			
State						
ACT	1361	640	*47.0*			
NSW	1916	767	*40.0*			
NT	295	134	*45.4*			
QLD	1906	826	*43.3*			
SA	224	106	*47.3*			
TAS	92	37	*40.2*			
VIC	679	295	*43.4*			
WA	531	198	*37.3*			
Overseas	67	4	*6.0*	63	8	<0.001
missing	1	1	*100.0*			

Note: Participation refers to submission of self-reported questionnaire data

38. Table 4 shows the breakdown of demographics in the Bougainville veteran and comparison groups. Distribution of demographics is similar between the two exposure groups, except for employee status (current or ex-serving) and questionnaire

method. Veterans were more likely to be currently serving and to use the online questionnaire.

Table 4: Participant characteristics by exposure status

Characteristic	Veteran N=2201		Comparison N=807		Test statistic		
	n	%	n	%	X^2	df	P
Sex							
Male	1912	*86.9*	693	*85.9*			
Female	289	*13.1*	114	*14.1*	0.5	1	0.48
Age group							
22-30	236	*10.7*	86	*10.7*			
31-35	469	*21.3*	174	*21.6*			
36-40	529	*24.0*	180	*22.3*			
41-45	428	*19.4*	159	*19.7*			
46+	539	*24.5*	208	*25.8*	1.2	4	0.88
Service							
ARMY	1583	*71.9*	544	*67.4*			
NAVY	524	*23.8*	226	*28.0*			
RAAF	94	*4.3*	37	*4.6*	6.0	2	0.05
Employee status							
Currently serving	1940	*88.2*	681	*84.4*			
Ex-serving	259	*11.8*	126	*15.6*	7.8	1	0.005
Service Type							
Regular/Permanent	1366	*62.1*	496	*61.5*			
Reserve	835	*37.9*	311	*38.5*	0.1	1	0.76
Questionnaire method							
Mail	275	*12.5*	121	*15.0*			
Web	1917	*87.1*	678	*84.0*			
Interview	9	*0.4*	8	*1.0*	7.0	2	0.03
State							
ACT	446	*20.3*	194	*24.0*			
NSW	576	*26.2*	191	*23.7*			
NT	99	*4.5*	35	*4.3*			
QLD	624	*28.4*	202	*25.0*			
SA	81	*3.7*	25	*3.1*			
TAS	29	*1.3*	8	*1.0*			
VIC	203	*9.2*	92	*11.4*			
WA	139	*6.3*	59	*7.3*	12.6	7	0.08

Note: Participation refers to submission of self-reported questionnaire data

3.3 Summary of data collection process

39. The process for management of the data collection is summarised in Table 5.

Table 5: Self-reported data: Summary of management activities by month

Month	Study management activities
	Ongoing tasks: ▪ Tracking and reporting (DHSP database) ▪ Communications strategy
November 07	▪ Piloted emailing of invitations, batching by service and region ▪ Some website problems experienced, related both to the online questionnaire and access through the DRN. Emails were sent out to those affected, with alternative options for completing the questionnaire provided. ▪ Commenced consultation with printing house re mail out packs
December 07	▪ Continued send out of email invitations ▪ Web problems resolved, emails sent out to those affected
January 08	▪ Remaining email invitations sent, except for people approached during the Solomon Islands Health Study
February 08	▪ Continued consultation with printing house ▪ Commenced email reminders ▪ Telephone follow-up commenced ▪ Commenced sending mail out packs to those who requested hard copies of the invitation pack and the questionnaires ▪ Advertisements published in APPVA and service newspapers
March 08	▪ Continued consultation with printing house ▪ Further batches of email reminders sent to email invitees yet to respond ▪ Further telephone follow-up of email invitees yet to respond ▪ Continued to send mail out packs to those who requested them ▪ Advertisements and an insert on the DHSP included in service newspapers
April 08	▪ Invitation packs and questionnaire printed ▪ Mailed out invitation packs to those in the sample without email addresses ▪ Final batch of reminder emails sent to email invitees who had yet to respond ▪ Continued to send mail out packs to those who requested them ▪ Advertisements published in service newspapers, as well as regional publications such as the Chronicle, City West News, Fremantle Gazette and Penrith Press, to coincide with paper mail outs
May 08	▪ Email invitations sent to people approached during the Solomon Islands study ▪ Invitation reminder cards mailed ▪ Questionnaires sent out to participants who had requested hard copies ▪ Commenced mail out of questionnaire reminder cards for outstanding paper questionnaires ▪ Continued to send mail out packs to those who requested them
June 08	▪ Continued to make follow up telephone calls to non-respondents and persons with outstanding questionnaires ▪ Continued to mail or email questionnaires, reminders and other study documents where requested ▪ The list for enhanced contact tracing was forwarded to DVA
July-October 08	▪ Continued to make follow up telephone calls to non-respondents and persons with outstanding questionnaires ▪ Continued mailing questionnaires, reminders and other study documents ▪ Enhanced contact tracing and mail out by DVA continued

40. Despite the communications strategy implemented by CMVH, enquiry staff received a number of queries about the study auspices, suggesting that most ADF personnel had not heard about the study prior to being contacted.

41. Table 6 shows the number of emailed/mailed items and follow-up attempts per individual, giving an indication of the level of effort required to obtain a single questionnaire. (Note that some of these contacts were initiated by the respondents).

Table 6: Contacts or contact attempts made per person by participation status

Participant	No. of contacts or contact attempts per person (mean)			
	Email	Mail	Phone/fax	All
Yes (N=3008)	2.6	0.5	1.6	4.7
No (N=4064)	2.0	1.2	3.0	6.2
All (N=7072)	2.2	0.9	2.4	5.6

Note: contact attempts did not necessarily yield actual contact with a person.

42. The mean number of contacts or contact attempts made per potential participant was 5.6. This is just over half the contact attempts per person as for the Solomon Islands study where the average was 10. This demonstrates that our processes were more streamlined, especially for mail contacts, than for the Solomon Islands study. A detailed monthly breakdown of contact activity is given in Appendix I.

3.4 Evaluation of recruitment strategies

43. Table 7 summarises the effectiveness of each recruitment strategy. This table reports on recruitment activity during the Bougainville study, hence data for the 50 persons who participated during the Solomon Islands study are not shown. Emailing the original invitation was more than twice as effective as mailing; however, it should be borne in mind that postal invitations were only sent where an email address was lacking; three-quarters of the persons approached in this way were ex-ADF members whose postal address details were also more likely to be out of date. Twenty-two percent of these initial invitations were returned undeliverable. Similarly, invitations mailed by DVA went to persons for whom other contact strategies had proved ineffective, hence comprised the most difficult to reach group

44. Emailing of invitations for self-report data collection has proved to be a cost-effective means of contacting potential respondents, particularly serving members with Defence email addresses. The proportion of invalid or out-of-date email address was relatively small (i.e. 5%) and this was able to be ascertained, and the telephone follow-up protocol implemented, immediately.

45. Emailing of invitations and the online questionnaire also enabled rapid data collection. Five percent of participants submitted data within one day of their invitation being sent, and 11% within one week. Among participants, the mean time

from sending the invitation to submission of data was approximately three and a half months. (Participant characteristics for the combined Bougainville and East Timor studies, by elapsed time from invitation to data collection are shown in Appendix II.)

46. The most effective recruitment strategy was a telephone call plus an email of login details for the online questionnaire. Forty-three percent of those approached in this way participated without the need for a questionnaire reminder to be sent. This was a higher rate of participation than for telephone call plus the mailing of study documents (successful in 26% of cases). The participation rate for the questionnaire reminders was similar whether sent by email or mail; however, emails elicited a higher proportion of explicit refusals. The advantage of email contact was greater timeliness and convenience for recipients as well as for the study team.

Table 7: Response by recruitment strategy

Contact mechanism	Persons approached		Response type: Participated N=2958		Refused N=1008	
	n	%	n	%	n	%
Invitation						
Email	4706	*100.0*	690	*14.7*	71	*1.5*
Mail	2224	*100.0*	142	*6.4*	44	*2.0*
DVA (mail)	786	*100.0*	35	*4.5*	14	*1.8*
Invitation reminder						
Email	3613	*100.0*	469	*13.0*	130	*3.6*
Mail	1554	*100.0*	18	*1.2*	7	*0.5*
DVA (mail)	620	*100.0*	17	*2.7*	7	*1.1*
Telephone follow up						
Telephone follow up alone	1547	*100.0*	209	*13.5*	462	*29.9*
Resend login details (email)	2135	*100.0*	921	*43.1*	137	*6.4*
Send / resend QA +/- invitation (mail)	714	*100.0*	188	*26.3*	7	*1.0*
Questionnaire reminder						
Email	856	*100.0*	178	*20.8*	117	*13.7*
Mail	378	*100.0*	85	*22.5*	8	*2.1*
Volunteered*	10	*100.0*	4	*40.0*		*0.0*

** Volunteers contacted CMVH in response to publicity about the study before receiving an invitation.*

Note: throughout this report, "response/respondent" refers to individuals who replied to the study invitation, while "participation/participant", refers only to those individuals who provided self-reported questionnaire data. "Contact mechanism" is the last mechanism used before the response was received; "Response type" is the eventual outcome of all contact.

47. Locating ex-serving individuals proved difficult. DVA enhanced contact tracing was useful for persons who were DVA clients or were on the electoral roll, but limitations imposed by the terms and interpretation of the Commonwealth Electoral

Act meant that telephone follow-up was not possible. It should also be noted that some persons responded to invitations and invitations reminders by completing the consent process only. In such cases their actual participation or refusal was only elicited after further contact on the part of CMVH. In Table 7 these are shown according to the last contact strategy used before the submission of data or receipt of a refusal. A more detailed evaluation of DVA contact tracing follows.

3.5 Contact tracing

48. The Department of Veterans' Affairs (DVA) provided an enhanced contact tracing service, electronically matching DHSP requests to their own in-house databases in the first instance (30% matched) and then to the Australian Electoral Roll (an additional 27% were matched). When required, reminders were also sent by DVA. The overall response rate from mailings by DVA, including responses elicited after additional contact by CMVH, was 12%, with a further 4% having completed the consent process but their questionnaire data is outstanding. Seventeen percent of invitations were returned undeliverable to DVA.

Table 8: Contact tracing by DVA

Tracing activity	N	% of requested
Total requested	**2296**	**100.0**
New address found:		
- DVA database	688	30.0
- Electoral roll	611	26.6
Total traced	**1299**	**56.6**
Not mailed*	86	3.7
Yet to be mailed	426	18.6
Mailed	**787**	**34.3**
		% of mailed
Returned undeliverable	134	17.0
Responded:		
Refused	21	2.7
Participated	75	9.5
Consented; questionnaire outstanding	29	3.7
Total response	**125**	**15.9**

** This was because CMVH had found them in the meantime, or the address discovered by DVA was insufficient, or the person was deceased.*

Note: throughout this report, "response/respondent" refers to individuals who replied to the study invitation, while "participation/participant", refers only to those individuals who provided self-reported questionnaire data.

49. The potential to conduct contact tracing through ComSuper was also explored. ComSuper have indicated a willingness to help in this regard and ADHREC have recently given approval for this to be pursued. A pilot of this process will be

conducted in the near future in order to capitalise on the liaison with ComSuper to date and to inform future studies.

3.6 Preferred modes of delivery for the self-report questionnaire

50. Eighty-six percent of participants submitted their data via the online questionnaire with13% submitting hard copies. Only 0.5% of questionnaires were completed by telephone interview as this was not listed as an option in the invitation, but only offered where people stated they had had difficulty with other methods. Participants availing themselves of this mode of delivery did so for convenience, or where they had encountered problems accessing the online questionnaire.

51. A feature of the online questionnaire was a progress tracking meter, intended as a guide for participants. Not all questions were applicable to all individuals; therefore a completion figure of at least 90% usually indicated that all relevant questions had been answered. As the hard copy questionnaires received by CMVH were also entered into the online database, this progress meter also provides a means of evaluating the level of completion of all questionnaires received. It should be noted that individuals who submitted less than 10% of the questionnaire were not counted in participation rates.

52. The overall mean percentage of questions answered was 81%, with the figure for hard copies being 87% and online responses being 80%. Eighty-nine percent of hard copies, and 75% of online questionnaires, were at least 80% complete. Only three percent of persons submitting hard copies completed less than 50% of the questionnaire, while for online responses the figure was 16%.The online method captures all data entered, even if the participant fails to complete the whole questionnaire and submit it, making more data items available for subsequent analysis.

3.7 Consent to linkage

53. Table 9 below shows participants' consent patterns for record linkage to ADF health and psychology records. Eighty-two percent of participants consented to health record linkage and 75% to psychology record linkage, while 73% gave permission for both.

Table 9: Consent to record linkage

ADF Psychology record linkage	ADF Health record linkage					
	Consented		Refused		Total	
	n	%	n	%	**n**	%
Consented	2149	*72.7*	65	*2.2*	**2214**	*74.9*
Refused	272	*9.2*	469	*15.9*	**741**	*25.1*
Total	**2421**	*81.9*	**534**	*18.1*	**2955**	*100.0*

4 Discussion

54. Emailing of invitations and refinements to the online questionnaire proved to be both effective and efficient. While the level of participation (43%) may be less than optimal for a cross-sectional study, low response is considered less of an issue for longitudinal studies, as long as follow-up is good (Kelsey 1996). The level of participation achieved for this study compares favourably with the Solomon Islands study, especially as there were twice as many people in the Bougainville sample who were no longer in Defence at the commencement of the study (26%, compared with 12% than in the Solomon Islands sample). In fact, participation was higher in the Bougainville study than in the Solomon Islands study among both serving personnel (51%, compared with 46%) and ex-serving personnel (21%, compared with 9%).

55. Several factors are likely to affect to participation levels in studies of military health. Secular trends in epidemiological research show declining participation rates over recent years. In the Australian Longitudinal Study of Women's Health, for example, an estimated 41–42% of the younger women (*n* = 14 247), 53–56% of the mid-age women (*n* = 13 716), and 37–40% of the older women (*n* = 12 432) agreed to participate (Lee et al. 2005). However, women may be more likely than men to volunteer as study participants (Todd et al. 1983). ADF personnel also differ from the general Australian population with regard to their high geographical mobility.

56. Both the salience of the issue, and the time elapsed since the event in question, are important motivators of participation. The Bougainville study covered the period 1997 to 2003, and unlike recent Gulf War and Vietnam studies, no particular health concerns have been widely expressed in recent times. The time factor impacts on both motivation to participate and the proportion of persons who are no longer serving and thus more difficult to locate. "Hot" topics generate widespread publicity which assists greatly in bringing research to the attention of potential participants. Participation in the Bougainville study compares favourably with similar international studies, for example, the US Millennium Cohort study—which concerns a much more recent and controversial theatre of action—achieved an overall response rate of 33% (Ryan et al. 2007) for the first wave of data collection.

