# Research into Social Isolation in the Australian Veteran Community

## Final report

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# Executive summary

The purpose of this research project was to address the following research question:

> *"What are the effects of military service on social isolation among younger members of the veteran community, which factors increase or decrease the risk of social isolation, how are these factors related, what is the role of and impacts on veterans' carers, and how can we improve the evidence base for policy-making?"*

To address this question, we reviewed the national and international academic literature. The results of the review of the existing scientific literature are presented in Part A of this report. The final report of the research project provides a shorter version of the full literature review that was conducted in 2009. The full literature review is a standalone report with a complete bibliography and summaries of each articles reviewed.

We concluded from the literature review that the scientific literature on the health and social wellbeing of veterans does not directly address social isolation among veterans, nor does it address the experiences and needs of younger veterans.

However, two of the major components in the literature included themes relating to:

- war as a special kind of major life event that impacts differently on individuals depending on their background factors, the nature of the war and combat exposure, and
- the effects of war on health and wellbeing among veterans. The discussion about health and wellbeing includes material on economic participation and wellbeing, social support and networks, and marriage and family life. These themes are the closest that the scientific literature came to addressing the concept of social isolation.

A number of gaps in the research literature were identified in relation to the experience of military service; predisposing vulnerabilities and resilience; socio-demographic factors, and health outcomes as factors that could increase or decrease the risk of social isolation for veterans returning after military service. These gaps are specified in Part A, page 15.

Although research gaps were identified, well-conducted scientific studies in the existing academic literature informed the core concepts relevant to our research question and, in particular, to the statistical modelling of DVA Client data pertaining to social isolation among younger Australian veterans. Part B of this final report presents the findings of the statistical modelling undertaken.

Despite the limitations of the data used for the statistical modelling, and the need for further research, we were able to investigate community participation, social isolation and mental health in a large sample of Australian veterans.

Consistent with our proposed conceptual model, more favourable socio-demographic characteristics were linked to greater community participation and less isolation which were, in turn, linked to better health and wellbeing.

We also found indicative evidence for a feedback loop in which poorer mental health was linked to less participation and more isolation. There were differences in the factors that predicted participation, isolation and mental health among younger compared to older veterans, suggesting the need for differentiated programs. We also found that community participation and isolation were more strongly linked to mental health among younger veterans compared to their older peers.

With lower levels of (protective) community participation, higher levels of isolation and worse mental health, younger veterans may require supplementary support services to facilitate greater community connectedness. Interventions that recognise the complexity of the relationship between participation, isolation and wellbeing (especially the key role that mental health appears to play) would be beneficial, especially for younger veterans. In considering potential barriers to increased participation, and despite poor physical health, what veterans think and feel is as much (perhaps more) important than what their bodies can or cannot do.

Finally, in Part C of this report, we canvass an approach to future research into the Australian veteran community. This approach will build upon what we don't know from the existing scientific evidence, but also what we have learned from undertaking the present study into social isolation in the young veteran community.

Our literature review revealed that there has been no direct research into social isolation among veterans, or into a number of related factors. Most importantly, no studies have compared the post-service wellbeing of veterans who *choose* solitude, those unwillingly isolated, and the socially active. Differences between working age veterans compared to those in retirement in the extent or nature of social isolation have not been considered. Nor have the particular experiences of women, reservists, those engaging in multiple deployments (for example, modern 'career' service people), those in specialist roles (such as Special Air Services personnel or medical officers) and those in peacekeeping roles been sufficiently considered.

Our study has been able to contribute to addressing the lack of research in some of these areas. For example, we have been able to investigate social isolation directly, albeit through the use of a single item in the data we analysed, and to link it clearly to physical and, especially, to mental health. We have also been able to consider a number of types of participation, and frequency and breadth of participation, and to show that these are related to but not the same as (or the inverse of) isolation. For example, veterans may participate frequently and still feel isolated or participate infrequently and not feel isolated. We have also shown that participation, isolation and mental health are strongly related to each other and to a range of socio-demographic factors, but not to the same factors. Thus, for example, addressing certain socio-demographic factors may assist in increasing participation but not in improving mental health. Further, we have demonstrated substantial differences in the experiences of younger and older veterans.

In order to secure excellence of design and outcome, we advise that the planning and design of a future study of Australian veterans is best approached in linked phases, with the results of one phase informing the next along the lines of:

**Phase 1**: Build upon the findings of this research into social isolation in the Australian veteran community through undertaking further research under the priorities identified in the Department's Applied Research Plan

**Phase 2**: Undertake a qualitative study of veterans' health and wellbeing

**Phase 3**: Undertake a cross-sectional study of veterans' health and wellbeing with a view to conducting a cohort study

**Phase 4**: Undertake intervention trials

This phased approach to research will build a sound evidence base about the complex factors that impact on veterans/ health and well-being; and the type of strategies that could be implemented to address the effects of active military service on Australian veterans into the future.

# PART A: REVIEW OF THE ACADEMIC LITERATURE

## 1. Introduction

The purpose of our literature review was to address the following research question:

> *"What are the effects of military service on social isolation among younger members of the veteran community, which factors increase or decrease the risk of social isolation, how are these factors related, what is the role of and impacts on veterans' carers, and how can we improve the evidence base for policy-making?"*

The literature did not directly address young veterans, their carers, or, most importantly, their social isolation. It did, however, consider the issues that predispose them to it. These included the quality of their mental and physical health, their ability to make a living, and having friends, family, and the respect of the wider community.

The experience of war, especially exposure to combat and trauma, as well as the life experiences brought to the war, played a significant role in the ability of veterans to fully participate in society after they returned home.

In this review, after a brief discussion of the literature and our methodology, we will consider the experiences of military service and then move on to the issues pertinent to social participation.

## SUMMARY OF FINDINGS

The literature did not directly address social isolation; however, it considered the factors that contribute to it in some detail. We placed these in the following two broad categories.

### War as a Special Kind of Life Event

Major life events, such as military service during war, can have a major impact on the mental health of individuals. The studies showed that veterans were affected differently depending on:

- *Socio-demographic factors:* these included the age at which the veteran met military milestones, especially joining-up and first deployment, their race or ethnicity, childhood experiences, levels of education, and their gender, although the literature does not address sexual orientation.

- *Position in the armed forces:* especially the rank held by the veterans and whether or not s/he served in the Army, Navy or Air Force. An important factor was the cohesion within the unit.

- *The kind of war that the individual went to:* this was determined by the historical period in which it was set, its intensity, and the idiosyncrasies of different wars.

### Post-War Factors that Increased or Decreased the Risk of Social Isolation

They are:

- *Mental health:* Despite the resilience of many veterans, a significant number experienced poor mental health, including PTSD, anxiety disorders, depression, poor cognitive functioning, and addiction to tobacco. The extent to which these were debilitating depended on the attitudes of medical officers, the effect of the social stigma against mental illness, and the efficacy of treatment.

- *Economic participation:* Joining-up could give young men useful training and life skills which could help in civilian careers. If they came from socially or racially disadvantaged backgrounds, it removed them from a difficult situation. However, those joining-up later in life often disrupted careers and marriages in ways that could not be repaired.

- *Social support:* The studies showed that, although some relationships could be problematic, social support was essential to maintaining physical and mental health. It could be derived from marriage or other intimate relationship, relatives, veteran and non-veteran friends, and the respect of the wider community

# 2. Methodology and scope of the literature

In selecting the studies we adhered to the review protocol set out at the beginning of the full literature review. The following discussion is a brief outline of the scope of those studies and our analytic approach. We have discussed this at greater length in the full literature review.

## 2.1 Source and coverage

We considered seventy-three articles, but rejected twenty on grounds of relevance, methodology or because they were not peer-reviewed. The majority came from the United States (23) and the rest from the United Kingdom (8), New Zealand (1), Canada (2) and Australia (12). In addition, we included three multinational studies and one from the Netherlands because of its insights and sound methodology. Some of the articles reported on findings concerning a number of different wars, while others focused on a particular one. These included World War II, the Korean, Vietnam, and Falklands Wars, and Gulf Wars I and II. Studies relating to the Vietnam War and Gulf War I featured most prominently.

Apart from the seminal work of Elder and his colleagues, all the studies were published after 1998. We included Elder's work because it incorporates a life-course perspective on the effects of war. That is, it applies the principles of human agency, historical context, and place to the interpretation of the life stages at which military service took place. In combination with social supports after the home coming, this shows the life-long effects of that service.

## 2.2 Analytic approaches and measures

Most of the articles (43) employed quantitative methodologies. Sample sizes ranged from two (N=2) to N=679,859 with the majority containing between 213 and 12,734 respondents. The articles used a wide range of measures of health, especially of mental health, social support or engagement, and military or combat experience. Most of them are well-known, widely used, reliable and well-validated.

We also included four (3) qualitative studies, one (1) clinical case study, and three (3) literature reviews which all met our study selection criteria. The qualitative studies raised different issues to the quantitative studies and articulated the veterans' points of view while the clinical case study offered a different approach to treatment. The literature reviews provided an explanatory overview of many of the topics raised in the empirical studies and an indication of the range of material available on a given issue.

## 2.3 Sensitivity and compassion in this literature

Veterans' health and wellbeing is, understandably and appropriately, a sensitive topic. Yet the scientific method and language used in many of the quantitative studies may seem overly cool and lacking compassion in the face of evident human distress. In addition, the language of science, as well as the inaccessibility of scientific writing to the lay person, may appear to objectify participants in these studies. As the objects of investigation, respondents are not on equal terms with researchers. Sensitive to this, many researchers provided respectful context for the introductions to their studies, indicating an understanding of the veterans' situations, as well as a thorough discussion at the end, drawing out the human implications of scientific findings. We supported this approach.

Many researchers also attempted to reflect veterans' perspectives in the framing of their research questions and conclusions. A few made judicious use of qualitative evidence to introduce a human element into their papers. We consider the work of Glen Elder and his colleagues to be exemplary in this regard. By using quotes from

archival material to illuminate points and to convey a moving sense of the veterans' experiences, they emphasised their agency and dignity.

# 3. Life events, health and wellbeing: War as a special kind of life event

Major life events, including positive ones, can have a negative impact on mental health and well-being, if only temporarily. Major *negative* events, especially if there are a number at the same time, are associated with the worsening of existing mental health problems and the development of new ones. The effects of a major life event are determined by its nature and significance and how that impacts on an individual's personal characteristics. War can be seen as a particularly major event for those who serve in it and often for those who remain at home. The literature showed that the experience affected veterans differently depending on their socio-demographic circumstances, their position in the armed forces, the characteristics of the war in which they served, and the number, duration, and nature of exposures to combat and trauma.

## 3.1 Socio-demographic factors

No Australian studies considered socio-demographic factors, however overseas studies detailed the age at which veterans met military milestones as well as their race and education, all of which are potential influences on the experience of war. Omissions from the literature included the sexual orientation of recruits and the role of childhood experiences (briefly considered by Brewin, et al 2007).

### 3.1.1 Age of meeting military milestones

The age at which members of the armed forces attained military milestones may affect the course of their working and family lives in positive and negative ways, depending on their circumstances. In particular, being young could be both an advantage and a drawback. For instance, young American men who joined-up to fight in World War II were able to escape the 1930s Depression, widen their horizons, meet new people, and learn new skills, including resourcefulness and leadership, while older men suffered from disruption to their working and family lives which many could not overcome when they returned home (Elder, 1987; Elder et al, 1991; Elder et al, 1994; Pavalko et al, 1990). On the other hand, studies have shown that youthfulness at first deployment can adversely affect the mental health of veterans, sometimes for many years (Ikin et al, 2007; McKenzie et al, 2004; Kelsall, 2009; Brewin, 2000).

### 3.1.2 Gender

Perhaps as a reflection of their smaller numbers in the services, women veterans only featured minimally in the studies (Mckenzie et al, 2004). Those that addressed their issues usually focused on the effects of war, sexual trauma, and reintegration into civilian society. One showed that joining the military disrupted the life-courses of women because they did not meet development stages such as education, marriage, and motherhood at the same time as their peers. This limited the scope of their social networks and was associated with poorer mental health in later life (Frayne et al, 2006).

### 3.1.3 Racial and cultural background

No Australian studies considered the ways in which belonging to a minority racial or ethnic group impacted on veterans' experience of war. However, two American studies showed that it can be positive. In one, Indigenous veterans who fought in a range of wars indicated that, although they suffered from discrimination, the overall experience was good because it offered them opportunities that they would not have otherwise had (Harada et al, 2005). The other demonstrated that black men with less

than twelve years of schooling, the most disadvantaged recruits of the all-volunteer era, had better incomes in the long run than their civilian counterparts (Teachman and Tedrow, 2007). The downside to these findings is that being a non-white man was an important predictor of severe PTSD. This was probably because these men tended to be exposed to more war trauma; in studies accounting statistically for that, race was not a predictive factor (Brewin, 2000).

### 3.1.4 Education

The relationship between level of education and post-service mental health was inconclusive. While a British study of veterans of Gulf War I showed no association between pre-service education and the mental health of veterans (Ismail, 2000), an American study indicated that those with a college education prior to joining-up were more likely to develop a serious mental illness (Kilbourne, 2007). On the other hand, Brewin's meta-analysis of twenty-nine scientific studies, show that limited education was a predictor of PTSD, throws doubt on the findings of both these studies (Brewin, 2000). We discuss the possible reasons for these discrepancies in the full literature review.

## 3.2 Individual characteristics and circumstances of service

Differences in rank, whether the veterans served in the Army, Navy or Air Force, and how well their units functioned, strongly influenced their war experiences. This had implications for their mental health in later life.

