Australian Government
Department of Veterans' Affairs

Australian Government
Australian Institute of Family Studies

Vietnam Veterans
Family Study

Spouses and partners of Vietnam veterans – Findings from the Vietnam Veterans Family Study

Maggie Yu, Diana Smart, and Galina Daraganova

Australian Institute of Family Studies

2021

Published by the Department of Veterans' Affairs, Canberra, 2021. Publication no. P03925

ISBN 978-0-6482602-6-4 (PDF)
978-0-6482602-9-5 (electronic version)

Suggested citation

Yu, M., Smart, D. & Daraganova, G. (2021). *Spouses and partners of Vietnam veterans – Findings from the Vietnam Veterans Family Study.* Melbourne: Australian Institute of Family Studies.

Copies of this report can be found on the DVA website: www.dva.gov.au

Contents

Acknowledgements ..... **viii**

Executive summary ..... **ix**

1 Introduction **1**

1.1 Contents of the report 2

2 A brief review of the literature **3**

2.1 Introduction 3

2.2 Separation during deployment 3

2.3 Post-deployment adjustment and the impact of veterans' post-traumatic stress disorder 7

2.4 Summing up 10

3 Study methodology **11**

3.1 Sample recruitment 11

3.2 Selection bias of the VVFS analysis sample 14

3.3 Summary 32

4 Adjustment for servicemen's pre-deployment differences using propensity score analysis **37**

4.1 Investigating the impact of Vietnam War service 37

4.2 Propensity score analysis 38

4.3 Summary 49

5 Differences between spouses/partners of Vietnam veterans and Vietnam-era personnel **50**

5.1 Mental health and risky behaviours 51

5.2 Physical health 54

5.3 Combined burden of poor mental and physical health; perceived impact of military service 57

5.4 Family functioning 59

5.5 Socio-economic wellbeing 62

5.6 Summary 66

5.7 Ex-spouses/partners 71

6 What are the mechanisms by which deployment to the Vietnam War affect spouses/partners? **74**

6.1 Variables in the models 75

6.2 Analysis approach 87

6.3 Results of mediation analyses 90

6.4 Results of moderated mediation analyses 105

6.5 Summary 110

7 Relationships between specific deployment characteristics and spouse/partner outcomes 113
7.1 Sample and measures 113
7.2 Results 116
7.3 Summary 121

8 Discussion and implications 122
8.1 Recruitment and representativeness of the VVFS sample 123
8.2 Controlling for pre-deployment differences between Vietnam veterans and Vietnam-era personal 125
8.3 Differences between spouses/partners of Vietnam veterans and Vietnam-era personnel 126
8.4 Effects of deployment to Vietnam: mechanisms of influence 133
8.5 What elements of deployment to Vietnam were related to spouse/partner outcomes? 140
8.6 Strengths and limitations of the VVFS study 141
8.7 Implications 142

Appendix A: Mechanisms of deployment: results 145

Appendix B: Moderation results 162

Appendix C: Impact of deployment on outcomes of veteran's spouses/partners: analysis result 169

Glossary 182

Abbreviations 183

References 184

Tables

Table 3.1 Variables included in the comparison analyses between VV in the analysis sample and the Nominal Roll 16
Table 3.2 Vietnam veterans in the estimation sample of VVFS compared to Vietnam veterans in the Nominal Roll 18
Table 3.3 Variables included in the comparison analyses between the analytical sample and the excluded sample 20
Table 3.4 Comparison of VV respondents whose spouses/partners did or did not participate in the VVFS 24
Table 3.5 Comparison of VEP respondents whose spouses/partners did or did not participate in the VVFS 25
Table 3.6 Comparison of spouses/partners whose VV did, or did not, participate in the VVFS 28
Table 3.7 Comparison of spouses/partners whose VEP did or did not take part in the VVFS 30

Table 3.8 Factors on which analysis sample respondents significantly differed from VVFS respondents not included in the analysis sample 35
Table 4.1 Variables included in propensity score analyses 40
Table 4.2 Comparisons of VV and VEP sub-samples on pre-deployment characteristics before PSA 45
Table 4.3 Comparisons of the VV and VEP sub-samples after propensity score weighting 47
Table 5.1 Measures of spouses/partner mental health and risky behaviours 51
Table 5.2 Incidence of mental health problems and risky behaviours and significant differences between spouses/partners of VEP and VV 53
Table 5.3 Measures of spouses'/partners' physical health 54
Table 5.4 Incidence of physical health problems and significant differences between spouses/partners of VV and VEP 56
Table 5.5 Measures of cumulative burden of health problems and effects of military service 57
Table 5.6 Incidence of combined burden of poor health and military service effects and significant differences between spouses/partners of VEP and VV 59
Table 5.7 Measures of family functioning 60
Table 5.8 Incidences on family functioning outcomes and significant differences between spouses/partners of VV and VEP 61
Table 5.9 Measures of socio-economic wellbeing 62
Table 5.10 Incidences on economic wellbeing outcomes and significant differences between spouses/partners of VV and VEP 65
Table 5.11 Summary of significant differences between VV and VEP spouses/partners .. 69
Table 5.12 Characteristics of ex-spouses/partners and significant differences between the VV and VEP groups 72
Table 6.1 Measures of services used by servicemen and spouses/partners, and prevalence rates among VEP and VV groups 77
Table 6.2 Measures of services used by servicemen and spouses/partners, and prevalence rates among VEP and VV groups 80
Table 6.3 Measures of spouses'/partners' social support, and prevalence rates among VEP and VV groups 81
Table 6.4 Measures of coping strategies used by spouses/partners, and prevalence rates among VEP and VV groups 82
Table 6.5 Measures of spouses'/partners' characteristics, and prevalence rates among VEP and VV groups 83
Table 6.6 Measures of servicemen's factors, and prevalence rates among VEP and VV groups 84
Table 6.7 Measures of children's functioning, and prevalence rates among VEP and VV groups 85
Table 6.8 Measures of specific control variables, and prevalence rates among VEP and VV groups 87

Table 6.9 Summary of direct and indirect effects for spouses/partner outcomes. 104
Table 6.10 Marginal effects of PTSD on spouses'/partners' outcomes 107
Table 6.11 Summary of Section 6 results 111
Table 7.1 Deployment characteristics and measures used 114
Table 7.2 Control variables used in specific analyses. 116
Table 7.3 Marginal effects of deployment for mental health outcomes 117
Table 7.4 Marginal effects of deployment for physical health outcomes 118
Table 7.5 Marginal effects of deployment for physical health outcomes 119
Table 7.6 Marginal effects of deployment for couple relationship 120
Table A.1 Mechanisms of deployment—results for anxiety 145
Table A.2 Mechanisms of deployment—results for depression 146
Table A.3 Mechanisms of deployment—results for suicidal ideation. 148
Table A.4 Mechanisms of deployment—results for problem drinking. 150
Table A.5 Mechanisms of deployment—results for mental health SF36 scores 152
Table A.6 Mechanisms of deployment—results for skin condition 153
Table A.7 Mechanisms of deployment—results for sleep condition 154
Table A.8 Mechanisms of deployment—results for general physical health 156
Table A.9 Mechanisms of deployment—results for combined physical and mental health burden 157
Table A.10 Mechanisms of deployment—results for couple relationship 160
Table B.1 Moderation effect of spouses/partners' use of military-related services—results for general physical health 162
Table B.2 Moderation effect of spouses/partners' use of military-related services—results for combined burden of mental and physical health problems. 163
Table B.3 Moderation effect of spouses/partners see their friends weekly—results for problem drinking 167
Table C.1 Impact of deployment on general mental health of veteran's spouse/partner 169
Table C.2 Impact of deployment on anxiety of veteran's spouse/partner 170
Table C.3 Impact of deployment on depression of veteran's spouse/partner 171
Table C.4 Impact of deployment on problem drinking of veteran's spouse/partner 172
Table C.5 Impact of deployment on suicidal ideation of veteran's spouse/partner 173
Table C.6 Impact of deployment on general physical health of veteran's spouse/partner 175
Table C.7 Impact of deployment on skin condition of veteran's spouse/partner. 176
Table C.8 Impact of deployment on sleep disturbance of veteran's spouses/partners . . 177
Table C.9 Impact of deployment on cumulative burden of physical and mental health problems of veteran's spouse/partner. 178
Table C.10 Impact of deployment on couple relationship quality of veteran's spouses/partners 181

Figures

Figure 3.1 Selection process for VV families 13
Figure 3.2 Selection process for VEP families 13
Figure 4.1 Propensity score analysis steps 39
Figure 6.1 Theoretical model of the impact of deployment on spouses/partners outcomes 74
Figure 6.2 Baron and Kenny's (1986) mediation approach 88
Figure 6.3 Moderated mediation model 89
Figure 6.4 Model of spouses'/partners' general mental health: standardised path coefficients 91
Figure 6.5 Model of spouses'/partners' anxiety: odds ratios 92
Figure 6.6 Model of spouses'/partners' depression: odds ratios 93
Figure 6.7 Model of spouses'/partners' suicidal ideation: odds ratios 94
Figure 6.8 Model of spouses'/partners' problem drinking: odds ratios 95
Figure 6.9 Model of spouses'/partners' general physical functioning: standardised path coefficients 96
Figure 6.10 Model of spouses'/partners' skin condition: odds ratios 98
Figure 6.11 Model of spouses'/partners' sleep disturbance: path coefficients and odds ratios 99
Figure 6.12 Model of spouses'/partners' co-occurring mental and physical health difficulties: odds ratios 101
Figure 6.13 Model of spouses/partners' couple relationships: standardised coefficients 102
Figure 6.14 Model of spouses'/partners' general physical health by use of military services 106
Figure 6.15 Model of spouses'/partners' general physical health by use of military services 108
Figure 6.16 Model of spouses'/partners' problem drinking by use of military services 109

Acknowledgements

Views expressed in this report are those of individual authors and may not reflect those of the Australian Government or the Australian Institute of Family Studies.

We wish to acknowledge the role of the Department of Veterans' Affairs (DVA) in providing the impetus and funding for the Vietnam Veterans Family Study (VVFS) study, the data used in the report, and its support and advice on the contents of the report. We would also like to acknowledge the contribution of the independent reviewers for their insightful comments.

We also gratefully acknowledge the enormous contribution of the Vietnam veterans and Vietnam-era personnel and their families who have participated in the study.

Executive summary

The Department of Veterans' Affairs (DVA) commissioned the Vietnam Veterans' Family Study (VVFS), a comprehensive study of Vietnam veterans and Australian Defence Force (ADF) personnel and their families. The study aimed to investigate the impact of service in the Vietnam War on the lives of the families of Australia's veterans. It used an innovative design in which families of Army Vietnam veterans (VVs) were compared to families of other Army servicemen[1] who served in the Australian military at the time of the Vietnam War (1962–75) but were not deployed (hereafter referred to as Vietnam-era personnel, VEP). By comparing families of servicemen who had similar military backgrounds but differed on whether they were deployed to Vietnam, the impact of service in the Vietnam War can be investigated. The data were collected in 2011, approximately 40 to 50 years after deployment to Vietnam occurred.

This study builds on previous work undertaken by the Australian Institute of Family Studies (AIFS) to understand the health and wellbeing of adult children of Vietnam veterans (see Forrest, Edwards, & Daraganova, 2014 for details). The current study aims to understand the health and wellbeing of servicemen's spouses and partners.

AIFS was engaged to undertake further analyses of the VVFS to investigate:

- What effect, if any, has active Vietnam service had on the physical, mental and social wellbeing of the spouses/partners of Australian Vietnam veterans?
- Which risk, protective and mediating factors might account for these effects, and what implications might they have for policies and service delivery?

Study methodology

A total of 3,318 VV families and 2,647 VEP families (servicemen and/or their spouses/partners) in the random-selected sample took part in the VVFS.[2] As the analyses required information from both servicemen and their spouses/partners, the findings reported here are based on a sub-sample of 2,284 families (1,435 VV families and 849 VEP families) for whom such data were available (hereafter referred to as the analysis sample).

1 While women served in the Army and deployed to Vietnam during this period, they represent a small minority of the military population. Female military personnel and male spouses/partners of servicemen were excluded from analyses.
2 The study was based on a random-selected sample and a self-select sample. Sample selection process will be explained in detail in Section 3.

Representativeness and validity analyses show that:

- The analysis sample of Vietnam veterans was generally representative of the broader population of Vietnam veterans. Even though some minor differences were found between the analysis sample and male army Vietnam veterans listed on the Department of Veterans' Affairs Nominal Roll, [3] the military characteristics and experiences were overall very similar between the two groups.
- The analysis sample of spouses/partners was also generally representative of the broader family sample. Comparison was made between the analysis sample of spouses/partners and the VVFS families for whom completed data from veterans or their spouses/partners were not available. The results suggested that the analysis sample of spouses/partners was faring a little better on a few outcomes such as family relationships. However, there were no consistent differences on military service, spouses'/partners' demographic characteristics, health or substance use.
- Pre-deployment characteristics between VVs and VEP were adjusted using propensity score weighting. Following adjustment, no significant differences between VV and VEP servicemen remained with the exception of age.

Impact of deployment

The health and wellbeing of spouses/partners of VVs and VEP was found to differ significantly across five major life areas after controlling for spouses'/partners' age and the length of couple relationships. Overall, VV spouses/partners were found to be faring less well than VEP spouses/partners, with the significant differences found summarised below.

On almost all indicators of mental health a higher percentage of VV than VEP spouses/partners were experiencing problems, and more reported problem drinking. VV spouses/partners also tended to more often hold negative perceptions of their own general physical health and be experiencing a combined burden of mental and physical health problems. While perceptions of family relationships were very positive across all spouses/partners, VV spouses/partners tended to be a little less positive than their VEP counterparts. There were also some signs that VV spouses/partners had experienced more socio-economic disadvantage than VEP spouses/partners. Finally, VV spouses/partners more often believed there had been negative effects of ADF servicemen's military service on their own relationships, health and economic wellbeing, with this likely reflecting the effects of veterans' deployment and combat exposure.

There appeared to be some long-term impact of servicemen's deployment to Vietnam on spouses/partners across all the areas of life examined.

3 The Nominal Roll of Vietnam Veterans was used as the main tool for recruitment into this study; this roll was developed by DVA in conjunction with Defence.

Explaining the impact of deployment—servicemen's PTSD

Differences between VV and VEP spouses/partners were further explored taking into account a wider range of salient factors, such as other spouse/partner characteristics, servicemen characteristics, and the characteristics of parents and children. Inclusion of these potentially influential factors was needed in order to obtain a more valid understanding of the effects of deployment to Vietnam. It was also thought important to investigate the mechanisms by which deployment to Vietnam might affect spouses/partners. The main mechanism examined was servicemen's post-traumatic stress disorder (PTSD), which has been shown by much prior research to be a powerful influence on spouse/partner outcomes (e.g. Dekel, Solomon, & Bleich, 2005; Gallagher, Riggs, Byrne, & Weathers, 1998; Hendrix, Erdmann, & Briggs, 1998). We therefore undertook a second series of analyses that examined whether direct effects of deployment remained after servicemen's PTSD and other influential factors were taken into account.

Servicemen's PTSD appeared to be a major mechanism through which the effects of deployment flowed, with mediated effects found for the spouse/partner outcomes of general mental health, problem drinking, suicidal ideation, general physical health, sleep disturbances, a combined burden of mental and physical health problems, and couple relationship quality. Mediated effects were not found for the spouse/partner outcomes of diagnosis or treatment for anxiety or depressive disorders, or skin conditions.

Nevertheless, while mediation of the effects of deployment was evident, direct effects of deployment were still present for the spouse/partner outcomes of general mental health, sleep disturbance, mental health problems, and couple relationship quality, with mediation being partial, not complete. Servicemen's PTSD fully mediated the effects of deployment on spouse/partner problem drinking, suicidal thoughts, general physical health and co-occurring mental and physical health problems.

The findings indicate that effects of deployment on spouses'/partners' wellbeing are evident more than 40 years after the end of the Vietnam War. While these seemed to be mainly conveyed through veterans' PTSD, direct effects of deployment were still evident, particularly for spouses'/partners' general mental health and their couple relationships.

Other influential factors were: spouse/partner age and education; their physical health functioning; presence of long-term health conditions or a disability; disciplinary and behaviour problems experienced at school; and whether spouses/partners had experienced financial stress in the past. Additional contributing factors were servicemen's physical health functioning; mental health/behaviour problems in spouses'/partners' children; mental health problems in spouses'/partners' parents; and couple relationship length. These factors contributed to several outcomes and

hence seemed to be relevant influences. Some of these factors are likely to be part of the pathways by which deployment to Vietnam affected spouse/partner outcomes. However, we were not able to perform mediation tests for these characteristics in the study due to design and methodology limitations (explained in detail in section 6).

Servicemen's PTSD and spouse/partner outcomes—risk and protective factors

Having established that PTSD was a major mechanism through which the impacts of deployment to Vietnam affected spouses/partners, we investigated whether particular spouse/partner psychosocial resources increased or decreased ('moderated') the effects of servicemen's PTSD on spouses/partners. These resources can provide guidance for the types of supports and services that could be provided in the future. The moderating role of three differing types of resources was investigated—access to services, the social support provided by families and friends, and spouses'/partners' coping capacities.

Overall, very few moderation effects were found, and for only a very small number of outcomes. Spouses'/partners' use of military-related services appeared to play an important role in facilitating their physical health and ameliorating the effects of veterans' PTSD. However, weekly or more frequent contact with friends seemed to increase the likelihood of problem drinking among spouses/partners of veterans with PTSD compared to spouses/partners of veterans with PTSD who had less frequent contact, perhaps because interactions took place in social situations where alcohol was served. The findings reinforce the importance of spouses/partners having access to military-related services as these services appeared to facilitate spouses'/partners' long-term physical health.

What aspects of deployment were important?

The third issue investigated was whether veterans' deployment experiences—length of deployment, experience of trauma, exposure to Agent Orange, whether conscripted, the type of corps served in and rank held, and whether spouses/partners were in a couple relationship with veterans at the time of their deployment—were related to spouse/partner outcomes. These analyses focused on Vietnam veterans and their spouses/partners (as VEP servicemen had not served in Vietnam), and controlled for the effects of veterans' PTSD and other influential spouse/partner, veteran, parent and child factors (thus, any effects found are likely to be additional to the effects of veterans' PTSD).

Only one characteristic was related to spouse/partner outcomes—those who had been in a couple relationship when servicemen were deployed were less likely to have experienced suicidal thoughts in their lifetimes than those who had formed a relationship after deployment. This finding could reflect positive effects of a very long-term relationship. Interestingly, when analyses were conducted without adjusting for veterans' PTSD and other salient factors, servicemen's experience of trauma and exposure to Agent Orange were risks for poorer spouse/partner outcomes, while spouses/partners of servicemen who had held a higher rank or been conscripted tended to have more positive outcomes. However, these relationships were no longer significant when veterans' PTSD and control variables were included. Thus, it seemed that once again servicemen's PTSD mediated the effects of deployment to Vietnam.

Concluding comments

The VVFS study confirms there are long-standing effects of deployment to the Vietnam War for the spouses/partners of Australian Army veterans. It has provided evidence of adverse consequences more than 40 years after the war ceased, with the main areas affected being spouses'/partners' mental and physical health, and couple relationships. One learning from the study is that professionals and service providers assisting veterans' spouses/partners should be mindful of the possible presence of stressors arising from servicemen's Vietnam experiences. Another is the likely ongoing need for the provision of services and supports for spouses/partners of veterans, especially if veterans are suffering with PTSD.

The findings again show the powerful consequences of veterans' PTSD for spouses/partners. Veterans' PTSD was found to be the major mechanism by which the effects of veterans' deployment to Vietnam affected spouses/partners. Alleviating veterans' PTSD may also help relieve their spouses'/partners' burden.

Military-related services were found to play an important role in assisting spouses/partners. These services appear to be effective, and emphasise the importance of their continuation both for Vietnam veterans and their families as well as for later cohorts of servicemen involved in conflicts and their family members.

In summary, the VVFS study has provided valuable new Australian evidence about the very long-term effects of service in the Vietnam War on the spouses/partners of Army veterans. While many spouses/partners were faring well, effects of veterans' Vietnam service remained evident into late mid-life and older age, especially if veterans were suffering with PTSD.

1 Introduction

More than 40 years after the last Australian troops left Vietnam, many veterans remain concerned about how their service in the war affected them and their families. Vietnam veterans are more likely to die from cancers, heart disease and suicide than other Australian men of a similar age (Crane, Barnard, Horsley, & Adena, 1997), while veterans who were conscripted are more likely to die from lung cancer and cirrhosis of the liver than non-deployed national servicemen (Crane et al., 1997). Of particular concern, the apparent impact of service in the Vietnam War may not be limited to the veterans who were deployed to the conflict but may also extend to their families. For example, separations resulting from military deployment have been shown to negatively affect spouses'/partners' outcomes across a range of areas, including health, social functioning and marital satisfaction (Keeling, Wesseley, Dandeker, Jones, & Fear, 2015; Mansfield et al., 2010; Skomorovsky, 2014).

Despite several studies investigating the health and welfare of Vietnam veterans, there have been few large-scale Australian studies examining the emotional, physical and social wellbeing of their families. In response to these concerns, and the knowledge gaps surrounding them, the Department of Veterans' Affairs (DVA) commissioned the Vietnam Veterans' Family Study (VVFS), a comprehensive survey of Vietnam veterans and Australian Defence Force (ADF) personnel and their families. The study, which is part of a larger research program funded by DVA, aims to improve understanding of the impact of deployment to the Vietnam War on the families of military personnel. It is based on a case-control design in which the families of veterans of the war in Indochina were compared to the families of other men who served in the ADF during the Vietnam War (1962–75) but were not deployed—hereafter referred to as Vietnam-era personnel.

Using this approach, the Australian Institute of Family Studies (AIFS) has previously investigated the impact of a parent's military service in Vietnam on the long-term health of their adult children. Results showed that almost 40 years after the end of the Vietnam War, there were significant and enduring adverse effects of parents' deployment on the health, social functioning and economic wellbeing of adult children. Specifically, relative to sons and daughters of comparable, non-deployed personnel, adult children of deployed men were more likely to report physical health problems, have been diagnosed with a mental health illness, have had more than one marriage or de facto relationship, have lower levels of education and to experience financial stress (Forrest, Edwards, & Daraganova, 2014).

This study extends the previous study of Vietnam-era military personnel's adult children. It also aims to address concerns expressed at the Ex-Service Organisations' Roundtable (a peak DVA ex-service consultative forum) that the previous work did

not consider impacts on spouses/partners (December, 2015). The present study therefore focuses on *the effects of active Vietnam service on the spouses/partners of Vietnam veterans*. The following research questions are addressed in this study:

1. What effect, if any, has active Vietnam service had on the mental, physical and social health of the spouses/partners of Australian Vietnam veterans (including relationship quality and separation)?
2. Which risk, protective and mediating factors might account for these effects?What spouse/partner characteristics might alleviate the impact of veterans' post-traumatic stress disorder (PTSD)? What are the implications for policy and service delivery?

1.1 Contents of the report

The report aims to address a significant gap in knowledge about the effects of deployment to the Vietnam War on the wellbeing of spouses/partners of Australian Army veterans. By comparing these spouses/partners to spouses/partners whose servicemen had not been deployed to Vietnam, it aims to shed light on the effects of deployment, whether these effects are mediated by returned veterans' PTSD, and whether spouses'/partners' personal and social resources play a role in how they coped with the effects of their veterans' deployment to Vietnam.

Section 2 provides an overview of research on the effects of service in the Vietnam War on the spouses/partners of servicemen, and the possible mechanisms of these effects. Section 3 describes the methodology of the study and representativeness of the sample, while Section 4 describes the methods used to adjust for pre-deployment differences between Vietnam veterans and Vietnam-era personnel. Section 5 looks at whether spouses/partners of Vietnam veterans and Vietnam-era personnel significantly differ on outcomes; while Section 6 examines whether effects of deployment to Vietnam remain after servicemen's PTSD and other salient factors are included in the models. Additionally, Section 6 investigates whether spouse/partner psychosocial resources—access to services, social support and coping capacities—reduce the impact of servicemen's PTSD on outcomes. Section 7 looks at whether specific aspects of servicemen's deployment to Vietnam—e.g. length of deployment, whether conscripted, corps served in, rank, exposure to herbicides and trauma—are related to spouse/partner outcomes. Finally, the implications of the findings are drawn together and discussed in Section 8.

2 A brief review of the literature

2.1 Introduction

This section provides a brief and selective review of prior research regarding the effects of service in the Vietnam War or other areas of military conflict on the spouses/partners of servicemen, and the possible mechanisms of these effects.

Even in the absence of exposure to combat, military deployment may have adverse consequences for military personnel and their families. Far from being a discrete event, deployment is a cyclical process comprising three distinct stages: (1) pre-deployment, where families prepare for an impending deployment and the separation of family members; (2) deployment, where the deployment of military personnel results in the physical separation of serving members and spouses/partners; and (3) post-deployment, when veterans and their families have to readjust to family life after the absence. Each of these phases may present military personnel and their families with unique challenges that could affect their physical and mental health.

This review outlines the evidence for the impact on spouses/partners of a) separation during military deployment and b) the pressures of the post-deployment period. Where there is sufficient evidence that spouses/partners are affected, the existing literature relating to the possible mechanisms by which deployment affects outcomes is also discussed.

2.2 Separation during deployment

Overall, a large number of studies indicate that spouses/partners tend to report more psychological distress and substance abuse during their military members' deployment than do spouses/partners of non-deployed personnel (Everson, 2005; Mansfield et al., 2010) or general civilian populations (Eaton et al., 2008; Lester et al., 2010). For example, one study examined the mental health status of 250,626 wives of active-duty U.S. military personnel who were currently, or not currently, serving in Iraq or Afghanistan (Mansfield et al., 2010). Their results showed that women whose husbands were deployed more often received a mental health diagnosis of depression or an anxiety disorder than wives of non-deployed military personnel.

While research has focused on the mental health effects of deployment for spouses/partners, there is evidence of other effects as well. Physical symptoms such as headaches, fatigue, insomnia, eating disorders and menstrual changes have also been reported by spouses (Blount, Curry, & Lubin, 1992). In addition, deployment is associated with decreased rates of employment or reduced work hours among military spouses/partners (Murphey, Darling-Churchill, & Chrisler, 2011). For instance,

Angrist and Johnson (2000) suggested that the deployment of male soldiers led their wives to work less, likely due to added child care responsibilities at this time.

Deployment: mechanisms of influence

Separation due to deployment can present a range of stresses for spouses/partners, including increased household duties, lack of support and loneliness, and worries about the safety and wellbeing of their deployed serving member. All have associated psychological, physical and social consequences. However, positive coping capacities and the availability of community and social supports can serve as protective factors, enhancing the ability of spouses/partners to deal with the stresses associated with deployment. Research on the role of these factors in reducing (or increasing) the effects of separation due to deployment is presented next.

Negative feelings associated with the deployment separation

Stress, loneliness, anxiety and depression experienced immediately prior to and during deployment can have an adverse impact on stay-at-home spouses'/partners' mental and physical health. As an example, Warner, Appenzeller, Warner, and Grieger (2009) surveyed military spouses as their service members prepared for deployment. The results revealed that 90 per cent identified 'feeling lonely' and 'worry about the safety of my deployed spouse' as current sources of stress. Burton, Farley, and Rhea (2009a) found that spouses of deployed military personnel experienced twice as high levels of stress on average than spouses of non-deployed personnel.

Deployment to a combat zone adds to the stress by creating uncertainty and fear for the safety and wellbeing of loved ones (Eaton et al., 2008). This was found to be associated with mental and physical health-related problems (Burrell, Adams, Durand, & Castro, 2006). Thus, substantial evidence suggests that separation due to deployment is a source of stress and negative emotions that contribute to mental health problems among spouses/partners.

Increased family responsibilities

During deployment, the day-to-day responsibilities of military spouses/partners often increase as they take on new roles and duties, especially if they are caring for young children as the sole responsible adult at home (Chartrand, Frank, White, & Shope, 2008). The research indicates that spouses remaining at home shoulder an increased burden of household duties, including maintaining the household, taking care of sick relatives, and parenting and caring for children (e.g. Mansfield et al., 2010). Increased household duties have been identified as one of the major stressors during deployment (Burton, Farley, & Rheas, 2009b; Ghahramanlou-Holloway, Cox, Fritz, & George, 2011; Warner et al., 2009).

Absence of military personnel during important life events

Another risk factor for mental health problems in spouses/partners is the absence of military personnel during important life events such as the birth of a child, the reaching of child milestones or birthdays, significant family achievements or difficulties, and the death or serious illness of relatives (Haas & Pazdernik, 2007; Haas, Pazdernik, & Olsen, 2005). As an example, deployment during pregnancy was associated with an almost three-fold higher risk of postpartum depression in spouses/partners by comparison with women whose serving members were not deployed during their pregnancy (Robrecht, Millegan, Leventis, Crescitelli, & McLay, 2008).

Lifestyle changes

In addition to the adverse effect of deployment on spouses'/partners' physical health described earlier, deployment is related to changes in stay-at-home spouses'/partners' health-related behaviours. Firstly, the length and number of deployments are associated with decreased participation in beneficial health-related behaviours such as exercise, diet, check-ups, stress management and rest (Padden, Connors, & Agazio, 2011a). Secondly, individuals in both civilian and military populations sometimes use alcohol or illicit drugs to self-medicate to deal with stress (Loxley et al., 2004; Pietrzak, Pullman, Cotea & Nasveld, 2013). Given the increased stress experienced by spouses/partners during deployment, it is possible that their alcohol or illicit drug use increases during this time. As alcohol and illicit drug misuse can become entrenched and lead to long-term negative health consequences (Loxley et al., 2004), this is another potential mechanism of influence.

Community and social support

Social support can have a particularly important protective effect on the management of psychological distress caused by stressful life events (Kilpatrick et al., 2007). In Rosen and Moghadam's study (1990) of 1,090 military wives, the stress related to deployment was buffered by wives' perceived levels of social support from other wives in their husbands' units. Similarly, Murray's (2016) meta-synthesis of 11 studies examining spouses'/partners' experience of deployment found that social support was a key factor in the successful navigation of this period. Support can be gained from spouses' children (Davis, Ward, & Storm, 2011), family and friends (Merolla, 2010), other spouses of military personnel (Easterling & Knox, 2010), as well as religious communities (Wheeler & Torres Stone, 2010; Wood, Scarville, & Gravino, 1995).

On the other hand, military families without social support have been found to be at increased risk for mental health problems and relationship distress (Wiens & Boss, 2006). For example, spouses'/partners' reduction in working hours during

serving members' deployment can result in psychological distress and isolation. This is suggested by Trewick and Muller's study (2014), which found that unemployed Australian military spouses had less access to social contact and were more psychologically distressed than employed military spouses.

Coping capacities

As previously discussed, deployment can be a difficult time for the spouses/partners of military personnel. An inability to cope with the stress of the deployment separation can ultimately affect health and general wellbeing (Padden, Connors, & Agazio, 2011b). Hence, the coping strategies used by spouses/partners can be a crucial influence on how well they manage the deployment period. A large body of research on general community populations has shown that positive coping strategies can promote successful outcomes while maladaptive strategies can create risk for negative outcomes (Ntoumanis, Edmunds, & Duda, 2009).

Positive strategies include problem-focused actions that attempt to resolve the problem such as reframing the issue, making a plan, taking action, or seeking knowledge or support (Lazarus & Folkman, 1984). Less effective coping strategies reflect attempts to reduce negative emotions such as denial, distancing, isolation or giving up, and dysfunctional behaviours such as substance use or acting out (Lazarus & Folkman, 1984). However, the choice of strategy also depends on the demands of the situation; hence, it is expected that an individual will use a variety of strategies that best fit the situation encountered. Nevertheless, individuals do differ on their typical ways of coping with stress (Ntoumanis et al., 2009).

Studies of military families have shown that spouses use a variety of coping methods during their partners' deployment, including keeping busy, taking up new hobbies or interests, maintaining an optimistic outlook, and making plans for their reunion and the future (Blank, Adams, Kittelson, Connors, & Padden, 2012; Lapp et al., 2010). Efficient coping mechanisms can also bring about a sense of pride and confidence (Pittman, Kerpelman, & McFadyen, 2004). Thus, coping capacities are another avenue by which the effects of deployment may be ameliorated.

Summing up

Overall, based on prior research, it is expected that poorer mental and physical health is likely to be reported by spouses of deployed military personnel as a result of fears for serving members' safety and wellbeing, negative perceptions of the separation, increased family responsibilities, a decrease in health-promoting behaviours, lack of social and community support during separation, and the use of less effective coping strategies to deal with stress.

2.3 Post-deployment adjustment and the impact of veterans' post-traumatic stress disorder

The return home and reunion period following deployment or combat can be difficult for both veterans and their families. Numerous studies document the difficulty that returned veterans have with fitting back into their communities (Doyle & Peterson, 2005), relating to others (Manguno-Mire et al., 2007; Solomon, Dekel, & Zerach, 2008), and regaining their family roles (Galovski & Lyons, 2004). In particular, veterans can return home with mental health problems such as post-traumatic stress disorder (PTSD), which can severely affect them and their families long after they have returned from deployment (Chatterjee, Spiro, King, King, & Davison, 2009). For example, Australian research found that when Vietnam veterans had mental health difficulties such as PTSD, their spouses/partners had higher rates of mental health difficulties than in the general community three decades after the Vietnam War, especially anxiety disorders and severe recurrent depression (O'Toole, Outram, Catts, & Pierse, 2010).

Military service, particularly conflict, can result in exposure to extremely dangerous and traumatic situations, such as the risk of being killed or injured, engaging in close combat, witnessing death or serious injury of others, and being responsible for the death or injury of others (Tanielian, 2009). A substantial proportion of veterans develop PTSD, depression, anxiety disorders and other mental health problems as a consequence of these experiences (e.g. Hoge et al., 2004; Thomas et al., 2010). PTSD is of particular concern because it is the most prevalent psychiatric disorder among returning veterans and can severely impair psychosocial and occupational functioning and overall wellbeing (Hoge et al., 2004; Zatzick et al., 1997). Studies also find that PTSD has a greater impact on quality of life than mood and other anxiety disorders (Mendlowicz & Stein, 2000; Rapaport, Clary, Fayyad, & Endicott, 2005).

Numerous studies report high rates of mental health problems among veterans who had been involved in combat (Dekel, Solomon, & Bleich, 2005; Evans, McHugh, Hopgood, & Watt, 2003; Solomon, Greenberg, & Pyszczynski, 1991). Using self-reported data from over 40,000 Australian veterans who had served in Vietnam, the Morbidity of Vietnam Veterans Study found that 31 per cent of returned veterans reported PTSD (The Department of Veterans Affairs, 2013). The National Survey of the Vietnam Generation also found that around 27 per cent of 1,200 U.S. returned veterans reported PTSD. As the majority were married or living with a partner (Jordan et al., 1992), a significant proportion of spouses/partners were exposed to the effects of their ex-serving members' PTSD.

Research with veteran families has demonstrated that spouses/partners of veterans experiencing PTSD are at increased risk for mental health problems too (e.g. Dekel

et al., 2005; Gallagher, Riggs, Byrne, & Weathers, 1998; Hendrix, Erdmann, & Briggs, 1998). In Calhoun, Beckham, and Bosworth's (2002) study of 71 partners of U.S. Vietnam War combat veterans, partners of veterans diagnosed with PTSD reported more caregiver burden and experienced more depression, anxiety, hostility and obsessive-compulsive symptoms than did partners of veterans without PTSD. Studies by Solomon and colleagues reported that combat trauma and PTSD in veteran husbands significantly contributed to mental illness and impaired social relations in wives (Dekel et al., 2005; Solomon, Waysman, Levy et al. 1992).

Furthermore, veterans' PTSD has consistently been shown to be related to couple relationship dissatisfaction and marital instability. Wives of returned veterans with PTSD reported significant reductions in marital cohesion and satisfaction and increase in conflict (Solomon, Waysman, Belkin et al., 1992). The U.S. Centre for Military and Veteran's Health (2007) reported findings from a number of high quality studies showing that couple relationships were affected by PTSD and there was more marital instability in families of veterans suffering from PTSD. Similarly, the U.S. National Vietnam Veterans Readjustment Study (Jordan et al., 1992; Kulka, 1990) found that divorce rates were elevated among Vietnam Veterans with PTSD.

It is clear that veteran PTSD can have a large impact on spouses/partners and families that can be felt for many years. Therefore, a major focus of the current report is the impact of veterans' PTSD on spouses/partners. The next section provides an overview of research that can shed light on the mechanisms by which PTSD may affect spouses/partners.

Post-traumatic stress disorder: mechanisms of influence

The research literature suggests that veterans' PTSD may adversely affect spouses/partners in a number of ways.

Impaired communication

One mechanism by which veterans' PTSD can affect spouses/partners is its impact on communication, as indicated by a sizable body of research. For example, disruption of communication and bonding between veterans and their spouses/partners was found to mediate the impact of veterans' PTSD on spouses' marital satisfaction (Allen, Rhoades, Stanley, & Markman, 2010). The avoidance symptoms of PTSD, such as loss of interest in activities and detachment from others, are associated with impaired communication and interactions between veterans and their spouses (Foa, Riggs, & Gershuny, 1995; Litz, 1992), as well as their willingness to engage with other family members (Riggs, Byrne, Weathers, & Litz, 1998). Similarly, hyperarousal symptoms of PTSD (i.e. irritability, concentration problems) can adversely affect family interactions and increase marital conflict and distress (Meis, Erbes, Polusny, &

Compton, 2010; Solomon et al., 2008). Finally, taking care of and supporting veterans with PTSD who have trouble communicating their problems, fly into rages, and are verbally abusive, leads many spouses/partners to become depressed, anxious, defensive and hostile (MacPherson, 2009; Shehan, 1987).

Relationship conflict and domestic violence

Veterans diagnosed with PTSD are more likely to be psychologically and physically aggressive towards their partners and children than veterans without PTSD (Verbosky & Ryan, 1988). Verbal aggression has been found to mediate the association between PTSD symptoms and marital intimacy (Solomon et al., 2008). Interviews with 1,200 U.S. male Vietnam veterans and 376 of their spouses found that about 60 per cent of veterans with PTSD and their spouses reported medium-high to high levels of marital conflict. Families of veterans with PTSD were also more likely to report that family violence was committed by both veterans and spouses than families of veterans without PTSD (Jordan et al., 1992).

Veterans' problem behaviours

A number of studies have provided evidence of post-deployment reintegration difficulties due to veterans' problem behaviours such as dangerous driving, gambling, interpersonal conflict, increased substance use and anger control problems (Stefanovics, Potenza, & Pietrzak, 2017). Some serving members returning from a combat zone develop problems with impulse control and aggressive behaviour, which can lead to domestic violence, child abuse and other aggressive behaviour problems. In Sayer and colleagues' U.S. study of 754 Iraq-Afghanistan combat veterans who were receiving Veterans Affairs medical care, more than one-half were struggling with anger control problems, and nearly one-third engaged in problem behaviours such as dangerous driving and greater alcohol or drug use (Sayer et al., 2010).

Effects of other trauma symptoms

Returned veterans with PTSD have often reported sexual problems (Schwartz, Doebbeling, Merchant, & Barret, 1997), dissociation or feeling distanced from their own thoughts, feelings or memories (Simmons, Maconochie, & Doyle, 2004), feeling depressed (Barak, Bodner, Klayman, Ring, & Elizur, 2000) and having sleep disturbances. All have been found to be associated with marital dissatisfaction and relationship issues (Goff, Crow, Reisbig, & Hamilton, 2007). Thus, PTSD often affects other aspects of veterans' physical and mental health, which, in turn, affect couple relationship quality and stability.

2.4 Summing up

Much research shows that veterans' post-deployment adjustment is a significant contributor to the wellbeing of their spouses/partners and families. One of the strongest influences is veterans' PTSD, which as well as having direct effects also impacts families through its effect on key elements of couple relationships (e.g. communication, conflict, domestic violence) and its roll-on effect on other veteran health difficulties (e.g. sexual or sleep problems, disassociation) or problem behaviours (e.g. alcohol or drug use, dangerous driving). Accordingly, a key interest of this report is the role of returning members' PTSD in mediating the effects of deployment to Vietnam on spouses/partners.

3 Study methodology

The next section describes the methodology used in the VVFS: how the sample was obtained, how the data was collected, and the representativeness of the sample compared to the larger population from which it was derived. As our focus is upon the emotional, physical and social wellbeing of the spouses/partners of Vietnam veterans, survey data collected from servicemen (questionnaire 1) and their spouses/partners (questionnaire 2) are the primary sources of information (information regarding the data collections for servicemen's adult children and siblings can be found in Volumes 2 and 3 of this series: Forrest et al., 2014, and the Commonwealth of Australia, 2014).

3.1 Sample recruitment

Overall, the VVFS serviceman cohort was recruited from two sources:

- a randomly selected sample of 3,940 army Vietnam veterans (VV) and 3,967 army Vietnam-era personnel (VEP) obtained from the DVA Nominal Roll of Vietnam Veterans and from a combination of DVA client lists and the Australian Electoral Roll (in the case of the Vietnam-era personnel). All had served in the Australian Army at some point between 1962 and 1975.
- a self-selected sample consisting of 2,569 Vietnam veterans and 418 Vietnam-era personnel who contacted DVA and volunteered to participate in the VVFS.

For the current report, the analyses were restricted to the randomly selected sample because the self-selected sample was comprised disproportionately of Vietnam veterans and included relatively few Vietnam-era personnel. In addition, the self-selected Vietnam veterans who volunteered to complete the survey were less representative of the larger population of Vietnam veterans than those who were selected at random.

The process of recruitment was as follows:

1. A total of 3,633 VV and 2,751 VEP were contacted and invited to take part in the VVFS; i.e. were 'registered' for the study.
2. During their registration, these servicemen were asked to supply contact details for family members who could be invited to participate in the study.
3. The names and addresses of family members supplied by VVs and VEP were then provided to Colmar Brunton, the data collection agency.
4. Colmar Brunton contacted family members to ascertain their interest in taking part in the study. If they expressed interest, they were 'registered'.

5. Questionnaires were then mailed to all 'registered' family members. In addition, if an email address had been provided, family members were emailed a link to complete an online version of the survey. In some cases, surveys were completed by telephone interviews.
6. Follow-up reminders were mailed. Finally, non-respondents were contacted a second time by telephone to encourage their participation.

Overall, 3,318 VV families and 2,647 VEP families (servicemen and/or their spouses/partners) participated in the VVFS.[4] A total of 27 VV and 7 VEP servicemen with male spouses/partners were excluded.

Among the participating VV families, there were 1,435 families in which both veterans and spouses/partners responded, 1,554 families where only veterans responded and 302 families where only spouses/partners responded (see Figure 3.1). Among the participating VEP families, there were 849 families in which both servicemen and spouses/partners responded, 1,675 families where only servicemen responded and 123 families where only spouses/partners responded (see Figure 3.2). As this report focuses on the wellbeing of spouses/partners, the final sample used in the statistical analyses required responses from both servicemen and spouses/partners. Thus, the final analysis sample comprised 1,435 VV and 849 VEP families.

Figures 3.1 and 3.2 show the selection process and samples achieved for VV and VEP families, respectively. The right-hand column shows the steps taken to obtain the final analysis sample, while columns to the left show the points at which potential respondents were lost to the study or excluded.

4 Please note that these numbers will differ somewhat from other reports because they are calculated for veterans and spouses/partners, whereas numbers in other reports in the series are calculated for veterans and their adult children (Report 2) and veterans and all types of family members (Report 3).

Figure 3.1 Selection process for VV families

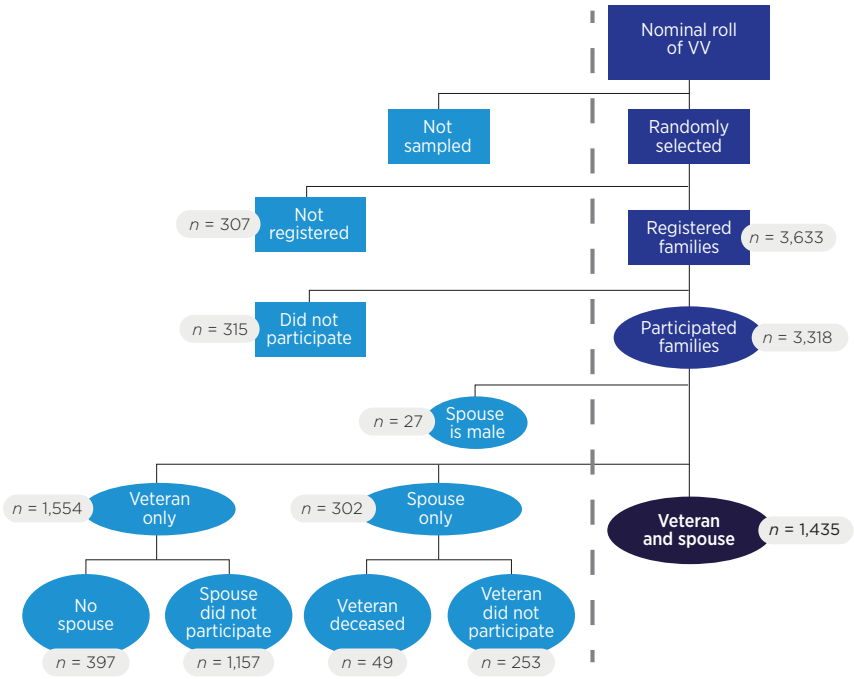
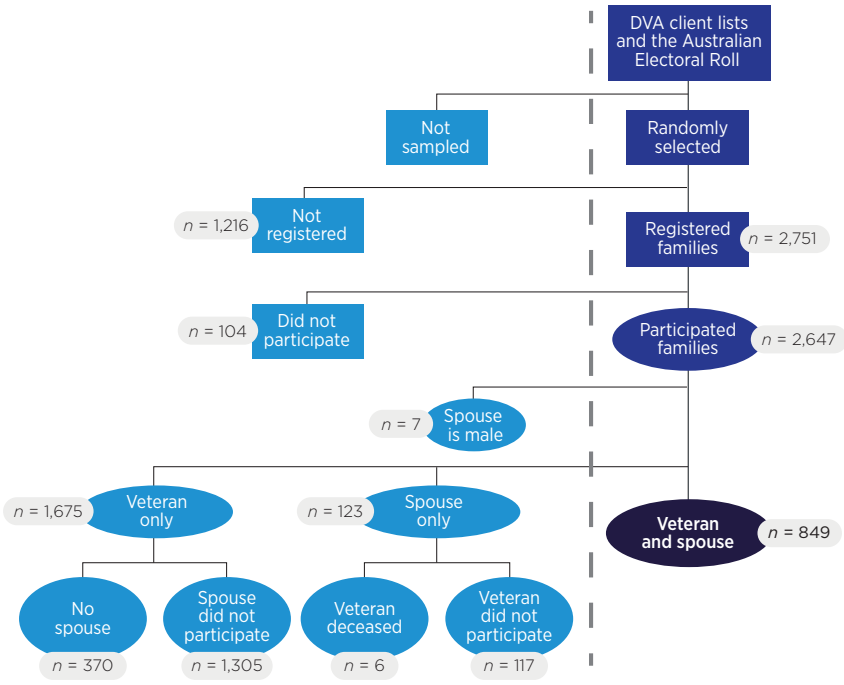


Figure 3.2 Selection process for VEP families



3.2 Selection bias of the VVFS analysis sample

As noted earlier, the analysis sample was constrained to the sub-group of servicemen and their spouses/partners who both provided information for the VVFS. Figures 3.1 and 3.2 show that 43.2 per cent of the participating VV families and 32.1 per cent of participating VEP families were included in the final analysis sample. Various factors might have influenced servicemen's and spouses'/partners' willingness to take part, particularly reasons connected to their social, physical or mental wellbeing. For example, servicemen who experienced PTSD may have had more troubled relationships with their spouses/partners and this could have either increased or decreased the willingness of their spouses/partners to participate. If one of these possibilities predominated, estimates of the effects of Vietnam War service on the outcomes of veterans and their spouses/partners could be biased. This, combined with the non-participation of registered servicemen or spouses/partners, raises the possibility that the VVFS might not be able to reliably capture the effects of service in the Vietnam War on spouses/partners.