57. Other factors likely to impact on participation include the nature of the deployment and the roles and characteristics of the personnel involved. Participation differed between the Bougainville and East Timor studies, even though they were conducted concurrently. The overall participation rate for East Timor was 40%, despite there being fewer ex-serving personnel in the sample (23%). It is not surprising to find higher volunteerism to participate in research among Bougainville veterans, as persons who deployed to this region generally did so voluntarily.

58. As with the Solomon Islands study, deployment to the location in question, and age, were positively associated with participation. However, for the Bougainville study, neither regular / reserve status, or gender, had a significant impact. Further, there was a significantly lower participation rate among Navy personnel when compared with Army and RAAF personnel. This may be related to different roles played by the services on different deployments.

59. While the proportion of ex-serving personnel participating in the Deployment Health Surveillance Program is improving, locating the remaining large numbers of individuals is still a significant challenge. In October 2008 ADHREC approved the transmission of personal information to ComSuper, in order that further enhanced tracing may be conducted via this organisation, similar to the agreement with DVA. This process will be piloted in the near future. However, the benefits of such tracing are limited without CMVH having access to the contact information found, and the possibility of telephone follow-up.

60. Characteristics were similar for the veteran and comparison groups, with the exception of service status (current or ex-serving). This is encouraging and demonstrates a lack of differential response bias between groups, and improves the internal validity of the study.

61. While the study included a communication strategy targeted at Defence publications, and involved a high degree of liaison with stakeholders within the ADF, general awareness about the study and the role of CMVH among Defence personnel remains low. As the Deployment Health Surveillance Program builds, this is likely to improve, however, strategic use of internal Defence communications mechanisms would assist in this regard. However, it would be important that this was done in a sensitive way, so as not to prejudice the perceived independence of CMVH.

5 Recommendations for changes to future study protocols

62. A secure online means for program participants, including ex-serving ADF members, to voluntarily update their contact details and email addresses for the purpose of DHSP research could assist recruitment for future studies. This could improve contactability of those who are no longer the responsibility of the ADF but are not (yet) the responsibility of DVA. They could be anywhere in Australia or living overseas. It may also allow telephone contact with some DVA clients who are uncontactable via the last information held by Defence. CMVH interface with the Defence-DVA pilot for keeping track of those separating from ADF would also assist in this regard.

63. Future participation can also be improved by maintaining regular contact with program participants. As well as the promised participant feedback report of study findings, sending a twice yearly postcard is also proposed.

64. Study materials will be reviewed for future studies. The length of the questionnaire is still an issue and instructions in the information pack can be clarified, for example, advising that online respondents need not return any of the paper forms.

6 Conclusions

65. The Bougainville Health Study has provided a solid positive response from serving members, which will form the basis of a future Near North cohort for subsequent studies.

7 References

Kelsey J. (1996) Methods in observational epidemiology). New York: Oxford University Press.

Lee C, Dobson AJ, Brown WJ, Bryson L, Byles J, Warner-Smith P, Young AF. (2005) Cohort Profile: The Australian Longitudinal Study on Women's Health. Int J Epidemiol. 34(5):987-91.

Ryan MA, Smith TC, Smith B, Amoroso P, Boyko EJ, Gray GC, Gackstetter GD, Riddle JR, Wells TS, Gumbs G, Corbeil TE, and Hooper TI. (2007) Millennium Cohort: enrollment begins a 21-year contribution to understanding the impact of military service. J Clin Epidemiol. 60(2):181-91.

Todd M, Davis KE, Cafferty TP: Who volunteers for adult development research? Research findings and practical steps to reach low volunteering groups . Int J Aging Hum Dev 1983; 18:177–184.

8 Appendices

Appendix I **Self-reported data (combined Bougainville and East Timor studies)—Recruitment activity by month**

	Month	Nov / Dec 2007	January 2008	February 2008	March 2008	April 2008	May 2008	June 2008	July 2008	August 2008	September 2008	October 2008	TOTAL (N)
Emails (N)	Invitation	2729	5848				102				1		8680
	Invitation reminder		1689	3027	2498	1810		101					9125
	Resend login details			391	539	648	961	769	733	218	113	488	4860
	Questionnaire reminder			2	456	4		1097	530	3	97	16	2205
	Other emails	434	584	644	606	535	136	439	427	141	95	115	4156
	TOTAL	3163	8121	4064	4099	2997	1199	2406	1690	362	306	619	29026
Mailed items (N)	Invitation					3857	18			654	642		5171
	Invitation reminder						2786					1031	3817
	Questionnaire	9	42	67	55	75	297	277	234	83	141	106	1386
	Questionnaire reminder							265	186	133	60	78	722
	TOTAL	9	42	67	55	3932	3101	542	420	870	843	1215	11096
Phone calls (N)	Non-respondent / undeliverable (e-)mail	2	678	1743	2905	3773	4958	5089	4028	1613	650	1968	27407
	Outstanding questionnaire							36	971	390	1062	3141	5600
	TOTAL	2	678	1743	2905	3773	4958	5125	4999	2003	1712	5109	33007
QAs received (N)	Online	34	12	23	23	25	116	120	121	80	42	72	668
	Mail	230	809	560	571	412	396	388	389	187	303	263	4508
	Interview	14		1	1		2	1	8	2	5	3	37
	TOTAL	278	821	584	595	437	514	509	518	269	350	338	5213
	CUMULATIVE TOTAL (% of 12 737*)	2.2	8.6	13.2	17.9	21.3	25.4	29.3	33.4	35.5	38.3	40.9	

* Potential respondents (net sample for both studies)

Key: DHSP activity | DVA activity

Appendix II **Self-reported data (Bougainville and East Timor studies)**
Participant characteristics by elapsed time from invitation to data collection

Characteristic	0-30 days N=997		31-90 days N=1632		91+ days N=2584				
	n	%	n	%	n	%	X^2	df	P
Exposure									
Neither deployment	228	*22.9*	494	*30.3*	790	*30.6*			
Bougainville only	462	*46.3*	615	*37.7*	915	*35.4*			
East Timor only	277	*27.8*	465	*28.5*	758	*29.3*			
Both deployments	30	*3.0*	58	*3.6*	121	*4.7*	45.6	6	<0.001
Sex									
Male	872	*87.5*	1428	*87.5*	2252	*87.2*			
Female	125	*12.5*	204	*12.5*	332	*12.8*	0.1	2	0.94
Age group									
21-25	106	*10.6*	214	*13.1*	519	*20.1*			
26-30	188	*18.9*	340	*20.8*	600	*23.2*			
31-35	229	*23.0*	378	*23.2*	555	*21.5*			
36-40	217	*21.8*	303	*18.6*	425	*16.4*			
41+	257	*25.8*	397	*24.3*	485	*18.8*	96.0	8	<0.001
Service									
ARMY	707	*70.9*	1280	*78.4*	1799	*69.6*			
NAVY	210	*21.1*	192	*11.8*	639	*24.7*			
RAAF	80	*8.0*	160	*9.8*	146	*5.7*	120.1	2	<0.001
Employee status									
Active	87	*8.7*	279	*17.1*	251	*9.7*			
Ex-serving	910	*91.3*	1352	*82.8*	2332	*90.2*	63.7	2	<0.001
missing	0	*0.0*	1	*0.1*	1	*0.0*			
Service Type									
Regular/Permanent	746	*74.8*	1027	*62.9*	1629	*63.0*			
Reserve	251	*25.2*	605	*37.1*	955	*37.0*	49.7	2	<0.001
State									
ACT	238	*23.9*	304	*18.6*	464	*18.0*			
NSW	261	*26.2*	402	*24.6*	630	*24.4*			
NT	41	*4.1*	115	*7.0*	129	*5.0*			
QLD	259	*26.0*	399	*24.4*	806	*31.2*			
SA	31	*3.1*	81	*5.0*	89	*3.4*			
TAS	6	*0.6*	36	*2.2*	27	*1.0*			
VIC	107	*10.7*	163	*10.0*	276	*10.7*			
WA	49	*4.9*	131	*8.0*	162	*6.3*	199.0	7	<0.001
Overseas	4	*0.4*	1	*0.1*	1	*0.0*			
missing	1	*0.1*	0	*0.0*	0	*0.0*			

Note: throughout this report, "response/respondent" refers to individuals who replied to the study invitation, while "participation/participant", refers only to those individuals who provided self-reported questionnaire data

9 Annexes

Annex 1 - Ethics Approval

Annex 2 - Invitation Package

Annex 3 - Invitation Reminder Card

Annex 4 - Questionnaire Reminder Card

Annex 5 - Health and Demographics Questionnaire

Annex 6 - Bougainville Deployment Questionnaire

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Defence Owned Data Completion Report

Bougainville Health Study

Deliverable Item 6 (Phase 2)

10 December 2008

PEACE MONITORING GROUP

Author **Tegan Cosgrove, Annabel McGuire, Tracy Carthew, Lisa Nielsen, Colleen Loos, Nadine Mammone, Michael Waller, Penny Williamson, Christine McClintock, Susan Treloar**

Document Version **2.0**

Status **Draft**

Date Saved **10/12/2008**

Centre for Military and Veterans' Health

Mayne Medical School Building
Herston Road Herston QLD 4006

Telephone: 07 3346 4873
Facsimile: 07 3346 4878
Email: CMVH.enquiries@uq.edu.au

CONTENTS

Document Administration

Document Location

The Master copy of this document is held at the following location:

P:\Research\DHSP\Phase 2\2. Bougainville\Deliverables\Completion Defence Owned Data Collection \BV Complete Defence Owned Data Collection v2.doc

Revision History

Date	Version	Description	Track Changes
17/11/08	V1.0	Version submitted to PMO	No
10/12/08	V2.0	Version revised following SAC meeting 1/12/08	No
		Summary data added to the Executive Summary at the request of the SRT	

Approvals

This document requires the following approvals:

Name	Position	Signature	Date	Version
A/Prof Susan Treloar	First Chief Investigator			
Prof Annette Dobson	Chair Scientific Research Team			
Prof Michael Moore	Scientific Advisory Committee			
BRIG Tony Gill	Program Management Board			

Signed approval forms are filed in the Management section of the project file.

Distribution

This document has been distributed to:

Organisation and Title	Date	Copies
SRT	12/11/08	Electronic
PMO	17/11/08	Electronic
SAC	17/11/08	Electronic
PMO	10/12/08	Electronic
SAC	10/12/08	Hard

Executive Summary

1. This report describes the Defence owned data collection stage of the Bougainville Health Study. Two types of Defence owned data were collected: the Defence health data, which were extracted from medical records, and Defence psychology data, which were sourced from the electronic files managed by the Psychology Research and Technology Group (PRTG).

2. The collection of the psychology data relies on the completion of the self-report component of the Bougainville Health Study, when details of consent are completed, collated and supplied to PRTG.

3. For Defence heath data, selected health assessment documents were obtained from Unit Medical Records (UMRs) or from Central Medical Records (CMRs) when the UMR was not available. These documents were requested for this study in accordance with the approved protocols. UMRs include vaccination records and are, theoretically, a more up-to-date record than the CMR.

4. Ex-serving personnel's UMRs and all CMRs are stored in Defence records facilities. The UMRs of serving personnel are in use and should be located within the unit health facilities at the bases where the individuals are posted.

5. Four thousand seven hundred and eighty-four (4,784) ADF personnel were deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II. The original intention was to include Unit Medical Records (UMRs) for all Bougainville veterans in the Bougainville Health Study and a matched comparison group who did not deploy to Bougainville but were eligible to do so.

6. Early difficulties in obtaining the UMRs for serving personnel necessitated a revision of the sample size. The figures were reduced to 25% (845) of serving Army members' records and 50% (786) of serving Navy members' records. The numbers for ex-serving personnel were not reduced as they are under-represented in the self-report data. The numbers of RAAF personnel were also not reduced as they already comprised only a small proportion of the sample.

7. In total, 3138 Defence medical records were available for the Bougainville Health Study. Most were UMRs; 12% were CMRs. This number represents 82% of the reduced sample and 53% of the original number of records.

8. The reduced availability of UMRs was largely confined to serving personnel where only 34% of all requested records were available. In contrast, there was a 95% availability of records for ex-serving personnel.

9. There were differences between Services in availability of records; a total of 75% of Navy, 93% of Army and 41% of RAAF records requested were available. These percentages were lower for currently serving members' UMRs; 19% of requested Navy, 55% of Army and 21% of RAAF UMRs were available.

10. Most medical records contained the relevant health assessment forms for data extraction; 81% of records included a relevant Annual Health Assessment or equivalent, 79% included a Comprehensive Preventive Health Examination or equivalent, and 72% of UMRs contained vaccination records.

11. The Defence owned data collection represents a key component of this study; however, obtaining these records was logistically complex and labour-intensive for both CMVH and the Defence health facilities involved. It remains to be seen whether accessing the UMR is either practical or cost effective. A Defence-wide system of electronic health records would facilitate data collection for future Defence health surveillance.

1 Introduction

1. The Defence Deployed Bougainville Health Study (hereafter referred to as the Bougainville Health Study) is part of a series of studies that aim to investigate the health and well-being of Australian Defence Force (ADF) veterans who have deployed on active service overseas. It is being conducted by the Centre for Military and Veterans' Health (CMVH) as part of the Deployment Health Surveillance Program (DHSP).

2. The aim of the Bougainville Health Study is to determine the health status of Australian Service personnel who deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II, relative to an appropriate comparison group who did not deploy on these Operations.

3. This report presents the collection of the Defence owned data for the Bougainville Health Study and reports on the availability of the various types of data collected. It does not report on data completeness or quality and contains no analysis of the Defence owned data; this will be the subject of a further report.

4. Two types of Defence owned data were collected: the Defence health data, which were extracted from medical records, and Defence psychology data, which were sourced from the electronic files managed by the Psychology Research and Technology Group (PRTG). The methods of collection for each type of data are described separately.

2 Methods of Data Collection

2.1 Defence Health Records

5. Four thousand seven hundred and eighty-four (4,784) ADF personnel were deployed to Bougainville between November 1997 and June 2003 as part of Operations BEL ISI I & II. The original intention was to include Unit Medical Records (UMRs) for all Bougainville veterans in the Bougainville Health Study and a matched comparison group who did not deploy to Bougainville but were eligible to do so. Due to logistical and human resource limitations associated with obtaining UMRs, this was not possible within the timeframe and the sample for Defence health data was reduced.