### 3.2.1 Rank

Higher rank was strongly associated with better health among British, American, and Australian veterans of World War II, Korea and Gulf War I (Ismail et al, 2000; Ikin, 2007; Kelsall, 2009). According to Ismail et al (2000) and Ikin (2007), this does not appear to be due to less exposure to toxic substances or combat. More likely, it relates to differences in personal characteristics and training or levels of responsibility regarding confidential information (Ikin et al, 2007). Both studies acknowledged that senior rank denoted higher social status, which is known to predict better health (Ikin et al, 2007; Ismail et al, 2000). The seminal 'Whitehall Studies' of members of the British civil service demonstrated a social gradient in health in which personnel in higher grades had the best overall physical and mental health (e.g., Marmot et al, 1991).

### 3.2.2 Army, Navy or Air Force

On balance, most studies suggested that the service (and the part of that service) in which veterans served affected their subsequent mental health, with those in combat sections most likely to suffer from PTSD (Engelhard, 2007; Ikin, 2007). However, in wars with limited combat duties, such as Gulf War I, the particular service was unlikely to bear a differential relationship to health. (Ismail, 2000).

### 3.2.3 Unit cohesion

Across a range of wars, national contexts and types of duties, good social networks and connectedness among men and women members of military units during the war were associated with better mental health afterwards (McTeague, 2004; Fikretoglu, 2006; Pietrzak, 2009). Such networks provided hope and courage in tense working conditions, greatly improving the effectiveness of the team. In Australia, this kind of loyalty or 'mateship' is an integral part of the nation's founding story, the ANZAC legend. Yet, despite the potency of that story, the significance of mateship in terms of the mental health of veterans has not been scientifically investigated.

## 3.3 The nature of the war

### 3.3.1 Historical background

The historical context of a war can influence outcomes for veterans. For instance, for many young men coming out of the 1930s Depression, World War II offered opportunities, especially since an economic boom followed it (Elder, 1987; Elder et al, 1991; 1994; MacLean and Elder, 2007), that were unavailable to veterans of later wars. Attitudes within the broader community towards veterans also influenced their outcomes. The total involvement of all of society in World War II meant that its male veterans received unusually strong social support during and after service (Burnell, 2006). This has not always been the case. A forgotten war that is not commemorated, like the Korean War, can intensify social isolation among its veterans (Ikin, 2007). Ignoring the contributions of particular groups can also be isolating. This was the case for British women veterans of World War II, many of whom felt that Cenotaph ceremonies were not really for them (Barron, 2008).

### 3.3.2 Intensity of war

Wars of high intensity with elevated rates of combat stress, immediate casualties, and psychiatric impacts are widely thought to have the worst mental and physical health effects. Yet as the work of Dohrenwend on the Vietnam War shows, the intensity of a war can also be determined by the amount of stress caused by a realistic expectation of danger. As a result, although many Vietnam veterans displayed resilience, a significant proportion experienced extremely elevated rates of PTSD (Dohrenwend et al, 2006). For a discussion of Dohrenwend's findings, see the full literature review.

### 3.3.3 Particular wars

All wars are different, and particular wars can have unique stressors with idiosyncratic outcomes for veterans. This is especially evident from the literature concerning Gulf War I. A unique complex of symptoms, known as the 'Gulf War Syndrome', consisted of skin, musculoskeletal and mental health disorders that seemed to be associated with over-immunisation before deployment, exposure to organophosphate pesticides and insect repellants, being in a chemical weapons area, and stress (Kelsall, 2009; Ikin, 2004). A British comparison of Gulf War I veterans, former Bosnian peacekeepers, and a military comparison group concluded that the Gulf War veterans were more likely to have extensive fatigue and symptoms of PTSD than the other two groups and nearly twice as likely to meet the Center for Disease Control and Prevention criteria for severe symptoms (Unwin, 1999). Some researchers have expressed doubts about the accuracy of self-report questionnaires used to establish such findings (Ikin, 2004; Glass, 2006). However, rigorous testing of the questionnaires concluded that they were a valid tool (Ikin, 2004; Kelsall, 2009; McKenzie, 2004). We have discussed this issue at greater length in the full literature review.

Differences in rank, whether the veterans served in the Army, Navy or Air Force, and how well their units functioned, strongly influenced their war experiences. This had implications for their mental health in later life.

## 3.4 Combat exposure and war trauma

Although there can be positive effects from combat experience or from surmounting war or peacekeeping traumas (Elder 1987; MacLean and Elder, 2007; Wessely et al, 2006), these emerge from most studies as the single biggest predictor of later mental health and related problems. Experiencing severe combat over a long period of time seems to be particularly damaging to mental health (Ikin et al, 2007). Combat-related trauma in young men can affect cognitive functioning in later life, and is associated with the development of social isolation (Alpass et al, 2004).

Much of the literature did not distinguish between the effects of combat exposure and war trauma. Yet they are different. While combat trauma results specifically from events that occur during battle, war trauma encompasses helplessness in the face of a grave situation, a fear of dying, witnessing distressing incidents and feeling endangered. These related but distinct sources of trauma can lead to different mental health outcomes. In a Canadian study, combat experience tended to be associated with generalised anxiety disorder and PTSD, whereas the expectation of danger was more strongly associated with generalised anxiety disorder, PTSD and depression (Fikretoglu, 2006).

Understanding the effects of war trauma is important because younger veterans are more likely to have been engaged in peacekeeping or modern warfare, both of which involve little or no face-to-face combat (Ismail, 2000). However, they do produce traumas such as isolation, discomfort, and fear of combat or attack (Ikin et al, 2004). For peacekeepers there was the added stress of working with civilians, which might involve helplessness in the face of atrocities and being inadequately trained (Wessely et al, 2006; Greenberg et al, 2008; Haas, 2003).

### 3.4.1 Experiences of women

Understanding war trauma is also important because of the increasing numbers of women joining the armed forces who will have to deal with it although they are unlikely to face combat. A study of American health providers in Vietnam showed that they suffered from PTSD as a result of the frustration caused by the lack of basic medical supplies and the apparent futility of their work (McTeague et al, 2004). In another instance, sexual trauma suffered by women veterans attending a Veterans Affairs Health Centre in Connecticut, led them to report intense pain (Haskell et al, 2008).

## 3.5 Health and wellbeing among veterans

Much of the literature on veterans' mental health and wellbeing concerns Vietnam veterans, who developed a wide range of problems as a result of their service. These included PTSD, other anxiety disorders, depression, poor cognitive functioning, addiction to tobacco, and sleep disturbances, including nightmares (Alpass et al, 2004). Yet these veterans could be remarkably resilient, with the majority of those exposed to combat or trauma never developing any problems (Dohrenwend et al, 2006). American veterans of World War II and British veterans of Gulf War I have shown a similar resilience (Elder et al, 1994; Iversen, 2005). However, for those affected by mental health problems, the attitudes of medical officers, the stigma of mental illness, and the efficacy of treatment are all important in how their mental health is managed.

### 3.5.1 Attitudes of medical officers

Medical officers' attitudes towards medically inexplicable Gulf War I symptoms differed depending on whether the doctor served in the Australian Defence Force (ADF) or in the Department of Veterans Affairs (DVA). ADF doctors, believing that a medical problem must be either physical or psychological, excluded a physical diagnosis and referred veterans with Gulf War Syndrome to a psychologist or psychiatrist. Doctors working for the DVA considered symptoms to be a combination of psychological and physical factors. Their approach was to form a good relationship with affected veterans, then to teach them how to live with their symptoms. This seems to have been the more effective: primarily, veterans with Gulf War Syndrome wanted support and, if possible, an explanation, rather than medical treatment (Adams et al, 2009).

### 3.5.2 Mental health stigma

It is widely understood that there is a profound stigma associated with mental illness (Horton, 2007). This stigma is, perhaps, particularly evident in the military where

toughness, self-containment, and courage in the face of danger are considered essential attributes. In such a culture, mental illness may be considered a sign of weakness, rendering many personnel reluctant to seek treatment while enlisted. Veterans have reported being afraid that, if they sought treatment, they would not be given responsibility, would lose out on opportunities for promotion and would not be trusted by other members of their unit or their leaders (Greenberg, 2007; Haas, 2003). Fear of the stigma led substantial numbers of the Royal Australian Army Nursing Corps personnel and Royal Australian Army Medical Corps reservists to say that they would not use a counselling service while deployed (Haas, 2003). This is concerning, since these clinically trained personnel were aware of the risks of failing to seek treatment and were likely to influence the attitudes of others.

### 3.5.3 Treatment efficacy

Some authors have advocated the deployment of mental health intervention as soon as possible after the trauma, with one recommending on-the-spot treatment for battlefield stress in the expectation that the soldier would resume duties immediately (Haas, 2003; Greenberg, 2007). Most of the studies about treatment, however, focus on post-military service interventions, typically contrasting cognitive behavioural with attachment therapy approaches. There is considerable debate about the value of – and version of – cognitive behavioural therapy approaches for mental health problems.

Australian studies showed that group-based cognitive therapy was effective for treating PTSD, especially when the intensity of the programme was tailored to its severity. However, it was less effective for treating comorbid depressive and other anxiety disorders. It resulted in little improvement in the ways veterans used alcohol and in which their traumatised families functioned (Creamer, 2006; Forbes, 2008).

These cognitive behavioural models, which are focused on the individual, do not take into account how profoundly veterans' traumatic experiences of war affect couple and family relationships. Using a single clinical example to illustrate, Basham (2008) argued that, rather than considering mental health problems to be a cognitive disorder, they should be seen as an injury that makes attachment to and relationships with self and others difficult (Basham, 2008). While this argument is based on a single case study, it is nevertheless consistent with the Australian findings that cognitive behavioural therapy-based approaches made little difference to family functioning (Creamer, 2006).

## 3.6 Economic participation and wellbeing

As discussed earlier, the age that American World War II servicemen joined up had a profound impact on their employment afterwards. Young men had opportunities through training and learning life skills, such as self-discipline, leadership and resilience, which helped them later in civilian careers. As veterans, they could take advantage of the GI Bill to further their educations (Elder, 1987; Elder et al, 1994). Many of these young men saw joining the military as a turning-point in their lives because it removed them from the poverty and limited possibilities of the 1930s Great Depression (Elder, Gimbel, Ivie, 1991). This may not be the case in later wars: as the United States became increasingly prosperous, joining-up did not, in general, offer such dramatic life-changing opportunities.

Yet, for some veterans, it does. As already discussed, the most disadvantaged American recruits of the all-volunteer era, black men with fewer than twelve years schooling, attained higher incomes while serving than did their non-veteran contemporaries, and this continued after leaving the military (Teachman and Tedrow, 2007). Thus, joining up can still give young people a chance to change direction and perhaps improve their situation. Studies consistently show that most people who leave the armed forces find good employment afterwards. In a study of 8,195 recent leavers from the British forces, the majority found full-time jobs (Iversen et al, 2005, p. 181).

Not all groups improve their circumstances by entering the military. The men of World War II who joined up later in life often found that, after the war, their civilian jobs had altered so much that they had difficulty resuming them. This had a life-long negative effect on the progress of their careers (Elder 1987; Elder et al 1984). Similarly, although disadvantaged black men in the all-volunteer era gained better employment prospects than did their civilian counterparts, black and white men with higher levels of education did less well than their non-veteran peers (Teachman and Tedrow, 2007).

These findings vary slightly from the British study. One reason for this may be that Teachman and Tedrow investigated racial sub-groups, which the British study did not. Alternatively, the findings may vary because of the different historical periods and national contexts involved. In particular, until the Global Economic Crisis of 2008-09, recent leavers of the forces in Britain entered a strong labour market. It is also possible that, if the British study had followed the veterans over a number of years, as the American study did, it would have shown that the British did not sustain their income levels over the long term. Most notably, the findings of the British study only held true for veterans who enjoyed good health. Those with mental health problems, who tended to leave the military early, had less chance of finding work than did their healthy peers (Iversen et al, 2005).

## 3.7 Social support and social networks

Although some studies failed to demonstrate that social support alleviated the course of PTSD or supported cognitive functioning, they did show that PTSD undermined social support (Alpass, 2004; Laffaye, 2008). More often, these studies demonstrated that having social support was essential to maintaining physical and mental health (Basham, 2008; Brewin, 2000; Fikretoglu, 'Validation of the Deployment Risk and Resilience Inventory', 2006; Frayne et al, 2006; LePage and Garcia-Rea, 2008; Mistry et al, 2001; Pietrzak et al, 2009). Social support can be derived from a successful marriage or other intimate partnership and from family life, relatives and veteran or non-veteran friends. Of these, the contribution of spouses and veteran–friends was most important to veterans' wellbeing, with that of relatives and non-veteran friends less so.

There are different kinds of social support and these can be health-promoting in different ways. Instrumental or 'tangible' (Cohen et al, 1985) support assists with practical needs, such as transport or shopping. It can be important in maintaining the health of veterans, for instance, by making sure medical appointments with doctors or at the hospital are kept. Emotional support is at least equally important to mental health and wellbeing because it creates a sense of belonging which is strongly related to mental health (Berry, multiple). Consistent with this, having somebody close, as well as being part of a wider social network, was shown to alleviate the symptoms of PTSD suffered by American women who were Vietnam health care veterans (McTeague et al, 2004). In addition, social networks have been shown to be an important way of maintaining health-promoting leisure and social activities; and of encouraging coping skills that are problem-solving in their orientation, rather than avoidant (such as using alcohol to cope with difficulties). Building social networks, for example, made previously homeless American veterans with a history of substance use less likely to relapse (LePage et al, 2008).

## 3.8 Marriage and family life

This literature considers marriage in two ways: it addresses the effect of war service on marriage as well as the effect of marriage on veterans' health and wellbeing.