To address these concerns, two potential sources of selection bias among study members and their families were examined:

- the extent to which the VV analysis sample was representative of the larger population of men who served in the army and served in the Vietnam War (Section 3.3.1)
- whether non-participation by servicemen or their spouses/partners led to either an under- or over-estimate of the impact of Vietnam War service on veterans and their spouses/partners (Section 3.3.2). For these analyses, servicemen whose spouses/partners did, or did not, participate in the VVFS were compared, while spouses/partners whose servicemen did, or did not, take part in the VVFS were compared.

Unfortunately, information about the entire population of VV and VEP families is not available, limiting our investigation of the representativeness of the analysis sample. However, it was possible to use VVFS study information obtained from all participating servicemen and spouses/partners as well as information obtained from the Nominal Roll to compare those included in the analysis sample and those excluded from it.

To investigate differences in servicemen's and spouses'/partners' characteristics across sub-samples, mean-comparison and proportion-comparison tests were performed in Stata. Firstly, to examine the significance of differences, the following tests were performed: T-tests (ttest command in Stata) for continuous outcome variables (e.g. age); tests of proportions (prtest command in Stata) for binary outcome variables (e.g. diagnosis of or treatment for depression); and Chi-square tests (chi2 command in Stata) for categorical outcome variables (e.g. level of education).

Secondly, to investigate the 'magnitude' of significant differences, Cohen's d (for continuous outcome variables) and Cramér's V (for binary and categorical outcome variables) were used to measure the effect sizes. The effect sizes were interpreted according to Cohen's criteria (1988). A Cohen's d of 0.20–0.49 is classified as 'small'; 0.50–0.79 as 'medium'; and 0.80+ as 'large'. For Cramér's V, an effect size of <0.10 is classified as 'less than a small effect' (negligible); 0.10 to <0.20 is classified as 'small'; 0.20–0.39 as 'moderate'; and 0.40+ as 'large' (Rea & Parker, 1992). It should be noted that the magnitude of effect sizes can be affected by methodological factors such as measurement error and study design. Cohen notes that 'many effects in the social sciences are small' and other researchers argue that the small effects found in social science research can be useful and meaningful (e.g. Cortina & Landis, 2009; McCartney & Rosenthal, 2000). Therefore, small effects are treated as meaningful in this report.

3.2.1 Are the Vietnam veterans in the analysis sample representative compared to the Nominal Roll?

In order to evaluate the representativeness of the VV analysis sample, this sample was compared to the larger population of male army Vietnam veterans listed on the Nominal Roll.[5] Confidential identification numbers were provided by the DVA in order to extract information contained in the Nominal Roll on the military and demographic characteristics of the veterans in the analysis sample. It was possible to identify all but 11 of the 1,435 Vietnam veterans in the analysis sample on the DVA Nominal Roll.[6] The analysis sub-sample of 1,424 veterans comprises roughly 3.5 per cent of the surviving male army veterans listed on the nominal roll. The description of the variables used is provided in Table 3.1.

5 Non-response by VEPs is of less concern because the VEP members and their family members are included in the study to provide a comparison (or control) group for the Vietnam veterans and their spouses/partners. Given that the VEPs included in the estimation sample are chosen because they are comparable to the Vietnam veterans, it is not necessary that they are representative of the total population of Vietnam-era personnel. Thus, analyses of the representative of the VVFS VEP sample were not undertaken.

6 The identification numbers of 11 respondents were not in the Nominal Roll.

Table 3.1 Variables included in the comparison analyses between VV in the analysis sample and the Nominal Roll

Variables	How measured
Age	Age of servicemen in years
Birth place (Australian state or territory, other country)	Servicemen's birth place: Australian Capital Territory, New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria, Western Australia and overseas.
National servicemen	Served as a National Serviceman while in Vietnam. Only Army personnel served as National Servicemen.
Corps mortality rate	The number of deaths per 1,000 population
Honoured	Servicemen being honoured for their service, including the Officer of the Order of the British Empire, Mention in dispatches, etc.
Total duration of deployment	The total number of days the servicemen was deployed (in days)
Conscription	Conscription status of servicemen: 1 = Yes; 0 = No.
Corps served in	The corps servicemen served in, including the Royal Australian Infantry; the Royal Australian Engineers, the Royal Australian Artillery, the Royal Australian Survey Corps, the Australian Army Legal Corps, etc.
Rank	Three categories of rank were used: enlisted (private, musician, signalman, gunner, trooper, sapper, craftsman, patrolman, recruit); non-commissioned officer (lancecorporal, corporal, sergeant, warrant, bombardier); and officer (lieutenant, captain, major, colonel, brigadier, general).

Source: Vietnam Veterans Family Study

Table 3.2 provides an overview of characteristics of the VVFS analysis sample and the larger population of male Vietnam veterans. It also reports the results of analyses investigating differences on means or proportions between the analysis sample and the Nominal Roll population (depending on the type of data available). Comparisons are restricted to male Vietnam veterans who served in the army to reflect the intended focus of the VVFS sample.[7]

Overall, significant differences were found on approximately one-fifth of the aspects examined. Thus, on average, the VV analysis sample was younger than the army Vietnam veterans on the DVA Nominal Roll. At 67 years on average, the mean age of the analysis sample was about one year younger than the average age of the general population of army Vietnam veterans.

This difference is most likely due to the significantly higher percentage of national servicemen in the analysis sample than in the Nominal Roll comparison population (50.4 per cent compared with 44.8 per cent). Given that all conscripts were born between 1945 and 1953, the large number of national servicemen in the analysis sample may account for the slightly younger age composition of this sample.

7 After restriction to male veterans who served in the army during the Vietnam War period, 40,997 Vietnam veterans were available from the Nominal Roll for comparison.

Additionally, the VV analysis sample had on average experienced significantly more time on deployment than the VV on the Nominal Roll (almost two weeks on average; 322.8 days compared with 309.5 days).

Veterans born in New South Wales were slightly under-represented in the analysis sample by comparison with the Nominal Roll population, while veterans born in South Australia were slightly over-represented. There were no other differences by state of birthplace.

Finally, a slightly lower percentage of the analysis sample had served in the Army Ordnance Corps than the comparison Nominal Roll population.

Despite the over-representation of conscripts and longer duration of deployment in the VVFS sample, the VV analysis sample and the larger population of army Vietnam veterans did not significantly differ on other service characteristics:

- There were no significant differences on the percentages who served as enlisted, non-commissioned officers, and officers when comparing the analysis sample and the Nominal Roll comparison population.
- The VV analysis sample was just as likely to have been honoured for their service (e.g. Mentioned in Despatches) as veterans on the Nominal Roll.
- The percentages of analysis sample veterans who served in the major Army corps (e.g. Royal Australian Infantry, Royal Australian Engineers, and Royal Australian Artillery) were similar to the larger population of veterans.

As can be seen in the table, the significant differences were either in the small effect size range (age) or weaker than a small effect size (whether VV were born in South Australia or were national servicemen; duration of deployment; whether VV were born in New South Wales; whether VVs had served in the Ordnance Corps).

These findings suggest that the VVFS analysis sample is broadly representative of the total population of army Vietnam veterans. They also imply that respondents to the survey were just as likely as other Vietnam veterans to have served in combat roles and to have been exposed to combat-related harms. For example, the average corps death rate for the analysis sample was similar to that of the general Vietnam veteran army population (15.7 compared to 15.2 per 1,000; Table 3.2).

Table 3.2 Vietnam veterans in the estimation sample of VVFS compared to Vietnam veterans in the Nominal Roll

Characteristics of serviceman	VV on Nominal Roll	VV in estimation sample	Difference	Effect size
		Mean or %		
Age (years)	68.11	66.67	1.50***	0.23[b]
Place of Birth (%)				
ACT	0.27	0.02	0.02	0.00
New South Wales	34.24	30.95	-3.29*	0.01[a]
Northern Territory	0.15	0.15	0.02	0.00
Queensland	18.33	18.22	0.11	0.00
South Australia	9.76	13.06	-3.30***	0.02[a]
Tasmania	4.36	3.58	0.75	0.04
Victoria	22.97	23.21	-0.24	0.00
Western Australia	9.95	10.57	-0.62	0.00
Born overseas	17.00	15.59	1.41	0.01
Service record				
National servicemen (%)	44.80	50.35	-5.56***	0.02[a]
Rank (%)				
Enlisted	53.52	56.12	-2.60	0.01
Non-commissioned officer	37.34	35.30	2.04	0.01
Officer	9.14	8.58	0.57	0.00
Corps mortality rate (per 1000)	15.15	15.70	0.57	0.03
Honoured (%)	1.70	1.76	-0.06	0.00
Duration of deployments (days)	309.96	322.79	-12.84***	0.09[a]
Army corps (%)				
Royal Australian Infantry	3.21	2.81	0.40	0.01
Royal Australian Engineers	0.17	0.07	0.10	0.01
Royal Australian Army Service Corps	4.50	4.78	-0.28	0.01
Royal Australian Artillery	38.53	40.10	-1.57	0.03
Royal Australian Electrical and Mechanical Engineers	0.14	0.07	0.07	0.02
Royal Australian Corps of Signals	8.53	7.58	0.95	0.03
Royal Australian Army Ordnance Corps	3.20	2.32	0.89*	0.01[a]
Royal Australian Armoured Corps	6.56	6.53	0.03	0.00
Australian Army Catering Corps	0.28	0.21	0.07	0.01
Royal Australian Army Medical Corps	6.97	7.94	-0.96	0.01
Others	27.94	27.59	0.35	0.02
N	40,997	1,424		

Notes: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. [a] = very small effect size, [b] = small effect size. *N* indicates the maximum sample available, which may vary due to missing data.

Source: Vietnam Veterans Family Study

3.2.2 Differences between the analysis sample and the remaining VVFS servicemen and spouses/partners

As discussed in Section 3.1, spouses/partners who participated in the VVFS survey were recruited into the study via the servicemen with whom they were affiliated. After being nominated by servicemen, spouses/partners were invited to participate in the study. Given this method of recruitment, there were at least three potential sources of sample selection bias:

- non-response and/or non-participation by the VV or VEP service member.
- failure by the VV or VEP to nominate his spouse/partner.
- non-response and/or non-participation by the spouse/partner.

As described in the previous section, the VV sub-sample appears to be broadly representative of the larger population of Vietnam veterans from which it was derived. Nonetheless, it cannot be assumed that it is representative of the population of Vietnam veterans with spouses/partners. It is still possible that responding VVFS veterans and spouses/partners were not representative of the population of veteran families with spouses/partners. To investigate this issue, data would be needed for the total population of Vietnam veterans and spouses/partners so that the VVFS veterans and spouses/partners could be compared to this broader population. Such information is not available.

Despite being unable to compare the analysis sample (both servicemen and spouses/partners) to their respective populations, it was possible to examine how representative the analysis sample was compared to families where only servicemen or spouses/partners participated in the VVFS. Firstly, the differences between servicemen with and without VVFS spouse/partner data were examined, then differences between spouse/partner respondents with and without VVFS servicemen data. The groups were further divided by the deployment status of servicemen (i.e. VV and VEP sub-groups).

The following characteristics of servicemen and spouses/partners were used for these analyses: age; Indigenous status; military service characteristics (e.g. age when entered the army (servicemen only); whether spouses/partners had serviced in the ADF); educational level; impact of servicemen's military service on respondents; couple relationship quality (reported by servicemen and their spouses/partners); relationships with children, siblings, parents and friends; employment status; financial stress in the past 12 months; whether the respondent had been homeless in this time period; general physical health; depressive symptoms; anxiety; PTSD symptoms; suicidal ideation; problem drinking; illegal drug use; criminal record; and whether respondents had been the victim of a violent assault. The measures used are described in Table 3.3.

Table 3.3 Variables included in the comparison analyses between the analytical sample and the excluded sample

Variables	How measured
Age	Servicemen's and spouses'/partners' age at the study in years
Duration of service	Total duration of service in military in years
Trauma experienced	The experience of trauma was derived from eight items, with response options ranging from 1 (never) to 5 (very often; i.e. 11 or more times). Items used were [How often did you experience]: being in danger of being killed; being in danger of being injured; having to handle dead bodies; seeing dead bodies; hearing of a close friend, relative or other service personnel being injured or killed; being present when a close friend, relative or other service personnel was injured or killed; fear that you had been exposed to a contagious disease, toxic agent or other contaminant; being a witness to a significant level of human degradation and misery. The level of traumatic experience was calculated as the average score across the eight items, with higher scores indicating greater exposure to trauma.
Positive impact of deployment	Both servicemen and spouses/partners were asked how negative or positive they think the military service of the servicemen has been on their: (1) relationships with their spouses/partners; (2) other romantic relationships; (3) relationships with immediate family; (4) relationships with wider family; (5) relationships with friends; (6) employment; (7) physical health; (8) mental health; and (9) financial situation. Servicemen and spouses/partners rated each item on a five-point likert scale, ranging from 1 'extremely negative' to 5 'extremely positive'. Items 1 to 5 were averaged to indicate the impact of deployment on their social surroundings, with higher scores indicating more positive impacts of military service. Items 6 to 9 were averaged to indicate the impact of deployment on their daily functioning such as health, employment and finance, with higher scores indicating more positive impacts of military service.
Education level	Servicemen and spouses/partners were asked about their highest education qualification obtained. This was recoded into: 1 = Year 10 or below; 2 = Year 11 or 12; 3 = Certificate/ diploma and 4 = University degree or higher.
Couple relationship quality	The quality of relationships with servicemen as perceived by spouses/partners was measured by the Relationship Assessment Scale (RAS; Hendrick, 1988). The RAS contains six items measuring relationship quality for current spouses/partners or previously for ex-spouses/partners (e.g. How well does your spouse/partner meet your needs?). Items are scored on a five-point Likert scale of 1 (not at all) to 5 (very much). The scale yields a single score derived from the average of all six items. A higher score indicates a more positive assessment of the relationship. Only current spouses/partners responded to the RAS.
Abuse in relationship	The occurrence of abuse at some stage of the couple relationship was measured using the Women Abuse Screening Tool (WAST), a six-item screening scale probing whether there had been verbal, emotional, physical or sexual abuse between partners (e.g. Do arguments ever result in you feeling put down or bad about yourself?). The items were scored using a three-point Likert scale of 1 (Never), 2 (Sometimes) and 3 (Often). The average across the six items was calculated, with the composite score derived ranging from 1–3. Higher scores indicate higher levels of abuse.
Family satisfaction	Family satisfaction was measured by the Family Satisfaction Scale (FSS; Olson, 2011). The FSS contains 10 items measuring satisfaction with the family's cohesion, adaptability and communication (e.g. In general, how satisfied are you with the degree of closeness between family members?). A total score is calculated as the sum of the 10 items (a possible range from 10–50) with a higher score indicating higher family satisfaction.

Variables	How measured
Relationship with families	Spouses/partners were asked in general, how satisfied they were with their relationship with their (a) children/step-children, (b) own brothers or sisters (or step-brothers/sisters) and (c) parents (or step-parents or parents-in-law). Each question has responses ranging from 1 (very dissatisfied) to 5 (very satisfied). The responses were dichotomised into dissatisfied (combining very dissatisfied, dissatisfied and neither) and satisfied (combining satisfied and very satisfied). Four scores were derived reflecting satisfaction with each type of relationship.
Relationship with friends	Relationship with friends was measured by six questions that assess the impact of positive and negative interactions with friends (e.g. How often do your friends make you feel cared for?), with options from 1 'never' to 4 'often'. Items were recoded and averaged so a high average score indicates more positive interaction with friends.
Working status	Servicemen and spouses/partners were asked 'Which of the following best describes the MAIN type of work you currently do?' Ten response options were provided such as working for pay as an employee, self-employed, studying, household duties, living with a disability. Two binary indicators were derived: whether the servicemen and spouses/partners were working or self-employed (Yes = 1; Otherwise = 0); whether the servicemen and spouses/partners were retired or semi-retired (Yes =1; Otherwise =0).
Financial stress in the past 12 months	Five binary indicators of whether servicemen and spouses/partners had ever experienced financial hardships such as couldn't keep up with payments for water, electricity, gas or telephone; got behind with the rent or mortgage; had to pawn or sell something or borrow money from a money lender; or had to ask a welfare agency for food, clothes, etc. (Yes = 1; No = 0). If servicemen and spouses/partners had experienced any of these hardships, they were deemed to have experienced financial hardship (Yes = 1, No = 0).
Homeless in the past 12 months	Four binary indicators of whether spouses/partners had been homeless in the last 12 months (as defined above) at the time of the interview (Yes = 1; No = 0).
Poor physical health	A single question was used to measure general health: 'In general, how would you say your health is?' Servicemen and spouses/partners responded to five options: excellent, very good, good, fair and poor. Responses were dichotomised into Good heath (combining excellent/very good/good) and Poor health (combining fair/poor).
Depression (ever)	Binary indicator of whether servicemen and spouses/partners were ever diagnosed with or treated for depression (Yes = 1, Otherwise = 0).
Depression (past 5 years)	Binary indicator of whether servicemen and spouses/partners were unable to fulfill their responsibilities due to depression in the last 5 years (Yes = 1, Otherwise = 0).
Anxiety (ever)	Binary indicator of whether servicemen and spouses/partners were ever diagnosed with or treated for anxiety (Yes = 1, Otherwise = 0).
Anxiety (past 5 years)	Binary indicator of whether servicemen and spouses/partners were unable to fulfill their responsibilities due to anxiety in the last 5 years (Yes = 1, Otherwise = 0)
PTSD (ever)	Binary indicator of whether servicemen and spouses/partners were ever diagnosed with or treated for PTSD (Yes = 1, Otherwise = 0).
PTSD (past 5 years)	Binary indicator of whether servicemen and spouses/partners were unable to fulfill their responsibilities due to PTSD in the last 5 years (Yes = 1, Otherwise = 0)
Suicidal ideation	Suicidal ideation was derived from the five-item Psychiatric Symptom Frequency Scale (PSF) (Lindelow, Hardy & Rogers, 1997): (1) Have you ever felt that life is hardly worth living?; (2) Have you ever thought that you would really be better off dead?; (3) Have you ever thought about taking your own life?; (4) Have you ever made plans to take your own life?; (5) Have you ever attempted to take your own life? These five items were reformulated into a composite Guttman-type scale, ranging from never feeling that life was hardly worth living through to attempting to take one's own life, yielding a 0 to 5 rating, respectively. A total score was calculated as the sum of all items and yielded the following categories: 0 = no suicidal ideation; 1–3 = suicidal thoughts; 4–5 = suicidal plans/actions.

Variables	How measured
Problem drinking	Current alcohol risk was derived according to the National Health and Medical Research Council (NHMRC, 2009) Australian guidelines for women. Consumption of five or more standard drinks in one day was defined as high risk.
Illicit drug use (ever)	Binary indicator of whether spouses/partners had ever tried marijuana/hashish (Yes = 1, Otherwise = 0).
Illicit drug use (past 12 months)	Binary indicator of whether spouses/partners had used marijuana/hashish in the past 12 months (Yes = 1, Otherwise = 0).
Criminal record	Binary indicator of whether servicemen and spouses/partners have ever been convicted of a criminal offence (Yes = 1, Otherwise = 0).
Victim of assault	Binary indicator of whether spouses/partners have ever been the victim of personal violence (Yes = 1, Otherwise = 0).

Source: Vietnam Veterans Family Study

Comparisons of servicemen with and without spouse/partner data

Differences between servicemen whose spouses/partners did, or did not, participate in the VVFS were examined first. Two sub-samples were compared:

- the analysis sample of servicemen
- the VVFS responding servicemen who reported that they were in a couple relationship but whose spouse/partner did not participate in the VVFS.

These sub-samples were further divided by servicemen's VV and VEP status.

Table 3.4 shows comparisons of the responding VV whose spouses/partners participated in the VVFS and the responding VV whose spouses/partners did not participate. Overall, significant differences were found on approximately one-third of the characteristics on which these sub-samples were compared.

Thus, VVs whose spouses/partners participated tended to be slightly younger than VV whose spouses/partners did not participate. They had also served in the ADF on average one year less than their counterparts. The two sub-samples had similar exposures to trauma during their ADF service but VV with participating spouses/partners less often reported positive effects of military service on their lives than those with non-participating spouses/partners. There were no significant differences on the highest level of education achieved.

In terms of their interpersonal relationships, veterans with participating spouses/partners tended to be more positive about their couple relationships than their counterparts, while no significant differences were found on the occurrence of abuse. The two sub-samples did not significantly differ on relationships with other family members or friends. Most VV were retired or semi-retired at the time of the survey; nevertheless, VV without spouse/partner data were more likely to still be working or be self-employed than those with spouse/partner data. They were also more likely to

have experienced financial stress in the past 12 months compared to VV with spouse/partner data. Homelessness was very rare and similar across the two sub-samples.

Regarding their health, significantly more VV with participating spouses/partners reported poor physical health then veterans with non-participating spouses/partners. More than half of all VV respondents reported that they had been diagnosed with or treated for depression or PTSD in their lives, with the proportion significantly higher among veterans of participating spouses/partners. However, there were no significant differences on their experience of mental health problems in the past five years or more recent PTSD or lifetime suicidal ideation. There were also no significant differences on engagement in risky behaviours such as problem drinking, illicit drug use or having a criminal record.

As can be seen in Table 3.4, although some of the differences were significant, they were either small or very small in effect size.

VEPs whose spouses/partners participated are next compared to VEPs whose spouses/partners did not participate (Table 3.5). Significant differences were found on approximately 30 per cent of the characteristics examined.

There were no significant differences on military service characteristics, or on VEP's age or highest educational level achieved. VEPs with spouse/partner data reported more positive couple relationships on both indicators (quality and abuse) than VEPs with non-participating spouses/partners. They also tended to be significantly more satisfied with their general family relationships and relationships with children. As was found for the VV group, VEPs with spouse/partner data were less likely to be working or self-employed and more likely to be retired or semi- retired. They were also less likely to have experienced financial stress in the past year but did not significantly differ on whether they had been homeless. No significant differences emerged on mental health and wellbeing characteristics or engagement in risky behaviours except that VEP with spouse/partner data were less likely to have ever used illegal drugs in their life (but did not differ on illicit drug use in the past 12 months).

It is worth noting that although some of the differences were significant, the differences were either small or below the criterion for a small effect size.

Table 3.4 Comparison of VV respondents whose spouses/partners did or did not participate in the VVFS

	Spouse responded	Did not respond	Difference	Effect size
	Mean or %			
Serviceman's age (years)	66.69	67.12	-0.43*	-0.01[a]
ADF service (Mean)				
Duration of service (years)	8.50	9.51	-1.01*	-0.10[b]
Trauma experienced during service	2.80	2.72	0.08*	0.09[a]
Positive impact of deployment (Mean)				
On family and friends	2.95	3.09	-0.13***	-0.14[b]
On daily functioning	2.48	2.61	-0.13**	-0.13[b]
Serviceman's education (%)				
Year 10 or below	34.73	34.28		
Year 11 to 12	15.24	16.16	1.07	0.02
Certificate or diploma	38.55	37.21		
University degree	11.48	12.34		
Relationship with spouses/partners				
Abuse in couple relationship (Mean)	1.27	1.28	-0.01	-0.04
Relationship quality (Mean)	4.29	4.20	0.09**	0.12[b]
Family relationships				
Family satisfaction (Mean)	3.28	3.26	0.02	0.03
Relationship with children (% satisfied)	81.39	80.78	0.61	0.02
Relationship with sibling (% satisfied)	56.08	57.45	-1.36	-0.03
Relationship with parents (% satisfied)	60.93	65.70	-4.77	-0.10
Relationship with friends (Mean)	3.13	3.12	0.00	0.01
Serviceman's current employment/financial situation (%)				
Working/self-employed	12.35	17.04	-4.68***	0.07[a]
Retired/semi-retired	72.16	68.15	4.01*	0.04[a]
Financial stress in past 12 months	9.15	11.92	-2.91*	0.05[a]
Homeless in past 12 months	1.02	1.00	-0.00	0.00
Serviceman's health (%)				
Poor physical health (past 12 months)	56.59	51.56	5.08*	0.05[a]
Depression diagnosis/treatment (ever)	57.91	53.85	4.06*	0.04[a]
Anxiety diagnosis/treatment (ever)	58.40	54.71	3.77	0.04
PTSD diagnosis/treatment (ever)	69.48	64.48	5.00*	0.05[a]
Depressive symptoms (past 5 years)	31.01	28.00	3.16	0.07
Anxiety symptoms (past 5 years)	29.41	28.00	1.58	0.03
PTSD symptoms (past 5 years)	38.54	35.35	3.22	0.07
Suicidal ideation (ever)	60.65	59.20	1.45	0.01

	Spouse responded	Did not respond	Difference	Effect size
			Mean or %	
Risky behaviours (%)				
Problem drinking (past 12 months)	17.23	16.54	0.68	0.01
Illicit drug use (ever)	27.15	25.00	2.14	0.02
Illicit drug use in the past 12 months	1.25	1.30	-0.00	0.00
Criminal record	10.83	10.40	0.43	0.01
N	1,435	1,157		

Notes: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. [a] = less than a small effect size (negligible), [b] = a small effect size. *N* indicates the maximum sample available, may vary due to missing data.

Source: Vietnam Veterans Family Study

Table 3.5 Comparison of VEP respondents whose spouses/partners did or did not participate in the VVFS

	Spouse responded	Did not respond	Difference	Effect size
			Mean or %	
Serviceman's age (years)	64.06	63.89	0.17	0.04
ADF service (Mean)				
Duration of service (years)	5.54	5.61	-0.08	-0.01
Trauma experienced during service	1.41	1.42	-0.01	-0.02
Positive impact of deployment (Mean)				
On family and friends	3.33	3.32	0.01	0.02
On daily functioning	3.26	3.20	0.05	0.06
Serviceman's education (%)				
Year 10 or below	26.54	25.51		
Year 11 to 12	12.44	13.62	0.83	0.02
Certificate or diploma	42.89	43.23		
University degree	18.13	17.64		
Couple relationships				
Abuse in couple relationship (Mean)	1.16	1.19	-0.03**	-0.11[b]
Relationship quality (Mean)	4.48	4.34	0.14***	0.21[b]
Family relationships				
Family satisfaction (Mean)	3.57	3.46	0.12***	0.17[b]
Relationship with children (% satisfied)	90.20	85.07	5.13***	0.08[a]
Relationship with sibling (% satisfied)	67.99	64.20	3.79	0.04
Relationship with parents (% satisfied)	76.02	74.40	1.62	0.02
Relationship with friends (Mean)	3.23	3.22	0.01	0.01

	Spouse responded	Did not respond	Difference	Effect size
	Mean or %			
Serviceman's current employment/financial situation (%)				
Working/self-employed	49.29	57.58	-8.29***	0.08[a]
Retired/semi-retired	43.13	33.31	9.82***	0.10[b]
Financial stress in past 12 months	5.68	7.93	-2.26*	0.04[a]
Homeless in past 12 months	0.60	0.72	-0.12	0.01
Serviceman's health (%)				
Poor physical health (past 12 months)	25.78	24.98	0.07	0.01
Depression diagnosis/treatment (ever)	19.79	21.07	-1.28	0.03
Anxiety diagnosis/treatment (ever)	18.96	18.62	0.34	0.01
PTSD diagnosis/treatment (ever)	5.53	5.75	-0.25	0.02
Depressive symptoms (past 5 years)	7.66	7.36	-0.25	0.01
Anxiety symptoms (past 5 years)	6.36	5.82	0.54	0.02
PTSD symptoms (past 5 years)	2.47	2.84	-0.37	0.02
Suicidal ideation (ever)	27.94	31.29	-3.43	0.04
Risky behaviours (%)				
Problem drinking (past 12 months)	6.45	8.41	-1.96	0.04
Illicit drug use (ever)	21.50	26.18	-4.68*	0.05[a]
Illicit drug use in the past 12 months	0.94	1.84	-0.90	0.04
Criminal record	7.38	7.32	0.00	0.00
N	849	1,305		

Notes: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. [a] = less than a small effect size (negligible), [b] = a small effect size. *N* indicates the maximum sample available, may vary between analyses due to missing data.

Source: Vietnam Veterans Family Study

Comparability of spouses/partners whose servicemen did or did not take part in the VVFS

To investigate differences between spouse/partner respondents with and without servicemen data, two sub-samples were compared:

- The analysis sample of spouses/partners who participated in the VVFS study
- A sub-sample of spouse/partner respondents whose servicemen did not take part in the VVFS study (excluding spouses/partners of deceased veterans).

As before, the groups were further divided by veteran servicemen's deployment status (VV and VEP). Tables 3.6 and 3.7 show comparisons of spouses/partners of VV and VEP servicemen, respectively.

Overall, there were significant differences on approximately 30 per cent of the characteristics on which the spouses/partners of VV were compared (Table 3.6).

Those with participating VVs tended to be older than their counterparts with non-participating VVs (although the average difference was less than 1 year, small effect size). While there were very few Indigenous spouses/partners altogether, significantly more spouses/partners of non-participating VV were Indigenous than spouses/partners of participating VV (less than a small effect size). The two sub-samples did not differ significantly on the highest level of education achieved. When comparing spouses'/partners' perceptions of the effect of their VV's military service on their lives, spouses/partners of participating veterans perceived more positive effects compared to their counterparts with non-participating VV (less than a small effect size).

Regarding couple relationships, spouses/partners with VV data tended to report better relationships with their VV with the differences being in the moderate range. For example, 76 per cent of spouses/partners of participating VV reported their relationship as being satisfying or very satisfying, compared to 60 per cent of spouses/partners of non-participating VV. Additionally, they also tended to report better quality couple relationships. Finally, while very few spouses/partners reported that abuse had occurred at some stage of their couple relationship, this was higher among those with non-participating VV (small effect size).

In terms of other interpersonal relationships, spouses/partners with VV data scored higher on family satisfaction compared to their counterparts (small effect). This might be largely due to their more positive relationships with VV, as no differences between spouses/partners with and without VV data were observed in their relationship satisfaction with other family members (e.g. with children).

No significant differences were observed between spouses/partners with and without VV data in employment and homelessness. However, spouses/partners with participating VV were less likely to have experienced financial stress in the past year (less than a small effect size).

There were two significant differences on the 13 aspects of physical and mental health examined. Spouses/partners of participating VV were less likely to report depressive symptoms in the past five years and were also less likely to report suicidal ideation. However, both differences were considered to be very small.

No significant differences were observed on problem drinking, illicit drug use or having a criminal record. However, spouses/partners with VV data were less likely to report being a victim of violence than their counterparts without VV data (less than a small effect size).

Table 3.6 Comparison of spouses/partners whose VV did, or did not, participate in the VVFS

	Serviceman responded	Serviceman did not respond	Difference	Effect size
	Mean or %			
Spouse/partner age (years)	63.72	62.78	0.94*	0.17[b]
Spouse/partner Indigenous status (%)	0.50	2.10	-1.59*	0.07[a]
Spouse/partner education (%)				
Year 10 or below	40.18	38.43		
Year 11 to 12	14.92	17.36	1.15	0.03
Certificate or diploma	32.72	33.06		
University degree	12.17	11.16		
Military service				
Spouse/partner had served in defence force (%)	5.76	7.63	-1.87	0.03
Positive impact of veteran's military service (Mean)				
On family and friends	2.98	2.71	0.27***	0.28[b]
On daily functioning	2.83	2.63	0.20**	0.22[b]
Couple relationships				
Relationship quality (Mean)	3.84	3.47	0.37***	0.42[c]
Satisfaction in the relationship (% satisfied)	75.62	59.83	15.80***	0.13[b]
Abuse in relationship (Mean)	1.35	1.44	-0.09***	0.29[b]
Family relationships				
Family satisfaction (Mean)	3.21	3.09	0.11*	0.15[b]
Relationship with children (% satisfied)	85.06	83.69	1.37	0.04
Relationship with sibling (% satisfied)	67.26	69.37	-2.11	0.02
Relationship with parents-in-laws (% satisfied)	72.31	75.23	-2.92	0.02
Relationship with friends (Mean)	3.38	3.40	-0.02	0.04
Spouse/partner current employment/finance (%)				
Working/self-employed	19.40	25.10	-5.29	0.05
Retired/semi-retired	55.92	50.62	4.90	0.04
Financial stress in the past 12 months	7.58	13.33	-5.84**	0.07[a]
Homeless in the past 12 months	0.22	0.00	0.22	0.02
Spouses'/partners' health (%)				
Poor physical health (current)	27.41	28.69	-1.28	0.01
Depressive symptoms (ever)	33.17	38.19	-4.86	0.04
Anxiety symptoms (ever)	30.82	36.22	-5.09	0.04

	Serviceman responded	Serviceman did not respond	Difference	Effect size
	Mean or %			
PTSD symptoms (ever)	4.77	6.69	-2.28	0.03
Depressive symptoms (past 5 years)	7.67	11.42	-3.75*	0.04[a]
Anxiety symptoms (past 5 years)	5.87	8.67	-3.13	0.11
PTSD symptoms (past 5 years)	1.38	2.76	-1.37	0.04
Suicidal ideation (ever)	39.12	51.85	-12.7***	0.09[a]
Risky behaviours (%)				
Problem drinking (past 12 months)	4.81	4.17	0.64	0.01
Illicit drug use (ever)	13.00	14.81	-1.50	0.02
Illicit drug use in the past 12 months	0.62	0.79	-0.16	0.01
Criminal record	0.71	1.24	-0.94	0.02
Victim of assault (ever)	14.11	19.17	-5.05*	0.05[a]
N	1,447[d]	254		

Notes: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; [a] = less than small effect size (negligible), [b] = small effect size, [c] = medium effect size. *N* indicates the maximum sample available, may vary between analyses due to missing data. [d] *N* = 13 families had two spouses/partners who participated in the VVFS (both were included in analysis).

Source: Vietnam Veterans Family Study

Next, differences between the spouses/partners of VEP who did or did not take part in the VVFS study are summarised. Significant differences were found on around 30 per cent of the characteristics on which they were compared (Table 3.7). As indicated by effect sizes, most of the differences were small or weaker than a small effect size.

Significantly fewer spouses/partners with VEP data had served in the defence force compared to spouses/partners without VEP data (4 per cent vs 11 per cent, small effect size). When comparing spouses'/partners' perception of the effects of their VEP's service on their health and financial status, more spouses/partners of participating VEPs believed that there had been positive effects on their own functioning (e.g. health, financial status) compared to counterparts with non-participating VEP (small effect).

Spouses/partners with VEP data tended to be more highly educated than spouses/partners without VEP data (small effect). For example, 46.3 per cent of spouses/partners with VEP data reported Year 12 or less as their highest level of education achieved while the rate was 61 per cent among spouses/partners whose VEP did not participate, and spouses/partners of participating VEPs were more likely to have a certificate/diploma or a university degree.

Similar to spouses/partners with VV data, spouses/partners with VEP data tended to report better couple relationships than spouses/partners without VEP data. Thus, they tended to report higher relationship quality (small effect) and less abuse in the relationship (although this was rare overall, small effect).

With regard to spouses'/partners' physical or mental health, only one significant difference was found, with suicidal ideation less often reported by the spouses/partners of participating than non-participating VEP (25 per cent and 36 per cent respectively, less than a small effect). However, significant differences were found on engagement in risky behaviours, with problem drinking and the experience of being a victim of violence being lower among spouses/partners with VEP data than those without VEP data (less than a small and small effect sizes, respectively).

No significant differences were found on spouses'/partners' age and Indigenous status.

Table 3.7 Comparison of spouses/partners whose VEP did or did not take part in the VVFS

	Serviceman responded	Serviceman did not respond	Difference	Effect size
		Mean or %		
Spouse/partner age (years)	61.69	60.86	0.83	0.17
Spouse/partner Indigenous status (%)	0.75	0.00	0.75	0.03
Spouse/partner education (%)				
Year 10 or below	31.89	38.32		
Year 12 or below	14.44	22.43	1.15	0.03
Certificate/diploma	35.26	23.36	9.43*	0.10[b]
University degree	18.41	15.89		
Military service				
Spouse/partner had served in defence force (%)	3.91	10.53	-6.62**	0.10[b]
Positive impact of veteran's military service (Mean)				
On family and friends	3.41	3.32	0.09	0.12
On daily functioning	3.22	3.03	0.19*	0.24[b]
Couple relationships				
Relationship quality (Mean)	4.32	4.06	0.26**	0.36[b]
Satisfaction with the relationship (% satisfied)	86.92	80.20	6.73	0.06
Abuse in the relationship (Mean)	1.18	1.26	-0.08**	0.35[b]
Family relationships				
Family satisfaction (Mean)	3.58	3.30	0.28**	0.38[b]
Relationship with children (% satisfied)	92.17	87.13	5.05	0.06
Relationship with sibling (% satisfied)	70.09	61.22	8.87	0.06

	Serviceman responded	Serviceman did not respond	Difference	Effect size
	Mean or %			
Relationship with parents/in-laws (% satisfied)	76.74	67.21	9.53	0.07
Relationship with friends (Mean)	3.41	3.42	0.01	0.04
Spouse/partner current employment/finance (%)				
Working/self-employed	39.45	49.07	-9.63*	0.06[a]
Retired/semi-retired	35.44	26.42	9.03	0.06
Financial stress in the past 12 months	6.16	8.51	-2.35	0.03
Homeless in the past 12 months	0.37	0.00	0.37	0.02
Spouse/partner health (%)				
Poor physical health (current)	16.53	17.59	-1.06	0.01
Depressive symptoms (ever)	23.94	23.73	0.22	0.00
Anxiety symptoms (ever)	20.66	19.49	1.17	0.01
PTSD symptoms (ever)	2.46	5.08	-2.62	0.05
Depressive symptoms (past 5 years)	4.23	5.93	1.71	0.03
Anxiety symptoms (past 5 years)	3.76	3.39	0.37	0.01
PTSD symptoms (past 5 years)	0.94	2.54	-1.60	0.05
Suicidal ideation (ever)	25.39	36.45	-10.70*	0.08[a]
Risky behaviours (%)				
Problem drinking (past 12 months)	2.06	6.54	-4.49**	0.09[a]
Illicit drug use (ever)	11.35	15.60	-4.25	0.04
Illicit drug use in the past 12 months	0.12	0.00	0.12	0.01
Criminal record	1.09	1.85	-0.65	0.02
Victim of assault (ever)	7.35	18.52	-11.20**	0.13[b]
N	852[a]	118		

Notes: *** $p < 0.01$; ** $p < 0.01$; * $p < 0.05$. [a] = less than small effect size (negligible), [b] = small effect size. *N* indicates the maximum sample available, may very between analyses due to missing data. [c] *N* = 4 families had two spouses/partners who participated in the VVFS (both were included in the analysis).

Source: Vietnam Veterans Family Study

3.3 Summary

Section 3 described the data selection process and tested the representativeness of the analysis sample of Vietnam veterans (VV) and Vietnam-era personnel (VEP) in the VVFS study. Selection into the study involved several steps and allowed servicemen, their spouses/partners, or both, to participate. The analysis sample was constrained to those who had data from both servicemen and their spouses/partners (n = 2,284). In addition, there were another 2,462 servicemen who participated whose spouses/partners did not participate and 425 spouse/partner respondents whose serviceman did not participate or had become deceased.

Given that fewer than half of all VVFS participants were included in the analysis sample, it was important to investigate how representative the analysis sample was. This was examined in two ways:

1. comparing the analysis sample of VV to the total population of VVs using data from the Nominal Roll
2. comparing the analysis sample to the rest of the VVFS participating families who had data from only one of the two types of respondents (servicemen or spouses/partners).

Comparison of the analysis sample of Vietnam veterans to the population of Vietnam veterans

Information from the Nominal Roll revealed few significant differences between the VV in the analysis sample and the population of Vietnam veterans. The VV in the analysis sample tended to:

- have been deployed to Vietnam for longer (on average two weeks)
- be marginally younger (on average, just over one year)
- be more often national servicemen
- were more often born in South Australia but less often born in New South Wales
- have served in the Royal Australian Army Ordnance Corps.

However, there were no significant differences on ADF service-related characteristics (e.g., rank, main type of army corps served in (noting the one difference above), exposure to combat, whether they had been honoured for service).

These findings suggest that the VVFS analysis sample was broadly representative of the military characteristics and experiences of the total population of Vietnam veterans.

Differences between the analysis sample and the remaining VVFS families who did not have data from both respondents (servicemen and spouses/partners)

Ideally, to assess how representative the VVFS families were, they would need to be compared to the total population of families of VV or VEP. However, data is simply not available on the wider population of VV or VEP families. Therefore, to gain a sense of how representative the families in the analysis sample were, the information collected from the VVFS participants who were excluded from the analysis sample (those who did not have data from both informants—servicemen and spouses/partners) was used.

Four comparisons were undertaken:

1. VVs who had spouse/partner data with VV who did not have spouse/partner data
2. VEP who had spouse/partner data with VEP who did not have spouse/partner data
3. spouses/partners who had VV data with spouses/partners who did not have VV data
4. spouses/partners who had VEP data with spouses/partners who did not have VEP data.

Table 3.8 shows the characteristics on which significant differences were found. If levels were higher in the analysis sample, this is shown by an up arrow (↑), while if levels were lower in the analysis sample, this is shown by a down arrow (↓).

Characteristics for which no significant differences were found are not shown in Table 3.8 or are left blank in the table.

When comparing servicemen with and without spouse/partner data, consistent differences were found in couple relationship quality, working status and financial stress across both VV and VEP. Vietnam veterans and VEP in the analysis sample reported better quality couple relationships and lower rates of financial stress in the past 12 months. Additionally, VV and VEP in the analysis group were less likely to be working or self-employed and more likely to be retired or semi-retired than their comparison groups.

Some differences between the analysis sample and the comparison group were only observed in VV or VEP. Vietnam veterans with spouses/partner data were slightly younger, had served in a military force for a shorter period of time, perceived their deployment to Vietnam as having a less positive impact on their social relationships and daily functioning, and reported poorer physical health and higher rates of depression and PTSD in the past than VV without spouse/partner data. These differences were not observed in the VEP group. On the other hand, differences in the occurrence of abuse in couple relationships (lower in the analysis group) and relationships with family members and children (better in the analysis group) were only found amongst VEP.

When comparing the characteristics of spouses/partners according to servicemen's participation in the VVFS, spouses/partners in the analysis sample reported more positive outcomes in a number of areas than their comparison group, across both VV and VEP groups. For example, spouses/partners of servicemen who participated in the study more often perceived there had been a positive impact of servicemen's military service on their own daily functioning, tended to report better relationships with servicemen and less abuse in the relationship, were more satisfied with their relationships with the other family members and had experienced less suicidal ideation than spouses/partners of servicemen who did not participate the study. Additionally, spouses/partners of VV and VEP in the analysis group were less likely to be a victim of violence than their comparison group.

Again, some differences in spouses/partners were only observed in the VV or VEP group. Differences in spouses'/partners' age (older in the analysis group), Indigenous status (higher in the analysis group), impact of veterans' service on social relationships (more positive in the analysis group), satisfaction with relationships with veterans (higher in the analysis group), experience of financial stress in the past year (lower in the analysis group) and depression in the past five years (lower in the analysis group) were only found in the VV group. Differences in spouses'/partners' education (higher in the analysis group), spouses'/partners' service in a defence force (lower in the analysis group), working status (the analysis group was less likely to be working or self-employed) and problem drinking (lower in the analysis group) were only found in spouses/partners of VEP.

Overall, some consistent differences were found across servicemen and spouses/partners. For example, the analysis sample tended to report better quality couple relationships and lower rates of abuse at some stage of the couple relationship (noting that this was very rare overall), and better relationships with other family members. However, it is worth noting that there were some areas on which VV and their spouses/partners showed different trends. First, VV with spouse/partner data tended to be younger than their comparison VV while their spouses/partners tended to be marginally older when compared to spouses/partners without VV data (both differences were by about one year on average). Second, fewer VV in the analysis sample perceived there to be positive effects of military service on their relationships with family and friends than their comparison VV, while a higher percentage of their spouses/partners had positive perceptions than spouses/partners without VV data. Therefore, caution needs to be taken when applying the findings of the report.

Overall, the analyses conducted suggest that there may be a certain amount of bias present in the analysis sample as its participants tended to report consistently better family relationships, fewer were still working or experiencing financial stress, and spouses/partners were less likely to report suicidal ideation or having been a victim

of violence than other VVFS participants (those with responses from only one type of respondent). Given the analysis sample's consistently more positive profile on these aspects, it is possible that the findings reported in later sections of this report might somewhat underestimate the effects of service in Vietnam on family relationships and on late-in-life employment and financial wellbeing.

However, there was no consistent trend for differences on aspects of military service or experiences (duration, rank); demographic characteristics (e.g. age, Indigenous status); physical or mental health (with the exception of spouse/partner suicidal ideation); or on the risky behaviours of alcohol or illicit drug use. Thus, on these aspects the analysis sample can be considered representative.

Table 3.8 Factors on which analysis sample respondents significantly differed from VVFS respondents not included in the analysis sample

Characteristic	VV with S/P data vs VV without S/P data	VEP with S/P data vs VEP without S/P data	S/P with VV data vs S/P without VV data	S/P with VEP data vs S/P without VEP data
Age	↓		↑	
Education				↑
Indigenous status			↓	
Serviceman duration of service	↓			
Spouse/partner served in defence				↓
Positive impact of serviceman's service				
On family & friends	↓		↑	
On daily functioning	↓		↑	↑
Couple relationships				
Satisfaction			↑	
Quality	↑	↑	↑	↑
Abuse at some stage		↓	↓	↓
Other relationships				
With family		↑	↑	↑
With children		↑		
Employment and finances				
Working/self-employed	↓	↓		↓
Retired/semi-retired	↑	↑		
Financial stress	↓	↓	↓	
Health				
Poor physical health	↑			
Depression (ever)	↑			
PTSD (ever)	↑			
Depression (in last 5 years)			↓	
Suicidal ideation			↓	↓

Characteristic	VV with S/P data vs VV without S/P data	VEP with S/P data vs VEP without S/P data	S/P with VV data vs S/P without VV data	S/P with VEP data vs S/P without VEP data
Risky behaviour				
Problem drinking				↓
Drug use (lifetime)		↓		
Spouse/partner victim of violence			↓	↓

VV = Vietnam veterans

VEP = Vietnam-era personnel

S/P = Spouses/partners

↑ = higher in the analysis sample

↓ = lower in the analysis sample

4 Adjustment for servicemen's pre-deployment differences using propensity score analysis

This section examines whether Vietnam veterans (VV) and Vietnam-era personnel (VEP) differed systematically on personal and family characteristics prior to VV's deployment to Vietnam. If differences do exist, they could obscure the true effects of deployment to Vietnam and would require statistical adjustment to minimise the effects of these differences. Therefore, the next section examines:

- whether there were differences between VV and VEP on pre-deployment characteristics
- methods used to minimise the effects of pre-deployment differences (propensity score analysis)
- whether adjustments made on the basis of propensity scores eliminated differences between the VV and VEP sub-samples on pre-deployment characteristics.

4.1 Investigating the impact of Vietnam War service

A key feature of the VVFS was the inclusion of a control group consisting of the families of military personnel who served in the Australian Army during the Vietnam War but were not deployed to Vietnam on active service. Comparisons of VV and VEP can provide insight into the effects of Vietnam War service relative to non-Vietnam military service on families, as long as the groups do not differ systematically on other influential factors.

However, servicemen were not assigned randomly to serve in Vietnam. Instead, they were assigned to specific corps and units, sometimes because of personal characteristics that made them particularly suitable for specific roles within the ADF. The corps and units then became the basis for deployment decisions. Thus, differences observed between the families of VV and their VEP counterparts may not necessarily reflect VV's service in the Vietnam War; instead, they could be due to other factors that influenced whether servicemen were deployed to Vietnam. Simple comparisons between VV and VEP that do not take into account other relevant differences could be biased. A strategy to address any differences is required so that the impact of deployment to Vietnam can be accurately estimated.

4.2 Propensity score analysis

To test and adjust for pre-deployment differences between the VV and VEP groups, propensity score analysis (PSA) was performed. Propensity score analysis is a method used to estimate and overcome the selection biases commonly encountered in observational research (Guo & Fraser, 2014). It can be used to estimate the conditional probability of experiencing a particular event or intervention (e.g. deployment to Vietnam) after accounting for the effects of other characteristics and to perform statistical adjustment to ensure that the groups being studied are now similar on those characteristics.