6. Previous Defence Deployed Health Studies used Central Medical Records (CMRs) to access Defence health data. For the Bougainville Health Study UMRs were sought rather than CMRs as they are considered to be more complete, up-to-date and contain the vaccination record, which is not duplicated in the CMR.

2.1.1 Accessing Ex-Serving Members' UMRs

7. Ex-serving Navy and Army UMRs were requested from the relevant Defence Medical Records storage facilities. After staff conducted a database search it was established that 75% of ex-serving Army UMRs were not located at the Army Medical Record facilities at Victoria Barracks as expected, but instead had been archived to Dandenong. This delayed data collection while negotiations took place with the Dandenong facility on how the consequential management and human resource impacts would be addressed.

8. Files for ex-serving RAAF personnel were obtained from the Micro Imagery of RAAF Medical Records (MIRMER) project. Over 90%of files were available for capture.

2.1.2 Accessing Serving Members' UMRs

9. UMRs of serving members are located at the members' supporting unit health facilities. PMKeyS data was used to locate members and the relevant unit health facilities were identified and requested to supply the UMRs to CMVH. The original intention was for all files to be sent via courier to CMVH for data extraction.

10. Several significant difficulties were experienced in trying to obtain access to serving members' UMRs. More than half of the files requested were not at the location indicated by the PMKeyS unit address data. Many units expressed a reticence to supply files to an organisation outside of Defence. Several units were already functioning at capacity and did not have the available resources to supply the UMRs within the timelines. Other units were concerned that the UMRs would be needed for deployment or a medical appointment.

11. An Army Reserve Nursing Officer was appointed by CMVH as a Defence Liaison to assist in negotiations with health facilities and the refinement of protocols. In response to feedback from units contacted three additional methods of data collection were developed.

2.1.3 Additional Options Offered

12. Option 1. Photocopied extracts of the relevant documents could be supplied to CMVH in place of the UMR itself. This method required additional human resources from the unit health facilities but files no longer needed to be released.

13. Option 2. Onsite data extraction by CMVH staff was offered to several Defence centralised locations with multiple units and a large concentration of files. Research assistants were sent to health facilities in Darwin, Canberra and Townsville for up to two weeks as well as to facilities within a reasonable travel time from the CMVH UQ node. This option had the least resource impact on the health facilities involved. However, it generated a significantly higher access cost per file due to the related expenses of travel, accommodation and subsistence allowances for the CMVH staff.

14. Option 3. In a small number of unit health facilities CMVH was able to coordinate onsite data collection by employing or funding staff at that location. Temporary staff, Army Reservists and existing staff members willing to work outside of their normally designated work hours were sought to reduce the human resource impact on the health facilities. This system presented a convenient solution to many of the supporting health facilities, however finding appropriate and available onsite staff was difficult at most locations.

2.1.4 Sample Size Reduction

15. It became apparent that due to the many and varied logistical complications associated with obtaining serving members' UMRs, combined with the unexpected delays in obtaining the UMRs of the ex-serving members, that meeting the intended targets would be impossible within the study's timeframe. Therefore the sample size was reduced. A decision was made to limit the records for currently serving personnel for Army and Navy in both the Bougainville veteran and comparison groups.

16. All ex-serving individuals were retained in the sample. This was based on experience from the Solomon Islands Health Study which had shown that contacting ex-serving members to participate in the self-report questionnaire component of the study was extremely difficult and hence this demographic was under-represented in this component of data collection.

17. The number of currently serving Army personnel files sought was reduced to a 25% sample (845). Records for Navy personnel were reduced by 50% (786). The number of files sought for RAAF was not reduced as there were comparatively few RAAF personnel included in the study. An exception report detailing the reduced scope through sampling was submitted and accepted on 3 April 2008.

18. This service-specific reduction left 53% of the original sample. The changes should still enable sufficient power to detect moderate to large differences in the health and well-being of Bougainville veterans compared with those who did not deploy to Bougainville.

2.2 Defence Health Data Extraction

19. Defence routinely conducts and documents various health assessment activities for individuals and these form the basis of the Defence health data collection. Selected health assessment documents were obtained from the UMR, CMR or MIRMER for individuals in the Bougainville Health Study. These documents were:

The most recent:

a. Annual Health Assessment (AHA) (AD146) (Annex A) – conducted annually
b. Five Yearly Comprehensive Preventive Health Examination (CPHE) (AD147) (Annex B) – a more detailed assessment which replaces the AHA every 5 years
c. Specialist Employment Stream Annual Health Assessment (SESAHA) (AD146-1) – an AHA for those in specialist categories such as divers etc (Annex C)

All Operation BEL ISI I & II:

d. Pre-Deployment Medical Checklists (AD359) (Annex D)
e. Post-Deployment Health Screens (AD369) (Annex E)
f. Health/Medical Insert Slips (AD367) (Annex F) and

All:

g. Yellow Vaccination Booklets (Annex G)
h. Inoculation records and
i. Immunisation records

In the absence of an AHA the most recent:

j. Medical Board (MB) (PM005, PM085, PM128) – similar to and predating the AHA (Annex H) or
k. Supplementary Health Assessment – similar to and predating the AHA (Annex I)
l. Health Assessment – similar to and predating the AHA (Annex J)

In the absence of a CPHE the most recent:

m. Medical Examination Record – similar to and predating the CPHE (Annex K).

20. A UMR, CMR or extract was received for 3138 members of the sample (including 28 individuals later found to have died). The process below describes the methods of data extraction from the medical files.

21. UMRs, CMRs and extracts delivered to CMVH were released into the custody of the senior medical officer at CMVH, LTCOL (Dr) Peter Nasveld (Research

Manager). While the documents were in the custody of CMVH they were either stored in locked cabinets in secure rooms or were under the supervision of a CMVH staff member who held appropriate clearances.

22. Documents collected onsite were either processed in the same manner as they would be at the CMVH office, or copies were made of the relevant forms which were then securely transported to CMVH and processed in the same manner as extracts.

23. At CMVH the forms outlined above were located, de-identified and recorded on a summary sheet. This sheet was then labelled with a specific study number generated for Defence health data. This number is different from the identification numbers used for self-report questionnaire data and for the psychology data, but with consent, is linkable to these sources using a key held at CMVH. The de-identified form was photographed with the study number and saved as a PDF file.

24. The details recorded on the summary sheet and the forms digitally collected were entered into a database. The summary sheet also recorded when a file held no relevant forms, thus documenting that the file had been reviewed.

25. All staff received extensive briefings on the particular nature of this medical-in-confidence data, the importance of confidentiality, signed a confidentiality agreement, and were under supervision of CMVH staff holding security clearances while working with the documents.

26. After all relevant forms had been collected, original documents were returned to their unit health facility and any copied extracts were securely destroyed.

27. Collected PDF files were transferred to the Data Management and Analysis Centre (DMAC) at the University of Adelaide using secure transfer processes: either personal delivery or via registered post person-to-person.

28. DMAC entered the de-identified data from the PDF files into a database that was specifically constructed for the Defence health data in the DHSP studies. Data entry commenced on 17 April 2008 and is continuing.

29. All processes were approved by the Australian Defence Human Research Ethics Committee (Protocol no. 476/07), University of Queensland Behavioural and Social Sciences Ethical Review Committee (Protocol no. 2007000230) and DVA Human Research Ethics Committee (Protocol no. E07/002) (See Annex L).

2.3 Defence Psychology Data

30. DHSP's research protocol included the collection of psychological screening tests routinely conducted by Defence for those who deploy on operations. Specifically, this includes the Return to Australia Psychological Screen (RtAPS), completed on leaving theatre along with individual interviews, and the Post Operational Psychological Screen (POPS), completed six months after return from theatre.

31. The Psychology Research and Technology Group (PRTG), as part of the Directorate of Mental Health, are the custodians of the electronic database containing the RtAPS and POPS data. A process has been established for the management and transfer of the relevant RtAPS and POPS data and is described in Annex J.

32. Data collected from PRTG were de-identified and assigned a unique study number that was different from both the Defence health data and the self-report data study numbers, but with consent linkable to these records. In the study consent form, participants were asked to provide separate consent for linkage between each of the three components of the study: self-report data, Defence health data and Defence psychology data.

33. PRTG provided to DHSP the RtAPS and POPS data for those participants who specifically consented to the linkage of their RtAPS and POPS with their self-report data. For participants who did not provide explicit consent, including those who were not able to be contacted for this study, PRTG agreed to conduct specified analyses for DHSP.

34. As this process relies upon consent from participants, it will be completed after the collection of the self-report component of the Bougainville Health Study is completed.

3 Results

3.1 Defence Health Records

3.1.1 Health Records Collected

35. In total 3138 Defence health records were collected for the Bougainville Health Study. Table 1 provides a summary of the files collected and the revised sample size.

Table 1: Files Available

	Population	*Revised Sample*		*Files Available*	
Service	*N*	*N*	*% of Population*	*N*	*% of Revised Sample Available*
Navy	2115	1325	(63)	992	(75)
Army	4718	2179	(46)	2023	(93)
RAAF	304	302	(99)	123	(41)
Total	7137	3806	(53)	3138	(82)

36. The majority of UMRs for ex-serving personnel were able to be obtained. UMRs for currently serving members were far more difficult to acquire. Table 2 shows the number of files requested by CMVH and the number that were available for data collection.

Table 2: UMRs Requested and Available

	Currently Serving			*Ex-Serving*		
	Requested	*Available*		*Requested*	*Available*	
Service	*N*	*N*	*%**	*N*	*N*	*%**
Navy	1488	290	(19)	539	522	(97)
Army	1177	647	(55)	1334	1254	(94)
RAAF	248	51	(21)	53	46	(87)
Total	2913	988	(34)	1926	1822	(95)

*Denominator = number of files requested

37. The lower availability of UMRs can be primarily attributed to files not being located where the PMKeyS data indicated in the unit address fields. Some files were in use or deployed with the member. Some unit health facilities had additional UMRs, but did not have the resources to supply the files within the timelines of the study and CMVH was unable to arrange additional staff to assist at the facility. Table 3 presents the reasons reported by units for UMRs being unavailable. No reason was supplied for 1811 of the inaccessible files, though feedback from the unit health facilities suggests that most of these were not at the location they were requested from.

Table 3: Reported Reasons for UMR Unavailability

Reason Reported	*N*	*%*
*Files Not With This Unit**	166	(63)
File In Use	31	(12)
*Member Not With This Unit**	20	(7.6)
On Deployment	16	(6.1)
With Member	11	(4.2)
On Course/Exercise	7	(2.7)
Other	7	(2.7)
Member Discharging	4	(1.5)
Total	262	

*'Member Not with This Unit' was belatedly introduced as an option on the tick sheet. Prior to this they would likely have been recorded under 'Files Not With This Unit'

38. Where the UMR was not available the CMR was requested. Table 4 shows the number of CMRs collected in place of UMRs and what proportion of the total files collected they represented.

Table 4: Serving Members' CMRs Collected

	Bougainville Veterans			*Comparisons*			*Total*		
	Total Files Available	*CMRs Collected*		*Total Files Available*	*CMRs Collected*		*Total Files Available*	*CMRs Collected*	
Service	*N*	*N*	*%*	*N*	*N*	*%*	*N*	*N*	*%*
Navy	682	93	(14)	310	94	(30)	992	187	(19)
Army	1255	136	(11)	768	24	(3.1)	2023	160	(7.9)
RAAF	90	15	(17)	33	11	(33)	123	26	(21)
Total	2027	244	(12)	1111	129	(12)	3138	373	(12)

3.1.2 Health Assessment Forms

39. The most recent Annual Health Assessment (AHA) and the most recent Comprehensive Preventative Health Examination (CPHE) were collected. If no AHA or CPHE were available the most recent equivalent form was captured as described by the protocol. Table 5 shows the number of forms that contained an AHA or older equivalent.

Table 5: Number of Files Containing an AHA or Equivalent Form

	UMR/CMR /MIRMER Available	*AHA or SESAHA in File*		*AHA Equivalent in File*		*Total Files Containing an AHA or Equivalent*	
Service	*N*	*N*	*%*	*N*	*%*	*N*	*%*
Navy	992	556	(56)	210	(21)	766	(77)
Army	2023	916	(45)	778	(38)	1694	(84)
RAAF	123	66	(54)	6	(4.9)	72	(59)
Total	3138	1538	(49)	994	(32)	2532	(81)

40. Table 6 shows the number of files that contained a CPHE or older equivalent.

Table 6: Number of Files Containing a CPHE or Equivalent Form

	UMR/CMR/ MIRMER Available	*CPHE in File*		*CPHE Equivalent in File*		*Total Files Containing a CPHE or Equivalent*	
Service	*N*	*N*	*%*	*N*	*%*	*N*	*%*
Navy	992	671	(68)	242	(24)	913	(92)
Army	2023	1220	(60)	250	(12)	1470	(73)
RAAF	123	78	(63)	9	(7.3)	87	(71)
Total	3138	1969	(63)	501	(16)	2470	(79)

41. The Bougainville deployment ended in August 2003 and therefore any AHAs or CPHEs collected after that date were conducted after any exposures in Bougainville. Table 7 shows the number of members' files whose most recent AHA, CPHE or older equivalent was conducted after August 2003.

Table 7: AHAs and CPHEs or Equivalents Conducted Post Bougainville Deployment

	UMR/CMR/ MIRMER Available	*AHA or Equivalent Post 2003*		*CPHE or Equivalent Post 2003*	
Service	*N*	*N*	*%*	*N*	*%*
Navy	992	444	(45)	532	(54)
Army	2023	791	(39)	871	(43)
RAAF	123	41	(33)	43	(35)
Total	3138	1276	(41)	1446	(46)

3.1.3 Deployment Forms

42. Any Pre-Deployment forms, Post-Deployment forms or health insert slips for Operations BEL ISI I & II were collected. It is important to note that completion of pre- and post-deployment health check forms did not become a regular practice until after 2001. This will have contributed to the low rates of deployment forms collected.

43. Table 8 shows the number of BEL ISI I & II deployment forms and health insert slips collected from the files of Bougainville veterans.

Table 8: Deployment Forms Collected for the Veteran Group

	UMR/CMR/ MIRMER Available	*Pre-Deployment Form*		*Health/Medical Insert Slip*		*Post-Deployment Form*	
Service	*N*	*N*	*%*	*N*	*%*	*N*	*%*
Navy	682	26	(3.8)	46	(6.7)	0	(0.00)
Army	1255	474	(38)	356	(28)	4	(0.32)
RAAF	90	23	(26)	10	(11)	0	(0.00)
Total	2027	523	(26)	412	(20)	4	(0.20)

3.1.4 Vaccination records

44. Table 9 shows the availability of vaccination records within the files. 'Other Vaccination Records' includes the inoculations summary on the cover of the UMR or a similar document specific to vaccinations only. It does not include consent forms to receive a vaccine unless it specifically states that the vaccine was administered. Some records contained both a yellow book and another form of vaccination record. This has been accounted for in the total number of records containing some type of vaccine data.