### 3.8.1 Effects of war service on marriage and family life

The timing of a marriage in relation to a war has been associated with the likelihood of its survival over the long term. Elder's work shows that, for World War II veterans, divorce was more likely in marriages made before the war than in those made

between 1942 and 1945. Having the opportunity to anticipate war-induced separation and other dangers to their relationships appeared to increase stability in couples married well into the war. Divorce occurred most frequently among men who entered the military at a later age when they had established marriages and their family demands were greatest (Pavalko and Elder, 1990).

Combat-related PTSD and memories of dead comrades also made divorce more likely among American World War II veterans (Pavalko and Elder, 1990). Studies of British veterans of Gulf Wars I and II showed that PTSD, other forms of psychological distress, and poor health compromised their ability to maintain a marriage (Rona, 2009; Ismail, 2000). Some authors described the extent to which PTSD can disrupt family life. A small study of thirty-eight American Vietnam veterans demonstrated a link between combat-related PTSD and antagonism between husbands and wives (Glenn et al, 2002). This was linked to their wives' psychological distress and to aggression, including violence, in their children. This is consistent with a detailed case study showing how the veteran transmitted the 'world of combat' to the whole family 'through a range of processes of secondary traumatisation and cyclic patterns of disrupted attachments' (Basham, 2008, p. 94). In other words, in reliving their trauma and experiencing its mental health consequences, veterans inadvertently repeatedly subjected their families to trauma, damaging relationships a little more each time.

### 3.8.2 Effects of marriage on veterans' wellbeing

Successful marriages often provided veterans with the benefits of emotional support and encouraged greater help-seeking. For British service personnel who left the forces prematurely, usually with a mental health problem, marriage had a 'protective effect' (Iversen, 2005, p. 179). Canadian veterans who were married, in a de facto relationship, divorced, widowed or separated sought treatment for mental health problems more often than did those who were never-married. The authors speculated that having, or having ever had, a close relationship prompted an individual to recognise the need for (and to seek) help. The loss of a relationship appeared to have the same effect (Fikretoglu, 2006).

While, generally, relationships had a protective effect on veterans' mental health (though note that Rona, 2009, found only very small effects), these studies did not usually take account of gender. However, a study of 679, 859 men and women veterans in the United States found that being married or living with someone was associated with better mental health among men aged under sixty-five years but not among women (Frayne, 2006). This is consistent with studies of the general population which find, on balance, that marriage is associated with better mental health for men but not women. Also consistent with general population studies, single women veterans over the age of forty-five years in the United States were more likely than were their male peers to be unmarried and to live alone (Frayne, 2006).

Despite the apparent advantage to men of being in a relationship (for brevity, 'marriage'), it did not necessarily offer all the support that male veterans needed. Some felt isolated within their marriage (or family) especially if they could not discuss war-related experiences. A study of 128 male veterans who had undergone a residential treatment program for PTSD in the United States examined the relationship between their symptoms and support from wives, relatives, non-veteran and veteran friends (Laffaye et al, 2008). The object was to investigate how veterans experienced support from different sources and the extent to which each source mitigated their symptoms. The authors found that, while the support wives offered was significant, so too was the stress that the relationship created. Relatives and non-veteran friends supplied still less useful support. But fellow veterans were perceived to be a considerable source of support and not of stress.

One of the difficulties of seeking support from non-veteran friends, relatives and families was that veterans believed these people would not be able to understand the

experiences of war. However, this belief has been challenged. A small qualitative study of four British veterans of the Falklands War found that they did not share memories with their families until the war's twentieth anniversary commemoration because they did not think that the families would understand. Yet, when the memories were shared, these families were able to empathise. Knowing this, it would be appropriate for military authorities to give families and significant others more information from the start (Burnell, 2006).

While wives and families may be able to offer more support than veterans realise, veteran-friends – although extremely important – may have a limited capacity because of attitudes within the military. Burnell (2006) found that, though veterans do offer each other strong support, those that were still-enlisted did not discuss traumatic memories with one another or with other military personnel. This could lead to ultimately ineffectual coping strategies based on avoidance. Although the 'buddy system' within a number of different militaries certainly alleviated distress, it could also create a culture that made it disloyal or weak to seek outside help (Greenberg, 2007).

## 3.9 Conclusion

In undertaking this review, it became clear that the scientific literature on the health and social wellbeing of veterans does not directly address social isolation among veterans, nor does it address the experiences and needs of younger veterans. Nevertheless, it includes well-conducted scientific studies that help to inform the core concepts relevant to our research question and, in particular, to the analysis of data pertaining to social isolation among younger Australian veterans.

We identified two major components in this literature: the first pertains to understanding war as a special kind of major life event that impacts differently on individuals depending on their background factors, the nature of the war and combat exposure. The second component is about the effects of war on health and wellbeing among veterans. Our discussion about health and wellbeing includes material on economic participation and wellbeing, social support and networks, and marriage and family life. These themes are the closest that scientific studies come to addressing social isolation.

## GAPS IN THE RESEARCH LITERATURE THAT RELATE TO SOCIAL ISOLATION

The following broad headings provide a number of gaps in the literature, as well as possible new areas of research.

### Social isolation:

- Social isolation is only addressed through related issues such as health, especially mental health, social support or networks which are not the same as social fulfilment or positive social engagement
- Differences between the age cohorts in relation to risk of social isolation
- Particular issues for young Australian veterans aged <45.

### Experience of war:

- Duration of war / frequency of deployment
- Nature of military combat and exposure to injury and death
- Conscription versus voluntary enlistment

### Predisposing vulnerabilities and resilience:

- Childhood experience (minimally covered by Brewin), mental health or tendency to smoke or drink prior to enlistment, and sexual orientation.
- Pre-existing physical health, however, those with poor health profiles are likely to be excluded from enlisting.
- Ways in which the culture of the armed forces contributes to social isolation e.g. drinking culture, access to cut price cigarettes.
- The role of mateship during service in preventing or increasing the risk of social isolation
- The role of marriage and significant relationships in providing social support and protection to veterans e.g. carers and spouses.

### Socio-demographic factors:

- The Australian literature omits a number of issues that are addressed internationally, for example, socio-demographic factors, including whether from Aboriginal and Torres Straight Islander origin, and the role that gender and /or level of education could play in contributing to social isolation.
- There is limited research about socio-economic status or class.
- The role of rank is discussed in relation to health outcomes, but not social status or class per se

### Health outcomes:

- Comparison of health outcomes of veterans who choose solitude, those unwillingly isolated, and the socially active
- Death (through ill-health, by suicide, or accident) and relationship to social isolation.
- Issues specific to the health and social wellbeing of carers.

# PART B: STATISTICAL MODELLING

## 1. Methods

Data for this study were taken from the 2006 DVA Client survey. This survey population comprised veterans and war widows entitled to white or gold DVA card. Veterans out of scope included those living overseas and institutionalized. The response rate for the 2006 survey was 83.9%.

The database included a total of 2,415 respondents (n=1,771 men and n=644 women). Of the 2,415 respondents to the 2006 survey 25% of veterans were <45years; 17% were 45-64years and 59% were 65+years.

Analyses were performed using SPSS 17.0 for Windows (Statistical Package for Social Sciences, SPSS Inc.). Where small amounts data were missing, these were imputed in SPSS using expectation-maximisation methods.

### 1.1 Measures

#### 1.1.1 Health

Physical and mental health were measured using the transformed mental health sub-scale of the SF-12, a widely used and extensively validated health screening instrument (J. E. Ware, Snow, Kosinski, & Gandek, 1993; J. E. J. Ware, Kosinski, & Kellar, 1996).

Both physical and mental health scores had been recoded in the dataset into six categories: less than or equal to 19; 20-29; 30-39; 40-49; 50-59; and equal to or greater than 60.

In the absence of the original scores, the recoded scores were used as a continuous variable in our analyses. This is not ideal because the categories were not all equal. However, there were several (6) categories, most of which were equal (representing 10-point increments), and diagnostic procedures did not reveal multivariate non-normality or other problems in the data. We could have (further) reduced the data to a simple categorical variable: has health problems (yes/no). However, in the interests of avoiding the loss of further information, we retained the 6 categories. Physical health was also measured using the single self-rated health item, a commonly used measure that is strongly linked to mortality across cultures (Idler & Benyamini, 1997).

In all cases, higher scores indicated better health. We used two further items, one tapping mental health-related disability and the other tapping problem alcohol use. The former was an item from the SF-12 asking whether respondents had 'accomplished less' due to 'emotional problems' (1= all of the time, 2=most of the time, 3= some of the time, 4=a little of the time, 5=none of the time). The latter was an item asking whether a health care provider (such as a doctor) had spoken to the respondent about problems with their alcohol consumption (1=yes, 0=no).

#### 1.1.2 Community participation

We used three approaches to measuring community participation: *frequency of participation* in informal social activities, *breadth of participation* across the same informal social activities, and *isolation* (self-reported insufficiency of participation). We focused on types of participation that are known to be related to connectedness and wellbeing (primarily informal social types of participation) and avoided those that are known not to be (for analyses of Australian samples, see Berry, Rodgers, & Dear, 2007; Berry & Welsh, 2010), including among older Australians (Olesen & Berry, 2010).

*Frequency and breadth of participation* were measured using 7 of a list of fifteen different types of activities included in the questionnaire. The 7 items selected were those that necessarily require social contact with others: 'spending time with family you don't live with'; 'telephone family/friends you don't live with'; 'spend time with friends'; 'go dancing'; 'go to restaurants/hotels'; 'go on excursions or sightseeing activities'; and 'attend church or other religious activities'. Other items, such as 'go walking for recreation', 'participate in active sports (e.g., cycling, golf, tennis)' and 'do housework' were excluded because they might, but do not necessarily, involve social contact with others.

In the questionnaire, respondents were asked to indicate (i) which, if any, of this list of activities they 'usually do' (1='yes' and 0='no') and (ii) how often they did them (1='at least daily', 2='at least weekly', 3='at least monthly' and 4='less often'). We computed a mean score for *frequency of participation* using respondents' scores on how often they participated in each (scores could thus range from 1-7, with lower scores indicating higher levels of participation). We also computed an index of *breadth of participation* by summing respondents 'yes' answers to the question about which types of activities they 'usually do' (this delivered an 8-point index because scores could range from 0 to 7, with higher scores representing greater breadth of participation).

In addition, there were 2 items in the dataset asking respondents whether they belonged to (i) social or recreational clubs and (ii) ex-services clubs (in both cases, 1='yes' and 0='no'). We used these items to supplement our measures of frequency and breadth of community participation.

*Social isolation* (inadequate levels of participation) was measured using a single item in the questionnaire: 'overall, would you say that your social activity is .....': 'not enough', 'about right' or 'too much'. We recoded these responses such that 'not enough'=1 (i.e., indicating the presence of perceived isolation) and 'about right' or 'too much' =0 (i.e., indicating an absence of perceived isolation).

### 1.1.3 Self-efficacy

The questionnaire contained a general question asking respondents whether there were things they could do to improve their health and wellbeing (1=yes, 0=no), and we used this item. The questionnaire also contained a series of 7 items asking respondents whether there were actions they could take to 'make [their] health better'.

These included: 'my weight', 'the amount I exercise', 'the type of food I eat', 'my smoking habits', 'time spent with family I don't live with', 'meeting other people' and 'time spent out and about'. Respondents answered yes=1 or no=0 indicating which, if any, of these they believed that they could change. This list appeared to contain some related items. For example, items about weight, food and exercise appeared to be related to the underlying weight-related issues. To test whether this was the case, we conducted an exploratory factor analysis using maximum likelihood factoring with oblimin rotation. This statistical techniques provides an analysis of whether items in a larger set may be reduced to a smaller number of underlying latent concepts (such as obesity), or 'factors'.

Our analysis revealed 4 factors: the 'weight-related' factor, smoking, alcohol (each item was a factor on its own) and 'social', containing the remaining three items ('time spent with family I don't live with', 'meeting other people' and 'time spent out and about'). Factor analysis produces weightings for each item that loads on the factor, indicating the strength of the relationship between the item and the factor.

These weightings can be applied to respondents' scores on each item to produce a weighted composite score for each 'could improve' factor, and this procedure was undertaken. We did not produce mean scores for these factor weighted composites

because the scores themselves are not intuitive. However, mean scores for each of the items separately are reported in Appendix 1.

### 1.1.4 Trying to improve health

Respondents were also asked which of these seven types of health improvement approaches they had actually tried. We conducted a second exploratory factor analysis, as before, on these responses and found the same underlying factor structure. We therefore computed weighted composite score for each 'tried to improve' factor. Again, mean scores are not meaningful and are, therefore, not reported but mean scores for each of the items separately are reported in Appendix 1. As for self-efficacy, the questionnaire contained a general question asking respondents whether there were things that they had tried to do to improve their health and wellbeing (1=yes, 0=no), and we used this item as well.

### 1.1.5 Socio-demographic information

In all analyses, we controlled for the following socio-demographic factors: sex, age group (1=under 45, 0=45+), active service (1=yes, 0=no, with 0 meaning peacetime or similar other non-combat service), housing (1= living in a private dwelling, such as a house or flat, 0= living in an institutional setting, such as residential care), having a Gold Card vs a White Card (1=Gold, 0=White), using public transport (1=yes, 0=no), driving a car (1=yes, 0=no), and urbanicity (1=metropolitan, 0=non-metropolitan).

We also controlled in all analyses for living arrangements: relationship status (1=married or de facto, 0=other), having a caregiver (1=yes, 0=no), being a caregiver (1=yes, 0=no), living alone (1=yes, living alone, 0=no, not living alone) and living with a range of others (living with spouse/partner, son/daughter/in law, other relatives or friends, in each case 1=yes, 0=no).