Some commonly used types of PSA methods are propensity score matching, stratification on the propensity score, covariate adjustment using the propensity score, and propensity score weighting. In this report, the approach of propensity score weighting was used. Since propensity score weighting makes use of all cases for which the chances of experiencing the event can be estimated, by using this approach it was possible to maximise the size of the sample used in analyses and utilise information from as many participating servicemen as possible.

Our approach involves weighting cases by the probability of experiencing the event (deployment to Vietnam) and then conducting multivariate analyses to investigate group differences following adjustment.

The full process of PSA involves four steps, which are summarised in Figure 4.1 below:

- **Step 1:** Identify an appropriate set of conditioning variables and test data balance before PSA. In the current study, the first step of PSA involved identifying an appropriate set of variables (pre-deployment characteristics of VV and VEP) that may cause an imbalance between VV and VEP groups. T-tests were performed in order to check data balance before PSA. A significant *p* value means that there is a significant difference between the VV and VEP groups on the pre-deployment characteristic. Significant differences in the pre- deployment characteristics between VV and VEP groups mean there is potential selection bias that needs to be addressed.
- **Step 2:** Estimate a propensity score weight. Our approach of propensity score weighting is derived from Rosenbaum and Rubin's (1983) seminal work that defines a propensity score as the conditional probability of assignment to a particular treatment given a vector of observed covariates:
    - 2A: A logistic regression model was performed to obtain propensity scores. The definition of propensity score is the estimated probabilities of receiving a treatment (deployed to Vietnam in our case).

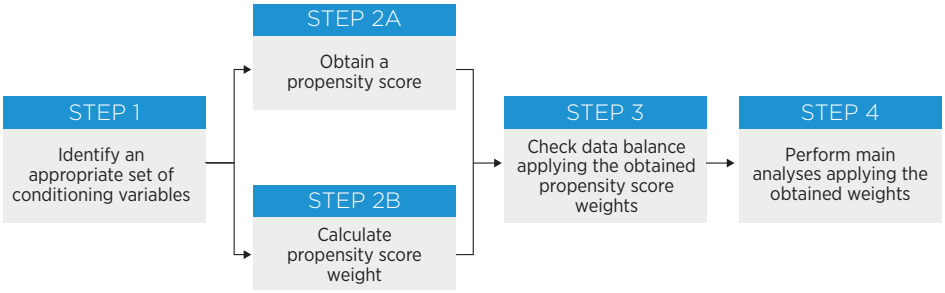
$$PS = \text{logit}^{-1}(\hat{\delta}_0 + \hat{\delta}_B B + \hat{\delta}_C C)$$

— 2B: Calculate propensity score weights using propensity scores with the formula below. WATE is the average treatment effect (deployment to Vietnam), E is a binary treatment (E = 1 for VV group and E = 0 for VEP group). PS is the obtained propensity score. Thus, propensity score weights are 1/PS for VV and [1/ (1-PS)] for VEP group.

$$W_{ATE} = \frac{E}{PS} + \frac{1 - E}{1 - PS}$$

- **Step 3:** Evaluate the quality of the propensity score weights. T-tests were performed using the weighted data to estimate how well matched VV and VEP groups appear after weighting.
- **Step 4:** Conduct all subsequent statistical analyses using a new data set created on the basis of the propensity score sampling weights. As mentioned earlier, this method does not resample the data, and therefore avoids undesirable loss of study participants. Use of propensity scores as weights is analogous to the re-weighting procedures used in survey sampling (svy command in Stata), where adjustments are made for observations on the basis of the probabilities of inclusion in a sample.

Figure 4.1 Propensity score analysis steps



4.2.1 Pre-deployment characteristics included

It was first investigated whether VV and VEP statistically differed on pre- deployment characteristics (Step 1 in Figure 4.1). The VVFS main survey provided a number of variables that can be used to identify factors that might have affected the chances of being deployed to Vietnam. While, as noted above, deployment was based on the corps and the units to which servicemen were assigned, individual factors were used for two reasons:

- Individual characteristics likely influenced servicemen's assignment to units, as well as their chances of being deployed to Vietnam. This means that some individual-level factors may have indirectly influenced the chances of being deployed to Vietnam.
- As our samples were drawn retrospectively from two larger samples of defence force personnel, in identifying factors that differentiate those who served in Vietnam from those who did not, our model also effectively estimates the probability of being in the VV or VEP sub-samples (conditional on having participated in the VVFS study). The analyses can help control for differences between VV and VEP on their likelihoods of participating in the VVFS, a decision that could be expected to be influenced by individual characteristics.

In total, 37 variables were identified for inclusion in the analyses. A description of these variables and how they were coded for use in the analyses is provided in Table 4.1.

Table 4.1 Variables included in propensity score analyses

Variable	Coding/Notes
Current age of servicemen	Binary variables corresponding to ages 60, 61, 62, 63, 64, 65, 66 and 67. Servicemen aged 68 and over or 59 and below formed the reference category to which each age year was compared. A series of analyses compared the proportions of VV and VEP at each age to the reference group. For example, the proportion of VV and VEP who were 60 years of age at the time of the survey was compared to the reference group to determine whether the proportions of 60-year-old VV and VEP significantly differed. However, for reader ease, VV and VEP overall group means are presented in Table 4.2 along with t-test statistical analysis results.
Military service	
Servicemen's age on first entry to military service	Servicemen were asked: 'What year did your military service begin?' By comparing to servicemen's date of birth, their age on first entry to military service was calculated.
Era in which servicemen entered military service	Using information on the year when servicemen first entered military service and the year their military service ended, whether they had served during periods of war could be determined. The following variables were formed: Served during the World War II period (Yes = 1, Otherwise = 0) Served during the Korean War period (Yes = 1, Otherwise = 0) Served during the Malayan Emergency period (Yes = 1, Otherwise = 0) Served during the Vietnam War period (Yes = 1, Otherwise = 0)
Serviceman's parent served in the military	Binary indicator of whether serviceman's mother or father had military experience, including as full-time personnel or as a reservist (Yes = 1, Otherwise = 0).
Serviceman's grandparent served in the military	Binary indicator of whether serviceman's grandmother or grandfather had military experience, including as full-time personnel or as a reservist (Yes = 1, Otherwise = 0).
National serviceman (1965–73)	Binary indicator of whether the serviceman was conscripted into the ADF (Yes = 1, Otherwise = 0). Missing cases were classified as national servicemen if they were born on a day selected in the national service ballot.

Variable	Coding/Notes
Education	
Year 9 or above	Binary indicator of whether serviceman had completed Year 9 or higher before they joined the ADF (Yes = 1, Otherwise = 0). Servicemen who did not complete Year 9 formed the reference category (it was possible that servicemen had attained Year 9 or higher educational qualifications afterwards but this is not included here as our focus is on pre-deployment characteristics).
Disciplinary problems	Binary indicator of whether serviceman was suspended or expelled from primary or high school (Yes = 1, Other = 0).
Other school issues	Binary indicator of whether serviceman was absent for more than 10% of days in a school year or was bullied at school (Yes = 1, Other = 0).
Gifted and talented	Binary indicator of whether serviceman had been advanced by year or more, or placed in an accelerated class in primary or high school (Yes = 1, Other = 0)
Learning problems	Binary indicator of whether the serviceman repeated a year (including failing exams); worked with a psychologist, counsellor or specialist teacher to assist with a learning difficulty; was placed in a remedial class; or dropped out of a course (Yes = 1, Other = 0).
Prior employment	Four binary indicators of the number of jobs held prior to joining the military: None (Yes = 1, Otherwise = 0); One (Yes = 1, Otherwise = 0); Two (Yes = 1, Otherwise = 0); Three or more (Yes = 1, Otherwise = 0). None formed the reference category. As for other variables of this type, each separate category was compared to the reference category (e.g. the percentage of VV and VEP who had held two jobs) but for reader ease overall means are presented in Table 4.2 and t-test statistical analysis results.
Family characteristics	
Parenting (Serviceman's mother)	
Affectionate	Four binary indicators derived from the question: 'How affectionate was your mother towards you?' Not at all (Yes = 1, Otherwise = 0); A little (Yes = 1, Otherwise = 0); Somewhat (Yes = 1, Otherwise = 0); Very (Yes = 1, Otherwise = 0). Servicemen who did not have a mother Figure were coded with 0 on all indicators. 'Not at all' formed the reference category for each level of VV's and VEP's mothers' affectionateness. However, for reader ease, group means are shown, along with t-test statistical analysis results.
Caring	Mean score of three items: 'My mother seemed emotionally cold to me' (reverse coded); 'My mother appeared to understand my problems and worries'; and 'My mother could make me feel better when I was upset'. Items were recorded on a four- point scale ranging from 0 to 3 and coded so that high scores reflected high parental warmth.
Overprotective	Mean score of four items: 'My mother liked me to make my own decisions' (reverse coded); 'My mother tried to control everything I did'; 'My mother tended to baby me and tried to protect me from everything'; 'My mother gave me as much freedom as I wanted' (reverse coded). Items were recorded on four-point scale ranging from 0 to 3 and coded so that high scores reflected high protectiveness.
Parenting (Serviceman's father)	
Affectionate	As for servicemen's mother
Caring	As for servicemen's mother
Overprotective	As for servicemen's mother
Mother or father of serviceman had alcohol problem	Binary indicator of whether mother or father of serviceman had trouble with alcohol or drug use (Yes = 1, Otherwise = 0).

Variable	Coding/Notes
Pre-existing medical conditions of serviceman	
Mental health problems	Binary indicator of whether the serviceman was diagnosed with or treated for Depression, Anxiety, or PTSD before he joined the ADF (Yes = 1, Otherwise = 0).
Musculoskeletal system	Binary indicator of whether the serviceman was diagnosed with or treated for Arthritis, Osteoporosis, or Other joint disorders before he joined the ADF (Yes = 1; Otherwise = 0)
Circulatory system	Binary indicator of whether the serviceman was diagnosed with or treated for: Stroke; Angina; Hypertension (or high blood pressure); Heart condition (coronary heart disease); or Heart attack (myocardial infarction) before he joined the ADF (Yes = 1; Otherwise = 0).
Neoplasms	Binary indicator of whether the serviceman was diagnosed with or treated for: Skin cancer (excluding melanoma); Melanoma; Soft tissue/organ cancer; Blood/bone cancers (other than acute myeloid leukaemia); Acute myeloid leukaemia (AML); or Tumour (cancerous or benign) before he joined the ADF (Yes = 1; Otherwise = 0).
Respiratory system	Binary indicator of whether the serviceman was diagnosed with or treated for Asthma or Chronic lung disease (e.g. emphysema, chronic bronchitis) before he joined the ADF (Yes = 1; Otherwise = 0).
Genitourinary system	Binary indicator of whether the serviceman was diagnosed with or treated for Kidney disease before he joined the ADF (Yes = 1; Otherwise = 0).
Nervous system	Binary indicator of whether the serviceman was diagnosed with or treated for Epilepsy; Motor Neurone Disease; Sleep disturbance/insomnia; Sleep apnoea; or a Neurological disorder before he joined the ADF (Yes = 1; Otherwise = 0).
Health conditions of serviceman's parents	
Musculoskeletal system diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Arthritis, Osteoporosis, or Other joint disorders (Yes = 1; Otherwise = 0)
Mental and behavioural disorders	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Depression, Anxiety, PTSD, or Other psychological disorders (Yes = 1, Otherwise = 0).
Circulatory system diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for: Stroke; Angina; Hypertension (or high blood pressure); Heart condition (coronary heart disease); or Heart attack (myocardial infarction) (Yes = 1; Otherwise = 0).
Neoplasms	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for: Skin cancer (excluding melanoma); Melanoma; Soft tissue/organ cancer; Blood/bone cancers (other than acute myeloid leukaemia); Acute myeloid leukaemia (AML); or Tumour (cancerous or benign)
Endocrine, nutritional and metabolic diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for: Type 1 Diabetes (childhood onset); Type 2 Diabetes (adult onset) (Yes = 1; Otherwise = 0).
Respiratory system diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Asthma or Chronic lung disease (e.g. emphysema, chronic bronchitis) (Yes = 1; Otherwise = 0).
Digestive system diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Liver disease (Yes = 1; Otherwise = 0).
Nervous system diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Epilepsy; Motor Neurone Disease; or Neurological disorders (Yes = 1; Otherwise = 0).
Genitourinary system diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Kidney disease (Yes = 1; Otherwise = 0).

Variable	Coding/Notes
Infectious and parasitic diseases	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for Polio, Tuberculosis, Herpes zoster (Yes = 1, Otherwise = 0).
War-related health conditions	Binary indicator of whether the serviceman's mother or father was diagnosed with or treated for any medical condition connected to their exposure to war (Yes = 1, Otherwise = 0).

Source: Vietnam Veterans Family Study

4.2.2 Comparability of the VV and VEP sub-samples

Table 4.2 below shows results of comparisons of VV and VEP on a range of pre-deployment characteristics.

The VEP sub-sample tended to be younger than VV sub-sample by, on average, approximately two and a half years. Both sub-samples first entered the ADF around age 20 on average, although VV were marginally younger at the time they entered than VEP. These differences are likely due to the higher percentage of national servicemen in the VEP sub-sample (national servicemen first joined the ADF at 20 years of age, whereas individuals could voluntarily enlist from 18 years of age). Just under half of the VV sub-sample was conscripted compared with almost three-quarters of the VEP sub-sample. Additionally, VEP were less likely to have entered the ADF during World War II, the Korean War, or the Malaysian Emergency but more likely to have entered during the Vietnam War era than VV. Finally, VV's duration of service was on average three years longer than VEP's.

These patterns are broadly consistent with the actual patterns of ADF service during the Vietnam War era given that less than one-third of national servicemen served in Vietnam and that the majority of those who served in Vietnam entered the ADF voluntarily. Nonetheless, these findings raise some potential challenges for assessment of the effects of Vietnam War service:

- First, a larger percentage of VV had served in conflicts prior to their deployment to Vietnam, e.g. in Malaya or Korea (9.7 per cent of VV compared with 3.4 per cent of VEP). Thus, any differences between VV and VEP families could to a certain extent reflect these earlier deployment experiences.
- Second, given that national servicemen were selected at random from the registered population of 20-year-old men, the population of conscripts may have been more representative of the general Australian population than those who entered the ADF voluntarily. In other words, if there were more national servicemen in the VEP sample, differences between the VEP and VV sub-samples might be expected regardless of the effects of service in the Vietnam War.

In addition, Table 4.2 reports other significant differences between VV and VEP:

- Vietnam veterans reported having been in more jobs prior to their entry into the ADF than did VEP (although the difference was numerically quite small).
- Vietnam veterans were less likely to describe either of their parents as being affectionate or caring.
- Twenty-nine per cent of VV indicated that at least one of their parents had had a drinking problem, compared with 25 per cent of VEP.
- Vietnam-era personnel had more often shown signs of being gifted and talented at school than VV (e.g. had been advanced a grade or placed in a class for gifted children).
- Vietnam-era personnel were more likely to have had musculoskeletal system diseases (e.g. arthritis, osteoporosis or other joint diseases) before they entered the ADF (although the incidence was very low overall).
- Vietnam veterans were less likely to have had a parent with cancer or heart disease but they were more likely to have had a parent with mental health problems.

These pre-service differences are likely to affect comparisons of VV and VEP and their families and could cause an over-estimate of the impact of Vietnam War service. Unless these differences are taken into account, the study's findings may be biased. While multivariate statistical methods can control for such differences, estimates of the impact of being deployed to the Vietnam War could still be biased. The most appropriate solution to this problem is to use pre-ADF characteristics to adjust the VV and VEP sub-samples so they no longer significantly differ on pre-deployment characteristics.

Table 4.2 Comparisons of VV and VEP sub-samples on pre-deployment characteristics before PSA

	VEP	VV	Significant Differences
		Means (%)	
Serviceman's age	64.06	66.69	-2.63***
Military service (%)			
Serviceman's age entered ADF	20.70	20.49	0.21*
Serviceman's timing of entry into ADF			
WWII	0.47	0.00	0.47**
Korean War	0.23	1.60	-1.37***
Malayan Emergency	2.70	8.10	-5.37***
Vietnam War	93.05	87.46	5.59***
Duration of service	5.54	8.50	-2.96***
Serviceman's parent served in military	56.42	56.68	0.74
Serviceman's grandparent served in military	29.45	31.02	-1.56
National serviceman (1965–73)	70.79	47.94	22.8***
Serviceman's education (%)			
Highest level of schooling	51.35	47.53	3.83
Disciplinary problems	3.77	5.30	-1.53
Other school issues	29.09	28.36	0.73
Gifted and talented	11.19	8.01	3.18*
Learning problems	39.69	38.75	0.89
Serviceman's prior employment	1.50	1.65	-0.15***
Parenting			
Caring	2.52	2.23	0.29***
Overprotective	1.72	1.70	-0.01
Mother or father had alcohol problem (%)	24.97	29.13	-4.16***
Pre-existing medical conditions of servicemen			
Mental health disorder	0.70	0.34	0.36
Musculoskeletal system	1.64	0.55	1.09*
Circulatory system	0.47	0.21	0.26
Neoplasm	0.23	0.21	0.03
Endocrine, nutritional and metabolic	0.00	0.00	0.00
Respiratory system	3.16	2.33	0.82
Genitourinary system	0.35	0.27	0.08
Digestive system	0.12	0.07	0.05
Nervous system	4.59	4.67	-0.11
Health conditions of servicemen's parents			
Musculoskeletal system	49.12	51.01	-1.89
Mental health disorder	20.26	24.67	-4.41*
Circulatory system	75.27	71.98	3.28*

	VEP	VV	Significant Differences
		Means (%)	
Neoplasm	54.27	48.66	5.40**
Endocrine, nutritional and metabolic	13.33	11.94	1.44
Respiratory system	24.56	26.70	-1.89
Digestive system	5.50	6.38	-0.92
Nervous system	39.58	39.37	0.20
Genitourinary system	7.89	7.24	0.64
Infectious and parasitic	0.71	0.84	-0.13
War-related health conditions	0.59	0.56	0.03
N	849	1,435	

Notes: *** $p < 0.01$; ** $p < 0.01$; * $p < 0.05$.

Source: Vietnam Veterans Family Study

4.2.3 Estimating propensity score weights

A series of logistic regressions was conducted using pre-deployment characteristics (Table 4.2) to estimate the predicted probability of belonging to the VV sub-sample for both VV and VEP (Step 2a in Figure 4.1). These results were then used to create propensity score weights for each respondent equal to the inverse probability of belonging to the VV sub-sample for the Vietnam veterans and the inverse probability of belonging to the VEP sub-sample for the Vietnam-era personnel (Step 2b in Figure 4.1).

In effect, this scoring method gives more weight to VV whose deployments or membership seemed less likely given their circumstances prior to deployment (e.g. they were national servicemen, their parents had not served in the army) than it does to those who had high chances of being deployed. Similarly, it weights more highly VEP whose pre-deployment characteristics might have made them likely candidates for deployment (e.g. they volunteered for the army and entered before the conflict commenced) than VEP whose chances of being sent to Vietnam were low. Finally, VV and VEP with equal probabilities of experiencing the alternative outcome (i.e. deployment for VEP and non-deployment for VV) are weighted equally.

These weights were then applied in subsequent analyses to investigate the effects of deployment to Vietnam on the spouses/partners of VV and VEP.

4.2.4 Comparisons of VV and VEP sub-groups after propensity score weighting

Table 4.3 shows comparisons of the VV and VEP sub-samples using the same pre-deployment characteristics as previously after propensity score weighting (Step 3 in Figure 4.1). While there were several significant differences between the VV and VEP sub-samples prior to the weighting, the two groups differed on only one pre-deployment characteristic following the application of propensity score weights. The VV sub-sample remained marginally older than the VEP; nonetheless, the difference was small (just over one year). These results suggest that any subsequent differences that emerge on the physical, social and emotional wellbeing of VV and VEP sub-samples and their families are unlikely to be due to differences on servicemen's pre-deployment circumstances and characteristics.

However, it remains possible that other differences between VV and VEP sub-samples may contribute to the findings. Unless all known and pre-existing differences between the VV and their VEP counterparts are eliminated, differences between groups cannot be attributed entirely to the effects of deployment. That said, propensity score analysis enables a substantially more rigorous test of the effects of service in the Vietnam War than would be possible using standard multivariate analytical techniques with control variables.

Table 4.3 Comparisons of the VV and VEP sub-samples after propensity score weighting

	VEP	VV	Significant Differences
		Means (%)	
Serviceman's age (years)	65.13	66.18	-1.05**
Military service (%)			
Serviceman's age entered military (years)	20.63	20.46	0.17
Serviceman's timing of entry into ADF			
WWII	..	..	..
Korean War	1.15	1.43	-0.28
Malayan Emergency	6.36	6.37	-0.01
Vietnam War	89.51	88.96	0.55
Duration of service	7.34	7.92	-0.58
Serviceman's parent served in military	54.63	55.18	-0.55
Serviceman's grandparent served in military	29.22	29.85	-0.63
National serviceman (1965–73)	52.50	53.91	-1.41
Serviceman's education (%)			
Highest level of schooling	48.74	47.58	1.16
Disciplinary problems	4.08	4.68	-0.60

	VEP	VV	Significant Differences
		Means (%)	
Behavioural problems	28.73	27.54	1.19
Gifted and talented	8.67	8.60	0.07
Learning problems	39.18	38.54	0.64
Serviceman's prior employment (Mean)	1.63	1.63	0.00
Parenting (Serviceman's mother) (Mean)			
Affectionate	3.12	3.09	0.03
Caring	2.86	2.86	0.00
Overprotective	1.80	1.78	0.02
Parenting (Serviceman's father) (Mean)			
Affectionate	2.24	2.21	0.03
Caring	2.31	2.33	-0.02
Overprotective	1.71	1.70	0.01
Mother or father had alcohol problem (%)	27.58	27.11	0.47
Pre-existing medical conditions of servicemen (%)			
Mental health disorder	0.51	0.42	0.09
Musculoskeletal system	0.80	0.73	0.07
Circulatory system	0.28	0.29	-0.01
Neoplasms	0.18	0.23	-0.05
Endocrine, nutritional and metabolic	0.00	0.00	0.00
Respiratory system	3.11	2.60	0.51
Genitourinary system	0.24	0.28	-0.04
Digestive system	0.00	0.08	-0.08
Nervous system	4.47	4.49	-0.02
Health conditions of serviceman's parents (%)			
Musculoskeletal system	53.75	50.90	2.85
Mental health disorders	23.98	23.59	0.39
Circulatory system	72.79	72.79	0.00
Neoplasms	52.04	51.71	0.33
Endocrine, nutritional and metabolic	12.40	12.51	-0.11
Respiratory system	25.17	25.30	-0.13
Digestive system	7.41	5.82	1.59
Nervous system	40.46	39.74	0.72
Genitourinary system	8.53	7.74	0.79
Infectious and parasitic	0.69	0.75	-0.06
War-related health conditions	0.89	0.62	0.27
N	849	1,435	

Notes: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Source: Vietnam Veterans Family Study

4.3 Summary

Section 4 tested whether a range of pre-deployment characteristics may have affected the probability of deployment to Vietnam. The characteristics included age, military service history, education, prior employment, family characteristics and childhood experiences, pre-existing medical conditions, and health conditions in servicemen's parents.

There were statistically significant differences on a number of these characteristics. On average, VV were 2.5 years older than the VEP. Relative to VEP, VV tended to:

- have entered the military at a slightly younger age (less than half year)
- have entered the military during prior conflicts (e.g. in Malaya or Korea; 9.7 per cent compared with 3.4 per cent)
- less often been conscripted (29.2 per cent compared with 52.1 per cent)
- have been employed previously
- report their parents were less affectionate and caring
- less often been accelerated a year at school or been in a gifted program (8 per cent compared with 11.2 per cent).
- have had a parent with a drinking problem (29.1 per cent compared with 25 per cent)
- have had a parent who was diagnosed with a mental health disorder (24.7 per cent compared with 20.3 per cent)
- less often have a parent who was diagnosed with cancer (48.7 per cent compared with 54.3 per cent) or heart disease (72 per cent compared with 75.3 per cent).

After adjusting for the probability of belonging to the VV sub-sample using propensity score weighting on pre-deployment characteristics, no significant differences between VV and VEP sub-groups were evident with the exception that VV remained just over one year older than VEP after the weighting. Hence, any subsequent differences observed between the spouses/partners of VV and VEP are unlikely to be attributable to pre-deployment differences. The propensity scores were then applied to create a weighted dataset that is used in the analyses reported in Sections 5 and 6 (Step 4).

5 Differences between spouses/partners of Vietnam veterans and Vietnam-era personnel

This section reports comparisons of spouses/partners of Vietnam veterans (VV) and Vietnam-era personnel (VEP), which can shed light on the long-term effects of active service in the Vietnam War. The final analysis sample[8] of 1,435 VV and 849 VEP families was used for these comparisons, as the sample comprised servicemen and spouses/partners who had both responded to the VVFS survey (as discussed in Section 3). The sample also contained 88 ex-spouses/partners who were included in all analyses with the exception of couple relationship quality with servicemen.[9]

Selection of outcomes was informed by the literature review (see Section 2) and the availability of appropriate measures in the VVFS dataset. There were six broad types of outcomes:

- mental health and risky behaviours (*n* = 9 indicators)
- physical health (*n* = 19 indicators)
- the combined burden of poor mental and physical health (one indicator)
- the perceived impact of military service on spouses/partners (*n* = 9 indicators)
- family functioning (*n* = 7 indicators)
- socio-economic wellbeing (*n* = 11 indicators).

Logistic regressions were used for binary outcomes, linear regressions for continuous outcomes and multinominal regressions for outcomes with multiple categories, in order to estimate the impact of Vietnam War experience on spouses'/partners' health and wellbeing. Each outcome was estimated separately after cases had been weighted using propensity score weights to adjust for pre-existing differences between VV and VEP (as discussed in Section 4). As there were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study, the estimates were also adjusted for sample clustering. Additionally, the effects of spouse/partner age and the length of couple relationships[10] were controlled in the analyses.

8 There was some variation in sample size between analyses due to missing data.
9 The couple relationship quality questions were either only for current spouses/partners, or framed differently for ex-spouses/partners.
10 The length of couple relationship was derived using two variables: the length of time servicemen and spouses/partners had been married or lived together, and the length of time servicemen and ex-spouses/partners had been separated/divorced.

The focus is primarily on marginal effects, which are termed 'adjusted differences' in the tables. Marginal effects are useful as they measure the degree to which an outcome will change when an explanatory or predictor variable changes (in points for continuous variables and in percentage points for binary and categorical variables), while holding the effects of other variables at their average value. As an example, Table 5.2 shows that the likelihood of ever being diagnosed with or treated for depression was 6.4 percentage points higher among the spouses/partners of VV than the spouses/partners of VEP, while holding the effects of spouse/partner age and couple relationship length constant.

A description of the measures used, how they were coded, and the questions that comprised them is presented in Tables 5.1, 5.3, 5.5, 5.7 and 5.9.

5.1 Mental health and risky behaviours

The measures used to assess mental health and engagement in risky behaviours are presented in Table 5.1 and results of analyses comparing spouses/partners of VV and VEP on these dimensions are presented in Table 5.2.

Table 5.1 Measures of spouses/partner mental health and risky behaviours

Variable	Coding/Notes
General mental health	The Short Form Health Survey (SF-36; Ware, 1992) was used to measure spouses'/partners' health and wellbeing in the previous four weeks. The SF-36 contains eight scales assessing functional physical and mental health and wellbeing. The four subscales assessing mental health were aggregated to form a single mental health score ranging from 0–100. The dimensions used were Emotional wellbeing (e.g. felt so down that nothing could cheer you up; 5 items); Emotional role (e.g. whether problems interfered with work activities; 3 items); Social functioning (e.g. whether problems interfered with social activities; 2 items) and Vitality (e.g. felt tired; 4 items). A higher score indicates better mental health functioning.
Life satisfaction	Single item asking, 'All things considered, how satisfied are you with your life?' Spouses/partners used a seven-point Likert scale ranging from 1 (totally dissatisfied) to 7 (totally satisfied). A higher score indicates a higher level of satisfaction with one's life overall.
Diagnosed with or treated for a mental illness	
Depression	Binary indicator of whether spouses/partners were ever diagnosed with or treated for depression (Yes = 1, Otherwise = 0).
Anxiety	Binary indicator of whether spouses/partners were ever diagnosed with or treated for anxiety (Yes = 1, Otherwise = 0).
Post-traumatic stress disorder (PTSD)	Binary indicator of whether spouses/partners were ever diagnosed with or treated for PTSD (Yes = 1, Otherwise = 0).

Variable	Coding/Notes
Suicidal ideation in lifetime	Suicidal ideation was derived from the five-item of Psychiatric Symptom Frequency Scale (PSF) (Lindelow, Hardy & Rogers, 1997): (1) Have you ever felt that life is hardly worth living?; (2) Have you ever thought that you would really be better off dead?; (3) Have you ever thought about taking your own life?; (4) Have you ever made plans to take your own life?; (5) Have you ever attempted to take your own life? These five items were reformulated into a composite Guttman-type scale, ranging from never feeling that life was hardly worth living through to attempting to take one's own life, yielding a 0 to 5 rating, respectively. A total score was calculated as the sum of all items and yielded the following categories: 0 = no suicidal ideation, 1–3 = suicidal thoughts only, 4–5 = suicidal plans/actions. The reference period was suicidal ideation ever in the lifetime.
No suicidal thoughts	
Suicidal thoughts	
Suicidal plans/actions	
Risky behaviours	
Marijuana use ever (lifetime)	Binary indicator of whether spouses/partners had ever tried marijuana/hashish (Yes = 1, Otherwise = 0).
Marijuana use in last 12 months	Binary indicator of whether spouses/partners had used marijuana/hashish in the past 12 months (Yes = 1, Otherwise = 0).
Problem drinking (high-risk alcohol use)	Current alcohol risk was derived according to NNMRC (2009) guidelines for women. Consumption of five or more standard drinks in one day was defined as high risk.

Source: Vietnam Veterans Family Study

Table 5.2 presents the percentages or averages on mental health outcomes for the VV and VEP spouse/partner groups along with adjusted differences for the spouses/partners of VV relative to the spouses/partners of VEP. Overall, there were significant differences at the conventional $p < 0.05$ level on seven of the nine indicators, with spouses/partners of VV consistently reporting more problems and higher engagement in risky behaviours than spouses/partners of VEP (after controlling for spouses/partners age and the length of relationships between spouses/partners and servicemen).

Spouses/partners were asked about their general mental health wellbeing using the SF 36 measure. While levels tended to be high overall, VV spouses/partners tended to be somewhat less positive than VEP spouses/partners (means of 69.3 and 76.9 respectively). Spouses/partners were also asked whether they had ever been diagnosed with or treated for a mental health condition such as depression, anxiety or PTSD. Compared to spouses/partners of VEP, a higher proportion of spouses/partners of VV reported that they had been diagnosed with depression or anxiety but not PTSD. When asked about their life satisfaction, spouses/partners of VV tended to report lower levels than their VEP counterparts.

Spouses/partners of VV also reported higher rates of suicidal thoughts, with 31.3 per cent reporting suicidal thoughts compared to 21.8 per cent of VEP spouses/partners. The prevalence of suicidal plans and actions was also higher among spouses/partners of VV (7.6 per cent) compared to spouses/partners of VEP (4.8 per cent).

Life-time marijuana use was higher among spouses/partners of VV than those of

VEP (13.2 per cent compared to 8.6 per cent). There were no significant differences on recent marijuana use (in the past 12 months). Spouses/partners of VV were also more likely to report problem drinking (4.7 per cent compared with 1.6 per cent of spouses/partners of VEP).

The marginal effects indicate that relative to the spouses/partners of VEP, predicted probabilities for spouses/partners of VV were:

- 8.1 points lower on general mental health (SF36)
- 6.4 per cent points higher on ever being diagnosed with or treated for depression
- 7 per cent points higher on ever being diagnosed with or treated for anxiety
- 12 per cent points lower on never experiencing suicidal ideation
- 9.6 per cent points higher on experiencing suicidal thoughts
- 2.3 per cent points higher on experiencing suicidal plans and/or actions
- 0.6 points lower on mean levels of life satisfaction
- 3.9 per cent points higher on marijuana use in one's lifetime;
- 2.8 per cent points higher on problem drinking.

Table 5.2 Incidence of mental health problems and risky behaviours and significant differences between spouses/partners of VEP and VV

Mental health problems and risky behaviours	VEP, spouses/ partners	VV, spouses/ partners	Adjusted difference #	Significance
	Mean or %			
General mental health (mean)	76.9	69.3	-8.1	***
Life satisfaction (mean)	5.60	5.03	-0.6	***
Depression (%)	27.2	33.6	6.4	*
Anxiety (%)	22.8	30.2	7.0	**
PTSD (%)	2.8	4.8	1.6	ns
Suicidal ideation ever (%)				
No suicidal thoughts	73.3	61.1	-12.0	***
Suicidal thoughts	21.8	31.3	9.6	***
Suicidal plans and actions	4.8	7.6	2.3	*
Marijuana use—lifetime (%)	8.6	13.2	3.9	*
Marijuana use—last 12 months (%)	0.2	0.7	0.4	ns
Problem drinking (%)	1.6	4.7	2.8	***
N	852	1,447		

Notes: *** $p < .001$; ** $p < .01$; * $p < .05$; ns = not significant. Total number of observations varies across models due to missing values. There were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study. # adjusted differences reflect rates for VV spouses/partners relative to VEP spouses/partners. Differences were adjusted for couple relationship length and age of spouses/partners.

Source: Vietnam Veterans Family Study

5.2 Physical health

Next, the measures used to assess physical health (Table 5.3) and findings regarding differences between spouses/partners of VV and VEP on these measures are described (Table 5.4).

Table 5.3 Measures of spouses'/partners' physical health

Variable	Coding/Notes
Health status	
Global health rating	A single question was used to measure general health: 'In general, how would you say your health is?' Spouses/partners responded to five options: excellent, very good, good, fair and poor. Responses were dichotomised into Good heath (combining excellent/very good/good) and Poor health (combining fair/poor).
General physical health	The SF-36 contains questions on four physical health sub-scales: Physical functioning (e.g. whether physical health limited their capacity to climb several flights of stairs; 10 items), Role limitations due to physical health (e.g. whether physical health affected their capacity to perform work activities; 4 items), Pain (e.g. how much bodily pain they experienced; 2 items) and General health (e.g. rating of their general physical health; 5 items). The scores on each dimension were combined to form a single general physical health score ranging from 0–100. A higher score indicates better physical functioning.
Diagnose/treatment for health conditions	
Musculoskeletal system	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Arthritis; Osteoporosis; or Other joint disorders (Yes = 1; Otherwise = 0).
Circulatory system	Binary indicator of whether spouses/partners were ever diagnosed with or treated for: Stroke; Angina; Hypertension (or high blood pressure); Heart condition (coronary heart disease); or Heart attack (myocardial infarction) (Yes = 1; Otherwise = 0).
Neoplasms	Binary indicator of whether spouses/partners were ever diagnosed with or treated for: Skin cancer (excluding melanoma); Melanoma; Soft tissue/organ cancer; Blood/ bone cancers (other than acute myeloid leukaemia); Acute myeloid leukaemia (AML); or Tumour (cancerous or benign) (Yes = 1; Otherwise = 0).
Endocrine, nutritional and metabolic	Binary indicator of whether spouses/partners were ever diagnosed with or treated for: Type 1 Diabetes (childhood onset); Type 2 Diabetes (adult onset) (Yes = 1; Otherwise = 0).
Respiratory system	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Asthma or Chronic lung disease (e.g. emphysema, chronic bronchitis) (Yes = 1; Otherwise = 0).
Genitourinary system	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Kidney disease (Yes = 1; Otherwise = 0).
Digestive system	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Liver disease (Yes = 1; Otherwise = 0).
Hearing problems	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Hearing problems excluding age-related hearing loss (Yes = 1; Otherwise = 0).
Skin conditions	Binary indicator of whether spouses/partners were diagnosed with or treated for Skin conditions (e.g. eczema, psoriasis) (Yes = 1; Otherwise = 0).
Migraines	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Migraines (persistent conditions) (Yes = 1; Otherwise = 0).
Sleep condition	Binary indicator of whether spouses/partners were ever diagnosed with or treated for a Sleep condition (e.g. sleep disturbance/insomnia, sleep apnoea) (Yes = 1; Otherwise = 0).

Variable	Coding/Notes
Neurological problems	Binary indicator of whether spouses/partners were ever diagnosed with or treated for Neurological disorders including epilepsy or motor neurone disease (Yes = 1; Otherwise = 0).
Pregnancy and birth defects	
Problems conceiving a baby	Binary indicator of whether spouses/partners had ever experienced difficulties in conceiving a baby (Yes = 1, Otherwise = 0).
Miscarriage	Binary indicator of whether spouses/partners ever experienced a pregnancy that ended with miscarriage (Yes = 1, Otherwise = 0).
Stillborn	Binary indicator of whether spouses/partners ever gave birth to a child who was stillborn (Yes = 1, Otherwise = 0).
Spina bifida	Binary indicator of whether spouses/partners had any biological children born with spina bifida (Yes = 1, Otherwise = 0).
Cleft lip/palate	Binary indicator of whether spouses/partners had any biological children born with cleft lip/palate (Yes = 1, Otherwise = 0).

Source: Vietnam Veterans Family Study

Table 5.4 presents the physical health status and incidence of a range of physical health conditions among the spouses/partners of VV and VEP. Negative impacts of servicemen's deployment to Vietnam were found on five of the 19 spouses'/partners' physical health outcomes although differences were less extensive than found for mental health.

While most spouses/partners rated their health positively, significantly more VV spouses/partners (27.6 per cent) than VEP spouses/partners (18 per cent) felt their health was only fair or poor. Additionally, VV spouses/partners tended to report poorer general physical health on the SF36 than their VEP counterparts.

In terms of diagnosis of physical health conditions, the most prevalent type of condition was problems of the musculoskeletal system such as arthritis, osteoporosis and other joint disorders. Around two in three spouses/partners had been diagnosed or treated for musculoskeletal disease in their life (67.3 per cent of VV and 62.6 per cent of VEP spouses/partners).

The next most common conditions were circulatory system disease such as stroke, angina and hypertension (44.7 per cent of VV and 41.5 per cent of VEP spouses/partners), followed by neoplasms diseases (i.e. cancer or tumour, 41.8 per cent of VV and 37.7 per cent of VEP spouses/partners).

Statistically significant differences were observed for three health conditions: genitourinary disease (kidney), skin problems, and sleep conditions, with these all being more common in the spouses/partners of VV than VEP. The largest difference appeared to be on sleep conditions, with 32.5 per cent of VV spouses/partners experiencing problems such as sleep disturbance or sleep apnoea compared to 20 per cent of VEP spouses/partners.

Table 5.4 Incidence of physical health problems and significant differences between spouses/partners of VV and VEP

Physical health outcomes	VEP, spouses/ partners	VV, spouses/ partners	Adjusted difference #	Significance
	Mean or %			
Health status				
Global health rating (% fair/poor)	18.0	27.6	8.8	***
General physical health (mean)	66.7	62.1	-4.1	***
Diagnosis/treatment for health conditions (%)				
Musculoskeletal system	62.6	67.3	4.0	ns
Circulatory system	41.5	44.7	3.1	ns
Neoplasms	37.7	41.8	2.9	ns
Endocrine, nutritional and metabolic	6.8	9.8	2.6	ns
Respiratory system	19.9	23.7	3.5	ns
Genitourinary system	2.2	4.8	2.4	**
Digestive system	2.3	2.5	0.0	ns
Hearing problems	9.1	8.9	-0.2	ns
Skin problems	12.4	19.7	7.4	***
Migraines	17.0	20.1	3.6	ns
Neurological problems	5.0	4.6	-0.5	ns
Sleep condition	20.0	32.5	12.4	***
Pregnancy and birth defects (%) [a]				
Problems conceiving a baby	16.3	17.8	1.6	ns
Miscarriage	27.0	31.5	4.6	ns
Stillborn	3.3	3.0	-0.4	ns
Spina bifida	0.9	1.3	0.4	ns
Cleft lip/cleft palate	0.8	0.6	-0.2	ns
N	852	1,447		

Notes: ***$p < .001$; **$p < .01$; *$p < .05$; ns = not significant. Total number of observations varies across models due to missing values. There were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study. [a] Questions were only asked to spouses/partners who have started (or attempted to start) a family together with their partners; $n = 569$ for VEP spouses/partners and $n = 860$ for VV spouses/partners. # adjusted differences reflect rates for VV spouses/partners relative to VEP spouses/partners. Differences were adjusted for couple relationship length and age of spouses/partners.

Source: Vietnam Veterans Family Study

There were no significant differences on the occurrence of problems during pregnancy or the birth defects of spina bifida or cleft palate/lip in children.

The marginal effects indicate that relative to the spouses/partners of VEP, the predicted probabilities for spouses/partners of VV were:

- 8.8 per cent points higher on poor general health
- 4.1 points lower on physical health functioning

- 2.4 per cent points higher on diagnosis with or treatment for a genitourinary system disease
- 7.4 per cent points higher on diagnosis with or treatment for skin problems
- 12.4 per cent points higher on diagnosis with or treatment for a sleep condition.

5.3 Combined burden of poor mental and physical health; perceived impact of military service

There is a strong link between mental health and physical health, and physical health problems are often related to comorbid mental health problems. Therefore, in this sub-section, the following outcomes are examined: spouses'/partners' combined burden of health problems (both mental and physical) and the perceived impact of ex-servicemen's military service on spouses/partners according to their servicemen's deployment. Table 5.5 provides a summary of the measures used.

Table 5.5 Measures of cumulative burden of health problems and effects of military service

Variable	Coding/Notes
Combined mental and physical health burden	This variable is derived from two summary scores—the mental health component and physical health component scores of the SF-36. Both scores were dichotomised into 1 = poor health (lowest 25%) and 0 = average/good health (the remaining 75%). The two binary variables of poor mental health and physical health were then combined into a categorical cumulative burden of health variable: 0 = no health burden (0 on mental and physical health dichotomous scores); 1 = poor physical health only (1 on physical health and 0 on mental health dichotomous scores); 2 = poor mental health only (0 on physical health and 1 on mental health dichotomous scores); 3 = both poor mental *and* physical health (1 on both mental and physical health dichotomous scores).
Impact of servicemen's military service on spouses/partners	Spouses/partners were asked their perceptions of the impact of servicemen's military service on their own: (1) relationships with servicemen; (2) other romantic relationships; (3) relationships with immediate family; (4) relationships with wider family; (5) relationships with friends; (6) employment; (7) physical health; (8) mental health; and (9) financial situation. Spouses/partners rated each item on a five-point Likert scale, ranging from 1 'extremely negative' to 5 'extremely positive', with higher scores indicating more positive impacts of military service.

Source: Vietnam Veterans Family Study

Table 5.6 presents findings for the combined burden of poor health and the impact of servicemen's military service on spouses/partners in the VV and VEP groups. Significant differences at the conventional $p < 0.05$ level were found on all indicators.

Although most spouses/partners reported no burden of poor mental or physical health, significantly more VV spouses/partners (38.9 per cent) than VEP spouses/partners (26.2 per cent) reported being in poor physical and/or mental health.

Significantly more VV spouses/partners suffered from poor mental health only (10.7 per cent) or both poor physical and mental health (19.5 per cent) than VEP spouses/partners (rates for whom were 4.1 per cent and 12.7 per cent respectively) but they did not significantly differ on rates of poor physical health only.

In terms of spouses'/partners' perception of the impact of servicemen's military service, VV spouses/partners perceived servicemen's military service to have a significantly more negative impact on their relationships with their spouses/partners (this was the servicemen in 96 per cent of the cases), their other romantic relationships, and their relationships with families and friends than did VEP spouses/partners.

Compared with VEP spouses/partners, significantly more VV spouses/partners also felt that their servicemen's military service had a negative impact on their employment outcomes, mental health, physical health and financial situation.

The marginal effects indicate that relative to the spouses/partners of VEP, the predicted probabilities for spouses/partners of VV were:

- 11.7 per cent points lower on no burden of poor health
- 6.6 per cent points higher on burden of poor mental health
- 6.4 per cent points higher on burden of both poor mental and physical health
- 0.8 points less positive on the perceived impact of military service on spouses'/partners' relationships with servicemen
- 0.3 points lower on the perceived impact of military service on spouses'/partners' other romantic relationships
- 0.4 points lower on the perceived impact of military service on spouses'/partners' relationship with immediate family
- 0.4 points lower on the perceived impact of military service on spouses'/partners' relationship with wider family
- 0.3 points lower on the perceived impact of military service on spouses'/partners' relationship with friends
- 0.3 points lower on the perceived impact of military service on spouses'/partners' employment
- 0.5 points lower on the perceived impact of military service on spouses'/partners' mental health
- 0.7 points lower on the perceived impact of military service on spouses'/partners' physical health
- 0.2 points lower on the perceived impact of military service on spouses'/partners' financial situation.

Table 5.6 Incidence of combined burden of poor health and military service effects and significant differences between spouses/partners of VEP and VV

	VEP, spouses/ partners	VV, spouses/ partners	Adjusted difference #	Significance
Health and military servicemen affect	**Mean or %**			
Combined burden of poor health (%)				
No health burden	73.8	61.1	-11.7	***
Physical health burden only	9.4	8.7	-1.2	ns
Mental health burden only	4.1	10.7	6.6	***
Both physical and mental health burden	12.7	19.5	6.4	**
Impact of military service on spouses/partners (Mean)				
On relationship with their spouses/partners	3.28	2.70	-0.8	***
On their other romantic relationships	3.01	2.77	-0.3	***
On relationship with immediate family	3.16	2.91	-0.4	***
On relationship with wider family	3.19	2.92	-0.4	***
On relationship with friends	3.13	2.96	-0.3	***
On employment	3.14	2.93	-0.3	***
On mental health	3.14	2.71	-0.5	***
On physical health	3.14	2.53	-0.7	***
On financial situation	3.11	2.92	-0.2	**
N	852	1,447		

Notes: ***$p < .001$; **$p < .01$; *$p < .05$. Total number of observations varies across models due to missing values. There were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study. # Differences were adjusted for couple relationship length and age of spouses/partners and reflect rates for VV spouses/partners relative to VEP spouses/partners.

Source: Vietnam Veterans Family Study

5.4 Family functioning

Family functioning is the next outcome area examined. The measures used are shown in Table 5.7 while the results are presented in Table 5.8.

Table 5.7 Measures of family functioning

Variable	Coding/Notes
Relationship satisfaction with differing types of family members	Spouses/partners were asked, in general, how satisfied they were with their relationship with their (a) children/step-children, (b) own brothers or sisters (or step-brothers/sisters), (c) parents (or step-parents or parents-in-law), and (d) servicemen. Each question has responses ranging from 1 (very dissatisfied) to 5 (very satisfied). The responses were dichotomised into dissatisfied (combining very dissatisfied, dissatisfied and neither) and satisfied (combining satisfied and very satisfied). Four scores were derived reflecting satisfaction with each type of relationship.
General family satisfaction	Family satisfaction was measured by the Family Satisfaction Scale (FSS; Olson, 2011). The FSS contains 10 items measuring satisfaction with the family's cohesion, adaptability and communication (e.g. In general, how satisfied are you with the degree of closeness between family members). A total score is calculated as the sum of the 10 items (a possible range from 10–50) with a higher score indicating higher family satisfaction.
Couple relationship quality	The quality of relationships with servicemen as perceived by spouses/partners was measured by the Relationship Assessment Scale (RAS; Hendrick, 1988). The RAS contains six items measuring relationship quality for current spouses/partners or previously for ex-spouses/partners (e.g. How well does your spouse/partner meet your needs?) Items are scored on a Five-point Likert scale of 1 (not at all) to 5 (very much). The scale yields a single score derived from the average of all six items. A higher score indicates a more positive assessment of the relationship. Only the current spouses/partners responded to the RAS.
Abuse in the couple relationship (WAST)	The occurrence of abuse at same stage of the couple relationship was measured using the Women Abuse Screening Tool (WAST), a six-item screening scale probing whether there had been verbal, emotional, physical or sexual abuse between partners (e.g. do arguments ever result in you feeling put down or bad about yourself?) The items were scored using a three-point Likert scale of 1 (Never), 2 (Sometimes) and 3 (Often). The average across the six items was calculated, with the derived composite score ranging from 1–3. Higher scores indicate higher levels of abuse. Only current-spouses'/partners' results were reported in this section, as ex-spouses/partners responded to WAST questions with different options. The results of ex-spouses/partners are reported in Section 5.7.