Table 9: Vaccination Details Available

	UMR/CMR/ MIRMER Available	*Yellow Book*		*Other Vaccination Record*		*Number with Any Vaccination Records*	
Service	*N*	*N*	*%*	*N*	*%*	*N*	*%*
Navy	992	440	(44)	392	(40)	645	(65)
Army	2023	697	(34)	1278	(63)	1384	(68)
RAAF	123	26	(21)	30	(24)	44	(36)
Total	3138	1163	(37)	1700	(54)	2073	(66)

45. Vaccine data were available for the majority of Navy members, but unavailable for the majority of RAAF members. This may be attributable to the majority of RAAF files being collected from MIRMER, which does not include vaccination data.

46. A key reason that UMRs were sought in favour of CMRs was the presence of vaccination records. Table 10 compares the availability of these data in the UMRs collected with that of the files collected as CMRs or MIRMER. The UMRs were far more likely to include vaccination data than the CMRs and MIRMER.

Table 10: Vaccination Data Availability in UMRs and CMRs or MIRMER

	Total Available	*Contained Vaccination Records*	
File Type	*N*	*N*	*%*
UMR	2765	1981	(72)
CMR/MIRMER	373	72	(19)
Total	3138	2053	(65)

3.1.5 No Forms Available

47. A small number of the files collected contained none of the forms defined in the protocol. Table 11 provides the details of these files.

Table 11: No Forms Available

	UMR/CMR/ MIRMER Available	*No Forms Being Collected Available*	
Service	*N*	*N*	*%*
Navy	992	3	(0.3)
Army	2023	74	(3.7)
RAAF	123	4	(3.3)
Total	3138	81	(2.6)

3.2 Defence Psychology Data

48. The collection of the Defence psychology data for the Bougainville Health Study is more complex than it was for the earlier Solomon Islands Health Study. The types of data and the nature of the RtAPS and POPS screening processes varied over time and were not standardised until approximately 2003. Consequently, the data has been stored in multiple data bases by PRTG. DHSP has been working with PRTG on practical methods of combining the databases for the purposes of the Bougainville and East Timor Health Studies. This process is ongoing

49. The collection of the psychology data relies on the completion of the self-report component of the Bougainville Health Study, when details of consent are completed, collated and supplied to PRTG. Further, the collection of RtAPS and POPS data requires the completion of the screening process and entry of the screen into the database for the appropriate deployment. Finally, an individual can only consent if they were: a) successfully contacted by DHSP; and, b) agreed to participate in the study. Table 12 details those who consented to the linkage of their RtAPS and POPS data for the Bougainville study.

Table 12: Proportion of consenting participants

	Participated in Bougainville study	*Consented to linkage*	*N**
Bougainville veterans	2201	1785 (81%)	4736

* *Does not include those who have died or emigrated – see Table 1 Completion of Self-Report Data Collection Bougainville Health Study.*

50. It has been agreed that analysed aggregate data on Bougainville veterans who did not consent to access to the psychological screens will be provided by PRTG at the request of CMVH. This request will be made following the analysis of the data for those who have consented.

4 Discussion

4.1 Defence Health Data

51. Obtaining access to the serving members' UMRs was the greatest difficulty faced in the collection of the Defence Health Data. The system used for this study was both costly and labour-intensive. In future studies it is recommended that a different system of locating and accessing the data be implemented.

4.1.1 Accessing UMRs

52. Substantial negotiation was required to arrange access to the UMRs and to verify that the study was genuine. While the Defence liaison greatly expedited the negotiation process, in practice it had to be repeated with each service, base and health facility, and frequently with individual units across Australia. This significantly delayed the rate of access to the UMRs.

53. The most efficient method of obtaining the data from the UMRs was to employ staff from the local area to photocopy the relevant forms and send the extracts to CMVH for processing. This method minimised impact on the unit health facilities and reduced couriering costs. It also meant that files did not have to leave the facility.

54. Existing staff able to work outside their normal hours or reservists were an ideal solution. However, locating appropriate and available staff was not possible at some locations. Due to privacy concerns, most unit health facilities preferred that only staff with a health background be appointed. Further, some medical facilities at locations such as Robertson Barracks in Darwin specifically stated that they did not want casuals employed from the local area to work on the medical files. The concern was that likely employees would be spouses of military members serving in location and knowing other personnel employed on the base. Consequently, a breach of the privacy of individuals was more plausible.

55. At two locations temporary staff were hired from a recruitment agency. This was more costly to CMVH and the staff had to be trained and supervised by the unit health facility at their cost. This method presented a lower access cost per file than sending CMVH staff while decreasing human resource impact on the facility.

4.1.2 Locating UMRs

56. PMKeyS data were used to locate serving members and the relevant unit health facilities were contacted with a request for the UMRs. Frequently the unit health facilities held fewer than 60% of the files indicated by the PMKeyS unit address data. In two instances entire units were located at a different base from that which was listed.

57. The PMKeyS data were updated three times during 2008. Additionally adjustments were made to the data being collected along with a revision to how it was being interpreted. These updates had very little effect on success rates. The lowest success rates were found in Reserve and administrative units, as would be expected.

58. The discrepancy between the PMKeyS-identified unit address and actual location of a particular UMR at a given point in time appears to be an inherent difficulty in sourcing these files. They are dynamic documents which are constantly

in use and as mobile as their members. Changed locations as a result of this high mobility do not always appear to be accurately reflected in the PMKeyS system at a given point in time. Included in Appendix 1 is a case study describing the issues faced while trying to locate and access files in Canberra.

4.1.3 Availability of Vaccination Data in UMRs

59. A key reason for accessing UMRs as opposed to CMRs was that UMRs contain vaccination data that is not routinely copied into the CMR. The UMRs collected did contain substantially more vaccination data than the CMRs and MIRMERs collected.

4.1.4 Staff

60. Due to the highly variable flow of available files, and hence work, casual staff were employed to extract the data. CMVH chose to employ predominantly medical students as they have completed tertiary study in medical ethics and are familiar with medical records. This process worked very well over the university holiday periods, but caused significant staffing difficulties during university exam periods as the majority of the casual staff became unavailable for work.

61. For future studies it is recommended that measures be taken to ensure a more steady supply of work. This would allow a small number of full-time or part-time staff with reliable availability to be employed, with casual staff appointed to assist during periods of high turnover.

5 Conclusion

62. Defence health data potentially provides a significant contribution to the Deployment Health Surveillance Program studies, as they can increase coverage of the study population and have potential to reduce recall and self-report biases. However, accessing the data is both costly and labour-intensive. Analysis of the data will further inform decisions about its usefulness for Defence health surveillance. Questions of cost-benefit, feasibility and logistics will be addressed once the value of each data item and form is assessed.

63. For future studies it is recommended that the process for obtaining Defence health data be reviewed and a more efficient system for obtaining the data be found. A Defence-wide system of electronic health records would greatly facilitate up-to-date and efficient data collection for future Defence health surveillance.

Appendix 1: Canberra Case Study

The following case study highlights the systemic and logistic problems encountered when CMVH undertook to source serving members' UMRs for data collection. It also provides an example of excellent cooperation and assistance between Navy and CMVH in the ACT region.

Based on the information provided by PMKeyS, the ACT region was identified as holding 1664 TriService UMRs required. Some consideration was given to the fact that there were a number of very senior TriService Defence personnel in the ACT cohort. There were concerns expressed by the CMVH Senior Medical Officer regarding the appropriate manner in which to handle these UMRs. In order to address these concerns and the general logistical issues related to the access to such a large number of UMRs, the Defence Liaison for CMVH met with the Senior Health Officer (SHO) and Company Sergeant Major (CSM) for the Area Health Service, ACT and Northern NSW to negotiate options.

Following this meeting the CSM undertook a 100% audit on the 1664 members that PMKeyS indicated were located within the region. Of this figure, 382 were identified as being located within ACT and 70 were identified as location unknown. No alternate location for the unavailable files was able to be provided. The majority of the unavailable files were listed as being posted to the Directorate General of Navy Personnel and Training. This was identified to be an Administrative nominal posting location and in fact the member and their UMR were physically at an alternate location.

Although the numbers were substantially reduced, the decision was made that with the possibility of collecting data from 382 UMRs the most efficient course of action was to collect data onsite. In June a team of three research assistants was sent to the ACT for one week to extract data onsite across the various health centres including Russell Offices, HMAS Harman, Duntroon and Weston Creek. Of the 382 files sought, only 198 files were available for data capture.

In July 2008 a review of Navy files available in the Canberra region was conducted under direct orders of the Senior Navy Health Officer. An audit was undertaken by the Navy point of contact via the Navy MIMME data system at the Duntroon Health Centre with the assistance of an APS staff member. Of a list of over 700 names that revised PMKeyS data indicated should be present, only 35 files were confirmed to be within the region. Of that 35, four files were in use or with the member and were unavailable. As with the previous audit, the majority of the unavailable files were from the Directorate General of Navy Personnel and Training.

Whilst Navy and the ACT AHS provided CMVH with a high level of support and assistance, only a relatively low percentage of requested files were able to be obtained. In a large number of instances no alternative source of current UMR sites was identified.

Annexes

Annex A: Annual Health Assessment

Annex B: Comprehensive Preventative Health Examination

Annex C: Specialist Employment Stream Annual Health Assessment

Annex D: Pre-Deployment Medical Checklist

Annex E: Post-Deployment Health Screen

Annex F: Health/Medical Insert Slip

Annex G: Yellow Vaccination Booklet

Annex H: Medical Board

Annex I: Supplementary Health Assessment

Annex J: Health Assessment

Annex K: Medical Examination Record

Annex L: Ethics Approval

Annex M: Process for management and transfer of relevant RtAPS and POPS data

File Reference: DHSP - 070501

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

Commodore Robyn Walker
DHSD
CP20-2-021
CAMPBELL PARK ACT 2600

Dear Robyn

Re: Defence Health Surveillance Program – Solomon Islands Health Study

I am writing to seek your advice on the appropriate process to follow and personnel to contact with regard to obtaining the Defence owned psychological data relating to the Solomon Islands Health Study.

The intention to utilise Defence owned psychological data was described in the research plan approved by the Program Management Board (PMB) and in various ethics protocols. Specifically, the plan is to access and analyse the RtAPS and POPS psychological screens held by Defence on those service personnel deployed to the Solomon Islands who form our veteran sample for the Solomon Islands Health Study. The nature of the data is detailed in Enclosure 1.

While we understand the Psychology Research and Technology Group manage these data, it is currently unclear who owns the data. Therefore, would it be possible for you to, firstly, clarify who will direct the release of the data and, secondly, outline any specific processes we would be required to follow to obtain the data? Direct Liaison Authority with relevant stakeholders would be appreciated in order to facilitate clear and direct communication. This will assist in establishing comprehensive processes and documenting standard operating procedures that can, in turn, be employed for the Bougainville, East Timor and MEAO studies.

Thank you for your consideration of this request. I anticipate that your clarification of the issues raised will assist to progress this aspect of the study in a meaningful and transparent way.

Yours Sincerely

Cate D'Este

Associate Professor Cate D'Este
First Chief Investigator
Solomon Islands Deployment Health Study
Deployment Health Surveillance Program

1st May 2007

Enclosure 1:

DATA Requirements

1. RtAPS and POPS for the Solomon Islands Health Study sample
2. Individual item results and scores for each participant.
3. Cut off scores used by Defence
4. Categorical data used by Defence
5. Validation of measures conducted by Defence
6. Documentation relating to known systematic biases.

Use of the data

1. Data will be deidentified prior to analysis.
2. Where the participant has expressly consented to linkage with their self reported data and their Defence data, specific protocols relating to linkage of deidentified data will be followed.
3. Where consent has not been granted, we will use deidentified data for overall analysis of the sample.

COPY

Australian Government
Department of Defence
Defence Support Group

Defence Health
Services Division
CP2-7-194
Campbell Park

2003/28092/1
PRTG/OUT/2007/33

Associate Professor Cate D'Este
Centre for Military and Veterans' Health
Level 2, Mayne Medical School
Herston Road
Herston QLD 4006

Dear Cate,

RE: DEFENCE HEALTH SURVEILLANCE PROGRAM – RTAPS/POPS DATA REQUEST

Reference:

A. DHSP 070501 of 1 May 2007

1. In response to your query of 1 May 07, the RtAPS and POPS records are classified as Psychology-in-Confidence and are controlled by the Defence Force Psychology Organisation (DFPO) and managed by the Psychology Research and Technology Group (PRTG). Requests for data may be made to COL Peter Murphy, Director DFPO.

2. It is noted that you are seeking to obtain records that fall into two categories:

   a. Records that are identifiable and which will be linked to other data sets following receipt of consent from the individuals concerned;

   b. De-identified records for which consent for access has not been obtained.

3. With regard to 2(a), a data request form and proposed agreement for use of the data are attached (Enclosure A and B). The data request form seeks to clarify what data is required. The data use agreement protocol is designed to provide Defence with an assurance that the data will be used in accordance with agreed conditions of use.

4. These should be completed and forwarded to COL Murphy with a minute requesting release of the relevant records. Copies of completed consent forms for participating individuals should also be enclosed.

5. With respect to 2(b), the process for accessing de-identified data for deployment-related mental health screens (5(a) above) is to request data summary reports or technical briefs from PRTG, specifying details of the analyses you request. A data summary report request form is attached (Enclosure C). These reports will be released through Head Defence Health Services.

6. For assistance in requesting RtAPS and POPS data and data summary reports (Reference A, Enclosure 1, Data Requirements 1 and 2), including queries regarding the data use agreement protocol, my point of contact is Ms Helen Wood, on (02) 6266 3193.

7. With regard to the additional request for information relating to the use of psychological screens within Defence (Reference A, Enclosure 1, Data Requirements 3 to 6), you may liaise directly with Ms Wood.

8. If you require further assistance please contact either Ms Wood or Mr John Maguire, Programme Manager on (02) 6266 3879.