## 1.2 Analytic approach

We produced descriptive statistics and Pearson Product Moment correlations to report mean levels of and to examine the bivariate associations between socio-demographic factors, community participation variables (including isolation), self-efficacy, behaviours tried to change, and three measures of health. Multiple hierarchical linear regression modelling was used to examine the independent relationships between these factors in terms of our conceptual model.

Figure 1 below proposes that predisposing vulnerabilities and resilience (in this dataset, background socio-demographic factors) influence levels of social isolation (here, frequency and breadth of participation, isolation) which, in turn, influence health and social outcomes (in this dataset, physical and mental health).

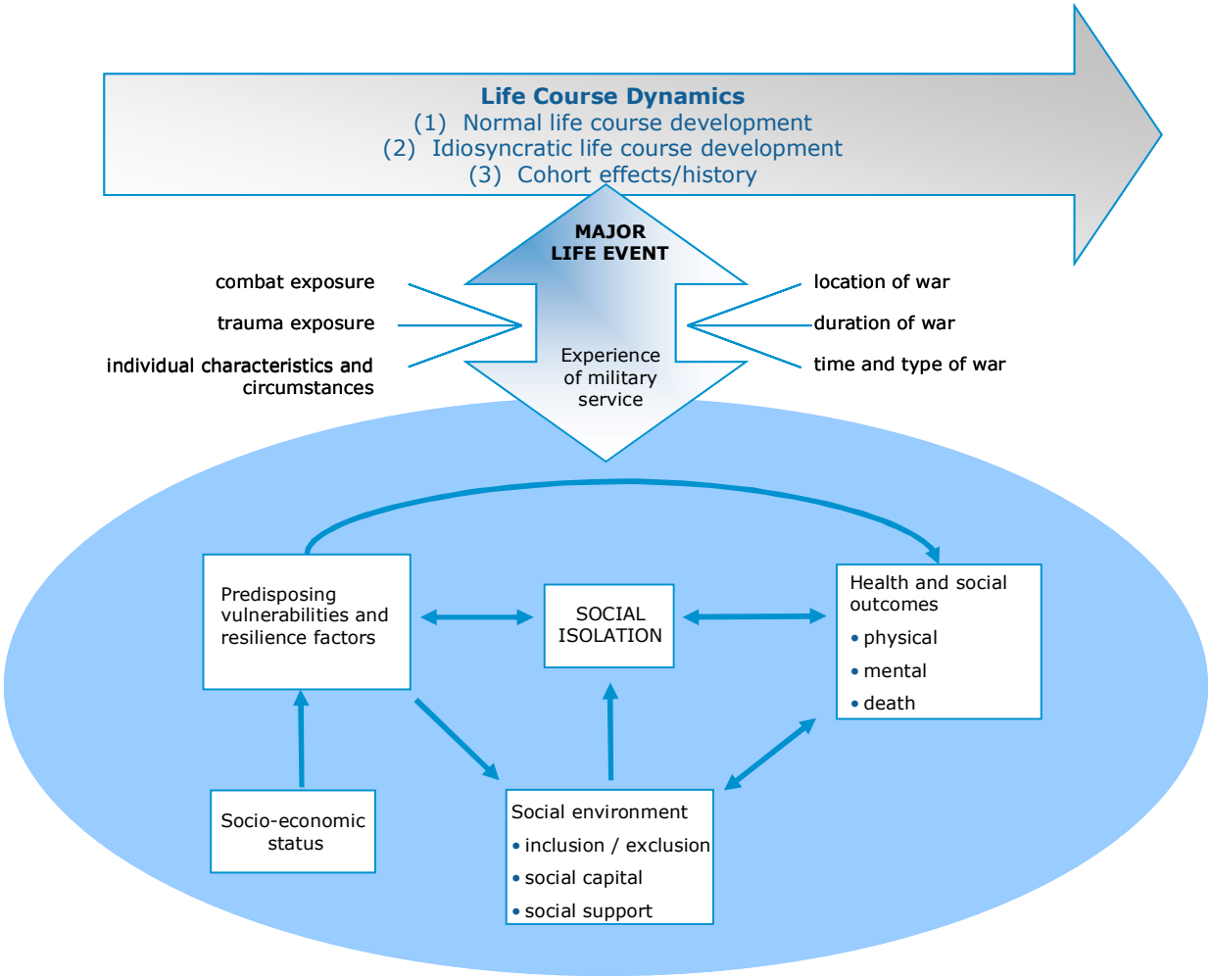
Feedback loops connect each of these concepts to each other in both causal directions. For example, isolation is a risk factor for mental health problems and mental health problems are, in turn, a risk factor for isolation. Because social isolation is the central concept of interest in this study, we conducted three separate analyses to predict (explain variance in): (i) social isolation itself, and two concepts we expected would be closely related to isolation, (ii) community participation, and (iii) mental health.

Explanatory (predictor) variables were added in blocks in the order suggested in Figure 1 - Conceptual Model (further details below); active service was added in the first block but did not contribute to explaining variance in the outcomes of interest in any analysis. It was therefore excluded from all analyses and is not further reported. For each analysis, the model was comprehensively re-evaluated at each block so that non-significant predictors of mental health were removed, one at a time, until only significant predictors remained in the model.

This is a conservative approach that ensures that none of the variables remaining in the final model has been 'double-counted'. Changes in standardised beta values from one step to the next were examined to assess putative mediation effects. Mediation effects, such as are proposed here, occur when one factor influences another factor because of its shared relationship with the outcome variable. For example, in the conceptual model for the present study, it is proposed that predisposing vulnerabilities are associated with worse mental health because they are associated with isolation (which is directly linked to mental health).

These mediation effects were tested by examining whether the standardised beta values for a variable entered in one block was rendered non-significant with the introduction into the model of additional variables in subsequent blocks. Note that multiple hierarchical regression analyses performed on cross-sectional data cannot confirm causality but they can establish the plausibility of causal hypotheses such as the hypotheses proposed here.

**Figure 1 - Conceptual Model**



# 2. Results

Table 1 presents mean scores and standard deviations for each measure (other than the weighted composites) by sex and age-group (under 45 years old *vs* 45+). Men reported greater self-efficacy than did women and were more likely to have tried to change health-related behaviours. With the exception of belonging to ex-service clubs, consistent with Australian population norms (Berry & Welsh, 2010), women reported greater participation than did men and less isolation. Contrary to Australian population norms (ABS, 2008), women reported better self-rated and mental health than did men.

Younger veterans were more likely than their older peers to agree that there were actions that they could take to improve their health and wellbeing (that is, they reported greater general self-efficacy) and they were more likely than older veterans to have tried to do so. Older veterans reported much greater community participation than did younger veterans, and less social isolation. They also reported better mental health (though less good physical health).

Table 2 presents bivariate associations between socio-demographic characteristics and four domains of self-efficacy, four domains of trying to improve wellbeing, participation and health. Men were more likely than women to report greater self-efficacy across each of the four domains of weight, smoking, alcohol and social activities, and were more likely to have tried to improve in all but the social domains of these activities. There were no sex differences in attempts to improve social wellbeing. Younger veterans were also more likely than their older peers to report greater self-efficacy across each of the four domains of weight, smoking, alcohol and social activities, and were more likely to have tried to improve in all of these social domains.

Holders of Gold Cards reported less self-efficacy and less inclination to try to improve their wellbeing across all four domains than did White Card holders. They also reported, overall, less participation (except for participation in ex-services clubs) and worse physical and mental health. Those living in private dwellings (houses or flats) did not differ greatly from those living in institutional settings. However, they were slightly more likely to report greater self-efficacy, greater uptake of activities to improve their wellbeing, less participation and greater isolation (all of these most likely confounded with age, as younger veterans tend to live in private dwellings *and* report greater self-efficacy, greater uptake of activities to improve their wellbeing, less participation and greater isolation).

Veterans with a carer reported slightly less self-efficacy and fewer attempts to improve their health and wellbeing than did those without a carer. They were more likely than were their peers to participate more and feel less isolated. They also reported considerably better physical and mental health. Finally, veterans living with their son or daughter/in law reported greater self-efficacy around their weight, together with a greater likelihood of having tried to improve their health, especially their weight, than did veterans living in other arrangements. They also reported, overall, less participation (though they used the internet more than their peers) and greater isolation. There were no health differences between those living with their children and other veterans.

## Table 1

Mean scores[1] and standard deviations for self-efficacy, trying to improve wellbeing[2], types of participation and three forms of health by sex and age group (under 45).

| | Sex | | | | | | Age | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Men (n=1,771) | | Women (n=644) | | Total (n=2,415) | | Age under 45 (n=563) | | Age 45+ (n=1,852) | | Total (n=2,415) | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| *Self-efficacy* | | | | | | | | | | | | |
| Things I can do ...^ | .72*** | .45 | .61 | .49 | | | .90*** | .30 | .63 | .48 | .69 | .46 |
| *Tried to improve* | | | | | | | | | | | | |
| Haven't tried to change ...^ | .37 | .48 | .45*** | .50 | | | .13 | .33 | .47*** | .50 | .39 | .49 |
| *Participation* | | | | | | | | | | | | |
| Mean participation[#] | 3.83*** | .56 | 3.58 | .54 | | | 3.82** | .60 | 3.74 | .57 | 3.76 | .58 |
| Participation index | 3.32 | 1.59 | 3.93*** | 1.43 | | | 2.91 | 1.60 | 3.65*** | 1.52 | 3.48 | 1.57 |
| Belong social/rec clubs^ | .57*ns* | .50 | .55 | .50 | | | .44 | .50 | .60*** | .49 | .56 | .50 |
| Belong ex-services clubs^ | .62*** | .49 | .53 | .50 | | | .37 | .48 | .66*** | .48 | .60 | .49 |
| Frequent use of internet[#] | 1.40 | .66 | 1.57*** | .77 | | | 1.37 | .63 | 1.47** | .73 | 1.43 | .69 |
| Too little participation^ | .37*** | .47 | .25 | .43 | | | .54*** | .50 | .28 | .45 | .34 | .47 |
| *Health* | | | | | | | | | | | | |
| Self-rated health | 2.57 | .98 | 2.83*** | .99 | | | 2.73** | .97 | 2.61 | .99 | 2.64 | .99 |
| Physical health (SF-12) | 3.13 | 1.17 | 3.23*ns* | 1.24 | | | 3.22*** | 1.12 | 3.14 | 1.21 | 3.16 | 1.19 |
| Mental health (SF-12) | 4.00 | 1.41 | 4.50*** | 1.33 | | | 3.98 | 1.42 | 4.18*** | 1.40 | 4.13 | 1.40 |

*** *p*-value <.001, ** p-value <.01, * p-value <.05, *ns*=non-significant, derived from one-way analyses of variance (higher scores indicated)

\# Lower scores = more frequent participation / use of internet

^ Nominal categorical variable (male/yes=1; female/no=0); scores can range from 0-1

1 Note that higher scores do not necessarily mean 'better' or 'more of'.

2 Mean scores for self-efficacy and improving wellbeing cannot be reported because these are factor weighted scores and do not correspond with their original scaling. Instead, mean scores for two overview items are presented: 'There are things I can do to improve my health' and 'I haven't tried to improve my health'.

## Table 2

Bivariate associations between SOCIODEMOGRAPHIC FACTORS and LIVING ARRANGEMENTS and self-efficacy, areas that respondent has tried to improve, community participation and health.

| | Sex (male) | Age (under 45) | Gold (*vs* White) card | House/flat (*vs* institutional) | Has a carer | Lives with son/daughter |
|---|---|---|---|---|---|---|
| *Self-efficacy (could improve)* | | | | | | |
| Self-efficacy (alcohol) | .18*** | -.12*** | -.14*** | .06** | -.03*ns* | .08*** |
| Self-efficacy (smoking) | .07*** | -.16*** | -.13*** | .08*** | -.02*ns* | .10*** |
| Self-efficacy (social) | .08*** | -.17*** | -.11*** | .03*ns* | -.09*** | .08*** |
| Self-efficacy (weight) | .09*** | -.23*** | -.25*** | .09*** | -.03*ns* | .21*** |
| *Has tried to improve* | | | | | | |
| Tried to improve (alcohol) | .15*** | -.13*** | -.14*** | .03*ns* | -.04*ns* | .09*** |
| Tried to improve (smoking) | .05** | -.17*** | -.11*** | .08*** | -.06** | .12*** |
| Tried to improve (social) | .04*ns* | -.19*** | -.08*** | .00*ns* | -.08*** | .05** |
| Tried to improve (weight) | .08*** | -.24*** | -.23*** | .08*** | -.04*ns* | .19*** |
| *Participation* | | | | | | |
| Mean participation[#] | .19*** | .06** | .00*ns* | .03*ns* | -.16*** | .05** |
| Participation index | -.17*** | -.20*** | .07** | -.07*** | .17*** | -.18*** |
| Belong to social/rec club | .02*ns* | -.14*** | .04* | -.04*ns* | .11*** | -.07** |
| Belong to ex-services club | .08*** | -.26*** | .18*** | -.04* | -.06** | -.14*** |
| Frequent use of internet | .10*** | .07** | -.13*** | .05*ns* | .04*ns* | .08*** |
| Too little participation | .12*** | .24*** | -.10*** | .10*** | -.16*** | .15*** |
| *Health* | | | | | | |
| Self-rated health | -.12*** | .05** | .14*** | .00*ns* | .29*** | .01*ns* |
| Physical health (SF-12) | -.04*ns* | .03*ns* | .14*** | .00*ns* | .32*** | -.03*ns* |
| Mental health (SF-12) | -.16*** | -.06** | .05* | -.02*ns* | .26*** | -.02*ns* |

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

\# lower scores = more frequent participation.