Source: Vietnam Veterans Family Study

The family functioning-related findings (Table 5.8) reveal significant differences at the conventional $p < 0.05$ level on five of the seven indicators, all suggesting less positive outcomes for spouses/partners of VV compared to spouses/partners of VEP. The areas in which significant differences were found related to relationships with close family members, whereas non-significant differences were found on relationships with more distant family members such as siblings or their own parents.

While most spouses/partners were satisfied with their relationships with family members, a higher percentage of spouses/partners of VEP than VV reported being satisfied with their relationships with their children (92.7 per cent compared with 85.8 per cent) and their servicemen (86.7 per cent compared with 75.7 per cent). There were no significant differences on relationships with siblings or parents/parents-in-law. Additionally, VV spouses/partners tended to report significantly

lower general family satisfaction than VEP spouses/partners, similar to findings for relationships with servicemen and children.

Couple relationship quality was slightly but significantly lower for the spouses/partners of VV than for the spouses/partners of VEP. The occurrence of abuse at some stage of the couple relationship was low for both groups. However, rates were slightly but significantly higher for the spouses/partners of VV compared to spouses/partners of VEP.

The marginal effects indicate that relative to the spouses/partners of VEP, the predicted probabilities for spouses/partners of VV were:

- 6.6 per cent points lower on relationships with children
- 1.5 per cent points lower on relationships with servicemen
- 3.5 points lower on mean levels of global family satisfaction (FACES)
- 0.5 points lower on mean levels of couple relationship quality (RAS)
- 0.2 points higher on mean levels of abuse in the couple relationship (WAST).

Table 5.8 Incidences on family functioning outcomes and significant differences between spouses/partners of VV and VEP

	VEP, Mean	VV, Mean	Adjusted difference #	Significance
Family functioning	**Mean or %**			
Satisfaction with relationships with family members (satisfied %)				
With children	92.7	85.8	-6.6	***
With siblings	70.9	66.6	-4.5	ns
With parents/parents-in-law	75.3	71.7	-3.5	ns
With servicemen	86.7	75.7	-11.5	***
General family satisfaction (FACES)	35.6	32.1	-3.5	***
Couple relationship quality (RAS)[a]	4.3	3.8	-0.5	***
Abuse in the couple relationship (WAST)[a]	1.2	1.4	0.2	***
N	852	1,447		

Notes: ***$p < .001$; ns = not significant. Total number of observations varies across models due to missing values. There were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study. There was some variation in sample size between analyses due to missing data and eligibility for the questions (e.g. relationship with children was only asked of spouses/partners who have a child(ren)). # Differences were adjusted for couple relationship length and age of spouses/partners. Adjusted differences reflect rates for VV spouses/partners relative to VEP spouses/partners. [a] Current spouses/partners only.

Source: Vietnam Veterans Family Study

5.5 Socio-economic wellbeing

The measures used to assess socio-economic wellbeing covered spouses'/partners' current employment status, main income source, employment stability, home ownership, living arrangements, and the experience of financial hardship or homelessness (Table 5.9). Spouses'/partners' age and highest level of education was also included here as they are connected with, and often drivers of, economic wellbeing, particularly among older age groups (Klein, 2015).

Table 5.9 Measures of socio-economic wellbeing

Variable	Coding/Notes
Education	Spouses/partners were asked about their highest educational qualification obtained. This was recoded into: 1 = Year 10 or below, 2 = Year 11–12, 3 = Certificate/diploma and 4 = University/degree or higher.
Current employment status	Spouses/partners were asked, 'Which of the following best describes the MAIN type of work you currently do?' with 10 response options provided such as working for pay as an employee, self-employed, studying, household duties, living with a disability. These were recoded as: 1 = employed/self-employed 2 = retired/semi-retired 3 = household duties/caring for a family 4 = living with a disability 5 = other
Main source of income	Spouses/partners were asked about their main source of income with the following response options provided: 1 = Wage/salary; 2 = Own business/share in partnership; 3 = Age service pension; 4 = Invalidity service pension; 5 = VEA Compensation Benefit; 6 = SRCA Compensation Benefit; 7 = MRCA Compensation Benefit; 8 = Child allowance (Family Tax Benefit); 9 = Child Support; 10 = Dividends/Interest/Income from investments; 11 = Carer pension or allowance; 12 = Age pension; 13 = Superannuation payment; 14 = Other government benefit or allowance; 15 = VEA War Widow Benefit; 16 = Spouse pay or pension; 17 = Other pension. The above responses were recoded into: 1 = Wage/salary (response 1) 2 = Government benefits (responses 3–8, 10–11, 13–17) 3 = Business/investment/superannuation (responses 2, 9, 12)
Employment instability	Employment instability was measured by the number of jobs the spouse/partner has held since starting work. The responses were categorised as follows: 1–4 jobs, 5–9 jobs, 10 or more jobs.
Home ownership	Spouses/partners were asked about their current living arrangement with the following response options provided: 1 = It is owned outright (i.e. mortgage paid in full) by me and/or my spouse/partner; 2 = I and/or my spouse/partner are currently paying off a mortgage; 3 = Renting—state/ territory/private landlord; 4 = Board and lodging; 5 = Live rent free with family or parents; 6 = Living in a Life Tenure arrangement; 7 = Involved in a rent to buy program. The above responses were recoded into: 1= own a house (response 1) 2 = paying mortgage/rent to buy (responses 2 and 7) 3 = renting (response 3) 4 = living free (responses 4–6)

Variable	Coding/Notes
Type of residence lived in	Spouses/partners were asked about the type of dwelling or place they currently live in with the following response options provided: 1 = Separate house 2 = Semi-detached house/Terrace house/Townhouse/Villa 3 = Flat or unit in a multi-storey apartment block 4 = Caravan 5 = Boarding House/Hostel 6 = Lifestyle accommodation (e.g. Over 45s, Over 55s) 7 = Residential aged care facility 8 = I have no permanent residence 9 = Shed or temporary accommodation 10 = Government or army housing The above responses were recoded into: 1 = Separate house (response 1) 2 = Townhouse/apartment (responses 2 and 3) 3 = Caravan (response 4) 4 = Boarding/lifestyle/age care/govt or army housing (responses 5–7, 10) 5 = No permanent place to live (responses 8–9).
Financial hardships in the past	Five binary indicators of whether spouses/partners had ever experienced financial hardships such as couldn't keep up with payments for water, electricity, gas or telephone; got behind with the rent or mortgage; had to pawn or sell something or borrow money from a money lender; or had to ask a welfare agency for food, clothes, etc. (Yes = 1; No = 0). If spouses/partners had experienced any of these hardships, they were deemed to have experienced financial hardship (Yes = 1, No = 0).
Financial hardships in the last 12 months	Whether spouses/partners experienced financial hardships in the last 12 months using the above criteria (Yes = 1; No = 0).
Homeless in the past	Four binary indicators of whether spouses/partners had ever been homeless. Spouses/partners were considered to have been homeless if they had slept in a public place, park or in a vehicle; had stayed in crisis or emergency accommodation because they had nowhere else to go; or had lived in a hostel or boarding house (Yes = 1; No = 0). If any of these were reported, spouses/partners were deemed to have been homeless (Yes = 1; No = 0).
Homeless in the last 12 months	Four binary indicators of whether spouses/partners had been homeless in the last 12 months (as defined above) at the time of the interview (Yes = 1; No = 0).

Source: Vietnam Veterans Family Study

The findings regarding spouses'/partners' socio-economic wellbeing are presented in Table 5.10. There were significant differences at the conventional $p < 0.05$ level on six of the eight indicators examined.

VV spouses/partners were significantly more likely to report Year 10 or below as their highest level of education and less likely to have attained a university degree or higher qualification than VEP spouses/partners. Thus, 39.7 per cent had reached Year 10 or below compared with 33.5 per cent of VEP spouses/partners, while 12.4 per cent had achieved a university degree compared with 17.5 per cent of VEP spouses/partners.

Relative to VEP spouses/partners, more VV spouses/partners were retired or semi-retired and fewer were working (e.g. 54.6 per cent were retired/semi-retired

compared to 39 per cent of VEP spouses/partners). There were no significant differences on the percentages whose main employment status was household duties or caring for a family member, with approximately one in five being in this situation.

Consistent with their employment status, a significantly greater percentage of VV spouses/partners reported that their main income source was a benefit or a pension, while fewer reported main income to come from a wage, salary, business, investment or superannuation. For example, 61 per cent of VV spouses/partners reported their main income source as being government benefits or pensions compared to only 28.8 per cent of VEP spouses/partners.

In terms of employment instability, VV spouses/partners were less likely to have held 1–4 jobs (48 per cent) and more likely to have held 5–9 jobs (40.5 per cent) in their working lives, as compared to VEP spouses/partners (55 per cent and 33.3 per cent respectively).

Regarding spouses'/partners' living arrangements, the vast majority were living in a separate house (91.5 per cent of VV spouses/partners and 93.9 per cent of VEP spouses/partners). Around five per cent of VV spouses/partners (5.8 per cent) and VEP spouses/partners (4.3 per cent) were living in a townhouse, unit, flat or apartment. Very few were living in a caravan, boarding house/hostel, lifestyle accommodation, residential aged care facility, government or army housing (1.5 per cent of VV spouses/partners and 1.2 per cent of VEP spouses/partners), and less than 1 per cent had no permanent residence or lived in a shed or temporary accommodation. Differences between VV and VEP groups on living arrangements were not significant.

Most owned their residences, but the percentage was significantly lower among VV than VEP spouses/partners (71.4 per cent vs 76.4 per cent). This difference was likely to due to the fact that significantly more VV than VEP spouses/partners were still paying off their mortgage (23.5 per cent vs 19.5 per cent). Similar percentages of VV and VEP spouse/partners were renting or living in a boarding house, with family or in a life tenure arrangement.

VV spouses/partners were also significantly more likely to have experienced financial hardship in the past than VEP spouses/partners (35.4 per cent vs 28.1 per cent). Fewer than one in 10 had experienced financial hardship in the last 12 months, with no significant differences found on this indicator. Rates of homelessness at some stage or in the last 12 months were very low overall and did not significantly differentiate spouses/partners of VV and VEP.

The marginal effects indicate that relative to the spouses/partners of VEP, the predicted probabilities for spouses/partners of VV were:

- 7 per cent points higher on having Year 10 or below as their highest level of educational achievement

  and

- 5.6 per cent points lower on having a University degree as their highest level of educational achievement
- 14.3 per cent points lower on being employed or self-employed
- 16.6 per cent points higher on being retired or semi-retired
- 20.4 per cent points lower on having a wage/salary as their main source of income
- 33.1 per cent points higher on having government benefits as their main source of income
- 12.7 per cent points lower on having business/investment/superannuation as their main source of income
- 6.7 per cent points lower on having 1–4 jobs while working
- 7.1 per cent points higher on having 5–9 jobs while working
- 5.3 per cent points lower on owning their current residence
- 4.4 per cent point higher on paying a mortgage on their current residence
- 7.1 per cent points higher on experiencing financial hardship in the past.

Table 5.10 Incidences on economic wellbeing outcomes and significant differences between spouses/partners of VV and VEP

Family functioning and economic wellbeing	VEP, spouses/ partners	VV, spouses/ partners	Adjusted difference #	Significance
	Mean or %			
Educational level (%)				
Year 10 or below	33.5	39.7	7.0	**
Year 11 or 12	13.7	14.9	-1.4	ns
Certificate/diploma	35.2	33.1	-2.9	ns
University degree or higher	17.5	12.4	-5.6	**
Employment status (%)				
Employed/self-employed	35.6	21.7	-14.3	***
Retired/semi-retired	39.0	54.6	16.6	***
Household duties/caring for a family	21.5	21.0	-1.1	ns
Living with disability	2.1	1.3	-0.8	ns
Other	1.8	1.4	-0.3	ns
Main source of income (%)				
Wage/salary	35.5	16.2	-20.4	***
Government benefits	28.8	61.2	33.1	***
Business/investment/superannuation	35.8	22.6	-12.7	***

Family functioning and economic wellbeing	VEP, spouses/ partners	VV, spouses/ partners	Adjusted difference #	Significance
	Mean or %			
Employment instability (%)				
1–4 jobs	55.0	48.0	-6.7	*
5–9 jobs	33.3	40.5	7.1	*
10 or more jobs	11.7	11.5	-0.4	ns
House ownership (%)				
Own outright	76.4	71.4	-5.3	*
Mortgage	19.5	23.5	4.4	*
Renting	3.1	3.9	0.1	ns
Boarding/live free/life tenure	1.0	1.2	0.1	ns
Living arrangements (%)				
Separate house	93.9	91.5	-1.8	ns
Townhouse/apartment	4.3	5.8	1.6	ns
Caravan	0.3	0.8	0.0	ns
Boarding/lifestyle/age-care/govt. or army housing	1.2	1.5	0.0	ns
No permanent place	0.3	0.5	0.2	ns
Financial stress (%)				
Financial hardship (ever)	28.1	35.4	7.1	*
Financial hardship in the last 12 months	7.4	7.3	-1.1	ns
Homelessness (%)				
Homeless (ever)	3.7	5.1	0.5	ns
Homeless in the last 12 months	0.8	0.2	-0.5	ns
N	852	1,447		

Notes: ***$p < .001$; **$p < .01$; *$p < .05$; ns = not significant. Total number of observations varies across models due to missing values. There were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study. There was some variation in sample size between analyses due to missing data. # adjusted differences reflect rates for VV spouses/partners relative to VEP spouses/partners. Differences were adjusted for couple relationship length and age of spouses/partners.

Source: Vietnam Veterans Family Study

5.6 Summary

This section investigated whether there were differences between the spouses/partners of Vietnam veterans (VV) and Vietnam-era personnel (VEP) in six main life areas: mental health and substance use; physical health; the combined burden of poor mental and physical health; the perceived impact of military service; family functioning; and socio-economic wellbeing. These analyses used information provided by all spouses/partners—current and former. Later sections of this report focus primarily on current spouses/partners.

Analyses were potentially complex because there were differences between VV and VEP servicemen on age, their military service history, and their home environment while growing up. However, propensity score analysis was used to adjust for these differences so they were unlikely to affect the comparisons of VV and VEP spouses/partners. The length of couple relationships and spouses/partner age were also controlled in the analyses.

After adjustment for the above factors, spouses/partners of VV were found to have significantly poorer outcomes across all broad life areas than spouses/partners of VEP, as follows.

Mental health and substance use

- While most spouses/partners were functioning relatively well on general mental health as measured by the SF36, levels were lower among spouses/partners of VV (a group mean of 69.3 compared with a mean of 76.9 for spouses/partners of VEP).
- Spouses/partners of VV were more likely to have been diagnosed with or treated for depression or anxiety in their lifetime, but not PTSD, than the spouses/partners of VEP.
- Spouses/partners of VV had more often experienced suicidal thoughts or suicidal plans/actions in their lifetime than their VEP counterparts.
- Spouses/partners of VV tended to report lower life satisfaction than spouses/partners of VEP (although levels were generally high overall).
- Spouses/partners of VV were more likely to have tried marijuana or hashish in their lifetime than their VEP counterparts, but did not significantly differ on use in the last 12 months.
- While very few spouses/partners reported problem drinking, rates were significantly higher among VV spouses/partners (4.7 per cent compared with 1.6 per cent of VEP spouses/partners).

Physical health

- The percentage rating their health as only fair or poor was higher among spouses/partners of VV than VEP (27.6 per cent compared with 18.0 per cent).
- Fewer spouses/partners of VV were functioning relatively well on general physical health as measured by the SF36 (62.1 per cent compared with 66.7 per cent of spouses/partners of VEP).
- Spouses/partners of VV had more often been diagnosed with genitourinary system problems (e.g. kidney disease), skin problems (e.g. eczema, psoriasis); or sleep disturbance problems (e.g. insomnia, sleep apnoea).

- Spouses/partners of VV and VEP did not significantly differ on the incidence of circulatory system, neoplasms, respiratory system, digestive system problems or neurological problems, hearing problems or migraines.
- There were no significant differences on pregnancy experiences and outcomes, or the incidence of spina bifida or cleft palate/lip in children.

Combined mental and physical health burden

- Spouses/partners of VV were significantly less likely to have no physical and/or mental health problems than VEP spouses/partners.
- Spouses/partners of VV and VEP did not significantly differ on rates of physical health problems alone.
- Spouses/partners of VV were significantly more likely to have poor mental health alone or both poor mental and physical health than VEP spouses/partners.

Impact of servicemen's military service on spouses/partners

- Spouses/partners of VV were more likely to feel there had been negative impacts of servicemen's military service, all types of spouse/partner social relationships, their mental and physical health, and their employment and financial situation.

Family functioning

- While most spouses/partners were satisfied or highly satisfied with their relationships with family members, Spouses/partners of VV tended to be less satisfied than spouses/partners of VEP with their relationships with their children and servicemen (although did not significantly differ on relationships with their siblings or parents).
- Spouses/partners of VV also tended to score lower on global family satisfaction than their VEP counterparts.
- Although couple relationship quality was generally high across the sample, VV spouses/partners tended to be somewhat lower than VEP spouses/partners.
- Fewer than 2 per cent of the sample reported there had been abuse in the couple relationship, but this was reported more often by spouses/partners of VV than VEP.

Socio-economic wellbeing

- Spouses/partners of VV more often reported Year 10 or below as their highest level of education and less often reported attaining a university degree. They did not significantly differ from VEP spouses/partners on rates of attaining Year 11 or 12 or a certificate diploma.

- A higher percentage of VV spouses/partners were retired or semi-retired (54.6 per cent compared to 39 per cent of VEP spouses/partners); and fewer were employed or self-employed (21.7 per cent compared with 35.6 per cent).
- Similar percentages of VV and VEP spouses/partners reported household duties or caring for families as their employment status (about one in five).
- Spouses/partners of VV more often reported government benefits as their main income source, and less often wages/salaries or business/investments/superannuation.
- More VV spouses/partners had experienced financial hardships in their lifetimes than VEP spouses/partners, although not in the previous 12 months.
- Very few spouses/partners had experienced homelessness in their lifetimes and this did not significantly differentiate VV and VEP spouses/partners.

Thus, the analyses revealed numerous significant differences across major life domains between the spouses/partners of VV and VEP, as summarised in Table 5.11 (non-significant differences are not shown). However, these analyses simply investigated differences between the two sub-groups and did not take into account other potentially influential factors such as spouses'/partners', servicemen's, parents' and children's characteristics, or servicemen's PTSD. These characteristics are included in the analyses reported next in Section 6, and the possible mechanisms of the impact of deployment are also explored.

Table 5.11 Summary of significant differences between VV and VEP spouses/partners

Outcomes	VV spouses/partners vs VEP spouses/partners
Mental health	
General mental health (SF36)	↓
Life satisfaction	↓
Diagnose/treatment for depression	↑
Diagnose/treatment for anxiety	↑
Suicidal thoughts	↑
Suicidal plan/action	↑
Marijuana use—lifetime	↑
High-risk drinking	↑
Physical health	
Fair/poor general health	↑
General physical health (SF36)	↓
Diagnosis/treatment for genitourinary system diseases	↑
Diagnosis/treatment for skin problems	↑
Diagnosis/treatment for sleep condition	↑

Outcomes	VV spouses/partners vs VEP spouses/partners
Cumulative health burden and impact of military service	
Combined burden of poor health	
No health burden	↓
Mental health burden only	↑
Both physical and mental health burden	↑
Impact of military service	
On relationship with their spouses/partners	↓
On their other romantic relationships	↓
On relationship with immediate family	↓
On relationship with wider family	↓
On relationship with friends	↓
On employment	↓
On mental health	↓
On physical health	↓
On financial situation	↓
Family functioning	
Satisfaction with relationships with family members:	
With children	↓
With servicemen	↓
General family satisfaction	↓
Couple relationship quality	↓
Abuse in the couple relationship	↑
Socio-economic wellbeing	
Educational level	
Year 10 or below	↑
University degree or higher	↓
Employment status	
Employed/self-employed	↓
Retired/semi-retired	↑
Employment instability	
1–4 jobs	↓
5–9 jobs	↑
Main source of income	
Wage/salary	↓
Government benefits	↑
Business/investment/superannuation	↓
House ownership	
Own outright	↓
Mortgage	↑
Financial stress in the past	↑

↑ = higher among VV than VEP spouses/partners

↓ = lower among VV than VEP spouses/partners

5.7 Ex-spouses/partners

A number of questions were asked separately of ex-spouses/partners only, which include the main reason for breaking up, length of time since they separated, whether there had been abuse in the couple relationship prior to or after servicemen's deployment or military service, and the perceived impact of servicemen's military service on relationships between ex-spouses/partners and servicemen. In this sub-section, the characteristics of ex-spouses/partners and the distribution of their responses to these questions are briefly described.

The final analysis sample contained 88 ex-spouses/partners, 67 (76 per cent) from the VV group and 21 (24 per cent) from the VEP group. Findings for this sub-group are reported in Table 5.12. It should be noted that the small number of ex-spouses/partners has likely reduced the statistical power to detect significant differences.

Ex-spouses/partners were in their sixties on average, with there being no significant differences between VV and VEP ex-spouses/partners on age. A total of 14.3 per cent of ex-spouses/partners in the VEP group and 8.5 per cent of ex- spouses/partners in the VV group had served in the military. The marginal effect was small and the statistical difference was not significant.

Few ex-spouses/partners in the VV group identified as being Indigenous (2.2 per cent) compared to zero in the VEP group, a non-significant difference. Although ex-spouses/partners in the VEP group had been separated from the servicemen for a longer period of time than those in the VV group (17.3 vs 11.4 years), this difference was not significant.

Regarding the main reasons underlying ex-spouses'/partners' break-up with servicemen, 'simply grew apart' was the most common main reason, following by 'mental health issues' and 'extramarital affairs'. The largest difference between VV and VEP ex-spouses/partners was on the main reason: 'simply grew apart' (34.3 per cent of VV and 69.6 per cent of VEP ex-spouses/partners). On the other hand, the main reason of 'alcohol and drug issue', was significantly more common among VV ex-spouses/partners (33.8 per cent compared with 4.8 per cent of VEP ex-spouses/partners). Although domestic violence appeared to be a more common reason among the VV group (28.1 per cent) than the VEP group (17.3 per cent), the difference was not significant.

Relative to ex-spouses/partners in the VEP group, those in the VV group tended to perceive more negative impacts of servicemen's military service on their relationship. For example, about one in three VEP ex-spouses/partners perceived the servicemen's military service as having a positive impact on their relationship, compared to only 4.8 per cent of VV ex-spouses/partners. However, this difference was not statistically significant.

Table 5.12 Characteristics of ex-spouses/partners and significant differences between the VV and VEP groups

Characteristics	VEP, spouses/ partners	VV, spouses/ partners	Adjusted difference #	Significance
	Mean or %			
Demographics				
Age	65.9	63.4	-2.6	ns
Served in military (%)	14.3	8.5	-0.0	ns
Indigenous status (%)	0.0	2.2	0.2	ns
Length of separation (years)	17.3	11.4	- 4.2	ns
Main reasons for breaking up (%)[a]				
We simply grew apart	69.6	34.3	-37.9	**
Domestic violence	17.5	28.1	14.4	ns
Feared for my own and children's safety and wellbeing	26.3	21.0	-4.1	ns
Alcohol and drug issues	4.8	33.8	27.8	***
Mental health issues	33.8	39.9	1.8	ns
Extramarital affairs	31.6	30.5	-0.1	ns
Impact of servicemen's military service on relationship (%)				
Negative	42.1	67.2	18.8	ns
No impact	24.5	28.0	10.3	ns
Positive	33.4	4.8	-29.1	ns
Abuse in the couple relationship (WAST) (Mean)[b]				
Prior to deployment/military service	2.5	0.3	-1.8	*
After deployment/military service	2.2	3.5	0.8	ns
N	21	67		

Notes: ***$p < .001$; **$p < .01$; *$p < .05$; ns = not significant. Total number of observations varies across models due to missing values. There were 15 instances in which both current- and ex-spouses/partners of servicemen participated in the study. There was some variation in sample size between analyses due to missing data. [a] Ex-spouses/partners were asked, 'What were the main reason your relationship with the servicemen named on the front page broke down?', with eight options (e.g. domestic violence) and they were allowed to select as many main reasons for breaking up with the servicemen as applied. The last two options of 'My partner passed away' and 'Some other reason—specify' were not included because they were not selected by any ex-spouses/partners. [b] Estimate not reliable (cell count less than 20). Abuse in the couple relationship questions were asked separately for prior to and after deployment/military service, which left less than 20 observations in the VEP group, and less than 50 observations in the VV group. # adjusted differences reflect rates for VV spouses/partners relative to VEP spouses/partners. Differences were adjusted for couple relationship length and age of spouses/partners.

Source: Vietnam Veterans Family Study

Ex-spouses/partners reported whether there had been abuse in their relationship with servicemen prior to and/or after servicemen's military service (if they were still together). Slightly, but significantly, more VEP ex-spouses/partners reported there had been abuse prior to deployment/military service than those in the VV group. No significant difference was observed in the rates of abuse in relationships after deployment/military service.

Overall, the marginal effects indicate that relative to the ex-spouses/partners of VEP, the predicted probabilities for ex-spouses/partners of VVs were:[11]

- 37.9 per cent points lower on breaking up because of 'simply grew apart'
- 27.8 per cent points higher on breaking up because of alcohol and drug issues.

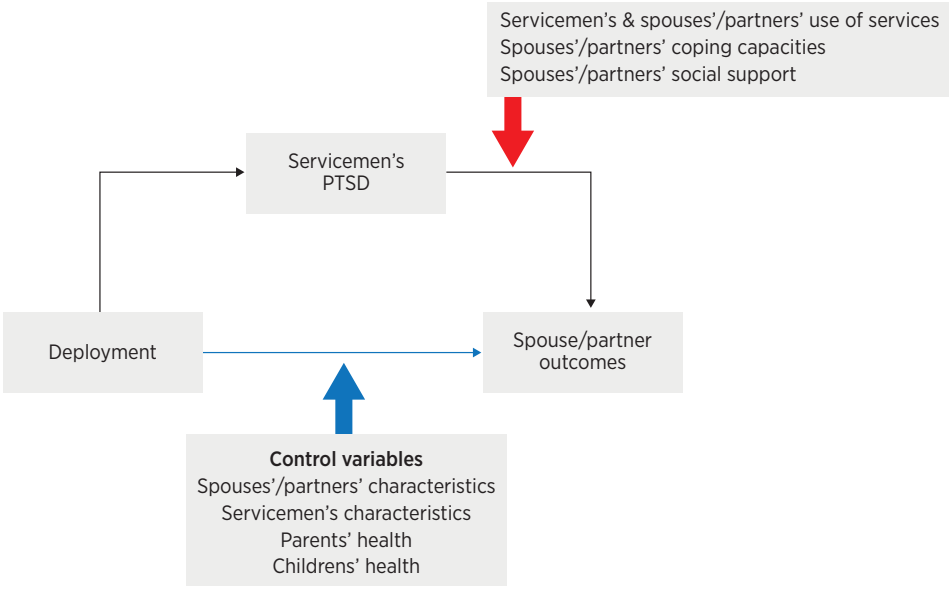
11 Difference in abusive couple relationship prior to deployment/military service was significant; however, this estimate was not reliable due to a very small cell size (<20).

6 What are the mechanisms by which deployment to the Vietnam War affect spouses/partners?

Previous research suggests that the effects of deployment to war on spouses'/partners' health and wellbeing are likely to be explained by servicemen's PTSD (see the literature review in Section 2 for details). Post-traumatic stress disorder can, in turn, affect servicemen's mental health and substance use, physical health and couple relationships following deployment, which can flow-on to affect spouses'/partners' health and wellbeing.

To understand the mechanisms by which deployment to the Vietnam War affected VVFS spouses/partners, a number of hypotheses suggested by the literature review were tested. A general model of effects is shown in Figure 6.1.

Figure 6.1 Theoretical model of the impact of deployment on spouses/partners outcomes



The model proposes both direct effects of deployment to the Vietnam War on spouses'/partners' outcomes, and indirect effects through servicemen's PTSD. These effects are expected to persist after inclusion of a range of control variables such as spouses'/partners' and servicemen's characteristics (e.g. age, education, childhood characteristics), spouses'/partners' parents' characteristics (e.g. whether parents had mental health problems, drinking problems) and problems among

children (e.g. mental health problems, long-term health conditions). Finally, three types of psychosocial resources are included as they are hypothesised to alleviate ('moderate') the effects of servicemen's PTSD: the use of services (servicemen and spouses/partners), the availability of social supports (spouses/partners), and coping capacities (spouses/partners).

This section focuses on current spouses/partners, comprising1,380 spouses/partners of VV and 831 spouses/partners of VEP.[12] It should be noted that the VVFS data were collected at a specific point in time (2011) and information on many explanatory variables was retrospectively reported. This means that the specific timing of prior events and conditions cannot be ascertained. These results are, therefore, correlational and suggestive rather than implying causation. The analyses used data provided by current spouses/partners and servicemen (data from ex-spouses/partners was excluded as their perspectives could be expected to be greatly influenced by experiences or circumstances that, while important, are less relevant to the purposes of the current analyses).

Although the literature suggests that other factors such as servicemen's physical health, substance abuse and family conflict are likely to be other mediators of the effects of servicemen's Vietnam deployment on spouses'/partners' health and wellbeing (Manguno-Mire et al., 2007; Meis, Erbes, Polusny, & Compton, 2010; Solomon, Dekel, & Zerach, 2008), they were not tested in the current report. Our measures of these characteristics assessed recent functioning (e.g. current family relationships, servicemen's mental and physical health in the past 12 months). This could differ greatly from when servicemen had just returned from Vietnam or when their children were growing up. Due to this methodological limitation, these mediators were not included in the current study.

6.1 Variables in the models

6.1.1 Outcomes

The VVFS dataset contains many outcomes that could be examined. In deciding which variables to focus on, we were guided by the findings in Section 5 in which spouses/partners of VVs and VEP were compared after controlling for spouse/partner age and the length of the couple relationship. Outcomes for which significant differences had been found were further examined here. Thus, we focused on 11 spouse/partner outcomes covering four broad areas of life:

12 Due to the measurement issues (e.g. some questions were asked separately depending on spouses'/partners' current relationship status with the servicemen), mediation and moderation analyses were performed to current-spouses/partners only. We cannot perform separate mediation and moderation analyses for ex-spouses/partners because the sample size for this group is too small (*N* = 86).

- **Mental health and substance use—*General mental health (SF36 mental component scores), anxiety, depression, suicidal ideation and problem drinking*.** The reference period for general mental health was within the past four weeks (assessed by SF36). The reference period for depression, anxiety and suicidal ideation was ever in spouses'/partners' lifetimes (e.g. ever diagnosed with or treated for depression). For reader interest it is worth noting that only a very small proportion of spouses/partners were first diagnosed with or treated for anxiety (2.1 per cent) or depression (3 per cent) before they were in a relationship with the servicemen. The reference period for problem drinking was within the past 12 months.
- **Physical health—*General physical health (SF36 physical component scores), skin conditions (e.g. eczema, psoriasis), and sleep disturbance.*** The reference period for general physical health (SF36 scores) was within the past four weeks. The reference period for skin conditions and sleep disturbance was ever in spouses'/partners' lifetimes (e.g. ever diagnosed with or treated for skin condition).
- **Combined mental and physical health difficulties—*the combined burden of poor physical and mental health*.** The reference period was within the past four weeks (assessed by the SF36). Four combinations of these problems were identified: neither difficulty was present; physical health difficulties only; mental health difficulties only; and both difficulties were present.
- **Couple relationships**—the ***quality of couple relationships*** between spouses/partners and servicemen as measured by the Relationship Assessment Scale (Hendricks, 1988). Although the questions did not specify the time period, it is likely that spouses/partners responded according to their more recent relationship quality with the servicemen.

All measures were derived in the manner described in Section 5.

6.1.2 Mediator

The set of analyses in this section tested the mediating effect of servicemen's PTSD on relationships between deployment to Vietnam and spouse/partner outcomes. As shown in Table 6.1, the prevalence of PTSD was significantly higher among VV than VEP servicemen. Around four in 10 VV servicemen reported high levels of PTSD symptoms currently compared to only 7.1 per cent of VEP servicemen.

Table 6.1 Measures of services used by servicemen and spouses/partners, and prevalence rates among VEP and VV groups

Variable	Coding/Notes	VEP (%)	VV (%)
PTSD	Binary indicator of whether the serviceman (as reported by serviceman) reports levels of symptoms that would likely lead to a PTSD diagnosis (Yes = 1 (score 50–85); Otherwise = 0 (score 1–49)). PTSD was assessed using the Post-traumatic Stress Disorder Check List—Civilian version (PCL-C)—a standardised self-report measure for symptoms of PTSD (Blanchard et al., 1996). The PCL comprises 17 items that correspond to the key symptoms of PTSD (e.g. repeated disturbing memories, thoughts or images of a stressful experience, etc.). Respondents used a five-point scale from 1 to 5 to report how bothered they had been by the symptoms, with responses ranging from 'not at all bothered' to 'extremely bothered'. A total score was computed by adding the 17 items, with possible scores ranging from 17 to 85. A cut-off of 50 was used to identify respondents who would likely receive a PTSD diagnosis. The reference period is the past month.	7.1	39.3***
N		831	1,380

Notes: Total number of observations varies across models due to missing values. *** $p < .001$.

Source: Vietnam Veterans Family Study

Some caveats to the use of the measure of servicemen's PTSD should be noted. The time period covered by the measure was the past month. Although some of the outcomes of interest covered similar or recent time periods (e.g. the SF36 measures of general mental and physical health covered the prior four weeks), others covered much wider periods than the month prior to the survey (e.g. 'Have you ever made plans to take your own life?'). It is possible that this contravenes the criterion for establishing causal relationships—that independent or predictor variables should precede the occurrence of the outcome of interest. Whether this has occurred here depends on whether the onset of PTSD symptoms measured in the month prior to the survey was likely to have occurred earlier and prior to the outcomes studied.

As noted by Forrest and colleagues (2014):

> 'There is some evidence that the prevalence of post-traumatic stress disorder changes over time. Some people experience the first onset of symptoms months or even years after an event, while others may find that their symptoms abate over time (Long et al., 1996; Shlosberg & Strous, 2005). In a recent review of studies examining the progression of PTSD, Santiago and colleagues (2013) suggested that the progression of PTSD could vary in accordance with the nature of the traumatic events that precipitated it. In particular, they found that studies examining PTSD symptomology

following non-intentional events (e.g. traffic accidents, natural disasters) were more likely to report declines in the prevalence of PTSD among untreated populations. By contrast, studies that examined the progression of PTSD in the aftermath of intentional events (e.g. combat exposure, criminal victimisation) were more likely to report increases in its prevalence over time (Santiago et al., 2013). This finding suggests that the PTSD currently reported by the servicemen participating in the VVFS study may have been persistent.

Long-term prospective longitudinal studies of PTSD among survivors of intentional events are rare but those studies that have been conducted indicate that individual trajectories of PTSD are highly variable and may reflect patterns of remission, remission followed by relapses, and late onset even 20 years after the event (Horesh, Solomon, Keinan, & Ein-Dor, 2013; Shlosberg & Strous 2005; Solomon & Mikulincer, 2006). Although most sufferers develop the condition within a year of experiencing an intentional traumatic event, up to one-fifth of those who initially escape symptoms may still develop them years later (Horesh et al., 2013; Solomon & Mikulincer, 2006;).'

It is possible that the current measure has not provided a completely accurate estimate of which veterans were suffering from PTSD when they came back from deployment to Vietnam or returned from other types of military service. Some servicemen now classified as likely to have PTSD may have first experienced symptoms only recently, while others who now report few symptoms may have had severe symptoms much earlier.

This could limit our ability to accurately and fully estimate the effect of servicemen's PTSD on spouses/partners. For example, the analyses might not detect effects on spouses/partners whose veterans came back from Vietnam with PTSD but have recovered in recent years. This makes our test of the effects of veterans' PTSD on spouse/partner outcomes conservative. It is also possible that some of the apparent direct effects of deployment to Vietnam could reflect PTSD effects experienced earlier by servicemen that have waned.

The Main Survey also asked VV and VEP servicemen whether they had ever been diagnosed with PTSD at some time in their lives. However, this measure is unlikely to overcome the above problems. As Forrest and colleagues (2014) note:

'Diagnosis of PTSD was not included in the Diagnostic and Statistical Manual in 1980, which means that few veterans would have been diagnosed with PTSD at the time they first began to experience its symptoms. This is confirmed by the Main Survey, which shows that less than 5 per cent of servicemen ever diagnosed with PTSD were diagnosed before they turned 30. Additionally, whether and when a veteran is diagnosed with a psychiatric

disorder can reflect his decision to seek help as well as the ability of the mental health professionals he consults to recognise the condition. As knowledge of PTSD among the community has grown, it is likely that the accuracy of diagnosis has improved markedly. For these reasons, having previously been diagnosed with PTSD is not necessarily a more accurate measure of whether a veteran was experiencing PTSD symptoms when he first came back from the war.'

The VVFS measure of whether servicemen had ever been officially diagnosed as having PTSD is useful, however, as a source of indirect evidence of both change and stability in the prevalence of PTSD among the VV sample, which could be the result of both remission (temporary or complete) and late-onset PTSD. Two-thirds of the VV surveyed reported that they had been diagnosed with PTSD at some point of their lives; of them, 51.1 per cent were classified as having PTSD in the previous month, while 6 per cent of those classified as having high levels of PTSD symptoms in the past month had not previously received a PTSD diagnosis.

Overall, due to the measurement issues discussed above, the mediation models examined here should be seen as correlational and suggestive only, and caution is needed when applying the study's results.

6.1.3 Moderators

Selection of moderator characteristics was guided by the literature review (Section 2) and the availability of measures in the VVFS survey. Moderators are hypothesised to affect the strength of relationships between servicemen's PTSD and spouse/partner outcomes.

The selected moderators were:

- servicemen's and spouses'/partners' use of services
- spouses'/partners' social support
- spouses'/partners' coping capacities.

A description of these measures, how they were coded, and the questions that comprised them are presented in Table 6.2 along with statistically significant differences between VV and VEP samples of veterans and their spouses on these measures.

Servicemen's and spouses'/partners' use of services

Significant differences between VV and VEP servicemen and spouses/partners were found on the use of military- and health-related services (Table 6.2). VV servicemen were about three times more likely to have used the Veterans and Veterans Families Counselling Service, DVA websites and resources, or ex-service organisations than VEP servicemen (79.4 per cent vs 26.3 per cent). The vast majority of VV (87.5 per cent)

had also used the services of a general practitioner or other medical service, compared to 67.4 per cent of VEP.

The proportions of spouses/partners who used military-related and health-related services were significantly higher in the VV group. Thus, 45.3 per cent of VV spouses/partners had used military-related services, compared to only 10.6 per cent of VEP spouses/partners. They were also more likely to have used general practitioner services or other health-related services than their VEP counterparts (74.3 per cent vs 67.9 per cent).

Table 6.2 Measures of services used by servicemen and spouses/partners, and prevalence rates among VEP and VV groups

Variable	Coding/Notes	VEP (%)	VV (%)
Servicemen's use of services			
Military-related services	Binary indicator of whether servicemen (as reported by servicemen) ever used any of the following services: (1) Veterans and Veterans Families Counselling Services (VVCS); (2) DVA websites (e.g. the At Ease website) and resources (e.g. fact sheets); or (3) Ex-service organisations (Yes = 1; Otherwise = 0).	26.3	79.4***
Health-related services	Binary indicator of whether servicemen (as reported by servicemen) ever used any of the following services: (1) General Practitioner (GP) and/or (2) Medical service(s) other than a GP (Yes = 1; Otherwise = 0).	67.2	87.5***
Spouses/partners use of services			
Military-related services	As for servicemen but reported by spouses/partners about themselves	10.6	45.3***
Health-related services	As for servicemen but reported by spouses/partners about themselves	67.9	74.3**
N		831	1,380

Notes: Total number of observations varies across models due to missing values. ***$p < .001$; **$p < .01$

Source: Vietnam Veterans Family Study

Spouses'/partners' social support

Table 6.3 reveals that there were not significant differences between VV and VEP spouses/partners on their access of various types of social support. Nevertheless, while rates of social support did not significantly differ across VV and VEP spouses/partners, it remains possible that social support plays a role in ameliorating the effects of servicemen's PTSD, an issue which is taken up in Section 6.4.

Table 6.3 Measures of spouses'/partners' social support, and prevalence rates among VEP and VV groups

Variable	Coding/Notes	VEP (%)	VV (%)
Social support	Binary indicator of whether servicemen see their families weekly or more often (Yes = 1; No = 0)	45.2	42.8
	Binary indicator of whether servicemen see their friends weekly or more often (Yes = 1; No = 0)	41.8	43.6
N		814	1,345

Note: *N* presents the maximum sample available, varies across models due to missing values.

Source: Vietnam Veterans Family Study

Spouses'/partners' coping capacities

Spouses/partners were asked a series of questions about how they dealt with problems (see Table 6.4). These were designed to measure three types of coping capacities: emotion-focused (e.g. 'I look for something good in what is happening'); problem-focused (e.g. 'I try to come up with a strategy about what to do'); and dysfunctional coping (e.g. 'I use alcohol or other drugs to help get through it'). Dysfunctional coping capacities are believed to be ineffective while problem- focused capacities are believed to be adaptive. Emotion-focused coping is in- between, as while it can help individuals cope it does not directly address the problem (Lazarus & Folkman, 1984). Our analyses sought to determine whether the use of more adaptive coping capacities by spouses/partners would be associated with a lower impact of servicemen's PTSD on outcomes than the use of less adaptive coping skills.

The average score for each type of coping was computed for spouses/partners and then dichotomised into high (roughly the top 25 per cent of the servicemen or spouse/partner distributions on that type of coping) and average/low (the remaining 75 per cent).

As can be seen in Table 6.4, the proportion using high problem-focused coping was significantly lower among VV than VEP spouses/partners (26.7 per cent vs 35.6 per cent). Conversely, a significantly greater proportion of VV spouses/partners reported higher levels of dysfunctional coping than their VEP counterparts (35.4 per cent vs 21.7 per cent). Fewer VV than VEP spouses/partners reported high emotion-focused coping (17.3 per cent compared with 22.2 per cent).

Table 6.4 Measures of coping strategies used by spouses/partners, and prevalence rates among VEP and VV groups

Variable	Coding/Notes	VEP (%)	VV (%)
Problem-focused coping	The Brief COPE (Carver, 1997) was used to measure respondents' problem-focused coping. Problem-focused coping contained six items covering active coping (e.g. I concentrate my efforts on doing something about the situation I'm in), planning (e.g. I try to come up with a strategy about what to do), and use of instrumental support (e.g. I get help and advice from other people). Response options were 1 (not at all), 2 (a little bit), 3 (quite a lot) and 4 (a lot). An average score was calculated (range of 1–4) with a higher score indicating higher levels of problem-focused coping. The average score was then dichotomised into 1 = high levels of dysfunctional coping (top 25 per cent); and 0 = lower levels of dysfunctional coping (the remaining 75 per cent).[13]	35.6	26.7***
Emotion-focused coping	Emotion-focused, measured by the Brief COPE contains two items on positive reframing behaviours (e.g. I look for something good in what is happening). The same response options as problem-focused coping were used. An average score was calculated with a higher score indicating higher levels of emotion-focused coping. The average score was then dichotomised into 1 = high levels of emotion-focused coping (top 25 per cent); and 0 = lower levels of emotion-focused coping (the remaining 75 per cent).	22.2	17.3*
Dysfunctional coping	Dysfunctional coping is measured by the Brief COPE and contains six items covering denial (e.g. I tell myself this isn't real), substance use (e.g. I use alcohol or other drugs to help me get through it) and behavioural disengagement (e.g. I give up trying to deal with it). The same response options as problem-focused coping were used. The average score was calculated, with a higher score indicating higher levels of dysfunctional coping. The average score was then dichotomised into 1 = high levels of dysfunctional coping (top 25 per cent); and 0 = lower levels of dysfunctional coping (the remaining 75 per cent).	21.7	35.4***
N		807	1,345

Notes: *N* presents the maximum sample available, varies across models due to missing values. ***$p < .001$; **$p < .01$; *$p < .05$.

Source: Vietnam Veterans Family Study

6.1.4 Control variables

A range of additional variables that could be expected to influence spouse/partner outcomes was included in the analyses to control for their effects. Four types of control variables were used: (1) spouses'/partners' characteristics, (2) servicemen's characteristics, (3) the characteristics of parents of spouses/partners, and (4) characteristics of the children of spouses/partners.

13 Note, although we tried to identify high levels of coping by dichotomising variables to the top 25 per cent vs the remaining 75 per cent, the percentages are not exactly equal to 25 per cent and 75 per cent of the sample due to the variable's distribution.

Spouses'/partners' characteristics

The spouses'/partners' characteristics included as controls were: their age, whether they had ever served in the Australian Defence Force or the defence force of another country, length of the couple relationship, number of children, level of education, current working status, experience of financial stress in the past, and school-aged experiences while growing up (disciplinary problems, behavioural problems, learning problems, gifted or talented). The definition and way of deriving these spouses'/partners' characteristics were previously described in Section 5.

Significant differences in spouses'/partners' characteristics are summarised in Table 6.5. Compared to VEP spouses/partners, VV spouses/partners were slightly older (about one year), tended to have more children (a small but significant difference), tended to report lower levels of education, were less likely to currently be working and more likely to be retired/semi-retired, were more likely to have experienced financial stress in the past, and were more likely to have experienced disciplinary problems in school. They did not significantly differ on whether they had served in the ADF or another country's defence force, the length of couple relationships, and whether they had experienced school-aged behaviour or learning problems or been recognised as gifted or talented.

These spouses'/partners' characteristics were controlled in all models tested.

Table 6.5 Measures of spouses'/partners' characteristics, and prevalence rates among VEP and VV groups

Variable	VEP, spouses/partners	VV, spouses/partners
Spouses age (mean)	62.5	63.3**
ADF status	5.5	6.5
Number of children (mean)	2.7	2.9*
Length of couple relationship (mean)	36.7	36.1
Educational level		
Year 10 or below	33.9	40.5**
Year 11 and 12	14.1	15.2
Certificate/Diploma	34.1	32.5
University	17.8	11.8**
Employment status		
Working	35.9	20.9***
Retired/semi-retired	38.6	55.2***
Household duties	21.8	21.5
Living with disability	1.9	1.2
Other	1.8	1.3
Financial stress in the past	27.4	34.4*
School-age disciplinary problems	0.4	2.1**

Variable	VEP, spouses/partners	VV, spouses/partners
School-age behavioural problems	18.9	21.4
School-age learning problems	18.1	20.4
School-age gifted or talented	8.8	9.1
N	831	1,380

Notes: Total number of observations varies across models due to missing values. ***$p < .001$; **$p < .01$; *$p < .05$.

Source: Vietnam Veterans Family Study

Servicemen's characteristics

The major servicemen's characteristics included as controls were: physical functioning (a single scale from the SF36), and role limitations because of bodily pain. As discussed in the literature review, these characteristics can be a significant burden for spouses/partners, and adversely affect spouse/partner health and wellbeing. We therefore controlled for these potential confounding effects.

As can be seen in Table 6.6, VV servicemen reported significantly higher role limitations due to bodily pain, and lower level physical functioning than their VEP counterparts.

Table 6.6 Measures of servicemen's factors, and prevalence rates among VEP and VV groups

Variable	VEP (mean)	VV (mean)
Bodily pain: This was measured by two items in the SF36 Pain sub-scale (e.g. how much bodily pain have you had during the past four weeks) with response options of 1 = none, 2 = very mild; 3 = mild; 4 = moderate; 5 = severe, and 6 = very severe. Responses were recoded and converted to an average score ranging from 0–100. A higher score indicates lower level of bodily pain.	65.3	49.4***
Physical functioning: This was measured by the 10 items SF36 Physical Functioning sub-scale (e.g. whether physical health limited your capacity to climb several flights of stairs) with response options of 1 = yes, limited a lot; 2 = yes, limited a little; 3 = no, not limited at all. Responses were recoded and averaged (0–100). A higher average score indicates better physical functioning.	73.9	64.1***
N	827	1,367

Notes: *N* presents the maximum sample available, varies across models due to missing values. ***$p < .001$.