Yours sincerely,

R.M. WALKER
Commodore
Director General Strategic Health Personnel and Plans
Defence Health Services Division

28 May 07

Enclosures:

Enclosure A. Data Request Form
Enclosure B. Data Use Agreement
Enclosure C. Data Summary Report – Request Form

Australian Government
Department of Defence
Defence Support Group

DEFENCE FORCE PSYCHOLOGY ORGANISATION
PSYCHOLOGY RESEARCH AND TECHNOLOGY GROUP

DATA REQUEST FORM

Date of Request:	**Required Date of Completion**:
Requestor's Name:	**Section/Organisation**:

Is the data to be identifiable? Yes ☐ No ☐

If 'Yes' are copies of the original consent forms enclosed with this form? Yes ☐ No ☐

Details of data required (e.g. Dates, Task Group, Operation, Screening Instruments, Form type, etc)**:**

Reason for Request:

Details of Data Provided:

Release Authority (DDFPO) _____ _____ __/__/__
(name) (signature) (date)

Psychology Research and Technology Group Use Only

Point of Contact:

Phone Number:

Date Completed: **Request file number:**

Psychology Research and Technology Group Use Only

Australian Government
Department of Defence
Defence Support Group

DEFENCE FORCE PSYCHOLOGY ORGANISATION
PSYCHOLOGY RESEARCH AND TECHNOLOGY GROUP

DATA USE AGREEMENT

The following agreement provides conditions of use for psychology records, controlled by the Defence Force Psychology Organisation, and supplied to the Centre for Military and Veterans health (CMVH) by the Psychology Research and Technology group for the purpose of research.

I, _____ (Name), First Chief Investigator for the _____ (Name of study) agree to the following conditions of use:

a. The data will be managed in accordance with the Commonwealth Privacy Act 1988 National Health and Medical Research and Defence guidelines;

b. The data will be used only in accordance with obligations outlined in contractual arrangements between CMVH and the Department of Defence regarding the above-named research;

c. The data will be used only for such purposes as approved in the ADHREC Protocol (Protocol No_____), and for no other purpose;

d. The data will be destroyed following completion of the study in accordance with ADHREC guidelines;

e. The data will held in a secure location; and,

f. The data will not be released to any third party for any reason, unless legally obliged to do so.

_____ ___/___/___
(Signature) *(Date)*

Australian Government
Department of Defence
Defence Support Group

DEFENCE FORCE PSYCHOLOGY ORGANISATION
PSYCHOLOGY RESEARCH AND TECHNOLOGY GROUP

DATA SUMMARY REPORT – REQUEST FORM

Note that this form is to be completed in consultation with a Psychologist at PRTG. Please contact the relevant PRTG section for advice on (02) 6266 3193.

Requested From:

Section/Organisation:

Date Requested:

Date Required:

Information/Analysis Requested:

Reason for Request:

(PRTG Office Use Only)

Report Number:

Author:

Date Completed:

Information Provided:
(Copy of summary report attached here)

Summary Results:

ANNEX H

MEDICAL-IN-CONFIDENCE *(After first entry)*

AD 146
Revised Dec 2004

Department of Defence

Annual Health Assessment

- ***Use only black pen and/or stamps***

Health facility	
Service	
Unit, ship or section	
Corps, category or mustering	
Reason for assessment	
Current medical classification / Date of last five yearly examination	

Number		
Rank		
Family name		
Given name(s)		
Date of birth	Age	Gender

Encl or Folio

Patient to complete

General health

Do you have any current illnesses?

☐ Yes ☐ No

Details of current illnesses

Do you have any current injuries?

☐ Yes ☐ No

Details of current injuries

Have you undergone any operative procedure in the last 12 months?

☐ Yes ☐ No

Details of operative procedures within the last 12 months

Are you presently taking prescription medication or non prescription medication?

☐ Yes ☐ No

Details of medication *(Prescription, non prescripton, vitamins, etc)*

Patient to complete

Do you smoke?

☐ Yes ☐ No

Quantity

Do you drink alcohol?

☐ Yes ☐ No

Amount per day	How often do you drink?

How often do you feel that your present lifestyle is putting you under too much stress?

☐ Often ☐ Sometimes ☐ Seldom ☐ Never

During the past two weeks, how much stress have you experienced?

☐ A lot of stress ☐ A moderate amount of stress ☐ Relatively little stress ☐ Almost no stress at all

Have you been deployed overseas within the last 12 months?

☐ Yes ☐ No

Details of deployment

Date	Location

Do you wear glasses or contact lenses?

☐ Yes ☐ No

Have you had a dental check within the last 12 months?

☐ Yes ☐ No

Have you passed your annual fitness test?

☐ Yes ☐ No

NO, AMA, SMA or authorised delegate to complete

Height	Weight	BMI	Blood pressure
Pulse rate	Faecal occult blood test *(Result)*		FOBT date

Females

Pap smear date ☐ Not applicable	Mammogram date ☐ Not applicable
Pap smear result	Mammogram result

**** Perform lifestyle counselling at every opportunity ****

Number	Rank	Given name(s)	Family name	Encl or Folio

NO, AMA, SMA or authorised delegate to complete

Serology

HIV ☐ Positive ☐ Negative	Hep C ☐ Positive ☐ Negative
Hep B ☐ Positive ☐ Negative	Date serology performed
G6PD *(Once only)* ☐ Positive ☐ Negative	G6PD date

Are routine vaccinations required?
☐ Yes ☐ No

List vaccinations required

Hearing

	250	500	1000	1500	2000	3000	4000	6000	8000	Hearing standard
R										
L										

Comments

NO, AMA, SMA or authorised delegate to complete

P	U	L	H	E	E	M	S

MEC

Specialist employment classification

Action required

Problem	Action

Are vaccinations complete?
☐ Yes ☐ No

Is a continuation sheet attached?
☐ Yes ☐ No

Has UMR been reviewed?
☐ Yes ☐ No

Does assessment require a review by a Medical Officer?
☐ Yes ☐ No

Medical Individual Readiness Recommendation
☐ Fit ☐ Unfit

NO, AMA, SMA or authorised delegate conducting health assessment

Signature	Printed name	Rank or title	Phone number	Date

Confirming authority *(If required)*

Signature	Printed name	Rank or title	Phone number	Date

**** Perform lifestyle counselling at every opportunity ****

AHA Personal Health Summary Report

Rank	Given name(s)	Family name	Encl or Folio
Number	Age	Unit, ship or section	Date

This report gives an overall summary of your health status and provides advice to promote improved health.
Consult your Health Personnel if you have any questions or concerns.

Medical classification

Current MEC

Body weight

	Desirable	Actual
Height		
Weight		
BMI	Between 20.0 and 26.9	

Screening

Blood pressure	Normal range < 130/80 mmHg	

Other screening

Test	Result	Action

Blood profile

	Normal range	Actual
Cholesterol (mmol / l)	Less than 5 mmol / l	
HDL (mmol / l)	Greater than 1 mmol / l	
LDL (mmol / l)	Less than 3 mmol / l	
Ratio (HDL / LDL)	Less than 1:3	

Personal health issues

	Action
Smoking	
Alcohol or drugs	
Sun protection	
Diet	
Physical activity	
Oral hygiene	
Stress or mental health	

Recommendations or follow up action

Is a review appointment required?

☐ Yes ☐ No

Date

Completed by

Signature	Printed name	Rank or title	Phone number	Date

ANNEX I

AD 147
Revised Feb 2007

Department of Defence

Comprehensive Preventive Health Examination

- ***Use only black pen and/or stamps***

Health facility		Number			Encl or Folio
Service		Rank			
Unit, ship or section		Family name			
Corps, category or mustering		Given name(s)			
Reason for assessment		Date of birth	Age	Gender	
Current medical classification	Date of last five yearly examination				

Patient to complete

Family History

Have any of your family suffered from Heart disease, high blood pressure, diabetes, depression, stroke etc?

☐ Yes ☐ No

Relationship	Problem

General Health

Have you had any persistent cough?
☐ Yes ☐ No

Have you had any unusual shortness of breath or exertion?
☐ Yes ☐ No

Have you had any chest pains?
☐ Yes ☐ No

Have you had any persistent abdominal pains or cramps?
☐ Yes ☐ No

Have you suffered any persistent indigestion or heartburn?
☐ Yes ☐ No

Have you experienced any change of bowel habits?
☐ Yes ☐ No

Have you passed blood with your bowel motions?
☐ Yes ☐ No

Has your weight changed significantly?
☐ Yes ☐ No

Are you on any special diet?
☐ Yes ☐ No

Have you had any changes in passing urine?
☐ Yes ☐ No

Patient to complete

General health *(continued)*

Do you experience any menstrual problems?
☐ Yes ☐ No ☐ Not applicable

Have you had any pain or swelling in the scrotum?
☐ Yes ☐ No ☐ Not applicable

Do you have any persistent muscular pain or weakness?
☐ Yes ☐ No

Do you suffer migraines or severe headaches?
☐ Yes ☐ No

Do you suffer dizzy spells, fits, fainting ?
☐ Yes ☐ No

Do you experience any problems with your hearing ?
☐ Yes ☐ No

Do you experience any problems with you vision ?
☐ Yes ☐ No

Do you have any problems sleeping ?
☐ Yes ☐ No

Do you have current illnesses or injuries ?
☐ Yes ☐ No

Have you had any operative procedures since your last medical ?
☐ Yes ☐ No

Have you received medical care outside of the ADF since your last medical ?
☐ Yes ☐ No

If you answered 'Yes', to any questions, please describe

Number	Rank	Given name(s)	Family name	Encl or Folio

Patient to complete

Current medications

Are you taking any prescription or non-prescription medication?

☐ Yes ☐ No

Are you taking any vitamins or alternative therapies?

☐ Yes ☐ No

Details of medication, vitamins or alternative therapies

Allergies

Have you any allergies?

☐ Yes ☐ No

Details of allergies

Preventive health

Stress

How often do you feel that your present lifestyle is putting you under too much stress?

☐ Often ☐ Sometimes ☐ Seldom ☐ Never

During the past two weeks, how much stress have you experienced?

☐ A lot of stress ☐ A moderate amount of stress ☐ Relatively little stress ☐ Almost no stress at all

Is there any other health problem troubling you?

☐ Yes ☐ No

Details of problems troubling you

Patient to complete

Smoking history

Do you smoke?

☐ Yes ☐ No ☐ Never smoked OR Quit date

If 'Yes, what do you smoke?

☐ Cigarettes ☐ Other Please describe

How much do you smoke per day ?

How long have you smoked for ?

Exercise

How many days per week do you exercise

What type of exercise do you do?

☐ Sport

☐ Gym

☐ Unsupervised or individual

☐ Other

Please describe

How many sessions per week do you exercise *(One session equals 30 minutes of exercise)*

Sun protection

Do you use sun protection *(Hat, blockout, clothing, etc)*?

☐ Yes ☐ No

Do you regularly check for new moles or skin lesions ?

☐ Yes ☐ No

Contraception

Do you use contraception?

☐ Yes ☐ No

Females

Have you had pap smear in the last two years?

☐ Yes ☐ No

If over 50, have you had a mammogram in the last two years?

☐ Yes ☐ No

Operational factors

Have you seen the dentist in the last 12 months?

☐ Yes ☐ No

Date

Have you passed your fitness test in the last 12 months ?

☐ Yes ☐ No

Date

Do you wear glasses or contact lenses?

☐ Yes ☐ No

Date of last optometry or opthamology examination *(Month and year)*

Number	Rank	Given name(s)	Family name	Encl or Folio

Patient to complete

Operational factors *(Continued)*

Have you been deployed overseas since your last medical?

☐ Yes ☐ No

Details of deployment

Date	Location

Do you have any specific occupational or workplace exposure hazards or concerns *(eg radiation, noise, solvents, etc)*

Patient to complete

Aircrew only

Type of aircraft currently being flown

Type of aircraft that you have the most flying hours with

Total flying hours

Total military flying hours for the last six months

Total civilian flying hours for the last six months

Total aided night flying hours for last six months

Total unaided night flying hours for last six months

Date of last CASA medical examination

Parachutists only

Approximate date of your first jump

Current level of jump qualifications

Approximate number of military jumps

Approximate number of civilian jumps

Date of last chamber run *(Free fall parachutists only)*

Divers only

Date you obtained your qualification

Number of military hours logged

Number of civilian hours logged

Maximum diving depth

Date of maximum dive

Member's certification

I certify that this is an accurate record of my medical history since my last examination and I will immediately report any changes in my medical status to ADF medical personnel

Signature	Phone number	Date

Number	Rank	Given name(s)	Family name	Encl or Folio

NO, AMA, SMA or authorised delegate to complete

Alcohol history

Question 1

How often do you have a drink containing alcohol?

	Points
☐ Never *(Go to Question 9)*	0
☐ Monthly or less	1
☐ 2 to 4 times a month	2
☐ 2 to 3 times a week	3
☐ 4 or more times a week	4

Question 2

How many drinks containing alcohol do you have on a typical day when you are drinking ?

	Points
☐ 1 or 2	0
☐ 3 or 4	1
☐ 5 or 6	2
☐ 7, 8 or 9	3
☐ 10 or more	4

Question 3

How often do you have six or more drinks on one occasion ?

	Points
☐ Never	0
☐ Less than monthly	1
☐ Monthly	2
☐ Weekly	3
☐ Daily or almost daily	4

Question 4

How often after during the last year have you found that you were not able to stop drinking once you started ?

	Points
☐ Never	0
☐ Less than monthly	1
☐ Monthly	2
☐ Weekly	3
☐ Daily or almost daily	4

Question 5

How often during the last year have you failed to do what was normally expected from you because of your alcohol ?

	Points
☐ Never	0
☐ Less than monthly	1
☐ Monthly	2
☐ Weekly	3
☐ Daily or almost daily	4

Question 6

How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?

	Points
☐ Never	0
☐ Less than monthly	1
☐ Monthly	2
☐ Weekly	3
☐ Daily or almost daily	4

NO, AMA, SMA or authorised delegate to complete

Alcohol history *(Continued)*

Question 7

How often during the last year have you had a feeling of guilt or remorse after drinking?

	Points
☐ Never	0
☐ Less than monthly	1
☐ Monthly	2
☐ Weekly	3
☐ Daily or almost daily	4

Question 8

How often during the last year have you been unable to remember what happened during a night of drinking ?

	Points
☐ Never	0
☐ Less than monthly	1
☐ Monthly	2
☐ Weekly	3
☐ Daily or almost daily	4

Question 9

Have you or someone else been injured as a result of your drinking?

	Points
☐ No	0
☐ Yes, but not in the last year	2
☐ Yes, during the last year	4

Question 10

Has a relative, friend, or doctor or another health worker been concerned about your drinking or suggested you cut down?

	Points
☐ No	0
☐ Yes, but not in the last year	2
☐ Yes, during the last year	4

Record total of Questions 1 to 10 here ➡

Do not score Questions 11 and 12. These questions provide an indication of the client's 'readiness to change' or 'motivation to change' their alcohol use. This will assist you in deciding the level of intervention

Question 11

Do you think you presently have a problem with drinking ?