## 2.1 Participation, isolation and health

Overall, greater community participation was related to better health (Table 3). The strongest findings were for social isolation: those reporting isolation (inadequate levels of participation) reported worse physical health and much worse self-rated health and (especially) mental health. Breadth of participation (participating in a wide variety of types of activity) was more strongly related to all forms of health than was mean participation (overall frequency of participation), and belonging to social and ex-services clubs was the least strongly related.

**Table 3**
Bivariate associations between SELF-EFFICACY, AREAS THAT THE RESPONDENT HAS TRIED TO IMPROVE and COMMUNITY PARTICIPATION and physical and mental health.

| | Self-rated health | Physical health (SF-12) | Mental health (SF-12) |
|---|---|---|---|
| *Self-efficacy (could improve)* | | | |
| Self-efficacy (weight) | -.04*ns* | -.04*ns* | -.13*** |
| Self-efficacy (smoking) | -.09*** | -.01*ns* | -.14*** |
| Self-efficacy (alcohol) | -.08*** | .02*ns* | -.17*** |
| Self-efficacy (social) | -.16*** | -.04* | -.29*** |
| *Has tried to improve* | | | |
| Tried to improve (weight) | -.04*ns* | .01*ns* | -.11*** |
| Tried to improve (smoking) | -.11*** | -.03*ns* | -.15*** |
| Tried to improve (alcohol) | -.10*** | -.01*ns* | -.18*** |
| Tried to improve (social) | -.12*** | -.04*ns* | -.24*** |
| *Community participation* | | | |
| Mean participation# | -.26*** | -.16*** | -.27*** |
| Participation index | .24*** | .15*** | .29*** |
| Belong to social/rec club | .12*** | .10*** | .11*** |
| Belong to ex-services club | .10*** | -.08** | -.03*ns* |
| Use internet frequently# | -.13*** | -.07* | -.16* |
| Too little participation | -.26*** | -.19*** | -.34*** |

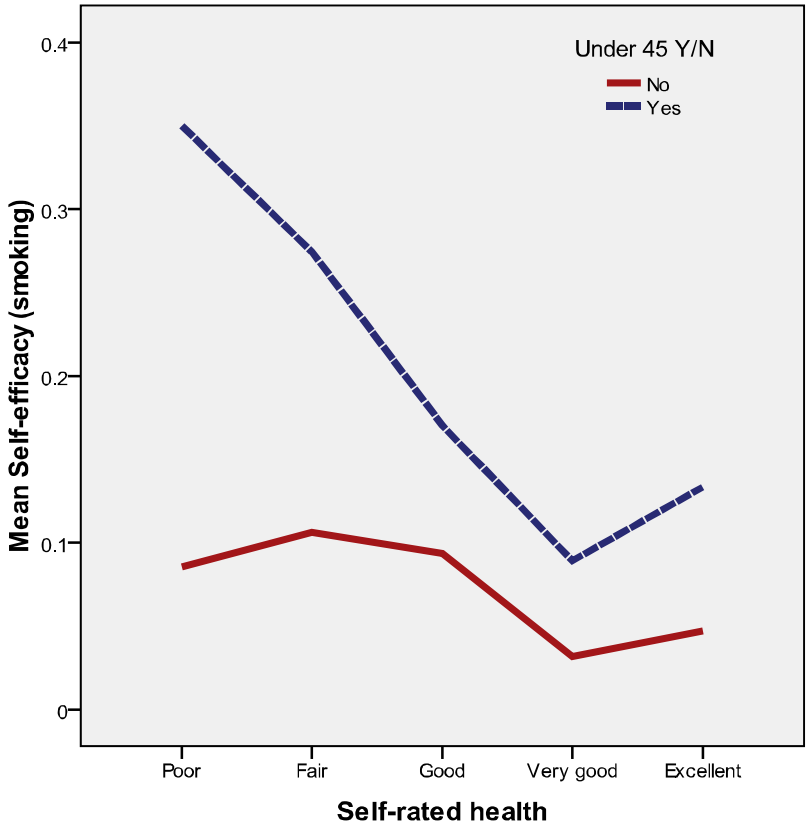
*** *p*-value <.001, ** p-value <.01, * p-value <.05
# lower scores = more frequent participation / use of the internet.

## 2.2 Self-efficacy and efforts to improve wellbeing: associations with health

In general, veterans who reported believing that there were things that they could do to improve their health and wellbeing (i.e. who reported greater health-related self-efficacy) also reported poorer self-rated and, especially, mental health. (Associations between self-efficacy and physical health were not significant.)

In most studies, self-efficacy is typically associated with better health and wellbeing. To investigate this anomaly, we computed interaction terms for socio-demographic factors that were significant in our final regression models (discussed below). These included computing interaction terms for age group (being under 45 years old or being aged 45+). We found that many of the interactions between age group and other variables in the model were significant. This meant that the patterns of relationships among many of the factors of interest in this study differed systematically by age group. For example, for older veterans, there was little or no relationship between self-efficacy for smoking and self-rated health (Figure 2). But, for younger veterans, greater self-efficacy for smoking was related to worse self-rated health.

**Figure 2**
Interaction between self-efficacy (smoking) and self-rated health for younger (dashed line) and older (solid line) veterans.




From these investigations, it seemed that age group was confounding (obscuring) the results for self-efficacy and that the anomalous findings for self-efficacy and health pertained only to the younger veterans. Because of the large number of significant interaction terms between age group and other variables in our models, to better elucidate factors pertaining to younger veterans' isolation and wellbeing, we conducted all further analyses separately for older and younger veterans. That is, we conducted all analyses twice, once for younger veterans and once again for their older peers. (The analyses conducted on the whole sample together are presented in Appendix 1 readers' information.)

We conducted three sets of multiple hierarchical regression analyses, one predicting variance in community participation, one predicting social isolation and one predicting mental health. For each of these, results for younger veterans are presented in detail first, followed by a summary of final results for older veterans. Points of similarity and difference between the two groups are noted in the results and discussed in the final chapter of the report. (For purposes of comparison, tables of results for regression analyses conducted on the whole sample together are presented in Appendix 1)

### 2.2.1 Regression analyses: Further explanation of approach

For all regression analyses, variables were added in the following blocks: (i) socio-demographic characteristics, including sex, having a Gold Card (vs. a White Card), driving a car, using public transport, living in a metropolitan (vs. non-metropolitan) area and living in a private dwelling (vs. an institutional setting); note that age group was not included because, as discussed above, the dataset had been split by age; (ii) living arrangements, including having a carer, being a carer, being married or in a de facto relationship, living alone, and living with a son/daughter/in law or a

spouse/partner or other relatives or friends; (iii) community participation, including frequency of participation, breadth of participation (except for the analysis for which breadth of participation was the outcome variable), belonging to social or ex-services clubs and using the internet frequently; (iv) social isolation (except for the analysis for which social isolation was the outcome variable); (v) self-efficacy, including the overall item (see Table 1) and the four domains of self-efficacy – smoking, alcohol, social and weight; (vi) areas in which the veteran had tried to make improvements, including the overall item (see Table 1) and the four domains– smoking, alcohol, social and weight; and, finally, (vii) health, including self-rated health, physical health, emotional problems limiting daily accomplishments, health-practitioner identified alcohol problems and mental health (except for the analysis for which mental health was the outcome variable).

## 2.3 What predicted community participation?

### 2.3.1 Younger veterans

Among the socio-demographic factors entered in the first block, only greater use of public transport contributed to explaining variance in breadth of participation scores (Table 4). The addition of living arrangements in block 2 revealed that both having and being a carer made significant independent contributions to explaining variance in breadth of participation scores. In block 3, belonging to social clubs and using the internet frequently contributed further to explained variance, with social isolation independently contributing in block 4. With the addition of social isolation, belonging to social groups no longer made an independent contribution to explaining variance in participation. This suggests a mediating effect whereby the relationship between belonging to social groups and community participation was accounted for by their shared association with isolation.

Among the self-efficacy variables included in block 5, only self-efficacy (alcohol) made an independent contribution to explaining variance in participation. In block 6, having tried to improve wellbeing with respect to alcohol added further to explained variance, but self-efficacy (alcohol) became non-significant. This suggested another mediating effect whereby the relationship between self-efficacy (alcohol) and community participation was due to their joint relationship with making an effort to change behaviour around the use of alcohol. In the final block, better self-rated and mental health each made an independent contribution to explaining variance in community participation. Making an effort to change behaviour around the use of alcohol became non-significant in this model, suggesting that its relationship with participation was accounted for by its relationship with health.

In the final model, in order of magnitude, a total of 16% of variance in greater breadth of participation among younger veterans was explained by: better self-rated health, better mental health, using public transport, not feeling isolated and using the internet frequently. Evidence of possible mediation effects was found for belonging to social clubs, self-efficacy (alcohol) and trying to improve wellbeing (alcohol). This suggests that these factors were related to veterans' breadth of informal social participation (as measured by the index) but that their contribution was better explained by other factors in the model. The following variables did *not* make an independent contribution to explaining variance in younger veterans' participation: sex, living in a house or flat, having a Gold Card *vs* a White Card, driving a car, living in a metropolitan area, all living arrangements, belonging to social or ex-services clubs, all facets of self-efficacy and of having tried to change and health (physical, accomplished less, alcohol).

## Table 4

Multiple hierarchical regression estimates for the prediction of variance in INFORMAL SOCIAL PARTICIPATION[3] by socio-demographic factors, living arrangements, other forms of community participation, self-efficacy, areas that respondent has tried to improve, and physical and mental health.

| | B | Std Err B | $\beta$ | $R^2$ |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .05*** |
| Age (under 45) | .40 | .12 | -.10*** | |
| Sex (male) | -.66 | .10 | -.05*** | |
| *Model 2: Living arrangements* | | | | .05*** |
| Age (under 45) | -.52 | .10 | -.16*** | |
| Sex (male) | -.39 | .12 | -.10*** | |
| Live with son/daughter (in-law) | -.36 | .10 | -.11*** | |
| *Model 3: Other community participation* | | | | .10*** |
| Age (under 45) | -.44 | .10 | -.13*** | |
| Sex (male) | -.47 | .12 | -.11*** | |
| Live with son/daughter (in-law) | -.40 | .10 | -.12*** | |
| Belong sport/recreational clubs | .57 | .09 | .18*** | |
| Use internet frequently | .29 | .07 | .12*** | |
| *Model 4: Self-efficacy* | | | | .12*** |
| Age (under 45) | -.40 | .10 | -.12*** | |
| Sex (male) | -.45 | .12 | -.11*** | |
| Live with son/daughter (in-law) | -.40 | .10 | -.12*** | |
| Belong sport/recreational clubs | .55 | .09 | .17*** | |
| Use internet frequently | .26 | .07 | .11*** | |
| Self-efficacy (smoking) | -.56 | .13 | -.13*** | |
| *Model 5: Has tried to improve* | | | | .13*** |
| Age (under 45) | -.34 | .10 | -.11*** | |
| Sex (male) | -.45 | .12 | -.11*** | |
| Live with son/daughter (in-law) | -.42 | .10 | -.13*** | |
| Belong sport/recreational clubs | .54 | .09 | .17*** | |
| Use internet frequently | .26 | .07 | .11*** | |
| Self-efficacy (smoking) | -.54 | .13 | -.12*** | |
| Has tried to improve (social) | -.44 | .10 | -.12*** | |
| *Model 6: Physical and mental health* | | | | .20*** |
| Age (under 45) | -.38 | .10 | -.12*** | |
| Sex (male) | -.40 | .11 | -.10*** | |
| Live with son/daughter (in-law) | -.45 | .10 | -.13*** | |
| Belong sport/recreational clubs | .41 | .09 | .13*** | |
| Use internet frequently | .16 | .07 | .07*** | |
| Self-efficacy (smoking) | -.44 | .12 | -.10*** | |
| Has tried to improve (social) | -.21 | .10 | -.06* | |
| Physical health (SF-12) | .18 | .04 | .13*** | |
| Mental health (SF-12) | .27 | .03 | .23*** | |

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

3 Using the participation index; higher scores = more frequent participation

### 2.3.2 Older veterans

As for their younger peers, this model explained a total of 16% of variance in breadth of participation (

Table 5). In order of magnitude, significant predictors of greater breadth of participation were: better self-rated health, better mental health, using public transport, not feeling isolated, using the internet frequently and having a carer. These were the same variables that predicted younger veterans' participation, except for the addition among older veterans of having a carer. The following variables did *not* make an independent contribution to explaining variance in older veterans' participation: sex, living in a house or flat, having a Gold Card *vs* a White Card, driving a car, living in a metropolitan area, all living arrangements except for having a carer, belonging to social or ex-services clubs, all facets of self-efficacy and of having tried to change and health (physical, accomplished less, alcohol).