Source: Vietnam Veterans Family Study

Children's characteristics

Caring for children with severe or chronic diseases can affect their parents' health and wellbeing by creating stress and burden for caregivers. Similar effects can result from children's behavioural and emotional problems. Therefore, these conditions, which were likely to have imposed a caregiving burden on spouses/partners while children were growing up (between 0–16 years), were controlled in the models tested (see Table 6.7). Children of VV spouses/partners were significantly more likely to have had mental health/behavioural problems and nervous system diseases than their counterparts in the VEP group. While children of VV spouses/partners had higher rates of long-term physical health conditions than children of VEP spouses/partners, this difference was not statistically significant.

Table 6.7 Measures of children's functioning, and prevalence rates among VEP and VV groups

Variable	VEP (%)	VV (%)
Mental and behavioural problems: Whether a health professional had diagnosed or treated spouses'/partners' children during childhood (0–16 years) for behavioural difficulties (e.g. ADD/ADHD), anxiety (including separation anxiety, phobias) or depression. Response options of 1 = Yes, 2 = No and 3 = Unsure/can't recall. Subsequently recoded as 1 = Yes and 0 = Otherwise.	16.6	27.7***
Allergies: Whether a health professional had diagnosed or treated spouses'/partners' children during childhood (0–16 years) for allergies (e.g. asthma); 1 = Yes and 0 = Otherwise.	38.2	39.8
Nervous system diseases: Whether a health professional had diagnosed or treated spouses'/partners' children during childhood (0–16 years) for nervous system diseases (e.g. migraines, skin conditions). 1 = Yes and 0 = Otherwise.	37.8	45.8**
Long-term health condition: Whether a health professional had diagnosed or treated spouses'/partners' children during childhood (0–16 years) for a long-term physical health condition (epilepsy, heart, cancer, kidney, liver, or diabetes); 1 = Yes and 0 = Otherwise.	9.6	12.2
N	831	1,380

Notes: ***$p < .001$; **$p < .01$; *$p < .05$.

Source: Vietnam Veterans Family Study

Control variables in specific models

While the above control variables were included in all models, some variables were only included in particular models. The rich VVFS dataset allowed inclusion of additional variables that could be expected to affect only some, but not all, outcomes. As an example, while it would appear important to control for biological parent/s' skin conditions when assessing spouses'/partners' skin conditions to account for inter-generational genetic or lifestyle effects, it would not seem necessary to control for biological parent/s' skin conditions when assessing couple relationship quality. Thus, some additional variables were included in specific models where they could have a potentially confounding effect. The additional variables included were:

- For spouse/partner mental health outcomes, spouse/partner physical health functioning, experience of bodily pain, and whether spouses/partners had long-term health conditions were included as these are known to negatively affect an individual's mental health (Daraganova, Smart, & Romaniuk, 2018). Additionally, for similar reasons, we controlled for spouses'/partners' parent/s' mental health problems, which could reflect genetic or lifestyle effects.
- For spouse/partner problem drinking, we controlled for spouse/partner physical health functioning (as problem drinking can be used to cope with physical health problems). Whether spouses'/partners' parent/s had experienced mental health problems was also included in analyses of spouse/partner problem drinking. Additionally, we controlled for parent/s' problem drinking for potential inter-generational genetic or lifestyle effects.
- For the three spouse/partner physical health outcomes (physical health functioning as measured by the SF36; skin conditions; and sleep disturbances), whether spouses'/partners' parent/s had experienced long-term physical health problems was included (as a possible genetic or lifestyle influence). Additionally, for analyses of spouses'/partners' skin conditions, skin conditions in parent/s was included.
- For couple relationship quality, servicemen's and spouses'/partners' mental and physical health status were included as they are established risk factors for relationship difficulties (Allen et al., 2010; Goff et al., 2007).

As revealed by Table 6.8, VV spouses/partners were significantly more likely to have a long-term chronic health condition, and their parents were more likely to have skin conditions than their VEP counterparts. Compared to VEP, VV servicemen were significantly more likely to have been diagnosed with or treated for depression or anxiety.

Table 6.8 Measures of specific control variables, and prevalence rates among VEP and VV groups

Variable	VEP (%)	VV (%)
Health condition of spouses'/partners' parents (%)		
Problem drinking	22.3	27.0
Skin condition	12.8	18.3**
Lifelong diseases	84.0	84.3
Mental health problems	29.4	30.7
Spouse/partner long-term (chronic) health condition (%)	64.4	69.6
Servicemen's mental health problems (%)	30.8	63.1***
N	831	1,380

Notes: Total number of observations varies across models due to missing values. ***$p < .001$; **$p < .01$.

Source: Vietnam Veterans Family Study

6.2 Analysis approach

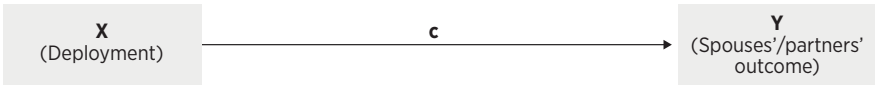
Two statistical approaches were used to test: (1) mediation models and (2) moderated mediation models. Firstly, mediation analyses (with the inclusion of control variables) were conducted to test whether the effects of deployment to Vietnam were mediated by servicemen's PTSD. The goal of mediation analyses is to provide insight into, and gain a deeper understanding of, how servicemen's deployment affects their spouses'/partners' outcomes.

Secondly, if the mediation effect of PTSD was found to be significant, the mediation models were repeated using variables hypothesised to change the mediating role of PTSD. The purpose of this analysis was to determine whether or not the mediation effect of PTSD remained similar across different groups of individuals (e.g. spouses/partners who had used services, and spouses/partners who had not used services). The three moderators examined were: servicemen's and spouses'/partners' use of services, spouses'/partners' social support, and spouses'/partners' coping capacities. These analyses can further our understanding of the mechanisms of deployment and can potentially be used to identify areas in which intervention strategies to support spouses/partners of deployed veterans could be provided in the future.

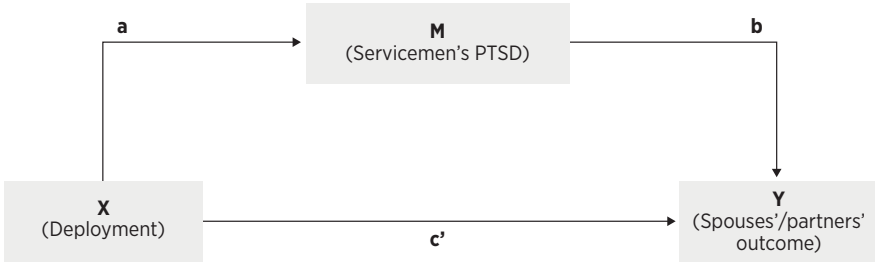
6.2.1 Mediation analyses

We examined whether servicemen's PTSD mediated the effect of deployment on spouses'/partners' outcomes using Baron and Kenny's (1986) mediation approach.

Figure 6.2 Baron and Kenny's (1986) mediation approach



Model 1: Simple-direct effects model



Model 2: Mediated model

Models 1 and 2 are two essential parts of Baron and Kenny's (1986) mediation approach. In the unmediated model (Model 1), a variable, X, is assumed to cause another variable, Y. The variable X is called the predictor and the variable that it causes (Y) is called the outcome. Path c is called the *total effect*. In the mediated model (Model 2), the effect of X on Y may be mediated or explained by a mediating variable M, or the variable X may still affect Y. Path c' is called the *direct effect*, which is the pathway from X to Y while controlling for M. Path a*b is called the *indirect effect*. Note that the:

Total effect (c) = direct effect (c') + indirect effect (ab)

According to Baron and Kenny, there are four steps in establishing mediation:

1. The relationship between **X** (deployment) and **Y** (outcomes) must be statistically significant—path 'c' in model 1. This condition establishes that there is an effect that may be mediated.
2. The relationship between X (deployment) and M (veteran's PTSD) must be statistically significant—path 'a' in model 2.
3. The relationship between M (veteran's PTSD) and Y (spouses'/partners' outcomes) must be statistically significant—path 'b' in model 2.
4. The effect of X on Y controlling for M (path c') should become non-significant.

If all four of these steps are met, then the data are consistent with the hypothesis that variable M *completely* mediates the X-Y relationship, and if the first three steps are met but the condition 4 is not, then *partial* mediation is indicated.

First, outcome variables that were significantly associated with veterans' deployment in Section 5 were selected (significant path **c**). To examine paths **a**, **b** and **c'**, we used structural equation modelling (SEM; in the case of continuous outcome variables) and generalised structural equation modelling (GSEM; in the case of binary and categorical outcome variables). Finally, to examine whether there was a significant mediation effect (path c – c'), we used the Sobel test adapted for binary mediator and outcome measures by Nathaniel Herr.[14]

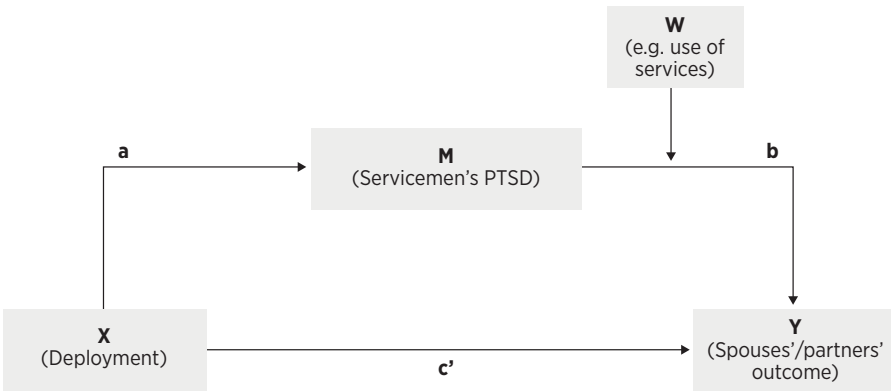
A wide range of spouses/partners, servicemen, children and parent factors were controlled (discussed in the previous section).

6.2.2 Moderated mediation analyses

Moderation analyses test whether a third variable affects the strength or direction of relationships between an independent variable and an outcome (Baron & Kenny, 1986). After assessing whether veterans' PTSD mediates the relationship between deployment and spouses'/partners' outcomes, we are interested in estimating whether the mediation effect of servicemen's PTSD differs according to their use of services, social support and coping capacities (Figure 6.3). For example, perhaps servicemen's PTSD only mediates the effect of deployment on spouses'/partners' physical health for spouses/partners who did not use health services.

Here, we are testing a moderated mediation approach (Hayes, 2013), to investigate whether the strength of a mediation effect depends upon the value of a **moderator (W)**. Moderated mediation occurs when a moderator variable (e.g. spouses'/partners' use of services) changes the mediation relationship (i.e. **W** affects **path b**).

Figure 6.3 Moderated mediation model



14 Available at www.nrhpsych.com/mediation/logmed.html.

The analyses were undertaken using Stata and Preacher. Rucker and Hayes' (2007) recommendations for testing interaction effects were used. The moderators (**W**) and their interaction terms with servicemen's PTSD (**W#M**) were added to the mediation models. If there was a significant interaction effect, the margins command in Stata was used to further estimate the magnitude of the moderation effect. Two separate mediation models were run in which the relationships were tested according to the levels of the moderator (e.g. whether spouses/partners used services or did not use services was tested in separate models). Control variables from the mediation analyses were also included in the moderation models.

6.3 Results of mediation analyses

Next, findings from the mediation analyses are presented and, in Section 6.4, the results of moderated mediation analyses.

6.3.1 Spouses'/partners' mental health and substance use outcomes

To investigate the impact of deployment to the Vietnam war on spouses'/partners' mental health and substance use, the following outcomes were examined: general mental health, anxiety, depression, suicidal ideation and problem drinking.

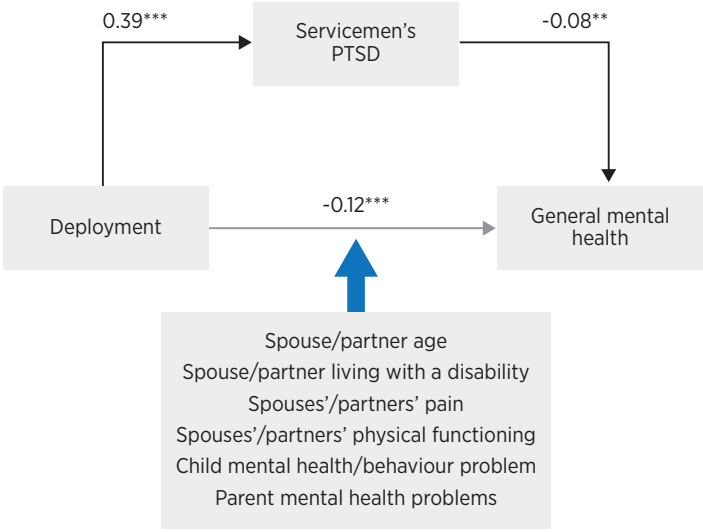
General mental health as measured by SF36

As Figure 6.4 shows, after adjusting for control variables, servicemen's deployment and PTSD were both significantly related to spouses'/partners' general mental health. The indirect effect via servicemen's PTSD was small but statistically significant. Therefore, it seemed that servicemen's PTSD partially mediated the influence of deployment on spouses'/partners' mental health functioning.

Control variables significantly related to spouses'/partners' general mental health were (see Appendix A for details):

- Older spouses/partners were more likely to report poorer general mental health.
- Spouses/partners who were living with disabilities were more likely to report poorer general mental health.
- Spouses/partners who were experiencing pain tended to report poorer general mental health.
- Spouses'/partners' physical health was positively related to their general mental health.
- Children's mental health/behaviour problems were negatively related to spouses'/partners' general mental health.
- If parents had mental health problems, spouses/partners were more likely to report poorer general mental health.

Figure 6.4 Model of spouses'/partners' general mental health: standardised path coefficients



Mediation test: Significant

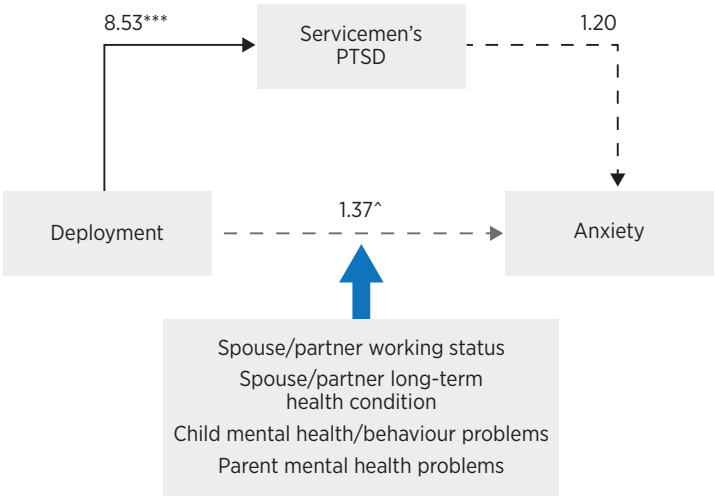
Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

Anxiety

Results of testing direct and indirect effects of servicemen's deployment on their spouses'/partners' anxiety are presented in Figure 6.5. After controlling for a range of spouse/partner, servicemen, child and parent factors, servicemen's deployment and PTSD were not significantly related to spouses'/partners' anxiety. The indirect effect of deployment on spouses'/partners' anxiety via servicemen's PTSD was small and non-significant. The effects of deployment to Vietnam were not mediated by servicemen's PTSD.

Some control variables were significantly related to spouses'/partners' anxiety: spouses/partners who were retired, living with a disability, had a long-term health condition, whose children had mental health or behaviour problems, or whose parents had mental health problems were more likely to have been diagnosed with or treated for anxiety (see Appendix A for details).

Figure 6.5 Model of spouses'/partners' anxiety: odds ratios



Mediation test: Not significant

Notes: The black arrows represent the indirect effect of deployment on spouses/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses/partners' outcomes. A solid arrow represents a significant relationship and dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). *** $p < .001$; ** $p < .01$; * $p < .05$; ^ $p < .10$.

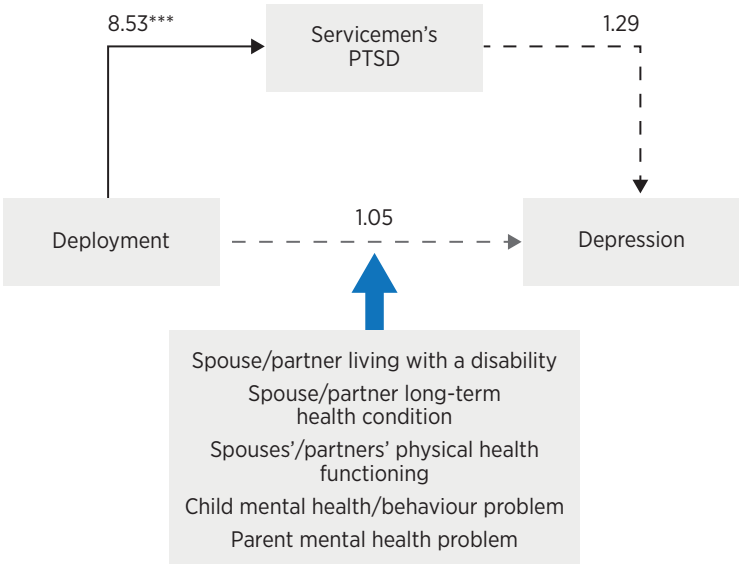
Depression

Deployment and servicemen's PTSD were not significantly related to spouses'/partners' depression after the inclusion of control variables (see Figure 6.6). The direct and indirect effects of deployment on spouses'/partners' depression were not significant.

Control variables significantly related to spouses'/partners' depression were: spouses/partners living with a disability, spouses/partners having a long-term health condition, spouses'/partners' poorer physical health functioning, children's mental health or behaviour problems and parents' mental health problems.

Spouses/partners were more likely to have been diagnosed with or treated for depression if they faced any of those situations in their lives.

Figure 6.6 Model of spouses'/partners' depression: odds ratios



Mediation test: Not significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

Suicidal ideation

The results of the mediation model of suicidal ideation are presented in Figure 6.7. Since the suicidal ideation outcome variable had multiple categories, 'no suicidal ideation' was the reference category to which the occurrence of suicidal thoughts, or suicidal plans/action, were compared.

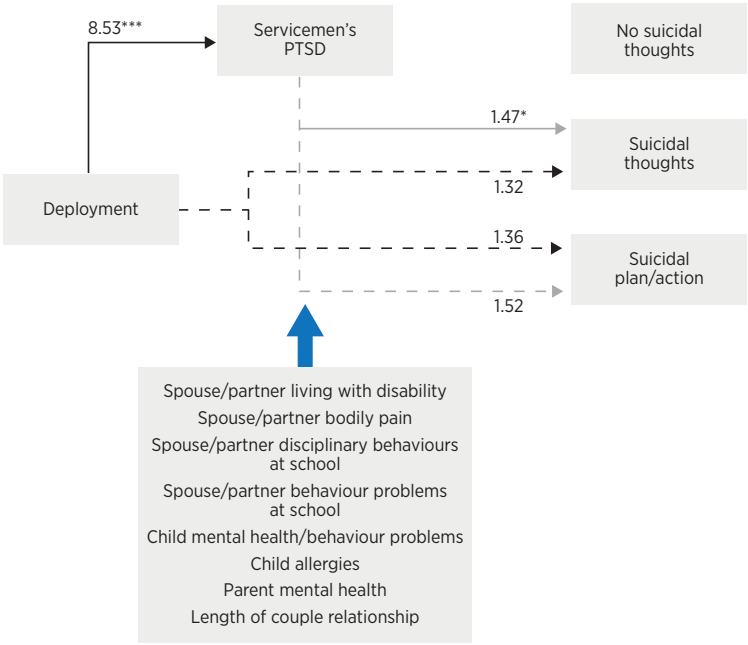
The direct effect of servicemen's deployment on spouses'/partners' suicidal thoughts and plans/actions was not significant after adjusting for the effects of control variables. An indirect effect via servicemen's PTSD was observed for spouses'/partners' suicidal thoughts (but not suicidal plans/actions) suggesting that servicemen's PTSD mediated the impact of deployment on spouses'/partners' suicidal thoughts.

The same control variables were included in this model as for other mental health outcomes. A number of control variables showed significant relationships with spouses'/partners' suicidal ideation as follows (see Appendix A for details):

- Spouses'/partners' bodily pain was related to an increased probability of suicidal thoughts while living with a disability was related to an increased probability of suicidal plans/actions.

- Disciplinary and problem behaviours—Spouses/partners who experienced disciplinary or problem behaviours at school were more likely to report suicidal thoughts but not suicidal plans/actions.
- Children's mental or behavioural problems—Spouses/partners were more likely to report both suicidal thoughts and suicidal plans/actions if their children had mental or behaviour problems.
- Children's allergies—Spouses/partners were more likely to report a suicidal plan/action if their children had experienced allergies.
- Parents' mental health problems—Spouses/partners were more likely to report both suicidal thoughts and suicidal plans/actions if their parents had experienced mental health problems.
- Length of couple relationship—the longer spouses/partners and servicemen had been together the less likely spouses/partners were to report making a suicide plan or action.

Figure 6.7 Model of spouses'/partners' suicidal ideation: odds ratios



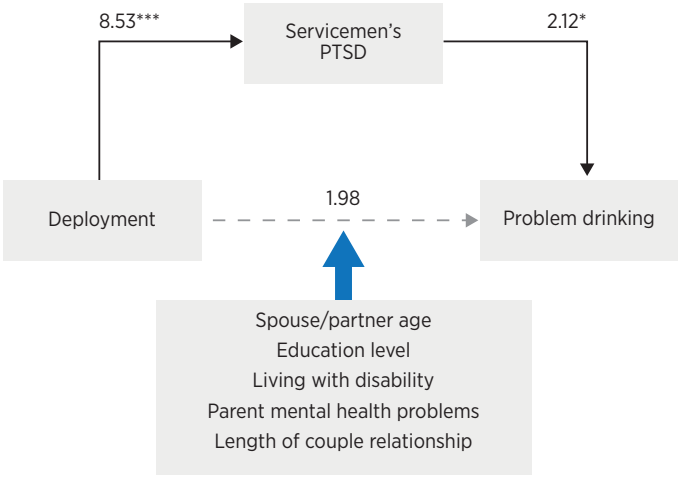
Mediation test: Significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and a dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

Problem drinking

Servicemen's PTSD was significantly related to spouses'/partners' problem drinking after the inclusion of control variables (Figure 6.8).

Figure 6.8 Model of spouses'/partners' problem drinking: odds ratios



Mediation test: Significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and a dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

The relationship between deployment and spouses'/partners' problem drinking was no longer significant after controlling for servicemen's PTSD and the control variables. Therefore, servicemen's PTSD appeared to fully explain the influence of servicemen's deployment on spouses'/partners' problem drinking.

- Other factors related to spouses'/partners' problem drinking were (see Appendix A for details):
- Spouses/partners who were older or had been in a longer couple relationship were less likely to report problem drinking.
- Compared to spouses/partners with a Year 10 or lower educational qualification, those with Year 11 and 12 education were more likely to report problem drinking; however, those who had attained higher levels of education (e.g. a university degree) were not.
- Spouses/partners who were living with a disability were more likely to report problem drinking (the size of the relationship was very small).
- Spouses/partners whose parents had mental health problems were more likely to report problem drinking.

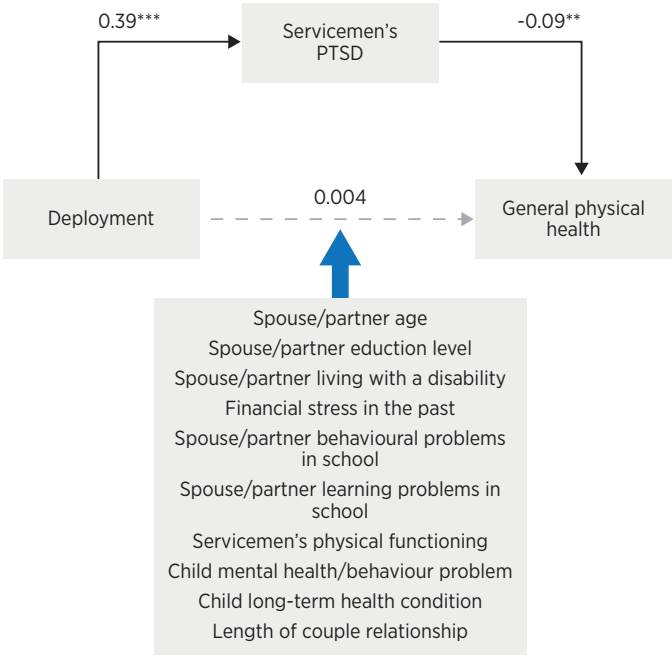
6.3.2 Spouses'/partners' physical health outcomes

To investigate whether servicemen's deployment to Vietnam exerted effects on spouses'/partners' physical health we estimated direct and indirect effects through servicemen's PTSD and also controlled for spouse/partner characteristics, servicemen's bodily pain and physical functioning, children's health conditions, and parents' long-term physical health conditions. The three types of spouse/partner physical health outcomes examined were: general physical health, sleep disturbance and skin conditions.

Spouses'/partners' general physical health as measured by the SF 36

As Figure 6.9 shows, after adjusting for control variables, servicemen's PTSD was significantly related to spouses'/partners' general physical health but deployment to the Vietnam war was not.

Figure 6.9 Model of spouses'/partners' general physical functioning: standardised path coefficients



Mediation test: Significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and a dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

The indirect effect via servicemen's PTSD was significant although the total and direct effects were not significant. Therefore, it seemed that servicemen's PTSD fully mediated the influence of deployment on spouses'/partners' general physical health.

Control variables significantly related to spouses'/partners' general physical health were (see Appendix A for details):

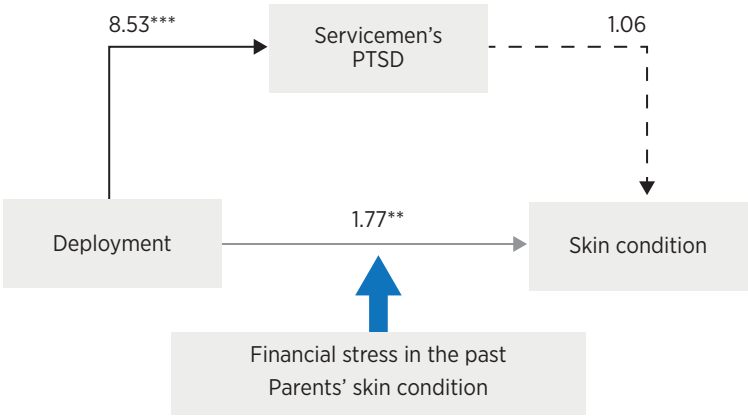
- Older spouses/partners were more likely to report poorer general physical health.
- Educational level was positively related to sounder physical health, as spouses/partners with a certificate/diploma or university degree reported better physical health than those with year 10 or less education.
- Spouses/partners who had experienced financial stress in the past, reported behaviour problems at school, or were diagnosed with or treated for a long-term health condition were more likely to report poorer general physical health.
- Servicemen's physical functioning was positively related to spouses'/partners' general physical health; whereas children's long-term health conditions and mental health/behaviour problems were negatively related to spouses'/partners' general physical health.
- Spouses/partners who were in a longer relationship with the servicemen reported better physical health.

Spouses'/partners' skin conditions

As Figure 6.10 shows, after adjusting the effects of servicemen's PTSD and control variables, deployment to Vietnam still held a significant and positive relationship with spouses'/partners' skin conditions. Both total and direct effects were significant but there was no indirect effect of servicemen's PTSD observed in this model, therefore servicemen's PTSD did not mediate the influence of deployment to Vietnam on spouses'/partners' skin conditions.

Spouses/partners who experienced financial stress in the past, or whose parents also had skin conditions were more likely to be diagnosed with or treated for a skin condition.

Figure 6.10 Model of spouses'/partners' skin condition: odds ratios



Mediation test: Not significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and a dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

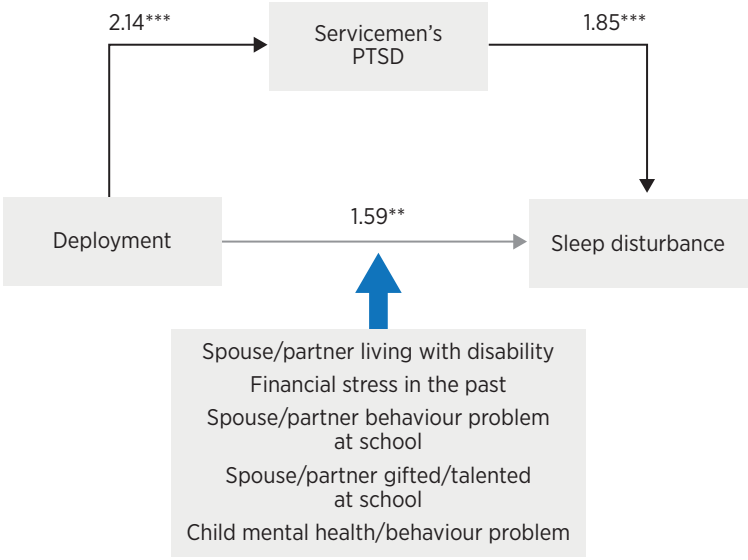
Spouses'/partners' sleep disturbance

After adjusting for the effects of other variables, servicemen's PTSD conveyed 1.7 increased odds of spouses'/partners' sleep disturbance, while deployment was related to 1.6 increased odds of sleep disturbance (Figure 6.11). It seemed that the influence of deployment on sleep disturbance was partially mediated by servicemen's PTSD.

Control variables also related to spouses'/partners' sleep disturbance:

- Spouses/partners living with a disability were much more likely to report sleep problems.
- The experience of financial stress in the past was associated with having sleep disturbances.
- Spouses'/partners' behaviour problems in school, or being gifted or talented were associated with a greater likelihood of sleep disturbance.
- Spouses'/partners' children having mental health or behavioural problems were a risk for sleep disturbance.

Figure 6.11 Model of spouses'/partners' sleep disturbance: path coefficients and odds ratios



Mediation test: Significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and a dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

6.3.3 The combined burden of mental and physical health problems

It was important to investigate whether deployment to Vietnam would be associated with a combined burden of mental and physical health problems, which can have a more profound effect on individuals than either problem alone (see Daraganova et al., 2018). This is next investigated. Since this outcome variable had multiple categories, 'neither problem' was the reference category. The same control variables were used as in Sections 6.3.1 and 6.3.2.

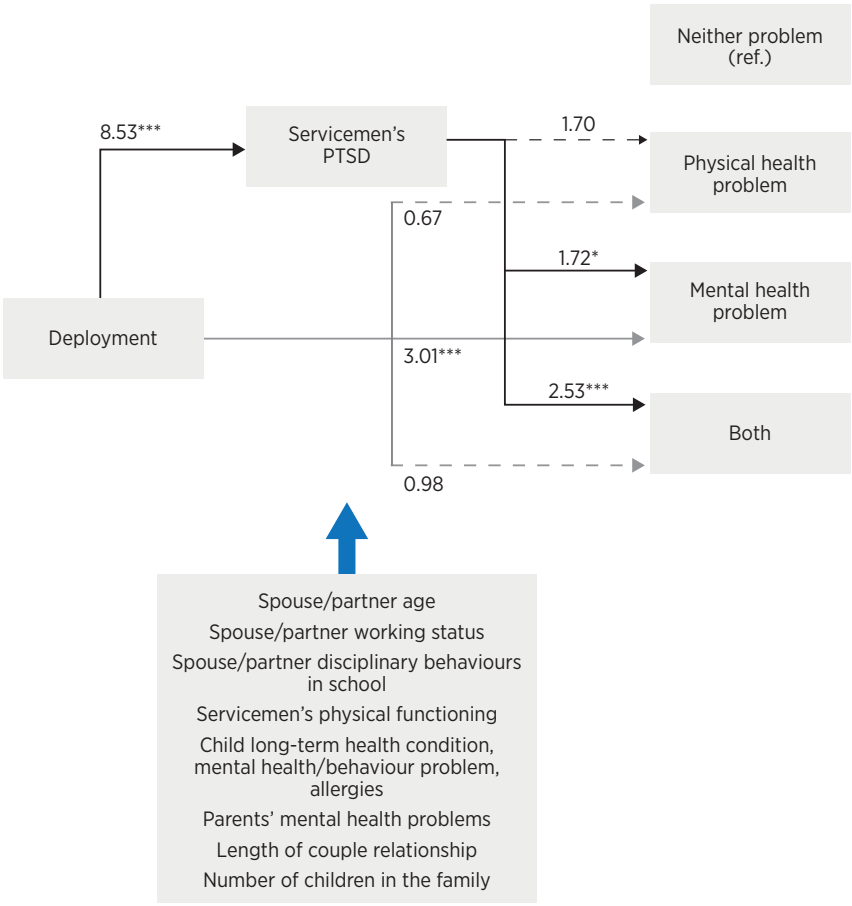
After controlling for a range of variables, there was no direct influence of servicemen's deployment or PTSD on the occurrence of spouse/partner physical health problems only (Figure 6.12). However, direct effects of servicemen's deployment and PTSD were found for spouses'/partners' mental health problems only. Regarding the combined burden of mental and physical health problems, there was no direct effect of deployment, but an indirect effect through servicemen's PTSD.

Therefore, servicemen's PTSD partially explained the relationship between deployment and spouses'/partners' mental health burden only, and fully explained the relationship between deployment and a combined burden of mental and physical health problems of spouses/partners.

Several control variables were related to the occurrence of mental or physical health problems or both:

- Older spouses/partners were more likely to report physical health problems but less likely to report mental health problems.
- Spouses/partners who were retired or semi-retired were more likely to report physical health problems (but not mental health problems), while spouses/partners who were living with a disability were more likely to report physical health, mental health, or both problems.
- Spouses'/partners' disciplinary behaviours in school were associated with a higher likelihood of co-occurring problems.
- Better physical functioning among servicemen was related to a lower likelihood of co-occurring problems.
- The greater the number of children in the family, the higher the likelihood of co-occurring mental and physical health problems.
- A child's long-term health condition was associated with a higher likelihood of physical health problems in spouses/partners.
- Parent mental health problems, child mental health/behaviour problems and children's allergies were all associated with a higher likelihood of co-occurring problems.
- Longer couple relationships were associated with fewer physical health problems.

Figure 6.12 Model of spouses'/partners' co-occurring mental and physical health difficulties: odds ratios



Mediation test: Significant

Notes: The black arrows represent the indirect effect of deployment on spouses'/partners' outcomes via servicemen's PTSD and the grey arrow represents the direct effect of deployment on spouses'/partners' outcomes. A solid arrow represents a significant relationship and a dashed arrow represents an insignificant relationship. Significant control variables in the model were presented in the Figure (see Appendix A for details). ***$p < .001$; **$p < .01$; *$p < .05$.

6.3.4 Spouse/partner couple relationships

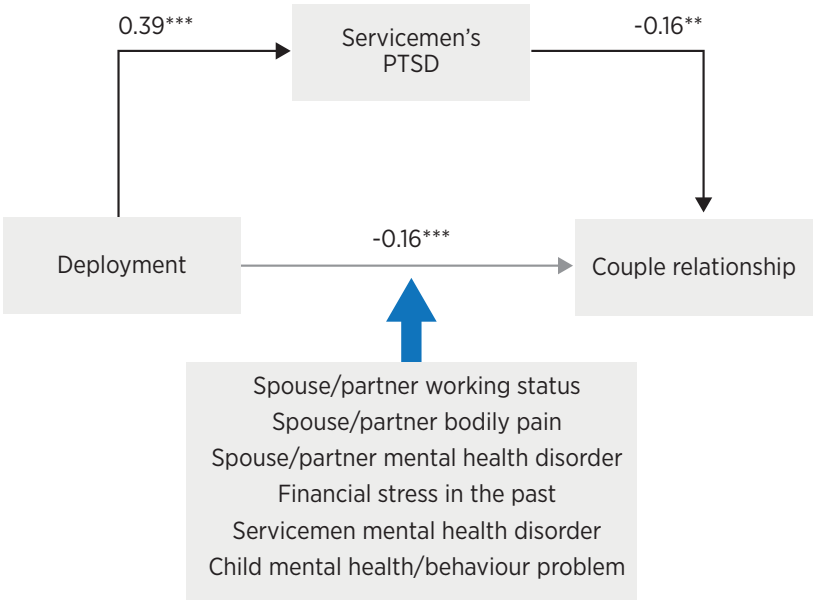
As Figure 6.13 shows, deployment and servicemen's PTSD were significant risk factors for poorer quality couple relationships after the inclusion of control variables. Thus, significant direct, indirect and total effects of deployment on couple relationships were observed. These results suggest that servicemen's PTSD partially explained the effects of deployment on couple relationships.

Other variables related to couple relationship quality were:

- Spouses'/partners' working status—slightly better couple relationships were reported by spouses/partners who were retired/semi-retired or doing household duties.
- The experience of financial stress in the past was associated with poorer couple relationships.
- Spouses'/partners' bodily pain was related to poorer couple relationships.
- Spouses'/partners' and servicemen's mental health disorders were associated with poorer couple relationships.
- Spouses/partners whose child had a mental or behavioural problem tended to report poorer couple relationships.

These findings should be seen in the context that spouses/partners generally reported high quality couple relationships, hence the above factors are associated with less positive couple relationships but do not imply that these spouses/partners had very poor couple relationships.

Figure 6.13 Model of spouses/partners' couple relationships: standardised coefficients



Mediation test: Significant

Notes: A black arrow represents a direct path and a grey arrow represents the indirect path. A solid arrow represents a significant relationship. The blue arrow represents significant control variables in the model (see Appendix A for details).

6.3.5 Summary of findings from the mediation analyses

The mediation analyses revealed that veterans' deployment to Vietnam and PTSD were related to some, but not all, spouse/partner outcomes while controlling for the effects of other influential spouse/partner, serviceman, parent and child factors. The outcomes examined had previously been found to significantly differentiate between spouses/partners of VV and VEP servicemen (see Section 5) but the previous analyses had not included the effects of servicemen's PTSD or such a wide range of other salient factors. A summary of the direct and indirect effects found is shown below in Table 6.9.

With regard to spouses'/partners' general mental health, direct effects of deployment and indirect effects through servicemen's PTSD were found. Therefore, it seemed that servicemen's PTSD partially mediated the influence of deployment on spouses'/partners' general mental health. For the outcomes of diagnosis of or treatment for anxiety or depression, there were no direct effects of deployment or servicemen's PTSD and therefore no mediation was evident. There were no direct effects of deployment on spouses'/partners' suicidal thoughts and plans/actions but an indirect effect via servicemen's PTSD was found for spouses'/partners' suicidal thoughts (but not suicidal plans/actions). It seemed that servicemen's PTSD mediated the impact of deployment on spouses'/partners' suicidal thoughts.

With regard to problem drinking, the direct effect of deployment was not significant when servicemen's PTSD and control variables were included, while there was a direct effect of servicemen's PTSD. Thus, servicemen's PTSD appeared to mediate the effects of deployment to Vietnam on spouses'/partners' problem drinking.

Results for the outcomes of general physical health, skin conditions and sleep disturbance are next summarised. There was no direct effect of deployment on spouses'/partners' general physical health but there was a negative impact of servicemen's PTSD, indicating that servicemen's PTSD had mediated the effects of deployment. For skin conditions, direct effects of deployment remained after inclusion of servicemen's PTSD and control variables, but there was no effect of servicemen's PTSD, and hence no mediation. For sleep disturbances, there were direct effects of deployment and indirect effects via servicemen's PTSD suggesting that servicemen's PTSD partially mediated the effects of deployment but did not fully explain them.

For the outcome of a combined burden of mental and physical health problems, there were no direct effects of deployment or indirect effects through servicemen's PTSD for physical health problems alone, but both direct and indirect effects were found for mental health problems alone. Regarding co-occurring physical and mental health problems, there was no direct effect of deployment, but an indirect

effect through servicemen's PTSD. Therefore, servicemen's PTSD appeared to partially explain the relationship between deployment and spouse/partner mental health problems alone, and fully explain the relationship between deployment and a combined burden of mental and physical health problems in spouses/partners.

For couple relationship quality, there were direct effects of deployment and indirect effects of servicemen's PTSD. Thus, it seemed that servicemen's PTSD partially mediated the effects of deployment but did not fully explain them.

It is worth noting that quite a number of control variables also contributed to spouse/partner outcomes, particularly spouse partner age and education; their physical health functioning, long-term health conditions and presence of a disability; disciplinary and behaviour problems experienced at school; servicemen's physical health functioning; mental health/behaviour problems in spouses'/partners' children; mental health problems in spouses'/partners' parents; couple relationship length, and whether spouses/partners had experienced financial stress in the past. These factors contributed to multiple outcomes and hence seemed very relevant influences.

Table 6.9 Summary of direct and indirect effects for spouses/partner outcomes

Spouse/partner outcome	Direct effect of deployment	Mediation by PTSD
Mental health outcomes		
General mental health	Yes	Yes
Anxiety	No	No
Depression	No	No
Suicidal ideation	No	Yes
Problem drinking	No	Yes
Physical health outcomes		
General physical health	No	Yes
Skin conditions	Yes	No
Sleep disturbance	Yes	Yes
Combined physical and mental health problems	Yes (Mental health problems)	Yes (Mental health problems; co-occurring physical and mental health problems)
Couple relationship quality	Yes	Yes

Source: Vietnam Veterans Family Study

6.4 Results of moderated mediation analyses

The moderated mediation analyses aimed to investigate whether spouse/partner psychosocial resources affected the mediating role of servicemen's PTSD on the effects of deployment to Vietnam for spouses/partner outcomes. Three types of spouse/partner psychosocial resources were studied: access to services, social support, and coping skills. Servicemen's access to services was also included as a potential moderator. Moderation analyses were only undertaken if a mediating effect of servicemen's PTSD was found in our mediation analyses (Section 6.3).

Thus, the following six spouse/partner outcomes were examined: general mental health, suicidal ideation, problem drinking, general physical health, sleep disturbance, a combined burden of mental and physical health problems, and couple relationship quality.

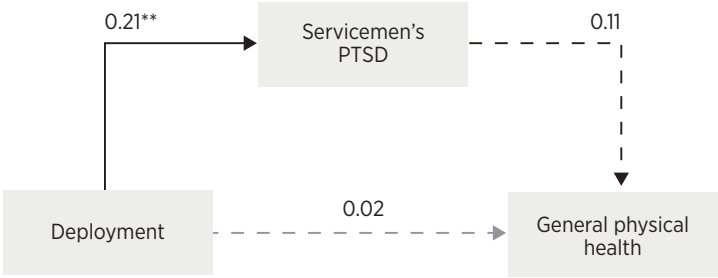
Two significant moderators were found to modify the relationship between PTSD and spouses'/partners' outcomes—(1) spouses'/partners' use of military-related services; and (2) spouses'/partners' contact with friends. We only present the significant results in this section. The full results can be seen in Appendix B.

6.4.1 Spouses'/partners' use of military-related services

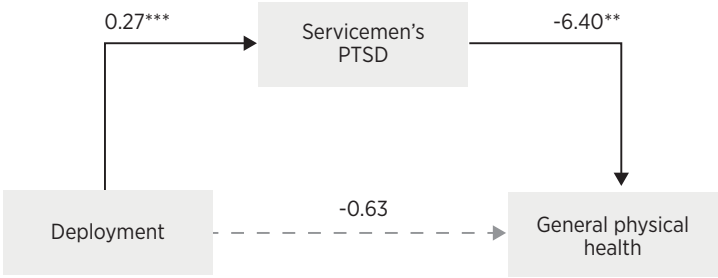
Spouses'/partners' use of military-related services were found to moderate the mediation effect of PTSD on two spouse/partner outcomes—(1) general physical health; and (2) a combined burden of mental and physical health problems.

When estimating whether the mediation effect of veterans' PTSD differed according to spouses'/partners' use of military-related services, we controlled for a range of spouse/partner, servicemen, child and parent factors. Figure 6.14 shows how PTSD mediated the effect of deployment on spouses'/partners' general physical health separately for spouses/partners who used military-related services and spouses/partners who did not. As can be seen, the association between veterans' PTSD and spouses'/partners' general physical health was only significant in the second model, among spouses/partners who did not use military-related services, but not in the first model for spouses/partners who had used military-related services.

Figure 6.14 Model of spouses'/partners' general physical health by use of military services



Used military-related services (*n* = 685)



Did not use military-related services (*n* = 1,526)

Notes: A black arrow represents a direct path and a grey arrow represents the indirect path. A solid arrow represents a significant relationship and a dashed arrow represents a non-significant relationship.

We estimated the adjusted differences on spouses'/partners' general physical health for spouses/partners of servicemen with and without PTSD who did, or did not, use military-related services. As Table 6.10 shows, spouses/partners who used military-related services were only 1.9 per cent lower on general physical health when veterans had PTSD when compared to spouses/partners who had used military-related services and whose servicemen did not have PTSD. For spouses/partners who did not use military-related services and whose veterans had PTSD, general physical health was 11.1 per cent points lower than among spouses/partners whose servicemen did not have PTSD who had not used military-related services. Thus, the adjusted difference between spouses/partners of veterans with and without PTSD was considerably larger among spouses/partners who did not use military-related services than spouses/partners who had used military-related services.

Table 6.10 Marginal effects of PTSD on spouses'/partners' outcomes

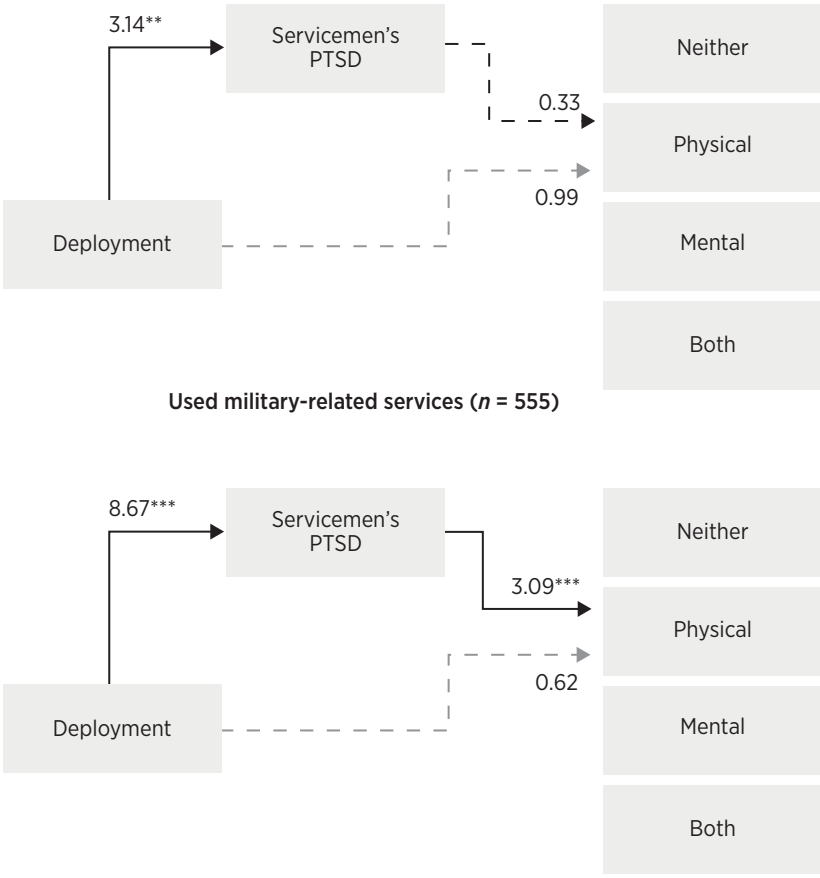
Moderators	Problem drinking	General physical health	Cumulative health burden (Physical)
Spouses'/partners' use of military-related services			
Used	-	-1.9	-7.2
Not used	-	-11.1	8.4
Spouses'/partners' social support			
See friends at least weekly	6.0	-	-
See friends less than weekly	0.1	-	-

Source: Vietnam Veterans Family Study

Regarding spouses'/partners' combined burden of mental and physical health problems, their use of military-related services was found to moderate the effect of PTSD on physical health burden alone (but not other categories). Figure 6.15 shows how PTSD mediated the effect of deployment on spouses'/partners' physical health burden, separated by spouses'/partners' use of military-related services. As can be seen, the association between veterans' PTSD and spouses'/partners' physical health burden was only significant in the second model, among spouses/partners who did not use military-related services.