☐ No
☐ Probably not
☐ Unsure
☐ Possibly
☐ Definitely

Question 12

In the next 3 months, how difficult would you find it to cut down or stop drinking?

☐ Very easy
☐ Fairly easy
☐ Neither difficult nor easy
☐ Fairly difficult
☐ Very difficult

**** Perform lifestyle counselling at every opportunity ****

Number	Rank	Given name(s)	Family name	Encl or Folio

NO, AMA, SMA or authorised delegate to complete

Date of last comprehensive medical

Anthropometry

Sitting height	Buttock to knee length	Buttock to heel length

Urinalysis

SG	Protein	Glucose	Blood	Other

Full blood count	Fasting blood glucose

Spirometry

FEV1	FVC	Ratio %

Sharpened rhomberg test

1 min	2 min	3 min	4 min	Total

Age or Specialist Employment Stream specific screening

Height	Weight	BMI	Pulse rate

Blood pressure *(Sitting)*	Blood pressure *(Second reading if required)*

Cholesterol	HDL	LDL	Ratio

Faecal occult blood test *(Result)*	FOBT date

Visual acuity

Distant		Near (N5)	
R6/	Corr to 6/	R	Corr to
L6/	Corr to 6/	L	Corr to

Visual standard	Colour perception

Females

Pap smear date ☐ Not applicable	Mammogram date ☐ Not applicable
Pap smear result	Mammogram result

Hearing

- Refer to form PM - 139 Hearing Conservation Report
- If there is a 10dB or greater difference between left and right ears at any one frequency refer to a Medical Officer.

Date of hearing test

	250	500	1000	1500	2000	3000	4000	6000	8000	Hearing standard
R										
L										

NO, AMA, SMA or authorised delegate to complete

Serology

HIV ☐ Positive ☐ Negative	HEP C ☐ Positive ☐ Negative	
HEP B ☐ Positive ☐ Negative	Date serology performed	
G6PD *(Once only)* ☐ Normal ☐ Deficient	G6PD date	Blood type

Vaccinations

Routine vaccinations	Date of vaccinations
Hep A	
Hep B	
Hep A and Hep B	
MMR	
Sabin	
ADT	
Typhoid	
Mantoux	
Varicella	

Other vaccinations	Date of vaccination
JEV	
Menecevax	
Influenza	
Anthrax	
Smallpox	

Vaccinations required		

NO,AMA or SMA signature		
NO, AMA or SMA printed name		
Rank or title	Phone number	Date

**** Perform lifestyle counselling at every opportunity ****

Number	Rank	Given name(s)	Family name	Encl or Folio

NO to complete
Lifestyle counselling
Have you conducted lifestyle counseling on the following:

Smoking
☐ Yes ☐ No
Comments

Drugs and alcohol
Alcohol audit score
Comments

Sun protection
☐ Yes ☐ No
Comments

Diet *(Including cholesterol, calcium, iron, and energy)*
☐ Yes ☐ No
Comments

Physical activity
☐ Yes ☐ No
Comments

Oral hygiene
☐ Yes ☐ No
Comments

Stress and mental health
☐ Yes ☐ No
Comments

NO to complete
Lifestyle counselling *(Continued)*

Sexual behaviour and STIs
☐ Yes ☐ No
Comments

Clinical examination	Normal	Abnormal
1. Head, face, neck, scalp		
2. Nose		
3. Mouth		
4. Teeth,gums		
5. Ears _ Including drums and valsalva		
6. Eyes - General		
7. Eyes - Ocular motility		
8. Eyes - Ophthalmoscopic		
9. Eyes - Visual fields (Confrontation)		
10. Respiratory system		
11. Cardiovascular system		
12. Peripheral vascular system		
13. Abdomen - Including hernial orifices		
14. Genito-urinary system		
15. Anus - per rectum (if applicable)		
16. Skin		
17. Nervous system		
18. Endocrine system		
19. Upper extremities		
20. Lower extremities		
21. Spinal system		
22. Posture		
23. Gait		
24. Lymphatic system		
25 Mental state		
26. Identifying marks and scars		
27. ECG results		

**** Perform lifestyle counselling at every opportunity ****

Number	Rank	Given name(s)	Family name	Encl or Folio

MO to complete
Clinical examination *(Continued)*

Comments

Are routine vaccinations complete?
☐ Yes ☐ No

Is a continuation sheet attached?
☐ Yes ☐ No

Is UMR available?
☐ Yes ☐ No

Outstanding problems

Problem	Action

MO to complete
Diagnosis of disabilities *(Continued)*

Comments

Restrictions

Comments

P	U	L	H	E	E	M	S

Recommended MEC

Recommended SPEC

Does the member require reclassification?
☐ Yes ☐ No

Is MECR *(Form PM518)* attached?
☐ Yes ☐ No

Has member been referred for MECRB?
☐ Yes ☐ No

**** Perform lifestyle counselling at every opportunity ****

Number	Rank	Given name(s)	Family name	Encl or Folio

MO to complete

Medical fitness recommendation

Is the member cleared for full specialist duties without restrictions?

☐ Yes ☐ No

Has the unit been notified by either PM 101 - Medical or Dental Fitness Advice, PM 64 - Notification of Medical Assessment or by Drivers Log Book?

☐ Yes ☐ No

Comments

MO to complete

Medical fitness recommendations *(Continued)*

Have all outstanding vaccinations been completed?

☐ Yes ☐ No

Has post deployment screening been conducted *(If applicable)*

☐ Yes ☐ No

Is a continuation sheet attached?

☐ Yes ☐ No

Has UMR been reviewed?

☐ Yes ☐ No

Individual readiness status

☐ Ready ☐ Not ready

Is the member in receipt of a Department of Veterans Affairs pension?

☐ Yes ☐ No

Disability percentage

Comments

Medical officer conducting examination

Signature	Printed name	Rank or title	Phone number	Date

Confirming authority *(If required)*

Is MEC valid?

☐ Yes ☐ No

Recommendations

Signature	Printed name	Rank or title	Phone number	Date

**** Perform lifestyle counselling at every opportunity ****

CPHE Personal Health Summary Report

Rank	Given name(s)	Family name	Encl or Folio
Number	Age	Unit, ship or section	Date

This report gives an overall summary of your health status and provides advice to promote improved health.
Consult your Health Personnel if you have any questions or concerns.

Medical classification

Current MEC

Body weight

	Desirable	Actual
Height		
Weight		
BMI	Between 20.0 and 26.9	

Screening

Blood pressure	Normal range < 130/80 mmHg	

Other screening

Test	Result	Action

Blood profile

	Normal range	Actual
Cholesterol (mmol / l)	Less than 5 mmol / l	
HDL (mmol / l)	Greater than 1 mmol / l	
LDL (mmol / l)	Less than 3 mmol / l	
Ratio (HDL / LDL)	Less than 1:3	

Personal health issues

	Action
Smoking	
Alcohol or drugs	
Sun protection	
Diet	
Physical activity	
Oral hygiene	
Stress or mental health	

Recommendations or follow up action

Is a review appointment required?

☐ Yes ☐ No

Date

Completed by

Signature	Printed name	Rank or title	Phone number	Date

ANNEX J

AD 146-1
Revised Dec 2004

MEDICAL-IN-CONFIDENCE *(After first entry)*

Department of Defence

Specialist Employment Stream Annual Health Assessment

(Divers, Submariners, Aircrew, Parachutists, Air Defence Officers and Air Traffic Controllers)

- ***Use only black pen and/or stamps***

Health facility			Number		Encl or folio
Service			Rank		
Unit, ship or section			Family name		
Corps, category or mustering			Given name(s)		
Reason for assessment			Date of birth	Age	Gender
Current MEC	Current SPEC	Date allocated			
Date of last CPHE	Date of last SESAHA				

Patient to complete

General health

Have you had any illnesses since your last medical examination?

☐ Yes ☐ No

Details of current or interim illnesses

Have you had any injuries since your last medical examination?

☐ Yes ☐ No

Details of current or interim injuries

Have you undergone any operative procedures in the last 12 months?

☐ Yes ☐ No

Details of operative procedures in the last 12 months

Are you presently taking prescription or non-prescription medication?

☐ Yes ☐ No

Details of medication *(Prescription, non-prescription, vitamins, etc)*

Number	Rank	Family name	Given name(s)	Encl or folio

Patient to complete

General health *(Continued)*

Have you experienced any of the following in the previous 12 months or since your last medical examination?

	Yes	No	Unsure	Medical Officer's comments *(If insufficient space use 'Additional comments' on page 4)*
1. Eye or vision problems				
2. Eye surgery or vision correction (Refractive) surgery				
3. Continual sneezing, runny nose, itchy eyes or hay fever				
4. Sinus pressure or infection				
5. Deafness, hearing problems or ringing in ear(s)				
6. Ear infections or discharge from the ear				
7. Problems with ears or sinuses when flying, diving or parachuting				
8. Ear surgery				
9. Severe motion sickness, seasickness or loss of balance				
10. Severe or frequent headaches or migraines				
11. Fainting, blackouts or unconsciousness				
12. Convulsions, fits or epilepsy				
13. Head injury or concussion				
14. Heart disease or history of rheumatic fever				
15. Palpitations or awareness of your own heartbeat				
16. High blood pressure				
17. Pain or discomfort in the chest on exertion				
18. Shortness of breath on exertion				
19. Bronchitis, pneumonia or lung abscess				
20. Coughing up blood or phlegm				
21. Chronic or persistent cough				
22. Positive TB skin test				
23. Pleurisy or severe chest pain				
24. Pneumothorax or collapsed lung				
25. Asthma or wheezing				
26. Need to use puffer or inhaler				
27. Chest, lung or heart surgery				
28. Indigestion, peptic ulcer or acid reflux				
29. Vomiting blood or passing red or black bowel motions				
30. Recurrent vomiting or diarrhoea				
31. Any change in bowel habits				
32. Jaundice, hepatitis or liver disease				
33. Hernia				
34. Back injury				
35. Joint problem or sports injury				
36. Limitation of movement				
37. Heat stress or heat illnesses				
38. Cold stress and cold injuries				
39. Fractures (Broken bones)				
40. Paralysis, muscle weakness, numbness or tingling				
41. Kidney or bladder disease (Including stones)				
42. Passing urine more or less frequently than usual				
43. Discharge from penis or vagina				
44. High blood sugar (Diabetes)				
45. Blood diseases or bleeding problem				

Number	Rank	Family name	Given name(s)	Encl or folio

Patient to complete

General health *(Continued)*

	Yes	No	Unsure	Medical Officer's comments *(If insufficient space use 'Additional comments' on page 4)*
46. Skin disease, rashes or skin lesions				
47. Any chronic or contagious disease				
48. Depression or metal illness				
49. Claustrophobia or panic attacks				
50. Experienced weight gain or loss in excess of 5kg				
51. Wires, pins, plates, rods or any surgical implants				
52. Allergies or reactions to medications or foods				
53. Diving, flying or parachuting injuries (Ear or sinus squeeze, barotrauma)				
54. Symptoms of decompression illness (DCI)				
55. Any other problem related to diving, flying or parachuting				
56. Have you received medical care outside the ADF since your last health assessment?				
57. Any possibility of being pregnant? (Females only)				
58. Any incapacity during menstrual periods? (Females only)				
59. Do you smoke?			Quantity	
60. Do you drink alcohol?			Amount per day	How often do you drink

61. How often do you feel that your current lifestyle is putting you under too much stress?

☐ Often ☐ Sometimes ☐ Seldom ☐ Never

62. During the past two weeks, how much stress have you experienced?

☐ A lot of stress ☐ A moderate amount of stress ☐ Relatively little stress ☐ Almost no stress at all

63a. Do you have any concerns about occupational or workplace exposure hazards (eg radiation, noise, asbestos, solvents, etc)?

☐ Yes ☐ No

63b. Are you enrolled in an occupational health surveillance program?

☐ Yes ☐ No

64. Have you been deployed overseas within the last 12 months?

☐ Yes ☐ No

Details of deployment

Date	Location	Date	Location

65. Do you wear glasses or contact lenses?

☐ Yes ☐ No

Date of last optometry or ophthamology examination *(Month and year)*

66. What was the date of your last dental examination? *(Month and year)*

67. Have you passed your annual fitness test?

☐ Yes ☐ No

Number	Rank	Family name	Given name(s)	Encl or folio

Patient to complete

Aircrew only

68. Type of aircraft currently being flown

69. Type of aircraft that you have the most flying hours with

70. Total flying hours

71a. Total military flying hours for the last six months

71b. Total civilian flying hours for the last six months

72a. Total aided night flying hours for the last six months

72b. Total unaided night flying hours for the last six months

73. Date of last CASA medical examination *(If applicable)*

Parachutists only

74. Approximate date of your first jump

75. Current level of jump qualification

76a. Approximate number of military jumps

76b. Approximate number of civilian jumps

77. Date of last chamber run *(Free fall parachutists only)*

Divers only

78. Date you obtained your dive qualification

79a. Number of military hours logged

79b. Number of civilian hours logged

80. Maximum diving depth

81. Date of maximum dive

Additional comments

Member's certification

I certify that this is an accurate record of my medical history since my last examination and I will immediately report any changes in my medical status to ADF medical personnel.

Signature	Phone number	Date

Number	Rank	Family name	Given name(s)	Encl or folio

NO, AMA, SMA or authorised delegate to complete

Height	Weight	BMI	BP *(Sitting)*
Pulse rate	Faecal occult blood test *(Result)*		FOBT date

Females only

Pap smear date ☐ Not applicable	Mammogram date ☐ Not applicable
Pap smear result	Mammogram result

Serology *(If required by HD 210)*

HIV ☐ Positive ☐ Negative	Hep C ☐ Positive ☐ Negative	
Hep B ☐ Positive ☐ Negative	Date serology performed	
G6PD *(Once only)* ☐ Normal ☐ Deficient	G6PD date	Blood type

Are all routine vaccinations up to date?

☐ Yes ☐ No

List vaccinations required

Hearing

- Refer to form PM 139 - Hearing Conservation Report.
- If there is a 10dB or greater difference between the left and right ears at any one frequency refer to a Medical Officer.

Date of hearing test

	500	1000	1500	2000	3000	4000	6000	8000	Hearing standard
R									
L									

Visual acuity

Distant		Near *(N5)*	
R 6/	Corr to 6/	R	Corr to
L 6/	Corr to 6/	L	Corr to

Aircrew only

Date of last eye prescription and refraction

Urinalysis

SG	Protein	Glucose	Blood	Other

Divers and Free fall parachutists only

Sharpened romberg test

1 min	2 min	3 min	4 min	Total
				/240

Spirometry

FEV1	FVC	Ratio %

Other tests

NO, AMA, SMA or authorised delegate conducting health assessment

Signature	Printed name	Rank	Phone number	Date

ANNEX K

[redacted]

Medical - in - Confidence

PREDEPLOYMENT CHECK - 3 HOSP

DATE OF CHECK 08 JUN 99

Unit	176 AD
Category / Mustering	RAADC.