## Table 5

Multiple hierarchical regression estimates for the prediction of variance in SOCIAL ISOLATION by socio-demographic factors, living arrangements, self-efficacy[4], physical and mental health and community participation[5].

| | B | Std Err B | $\beta$ | $R^2$ |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .06*** |
| Age (under 45) | .26 | .02 | .23*** | |
| Live in house/flat (*vs* institutional) | .13 | .04 | .07*** | |
| *Model 2: Living arrangements* | | | | .09*** |
| Age (under 45) | .26 | .02 | .23*** | |
| Live in house/flat (*vs* institutional) | .13 | .03 | .08*** | |
| Has a carer | -.21 | .03 | -.16*** | |
| *Model 3: Self-efficacy* | | | | .18*** |
| Age (under 45) | .18 | .02 | .17*** | |
| Live in house/flat (*vs* institutional) | .12 | .03 | .07*** | |
| Has a carer | -.17 | .02 | -.14*** | |
| Self-efficacy (social) | .31 | .02 | .30*** | |
| Self-efficacy (weight) | .31 | .11 | .06** | |
| *Model 4: Physical and mental health* | | | | .24*** |
| Age (under 45) | .20 | .02 | .17*** | |
| Live in house/flat (*vs* institutional) | .12 | .03 | .07*** | |
| Has a carer | -.07 | .02 | -.06** | |
| Self-efficacy (social) | .25 | .02 | .24*** | |
| Self-efficacy (weight) | .23 | .10 | .04* | |
| Physical health (SF-12) | -.06 | .01 | -.13*** | |
| Mental health (SF-12) | -.06 | .01 | -.18*** | |
| *Model 5: Community participation* | | | | .27*** |
| Age (under 45) | .18 | .01 | .14*** | |
| Live in house/flat (*vs* institutional) | .75 | .32 | .06*** | |
| Has a carer | -.75 | .45 | -.04* | |
| Self-efficacy (social) | .05 | .42 | .22*** | |
| Self-efficacy (weight) | .39 | .01 | .04* | |
| Physical health (SF-12) | -.03 | .01 | -.11*** | |
| Mental health (SF-12) | -.12 | .25 | -.15*** | |
| Informal social participation | -.05 | .97 | -.18*** | |

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

4 Areas that respondent has tried to improve were all non-significant in this model.

5 Using the participation index; higher scores = more frequent participation.

## 2.4 What predicted social isolation?

### 2.4.1 Younger veterans

Among the socio-demographic factors entered in the first block, having a Gold Card and not living in a private dwelling contributed independently to explaining variance in social isolation scores (Table 6).

Living alone made a further contribution in block 2. In block 3, the participation index and belonging to social clubs each independently contributed to explained variance in social isolation. With the addition of the self-efficacy variables in Block 4, self-efficacy (social) independently contributed to explaining variance in social isolation, while having a Gold Card became non-significant. This suggested a possible mediating effect in which the relationship between having a Gold Card (greater disability) and social isolation was explained by their shared relationship with self-efficacy (social). None of the variables measuring attempts to improve health and wellbeing made a significant independent contribution to explaining variance in isolation. But, with their addition into the model in Block 5, living in a house or flat and living alone were no longer independently related to isolation. In the final block, mental and physical health added further to explaining variance in social isolation, bringing the total variance explained to 25 %.

In the final model, in order of magnitude, greater social isolation among younger veterans was explained by: higher levels of social self-efficacy, worse mental health, worse physical health, not belonging to social groups and not participating broadly in the community. Evidence of possible mediation effects was found for having a Gold Card, living in a house or flat, living alone and social self-efficacy. This suggests that these factors played a part in explaining younger veterans' isolation, but that their isolation was better accounted for by other factors in the model.

The following variables did *not* make an independent contribution to explaining variance in younger veterans' isolation: sex, living in a house or flat, having a Gold Card *vs* a White Card, using public transport, driving a car, living in a metropolitan area, living arrangements (being married or de facto, having a caregiver, being a caregiver, living alone, living with a range of others [spouse/partner, son/daughter/in law, other relatives, friends]), aspects of community participation (ex-services clubs, internet use), self-efficacy (general, weight, smoking, alcohol), all domains of having tried to change, and health (self-rated, accomplished less, alcohol).

## Table 6

Multiple hierarchical regression estimates for the prediction of variance in MENTAL HEALTH by sociodemographic factors, living arrangements, community participation[6], isolation, self-efficacy[7] and physical health.

| | B | Std Err B | β | $R^2$ |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .04*** |
| Sex (male) | -.56 | .07 | -.19*** | |
| Gold (*vs* White) Card | -.29 | .07 | -.10*** | |
| *Model 2: Living arrangements* | | | | .08*** |
| Sex (male) | -.48 | .07 | -.16*** | |
| Gold (*vs* White) Card | -.21 | .07 | -.07*** | |
| Has a carer | .83 | .08 | .21*** | |
| *Model 3: Community participation* | | | | .12*** |
| Sex (male) | -.39 | .07 | -.13*** | |
| Gold (*vs* White) Card | -.24 | .07 | -.08*** | |
| Has a carer | .75 | .08 | .19*** | |
| Informal social participation | .17 | .02 | .19*** | |
| *Model 4: Too little participation (Isolation)* | | | | .18*** |
| Sex (male) | -.34 | .07 | -.11*** | |
| Gold (*vs* White) Card | -.30 | .06 | -.10*** | |
| Has a carer | .65 | .08 | .17*** | |
| Informal social participation | .11 | .02 | .12*** | |
| Too little participation | -.79 | .06 | -.26*** | |
| *Model 5: Self-efficacy* | | | | .21*** |
| Sex (male) | -.29 | .06 | -.09*** | |
| Gold (*vs* White) Card | -.38 | .06 | -.13*** | |
| Has a carer | .63 | .08 | .16*** | |
| Informal social participation | .09 | .02 | .10*** | |
| Too little participation | -.60 | .07 | -.20*** | |
| Self-efficacy (alcohol) | -.40 | .09 | -.09*** | |
| Self-efficacy (social) | -.48 | .07 | -.15*** | |
| Self-efficacy (weight) | -.78 | .34 | -.05* | |
| *Model 6: Physical health* | | | | .30*** |
| Sex (male) | -.21 | .06 | -.07*** | |
| Gold (*vs* White) Card | -.22 | .06 | -.07*** | |
| Has a carer | .37 | .08 | .09*** | |
| Informal social participation | .06 | .02 | .07*** | |
| Too little participation | -.44 | .06 | -.15*** | |
| Self-efficacy (alcohol) | -.35 | .09 | -.08*** | |
| Self-efficacy (social) | -.43 | .06 | -.14*** | |
| Self-efficacy (weight) | -.75 | .33 | -.05* | |
| Self-rated health | .44 | .03 | .32*** | |

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

6 Using the participation index; higher scores = more frequent participation.

7 Areas that respondent has tried to improve were all non-significant in this model.

### 2.4.2 Older veterans

As for their younger peers, this model explained a total of 25% of variance in social isolation, but isolation was predicted by a larger number of factors among older compared to younger veterans (Table 7).

In order of magnitude, greater isolation was predicted by: not participating broadly in the community, greater social self-efficacy, worse mental health, worse physical health, emotional problems interfering with daily accomplishments, living in a house or flat, trying to improve social wellbeing, greater self-efficacy with respect to weight and being a man.

Except for belonging to social groups, which helped explain younger veterans' isolation but not that of their older peers, the same variables that predicted younger veterans' isolation predicted that of older veterans. In addition, five further factors contributed: emotional problems interfering with daily accomplishments, living in a house or flat, trying to improve social wellbeing, greater self-efficacy with respect to weight and being a man also helped explain older veterans' isolation.

The following variables did *not* make an independent contribution to explaining variance in older veterans' isolation: having a Gold Card *vs* a White Card, using public transport, driving a car, living in a metropolitan area, all living arrangements, most aspects of community participation (frequency, social clubs, ex-services clubs, internet use), specific aspects of self-efficacy (smoking, alcohol), most aspects of having tried to change (weight, smoking, alcohol) and some facets of health (self-rated, alcohol problems).

**Table 7**

Multiple hierarchical regression estimates for the prediction of variance in SOCIAL ISOLATION AMONG OLDER VETERANS by socio-demographic factors, living arrangements, community participation, self-efficacy, areas that respondent has tried to improve, and physical and mental health.

| | B | Std Err B | *β* | *Adjusted R²* |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .03*** |
| Sex (male) | .16 | .02 | .16*** | |
| Lives in a house or flat | .12 | .03 | .08*** | |
| *Model 2: Living arrangements* | | | | .12*** |
| Sex (male) | .10 | .02 | .10*** | |
| Lives in a house or flat | .10 | .03 | .07*** | |
| Participation index | -.09 | .01 | -.29*** | |
| *Model 3: Community participation* | | | | .19*** |
| Sex (male) | .08 | .02 | .08*** | |
| Lives in a house or flat | .09 | .03 | .06** | |
| Participation index | -.07 | .01 | -.25*** | |
| Can improve health and wellbeing | .07 | .02 | .07** | |
| Self-efficacy (social) | .24 | .02 | .23*** | |
| Self-efficacy (weight) | .35 | .13 | .06** | |
| *Model 4: Social isolation* | | | | .20** |
| Sex (male) | .08 | .02 | .08*** | |
| Lives in a house or flat | .09 | .03 | .06** | |
| Participation index | -.07 | .01 | -.25*** | |
| Can improve health and wellbeing | .07 | .02 | .07** | |
| Self-efficacy (social) | .19 | .03 | .18*** | |
| Self-efficacy (weight) | .33 | .13 | .05* | |
| Has tried to improve (social) | .11 | .03 | .08** | |
| *Model 5: Self-efficacy* | | | | .25*** |
| Sex (male) | .04 | .02 | .04* | |
| Lives in a house or flat | .09 | .03 | .07*** | |
| Participation index | -.06 | .01 | -.19*** | |
| Can improve health and wellbeing | .06 | .02 | .06** | |
| Self-efficacy (social) | .15 | .03 | .15*** | |
| Self-efficacy (weight) | .27 | .13 | .05* | |
| Has tried to improve (social) | .08 | .03 | .06* | |
| Physical health (SF12) | -.04 | .01 | -.11*** | |
| Mental health (SF12) | -.04 | .01 | -.13*** | |
| Accomplish less (SF12) | -.03 | .01 | -.08* | |

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

## 2.5 Did community participation and social isolation predict mental health?

### 2.5.1 Younger veterans

Among the socio-demographic factors considered, being female, not having a Gold Card, driving a car and living in a metropolitan setting all made independent contributions to explaining variance in younger veterans' (better) mental health (Table 8).

In the second block, the addition of having a carer added further to explained variance in mental health, while breadth of participation and frequent use of the internet together contributed in block 3. In block 4, social isolation also made a significant independent contribution to explaining variance in younger veterans' mental health scores. Self-efficacy (social and weight) each made further independent contributions in block 5, with efforts to try to change behaviour (alcohol and weight) also independently contributing in block 6. In the final block, better self-rated health and worse physical health each made independent contributions to explaining variance in better mental health.

With the addition of the health variables in the final block, sex, not having a Gold Card, frequent internet use and having tried to change behaviour (alcohol) no longer made independent contributions to explaining variance in mental health. This suggested that their relationship with mental health was better explained by their relationship with self-rated and physical health.

In the final model, the following variables did *not* make an independent contribution to explaining variance in younger veterans' mental health: sex, living in a house or flat, having a Gold Card *vs* a White Card, using public transport, driving a car, most living arrangements (being married or de facto, being a caregiver, living alone, living with a range of others), community participation (frequency, social clubs, ex-services clubs, internet use), self-efficacy (general, and weight, smoking, alcohol), having tried to change (general, and smoking, alcohol, social) and some facets of health (accomplished less, alcohol).

## Table 8

Multiple hierarchical regression estimates for the prediction of variance in MENTAL HEALTH AMONG YOUNGER VETERANS by socio-demographic factors, living arrangements, community participation, social isolation, self-efficacy, areas that respondent has tried to improve, and physical and mental health.

| | B | Std Err B | *β* | *Adjusted R²* |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .12*** |
| Gold Card *vs* White Card | -1.27 | .20 | -.35*** | |
| *Model 2: Living arrangements* | | | | .15*** |
| Gold Card *vs* White Card | -1.09 | .20 | -.30*** | |
| Has a carer | .73 | .22 | .18*** | |
| *Model 3: Community participation* | | | | .17*** |
| Gold Card *vs* White Card | -1.06 | .20 | -.29*** | |
| Has a carer | .78 | .22 | .19*** | |
| Frequent internet use | .40 | .13 | .15** | |
| *Model 4: Social isolation* | | | | .29*** |
| Gold Card *vs* White Card | -.89 | .19 | -.24*** | |
| Has a carer | .70 | .21 | .17*** | |
| Frequent internet use | .34 | .13 | .13** | |
| Too little participation | -.93 | .13 | -.35*** | |
| *Model 5: Self-efficacy* | | | | .32*** |
| Gold Card *vs* White Card | -.81 | .18 | -.22** | |
| Has a carer | .63 | .20 | .15** | |
| Frequent internet use | .23 | .12 | .11* | |
| Too little participation | -.69 | .14 | -.26*** | |
| Self-efficacy (social) | -.60 | .14 | -.22*** | |
| *Model 6: Has tried to improve* | | | | .34** |
| Gold Card *vs* White Card | -.82 | .18 | -.23*** | |
| Has a carer | .60 | .20 | .15** | |
| Frequent internet use | .31 | .12 | .12** | |
| Too little participation | -.70 | .14 | -.27*** | |
| Self-efficacy (social) | -.55 | .14 | -.20*** | |
| Has tried to improve (alcohol) | -.51 | .17 | -.14** | |
| *Model 7: Physical and mental health* | | | | .48*** |
| Gold Card *vs* White Card | -.79 | .16 | -.22*** | |
| Has a carer | .60 | .19 | .15** | |
| Frequent internet use | .25 | .11 | .10* | |
| Too little participation | -.48 | .13 | -.18*** | |
| Self-efficacy (social) | -.46 | .13 | -.17*** | |
| Has tried to improve (alcohol) | -.34 | .15 | -.09* | |
| Self rated health | .69 | .08 | .49*** | |
| Physical health (SF-12) | -.44 | .07 | -.36*** | |

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

### 2.5.2 Older veterans

This model explained a total of 37 % of variance in mental health, less than for older veterans' younger peers, and it was predicted by a more complicated interplay of factors than was the case among younger veterans (

Table 9). In order of magnitude, better mental health was predicted by: having better self-rated health and worse physical health, not feeling isolated, having a carer, having low self-efficacy (social), greater breadth of participation, not trying to change (weight) and living in a metropolitan location. Again, it is possible that the apparently anomalous finding with physical health is due to the way in which the SF-12 sub-scales are constructed and is not discussed further here. The following variables did *not* make an independent contribution to explaining variance in older veterans' mental health: sex, living in a house or flat, having a Gold Card *vs* a White Card, using public transport, driving a car, all living arrangements except for having a caregiver, community participation (frequency, social clubs, ex-services clubs, internet use), self-efficacy (general, weight, smoking, alcohol), having tried to change (general, smoking, alcohol, social) and health (accomplished less, alcohol).