The adjusted differences between spouse/partners of servicemen with and without PTSD were calculated. As can be seen in Table 6.10, above, among spouses/partners who used military-related services, servicemen's PTSD was associated with 7.2 per cent decreased probability of a physical health burden for spouses/partners. Among spouses/partners who did not use military-related services, servicemen's PTSD was associated with an 8.4 per cent increased probability of a physical health burden.

Figure 6.15 Model of spouses'/partners' general physical health by use of military services

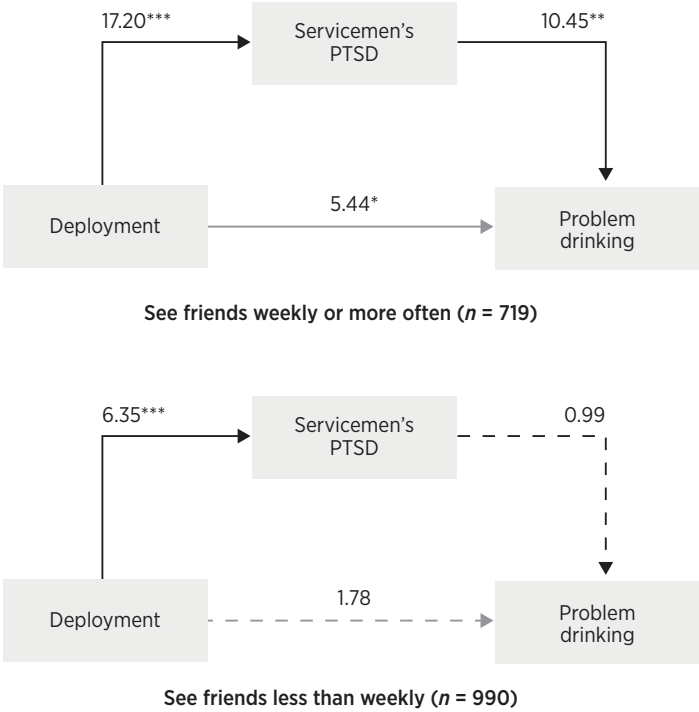


Notes: A black arrow represents a direct path and a grey arrow represents the indirect path. A solid arrow represents a significant relationship and a dashed arrow represents a non-significant relationship.

6.4.2 Spouses'/partners' contact with friends

Spouses'/partners' weekly contact with friends appeared to be a significant moderator of the effect of PTSD on spouses'/partners' problem drinking. Figure 6.16 shows the two mediation models separated by whether spouses/partners saw their friends at least weekly or less often. Veterans' PTSD was significantly associated with spouses'/partners' problem drinking among spouses/partners who saw their friends at least weekly (model 1). However, it was not related to spouses'/partners' problem drinking if spouses/partners saw their friends less often (model 2).

Figure 6.16 Model of spouses'/partners' problem drinking by use of military services



Notes: A black arrow represents a direct path and a grey arrow represents the indirect path. A solid arrow represents a significant relationship and a dashed arrow represents a non-significant relationship.

Table 6.10 shows that spouses/partners of veterans with PTSD who saw their friends weekly or more often were 6.0 per cent more likely to report problem drinking than spouses/partners of veterans without PTSD who saw their friends weekly or more often. On the other hand, spouses/partners of veterans with PTSD who saw their friends less frequently were only 0.9 per cent more likely to report problem drinking than spouses/partners of veterans without PTSD who saw their friends less frequently.

6.4.3 Summary of findings from the moderation analyses

Overall, only three significant moderated mediation results were found. Spouses'/partners' use of military-related services appeared to modify the mediation effect of PTSD on two aspects of spouses'/partners' physical health, while spouses'/partners' weekly contact with friends were found to modify the mediation effect of PTSD on spouses'/partners' problem drinking.

Servicemen's PTSD appeared to mediate the impact of deployment on spouses'/partners' general physical health only among spouses/partners who had not used military-related

services but not among spouses/partners who had used these services.

Similarly, servicemen's PTSD significantly mediated the impact of deployment on spouses'/partners' physical health burden only for spouses/partners who did not use military-related services, but not for spouses/partners who used military-related services.

Surprisingly, spouses/partners of servicemen with PTSD who saw their friends at least weekly were more likely to report problem drinking than spouses/partners of servicemen without PTSD. This difference was not evident among spouses/partners who had less frequent contact with friends. Possible reasons for this finding are discussed in Section 8.

Servicemen's use of services and spouses'/partners' coping capacities were not found to have any moderating effects. No moderating effects were found for the separate mental health outcomes, or for couple relationships.

6.5 Summary

In Section 5, we found that servicemen's deployment to Vietnam was negatively associated with spouses'/partners' health and wellbeing in a number of major life areas. In this section, we investigated whether servicemen's PTSD explained the impact of deployment on those outcomes, after considering a wide range of factors of spouses/partners, servicemen, spouses'/partners' parents and children. Additionally, we investigated whether the mediation effect of servicemen's PTSD changed according to servicemen's and spouses'/partners' use of services, and spouses'/partners' coping capacities and social support.

The mediation analyses focused on 10 main outcomes that were found to be significantly associated with servicemen's deployment in Section 5. Servicemen's PTSD was found to partially or fully mediate seven of the 10 outcomes—general mental health, suicidal ideation, problem drinking, general physical health, sleep disturbance, couple relationship quality, and co-occurring mental and physical health problems.

Moderated analyses were conducted to test whether the mediation effect of PTSD remained consistent according to spouses'/partners' use of services, coping capacities and social support. Significant moderation effects were found for two spouse/partner characteristics:

- Spouses'/partners' use of military-related services: The mediation effect of PTSD on spouses'/partners' physical health was stronger among spouses/partners who had not used military-related services.
- Spouses'/partners' weekly contact with friends: The mediation effect of PTSD on spouses'/partners' high-risk drinking was stronger among spouses/partners who had at least weekly contact with their friends.

Table 6.11 Summary of Section 6 results

Outcome	Mediation results			Moderation results
Spouse/partner Outcome	Direct effect of deployment	Mediation by PTSD variables	Significant control	Moderated mediation
Mental health outcomes				
Anxiety	No	No	• S/P long-term health • S/P working status • Child mental health/ behaviour problems • Parent mental health problems • S/P long-term diseases	Did not test
Depression	No	No	• As for anxiety • S/P physical health functioning	Did not test
Suicidal ideation	No	Yes	• S/P bodily pain • S/P working status • S/P school-age disciplinary problems • S/P school-age behaviour problems • Child mental health/ behaviour problems • Child allergies • Parent mental health • Longer couple relationships • Abuse in couple relationships	No
Problem drinking	No	Yes	• S/P age and education • S/P living with a disability • Parent mental health problems • Length of couple relationship	Spouses'/partners' weekly contact with friends
Mental health SF36 scores	Yes	Yes	• S/P age • S/P living with a disability • S/P physical health • Parents' mental health • Child mental health/ behaviour problems	No
Physical health outcomes				
Skin conditions	Yes	No	• Past financial stress • Parent skin conditions	Did not test
Sleep disturbance	Yes	Yes	• S/P living with a disability • Past financial stress • S/P school-aged behaviour problems • S/P school-age gifted/ talented • Child mental health/ behaviour problems	No

Outcome	Mediation results			Moderation results
Spouse/partner Outcome	Direct effect of deployment	Mediation by PTSD variables	Significant control	Moderated mediation
Overall physical health	No	Yes	• S/P age and education • S/P working status • Past financial stress related to poorer physical health • S/P school-aged behaviour problems • S/P school-aged learning problems • Servicemen's physical health • Child long-term health problems • Child mental health/ behaviour problems	Spouses'/partners' use of military services
Combined physical and mental health problems	Yes (Mental health problems)	Yes (Mental health problems; co-occurring physical and mental health problems)	• S/P age • S/P military service • Serviceman physical health functioning • Number of children • Child mental health/ behaviour problems • Parent mental health problem • Length of couple relationship	Spouses'/partners' use of military services
Couple relationship quality	Yes	Yes	• S/P age • Past financial stress • S/P mental health disorders and bodily pain • Serviceman mental health disorders • Child mental health/ behaviour problems	No

Source: Vietnam Veterans Family Study

7 Relationships between specific deployment characteristics and spouse/partner outcomes

This chapter looks at the impact of specific aspects of military service in Vietnam on spouse/partner outcomes. In particular, we examine whether different exposures—total length of deployment, experience of trauma, conscription, being in different corps or being of different rank—were related to various outcomes, while taking into account spouse/partner characteristics, health conditions of spouses'/partners' parents, children's health and other characteristics of Vietnam veterans. Given that we are interested in the impact of different elements of deployment to the Vietnam War, we focus only on current spouses/partners of Vietnam veterans (excluding VEP spouses/partners or former spouses/partners of VV) and outcomes associated with deployment.

7.1 Sample and measures

These analyses used data from VV in the analysis sample and their current spouses/partners only (as VEP did not have Vietnam deployment experiences). It should be noted that the VV sample of VVFS was broadly representative of the VV population (see Section 3).

The outcomes examined were the outcomes reported in Section 5 as being affected by deployment, particularly mental and physical health, and couple relationships. All measures were derived in the manner described earlier.

The outcomes used were:

- mental health—general mental health, anxiety, depression, suicidal ideation and problem drinking
- physical health—general physical health, skin conditions (e.g. eczema, psoriasis), sleep disturbances
- combined mental and physical health problems
- quality of couple relationships.

Data from the Nominal Roll of Vietnam veterans was used to derive the total duration of veterans' deployment, conscription status, corps, rank and deployment instability. Other indicators (exposure to herbicides, experience of trauma and whether VV and current spouses/partners were in a couple relationship at the time of deployment) were obtained from VV responses to the VVFS Main Survey. Table 7.1 shows details of the deployment characteristics and measures used.

Table 7.1 Deployment characteristics and measures used

Deployment characteristic	How measured
Total duration of deployment	Calculated as the total number of months the veteran was deployed in different units and/or at different times. It was divided into three categories: bottom 25 per cent of the distribution (<1 month – <8 months); middle 50 per cent of the distribution (8–12 months); and top 25 per cent of the distribution (>12 months).
Conscription	Derived from the Nominal Roll;[15] 1 = Yes (53% of VV); 0 = No.
Corps served in	There were three major army corps: Royal Australian Infantry (40% of VVFS VV); Royal Australian Engineers (11% of VVFS VV) and Royal Australian Artillery (10% of VVFS VV). Due to smaller numbers in other corps, these other corps were grouped together as 'other' (40% of VVFS VV).
Rank	Three categories of rank were used: enlisted (private, musician, signalman, gunner, trooper, sapper, craftsman, patrolman, recruit; 55% of VVFS VV); non-commissioned officer (lance- corporal, corporal, sergeant, warrant, bombardier; 35% of VVFS VV); and officer (lieutenant, captain, major, colonel, brigadier, general, chaplain; 10% of VVFS VV). In the Nominal Roll, warrant officer was considered as a separate category but for consistency with the VVFS Main Survey it was placed in the non-commissioned category for these analyses.
Deployment instability	A binary indicator of deployment instability was used: whether servicemen were transferred from one unit to another during their deployment or had multiple deployments (27% of VVFS VV); or had only one deployment in the same unit.
Exposure to herbicides	Exposure to herbicides was derived using two questions. In the VVFS Main Survey VVs were asked whether they believed they were exposed to Agent Orange and whether their belief had been confirmed. There were no details on how this information had been confirmed. Thirty-one per cent believed they were exposed to Agent Orange and their belief was confirmed. Other veterans either did not believe they were exposed to Agent Orange or their belief was not confirmed.
Experience of trauma	The experience of trauma was derived from eight items in the VV VVFS Main Survey, with response options ranging from 1 (never) to 5 (very often—i.e. 11 or more times). Items used were [How often did you experience]: being in danger of being killed; being in danger of being injured; having to handle dead bodies; seeing dead bodies; hearing of a close friend, relative or other service personnel being injured or killed; being present when a close friend, relative or other service personnel was injured or killed; fear that you had been exposed to a contagious disease, toxic agent or other contaminant; being a witness to a significant level of human degradation and misery. The level of traumatic experience was calculated as the average score across the eight items, with higher scores indicating greater exposure to trauma. The mean across all VV was 2.6 (standard deviation of 0.9).
Whether spouses/partners and servicemen were in a relationship at the time of deployment	Whether VV and their current spouses/partners were in a couple relationship at the time of VV's deployment to Vietnam. As reported in the VVFS Main Survey.

Source: Vietnam Veterans Family Study

15 This measure differs from the measure of conscription used in the propensity score analysis (Section 4). The latter came from the VVFS Main Survey. The conscription variable from the Nominal Roll was used here because it is a more accurate indicator, does not have missing values, and refers only to conscription in the National Service scheme.

7.1.1 Statistical approach and empirical model

Individual associations between VV's deployment experiences and spouses'/partners' health and wellbeing were examined via a series of multivariate regression analyses. These analyses controlled for servicemen's PTSD as well as a number of characteristics of spouses/partners, servicemen, children and parents of spouses/partners that were specific to each model. Selection of characteristics was based on the findings reported in Section 6 (i.e. comprised of the control variables showing significant associations with the outcome). Derivation of these measures is explained in earlier sections.

For each outcome, an individual model was estimated. Depending on the properties of the outcome measure, we used logistic regression (for binary outcomes), multinomial logistic regression (for multiple category outcomes) or multivariate linear regression (for continuous outcomes). For every outcome we report the marginal effects of deployment only. The marginal effects represent the change in the predicted probability for each outcome associated with a one unit change in the explanatory variable while holding all other variables in the model at their average value. In the tables we refer to marginal effects as adjusted differences because they approximate the adjusted difference between the probability of each outcome for spouses/partners of VV with differing deployment experiences.

It should be noted that the total number of observations may vary across models due to missing cases on some of the outcome or control variables. Additionally, as mentioned earlier, this section focused on current spouses/partners; therefore, it is not necessary to adjust for sample clustering (which had been needed when data for more than one spouse/partner of a VV were used, e.g. in Section 5). The total sample used in this section comprises 1,369 VV and spouses/partners.

7.2 Results

To investigate the influence of specific deployment characteristics on spouse/partner outcomes the characteristics listed in Table 7.2 that had been found to be associated with particular outcomes were included (see Section 5 for details):

Table 7.2 Control variables used in specific analyses

Spouses/partner outcome	Control variables used
General mental health	*Veteran's PTSD; spouse's'/partner's age,* working status, pain and physical functioning; *children's* mental health/behavioural problems; *parents'* mental health problems
Anxiety	*Veteran's* PTSD; *spouse's/partner's* working status, long-term health condition; *children's* mental health/behaviour problems; *parents'* mental health problems
Depression	*Veteran's* PTSD; *spouse's/partner's* working status, long-term health condition and physical functioning; *children's* mental health/behaviour problems; *parents'* mental health problems
Suicidal ideation	*Veteran's* PTSD; *spouse's/partner's* working status, disciplinary behaviours and behavioural problems at school; *children's* mental health/behaviour problems and allergies; *parents'* mental health problems; length of *couple relationship*
General physical health	*Veteran's* PTSD, physical health; *spouse's/partner's* age, experience of financial stress in the past, behavioural problems in school; *children's* mental health/behaviour problems and long-term health conditions
Skin conditions	*Veteran's* PTSD; *spouse's/partner's* experiences of financial stress in the past; *children's* mental health/behaviour problems and nervous system diseases; *parents'* skin condition
Sleep disturbance	*Veteran's* PTSD; *spouse's/partner's* experiences of financial stress in the past, behavioural problems in school, whether spouses/partners were gifted or talented when they were in school; *children's* mental health/behaviour problems
Co-occurring mental and physical health problems	*Veteran's* PTSD, physical health; *spouse's/partner's* age, working status, disciplinary behaviours in school, *children's* mental and behavioural problems; *parents'* mental health problems, length of *couple relationship, number of children in the family*
Couple relationship quality	*Veteran's* PTSD; *spouse's/partner's* working status, pain, mental health problems, experiences of financial stress in the past; *children's* mental and behavioural problems

Source: Vietnam Veterans Family Study

7.2.1 Mental health and problem drinking

The adjusted differences of various deployment characteristics are presented in Table 7.3.

Table 7.3 Marginal effects of deployment for mental health outcomes

					Suicidality		
	General mental health	Anxiety	Depr-ession	Problem drinking	No	Thoughts	Plans/ Actions
	Adjusted differences						
Total duration							
Up to 8 months	Reference						
8–12 months	0.70	-1.97	-4.14	-2.34	4.07	-5.24	1.17
More than 12 months	1.92	-7.30	-7.75	-1.53	2.92	-2.67	-0.26
Agent Orange	-1.20	3.17	-1.19	-0.55	3.13	-0.41	-2.72
Experience of trauma	-0.59	0.35	2.27	1.23	-0.18	-1.18	1.35
Conscript	1.77	-5.09	-5.75	-0.35	1.14	-0.42	-0.72
Deployment instability	0.25	0.46	0.65	1.58	-5.50	3.08	2.42
In a couple relationship during deployment	-1.89	-9.89	7.58	3.98	9.98	-13.8*	3.85
Corps							
Royal Australian Infantry	Reference						
Royal Australian Engineers	0.48	4.36	3.91	1.37	-1.61	-0.50	2.11
Royal Australian Artillery	1.58	-0.08	-1.41	2.81	-5.66	5.60	0.06
Others	1.41	-4.23	0.92	1.06	0.11	-2.64	2.53
Rank							
Enlisted	Reference						
Non-commissioned officer	0.24	-1.50	-4.37	0.05	3.5	-1.27	-2.22
Officer	3.67	2.72	1.78	-2.39	2.40	-4.27	1.89
N	1,014	1,026	1,021	998		1,013	

Notes: Total number of observations varies across models due to missing values. *$p < .05$.

Source: Vietnam Veterans Family Study

It can be seen that there were no statistically significant relationships between veterans' deployment characteristics and most spouses'/partners' mental health outcomes, after controlling for veterans' PTSD and a range of variables such as spouses'/partners' age, education, working status, long-term health condition, veterans' physical health, and mental and behavioural problems of children, etc.

Significant effects of deployment were found for suicidal ideation only. Spouses/partners who were in a couple relationship during deployment were less likely to have suicidal thoughts (13.8 per cent points lower).

7.2.2 Physical health

The adjusted differences of deployment for physical health outcomes are presented in Table 7.4.

Table 7.4 Marginal effects of deployment for physical health outcomes

	General physical health	Skin conditions	Sleep disturbance
		Adjusted differences	
Total duration			
No more than 8 months		Reference	
Between 8 to 12 months	1.75	-1.35	-0.56
More than 12 months	2.46	-2.47	-3.6
Agent orange	-0.03	2.22	-0.44
Experience of trauma	-0.52	-0.64	0.30
Conscripted	1.59	2.40	0.96
In a couple relationship during deployment	-3.50	2.85	7.93
Deployment instability	-0.33	2.21	0.66
Corps			
Royal Australian Infantry		Reference	
Royal Australian Engineers	1.54	0.58	5.35
Royal Australian Artillery	0.11	4.59	-3.46
Others	-0.56	0.81	5.06
Rank			
Enlisted		Reference	
Non-commissioned officer	0.66	-0.81	-0.77
Officer	1.02	4.94	-0.09
N	1,011	1,053	1,053

Notes: Total number of observations varies across models due to missing values.

Source: Vietnam Veterans Family Study

No significant effects of veteran's deployment characteristics to Vietnam were found for spouses'/partners' physical health outcomes, after controlling for veterans' PTSD and a range of other variables such as spouses'/partners' working status, financial stress, veterans' physical functioning, and mental and behavioural problems of children.

7.2.3 Combined burden of mental and physical health problems

Table 7.5 shows the adjusted differences of deployment characteristics for spouses'/partners' cumulative burden of mental and physical health problems.

Table 7.5 Marginal effects of deployment for physical health outcomes

	Combined health burden			
	None	**Physical only**	**Mental only**	**Both**
	Adjusted differences			
Total duration				
No more than 8 months		Omitted		
Between 8 and 12 months	2.37	0.20	0.55	-3.11
More than 12 months	4.66	-0.37	0.54	-4.83
Agent Orange	-4.22	2.50	0.88	0.85
Experience of trauma	-0.71	-1.12	0.55	1.33
Conscript	6.01	1.12	-0.34	-6.79
Married before deployment	-8.25	0.70	4.96	2.59
Deployment instability	-1.04	-0.54	-0.22	1.79
Corps				
Royal Australian Infantry		Omitted		
Royal Australian Engineers	1.89	-0.36	5.83	-7.36
Royal Australian Artillery	-3.78	2.43	3.81	-2.45
Others	-1.89	1.84	2.14	-2.09
Rank				
Enlisted		Omitted		
Non-commissioned officer	2.64	0.36	-3.12	0.12
Officer	10.45	0.73	-4.61	-6.56
N			1,043	

Notes: Total number of observations varies across models due to missing values. ***$p < .001$; **$p < .01$; *$p < .05$.

Source: Vietnam Veterans Family Study

It can be seen from Table 7.5 that veterans' deployment characteristics were not significantly associated with spouses'/partners' cumulative burden of mental and physical health problems, after adjusting for the effects of veterans' PTSD and other variables.

7.2.4 Couple relationship quality

Table 7.6 shows the adjusted differences of deployment characteristics for the quality of couple relationships between veterans and their spouses/partners.

Table 7.6 Marginal effects of deployment for couple relationship

	Couple relationships
	Adjusted differences
Total duration	
No more than 8 months	Reference
Between 8 and 12 months	0.12
More than 12 months	0.04
Agent Orange	-0.11
Experience of trauma	-0.03
Conscript	-0.01
In a couple relationship during deployment	-0.04
Deployment instability	0.03
Corps	
Royal Australian Infantry	Omitted
Royal Australian Engineers	-0.01
Royal Australian Artillery	-0.10
Others	-0.03
Ranks	
Enlisted	Omitted
Non-commissioned officer	0.05
Officer	0.15
N	1,043

Notes: Total number of observations varies across models due to missing values.

Source: Vietnam Veterans Family Study

Table 7.6 shows that veterans' deployment characteristics were not significantly associated with the quality of couple relationships, after controlling for veterans' PTSD and other variables.

7.3 Summary

This section examined the specific impact of deployment to Vietnam on the health and wellbeing of veterans' spouses/partners after controlling for servicemen's PTSD and other salient servicemen, spouse/partner, child and parent characteristics.

The only characteristic of deployment that was significantly related to spouse/partner outcomes was whether they had been in a couple relationship at the time of deployment. Compared to spouses/partners who were not in a relationship with veterans at the time of deployment, spouses/partners who were in a relationship were less likely to have experienced suicidal thoughts.

8 Discussion and implications

Despite the Vietnam War being waged more than 40 years ago, concerns are still held for the long-term health and wellbeing of servicemen who fought in the war and their families. Vietnam veterans have previously been found to be at risk of later mental health problems such as PTSD, suicidality and depression (Davy, 2012; Macfarlane, Simpson, Benke, & Sim, 2011), and physical health problems (e.g. Davy, 2012; Tansey, Raina, & Wolfson, 2013). They have also been found to be at risk of more troubled family relationships (Allen et al., 2010) and weaker social support, which often flow from mental health problems (DiMauro et al., 2016; McGuire et al., 2012). Research suggests that family members can also be affected, with higher rates of mental health problems evident among spouses/partners and children (Forrest et al., 2014; O'Toole et al., 2010); couple relationship difficulties (Allen et al., 2010); parenting stress (Blow et al., 2013); a less effective parenting alliance (Allen et al., 2010); and lower life satisfaction (MacDonell et al., 2014), although some of these studies were of families whose veterans served in later conflicts.

However, little is known about the very long-term effects of Vietnam War service on veterans and their families, and even less in the Australian context. It is important to understand whether difficulties persist or decline so that the welfare of Vietnam veterans and their families can be effectively supported. Accordingly, the Australian Government Department of Veterans' Affairs commissioned the Vietnam Veterans Family Study (VVFS). The aim of the study was to determine whether effects of the Vietnam War on servicemen and their families would be discernable more than 40 years after it ceased. This issue was investigated by comparing families of Vietnam veterans (VV) to families of servicemen who served in the ADF during the Vietnam war period but were not deployed to Vietnam (termed Vietnam era personnel, VEP). Four reports have been produced so far, with the current report being the fifth in the series.

The VVFS has already added substantially to what is known about the long-term consequences of Vietnam War service on the wellbeing of Australian veterans' adult sons and daughters. For example, when compared to the offspring of VEP servicemen, adult children of VV had more often experienced depression, anxiety, PTSD, and suicidal thoughts, plans and actions (Forrest et al., 2014). There were also differences on some aspects of physical health—the occurrence of skin conditions, migraines and sleep disturbance, with these more common in VV adult children. VV adult children had more often experienced more than one marriage or de facto relationship and less often only one of these types of committed relationships. Finally, they were less likely to have attained a university degree, and more likely to have experienced financial stress in the past (although not recently).

However, it should be noted that differences were not evident in a number of other areas (Forrest et al., 2014) and veterans' adult children did not have a higher mortality rate than similarly aged individuals in the Australian general population (Commonwealth of Australia, 2014). Analyses investigating how deployment to Vietnam might exert intergenerational effects revealed that veterans' PTSD was a key influence, as were harsh parenting in childhood and sons'/daughters' school problems.

The VVFS also collected information from current and former spouses/partners of VV and VEP, enabling investigation of whether there were long-term effects on spouses/partners. Six broad types of outcomes were investigated: mental health and substance use; physical health; combined mental and physical health problems; family relationships; socio-economic wellbeing; and the perceived effect of ADF members' military service on spouses/partners. The mechanisms by which veterans' Vietnam war experiences might affect spouses/partners were also investigated including the role of veterans' PTSD as well as spouses'/partners' personal resources and experiences (e.g. their social supports, coping capacities, use of services). The current report thus has two main aims:

- What effect, if any, did active Vietnam service have on the physical, mental and social health of the spouses/partners of Australian Vietnam veterans?
- Which risk, protective and mediating factors might account for these effects and what implications might they have for policies and service delivery?

8.1 Recruitment and representativeness of the VVFS sample

A total of 3,633 Vietnam veterans (VV) and 2,751 Vietnam-era personnel (VEP) who had served in the Army wing of the ADF were contacted and invited to take part in the VVFS, at which time they were asked to provide contact details for family members who could also be invited to participate. Overall, 3,318 VV families and 2,647 VEP families (servicemen and/or their spouses/partners) participated in the VVFS (for details see Section 3.1). For this report, data were required from both servicemen and their spouses/partners resulting in an analysis sample of 2,284 families (1,435 VV families and 849 VEP families). Families in which only ADF servicemen or spouses/partners participated in the VVFS were excluded from the analysis sample. Study information was collected by paper and pencil questionnaires in 2011 (an online version was also available).

Given that fewer than half of all VVFS participants were included in the analysis sample, it was important to investigate its representativeness (see Section 3.2 for further details). This was examined in two ways.

First, VV in the analysis sample were compared to the larger Army population who had served in the Vietnam War and from which they had been drawn. These analyses revealed several significant differences: VV in the analysis sample tended to have been deployed to Vietnam for slightly longer (on average two weeks); be marginally younger (on average, just over one year); were more often national servicemen; had more often been born in South Australia but less often in New South Wales; and had served in the Royal Australian Army Ordnance Corps.

However, there were no significant differences on ADF service-related characteristics (e.g. rank, main type of army corps served in (noting the one difference above), exposure to combat, whether honoured for service). These findings suggest that the VV analysis sample was broadly representative of the military characteristics and experiences of the total population of Army Vietnam veterans.

Second, although it was not possible to compare the analysis sample to the wider population of all VV, VEP and their families because data were simply not available, we were able to compare the sample to families in which only servicemen or spouses/partners participated in the VVFS (and had been excluded from the analysis sample). These analyses investigated whether the individuals included in the analysis sample might have reported better or worse functioning and wellbeing than those excluded from it, which could affect the generalisability of our findings.

Overall, the findings suggest that there may be some degree of bias present in the analysis sample on several aspects: participants' family relationships tended to be significantly better, fewer were still working or experiencing financial stress, and they were less likely to report suicidal ideation or having been a victim of violence than servicemen excluded from the analysis sample. Given the analysis sample's more positive profile on these aspects, it is possible that the report's findings might somewhat underestimate the effects of service in Vietnam on family relationships and on late-in-life employment and financial wellbeing. These limitations should be borne in mind when considering the VVFS' findings in these areas.

Nonetheless, there were no consistent significant differences on spouse/partner physical or mental health (one exception); and problem drinking or illicit drug use. Thus, the analysis sample can be considered reasonably representative on these spouse/partner aspects.

8.2 Controlling for pre-deployment differences between Vietnam veterans and Vietnam-era personal

Another important aspect considered was whether there were differences in the pre-deployment characteristics of VV and VEP that could affect comparisons of VV and VEP spouses/partners and obscure the true effects of Vietnam War experience (further details are available in Section 4).

When VV and VEP were compared on pre-Vietnam deployment characteristics, statistically significant differences were found on age (the VV sub-sample tended to be older); the percentage who were national servicemen (lower in the VV sub- sample); entry into the ADF during the World War II, Korean War or Malaysian Emergency eras (higher among VV); previous service in conflicts prior to Vietnam deployment (higher among VV); and the total duration of ADF service (higher among VV). Thus, it is possible that any differences found between VV and VEP families could, to a certain extent, reflect differing ADF experiences unrelated to deployment to Vietnam.

Additionally, the VV sub-sample tended to have held more jobs prior to their entry into the ADF than the VEP sub-sample; VV were less likely to describe either of their parents as having been affectionate or caring; VV were somewhat more likely to have had a parent with a drinking problem while growing up; VV were less likely to have had a parent with cancer or heart disease, but they were more likely to have had a parent with mental health problems; VV had less often shown signs of being gifted and talented at school than VEP (e.g. had been advanced a grade or placed in a class for gifted children); and VEP were more likely to have had musculoskeletal system diseases (e.g. arthritis, osteoporosis or other joint diseases) before they entered the ADF although the incidence was very low overall. These pre-service differences are likely to affect comparisons of VV and VEP and their families and could cause an over-estimate of the impact of Vietnam war service.

Given these pre-Vietnam deployment differences between the VV and VEP sub-samples, propensity score analysis was used to produce weights that reduced the pre-Vietnam deployment differences between the VV and VEP sub-samples. Comparisons of the two sub-samples following the application of weights found that they no longer significantly differed on these characteristics except servicemen's age, with the VV sub-sample remaining marginally older than the VEP sub-sample. The weighted dataset was used for all subsequent statistical analyses. Thus, any differences between VV and VEP servicemen or their spouses/partners are unlikely to be due to differences on servicemen's pre-Vietnam deployment and other service-related circumstances and characteristics.

8.3 Differences between spouses/partners of Vietnam veterans and Vietnam-era personnel

The first major issue addressed by this report was whether the spouses/partners of VV and VEP would significantly differ when compared, which could shed light on whether there may be very long-term effects of veterans' deployment to Vietnam. Overall, many statistically significant differences were found across all the major life dimensions examined, suggesting that some long-term impacts of deployment existed. However, as most spouses/partners were faring relatively well, the differences found should be seen as conveying increased risk rather than indicating that most VV spouses/partners were experiencing difficulties. Some were, and more frequently than VEP spouses/partners, but many were not.

It should also be noted that the analyses simply investigated whether there were differences between VV and VEP spouses/partners after controlling for spouse/partner age and the length of couple relationships. The analyses did not take into consideration the potential contribution of other serviceman and spouse/partner characteristics and experiences, which were investigated in a second series of analyses and are discussed later in Section 8.4. We next discuss differences between VV and VEP spouses/partners for each major life dimension examined.

8.3.1 Mental health and substance use

Looking first at spouses'/partners' mental health, the aspects measured were:

- overall mental health functioning (measured by the SF36 mental health component score)
- diagnosis of or treatment for depression, anxiety or PTSD in their lifetime
- suicidal ideation, plans or actions in their lifetime
- general life satisfaction.

It is first important to note that the majority of spouses/partners did not report mental health difficulties. However, VV spouses/partners were faring significantly less well on all aspects of mental health than VEP spouses/partners, with the exception of PTSD. For example, significantly more VV spouses/partners reported that they had been diagnosed with depression or anxiety than VEP spouses/partners. Further, a significantly greater percentage had experienced suicidal thoughts or had made a suicide plan or attempted to take their own life (although this was very rare overall) at some point in their lives. Finally, VV spouses/partners tended to be slightly less satisfied with their lives although the differences were numerically quite small. Overall, across almost all outcomes, around 30–33 per cent of VV spouses/partners were experiencing problems compared with 22–27 per cent of VEP spouses/partners. These findings are consistent with previous Australian and international research in

showing long-term effects of servicemen's deployment to Vietnam on their spouses'/partners' mental health (e.g. Dekel et al., 2005; O'Toole et al., 2010; Solomon, Waysman, Levy et al., 1992), primarily through the development of PTSD and other mental health problems in veterans that seem to flow on to affect spouses/partners.

Comparison to the Australian general female population is limited (it is important to compare only to females as Australian SF36 data show that adult men tend to report better mental health than adult women, e.g. Butterworth, Crosier, & Rogers, 2004). There is a scarcity of available SF36 data for older Australian females and the data we were able to source were published quite some time ago. If trends differ across historical eras, our comparisons may be limited. Bearing these constraints in mind, 2002 data for 365 South Australian females aged 55–64 years showed that the overall average score on the SF35 mental health component was 81.1 and was 80.4 for 65–74-year-old females (n = 281; Dal Grande & Taylor, 2004). By comparison, the VEP spouse/partner average was 76.9 and VV spouse/partner average was 69.3. The Australian Longitudinal Study on Women's Health found that among their oldest cohort of women aged 70–74 years in 1996, the overall mean score on the mental health component was 76.5 (Russell, Ball, & Spallek, 1998).

These comparisons, while limited by the 12–18 year gap in which data were collected, are consistent in showing that VV spouses/partners tend to report more mental health difficulties than similarly aged women in the general Australian population. Other Australian research using different measures has found higher rates of depression, anxiety and stress among female partners of veterans aged 43 to 70+ years (most of whose ADF members had served in Vietnam) than in comparable, civilian Australian females (MacDonell, Bhullar, & Thorsteinsson, 2016).

It is interesting to note that similar mental health differences were found when the adult sons and daughters of VV and VEP servicemen were compared (Forrest et al., 2014). Thus, the VVFS findings suggest there may be consistent negative effects of deployment to Vietnam on the mental health of various types of family members.

The aspects of substance use examined in the VVFS were marijuana use (lifetime and recent) and problem drinking. Again, only a small minority reported these types of substance use. Nevertheless, there were similar differences to those found on mental health, with significantly more VV than VEP spouses/partners reporting lifetime marijuana use and problem drinking. VV and VEP spouses/partners did not significantly differ on recent marijuana use.

Research on substance use among spouses/partners of Vietnam veterans is extremely scarce and does not examine whether there may be very long-term effects, hence our findings add to the evidence base on this issue. Similar differences were not found for the adult sons/daughters of Vietnam veterans (Forrest at el., 2014).

In summary, on almost all indicators of mental health and substance use, VV spouses/partners were faring significantly less well than VEP spouses/partners, suggesting negative effects of servicemen's deployment to Vietnam exist more than 40 years after the war ended.

8.3.2 Physical health

Three main areas of spouses'/partners' physical health were examined:

- global health rating (the percentage reporting this to be only fair or poor), and general physical health (measured by the SF36 physical health component score)
- diagnosis of or treatment for various health conditions in their lifetimes (e.g. cancer, heart problems, neurological problems)
- experience of pregnancy difficulties, or children were born with the birth defects of Spina Bifida or a cleft lip/palate.

Overall, VV spouses/partners reported more difficulties in the health area than their VEP counterparts. Firstly, a higher percentage perceived their global health to be only fair or poor and secondly, the VV group's general physical health was significantly lower. Thus, across both aspects, VV spouses/partners tended to report poorer overall physical health than VEP spouses/partners. We have been unable to locate other research on the overall general health of spouses/partners of Vietnam veterans, and particularly over such a long time frame. Hence, these findings add valuable new knowledge on this issue.

On the other hand, there were few significant differences on rates of actual diagnosed or treated physical health conditions. More VV than VEP spouses/partners reported genitourinary system conditions such as kidney disease, skin problems such as eczema or psoriasis, and sleep conditions such as sleep apnoea. But there were no significant differences on the remaining nine categories of physical health conditions included. These findings suggest that effects of servicemen's Vietnam War experiences on the occurrence of specific physical health conditions in spouses/partners were at best marginal and likely outweighed by more proximal factors.

Nevertheless, on more attitudinal and subjective measures of physical wellbeing, there seemed to be effects. These findings are consistent with more general research showing perceived physical wellbeing is related to social environmental factors such as support networks, social capital, social integration and community-level factors (Institute of Medicine and National Research Council, 2013). Overall, some negative effects of servicemen's deployment to Vietnam on spouses'/partners' physical health were evident but were less extensive than in the area of mental health.

Comparison to findings for the adult sons/daughters who participated in the VVFS study also found that those whose parents were Vietnam veterans tended to have higher rates of skin conditions and sleep disturbance than their VEP counterparts (Forrest et al., 2014). Thus again, similar effects were found for differing types of family members. Our study cannot explain why this may be so, although some possible explanations are environmental or intergenerational influences. The adult sons/daughters of Vietnam veterans were also more prone to experience migraines than VEP sons/daughters but this trend was not found for spouses/partners.

There were no indications of higher rates of pregnancy difficulties (e.g. problems conceiving a baby, miscarriages, stillbirths) or Spina Bifida or cleft lip/palate birth defects in the children of VV spouses/partners when compared to VEP spouses/partners. Birth defects have been found to be more common in the offspring of servicemen and Vietnamese civilians who were exposed to Agent Orange during the Vietnam War (Ngo, Taylor, Roberts, & Nguyen, 2006). Our non-significant findings could thus be due to the fact that the VVFS examined a broader risk— service in the Vietnam War—rather than the more specific risk of exposure to Agent Orange during the war.

8.3.3 The combined burden of physical and mental health problems

We also investigated whether VV spouses/partners experienced a greater combined burden of mental and physical health problems than their VEP counterparts. VV spouses/partners appeared to be experiencing a greater combined health burden than VEP spouses/partners as significantly more were experiencing solely mental health problems or co-occurring physical and mental health problems. However, the percentages experiencing only physical health problems were similar and did not significantly differ across VV and VEP spouses/partners. All in all, almost twice as many VV than VEP spouses/partners were experiencing one or more problems (around two in five VV spouses/partners compared with one in four VEP spouses/partners). Thus, as well as experiencing higher rates of the two separate problems (see Sections 8.3.1 and 8.3.2), VV spouses/partners were more often dealing with co-occurring physical and mental health problems. These findings add to the knowledge base concerning the long-term welfare of spouses/partners of Vietnam veterans as we are not aware of any other research investigating whether veterans' spouses/partners are more likely to experience combined mental and physical health problems.

8.3.4 Family relationships

A key interest of the VVFS study was whether Vietnam war experiences impacted on long-term family relationships. This was assessed in two ways:

- spouses'/partners' satisfaction with their relationships with differing types of family members (servicemen, children, their own siblings and their own parents/parents-in-law)
- how couples were getting along (couple relationship satisfaction, quality and whether there had been abuse at some stage of the couple relationship).

Overall, family relationships appeared to be healthy and strong as large majorities reported being satisfied with how they were getting on with various family members. Couple relationships appeared to be close, and very few reported the occurrence of abuse in couple relationships. However, within this very positive picture, there were significant differences, with fewer VV than VEP spouses/partners being satisfied with their relationships with servicemen and their children. Similarly, mean levels of satisfaction with the couple relationship and couple relationship quality were both significantly lower in the VV than the VEP spouse/partner groups (although they were generally high). Abuse, while rare, had occurred significantly more often in VV than VEP couple relationships.

It is interesting to note that no significant differences were found on satisfaction with relationships with more distant family members (spouses'/partners' siblings and parents/parents-in-law). Hence, the differences found seem to reflect slightly less positive perceptions of relationships within the immediate family unit among VV spouses/partners. Overall, there did appear to be some impact of servicemen's deployment to Vietnam on close family relationships, despite most spouses/partners reporting positively on these relationships.

Prior U.S. research shows that wives of returned Vietnam veterans reported significant reductions in marital cohesion and satisfaction and an increase in conflict, particularly if servicemen were suffering from PTSD (Jordan et al., 1992). Similarly, the U.S. National Vietnam Veterans Readjustment Study (Jordan et al., 1992; Kulka, 1990) found that rates of divorce were elevated in families of Vietnam veterans, with servicemen's PTSD a key risk, as it was for family violence. The VVFS study shows an increased risk of such outcomes for spouses/partners of VV relative to VEP former servicemen but it appears much less powerful. Of course, the timespan between the Vietnam War and measurement of family relationships is much longer in our study, which could indicate a weakening of effects over time, or that most effects have already occurred. It is also possible that cultural differences between Australia and the U.S. may have played some role.

8.3.5 Socio-economic wellbeing

To gain a picture of spouses'/partners' current and previous socio-economic wellbeing, a range of indicators was used, as follows:

- age and highest level of education achieved at the time of the survey
- current employment status (whether in employment, retired, caring for households, living with a disability or other situations)
- current main source of income (wages/salary, government benefits, or superannuation/business investments)
- employment instability during their working lives
- current home ownership (owned outright, mortgaged, renting, boarding/life tenure)
- current living arrangements (whether living in a separate house, townhouse/apartment, boarding house/aged care/army housing, or had no permanent place to live)
- homelessness (whether ever homeless, or in the last 12 months)
- financial stress (experienced financial hardship/s ever, in the last 12 months).

VV spouses/partners were on average one year older than their VEP counterparts. This mainly reflected the lower percentage of VV spouses/partners who were between 55 and 60 years old. Additionally, VV spouses/partners were significantly more likely to have Year 10 or below as their highest level of education and less likely to have attained a university degree. It is interesting to note that fewer of the adult sons/daughters of VV than VEP had attained a university degree (Forrest et al., 2014), similar to spouses/partners. As before, our data cannot explain the reasons for these consistent findings.

Fewer VV spouses/partners were currently employed or self-employed and more were retired or semi-retired. As the analyses controlled for spouse/partner age and the length of couple relationships, the significant differences found are unlikely to be due to such factors. Likewise, VV spouses/partners were less likely to report wages/salaries as their main income source or superannuation/business investment and were more likely to report receipt of government benefits. VV spouses/partners had experienced more employment instability during their working lives, with fewer holding between one and four jobs and more holding between five and nine jobs.

In terms of home ownership, we saw a positive picture overall, with more than 70 per cent of VV and VEP spouses/partners owning their homes outright and over 90 per cent living in a separate house. VV spouses/partners were significantly less likely to own their homes outright and more likely to be paying off a mortgage.

However, they did not differ on the type of home they were living in (e.g. a separate house, townhouse or apartment) or whether they had ever been homeless.

Finally, VV spouses/partners had significantly more often experienced financial hardship at some stage of their lives, although not in the last 12 months. Similarly, VV sons/daughters were more likely to have experienced financial stress at some stage of their lives than VEP sons/daughters (Forrest et al., 2014).

Overall, while the findings regarding VV spouses'/partners' socio-economic wellbeing seem generally positive, there were several signs that they may have experienced more difficulties than VEP spouses/partners, which may reflect some impact of their servicemen's deployment to Vietnam. While the VVFS study is not able to reveal how such an impact might have occurred, one possibility is an increased caregiving burden for spouses/partners, if veterans were suffering with PTSD or mental health problems, which may have impeded spouses'/partners' employment, income and career development.

As found for the other life areas examined, there seems to be little information on socio-economic wellbeing of Australian spouses/partners of Vietnam veterans as they enter retirement and old age. However, U.S. research comparing veteran and civilian older-adult households found that veteran households tended to be faring somewhat better on economic wellbeing if servicemen were not disabled (Wilmoth, London, & Heflin, 2015). While disabled veteran households were no more likely to be living in poverty than non-disabled civilian households, they were more likely to experience housing difficulties, medical hardships, difficulties paying bills and insufficient food (as did disabled civilian households). Hence, servicemen's disability may to some extent underpin socio-economic hardship in older-age veteran households.

8.3.6 Effects of servicemen's military service

Spouses/partners were asked to reflect on the effects of their servicemen's ADF service on their own interpersonal relationships, mental and physical health, and employment and financial situation. Across all aspects examined, VV spouses/partners tended to hold more negative perceptions than VEP spouses/partners, with the largest differences evident on couple relationships and on spouses'/partners' physical and mental health. Given that few VEP servicemen had experienced a war situation whereas all VV servicemen had, these findings likely reflect the impact of differing exposures to deployment and combat.

8.3.7 Summary of significant differences between spouses/partners of Vietnam veterans and Vietnam-era personnel

Comparisons of VV and VEP spouses/partners revealed many significant differences across a range of major life areas, with VV spouses/partners consistently faring less well than VEP spouses/partners. For example, on almost all indicators of mental health and substance use more VV spouses/partners were experiencing problems. VV spouses/partners also tended to more often hold negative perceptions of their own general physical health and be experiencing co-occurring physical and mental health difficulties. While perceptions of family relationships were very positive across all spouses/partners, VV spouses/partners tended to be a little less positive than their VEP counterparts. There were also some signs that VV spouses/partners had experienced more socio-economic disadvantage than VEP spouses/partners. Finally, VV spouses/partners more often believed there had been negative effects of veterans' military service on their own relationships, health and economic wellbeing, with this likely reflecting the effects of servicemen's deployment to Vietnam and combat exposure. Thus, there appeared to be some long-term impact of servicemen's deployment to Vietnam on spouses/partners across all the areas of life examined more than 40 years after the cessation of the war.

However, the analyses simply investigated whether there were differences between VV and VEP spouses/partners while controlling for spouse/partner age and the length of couple relationships. To better understand the effects of deployment to Vietnam, analyses need to investigate whether differences remain after the effects of other salient factors are included (e.g. spouse/partner and servicemen characteristics, intergenerational effects). Additionally, it is important to investigate the mechanisms by which deployment to Vietnam might affect spouses/partners; for example, through the development of PTSD in Vietnam veterans.

8.4 Effects of deployment to Vietnam: mechanisms of influence

The second major issue addressed by this report was the mechanisms by which servicemen's deployment to Vietnam might affect spouses/partners. The main mechanism tested was through the development of PTSD in veterans, which has been shown by much prior research to be a powerful influence on spouse/partner wellbeing (e.g. Dekel et al., 2005; Gallagher et al., 1998; Hendrix et al., 1998). Thus, the

study examined whether veterans' PTSD accounted for ('mediated') the effects of deployment to Vietnam. We also investigate whether particular features of veterans' deployment to Vietnam were related to spouse/partner outcomes such as the length of deployment, experience of trauma, exposure to Agent Orange, corps served in, and rank. These are discussed later in Section 8.5.

Spouse/partner outcomes could be expected to be influenced by a range of factors in addition to deployment to Vietnam and servicemen's PTSD, including *spouse/partner circumstances and characteristics* (e.g. whether they too had served in the ADF or another country's military service, age, level of education, experience of financial stress, school-age experiences); servicemen characteristics (e.g. physical health, problem drinking); *characteristics of spouses'/partners' parents* (e.g. whether they had mental or physical health problems, were problem drinkers); and children's characteristics (e.g. whether a child had mental health or behavioural problems, a long-term health condition, allergies, or a nervous system disease). Unless the effects of such factors are included, the effects of deployment to Vietnam could be overstated.

The study also sought to investigate whether spouse/partner characteristics might reduce ('moderate') the effects of veterans' PTSD on outcomes, which could provide guidance for the types of supports and services that could be provided in the future. The moderating role of three differing types of resources was investigated—use of services, social support, and coping capacities.

The rich VVFS dataset provided many possible outcomes that could be examined. To narrow these down, we focused on outcomes for which significant differences between VV and VEP spouses/partners had been found in our previous analyses. We first discuss mediated effects and then whether moderated effects were evident.