D.O.B. 30 OCT 58 Sex: M

PFT PASS (YES) / NO **DATE:** 15 FEB 99.

If no or not current member not deployable in accordance with PERS 53-13

EMPLOYMENT STANDARD: A G Z CLASS 2

"OPERATION BELISI".

Last Tetanus	09 DEC 92.
HIV / HCV :	17 JUN 95
Spectacles: (script to accompany)	YES / (NO)
Blood Group:	A NEG.
Overseas deployment	(Yes) / No

Destination:	BOUGAINVILLE.
Antimalarial	(YES) / NO
G6PD:	(Normal) / Deficient
Additional Vaccinations:	

DRUG ALLERGIES IN RED: NIL.

MEDICAL CONDITIONS:	MEDICATIONS:
VARICOSE VEINS STRIPPED IN "95" → REOCCURRED CAUSING DISCOMFORT.	NIL.

FIT FOR DEPLOYMENT (YES) / NO

Signature: [signature] Rank: QM Position: [illegible]

MEDICAL-IN-CONFIDENCE (After first entry)

AD 392 - Revised 28 October 2005 Department of Defence

Post Deployment Health Screen

GUIDANCE NOTES ON OBTAINING EXPOSURE HISTORY

The exposure history attempts to broadly determine exposure risk. The exposure to any hazard should be greater than normally encountered in a work setting.

Exposure Risk Assessment Guidance Notes *Describe the circumstances of exposure. Where, how often and how much exposure occurred? Were there any symptoms following exposure? Was any personal protective equipment worn?*

Hazardous Situation	Situation	Advice
Entry to Industrial or Chemical Manufacturing / Storage Sites	Look for genuine exposure to chemicals eg entry to areas where large amounts of chemicals were stored. Note presence of strong odours	No Specific Action For documentation
Oil Fire Smoke /Smoke from waste incineration	How close was the subject to the source? How long was spent within the smoke blanket? Any symptoms noted at the time or shortly after? What type of smoke? Oil, waste or unknown chemical.	No Specific Action For documentation Seek DPH advice if required
Exposure to Diesel Exhaust Fume	This is a common environmental hazard, persons at higher risk are those regularly exposed in poorly ventilated areas, or those subjected to conditions of increased fume density.	No Specific Action For documentation
Fuels (aviation, marine or automotive)	Odour from fuels and small splashes are common and of no significance. Persons at increased risk are those working with fuels in confined spaces for prolonged periods, those who developed symptoms after fuel handling, and those doused in fuel and unable to shower.	No Specific Action For documentation Seek DPH advice if required
Solvents (eg thinners, glues, sealants) and Paints	The type, quantity and frequency of exposure should be noted. Any symptoms experienced during or shortly after use. Aerosolised paints are of particular concern, especially with indoor use. Note the use of a respirator or otherwise.	No Specific Action For documentation Seek DPH advice if required
Pesticides /Herbicides	Thermal Pesticide Foggers — being exposed to the pesticide fog/mist	No Specific Action For documentation
Dusts or Fibres	Exclude sandstorms. The nature/source is important to determine if possible e.g. insulation/building materials/chemicals	No Specific Action For documentation
Non-Ionising Radiation (eg Radar or Microwave Transmitters)	Known incidents of close proximity to powerful transmitting sources whilst transmitting. Generally being in front of or to one side is a particular risk.	No Specific Action For documentation Seek DPH advice if required
Excessive Noise and Vibration	Noise hazards are very common especially in combat areas. All personnel claiming exposure to loud noise should undergo an audiogram.	Audiogram
Lasers	Known or suspected incidents of laser exposure. Note any ocular symptoms.	Measure V/A and visual field. Refer Ophthalmologist
Ionising radiation or radioactive materials	Known contact or proximity to an unshielded IR source. Look for acute health effects which may occur up to several weeks later.	Seek specialist advice re long term health monitoring
Potentially Contaminated Water – either through drinking or swimming	Note any exposure to potentially contaminated water. Note the possible source and type of contamination.	No Specific Action For documentation
Other Incidents or Concerns	An opportunity to raise any other issues of concern to the member.	
Directorate Preventive Health (DPH) contacts	Consultant in Occupational Medicine: (02) 6266 3830 SO2 Occupational Health: (02) 6266 4194	

Department of Defence

Post Deployment Health Screen

Operation Name

Reporting is required in accordance with DGDHS Health Directive 224 - Notifiable Condition Reporting in the Australian Defence Force.

This form is to be attached to the front inside cover of member's Unit Dental Record.

PMKeys number	
Service number	
Rank	
Family name	
Given name(s)	
Date of birth	Gender

Encl or Folio

Deployed Unit	Unit Location

The above-named member has served in the Operation during the following period:

Commencement date	Completiion date

During Deployment was the member admitted to a medical facility?

Yes No

↓

Date of admission	Length of time in medical facility	Diagnosis or Clinical Features

At any stage, during or since returning from the Operation has the member had any of the following? *(tick those which are applicable)*

Yes	No		Yes	No		Yes	No	
		Unexplained fevers, flushes or sweating			Haemoptysis			Malaise/Lethargy
		Unexplained joint or muscle pain			Unexplained loss of weight			Commenced Smoking
		A persistant cough			Skin rashes, lesions or ulcers			Alcohol overuse
		Sandfly or mosquito bites			Animal bite or scratch			Other unusual or unexplained symptoms or signs
		Diarrhoea			Since returning from the Operation has the member been sick?			Needle stick injury

Date	Diagnosis, Clinical Features or Comments

(if insufficient space attach comments on form PM 223 Continuation Sheet)

Service number and Employee ID	Family name	Department of Defence	Initials	Date of Birth

Civilian Populations in the Operation area may have been exposed to the health threats listed below, therfore the following diseases should be considered:

Amoebiasis	Diarrhoeal Diseases	Malaria	Shingellosis
Anthrax (endemic)	Filarial diseases	Onchocerciasis	Sindbis Fevers
Arbovirus Infections	Hepatitis (All types)	Plague	STDs (including HIV)
Brucellosis	Hydatid disease	Q Fever	Toxoplasmosis
Cholera	Intestinal worms/protozoa of various types	Rabies	Tuberculosis
Crimean-Congo Haemorrhagic Fever	Leishmaniasis	Rickettsial diseases	Typhoid
Dengue Fever	Leptospirosis	Schistosomiasis	

Targeted physical examination is specifically looking for evidence of Leishmaniasis. This examination should be performed after the examining Medical Officer has read Health Bulletin 06/2003 – Leishmaniasis.

Targeted physical examination					
Temperature:		Pulse:		Blood pressure:	

Abnormalities detected	Yes	No	Comments
Skin (scalp to toe examination)			
Ulcerated lesions			
Subcutaneous nodules			
Lymphadenopathy			
Liver enlargement			
Spleen enlargement			

Did the member experience any adverse effect associated with any of the pre-deployment vaccinations? If so what were the symptoms and how long after the vaccination did they experience them.

Service number and Employee ID	Family name	Department of Defence	Initials	Date of Birth

Hazardous Situation [For further assistance use the attached guidance notes]	Frequency of Exposure				Exposure above normal duty levels		The exposure history attempts to broadly determine exposure risk. The exposure to any hazard should be greater than normally encountered in a work setting
	Never	Once	Weekly	Daily	Yes	No	
	✓ appropriate box				✓ appropriate box		Medical Officer Comments
Entering or being in close proximity to recently destroyed military vehicles or structures							
Entry to industrial/chemical manufacturing/storage sites							
Oil Fire Smoke/Smoke from Waste Incineration							
Exposure to Diesel Exhaust Fumes							
Fuels (aviation, marine or automotive)							
Solvents (eg thinners, glues, sealants) or Paints							
Pesticides / Herbicides							
Dusts or Fibres							
Non-Ionising Radiation (eg Radar or Microwave Transmitters)							
Excessive Noise and Vibration							
Lasers							
Ionising radiation or radioactive materials							
Potentially Contaminated Water – either through drinking or swimming							
Other Incidents/Concerns							

N.B in all cases where there is a clear history of high risk exposure to hazardous agents seek specialist advice from the Directorate of Preventive Health (DPH) and note any advice given

Contacts in DPH:
Consultant in Occupational Medicine: (02) 6266 3830 SO2 Occupational Health (02) 6266 4194

Signature	Medical Officer	Location	Date	Contact Number

Distribution

Original:

To be filed as an enclosure in the member's UMR

Copy 2

NAVY & RAAF to be forwarded to:

Navy and Air Force ADF Health Records
Department of Defence
Queanbeyan Annex 4
Canberra ACT 2600

ARMY to be forwarded to :

ADF Health Records - Army
GPO Box 1932R
Melbourne VIC 3001
For inclusion on the member's CMR

Copy 3:

To be forwarded to:

Defence Health Service Branch
Operational Health Surveillance
CP2-7-158
Canberra ACT 2600

MEDICAL-IN-CONFIDENCE *(After first entry)*
Department of Defence

AD 367
Amended 17 May 04

Health Insert Slip – Op ANODE

- **Reporting is required in accordance with DGDHS Health Directive 224 Notifiable Condition Reporting in the Australian Defence Force**

Service number and Employer ID		Encl or Folio
Rank		
Family name		
Given name(s)		
Date of birth	Gender	

Deployed Unit

The above-named member has served on Op Anode during the following period:

Commencement date	Completion date

Post deployment, the following actions are to be completed and signed off by the member's treating medical facility. Navy personnel are to satisfy single service re-deployment requirements.

Action	Initials	Date	Results
G-6-PD screening has been confirmed prior to commencement of malaria eradication course or history of previous Primaquine course taken			
Doxycycline 100mg per day for 14 days on RTA. **OR** *(if contra indicated)* Mefloquine 250mg once weekly for two weeks			
Completed malaria eradication course of Primaquine *two tablets* **twice per day** *(To be taken concurrently with doxycycline) for 14 days on RTA*			
Return to Australia Psychological Screening on leaving area of operation			
Post Operational Psychological Screening within 3 months of RTA *(Ongoing support provided where indicated)*			
Mebendazole 100mg twice a day for 3 days *(Starting on the day of return to Australia depending on location of deployment or if clinically indicated)*			
Post Deployment Health Screen completed			
TST *(Depending on location of deployment and if clinically indicated)*			
AHA (at 3 months post RTA)			
HIV screening (at 3 months)			
HCV screening (at 3 months)			

Signature	Medical Officer	Location	Date	Contact Number

Distribution

Original:
To be filed as an enclosure in the member's UMR

Copy: Navy
Navy Health Records
Department of Defence
Queanbeyan Annex 4
Canberra ACT 2600

Copy: Army
Army Health Records
GPO Box 1932R
Melbourne VIC 3001

Copy: Air Force
Air Force Health Records
Department of Defence
Queanbeyan Annex 4
Canberra ACT 2600

MEDICAL-IN-CONFIDENCE *(After first entry)*

ANNEX N

World Health Organization

International Certificate of Vaccination or Prophylaxis

International Health Regulations (2005)

Organisation mondiale de la Santé

Certificat international de vaccination ou de prophylaxie

Règlement sanitaire international (2005)

Issued to / Délivré à

Passport number or
travel document number
Numéro du passeport ou
du document de voyage

ANNEX O

MEDICAL-IN-CONFIDENCE

Type of Board	PM 1 Introduced Sept 84

Department of Defence

MEDICAL BOARD EXAMINATION RECORD

1. Trade or Qualification	2. ECN	3. Corps

4. Unit	5. Length of Service	6. Age

7. Height (cm)	8. Weight (kg)	9. CHEST (cm)		10. Waist (cm)
		Exp	Ins	

Number
Rank
Surname
Christian or Given Names
Date of Birth / Sex

Encl/Folio

11. URINALYSIS		12. BP (Sitting)	13. DISTANT VISION		14. RESP FUNC	15. AUDIOGRAM					
Protein				Unaided / Corrected To			500	1000	2000	3000	4000
Sugar			R 6/	6/	FEV 1	R					
SG			L 6/	6/	FVC	L					

If not examined enter 'NE' in abnormal column	Normal	Abnormal	*If not examined enter 'NE' in abnormal column*	Normal	Abnormal
16. Head, face, neck, scalp			30. Anus *(per rectum if indicated)*		
17. Nose			31. Skin		
18. Mouth, throat, speech			32. Nervous system		
19. Teeth, gums			33. Endocrine system		
20. Ears – including drums			34. Upper extremities		
21. Eyes – general			35. Lower extremities		
22. Eyes – ocular motility			36. Back		
23. Eyes – ophthalmoscopic			37. Posture		
24. Eyes – visual fields *(confrontation)*			38. Gait		
25. Respiratory system			39. Lymphatic system		
26. Cardiovascular system			40. Emotional stability		
27. Peripheral vascular system			41. Mental capacity		
28. Abdomen, including hernial orifices			42. ECG *(if performed)*		
29. Genito – urinary system			43. Additional marks and scars		

44. Notes *(enter relevant item number before each comment)*

If additional comments on continuation sheet PM 223, mark √ in box

45. Particulars of any Disabilities *(Entered by the Examining Medical Officer)*

Diagnosis of Disabilities Discovered	Percentage Degree of Each Incapacity	Composite Assessment of Incapacity *(per cent)* for General Labour Market

46. Previous PES

.....

..... *(Date)*

47. Next Board Date	If Permanently Unfit List Disabilities by Item No	48. PULHEEMS								CP	New PES
		P	U	L	H	E	E	M	S		

49. Employment Restrictions

50.

a. ..... *(Signature of Examining MO)*

b. ..... *(Signature of Examining MO)*

..... *(Printed Name)*

..... *(Printed Name)*

Examined at..... Date.....

51. Decision of Confirming Authority

..... *(Signature)*

..... *(Date)*

Official Stamp

220

Stock No 7530–66–122–4271

MEDICAL-IN-CONFIDENCE

Number	Rank	Family name	Given name(s)	Encl or folio

Patient to complete

General health *(Continued)*

Have you experienced any of the following in the previous 12 months or since your last medical examination?