**Table 9**
Multiple hierarchical regression estimates for the prediction of variance in MENTAL HEALTH (SF-12) AMONG OLDER VETERANS by socio-demographic factors, living arrangements, community participation, social isolation, self-efficacy, areas that respondent has tried to improve, and physical and other aspects of health.

| | B | Std Err B | *β* | *Adjusted R²* |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .01*** |
| Live in metropolitan area | .23 | .07 | .08*** | |
| *Model 2: Living arrangements* | | | | .07*** |
| Live in metropolitan area | .22 | .06 | .08*** | |
| Has a carer | .92 | .08 | .25*** | |
| *Model 3: Community participation* | | | | .12*** |
| Live in metropolitan area | .15 | .06 | .05* | |
| Has a carer | .78 | .08 | .21*** | |
| Participation index | .21 | .02 | .23*** | |
| *Model 4: Social isolation* | | | | .18*** |
| Live in metropolitan area | .18 | .06 | .06** | |
| Has a carer | .66 | .08 | .18*** | |
| Participation index | .14 | .02 | .15*** | |
| Too little participation | -.81 | .07 | -.26*** | |
| *Model 5: Self-efficacy* | | | | .20*** |
| Live in metropolitan area | .18 | .06 | .06** | |
| Has a carer | .64 | .08 | .17*** | |
| Participation index | .13 | .02 | .14*** | |
| Too little participation | -.65 | .07 | -.21*** | |
| Self-efficacy (social) | -.54 | .07 | -.17*** | |
| *Model 6: Has tried to improve* | | | | .20** |
| Live in metropolitan area | .18 | .06 | .06** | |
| Has a carer | .64 | .08 | .17*** | |
| Participation index | .13 | .02 | .14*** | |
| Too little participation | -.64 | .07 | -.21*** | |
| Self-efficacy (social) | -.52 | .07 | -.16*** | |

| | B | Std Err B | *β* | *Adjusted R²* |
|---|---|---|---|---|
| Has tried to improve (weight) | -1.00 | .36 | -.06** | |
| *Model 7: Physical and mental health* | | | | .37*** |
| Live in metropolitan area | .14 | .05 | .05** | |
| Has a carer | .54 | .07 | .15*** | |
| Participation index | .08 | .02 | .09*** | |
| Too little participation | -.49 | .07 | -.16*** | |
| Self-efficacy (social) | -.36 | .06 | -.11*** | |
| Has tried to improve (weight) | -.89 | .32 | -.05** | |
| Self rated health | .78 | .04 | .55*** | |
| Physical health (SF- 12) | -.42 | .03 | -.36*** | |
| *Model 8: Interaction term* | | | | .37* |
| Live in metropolitan area | .14 | 0.5 | .05* | |
| Has a carer | .17 | .21 | .05 | |
| Participation index | .8 | .02 | .09*** | |
| Too little participation | -.49 | .07 | -.16*** | |
| Self-efficacy (social) | -.36 | .06 | -.11*** | |
| Has tried to improve (weight) | -.89 | .32 | -.05** | |
| Self rated health | .77 | .04 | .55*** | |
| Physical health (SF- 12) | -.72 | .16 | -.62*** | |
| Interaction carer x phys health | .16 | .08 | .31* | |

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

# 3. Discussion

## 3.1 Poorer health and wellbeing among veterans and men

Although *men veterans* tended to use the internet more than did women, and to report greater self-efficacy, greater likelihood of having tried to improve their health and of belonging to ex-services clubs, they reported deficits with respect to women in many key areas. These included participating less frequently in informal social activities than did women veterans, as well as having less breadth of participation, greater isolation, worse self-rated health and worse mental health. The last of these, worse mental health, is not consistent with Australian population norms (women consistently report worse mental health than do men, ABS, 2008). This anomaly most likely reflects the sample bias (further comment below).

*Younger veterans* showed a somewhat similar pattern to that revealed by men. Despite (slightly) better self-rated and physical health and more frequent use of the internet, younger veterans participated in informal social activities less frequently than did older veterans, had less breadth of participation, were less likely to belong to either a social or an ex-services club, were more isolated, had less self-efficacy, were less likely to have tried to change their health for the better and had worse mental health. With respect to participation, isolation and health, these findings for men and for younger veterans are consistent with Australian population norms (ABS, 2008; Berry & Welsh, 2010). There are no Australian norms for self-efficacy or trying to change behaviour using these measures (further comment below).

## 3.2 Associations among participation, isolation, health and wellbeing

Greater frequency and breadth of participation, belonging to social clubs and ex-services clubs and more frequent internet use were, as expected (see Figure 1),

related to better health and wellbeing across all measures. Greater isolation was, also as predicted, related to worse health and wellbeing on all measures. The strongest associations among variables were between mental health and the other variables, with the strongest of all being between isolation and mental health. This suggested a key role for mental health in understanding veterans' isolation.

Excess community participation was protective for isolation; that is, controlling for the expected association between participation and isolation (people who participated more were less isolate), participation played some kind of additional role in reduced isolation. Having a carer was helpful in this regard, because having a carer was related to more participation, but only among older veterans. Taking account of all variables simultaneously, for older veterans, having a carer was linked to less isolation (but note that it was not significant in multivariate analyses for younger veterans).

In our regression models, mental health was in every case a stronger predictor of participation and isolation than was physical health. This suggests that, in considering veterans' possible barriers to participation, what they think and feel may be at least as important as what their bodies can or cannot do.

## 3.3 Participation, isolation, health and wellbeing: What predicts what?

We found striking differences in the amount of variance explained (adjusted $R^2$ values) by our models, though we used exactly the same variables in each model. Our model predicting participation was able to explain 16% of variance in scores for both older and younger veterans while 25% of variance in social isolation scores was predicted for both groups. For older veterans, our model was able to explain 37% of variance in mental health scores, and 48% for their younger peers. Put another way, for older veterans, the model predicting mental health was around 1.5 times as powerful as that predicting isolation and twice as powerful as the model predicting community participation. For younger veterans, the latter was three times as powerful as the model predicting participation.

While analyses of cross-sectional data cannot usually permit causal inferences, these findings suggest tentative support for the *plausibility* of our conceptual model: that is, it is *possible*, as we propose, that (i) poor mental health is barrier to community participation, perhaps triggering or exacerbating social isolation, and that (ii) less community participation and greater isolation are particularly strongly involved in the development or maintenance of poor mental health. These findings and our tentative conclusion are consistent with a large body of research around participation, isolation and mental health (Eng, Rimm, Fitzmaurice, & Kawachi, 2002; Lauder, Mummery, & Sharkey, 2006; Locher, Ritchie, Roth, Baker, Bodner, & Allman, 2005; McPherson, Smith-Lovin, & Brashears, 2006) including research using Australian samples (Berry & Shipley, 2009; Berry & Welsh, 2010).

Indeed, it is believed that participation is related to mental health because participation engenders greater social cohesion (Putnam, 2000) which is strongly related to health and wellbeing, especially to mental health (Berry & Welsh, 2010). This combination of community participation and social cohesion is often referred to as 'social capital' (Putnam, 2000); individuals and communities that are rich in social capital show evidence of advantages in a very wide range of health, social and economic domains (see, for example, Borgonovi & Huerta, 2009; Derose & Varda, 2009; Snelgrove, Pikhart, & Stafford, 2009; Ziersch, Baum, Darmawan, Kavanagh, & Bentley, 2009).

## 3.4 Unexpected findings

We note three unexpected findings. First, in the general population, as in the present sample, better mental health is associated with better physical health. However, in our regression analyses predicting mental health, for both younger and older

veterans, worse physical health predicted better mental health. Follow-up analyses (not reported here) indicated that this might partly be due to whether or not the veteran had a carer.

Veterans with carers had better mental health than those that did not; and veterans with worse health were more likely than were their peers to have a carer. Significant interaction terms between having a carer and physical health were found when predicting mental health. Thus, it may be that, although poor physical health goes hand-in-hand with worse mental health, it also means a greater likelihood of having a carer, which is related to better mental health. Our interaction analyses did not fully account for the multivariate relationship between (worse) physical and (better) mental health and this apparent anomaly requires further research.

Second, greater self-efficacy is usually related to better health (see, for example, Karademas, 2006; Luszczynska, Mohamed, & Schwarzer, 2005; Schwarzer & Knoll, 2007). But, in the present study, the opposite was the case. The most likely explanations for this are technical: it could be accounted for by the very unusual sample, with the large majority of respondents recording poor to very poor mental and physical health; or it may be due to the use of variables that were not intended to measure self-efficacy; or it could be related to the issues around which we measured self-efficacy (such as weight problems, alcohol and smoking) which are related to worse mental health.

Third, the role of carers was less frequently statistically significant than we expected. *Being a carer* made a non-significant contribution to explaining variance in *all* models. *Having a carer* only made a significant contribution to explaining variance in two models: predicting mental health and predicting breadth of participation and, in the latter case, only for older veterans. Further, in all cases, the contribution having a carer made was small. This does not, of course, mean that carers (or being a carer, for that matter) are not important. It means that the relationship between having a carer and outcomes to do with participation, isolation and mental health is not well explained by the set of factors available for the present study. This is clearly an area for further research.

## 3.5 Limitations

We note five key limitations to the present study. First, our findings cannot be generalised to the wider population of veterans because the sample that we have analysed is not representative of all Australian veterans. For example, the sample population for the study comprised veterans and war widows entitled to white or gold DVA card. The broader veteran population who were not current clients of DVA, including veterans living overseas and institutionalized, were therefore not part of the sample population that was analyzed for this study. To the extent that we found anomalies in the results, these may be due to the unusual sample.

Second, we did not have access to the original data from which the database we analysed was formed. We could not, therefore, reconstitute or test the measures; in some cases, this led to limitations in our analyses. For example, we were not able to include continuous SF-12 mental and physical health scores or age in years in our models. We could not, therefore, control for age in our studies or investigate age-related moderation effects for relationships among predictor variables. We were also not able to investigate missing data.

Third and very importantly, other than an item asking in which conflicts, if any, veterans had served, the dataset contained no measures of the experience of military service or of combat exposure; we were thus not able to consider statistically any of these factors or exposures in our conceptual model.

Fourth, many of the measures included in the study were *ad hoc* and non-standard, so we could not compare the findings for the present sample of veterans with those for population norms. Finally, the dataset was not designed to examine younger

veterans or to examine social isolation. With respect to the latter, we were able to include in our analyses just a single, crude indicator of isolation.

## 3.6 Conclusion

Despite the limitations of our study and the need for further research, we were able to investigate community participation, social isolation and mental health in a large sample of Australian veterans.

Consistent with our proposed conceptual model, more favourable socio-demographic characteristics were linked to greater community participation and less isolation which were, in turn, linked to better health and wellbeing.

We also found indicative evidence for a feedback loop in which poorer mental health was linked to less participation and more isolation. There were differences in the factors that predicted participation, isolation and mental health among younger compared to older veterans, suggesting the need for differentiated programs, and community participation and isolation were more strongly linked to mental health among younger veterans compared to their older peers.

With lower levels of (protective) community participation, higher levels of isolation and worse mental health, younger veterans may require supplementary support services to facilitate greater community connectedness. Interventions that recognise the complexity of the relationship between participation, isolation and wellbeing (especially the key role that mental health appears to play) would be beneficial, especially for younger veterans.

In considering potential barriers to increased participation, and despite poor physical health, what veterans think and feel is as much (perhaps more) important than what their bodies can or cannot do.

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# Part C: Future research

## 1. Building on what we know we don't know: Gaps in knowledge prior to the present study

Our literature review revealed that there has been no direct research into social isolation among veterans, or into a number of related factors. Most importantly, no studies have compared the post-service wellbeing of veterans who *choose* solitude, those unwillingly isolated, and the socially active. Differences between working age veterans compared to those in retirement in the extent or nature of social isolation have not been considered. Nor have the particular experiences of women, reservists, those engaging in multiple deployments (for example, modern 'career' service people), those in specialist roles (such as Special Air Services personnel or medical officers) and those in peacekeeping roles been sufficiently considered.

Social isolation, to the limited degree that it has been considered in previous research, has been touched on only indirectly or by inference. It is implicit in considerations of veterans' of wellbeing, especially their mental health, in terms of the role played by social support or networks. But there is no literature on the pleasure or fulfilment that veterans may derive from community participation, on their goals in engaging in or avoiding it, or on what they do in their communities and its relationship to wellbeing and post-service functioning. Strangely, and of great importance to social isolation, Australian studies have not investigated the nature and role of mateship as a mediator of military experience and a promoter of post-service social inclusion.

We found very little consideration of predisposing vulnerabilities and resilience among those entering military service and, therefore, no attempt to understand how these factors might interact with service experiences to influence post-service isolation. Other than some minimal coverage of childhood experiences (Brewin et al., 2007), no studies have considered the effects of childhood experiences or of other factors highly likely to influence service experiences and later isolation.

Australian studies have also omitted full consideration of the role played by prior socio-demographic factors in contributing to post-service social isolation, including whether from Aboriginal and Torres Strait Islander origin, gender and level of education. Like the international literature, Australian studies have touched on, but have not fully investigated, socio-economic status as a predictor of service experiences and subsequent wellbeing. This is surprising given its known importance to social inclusion, health and wellbeing and the importance of rank in shaping military experience (which is discussed in the national and international literature).