8.4.1 Mediated effects for spouse/partner mental health and substance use

Veterans' PTSD mediated the effects of deployment for some mental health outcomes but not others. For spouses'/partners' general mental health, direct effects of deployment were found as well as indirect effects through veterans' PTSD, suggesting that the effects of deployment were partially but not fully mediated. Veterans' PTSD also appeared to mediate the effects of deployment on spouses'/partner's suicidal thoughts (but was not significantly related to suicidal plans/actions). On the other hand, no direct effects of deployment to Vietnam or indirect effects of veterans' PTSD were found in relation to spouses'/partners' diagnosis or treatment for anxiety or depression. These latter findings were somewhat unexpected in light of prior research showing that veterans' PTSD is a powerful risk for mental health difficulties in spouses/partners (Calhoun et al., 2002; MacDonell et al., 2016; McGuire et al., 2012).

One interpretation of these findings could be that deployment to Vietnam and veterans' PTSD are a source of pressure for spouses/partners, making them vulnerable to poorer mental health but not triggering serious types of mental illness. It is also possible that some of the control factors included may have been more central to the more severe types of mental health outcomes included in the VVFS study (diagnosis or treatment for a mental health disorder) and outweighed the longer-term effects of deployment to Vietnam. Additionally, our measures of depression and anxiety differ to those in some other studies as they require spouses/partners to be identified by a health professional as having a mental health disorder whereas other studies often report increased risk on a continuous scale (albeit sometimes using cut-offs to identify individuals with serious levels of problems). Thus, our depression and anxiety outcomes might reflect more severe levels of problems than in some other studies.

Control variables found to be related to multiple mental health outcomes were: spouses/partners having a long-term physical health condition, living with a disability, or being in poorer general physical health; their children having had a mental health/behavioural problem; and their parents having had a mental health problem. Thus, physical health problems were a consistent risk for mental health problems as was the burden of caring for children with a mental health or behaviour problem or having parents who were vulnerable to mental health difficulties. There were also some factors that were related to only one of the four mental health outcomes (e.g. being in bodily pain was a risk for suicidal thoughts).

Looking next at spouses'/partners' problem drinking, while no direct effect of deployment to Vietnam was evident, an indirect effect through veterans' PTSD was found. Hence, the mechanism by which deployment to Vietnam seemed to exert effects on spouses'/partners' problem drinking was through its role in instigating veterans' PTSD.

8.4.2 Mediated effects for spouse/partner physical health outcomes

Slightly different findings emerged across the three physical health outcomes—general physical health, the occurrence of skin conditions, and sleep disturbances. First, veterans' PTSD was found to fully mediate the influence of deployment to Vietnam on spouses'/partners' perceptions of their physical health. Second, there was no effect of veterans' PTSD and hence no mediation on the likelihood of spouse/partner skin conditions, although direct effects of deployment to Vietnam were evident. Third, both direct effects of deployment to Vietnam and indirect effects through veterans' PTSD were found in relation to spouses'/partners' sleep disturbance, with the effects of deployment being partially rather than fully mediated.

The findings suggest that spouses'/partners' perceived physical health was sensitive to servicemen's PTSD which accounted for the effects of Vietnam war service. However, for skin conditions and sleep disturbances, direct effects of deployment remained (although mediated effects were also present for sleep disturbances). These differing findings could to some extent reflect the types of outcomes examined which may have differing causes. As an example, one risk found for spouses'/partners' skin conditions was parental skin conditions, which could reflect environmental or intergenerational influences. Another possibility is that general physical health and sleep disturbances might be affected by a broader range of factors, both physiological and social, as suggested by the larger number and wider range of control variables related to these outcomes than found for skin conditions.

Summing up, both direct effects of deployment to Vietnam and indirect effects through veterans' PTSD were found for spouses'/partners' physical health outcomes, although relationships differed somewhat across the three outcomes.

8.4.3 Mediated effects for the combined burden of mental and physical health problems

As well as investigating separate mental and physical health problems, the possibility that spouses/partners were experiencing co-occurring problems was explored. A combination of problems can have more serious effects than either problem alone (Daraganova et al., 2018). To investigate whether deployment to Vietnam was related to a greater combined burden of mental and physical health problems for spouses/partners, four groups were identified: those who had neither problem, those with physical health problems alone, those with mental health problems alone, and those with both problems. The group with neither problem was the reference to which the other groups were compared.

The findings revealed direct effects of deployment on the likelihood of spouses'/partners' mental health problems alone although these direct effects were partially mediated by veterans' PTSD. There was no direct effect of deployment to Vietnam on the likelihood of physical health problems alone. Nor was there an indirect effect through veterans' PTSD, hence there were no mediated effects. For co-occurring problems, there were no direct effects of deployment but an indirect effect through veterans' PTSD, with the effects of deployment therefore appearing to be fully mediated. Consistent with much prior research (e.g. Calhoun et al., 2002; MacDonell et al., 2016; McGuire et al., 2012), veterans' PTSD was thus found to be a powerful risk for spouse/partner mental health problems and seemed to mediate the effects of deployment to Vietnam.

8.4.4 Mediated effects for couple relationship quality

Direct effects of deployment to Vietnam and indirect effects through veterans' PTSD were found for couple relationship quality, with slightly less positive couple relationships found in families in which servicemen had served in Vietnam. Mediation of the effects of deployment was evident although was partial, not complete. Effects of deployment to Vietnam still existed and continued to be important. These findings indicate that some effects of deployment to the Vietnam war on family relationships existed more than 40 years after it ceased.

Other factors that appeared important were spouses'/partners' age, with those who were older tending to report slightly more positive relationships; whether spouses/partners had experienced a mental health disorder; financial stress in the past; and whether children had experienced a mental health or behavioural problem. Couple relationships seemed to be more vulnerable when these characteristics were present (we cannot determine whether these characteristics put pressure on couple relationships or relationship problems put pressure on individual wellbeing as both were measured at the same point in time).

8.4.5 Moderated effects

Another issue examined was whether servicemen and spouses'/partners' psychosocial resources—their use of military or health-related services, the levels of social support available from families and friends, and the types of coping strategies they used would reduce ('moderate') the effect of veterans' PTSD on spouses/partners. These analyses probed whether the effects of veterans' PTSD on spouses/partners may be mitigated, which could provide guidance for the provision of services and supports.

Moderation analyses were only undertaken if a significant mediation effect had previously been found. Thus, six spouse/partner outcomes were examined: general mental health, suicidal ideation, problem drinking, general physical health, sleep disturbances, combined mental and physical health burden, and couple relationship quality. The effect of each potential moderator was separately investigated while controlling for the effects of a range of spouses/partners, servicemen, child and parent factors.

Overall, very few moderation effects were found, and for only a very small number of outcomes. Significant moderation effects were found for spouses'/partners' use of military-related services and the social support provided by friends but there were no significant moderation effects for spouses'/partners' coping capacities, levels of support provided by families, servicemen's use of military-related services, and servicemen's and spouses'/partners' use of other health services. The only outcomes

for which significant moderation effects were found were spouses'/partners' general physical health, cumulative mental and physical health burden, and problem drinking, but not general mental health, suicidal ideation, sleep disturbances, and couple relationship quality.

Spouses'/partners' use of military-related services substantially reduced associations between veterans' PTSD and spouses'/partners' general physical health such that effects of veterans' PTSD were now only found for those who had not used these services. Compared to spouses/partners who had used military-related services, spouses/partners who did not use these services were more adversely affected by their servicemen's PTSD. Thus, there seemed to be moderating effects of spouses'/partners' use of military-related services on the effects of veterans' PTSD for spouses'/partners' general physical health.

Similarly, spouses'/partners' use of military-related services significantly reduced the effects of veterans' PTSD on spouses'/partners' likelihood of experiencing physical health problems alone (but not on their likelihood of mental health problems alone, or co-occurring mental and physical health problems). The pathway between veterans' PTSD and spouses'/partners' physical health problems was significant for spouses/partners who did not use military-related services but was not significant for spouses/partners who used these services.

Together, these findings indicate that military-related services played an important role in facilitating spouses'/partners' physical health and ameliorating the effects of veterans' PTSD. The types of military-related services used were the Veterans and Veterans Families Counselling services, Department of Veterans' Affairs websites (e.g. fact sheets), and Ex-Service organisations. Close to half VV spouses/partners had used these types of services (45.3 per cent), as had 10.6 per cent of VEP spouses/partners. While our data does not given details of when military-related services were used, they show the services have had positive effects for spouses'/partners' physical health.

The third moderation effect found related to spouses'/partners' level of social support from friends. Seeing one's friends weekly or more often was associated with the continuation of an effect of veterans' PTSD on spouses'/partners' problem drinking, whereas for those who saw their friends less often, the pathway from veterans' PTSD to problem drinking was non-significant. For spouses/partners who saw their friends weekly or more often, rates of problem drinking were 6 per cent higher among those whose veterans had PTSD by comparison with those whose veterans did not. This difference was only 0.1 per cent among spouses/partners who saw their friends less often.

This result was unexpected, especially since social support from others is often found to be a protective factor that promotes healthy psychological outcomes (e.g. Siedlecki, Salthouse, Oishi, & Jeswani, 2014). One possible explanation is that spouses/partners struggling with the effects of veterans' PTSD frequently sought and obtained the support of friends, whereas those who had found ways of dealing with it did not seek such frequent support. Contact with friends may often have taken place in social situations where alcohol was served, increasing the risk of problem drinking. Another is that the findings reflect the tendency of individuals to associate with others who are similar to themselves. Thus, spouses/partners who engage in problem drinking might have friends who also enjoy drinking and when they meet, the venues chosen are likely to involve drinking.

Previous research has found that friend contacts, especially among females, are significantly likely to influence the spread of heavy alcohol consumption (Rosenquist, Murabito, Fowler, & Christakis, 2010). It is also possible that social contacts can be a catalyst for alcohol use in certain situations; for example, to deal with unhappiness or stress (Kuntsche, von Fischer, & Gmel, 2008) While our data cannot clarify exactly how friends' support contributed to spouses'/partners' problem drinking, these are some possible explanations.

8.4.6 Summary of mediated and moderated effects

The VVFS study sought to more fully understand the effects of deployment to Vietnam on spouses/partners by investigating whether veterans' PTSD underpinned and accounted for ('mediated') the effects of deployment.

On the whole, veterans' PTSD appeared to be a major mechanism through which the effects of deployment were exerted, with mediated effects found for the outcomes of general mental health, problem drinking, general physical health, sleep disturbances, co-occurring mental and physical health problems, and couple relationship quality. Mediated effects were not found for the outcomes of diagnosis or treatment for anxiety or depressive disorders, or skin conditions.

Nevertheless, while mediation of the effects of deployment was evident, direct effects of deployment were often still present, with mediation being partial not complete. Veterans' PTSD fully mediated the effects of deployment on spouse/partner problem drinking, general physical health and co-occurring mental and physical health problems. Direct effects of deployment remained for the outcomes of general mental health, sleep disturbance, mental health problems alone, and couple relationship quality. Overall, it seemed that while veterans' PTSD was a crucial contributor to spouse/partner outcomes, deployment to Vietnam continued to play a role.

The findings indicate that effects of deployment on spouses'/partners' wellbeing are evident more than 40 years after the end of the Vietnam War. While these seemed to be mainly conveyed through the impact of veterans' PTSD, direct effects of deployment were still evident, particularly for spouses'/partners' mental health and their couple relationships.

It was also thought important to investigate whether spouse/partner psychosocial resources mitigated the effect of veterans' PTSD on spouse/partner outcomes. The potential moderating characteristics examined were servicemen's and spouses'/partners' use of services, spouses'/partners' social support, and their coping capacities. Overall, very few moderation effects were found, and for only a very small number of outcomes.

Spouses'/partners' use of military-related services appeared to play an important role in facilitating their physical health and ameliorating the effects of veterans' PTSD. However, weekly or more frequent social support from friends seemed to increase the likelihood of problem drinking among spouses/partners of veterans with PTSD compared to those who had less frequent support, perhaps because contact took place in social situations where alcohol was served. The findings reinforce the importance of spouses/partners having access to military-related services as these appeared to facilitate spouses'/partners' long-term physical health.

8.5 What elements of deployment to Vietnam were related to spouse/partner outcomes?

The third major issue addressed by this report was whether specific characteristics of veterans' deployment to Vietnam would be related to spouses'/partners' wellbeing. These analyses can help clarify the particular aspects of deployment that affect spouses/partners in the long term. The aspects examined were the length of deployment, experience of trauma, exposure to Agent Orange, whether servicemen were conscripted, the type of corps served in and rank held, and whether spouses/partners were in a couple relationship with veterans at the time of their deployment.

We investigated whether these factors would be associated with spouse/partner outcomes after controlling for the effects of veterans' PTSD and other spouse/partner, servicemen, child and parent characteristics previously found to be related to spouse/partner outcomes. Only information from Vietnam veterans and their spouses/partners was used (VEP servicemen and spouse/partner data were excluded). It should be recalled that our earlier analyses showed that the Army Vietnam veterans who took part in the VVFS were broadly representative of the total population of Army veterans who served in Vietnam, increasing confidence in the generalisability of the findings.

Only one significant association was found, with spouses/partners who had been in a couple relationship with veterans at the time of deployment being significantly less likely to report suicidal ideation in their lifetimes than their counterparts who were not in a couple relationship at this time. This finding could to some extent reflect positive effects of long-term couple relationships as these were (by definition) longer if formed prior to deployment. Otherwise, no other significant effects of the elements of deployment examined were found.

It is interesting to note that when analyses were conducted without controlling for servicemen's PTSD and other servicemen and spouse/partner characteristics, several aspects of deployment were significantly related to spouse/partner outcomes. These were: veterans' experience of trauma (a risk for poorer spouse/partner outcomes); exposure to Agent Orange (a risk for poorer spouse/partner outcomes); veterans' rank (spouses/partners of veterans who had served as commissioned officers tended to have better outcomes); and veterans having been conscripted (related to better spouse/partner outcomes). It therefore appears that, once again, servicemen's PTSD mediated the effects of deployment to Vietnam on spouse/partner wellbeing.

8.6 Strengths and limitations of the VVFS study

The VVFS study had a number of strengths. The inclusion of Vietnam-era personnel and their spouses/partners for comparison purposes enabled us to gain a more accurate picture of the effects of service in Vietnam. The VVs in the VVFS study were broadly representative of the total population of Vietnam veterans, as established by comparisons on demographic variables from the Nominal Roll of Vietnam Veterans, increasing confidence in the findings obtained. Adjustment was made for pre-deployment differences between VVs and VEP, making it unlikely that any differences observed would be due to pre-deployment characteristics. The study controlled for a broad range of spouse/partner, serviceman, parent and child factors so that the effects of Vietnam service could be more clearly delineated. The sample size was large, making the study's findings more reliable. The study went beyond simply establishing that VV and VEP spouses/partners differed, by investigating the mechanisms by which deployment to Vietnam affected spouses/partners.

The study also had several limitations. The cross-sectional nature of the study limited our ability to estimate the causality of the correlations as the predictors and outcomes were measured at the same time point. The time frame for the occurrence of some predictor and outcome variables was not known and it is not possible to determine at what stage of life they occurred. For some individuals, the occurrence might have been quite some time ago, while for others it may have been more recent. Again, this makes it difficult to determine causality in the direction of effects. Servicemen's PTSD was assessed in the last four weeks but it is not known whether

this reflects ongoing or recent problems. Additionally, servicemen could have suffered with PTSD at an earlier stage but have recovered. Thus, there is a certain amount of imprecision around the duration of servicemen's PTSD.

While the study assessed a wide range of major life areas, most measures of servicemen's post-deployment risk behaviours assessed recent behaviours. We do not know whether these were typical and reflect stable patterns of behaviours, or whether there has been change over time. This study used self-reported data with few standardised scales. While this is a common practice in social science research, scales do provide greater reliability of measurement. No clinical assessment data were available for mental health and physical health outcomes. While the scales used are highly respected and widely used to identify individuals likely to be experiencing problems, clinical measures are regarded as the 'gold standard' (McCartney & Rosenthal, 2000). While our study was valuable in identifying mechanisms by which service in Vietnam appeared to affect spouses/partners, the data were not able to clarify the processes involved. Other mediators explaining the influence of deployment are possible (e.g. the experience of trauma, servicemen's risky behaviours and couple interactions) and could be explored by future research.

8.7 Implications

The VVFS study confirms there are long-standing effects of deployment to the Vietnam War for the spouses/partners of Australian Army veterans. It has provided evidence of adverse consequences more than 40 years after the war ceased, with the main areas affected being spouses'/partners' mental and physical health, and couple relationships. There were also some socio-economic disparities. While it might seem that the war was waged a very long time ago and effects should have dissipated, our study shows they still persist. One learning from the study is that professionals and service providers assisting spouses/partners should be mindful of the possible presence of stressors arising from veterans' Vietnam experiences. Another is the likely future need for the provision of services and supports for spouses/partners of veterans, especially if veterans are suffering with PTSD. This has implications for policy and practice. For example, there will likely be an ongoing need for the provision of services in the areas of couple relationships and mental health for spouses/partners of VV, especially if VV are dealing with PTSD.

Our findings also confirm the powerful consequences of veterans' PTSD for spouses/partners, which was found to be the major mechanism by which the effects of veterans' deployment to Vietnam impacted on spouses/partners. There is much greater awareness of the deleterious effects of PTSD nowadays than was the case when Vietnam veterans returned home, which has led to the development of tailored services for its remediation. Our study points to the importance of providing

preventative supports and early intervention services for servicemen returning from war to inhibit the onset of PTSD, especially given the long-term effects found here. This would involve monitoring servicemen to detect those with early PTSD symptoms and being responsive in providing services so that servicemen can be helped before symptoms become severe. Ongoing services will also be needed for those suffering the full effects of PTSD. Overall, our findings reinforce the critical importance of policies and services to curtail the development of PTSD in servicemen and help those who are living with its full effects. The flow on effect of these services will likely benefit spouses/partners as well.

Various psychological therapies have been found to be effective for use in treating PTSD, including cognitive behavioural therapy (CBT), individual and group trauma-focused cognitive therapy, and eye movement desensitisation and reprocessing (Bisson et al., 2013). Trauma-focused cognitive therapy, or TF-CBT, is a specialised form of cognitive behavioural therapy that aims to alter the way individuals think about themselves and the event(s) that precipitated their condition, helping them to avoid distorted and dysfunctional cognitions. Eye movement desensitisation and reprocessing, or EMDR, seeks to bring trauma-related images, beliefs and body sensations to mind, in controlled settings, in order to reprocess memories of the event, replacing negative views with more positive ones. Finally, non-TFCBT includes methods such as stress inoculation training, which aims to reduce anxiety by helping PTSD sufferers understand the thoughts underlying their anxiety, develop skills and techniques for stress management, and practice these skills to improve their application and effectiveness (Bisson, Roberts, Andrew, Cooper, & Lewis, 2013; Brewin, 2003).

The involvement of servicemen's families, especially spouses/partners, in the treatment of servicemen's PTSD can also be beneficial for both servicemen and their families. Nelson and Wright (1996) recommend that "treatment should involve family psychoeducation, support groups for both partners and veterans, concurrent individual treatment, and couple or family therapy" (pp. 462). Psychoeducation involves giving individuals an understanding of what PTSD is, how it manifests, and practical strategies to manage it. It is often provided in a group situation which can encourage mutual support and self-help. Couple and family therapy can be particularly helpful when servicemen's PTSD is affecting family life and the wellbeing of other family members (Johnson, 2002). For example, Behavioural Conjoint Therapies (BCT), which is provided alongside CBT, has been found to lead to improvements in veterans' PTSD and couple relationship quality. BCT involves veterans and their spouses/partners and aims to increase positive interactions, and communication and interpersonal problem-solving skills (see the reviews by Dekel & Monson, 2010 and Monson, Taft, & Fredman, 2009).

A third key implication is the valuable role played by military-related services in assisting spouses/partners. Access to these services was found to substantially reduce the impact of veterans' PTSD on spouses'/partners' physical health. It was interesting that access of more general health services did not convey the same benefits, therefore it seems likely that the military-related services had a deeper understanding of the issues that spouses/partners were encountering and knowledge of the strategies that were likely to be most useful. Two corollaries can be taken from our findings: first, that these services seem to be doing a good job; and second, it is important that they continue to be provided in the future.

This would appear necessary both for Vietnam veterans and their families and for servicemen involved in more recent conflicts and their families who are also likely to have long-term needs as suggested by our VVFS findings.

In summary, the study has provided valuable new Australian evidence about the very long-term effects of service in the Vietnam War on the spouses/partners of Army veterans. While many spouses/partners were faring well, effects of veterans' Vietnam service remained evident into late mid-life and older age, especially if veterans were suffering with PTSD.

Appendix A: Mechanisms of deployment: results

Table A.1 Mechanisms of deployment—results for anxiety

	Structural equation modelling		
Anxiety	**OR**	**Standard error**	**Significance**
Deployment	1.20	0.20	0.27
Servicemen's PTSD	1.37	0.24	0.08
Control variables			
Spouse/partner characteristics			
Age	0.97	0.02	0.08
Education (ref. Year 10 or below)			
Year 11 or 12	1.33	0.31	0.23
Certificate or diploma	1.51	0.34	0.07
University	1.25	0.32	0.38
Working status (ref. working)			
Retired/semi-retired	1.54	0.33	0.05
Household duties	1.46	0.34	0.10
Living with disability	4.17	2.96	0.03
Other	2.72	1.45	0.03
Served in defence	1.35	0.51	0.43
Number of children	0.99	0.06	0.90
Length of couple relationship	1.00	0.01	0.62
Financial stress in the past	1.28	0.29	0.28
Disciplinary behaviours	0.42	0.24	0.13
Behavioural problems	1.35	0.23	0.08
Learning problems	1.04	0.17	0.81
Gifted or talented	1.09	0.32	0.78
Servicemen health			
Bodily pain	1.01	0.00	0.21
Physical functioning	0.99	0.00	0.12
Children health			
Mental and behavioural problems	1.63	0.29	0.01
Allergies	1.34	0.24	0.09
Lifelong condition	0.76	0.16	0.19
Nervous system diseases	1.08	0.19	0.65
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.64	0.24	0.001
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-

	Structural equation modelling		
Anxiety	**OR**	**Standard error**	**Significance**
Spouse/partner bodily pain	1.00	0.00	0.98
Spouse/partner physical functioning	0.99	0.01	0.13
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	1.76	0.28	0.001
	Test statistics	**Standard error**	***p*-value**
Sobel test	0.57	0.38	0.57

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.2 Mechanisms of deployment—results for depression

	Structural equation modelling		
Depression	**OR**	**Standard error**	**Significance**
Deployment	1.29	0.24	0.16
Servicemen's PTSD	1.06	0.18	0.78
Control variables			
Spouse/partner characteristics			
Age	0.97	0.02	0.06
Education (ref. Year 10 or below)			
Year 11 or 12	0.82	0.17	0.32
Certificate or diploma	1.03	0.21	0.90
University	0.95	0.24	0.83
Working status (ref. working)			
Retired/semi-retired	1.06	0.22	0.79
Household duties	0.98	0.22	0.92
Living with disability	4.00	2.57	0.03
Other	2.14	1.02	0.11
Served in defence	1.34	0.46	0.39
Number of children	1.06	0.07	0.33
Length of couple relationship	1.00	0.01	0.99
Financial stress in the past	1.21	0.28	0.41
Disciplinary behaviours	1.09	0.60	0.87
Behavioural problems	1.16	0.20	0.40
Learning problems	1.14	0.19	0.45
Gifted or talented	1.21	0.33	0.48

	Structural equation modelling		
Depression	**OR**	**Standard error**	**Significance**
Servicemen health			
Bodily pain	1.00	0.00	0.25
Physical functioning	1.00	0.00	0.36
Children health			
Mental and behavioural problems	1.59	0.29	0.01
Allergies	1.15	0.18	0.38
Lifelong condition	0.73	0.16	0.16
Nervous system diseases	0.95	0.15	0.73
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.77	0.27	0.00
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	0.99	0.00	0.09
Spouse/partner physical functioning	0.98	0.01	0.003
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	1.51	0.23	0.01
		Effects (Coef.)	
	Test statistics	**Standard error**	***p*-value**
Sobel test	0.74	0.42	0.46

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.3 Mechanisms of deployment—results for suicidal ideation

	Structural equation modelling		
Suicidal ideation	**OR**	**Standard error**	**Significance**
No suicidal ideation (ref.)			
Suicidal thoughts			
Deployment	1.32	0.24	0.13
Servicemen's PTSD	1.47	0.28	0.04
Control variables			
Spouse/partner characteristics			
Age	0.98	0.02	0.33
Education (ref. Year 10 or below)			
Year 11 or 12	1.05	0.22	0.81
Certificate or diploma	1.15	0.20	0.42
University	1.49	0.37	0.11
Working status (ref. working)			
Retired/semi-retired	0.81	0.16	0.28
Household duties	0.94	0.22	0.78
Living with disability	3.92	2.84	0.06
Unemployed or other (e.g., studying)	1.38	0.65	0.50
Served in defence	1.28	0.38	0.41
Number of children	1.02	0.08	0.79
Length of couple relationship	0.99	0.01	0.36
Financial stress in the past	1.28	0.25	0.21
Disciplinary behaviours	7.84	4.04	0.00
Behavioural problems	1.45	0.25	0.03
Learning problems	1.25	0.23	0.22
Gifted or talented	1.36	0.33	0.20
Servicemen health			
Bodily pain	1.00	0.00	0.37
Physical functioning	1.00	0.00	0.54
Children health			
Mental and behavioural problems	1.70	0.33	0.01
Allergies	1.01	0.18	0.95
Lifelong condition	0.91	0.22	0.69
Nervous system diseases	1.00	0.17	0.99
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.54	0.24	0.01
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	0.98	0.00	0.01
Spouse/partner physical functioning	0.99	0.01	0.43

	Structural equation modelling		
Suicidal ideation	**OR**	**Standard error**	**Significance**
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	0.73	0.13	0.08
	Test statistics	**Standard error**	***p*-value**
Sobel test	1.98	0.41	0.05
Suicidal plans/actions			
Deployment	1.36	0.41	0.30
Servicemen's PTSD	1.52	0.40	0.11
Control variables			
Spouse/partner characteristics			
Age	0.96	0.03	0.22
Education (ref. Year 10 or below)			
Year 11 or 12	1.47	0.48	0.24
Certificate or diploma	0.83	0.25	0.53
University	1.08	0.53	0.88
Working status (ref. working)			
Retired	0.70	0.25	0.32
Household duties	1.02	0.38	0.96
Living with disability	8.87	7.73	0.01
Other	2.77	2.11	0.18
Served in defence	1.46	0.65	0.40
Number of children	1.10	0.10	0.28
Length of couple relationship	0.95	0.01	0.002
Financial stress in the past	1.37	0.38	0.26
Disciplinary behaviours	4.42	3.70	0.08
Behavioural problems	1.56	0.46	0.13
Learning problems	0.91	0.27	0.75
Gifted or talented	1.83	0.86	0.20
Servicemen health			
Bodily pain	1.00	0.01	0.76
Physical functioning	1.00	0.01	0.80
Children health			
Mental and behavioural problems	1.98	0.64	0.04
Lifelong condition	1.48	0.67	0.39
Nervous system diseases	1.33	0.35	0.26
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	2.05	0.56	0.01
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	0.99	0.01	0.06

	Structural equation modelling		
Suicidal ideation	**OR**	**Standard error**	**Significance**
Spouse/partner physical functioning	0.98	0.01	0.15
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	1.50	0.46	0.18
	Test statistics	**Standard error**	***p*-value**
Sobel test	1.57	0.57	0.12

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.4 Mechanisms of deployment—results for problem drinking

	Structural equation modelling		
Problem drinking	**OR**	**Standard error**	**Significance**
Deployment	1.98	0.71	0.06
Servicemen's PTSD	2.12	0.66	0.02
Control variables			
Spouse/partner characteristics			
Age	0.92	0.03	0.006
Education (ref. Year 10 or below)			
Year 11 or 12	2.47	1.08	0.04
Certificate or diploma	1.16	0.45	0.70
University	1.81	0.87	0.22
Working status (ref. working)			
Retired/semi-retired	1.26	0.48	0.54
Household duties	0.71	0.33	0.47
Living with disability	0.00	0.00	0.00
Other	1.38	0.93	0.64
Served in defence	0.86	0.45	0.78
Number of children	0.96	0.12	0.73
Length of couple relationship	0.97	0.01	0.02
Financial stress in the past	1.81	0.60	0.08
Disciplinary behaviours	0.65	0.65	0.67
Behavioural problems	0.71	0.26	0.34
Learning problems	0.88	0.34	0.75
Gifted or talented	1.17	0.49	0.71

	Structural equation modelling		
Problem drinking	**OR**	**Standard error**	**Significance**
Servicemen health			
Bodily pain	1.00	0.01	0.74
Physical functioning	1.00	0.01	0.62
Children health			
Mental and behavioural problems	1.55	0.48	0.15
Allergies	1.43	0.39	0.19
Lifelong condition	0.58	0.28	0.27
Nervous system diseases	1.00	0.31	0.99
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.85	0.54	0.03
Either parent had drinking problems	1.77	0.57	0.07
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	1.00	0.01	0.59
Spouse/partner lifelong condition	-	-	-
	Effects (Coef.)		
	Test statistics	**Standard error**	***p*-value**
Sobel test	2.37	0.68	0.02

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.5 Mechanisms of deployment—results for mental health SF36 scores

	Structural equation modelling		
Overall mental health	**Std Coefficient**	**Standard error**	**Significance**
Deployment	-0.12	0.02	0.00
Servicemen's PTSD	-0.09	0.02	0.01
Control variables			
Spouse/partner characteristics			
Age	0.05	0.02	0.04
Education (ref. Year 10 or below)			
Year 11 or 12	0.03	0.02	0.20
Certificate or diploma	-0.01	0.02	0.77
University	0.02	0.03	0.57
Working status (ref. working)			
Retired/semi-retired	0.04	0.03	0.12
Household duties	-0.01	0.03	0.60
Living with disability	-0.08	0.04	0.03
Other	-0.02	0.02	0.45
Served in defence	0.01	0.02	0.82
Number of children	-0.03	0.03	0.28
Length of couple relationship	0.01	0.03	0.77
Financial stress in the past	-0.02	0.02	0.46
Disciplinary behaviours	0.02	0.01	0.19
Behavioural problems	-0.04	0.02	0.09
Learning problems	-0.03	0.02	0.15
Gifted or talented	-0.00	0.02	0.81
Servicemen health			
Bodily pain	0.02	0.03	0.43
Physical functioning	0.06	0.03	0.06
Children health			
Mental and behavioural problems	-0.09	0.02	0.00
Allergies	-0.02	0.02	0.39
Lifelong condition	-0.01	0.02	0.56
Nervous system diseases	-0.00	0.02	0.98
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	-0.04	0.02	0.04
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	0.38	0.03	0.00
Spouse/partner physical functioning	0.22	0.03	0.00
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-0.01	0.02	0.59

	Structural equation modelling		
Overall mental health	**Std Coefficient**	**Standard error**	**Significance**
		Mediation test	
	Test statistics	**Standard error**	***p*-value**
Sobel test	-3.30	0.34	0.00

Note: '–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.6 Mechanisms of deployment—results for skin condition

	Structural equation modelling		
Skin condition	**OR**	**Standard error**	**Significance**
Deployment	1.77	0.35	0.004
Servicemen's PTSD	1.06	0.21	0.75
Control variables			
Spouse/partner characteristics			
Age	0.98	0.02	0.29
Education (ref. Year 10 or below)			
Year 11 or 12	1.49	0.39	0.13
Certificate or diploma	1.29	0.26	0.20
University	1.31	0.32	0.28
Working status (ref. working)			
Retired/semi-retired	1.11	0.24	0.64
Household duties	0.77	0.17	0.24
Living with disability	1.92	0.95	0.20
Other	0.95	0.60	0.93
Served in defence	1.07	0.34	0.82
Number of children	1.00	0.06	0.98
Length of couple relationship	1.00	0.01	0.67
Financial stress in the past	1.66	0.34	0.01
Disciplinary behaviours	0.62	0.37	0.62
Behavioural problems	1.29	0.24	1.29
Learning problems	1.10	0.21	1.10
Gifted or talented	0.83	0.20	1.03
Servicemen health			
Bodily pain	1.00	0.00	0.40
Physical functioning	1.01	0.01	0.27
Children health			
Mental and behavioural problems	1.52	0.35	0.06
Allergies	0.99	0.18	0.97
Lifelong condition	1.03	0.23	1.03
Nervous system diseases	1.43	0.27	0.06

	Structural equation modelling		
Skin condition	**OR**	**Standard error**	**Significance**
Model specific controls			
Either parent had lifelong condition	1.18	0.28	0.89
Either parent had skin condition	3.10	0.56	0.00
Either parent had mental health problems	-	-	-
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
	Test statistics	**Standard error**	***p*-value:**
Sobel test	0.31	0.42	0.75

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.7 Mechanisms of deployment—results for sleep condition

	Structural equation modelling		
Sleep condition	**OR**	**Standard error**	**Significance**
Deployment	1.60	0.26	0.01
Servicemen's PTSD	1.85	0.32	0.00
Control variables			
Spouse/partner characteristics			
Age	1.00	0.02	0.98
Education (ref. Year 10 or below)			
Year 11 or 12	0.71	0.14	0.09
Certificate or diploma	1.10	0.19	0.58
University	1.17	0.29	0.53
Working status (ref. working)			
Retired/semi-retired	1.12	0.22	0.57
Household duties	1.09	0.22	0.68
Living with disability	12.33	8.18	0.00
Other	1.62	0.88	0.37
Served in defense	1.45	0.49	0.27
Number of children	1.08	0.06	0.15
Length of couple relationship	1.01	0.09	0.51

	Structural equation modelling		
Sleep condition	**OR**	**Standard error**	**Significance**
Financial stress in the past	1.82	0.32	0.00
Disciplinary behaviours	0.87	0.41	0.77
Behavioural problems	1.76	0.28	0.00
Learning problems	0.96	0.16	0.81
Gifted or talented	1.70	0.39	0.02
Servicemen health			
Bodily pain	1.00	0.00	0.23
Physical functioning	1.00	0.00	0.25
Children health			
Mental and behavioural problems	1.39	0.22	0.04
Allergies	1.10	0.17	0.55
Lifelong condition	0.97	0.19	0.86
Nervous system diseases	1.33	0.20	0.07
Model specific controls			
Either parent had lifelong condition	1.36	0.27	0.12
Either parent had skin condition	-	-	-
Either parent had mental health problems	-	-	-
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
		Effects (Coef.)	
	Test statistics	**Standard error**	***p*-value:**
Sobel test	3.38	0.39	0.00

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.8 Mechanisms of deployment—results for general physical health

	Structural equation modelling		
General physical health	**Std Coef.**	**Standard error**	**Significance**
Deployment	-0.00	0.03	0.88
Servicemen's PTSD	-0.09	1.29	0.00
Control variables			
Spouse/partner characteristics			
Age	-0.15	0.11	0.00
Education (ref. Year 10 or below)			
Year 11 or 12	0.05	1.32	0.07
Certificate or diploma	0.08	1.16	0.01
University	0.13	1.46	0.00
Working status (ref. working)			
Retired/semi-retired	-0.07	1.14	0.03
Household duties	-0.05	1.36	0.07
Living with disability	-0.26	3.95	0.00
Other	-0.01	3.38	0.68
Served in defence	-0.02	2.47	0.49
Number of children	0.02	0.42	0.59
Length of couple relationship	0.07	0.06	0.02
Financial stress in the past	-0.08	1.18	0.00
Disciplinary behaviours	-0.09	7.39	0.03
Behavioural problems	-0.09	1.10	0.00
Learning problems	-0.06	1.12	0.02
Gifted or talented	0.04	0.03	0.30
Servicemen health			
Bodily pain	0.04	0.03	0.30
Physical functioning	0.13	0.03	0.00
Children health			
Mental and behavioural problems	-0.10	1.22	0.00
Allergies	-0.04	1.05	0.14
Lifelong condition	-0.07	1.47	0.00
Nervous system diseases	0.01	1.00	0.84
Model specific controls			
Either parent had lifelong condition	-0.03	0.03	0.30
Either parent had skin condition	-	-	-
Either parent had mental health problems	-	-	-
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-

	Structural equation modelling		
General physical health	Std Coef.	Standard error	Significance
		Mediation test	
	Test statistic	Standard error	*p*-value
Sobel test	-3.01	0.42	0.00

Notes: '–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.9 Mechanisms of deployment—results for combined physical and mental health burden

	Structural equation modelling		
Combined health burden	OR	Standard error	Significance
No health burden (ref.)			
Physical health burden only			
Deployment	0.67	0.18	0.14
Servicemen's PTSD	1.70	0.59	0.13
Control variables			
Spouse/partner characteristics			
Age	1.06	0.02	0.00
Education (ref. Year 10 or below)			
Year 11 or 12	1.19	0.41	0.60
Certificate or diploma	0.86	0.28	0.64
University	0.61	0.25	0.24
Working status (ref. working)			
Retired/semi-retired	2.59	0.94	0.01
Household duties	2.28	1.00	0.06
Living with disability	53.62	49.22	0.00
Other	1.82	1.54	0.48
Served in defence	1.43	0.77	0.51
Number of children	0.91	0.08	0.26
Length of couple relationship	0.96	0.02	0.02
Financial stress in the past	1.43	0.47	0.28
Disciplinary behaviours	3.04	2.53	0.18
Behavioural problems	0.96	0.25	0.88
Learning problems	0.82	0.22	0.45
Gifted or talented	1.07	0.41	0.86
Servicemen health			
Bodily pain	0.99	0.01	0.50
Physical functioning	0.99	0.01	0.35

	Structural equation modelling		
Combined health burden	**OR**	**Standard error**	**Significance**
Children health			
Mental and behavioural problems	1.09	0.37	0.81
Allergies	1.05	0.26	0.83
Lifelong condition	1.94	0.55	0.02
Nervous system diseases	1.13	0.30	0.64
Model specific controls			
Either parent had lifelong condition	1.31	0.67	0.60
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.08	0.26	0.73
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
	Effects (Coef.)		
	Test statistic	**Standard error**	***p*-value**
Sobel test	1.52	0.75	0.13
Mental health burden only			
Deployment	3.01	0.83	0.00
Servicemen's PTSD	1.72	0.37	0.01
Control variables			
Spouses/partners characteristics			
Age	0.94	0.02	0.01
Education (ref. Year 10 or below)			
Year 11 or 12	0.63	0.21	0.16
Certificate or diploma	0.94	0.23	0.79
University	0.92	0.40	0.84
Working status (ref. working)			
Retired/semi-retired	0.58	0.17	0.07
Household duties	0.79	0.24	0.44
Living with disability	0.00	0.00	0.00
Other	1.96	1.15	0.26
Served in defence	2.19	0.91	0.06
Number of children	1.06	0.09	0.46
Length of couple relationship	1.00	0.01	0.90
Financial stress in the past	0.88	0.25	0.66
Disciplinary behaviours	0.21	0.23	0.15
Behavioural problems	1.27	0.32	0.34
Learning problems	1.25	0.32	0.38
Gifted or talented	1.25	0.46	0.55

	Structural equation modelling		
Combined health burden	**OR**	**Standard error**	**Significance**
Servicemen health			
Bodily pain	1.00	0.05	0.49
Physical functioning	0.99	0.01	0.25
Children health			
Mental and behavioural problems	1.36	0.33	0.20
Allergies	0.90	0.20	0.64
Lifelong condition	0.72	0.25	0.35
Nervous system diseases	1.24	0.29	0.36
Model specific controls			
Either parent had lifelong condition	1.32	0.40	0.36
Either parent had skin condition	-	-	-
Either parent had mental health problems	0.78	0.18	0.28
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
	Effects (Coef.)		
	Test statistic	**Standard error**	***p*-value**
Sobel test	2.43	0.48	0.02
Physical and mental health burden			
Deployment	0.98	0.21	0.93
Servicemen's PTSD	2.53	0.51	0.00
Control variables			
Spouse/partner characteristics			
Age	1.04	0.02	0.03
Education (ref. Year 10 or below)			
Year 11 or 12	0.94	0.23	0.81
Certificate or diploma	0.93	0.20	0.72
University	0.47	0.20	0.08
Working status (ref. working)			
Retired/semi-retired	1.27	0.34	0.37
Household duties	1.17	0.38	0.63
Living with disability	214.54	209.95	0.00
Other	1.23	0.84	0.77
Served in defence	1.50	0.55	0.26
Number of children	1.18	0.09	0.04
Length of couple relationship	0.99	0.02	0.64
Financial stress in the past	1.18	0.24	0.42
Disciplinary behaviours	5.19	4.33	0.05

	Structural equation modelling		
Combined health burden	**OR**	**Standard error**	**Significance**
Behavioural problems	1.45	0.34	0.11
Learning problems	1.05	0.27	0.86
Gifted or talented	0.90	0.26	0.72
Servicemen health			
Bodily pain	1.00	0.01	0.85
Physical functioning	0.98	0.00	0.00
Children health			
Mental and behavioural problems	1.95	0.39	0.00
Allergies	1.60	0.34	0.03
Lifelong condition			
Nervous system diseases	0.84	0.17	0.38
Model specific controls			
Either parent had lifelong condition	0.81	0.19	0.39
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.64	0.31	0.01
Either parent had drinking problems	-	-	-
Spouse/partner mental health summary	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
		Effects (Coef.)	
	Test statistics	**Standard error**	***p*-value:**
Sobel test	4.29	0.46	0.00

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table A.10 Mechanisms of deployment—results for couple relationship

	Structural equation modelling		
Couple relationship	**Std Coef.**	**Standard error**	**Significance**
Deployment	-0.16	0.03	0.00
Servicemen's PTSD	-0.16	0.03	0.00
Control variables			
Spouse/partner characteristics			
Age	0.04	0.03	0.13

	Structural equation modelling		
Couple relationship	**Std Coef.**	**Standard error**	**Significance**
Education (ref. Year 10 or below)			
Year 11 or 12	0.01	0.02	0.68
Certificate or diploma	-0.01	0.03	0.63
University	-0.02	0.03	0.45
Working status (ref. working)			
Retired/semi-retired	0.07	0.03	0.02
Household duties	0.07	0.03	0.01
Living with disability	-0.00	0.02	0.97
Other	-0.02	0.03	0.44
Served in defence	0.04	0.03	0.18
Number of children	-0.04	0.03	0.11
Length of couple relationship	-0.02	0.03	0.48
Financial stress in the past	-0.07	0.02	0.00
Disciplinary behaviours	-0.01	0.02	0.76
Behavioural problems	-0.03	0.03	0.29
Learning problems	0.01	0.02	0.77
Gifted or talented	-0.02	0.03	0.56
Servicemen health			
Bodily pain	0.04	0.04	0.31
Physical functioning	0.02	0.04	0.68
Children health			
Mental and behavioural problems	-0.05	0.02	0.05
Allergies	0.01	0.02	0.59
Lifelong condition	-0.02	0.02	0.54
Nervous system diseases	-0.03	0.02	0.30
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	-	-	-
Either parent had drinking problems	-	-	-
Servicemen had mental health problems	-0.10	0.03	0.00
Spouse/partner had mental health problems	-0.13	0.02	0.00
Spouse/partner bodily pain	0.09	0.03	0.01
Spouse/partner physical functioning	-0.05	0.03	0.11
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
		Mediation test	
	Test statistics	**Standard error**	***p*-value**
Sobel test	-4.56	0.02	0.00

Notes: '–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Appendix B: Moderation results

Table B.1 Moderation effect of spouses/partners' use of military-related services—results for general physical health

General physical health	Std Coefficient	Standard error	Significance
Deployment	0.03	0.03	0.36
Servicemen's PTSD	-0.14	0.04	0.00
Spouses/partners' use of military-related services	-0.14	0.07	0.03
Interaction between 'spouses/partners' use of military-related services' and 'servicemen's PTSD'	0.10	0.04	0.02
Interaction between 'spouses/partners' use of military-related services' and 'deployment''	0.03	0.06	0.68
Control variables			
Spouse/partner characteristics			
Age	-0.15	0.03	0.00
Education (ref. Year 10 or below)			
Year 11 or 12	0.05	0.02	0.05
Certificate or diploma	0.09	0.03	0.00
University	0.13	0.03	0.00
Working status (ref. working)			
Retired/semi-retired	-.06	0.03	0.04
Household duties	-0.05	0.03	0.11
Living with disability	-0.26	0.05	0.00
Other	-0.01	0.02	0.63
Served in defence	-0.02	0.03	0.58
Number of children	0.02	0.03	0.65
Length of couple relationship	0.07	0.03	0.03
Financial stress in the past	-0.08	0.03	0.00
Disciplinary behaviours	-0.09	0.05	0.07
Behavioural problems	-0.08	0.02	0.00
Learning problems	-0.06	0.02	0.02
Gifted or talented	-0.02	0.02	0.37
Servicemen health			
Bodily pain	0.03	0.04	0.41
Physical functioning	0.12	0.04	0.00
Children health			
Mental and behavioural problems	-0.10	0.03	0.00
Allergies	-0.04	0.03	0.15
Lifelong condition	-0.07	0.02	0.01
Nervous system diseases	0.00	0.03	0.91
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-

General physical health	Std Coefficient	Standard error	Significance
Either parent had mental health problems	-	-	-
Either parent had drinking problems	-	-	-
Servicemen had mental health problems	-	-	-
Spouses/partners had mental health problems	-	-	-
Spouses/partners bodily pain	-	-	-
Spouses/partners physical functioning	-	-	-
Spouses/partners physical health summary	-	-	-
Spouses/partners lifelong condition	-0.04	0.03	0.16
Abuse in couple relationship	-	-	-

Notes: '–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table B.2 Moderation effect of spouses/partners' use of military-related services—results for combined burden of mental and physical health problems

Cumulative health burden	OR	Standard error	Significance
No burden (reference)			
Physical health problems only			
Deployment	0.67	0.22	0.23
Servicemen's PTSD	3.36	1.42	0.00
Spouses/partners' use of military-related services	4.91	2.91	0.01
Interaction between 'spouses/partners' use of military-related services' and 'servicemen's PTSD'	0.18	0.12	0.01
Interaction between 'spouses/partners' use of military-related services' and 'deployment''	0.42	0.29	0.20
Control variables			
Spouse/partner characteristics			
Age	1.07	0.02	0.00
Education (ref. Year 10 or below)			
Year 11 or 12	1.15	0.39	0.69
Certificate or diploma	0.77	0.22	0.35
University	0.59	0.24	0.20
Working status (ref. working)			
Retired/semi-retired	2.67	0.99	0.01
Household duties	2.19	0.88	0.05
Living with disability	48.33	46.33	0.00
Other	2.33	2.03	0.33
Served in defence	1.19	0.71	0.77
Number of children	0.93	0.08	0.35
Length of couple relationship	0.97	0.01	0.01
Financial stress in the past	1.56	0.49	0.15

Cumulative health burden	OR	Standard error	Significance
Disciplinary behaviours	3.55	2.93	0.13
Behavioural problems	0.89	0.24	0.68
Learning problems	0.77	0.23	0.38
Gifted or talented	1.08	0.42	0.83
Servicemen health			
Bodily pain	0.99	0.01	0.44
Physical functioning	0.99	0.01	0.35
Children health			
Mental and behavioural problems	1.14	0.41	0.72
Allergies	1.05	0.27	0.86
Lifelong condition	1.97	0.56	0.02
Nervous system diseases	1.14	0.31	0.63
Model specific controls			
Either parent had lifelong condition	1.55	0.61	0.27
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.05	0.26	0.84
Either parent had drinking problems	-	-	-
Servicemen had mental health problems	-	-	-
Spouse/partner had mental health problems	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition			
Mental health problems only			
Deployment	2.56	0.76	0.00
Servicemen's PTSD	2.10	0.60	0.01
Spouses/partners' use of military-related services	1.00	0.61	1.00
Interaction between 'spouses/partners' use of military-related services' and 'servicemen's PTSD'	0.61	0.26	0.25
Interaction between 'spouses/partners' use of military-related services' and 'deployment''	1.50	1.03	0.56
Control variables			
Spouse/partner characteristics			
Age	0.94	0.02	0.01
Education (ref. Year 10 or below)			
Year 11 or 12	0.62	0.21	0.15
Certificate or diploma	0.93	0.23	0.77
University	0.90	0.40	0.80
Working status (ref. working)			
Retired/semi-retired	0.58	0.17	0.07
Household duties	0.77	0.24	0.42
Living with disability	0.00	0.00	0.00
Other	2.16	1.29	0.20

Cumulative health burden	OR	Standard error	Significance
Served in defence	2.12	0.84	0.06
Number of children	1.06	0.09	0.46
Length of couple relationship	1.00	0.01	0.90
Financial stress in the past	0.88	0.25	0.65
Disciplinary behaviours	0.22	0.24	0.17
Behavioural problems	1.23	0.31	0.41
Learning problems	1.25	0.32	0.38
Gifted or talented	1.24	0.45	0.55
Servicemen health			
Bodily pain	1.00	0.00	0.57
Physical functioning	0.99	0.01	0.27
Children health			
Mental and behavioural problems	1.34	0.33	0.23
Allergies	0.91	0.20	0.68
Lifelong condition	0.72	0.26	0.36
Nervous system diseases	1.25	0.29	0.34
Model specific controls			
Either parent had lifelong condition	1.34	0.41	0.33
Either parent had skin condition	-	-	-
Either parent had mental health problems	0.77	0.18	0.25
Either parent had drinking problems	-	-	-
Servicemen had mental health problems	-	-	-
Spouse/partner had mental health problems	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition			
Both mental and physical problems			
Deployment	0.91	0.24	0.72
Servicemen's PTSD	2.72	0.76	0.00
Spouses/partners' use of military-related services	2.38	1.16	0.08
Interaction between 'spouses/partners' use of military-related services' and 'servicemen's PTSD'	0.74	0.28	0.43
Interaction between 'spouses/partners' use of military-related services' and 'deployment''	0.69	0.37	0.49
Control variables			
Spouse/partner characteristics			
Age	1.04	0.02	0.03
Education (ref. Year 10 or below)			
Year 11 or 12	0.89	0.22	0.63
Certificate or diploma	0.86	0.19	0.49
University	0.45	0.20	0.07
Working status (ref. working)			

Cumulative health burden	OR	Standard error	Significance
Retired/semi-retired	1.23	0.33	0.45
Household duties	1.08	0.36	0.81
Living with disability	198.24	194.87	0.00
Other	1.20	0.85	0.80
Served in defence	1.38	0.51	0.39
Number of children	1.19	0.09	0.03
Length of couple relationship	1.00	0.01	0.79
Financial stress in the past	1.17	0.24	0.45
Disciplinary behaviours	5.50	4.92	0.06
Behavioural problems	1.39	0.33	0.17
Learning problems	1.02	0.27	0.94
Gifted or talented	0.93	0.27	0.81
Servicemen health			
Bodily pain	1.00	0.01	0.89
Physical functioning	0.99	0.00	0.00
Children health			
Mental and behavioural problems	1.94	0.39	0.00
Allergies	1.61	0.35	0.03
Lifelong condition	1.41	0.35	0.16
Nervous system diseases	0.84	0.17	0.41
Model specific controls			
Either parent had lifelong condition	0.87	0.21	0.55
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.64	0.31	0.01
Either parent had drinking problems	-	-	-
Servicemen had mental health problems	-	-	-
Spouse/partner had mental health problems	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	-	-	-
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition			

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Table B.3 Moderation effect of spouses/partners see their friends weekly—results for problem drinking

Problem drinking	OR	Standard error	Significance
Deployment	1.69	0.66	0.18
Servicemen's PTSD	1.02	0.40	0.96
Spouses/partners see friends weekly	0.19	0.14	0.02
Interaction between 'spouses/partners see friends weekly' and 'servicemen's PTSD'	6.84	4.70	0.01
Interaction between 'spouses/partners see friends weekly' and 'deployment'	2.06	2.04	0.46
Control variables			
Spouse/partner characteristics			
Age	0.92	0.03	0.02
Education (ref. Year 10 or below)			
Year 11 or 12	2.79	1.27	0.03
Certificate or diploma	1.25	0.50	0.58
University	1.93	0.97	0.19
Working status (ref. working)			
Retired/semi-retired	1.21	0.48	0.63
Household duties	0.70	0.34	0.47
Living with disability	0.00	0.00	0.00
Other	1.17	0.80	0.82
Served in defence	0.94	0.48	0.91
Number of children	1.00	0.12	1.00
Length of couple relationship	0.97	0.02	0.03
Financial stress in the past	1.99	0.69	0.05
Disciplinary behaviours	0.79	0.79	0.82
Behavioural problems	0.69	0.26	0.33
Learning problems	0.88	0.36	0.76
Gifted or talented	1.24	0.56	0.64
Servicemen health			
Bodily pain	1.00	0.01	0.72
Physical functioning	1.00	0.01	0.70
Children health			
Mental and behavioural problems	1.26	0.42	0.48
Allergies	1.57	0.42	0.09
Lifelong condition	0.45	0.27	0.18
Nervous system diseases	1.01	0.32	0.98
Model specific controls			
Either parent had lifelong condition	-	-	-
Either parent had skin condition	-	-	-
Either parent had mental health problems	1.80	0.55	0.05
Either parent had drinking problems	1.72	0.58	0.10

Problem drinking	OR	Standard error	Significance
Servicemen had mental health problems	-	-	-
Spouse/partner had mental health problems	-	-	-
Spouse/partner bodily pain	-	-	-
Spouse/partner physical functioning	1.00	0.01	0.60
Spouse/partner physical health summary	-	-	-
Spouse/partner lifelong condition	-	-	-
Abuse in couple relationship	-	-	-

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

'–' refers to variables that were not included in the mediation model.