	Yes	No	Unsure	Medical Officer's comments *(If insufficient space use 'Additional comments' on page 4)*
1. Eye or vision problems				
2. Eye surgery or vision correction (Refractive) surgery				
3. Continual sneezing, runny nose, itchy eyes or hay fever				
4. Sinus pressure or infection				
5. Deafness, hearing problems or ringing in ear(s)				
6. Ear infections or discharge from the ear				
7. Problems with ears or sinuses when flying, diving or parachuting				
8. Ear surgery				
9. Severe motion sickness, seasickness or loss of balance				
10. Severe or frequent headaches or migraines				
11. Fainting, blackouts or unconsciousness				
12. Convulsions, fits or epilepsy				
13. Head injury or concussion				
14. Heart disease or history of rheumatic fever				
15. Palpitations or awareness of your own heartbeat				
16. High blood pressure				
17. Pain or discomfort in the chest on exertion				
18. Shortness of breath on exertion				
19. Bronchitis, pneumonia or lung abscess				
20. Coughing up blood or phlegm				
21. Chronic or persistent cough				
22. Positive TB skin test				
23. Pleurisy or severe chest pain				
24. Pneumothorax or collapsed lung				
25. Asthma or wheezing				
26. Need to use puffer or inhaler				
27. Chest, lung or heart surgery				
28. Indigestion, peptic ulcer or acid reflux				
29. Vomiting blood or passing red or black bowel motions				
30. Recurrent vomiting or diarrhoea				
31. Any change in bowel habits				
32. Jaundice, hepatitis or liver disease				
33. Hernia				
34. Back injury				
35. Joint problem or sports injury				
36. Limitation of movement				
37. Heat stress or heat illnesses				
38. Cold stress and cold injuries				
39. Fractures (Broken bones)				
40. Paralysis, muscle weakness, numbness or tingling				
41. Kidney or bladder disease (Including stones)				
42. Passing urine more or less frequently than usual				
43. Discharge from penis or vagina				
44. High blood sugar (Diabetes)				
45. Blood diseases or bleeding problem				

Number	Rank	Family name	Given name(s)	Encl or folio

Patient to complete

General health *(Continued)*

	Yes	No	Unsure	Medical Officer's comments *(If insufficient space use 'Additional comments' on page 4)*
46. Skin disease, rashes or skin lesions				
47. Any chronic or contagious disease				
48. Depression or metal illness				
49. Claustrophobia or panic attacks				
50. Experienced weight gain or loss in excess of 5kg				
51. Wires, pins, plates, rods or any surgical implants				
52. Allergies or reactions to medications or foods				
53. Diving, flying or parachuting injuries (Ear or sinus squeeze, barotrauma)				
54. Symptoms of decompression illness (DCI)				
55. Any other problem related to diving, flying or parachuting				
56. Have you received medical care outside the ADF since your last health assessment?				
57. Any possibility of being pregnant? (Females only)				
58. Any incapacity during menstrual periods? (Females only)				
59. Do you smoke?			Quantity	
60. Do you drink alcohol?			Amount per day	How often do you drink

61. How often do you feel that your current lifestyle is putting you under too much stress?

☐ Often ☐ Sometimes ☐ Seldom ☐ Never

62. During the past two weeks, how much stress have you experienced?

☐ A lot of stress ☐ A moderate amount of stress ☐ Relatively little stress ☐ Almost no stress at all

63a. Do you have any concerns about occupational or workplace exposure hazards (eg radiation, noise, asbestos, solvents, etc)?

☐ Yes ☐ No

63b. Are you enrolled in an occupational health surveillance program?

☐ Yes ☐ No

64. Have you been deployed overseas within the last 12 months?

☐ Yes ☐ No

Details of deployment

Date	Location	Date	Location

65. Do you wear glasses or contact lenses?

☐ Yes ☐ No

Date of last optometry or ophthamology examination *(Month and year)*

66. What was the date of your last dental examination? *(Month and year)*

67. Have you passed your annual fitness test?

☐ Yes ☐ No

Number	Rank	Family name	Given name(s)	Encl or folio

Patient to complete

Aircrew only

68. Type of aircraft currently being flown

69. Type of aircraft that you have the most flying hours with

70. Total flying hours

71a. Total military flying hours for the last six months

71b. Total civilian flying hours for the last six months

72a. Total aided night flying hours for the last six months

72b. Total unaided night flying hours for the last six months

73. Date of last CASA medical examination *(If applicable)*

Parachutists only

74. Approximate date of your first jump

75. Current level of jump qualification

76a. Approximate number of military jumps

76b. Approximate number of civilian jumps

77. Date of last chamber run *(Free fall parachutists only)*

Divers only

78. Date you obtained your dive qualification

79a. Number of military hours logged

79b. Number of civilian hours logged

80. Maximum diving depth

81. Date of maximum dive

Additional comments

Member's certification

I certify that this is an accurate record of my medical history since my last examination and I will immediately report any changes in my medical status to ADF medical personnel.

Signature	Phone number	Date

Number	Rank	Family name	Given name(s)	Encl or folio

NO, AMA, SMA or authorised delegate to complete

Height	Weight	BMI	BP *(Sitting)*
Pulse rate	Faecal occult blood test *(Result)*		FOBT date

Females only

Pap smear date ☐ Not applicable	Mammogram date ☐ Not applicable
Pap smear result	Mammogram result

Serology *(If required by HD 210)*

HIV ☐ Positive ☐ Negative	Hep C ☐ Positive ☐ Negative	
Hep B ☐ Positive ☐ Negative	Date serology performed	
G6PD *(Once only)* ☐ Normal ☐ Deficient	G6PD date	Blood type

Are all routine vaccinations up to date?

☐ Yes ☐ No

List vaccinations required

Hearing

- Refer to form PM 139 - Hearing Conservation Report.
- If there is a 10dB or greater difference between the left and right ears at any one frequency refer to a Medical Officer.

Date of hearing test

	500	1000	1500	2000	3000	4000	6000	8000	Hearing standard
R									
L									

Visual acuity

Distant		Near *(N5)*	
R 6/	Corr to 6/	R	Corr to
L 6/	Corr to 6/	L	Corr to

Aircrew only

Date of last eye prescription and refraction

Urinalysis

SG	Protein	Glucose	Blood	Other

Divers and Free fall parachutists only

Sharpened romberg test

1 min	2 min	3 min	4 min	Total
				/240

Spirometry

FEV1	FVC	Ratio %

Other tests

NO, AMA, SMA or authorised delegate conducting health assessment

Signature	Printed name	Rank	Phone number	Date

Number	Rank	Family name	Given name(s)	Encl or folio

MO to complete

Targeted physical examination findings	Normal	Abnormal	Comments
Respiratory			
Cardiovascular			
Gastrointestinal			
Neurologic			
Dermatologic			
Orthopaedic			
ENT			
Other			

Army only *(Refer DI(A) PERS 159-1)*

P	U	L	H	E	E	M	S

MEC

Specialist employment classification

Does the member require medical reclassification?

☐ Yes ☐ No

Medical fitness recommendation

Is the member cleared for full specialist duties without restrictions?

☐ Yes ☐ No

Has the unit been notified by either PM 101 - Medical or Dental Fitness Advice, PM 064 - Notification of Medical Assessment or by a Diver's Log Book?

☐ Yes ☐ No

The member requires the following restrictions

Have all outstanding vaccinations been completed?

☐ Yes ☐ No

Has post deployment screening been conducted *(If applicable)*?

☐ Yes ☐ No

Is a continuation sheet attached?

☐ Yes ☐ No

Has UMR been reviewed?

☐ Yes ☐ No

Individual readiness status

☐ Ready ☐ Not ready

Medical Officer conducting health assessment

Signature	Printed name	Rank	Phone number	Date

Confirming authority *(If required)*

Is MEC valid?

☐ Yes ☐ No

Recommendations

Signature	Printed name	Rank	Phone number	Date

ME

PM 197
Revised Oct 83

ANNEX P

SUPPLEMENTARY HEALTH EXAMINATION

Number	
Rank	
Surnam	
Christi	
Date of Bi	1

Folio/En: 25

1. HMAS	2. Gaining Ship
STIRLING	SWAN

3. Category/Branch/List	4. Current Medical Category	5. Reason for Examination	6. Last PM 85
ELECTRICAL	I	SEAPOSTING MEDICAL	Date 16/1/92 Encl No 23

7. Blood Pressure	8. Pulse	9. Urinalysis		10. Chest X-Ray	11. HS	12. Dental Examination
Sitting		Albumin	Sugar	PM 170 ✓ Normal ☑		Last PM 344
124/72	58	NEG	NEG	Encl No 18 Abnormal ☐	I	Date
				Date 22.1.87		

13. Distant Vision	14. Near Vision	15. VS	16. Serological Examination
R 6 6 Corr 6 L 6 6 To 6	R = N5 CorrN L = N5 To N	I	PM 170 ✓ Test RPR Result NEG (NON-REA Encl No Date 15 APR 93

17. Height (Cms)	18. Weight (Kgs)	19. Neck (Cms)	20 Abdomen (Cms)	21. % Body Fat (Males)	22. If Overweight State Action Taken
173cms	65Kgs	35cms	71cms	9.4%	N.A

23. Ongoing treatment necessitating follow-up by gaining ship, eg Specialist Consulation, Serology, IMS

REX ... TERED 13 OPERATOR

24. Me

(Signature) (Printed Name) (Rank) 30/8/93. (Date)

25. Confirming Authority *(Navy Office)*

(Signature of Confirming Authority) *(Date)*

Stock No 7530-66-115-2007

MEDICAL-IN-CONFIDENCE

ANNEX Q

[redacted]

MEDICAL-IN-CONFIDENCE *(After first entry)*

AC 782
Introduced Nov 98
Replaces Navy PM 085
Army PM 001
RAAF PM 128

Department of Defence

Health Assessment

- ***Use only black pen and/or stamps***

Health Facility or ADFRU		Encl or Folio
AHS-SA		82
Service: NAVY	Trade or Profession:	
Member's Unit or Ship: HMAS RANKIN	Contact Number:	
Reason for Examination: DISCH	Discharge Due:	

1. Current Classification											2. Height	3. Aircrew Only - Anthropometric Measurements			
P	U	L	H	E	E	M	S	CP	MEC	SPEC		Sitting Height	Buttock - Heel	Buttock to Knee	Functional Reach
											171				

4. Weight	5. BMI	6. PFT	7. Pulse	8. Blood Pressure		9. Urinalysis			
		Date last Attempted ☐ Pass ☐ Fail		Sitting	Lying	Protein	Sugar	Blood	Pregnancy *(If applicable)* ☐ Neg ☐ Pos
87			68	123/80		NAD	NAD	NAD	

10. Visual Acuity					11. Colour Perception			12. Hearing Standard
Distant Vision		Near Vision		Visual Standard	Isch	Farns	CPS	
R6/7.5	Corr 6	R=N	Corr N		15	✓	I	I
L6/12	Corr 6	L=N	Corr N					

13. Spirometry			14. Immunisation	Divers and Submariners Only					
FEV1	FVC	Ratio%	Immunisation required ☐ Yes ☐ No	15. Sharpened *(Tandem)* Rombergs					
				30 Secs	1 Min	2 Min	3 Min	4 Min	Total
									/240

16. Investigations *(If applicable)*

17. Supporting Documentation			18. Referred to Medical Officer		
Continuation Sheet Used	☐ Yes	☑ No		☑ Yes	☐ No
UMR Reviewed	☑ Yes	☐ No	Medical Examination Conducted	☑ Yes	☐ No
Questionnaire	☑ Yes	☐ No	Dr M McKellar CMO		

19. Member Conducting Health Assessment

Signature	Printed Name	Rank	Trade or Profession	Contact Number	Date

Stock No

ANNEX R

AC 782-1
Introduced Nov 98

MEDICAL-IN-CONFIDENCE *(After first entry)*

Department of Defence

[redacted]

Medical Examination Record

- ***Use only black pen and/or stamps***

Health Facility or ADFRU: AHS-SA	
Service: NAVY	Trade or Profession:
Member's Unit or Ship: HMAS RANKIN	Contact Number:
Reason for Examination: DISCH	Discharge Due:

Encl or Folio: 85

Physical Examination

If not examined enter 'NE' in Abnormal Column	Normal	Abnormal	*If not examined enter 'NE' in Abnormal Column*	Normal	Abnormal
1. Head, Face, Neck, Scalp	✓		15. Genito-Urinary System	✓	
2. Nose	✓		16. Anus	NE	-
3. Mouth, Throat, Speech		✓	17. Per Rectum *(If indicated)*	NE	-
4. Teeth, Gums	✓		18. Per Vagina *(If indicated)*	—	
5. Ears - Including Drums	✓		19. Skin	✓	Ref 3
6. Ear - Valsalva - Right Ear	✓		20. Nervous System	✓	
Ear - Valsalva - Left Ear	✓		21. Endocrine System	✓	
7. Eyes - General	✓		22. Upper Extremities	✓	
8. Eyes - Ocular Mobility	✓		23. Lower Extremities		✓
9. Eyes - Ophthalmoscopic	NE	-	24. Spinal System	✓	
10. Eyes - Visual Fields	✓		25. Posture	✓	
11. Respiratory System	✓		26. Gait	✓	
12. Cardio Vascular System	✓		27. Lymphatic System	✓	
13. Peripheral Vascular System	✓		28. Psychiatric Assessment	✓	
14. Abdomen - Include Hernial Orifices	✓		29. Identifying Marks, Scars, etc		✓

30. Notes *(Comment on all abnormal findings)*

EARLY NAVY VERSION OF CRHE

3. Lower lip cheilitis
23. (L) ankle pain - currently being reviewed by ortho Sx
29. L proximally described

31. Supporting Documentation

Continuation Sheet PM223 Used	Questionnaire	UMR Reviewed
☐ Yes ☑ No	☑ Yes ☐ No	☐ Yes ☑ No

32. Particulars of any Disabilities *(Entered by the Examining Medical Officer)*

Diagnosis of Disabilities Discovered	Percentage Degree of each Incapacity	Composite Assessment of Incapacity (per cent) for General Labour Market

33. Medical Employment Classification											34. Fit for Reserve Duty	35. MEC Valid	36. For MECR
P	U	L	H	E	E	M	S	CP	MEC	SPEC	☑ Yes ☐ No	☑ Yes ☐ No	☐ Yes ☑ No
				—	—				ONE	(S)			

37. Examining Medical Officer

Signature	Printed Name	Rank	Contact Number	Date
	[illegible]	MO		29/11/07

38. Address *(To be completed when Medical Examination is completed at a Non-Australian Defence Force Facility)*

39. Confirming Medical Authority — Recommended MEC Endorsed ☐ Yes *(If 'Yes', go to 41)* ☐ No

P	U	L	H	E	E	M	S	CP	MEC	SPEC	41. Comments
				—	—						

41. Signature	Printed Name	Rank	Contact Number	Date