Source: Vietnam Veterans Family Study

Appendix C: Impact of deployment on outcomes of veteran's spouses/partners: analysis result

Table C.1 Impact of deployment on general mental health of veteran's spouse/partner

	Coefficient	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	0.70	1.17	0.55
More than 12 months	1.92	1.41	0.17
Exposure to agent orange	-1.20	1.06	0.26
Exposure to trauma	-0.59	0.64	0.36
Conscription	1.77	1.09	0.10
Deployment instability	0.25	1.04	0.81
In a couple relationship during deployment	-1.89	2.46	0.44
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	0.48	1.58	0.76
Royal Australian Artillery	1.58	1.76	0.37
Others	1.41	1.20	0.24
Rank			
Enlisted		Reference category	
Non-commissioned	0.24	1.14	0.84
Officer	3.67	1.96	0.06
Control variables			
Spouses/partner age	0.31	0.10	0.003
Spouses/partner working status			
Working		Reference category	
Retired/semi-retired	0.47	1.36	0.73
Household duties	-1.83	1.53	0.23
Living with disability	-6.90	4.95	0.16
Other	0.33	4.63	0.94
Mental and behavioural problems of children	-4.01	1.05	0.00
Either parent had mental health problems	-1.15	1.02	0.26
Spouse/partner bodily pain	0.32	0.03	0.00
Spouse/partner physical functioning	0.29	0.04	0.00

Source: Vietnam Veterans Family Study

Table C.2 Impact of deployment on anxiety of veteran's spouse/partner

	OR	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8-12 months	0.92	0.16	0.61
More than 12 months	0.71	0.15	0.10
Exposure to agent orange	1.16	0.18	0.35
Exposure to trauma	1.08	0.09	0.38
Conscription	0.79	0.13	0.14
Deployment instability	1.02	0.16	0.89
In a couple relationship during deployment			
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	1.21	0.27	0.40
Royal Australian Artillery	1.00	0.26	0.99
Others	0.82	0.15	0.27
Rank			
Enlisted		Reference category	
Non-commissioned	0.84	0.13	0.27
Officer	1.02	0.27	0.95
Control variables			
Veterans' PTSD	1.30	0.19	0.07
Working status (ref. working)			
Retired/semi-retired	1.08	0.21	0.71
Household duties	1.09	0.24	0.69
Living with disability	4.11	2.97	0.05
Other	0.50	0.40	0.39
Spouse/partner lifelong condition	1.57	0.23	0.00

Source: Vietnam Veterans Family Study

Table C.3 Impact of deployment on depression of veteran's spouse/partner

	OR	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	0.83	0.14	0.29
More than 12 months	0.70	0.15	0.09
Exposure to agent orange	0.95	0.15	0.73
Exposure to trauma	1.11	0.11	0.29
Conscription	0.77	0.12	0.11
Deployment instability	1.03	0.16	0.85
In a couple relationship during deployment			
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	1.19	0.28	0.46
Royal Australian Artillery	0.94	0.25	0.81
Others	1.04	0.19	0.82
Rank			
Enlisted		Reference category	
Non-commissioned	0.82	0.14	0.24
Officer	1.09	0.30	0.78
Control variables			
Veterans' PTSD	1.17	0.17	0.27
Working status			
Working		Reference category	
Retired/semi-retired	0.66	0.13	0.03
Household duties	0.73	0.16	0.16
Living with disability	2.62	2.18	0.25
Other	0.98	0.65	0.98
Mental and behavioural problems	1.44	0.22	0.01
Either parent had mental health problems	1.52	0.22	0.00
Spouse/partner physical functioning	0.98	0.00	0.00
Spouse/partner lifelong condition	1.32	0.21	0.09

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

Source: Vietnam Veterans Family Study

Table C.4 Impact of deployment on problem drinking of veteran's spouse/partner

	OR	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8-12 months	0.52	0.19	0.07
More than 12 months	0.69	0.29	0.38
Exposure to agent orange	0.84	0.28	0.61
Exposure to trauma	1.45	0.28	0.06
Conscription	0.90	0.30	0.75
Deployment instability	1.55	0.50	0.18
In a couple relationship during deployment	2.29	1.83	0.30
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	1.52	0.76	0.41
Royal Australian Artillery	2.08	1.07	0.16
Others	1.40	0.54	0.38
Rank			
Enlisted		Reference category	
Non-commissioned	1.01	0.35	0.97
Officer	0.35	0.37	0.33
Control variables			
Veterans' PTSD	2.03	0.65	0.03
Spouse/partner age	0.90	0.03	0.00
Spouse/partner education			
Year 10 or below		Reference category	
Year 11 or 12	1.34	0.59	0.51
Certificate or diploma	1.22	0.44	0.58
University	1.53	0.76	0.40
Working status			
Working		Reference category	
Retired/semi-retired	1.65	0.69	0.24
Household duties	0.88	0.43	0.79
Living with disability		Omitted	
Other	2.33	2.76	0.48
Length of couple relationship	0.98	0.01	0.11
Parent had mental health problems	1.59	0.49	0.13

Note: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

Source: Vietnam Veterans Family Study

Table C.5 Impact of deployment on suicidal ideation of veteran's spouse/partner

	OR	Standard error	Significance
No suicidal ideation		Reference category	
Suicidal thoughts			
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	-0.23	0.18	0.20
More than 12 months	-0.13	0.21	0.55
Exposure to agent orange	-0.06	0.16	0.70
Exposure to trauma	-0.04	0.10	0.73
Conscription	-0.03	0.17	0.85
Deployment instability	0.19	0.16	0.24
In a couple relationship during deployment	-0.72	0.45	0.11
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	0.01	0.24	0.97
Royal Australian Artillery	0.26	0.26	0.33
Others	-0.09	0.19	0.63
Rank			
Enlisted		Reference category	
Non-commissioned	-0.10	0.17	0.58
Officer	-0.18	0.31	0.55
Control variables			
Veterans' PTSD	0.42	0.15	0.01
Working status (ref. working)			
Working		Reference category	
Retired/semi-retired	-0.23	0.20	0.26
Household duties	0.03	0.23	0.91
Living with disability	0.34	0.81	0.68
Other	0.87	0.64	0.18
Mental and behavioural problems of children	0.64	0.16	0.00
Either parent had mental health problems	0.26	0.16	0.10
Spouse/partner physical functioning	-0.01	0.00	0.00
Spouse/partner lifelong condition	-0.00	0.16	0.98
Suicidal plans/actions			
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	0.14	0.31	0.66
More than 12 months	-0.10	0.39	0.80
Exposure to agent orange	-0.58	0.29	0.05
Exposure to trauma	0.24	0.17	0.15

	OR	Standard error	Significance
Conscription	-0.14	0.29	0.62
Deployment instability	0.48	0.27	0.07
In a couple relationship during deployment	0.38	0.53	0.47
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	0.40	0.42	0.34
Royal Australian Artillery	0.11	0.49	0.83
Others	0.43	0.32	0.17
Rank			
Enlisted		Reference category	
Non-commissioned	-0.48	0.32	0.13
Officer	0.22	0.45	0.63
Control variables			
Veterans' PTSD	0.30	0.26	0.25
Spouse/partner working status (ref. working)			
Working		Reference category	
Retired/semi-retired	-0.93	0.33	0.01
Household duties	-0.06	0.35	0.87
Living with disability	0.70	0.94	0.46
Other	-11.81	406.76	0.98
Mental and behavioural problems of children	0.56	0.26	0.03
Either parent had mental health problems	0.72	0.25	0.00
Spouse/partner physical functioning	-0.03	0.01	0.00
Spouse/partner lifelong condition	0.30	0.31	0.33

Note: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

Source: Vietnam Veterans Family Study

Table C.6 Impact of deployment on general physical health of veteran's spouse/partner

	Coefficient	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	1.75	1.40	0.21
More than 12 months	2.46	1.68	0.14
Exposure to agent orange	-0.03	1.26	0.98
Exposure to trauma	-0.52	0.77	0.50
Conscription	1.59	1.29	0.22
Deployment instability	-0.33	1.24	0.79
In a couple relationship during deployment	-3.50	2.98	0.24
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	1.54	1.89	0.42
Royal Australian Artillery	0.11	2.11	0.96
Others	-0.56	1.43	0.70
Rank			
Enlisted		Reference category	
Non-commissioned	0.66	1.36	0.63
Officer	1.02	2.40	0.67
Control variables			
Veterans' PTSD	-3.06	1.22	0.01
Spouse/partner age	-0.63	0.12	0.00
Spouse/partner education			
Year 10 or below		Reference category	
Year 11 or 12	1.94	1.68	0.25
Certificate or diploma	3.34	1.34	0.01
University	6.75	1.99	0.00
Working status			
Working		Reference category	
Retired/semi-retired	-2.00	1.64	0.23
Household duties	-2.73	1.87	0.14
Living with disability	-39.84	5.79	0.00
Other	-2.36	5.53	0.67
Financial stress in the past	-3.34	1.35	0.01
Behavioural problems in school	-4.61	1.41	0.00
Learning problems in school	-3.66	1.44	0.01
Mental and behavioural problems of children	-4.97	1.25	0.00
Lifelong condition of children	-4.36	1.69	0.01

Source: Vietnam Veterans Family Study

Table C.7 Impact of deployment on skin condition of veteran's spouse/partner

	Coefficient	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	0.91	0.18	0.65
More than 12 months	0.84	0.21	0.49
Exposure to agent orange	1.16	0.21	0.41
Exposure to trauma	0.96	0.11	0.70
Conscription	1.18	0.23	0.38
Deployment instability	0.86	0.16	0.40
In a couple relationship during deployment	1.21	0.49	0.65
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	1.04	0.29	0.88
Royal Australian Artillery	1.35	0.39	0.30
Others	1..06	0.23	0.79
Rank			
Enlisted		Reference category	
Non-commissioned	0.94	0.19	0.77
Officer	1.37	0.44	0.34
Control variables			
Veterans' PTSD	1.10	0.19	0.58
Financial stress in the past	1.90	0.35	0.00
Either parent had skin condition	3.35	0.62	0.00

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

Source: Vietnam Veterans Family Study

Table C.8 Impact of deployment on sleep disturbance of veteran's spouses/partners

	OR	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	0.98	0.17	0.88
More than 12 months	0.85	0.18	0.42
Exposure to agent orange	0.98	0.15	0.90
Exposure to trauma	1.01	0.10	0.89
Conscription	1.05	0.17	0.78
Deployment instability	1.03	0.16	0.84
In a couple relationship during deployment	1.42	0.50	0.32
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	1.28	0.30	0.29
Royal Australian Artillery	0.98	0.26	0.95
Others	1.26	0.22	0.19
Rank			
Enlisted		Reference category	
Non-commissioned	0.97	0.16	0.83
Officer	1.00	0.28	0.99
Control variables			
Veterans' PTSD	1.21	0.18	0.20
Working		Reference category	
Retired/semi-retired	1.02	0.20	0.93
Household duties	1.46	0.32	0.09
Living with disability	2.52	1.75	0.18
Other	0.76	0.56	0.71
Financial stress in the past	1.61	0.26	0.00
Behavioural problems	1.91	0.31	0.00
Gifted or talented	1.98	0.49	0.01
Mental and behavioural problems of children	1.77	0.26	0.00

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

Source: Vietnam Veterans Family Study

Table C.9 Impact of deployment on cumulative burden of physical and mental health problems of veteran's spouse/partner

	OR	Standard error	Significance
No burden		Reference category	
Physical health problems only			
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8–12 months	-0.01	0.31	0.97
More than 12 months	-0.13	0.39	0.75
Exposure to agent orange	0.40	0.28	0.16
Exposure to trauma	-0.15	0.18	0.40
Conscription	0.06	0.31	0.83
Deployment instability	-0.06	0.29	0.83
In a couple relationship during deployment	0.23	0.57	0.69
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	-0.09	0.45	0.85
Royal Australian Artillery	0.39	0.47	0.41
Others	0.29	0.33	0.38
Rank			
Enlisted		Reference category	
Non-commissioned	0.01	0.32	0.97
Officer	-0.05	0.51	0.92
Control variables			
Veterans' PTSD	-0.02	0.28	0.93
Spouse/partner working status			
Working		Reference category	
Retired/semi-retired	0.75	0.44	0.09
Household duties	0.57	0.50	0.25
Living with disability	2.88	1.49	0.05
Other	-13.13	1,236.45	0.99
Number of children	-0.07	0.11	0.53
Length of couple relationship	0.01	0.02	0.44
Physical functioning of veterans	-0.01	0.01	0.08
Children health			
Mental and behavioural problems	0.15	0.29	0.62
Allergies	-0.23	0.27	0.41
Lifelong condition	0.55	0.34	0.11
Mental health problems only			
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	

	OR	Standard error	Significance
8–12 months	0.02	0.28	0.94
More than 12 months	-0.1	0.33	0.97
Exposure to agent orange	0.16	0.25	0.53
Exposure to trauma	0.07	0.15	0.65
Conscription	-0.13	0.25	0.61
Deployment instability	-0.01	0.25	0.98
In a couple relationship during deployment	0.57	0.61	0.35
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	0.54	0.36	0.13
Royal Australian Artillery	0.46	0.41	0.25
Others	0.28	0.29	0.34
Rank			
Enlisted		Reference category	
Non-commissioned	-0.38	0.27	0.17
Officer	-0.70	0.59	0.23
Control variables			
Veterans' PTSD	0.42	0.24	0.08
Spouse/partner age	-0.05	0.03	0.07
Spouse/partner working status			
Working		Reference category	
Retired/semi-retired	-0.27	0.29	0.34
Household duties	-0.29	0.33	0.38
Living with disability	-14.11	1869.18	0.99
Other	-0.21	1.13	0.85
Number of children	0.03	0.08	0.73
Length of couple relationship	-0.01	0.01	0.28
Physical functioning of veterans	-0.01	0.00	0.16
Children health			
Mental and behavioural problems of children	0.30	0.26	0.25
Allergies	-0.08	0.25	0.75
Lifelong condition	-0.01	0.36	0.98
Both physical and mental problems			
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8-12 months	-0.19	0.23	0.41
More than 12 months	-0.32	0.27	0.24
Exposure to agent orange	0.11	0.20	0.58
Exposure to trauma	0.08	0.12	0.52
Conscription	-0.44	0.21	0.04
Deployment instability	0.11	0.20	0.59

	OR	Standard error	Significance
In a couple relationship during deployment	0.26	0.46	0.57
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	-0.45	0.34	0.19
Royal Australian Artillery	-0.06	0.34	0.86
Others	-0.07	0.23	0.75
Rank			
Enlisted		Reference category	
Non-commissioned	-0.04	0.22	0.87
Officer	-0.55	0.40	0.16
Control variables			
Veterans' PTSD	0.69	0.20	0.00
Spouse/partner age	0.07	0.20	0.00
Spouse/partner working status			
Working		Reference category	
Retired/semi-retired	0.60	0.31	0.05
Household duties	0.89	0.33	0.01
Living with disability	3.92	1.13	0.00
Other	0.53	0.91	0.56
Number of children	0.01	0.07	0.86
Length of couple relationship	-0.02	0.01	0.15
Physical functioning of veterans	-0.01	0.00	0.05
Mental and behavioural problems of children	0.85	0.20	0.00
Children's allergies	0.15	0.20	0.43
Children's lifelong conditions	0.40	0.26	0.12

Notes: OR – refers to odds ratio. The odds ratio (OR) is a relative measure of risk, that tells how much more likely it is that someone who is exposed to the factor under study will develop the outcome compared to someone who is not exposed. The OR of greater than 1 suggests that the outcome is more likely for those who were exposed to the factor compared to those who were not. The odds ratio of 1 suggests that there is no difference in the outcome between two groups. An OR of less than 1 suggests the outcome is less likely for those who were exposed to the factor compared to those who were not.

Source: Vietnam Veterans Family Study

Table C.10 Impact of deployment on couple relationship quality of veteran's spouses/partners

	Std. Coefficient	Standard error	Significance
Deployment—related characteristics			
Total duration			
Up to 8 months		Reference category	
8-12 months	0.12	0.07	0.06
More than 12 months	0.04	0.08	0.63
Exposure to agent orange	-0.11	0.06	0.08
Exposure to trauma	-0.03	0.04	0.36
Conscription	-0.01	0.06	0.84
Deployment instability	0.03	0.06	0.61
In a couple relationship during deployment	-0.04	0.14	0.80
Corps			
Royal Australian Infantry		Reference category	
Royal Australian Engineers	-0.01	0.09	0.95
Royal Australian Artillery	-0.10	0.10	0.30
Others	-0.03	0.07	0.65
Rank			
Enlisted		Reference category	
Non-commissioned	0.05	0.06	0.41
Officer	0.15	0.11	0.17
Control variables			
Veterans' PTSD	-0.23	0.06	
Spouse/partner working status			
Working		Reference category	
Retired/semi-retired	0.10	0.07	0.15
Household duties	0.09	0.08	0.31
Living with disability	-0.20	0.27	0.47
Other	-0.05	0.26	0.86
Financial stress in the past	-0.10	0.06	0.10
Mental health and behavioural problems of children	-0.19	0.06	0.00
Veterans' mental health problems	-0.19	0.06	0.00
Spouse/partner mental problems	-0.22	0.05	0.00
Spouse/partner bodily pain	0.00	0.00	0.01

Source: Vietnam Veterans Family Study

Glossary

Term	Description
Cohen's d	An effect size used to indicate the standardised difference between two mean scores.
Cramér's V	Also known as Cramer's phi; is an effect size to indicate the association between two variables, based on chi-squared statistic.
Effect size	A quantitative measure of magnitude of the difference between two groups, or the correlation between two variables.
Marginal effect	Marginal effects shows how an outcome variable changes when a specific explanatory variable changes. Other covariates are assumed to be held constant. Often calculated when analysing regression results.
Mediation	A model to identify and explain the mechanism or process that underlies an observed relationship between a predictor and an outcome via the inclusion of a third variable, known as a mediator variable.
Moderation	A model to determine whether the relationship between two variables depends on (is moderated by) the value of a third variable, known as a moderator variable.
Nominal Roll	This roll was developed by Department of Veterans' Affairs in conjunction with Defence and was used as the main tool for recruitment into this study.
Protective factors	A variable associated with a lower likelihood of negative outcomes or that reduces the negative impact of a risk factor on negative outcomes.
Representativeness	The degree to which the sample selected for study can accurately represent or reflect the broad characteristics of the target population.
Risk factor	A variable associated with a lower likelihood of positive outcomes and a higher likelihood of negative outcomes.
Selection bias	A bias in which a sample is collected in such a way that some members of the intended population are less likely to be included.
Stata	A general-purpose statistical software package. Stata version 15 was used in this study.
Vietnam veterans	For the purpose of this study, Army servicemen who were deployed to the Vietnam War (1962–75)
Vietnam-era personnel	For the purpose of this study, Army servicemen who served in the Australian military at the time of the Vietnam War but were not deployed.

Abbreviations

Term	Description
ADF	Australian Defence Force
AIFS	Australian Institute of Family Studies
BCT	Behavioural Conjoint Therapy
CBT	Cognitive Behavioural Therapy
DVA	Department of Veterans' Affairs
FSS	Family Satisfaction Scale
PTSD	Post-traumatic stress disorder
PSA	Propensity Score Analysis
RAS	Relationship Assessment Scale
SF36	The Short Form (36-item) Health Survey
S/P	Spouses/partners
VVFS	Vietnam Veterans Family Study
VEP	Vietnam-era personnel
VV	Vietnam veterans
WAST	Women Abuse Screening Tool

References

Allen, E. S., Rhoades, G. K., Stanley, S. M., & Markman, H. J. (2010). Hitting home: relationships between recent deployment, posttraumatic stress symptoms, and marital functioning for Army couples. *Journal of Family Psychology, 24*(3), 280–288.

Angrist, J. D., & Johnson IV, J. H. (2000). Effects of work-related absences on families: Evidence from the Gulf War. *ILR Review, 54*(1), 41–58.

Barak, Y., Bodner, E., Klayman, N., Ring, A., & Elizur, A. (2000). Anxiety among Israeli soldiers during the Gulf War. *European Archive of Psychiatry for Clinical Neural Science, 250*, 148–151.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.

Bisson, J. I., Roberts, N. P., Andrew, M., Cooper, R., & Lewis, C. (2013). Psychological therapies for chronic post-traumatic stress disorder (PTSD) in adults. *Cochrane Database Syst. Rev., 12*.

Blank, C., Adams, L. A., Kittelson, B., Connors, R. A., & Padden, D. L. (2012). Coping behaviors used by Army wives during deployment separation and their perceived effectiveness. *Journal of the American Academy of Nurse Practitioners, 24*(11), 660–668.

Blount, B. W., Curry, A., & Lubin, G. I. (1992). Family separations in the military. *Military Medicine, 157*, 76–80.

Blow, A. J., Gorman, L., Ganoczy, D., Kees, M., Kashy, D. A., Valenstein, M., ... & Chermack, S. (2013). Hazardous drinking and family functioning in National Guard veterans and spouses postdeployment. *Journal of Family Psychology, 27*(2), 303.

Bowling, U. B., & Sherman, M. D. (2008). Welcoming them home: Supporting service members and their families in navigating the tasks of reintegration. *Professional Psychology: Research and Practice, 39*(4), 451–458.

Brewin, C. (2003). *Posttraumatic stress disorder: Malady or myth?* New Haven, CT: Yale University Press.

Butterworth, P., Crosier, T., & Rodgers, B. (2004). Mental health problems, disability and income support receipt: A replication and extension using the HILDA survey. *Australian Journal of Labour Economics,* 7(2), 151–174.

Burrell, L. M., Adams, G. A., Durand, D. B., & Castro, C. A. (2006). The impact of military lifestyle demands on well-being, army, and family outcomes. *Armed Forces & Society, 33*(1), 43–58.

Burton, T., Farley, D., & Rhea, A. (2009a). Stress-induced somatization in spouses of deployed and nondeployed servicemen. *Journal of the American Association of Nurse Practitioners, 21*(6), 332–339.

Burton, T., Farley, D., & Rhea, A. (2009b). Stress-induced somatization in spouses of deployed and nondeployed servicemen. *Journal of the American Academy of Nurse Practitioners, 21*(6), 332–339.

Calhoun, P. S., Beckham, J. C., & Bosworth, H. B. (2002). Caregiver burden and psychological distress in partners of veterans with chronic posttraumatic stress disorder. *Journal of traumatic stress, 15*(3), 205–212.

Carver, C. (1997). You want to measure coping but your protocol's too long: consider the Brief COPE. *International Journal of Behavioural Medicine, 4*(1), 92–100.

Chartrand, M. M., Frank, D. A., White, L. F., & Shope, T. R. (2008). Effect of parents' wartime deployment on the behavior of young children in military families. *Archives of Pediatrics and Adolescent Medicine, 162*(11), 1009–1014.

Chatterjee, S., Spiro, A., King, L., King, D., & Davison, E. (2009). Research on aging military veterans: Lifespan implications of military service. *PTSD Research Quarterly, 20*(3), 1–8.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. New York, NY: Routledge Academic.

Commonwealth of Australia (2014). Vietnam Veterans Health Study. *Volume 1, Introduction and Summary of the Studies of Vietnam Veterans Families*. Department of Veterans' Affairs, Canberra.

Cortina, J. M., & Landis, R. S. (2009). When small effect sizes tell a big story, and when large effect sizes don't. In C. E. Lance & R. J. Vandenberg (Eds.), *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences* (pp. 287–308). New York, NY: Routledge/Taylor & Francis Group.

Crane, P. J., Barnard, D. L., Horsley, K., & Adena, M. A. (1997). *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.

Dal Grande, E., & Taylor, A. (2004). *Quality of life in South Australia as measured by the SF-36: Population Norms for 2002, Trends from 1994 to 2002 and Impact of Chronic Diseases and Health Risk Factors on Quality of Life*. Population Research and Outcome Studies Unit.

Daraganova, G., Smart, D., & Romaniuk, H. (2018). *Family Wellbeing Study: Part 1: Families of Current and Ex-Serving ADF Members: Health and Wellbeing*. Canberra: Department of Defence and Department of Veterans' Affairs.

Davis, J., Ward, D. B., & Storm, C. (2011). The unsilencing of military wives: Wartime deployment experiences and citizen responsibility. *Journal of Marital and Family Therapy, 37*(1), 51–63.

Davy, C. (2012). *The Middle East Area of Operations (MEAO) health study: Prospective study report*. Herston, Qld: Centre for Military and Veterans' Health.

Dekel, R., Solomon, Z., & Bleich, A. (2005). Emotional distress and marital adjustment of caregivers: Contribution of level of impairment and appraised burden. *Anxiety, Stress & Coping, 18*(1), 71–82.

Dekel, R., & Monson, C. M. (2010). Military-related post-traumatic stress disorder and family relations: Current knowledge and future directions. *Aggression and Violent Behavior, 15*(4), 303–309.

DiMauro, J., Renshaw, K. D., & Kashdan, T. B. (2016). Beliefs in negative mood regulation and daily negative affect in PTSD. *Personality and Individual Differences, 95*, 34-36.

Doyle, M. E., & Peterson, K. A. (2005). Re-entry and reintegration: Returning home after combat. *Psychiatric Quarterly, 76*(4), 361–370.

Easterling, B., & Knox, D. (2010). Left behind: How military wives experience the deployment of their husbands. *Journal of Family Life*, 1–22.

Eaton, K. M., Hoge, C. W., Messer, S. C., Whitt, A. A., Cabrera, O. A., McGurk, D. et al. (2008). Prevalence of mental health problems, treatment need, and barriers to care among primary care-seeking spouses of military service members involved in Iraq and Afghanistan deployments. *Military Medicine, 173*(11), 1051–1056.

Evans, L., McHugh, T., Hopwood, M., & Watt, C. (2003). Chronic posttraumatic stress disorder and family functioning of Vietnam veterans and their partners. *Australian & New Zealand Journal of Psychiatry, 37*(6), 765–772.

Everson, R. B. (2005). *Quality of life among Army spouses: Parenting and family stress during deployment to Operation Iraqi Freedom*. Tallahassee, FL: Florida State University.

Foa, E., Riggs, D., & Gershuny, B. (1995). Numbing, intrusion, and arousal: Symptom patterns of post-traumatic stress disorder. *American Journal of Psychiatry, 152,* 116–120.

Forrest, W., Edwards , B., & Daraganova, G. (2014). *Vietnam Veterans Health Study. Volume 2, A Study of Health and Social Issues in Vietnam Veteran Sons and Daughters*. Melbourne: Australian Institute of Family Studies.

Gallagher, J. G., Riggs, D. S., Byrne, C. A., & Weathers, F. W. (1998). Female partners' estimations of male veterans' combat-related PTSD severity. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies, 11*(2), 367–374.

Galovski, T., & Lyons, J. A. (2004). Psychological sequelae of combat violence: A review of the impact of PTSD on the veteran's family and possible interventions. Aggression and *Violent Behavior, 9*(5), 477–501.

Ghahramanlou-Holloway, M., Cox, D. W., Fritz, E. C., & George, B. J. (2011). An evidence-informed guide for working with military women and veterans. *Professional Psychology: Research and Practice, 42*(1), 1–7.

Goff, B. S. N., Crow, J. R., Reisbig, A. M., & Hamilton, S. (2007). The impact of individual trauma symptoms of deployed soldiers on relationship satisfaction. *Journal of Family Psychology, 21*(3), 344–353.

Guo, S., & Fraser, M. W. (2014). *Propensity score analysis: Statistical methods and applications (Vol. 12)*. Thousand Oaks, CA: Sage.

Haas, D. M., & Pazdernik, L. A. (2007). Partner deployment and stress in pregnant women. *The Journal of Reproductive Medicine, 52*(10), 901–906.

Haas, D. M., Pazdernik, L. A., & Olsen, C. H. (2005). A cross-sectional survey of the relationship between partner deployment and stress in pregnancy during wartime. *Women's Health Issues, 15*(2), 48–54.

Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regress-Based Approach*. New York, NY: The Guilford Press.

Hendrick S.S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and the Family, 50*, 93–98.

Hendrix, C. C., Erdmann, M. A., & Briggs, K. (1998). Impact of Vietnam veterans' arousal and avoidance on spouses' perceptions of family life. *American Journal of Family Therapy, 26*(2), 115–128.

Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New England Journal of Medicine, 351*(1), 13-22.

Horesh, D, Solomon, Z, Keinan, G & Ein-Dor, T. (2013). The clinical picture of late-onset PTSD: a 20-year longitudinal study of Israeli war veterans. *Psychiatry Research, 208* (3), 265–73.

Jordan, B. K., Marmar, C. R., Fairbank, J. A., Schlenger, W. E., Kulka, R. A., Hough, R. L., & Weiss, D. S. (1992). Problems in families of male Vietnam veterans with posttraumatic stress disorder. *Journal of consulting and clinical psychology, 60*(6), 916–926.

Keeling, M., Wesseley, S., Dandeker, C., Jones, N., & Fear, N. T. (2015). Relationship difficulties among U.K, military personnel: Impact of sociodemographic, military, and deployment-related factors. *Marriage & Family Review, 51*(3), 275–303.

Kilpatrick, D. G., Koenen, K. C., Ruggiero, K. J., Acierno, R., Galea, S., Resnick, H. S. et al. (2007). The serotonin transporter genotype and social support and moderation of posttraumatic stress disorder and depression in hurricane-exposed adults. *American Journal of Psychiatry, 164*(11), 1693–1699.

Kulka, R. A. (1990). *The national Vietnam veterans readjustment study: Tables of findings and technical appendices*. New York: Brunner/Mazel Publisher.

Kuntsche, E., von Fischer, M., & Gmel, G. (2008). Personality factors and alcohol use: A mediator analysis of drinking motives. *Personality and individual differences, 45*(8), 796–800.

Lapp, C. A., Taft, L. B., Tollefson, T., Hoepner, A., Moore, K., & Divyak, K. (2010). Stress and coping on the home front: Guard and reserve spouses searching for a new normal. *Journal of Family Nursing, 16*(1), 45–67.

Lazarus, R. S., & Folkman, S. (1984). *Coping and adaptation* (Vol. 282325). New York: Guilford.

Lester, P., Peterson, K., Reeves, J., Knauss, L., Glover, D., Mogil, C. et al. (2010). The long war and parental combat deployment: Effects on military children and at-home spouses. *Journal of the American Academy of Child & Adolescent Psychiatry, 49*(4), 310–320.

Litz, B. T. (1992). Emotional numbing in combat-related post-traumatic stress disorder: A critical review and reformulation. *Clinical psychology review, 12*(4), 417–432.

Lindelow, M., Hardy, R., & Rodgers, B. (1997). Development of a scale to measure symptoms of anxiety and depression in the general UK population: the psychiatric symptom frequency scale. *Journal of Epidemiology & Community Health, 51*(5), 549-557.

Loxley, W., Toumbourou, J., Stockwell, T., Haines, B., Scott, K., Godfrey, C. et al. (2004). *The prevention of substance use, risk and harm in Australia: A review of the evidence*. Canberra: Commonwealth of Australia.

MacDonell, G. V., Bhullar, N., & Thorsteinsson, E. B. (2016). Depression, anxiety, and stress in partners of Australian combat veterans and military personnel: A comparison with Australian population norms. *Peer Journal Preprints, 4*, e1876v2. https://doi.org/10.7287/peerj.preprints.1876v2

MacFarlane, E., Simpson, P., Benke, G., & Sim, M. R. (2011). Suicide in Australian pesticide-exposed workers. *Occupational medicine, 61*(4), 259–264.

MacPherson, M. (2009). *Long Time Passing, New Edition: Vietnam and the Haunted Generation*. Bloomington, IN: Indiana University Press.

Manguno-Mire, G., Sautter, F., Lyons, J., Myers, L., Perry, D., Sherman, M. et al. (2007). Psychological distress and burden among female partners of combat veterans with PTSD. *The Journal of Nervous and Mental Disease, 195*(2), 144–151.

Mansfield, A. J., Kaufman, J. S., Marshall, S. W., Gaynes, B. N., Morrissey, J. P., & Engel, C. C. (2010). Deployment and the use of mental health services among US Army wives. *New England Journal of Medicine, 362*(2), 101–109.

McDonnell, D. P., Landry, J., & Detke, H. C. (2014). Long-term safety and efficacy of olanzapine long-acting injection in patients with schizophrenia or schizoaffective disorder: a 6-year, multinational, single-arm, open-label study. *International clinical psychopharmacology, 29*(6), 322.

McCartney, K., & Rosenthal, R. (2000). Effect size, practical importance, and social policy for children. *Child Development, 71*(1), 173–180.

McGuire, A., Runge, C., Cosgrove, L., Bredhauer, K., Anderson, R., Waller, M., et al.(2012). *Timor-Leste Family Study: Technical Report*. Brisbane: The University of Queensland, Centre for Military and Veterans' Health.

Meis, L. A., Erbes, C. R., Polusny, M. A., & Compton, J. S. (2010). Intimate relationships among returning soldiers: The mediating and moderating roles of negative emotionality, PTSD symptoms, and alcohol problems. *Journal of Traumatic Stress, 23*(5), 564–572.

Mendlowicz, M. V., & Stein, M. B. (2000). Quality of life in individuals with anxiety disorders. *American Journal of Psychiatry, 157*(5), 669–682.

Merolla, A. J. (2010). Relational maintenance during military deployment: Perspectives of wives of deployed US soldiers. *Journal of Applied Communication Research, 38*(1), 4–26.

Monson, C. M., Taft, C. T., & Fredman, S. J. (2009). Military-related PTSD and intimate relationships: From description to theory-driven research and intervention development. *Clinical Psychology Review, 29*(8), 707–714.

Murphey, D. A., Darling-Churchill, K., & Chrisler, A. (2011). The well-being of young children in military families: a review and recommendations for further study. *Child Trends, 21,* 1–43.

Murray, C. (2016). The Experience of Deployment for Partners of Military Personnel: A Qualitative Meta-synthesis. *Journal of Couple and Relationship Therapy, 15*(2), 102–120.

National Health and Medical Research Council (NHMRC). (2009). *Australian Guidelines to Reduce Health Risks from Drinking Alcohol*. Canberra: NHMRC.

Nelson, B. S., & Wright, D.W. (1996). Understanding and treating post-traumatic stress disorder in female partners of Veterans with PTSD. *Journal of Marital and Family Therapy, 22*, 455-467.

Ngo, A. D., Taylor, R., Roberts, C. L., & Nguyen, T. V. (2006). Association between Agent Orange and birth defects: systematic review and meta-analysis. *International Journal of Epidemiology, 35*(5), 1220–1230.

Ntoumanis, N., Edmunds, J., & Duda, J. L. (2009). Understanding the coping process from a self-determination theory perspective. *British Journal of Health Psychology, 14*(2), 249- 260.

Olson, D. (2011). FACES IV and the Circumplex Model: Validations Study. *Journal of Marital & Family Therapy, 3*(1), 64–80.

O'Toole, B. I., Outram, S., Catts, S. V., & Pierse, K. R. (2010). The mental health of partners of Australian Vietnam veterans three decades after the war and its relation to veteran military service, combat, and PTSD. *The Journal of Nervous and Mental Disease, 198*(11), 841–845.

Padden, D. L., Connors, R. A., & Agazio, J. G. (2011a). Determinants of health-promoting behaviors in military spouses during deployment separation. *Military Medicine, 176*(1), 26–34.

Padden, D. L., Connors, R. A., & Agazio, J. G. (2011b). Stress, coping, and well-being in military spouses during deployment separation. *Western Journal of Nursing Research, 33*(2), 247–267.

Pietrzak, E., Pullman, S., Cotea, C., & Nasveld, P. (2013). Effects of deployment on health behaviours in military forces: A review of longitudinal studies. *Journal of Military and Veterans' Health, 21*(1), 14–23.

Pittman, J. F., Kerpelman, J. L., & McFadyen, J. M. (2004). Internal and external adaptation in army families: Lessons from Operations Desert Shield and Desert Storm. *Family relations, 53*(3), 249–260.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research, 42*(1), 185–227.

Rapaport, M. H., Clary, C., Fayyad, R., & Endicott, J. (2005). Quality-of-life impairment in depressive and anxiety disorders. *American Journal of Psychiatry, 162*(6), 1171–1178.

Rea, L. M., & Parker, R. A. (1992). *Designing and conducting survey research*. San Francisco, CA: Jossey Bass.

Riggs, D. S., Byrne, C. A., Weathers, F. W., & Litz, B. T. (1998). The quality of the intimate relationships of male Vietnam veterans: Problems associated with posttraumatic stress disorder. *Journal of Traumatic Stress, 11*(1), 87–101.

Robrecht, D. T., Millegan, J., Leventis, L. L., Crescitelli, J., & McLay, R. N. (2008). Spousal military deployment as a risk factor for postpartum depression. *Journal of Reproductive Medicine, 53*(11), 860–864.

Rosen, L. N., & Moghadam, L. Z. (1990). Matching the support to the stressor: Implications for the buffering hypothesis. *Military Psychology, 2*(4), 193.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika, 70*(1), 41–55.

Rosenquist, J. N., Murabito, J., Fowler, J. H., & Christakis, N. A. (2010). The spread of alcohol consumption behavior in a large social network. *Annals of Internal Medicine, 152*(7), 426–433.

Russell A, Ball J, Spallek M. (1998). *Data Dictionary Supplement*. *Australian Longitudinal Study on Womens Health.* The SF-36 – ALSWH.

Santiago, P. N., Ursano, R. J., Gray, C. L., Pynoos, R. S., Spiegel, D., Lewis-Fernandez, R. et al. (2013). A systematic review of PTSD prevalence and trajectories in DSM-5 defined trauma exposed populations: international and non-international traumatic events. *Plos One, 8*(4), 1–5.

Sayer, N. A., Noorbaloochi, S., Frazier, P., Carlson, K., Gravely, A., & Murdoch, M. (2010). Reintegration problems and treatment interests among Iraq and Afghanistan combat veterans receiving VA medical care. *Psychiatric Services, 61*(6), 589–597.

Schwartz, D. A., Doebbeling, B. N., Merchant, J. A., & Barret, D. H. (1997). Self-reported illness and health status among Gulf War veterans: A population-based study. *Journal of the American Medical Association, 277*, 238–245.

Shehan, C. L. (1987). Spouse support and Vietnam veterans' adjustment to post-traumatic stress disorder. *Family relations*, 55–60.

Shlosberg, A., & Strous, R.D. (2005). Long-term follow-up (32 years) of PTSD in Israeli Yom Kippur war veterans. *Journal of Nervous and Mental Disease, 193*(10), 693–696.

Siedlecki, K., Salthouse, T., Oishi, S., & Jeswani, S. (2014). The Relationship Between Social Support and Subjective Well-Being Across Age. *Social Indicators Research, 117*(2), 561–576.

Simmons, R., Maconochie, N., & Doyle, P. (2004). Self-reported ill health in male UK Gulf War veterans: A retrospective cohort study. *BMC Public Health, 4*(1), 27.

Skomorovsky, A. (2014). Deployment stress and well-being among military spouses: The role of social support. *Military Psychology, 26*, 44–54.

Solomon, S., Greenberg, J., & Pyszczynski, T. (1991). A terror management theory of social behavior: The psychological functions of self-esteem and cultural worldviews. *Advances in Experimental Social Psychology,* 93–159.

Solomon, Z., Dekel, R., & Zerach, G. (2008). The relationships between posttraumatic stress symptom clusters and marital intimacy among war veterans. *Journal of Family Psychology, 22*(5), 659–666.

Solomon, Z., Waysman, M., Belkin, R., Levy, G., Mikulincer, M., & Enoch, D. (1992). Marital relations and combat stress reaction: The wives' perspective. *Journal of Marriage and the Family,* 316-326.

Solomon, Z., Waysman, M., Levy, G., Fried, B., Mikulincer, M., Benbenishty, R. et al. (1992). From front line to home front: A study of secondary traumatization. *Family Process, 31*(3), 289–302.

Stefanovics, E. A., Potenza, M. N., & Pietrzak, R. H. (2017). Gambling in a National US Veteran Population: Prevalence, socio-demographics, and psychiatric comorbidities. *Journal of Gambling Studies, 33*(4), 1099–1120.

Tanielian, T. (2009). *Assessing combat exposure and post-traumatic stress disorder in troops and estimating the costs to society: Implications from the RAND Invisible Wounds of War Study* (No. RAND-CT-321). Santa Monica Ca: Rand Corp.

Tansey, C. M., Raina, P., & Wolfson, C. (2013). Veterans' physical health. *Epidemiologic Reviews, 35*(1), 66–74.

Thomas, J. L., Wilk, J. E., Riviere, L. A., McGurk, D., Castro, C. A., & Hoge, C. W. (2010). Prevalence of mental health problems and functional impairment among active component and National Guard soldiers 3 and 12 months following combat in Iraq. *Archives of General Psychiatry, 67*(6), 614–623.

The Department of Veterans Affairs (2013). *Veteran Mental Health Strategy: A ten year framework*. Canberra, Australia.

Trewick, N., & Muller, J. (2014). Unemployment in military spouses: An examination of the latent and manifest benefits, quality of life, and psychological wellbeing. *Australian Journal of Career Development, 23*(2), 47–56.

Verbosky, S. J., & Ryan, D. A. (1988). Female partners of Vietnam veterans: Stress by proximity. *Issues in Mental Health Nursing, 9*(1), 95–104.

Ware Jr, J. E. (1992). Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med care, 30*(6), 473-483.

Warner, C. H., Appenzeller, G. N., Warner, C., & Grieger, T. (2009). Psychological effects of deployments on military families. *Psychiatric Annals, 39*(2), 56–83.

Wheeler, A. R., & Torres Stone, R. A. (2010). Exploring stress and coping strategies among National Guard spouses during times of deployment: A research note. *Armed Forces & Society, 36*(3), 545–557.

Wiens, T. W., & Boss, P. (2006). Maintaining Family Resiliency Before, During, and After Military Separation. In C. A. Castro, A. B. Adler, & T. W. Britt (Eds.), *The Military Life. Military life: The psychology of serving in peace and combat: The military family* (pp. 13-38). Westport, CT: Praeger Security International.

Wilmoth, J. M., London, A. S., & Heflin, C. M. (2015). Economic well-being among older-adult households: Variation by veteran and disability status. *Journal of Gerontological Social Work, 58*(4), 399–419.

Wood, S., Scarville, J., & Gravino, K. S. (1995). Waiting wives: Separation and reunion among Army wives. *Armed Forces & Society, 21*(2), 217–236.

Woof, S.H. & Aron, L. (2013). *U.S. Health in international perspective: shorter lives, poorer health*. National Research Council. Washington, DC: National Academies Press.

Zatzick, D. F., Marmar, C. R., Weiss, D. S., Browner, W. S., Metzler, T. J., Golding, J. M. et al. (1997). Posttraumatic stress disorder and functioning and quality of life outcomes in a nationally representative sample of male Vietnam veterans. *American Journal of Psychiatry, 154*(12), 1690–1695.