No studies have compared veterans' post-service outcomes with respect to the duration or frequency of deployment, the nature of combat itself and exposure to injury, death and other trauma (such as witnessing horrific events), or any differences between those conscripted compared with voluntary enlistment.

There have also been no studies that have investigated the ways in which the culture of the armed forces may contribute to health and other correlates of later social isolation, for example, through tolerating, even promoting, excessive use of alcohol and providing access to cut-price cigarettes. We consider factors such as pre-existing mental health states, substance use (or not) prior to service and sexual orientation to be important candidates for inclusion in future studies of veterans' isolation and (lack of) wellbeing. It is also important to consider physical health status. While it may be assumed, as a result of pre-service screening, that enlistees are in good health, no studies have tested this, or investigated the possible effects of prior health differences on post-service participation and wellbeing. Nor has research reported on post-service mortality, or (in any detail) on carers' wellbeing.

## 2. Building on what we have learned: Summary of what the present study adds

Our study has been able to contribute to addressing the lack of research in some of these areas. For example, we have been able to investigate social isolation directly, albeit through the use of a single item in the data we analysed, and to link it clearly to physical and, especially, to mental health. We have also been able to consider a number of types of participation, and frequency and breadth of participation, and to show that these are related to but not the same as (or the inverse of) isolation. For example, veterans may participate frequently and still feel isolated or participate infrequently and not feel isolated. We have also shown that participation, isolation and mental health are strongly related to each other and to a range of socio-demographic factors, but not to the same factors. Thus, for example, addressing certain socio-demographic factors may assist in increasing participation but not in improving mental health. Further, we have demonstrated substantial differences in the experiences of younger and older veterans.

## 3. Future research: Overview

Based on the findings of the present study, future studies will need to access a representative sample of veterans, be theory-driven (to assist in the development of hypotheses, in the interpretation of findings and in the design of interventions and their evaluation), cover an appropriate range of issues, and include valid, reliable and acceptable measures.

The role of physical health and its relationship to the presence of a carer requires further elucidation, as does the role played by psychosocial characteristics in promoting wellbeing. Given the importance of mental health in understanding isolation, and the known role of community participation and social cohesion in protecting against the development of mental health problems, ameliorating their course and preventing relapse, further research into social networks, social support and, especially, social capital could produce especially valuable new knowledge for veterans.

In the present study, we defined social isolation as requiring three conditions:

- The veteran's social participation is inadequate. The person wants or needs more, better or different social participation;
- The veteran experiences barriers to adequate social participation. For real or perceived reasons, the person cannot access the nature and extent of participation that s/he wants or needs; and
- Each veteran's experience is subjective. What each wants or needs, and real or perceived barriers to attaining it, are idiosyncratic and subjective, varying from person to person.

In our study, we were able to locate participants who reported that they did not have sufficient social participation and we were able to examine certain modifiers of (such as socio-demographic constraints, for example, living in a private dwelling or not having a carer) or barriers to their participation (such as lack of material resources or poor health). Future studies will need to be based on the use of such a definition and better measure social isolation.

More generally, future Australian studies will need to take account of:

(i) what is already known from local and international research,

(ii) the gaps that exist in this knowledge base, as summarised above,

(iii) the findings of the present study and

(iv) of policy priorities for future service and intervention planning.

Given the changing demographics and roles of service personnel, we consider proper consideration of the experiences and later wellbeing of those undertaking multiple deployments (for example, 'career' personnel) and those of working age when they leave the service to be very important.

The transition from military service to civilian life, like any major transition, is likely to involve upheaval and major readjustment to identity and the nature of daily life. It will be important for the wellbeing of future veterans to understand this transition process and, therefore, to acquire greater insight into its proper management, whether or not ex-service personnel become clients of the Department: it should not be assumed that those who do not become clients are without support needs. We would also recommend greater research attention be paid to previously neglected groups, especially women and reservists.

Finally, like the general population, the veteran population is ageing. Future research will need to address the normal process and demands of ageing as well as how they interact with veteran-specific characteristics and experiences.

## 4. Developing Australia's next study of service veterans

In order to secure excellence of design and outcome, we advise that the planning and design of a future study of Australian veterans is best approached in linked phases, with the results of one phase informing the next. Rather than recommend, here, issues and items to include in another questionnaire, we recommend the planning process outlined below. This process will ensure that the Department is clear about its goals and requirements from the study, that appropriate issues are canvassed, that concepts are adequately defined, measured and analysed, that increasingly robust levels of evidence are obtained, that findings are related directly to policy requirements and that interventions based on the findings of new research can be properly designed and scientifically evaluated.

Our recommended approach is:

**Phase 1**: Build upon the findings of this research into social isolation in the Australian veteran community through undertaking further research under the priorities identified in the Department's Applied Research Plan[8] to identify specific research projects in relation to the following identified research priorities:

- veterans physical and mental health needs: a wellness approach (including early intervention, resilience, rehabilitation, compensation, veterans' families, and women's health)
- younger veterans and transition (including specific deployments, multiple deployments, recent war service, peacekeeper issues and transition from military to civilian occupation)
- ageing issues for veterans and war widows (including WWII, Korean and Vietnam veterans, war widows, social isolation, dementia and other aged care issues)

**Phase 2**: Undertake a qualitative study of veterans' health and wellbeing. We recommend an exploratory study of a purposively sampled selection of Australian

[8] Department of Veteran Affairs (2010): The Applied Research Program

veterans to learn what different kinds of veterans want and need to live a full and productive life, and to understand their current experiences and future aspirations.

The sample should include veterans of working age and veterans in retirement, women, reservists, those who have undertaken multiple deployments, those who undertook specialist roles and those who undertook peacekeeping roles.

A particular purpose of the study would be to understand the antecedent factors associated with social isolation, its lived experience, its effects on wellbeing and functioning and veterans' opinions about how best to address it. It would also be helpful to understand why some veterans do not approach the Department for assistance. We recommend the hiring of a professional researcher team to undertake this study.

**Phase 3**: Undertake a cross-sectional study of veterans' health and wellbeing with a view to conducting a cohort study. We recommend the undertaking of a large, random sample cross-section questionnaire-based study of veterans' health and wellbeing and factors associated with their present capacity to engage productively in their communities.

The sample should include all veterans, not only veterans who are clients of the Department. Such a sample could be obtained by collaborating with the Department of Defence, by 'buying space' in an existing nationally representative dataset, or by undertaking a new survey. Ethics approval should be sought for a cohort study in which the same veterans are followed over time. For this reason, potential respondents would be asked to give their consent to be contacted beyond the initial cross-sectional study. Again, we recommend the hiring of a professional researcher team to undertake such a study.

**Phase 4**: Undertake intervention trials. We recommend that the findings of previous phases of research be used to plan, conduct and scientifically evaluate interventions designed to address identified needs. Randomised controlled trials would provide the strongest form of evidence, but simpler designs could also be usefully included. These interventions could assist in clarifying which types of participation are most helpful in optimising participation and wellbeing. Over time, intervention trials could be conducted hand-in-hand with the cohort study to build increasingly strong evidence to support policy development and service design.

**A final recommendation** is that, should the Department engage in further research, it build into its program a gradual increase in Departmental understanding of research: what research can and cannot do; how to understand different types of analyses and research findings; how to judge the competence of researchers and the quality of research; and how to work with researchers as part of the wider Departmental team, rather than see research as something that is undertaken outside and delivered in a report.

# APPENDICES

Table 1. Multiple hierarchical regression estimates for the prediction of variance in INFORMAL SOCIAL PARTICIPATION[9] by socio-demographic factors, living arrangements, other forms of community participation, self-efficacy, areas that respondent has tried to improve, and physical and mental health.

| | B | Std Err B | *β* | $R^2$ |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .05*** |
| Age (under 45) | .40 | .12 | -.10*** | |
| Sex (male) | -.66 | .10 | -.05*** | |
| *Model 2: Living arrangements* | | | | .05*** |
| Age (under 45) | -.52 | .10 | -.16*** | |
| Sex (male) | -.39 | .12 | -.10*** | |
| Live with son/daughter (in-law) | -.36 | .10 | -.11*** | |
| *Model 3: Other community participation* | | | | .10*** |
| Age (under 45) | -.44 | .10 | -.13*** | |
| Sex (male) | -.47 | .12 | -.11*** | |
| Live with son/daughter (in-law) | -.40 | .10 | -.12*** | |
| Belong sport/recreational clubs | .57 | .09 | .18*** | |
| Use internet frequently | .29 | .07 | .12*** | |
| *Model 4: Self-efficacy* | | | | .12*** |
| Age (under 45) | -.40 | .10 | -.12*** | |
| Sex (male) | -.45 | .12 | -.11*** | |
| Live with son/daughter (in-law) | -.40 | .10 | -.12*** | |
| Belong sport/recreational clubs | .55 | .09 | .17*** | |
| Use internet frequently | .26 | .07 | .11*** | |
| Self-efficacy (smoking) | -.56 | .13 | -.13*** | |
| *Model 5: Has tried to improve* | | | | .13*** |
| Age (under 45) | -.34 | .10 | -.11*** | |
| Sex (male) | -.45 | .12 | -.11*** | |
| Live with son/daughter (in-law) | -.42 | .10 | -.13*** | |
| Belong sport/recreational clubs | .54 | .09 | .17*** | |
| Use internet frequently | .26 | .07 | .11*** | |
| Self-efficacy (smoking) | -.54 | .13 | -.12*** | |
| Has tried to improve (social) | -.44 | .10 | -.12*** | |
| *Model 6: Physical and mental health* | | | | .20*** |
| Age (under 45) | -.38 | .10 | -.12*** | |
| Sex (male) | -.40 | .11 | -.10*** | |
| Live with son/daughter (in-law) | -.45 | .10 | -.13*** | |
| Belong sport/recreational clubs | .41 | .09 | .13*** | |
| Use internet frequently | .16 | .07 | .07*** | |
| Self-efficacy (smoking) | -.44 | .12 | -.10*** | |
| Has tried to improve (social) | -.21 | .10 | -.06* | |
| Physical health (SF-12) | .18 | .04 | .13*** | |
| Mental health (SF-12) | .27 | .03 | .23*** | |

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

[9] Using the participation index; higher scores = more frequent participation.

Table 2. Multiple hierarchical regression estimates for the prediction of variance in SOCIAL ISOLATION by socio-demographic factors, living arrangements, self-efficacy[10], physical and mental health and community participation[11].

| | B | Std Err B | *β* | $R^2$ |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .06*** |
| Age (under 45) | .26 | .02 | .23*** | |
| Live in house/flat (*vs* institutional) | .13 | .04 | .07*** | |
| *Model 2: Living arrangements* | | | | .09*** |
| Age (under 45) | .26 | .02 | .23*** | |
| Live in house/flat (*vs* institutional) | .13 | .03 | .08*** | |
| Has a carer | -.21 | .03 | -.16*** | |
| *Model 3: Self-efficacy* | | | | .18*** |
| Age (under 45) | .18 | .02 | .17*** | |
| Live in house/flat (*vs* institutional) | .12 | .03 | .07*** | |
| Has a carer | -.17 | .02 | -.14*** | |
| Self-efficacy (social) | .31 | .02 | .30*** | |
| Self-efficacy (weight) | .31 | .11 | .06** | |
| *Model 4: Physical and mental health* | | | | .24*** |
| Age (under 45) | .20 | .02 | .17*** | |
| Live in house/flat (*vs* institutional) | .12 | .03 | .07*** | |
| Has a carer | -.07 | .02 | -.06** | |
| Self-efficacy (social) | .25 | .02 | .24*** | |
| Self-efficacy (weight) | .23 | .10 | .04* | |
| Physical health (SF-12) | -.06 | .01 | -.13*** | |
| Mental health (SF-12) | -.06 | .01 | -.18*** | |
| *Model 5: Community participation* | | | | .27*** |
| Age (under 45) | .18 | .01 | .14*** | |
| Live in house/flat (*vs* institutional) | .75 | .32 | .06*** | |
| Has a carer | -.75 | .45 | -.04* | |
| Self-efficacy (social) | .05 | .42 | .22*** | |
| Self-efficacy (weight) | .39 | .01 | .04* | |
| Physical health (SF-12) | -.03 | .01 | -.11*** | |
| Mental health (SF-12) | -.12 | .25 | -.15*** | |
| Informal social participation | -.05 | .97 | -.18*** | |

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

[10] Areas that respondent has tried to improve were all non-significant in this model.
[11] Using the participation index; higher scores = more frequent participation.

Table 3. Multiple hierarchical regression estimates for the prediction of variance in MENTAL HEALTH by sociodemographic factors, living arrangements, community participation[12], isolation, self-efficacy[13] and physical health.

| | B | Std Err B | *β* | $R^2$ |
|---|---|---|---|---|
| *Model 1: Socio-demographic factors* | | | | .04*** |
| Sex (male) | -.56 | .07 | -.19*** | |
| Gold (*vs* White) Card | -.29 | .07 | -.10*** | |
| *Model 2: Living arrangements* | | | | .08*** |
| Sex (male) | -.48 | .07 | -.16*** | |
| Gold (*vs* White) Card | -.21 | .07 | -.07*** | |
| Has a carer | .83 | .08 | .21*** | |
| *Model 3: Community participation* | | | | .12*** |
| Sex (male) | -.39 | .07 | -.13*** | |
| Gold (*vs* White) Card | -.24 | .07 | -.08*** | |
| Has a carer | .75 | .08 | .19*** | |
| Informal social participation | .17 | .02 | .19*** | |
| *Model 4: Too little participation (Isolation)* | | | | .18*** |
| Sex (male) | -.34 | .07 | -.11*** | |
| Gold (*vs* White) Card | -.30 | .06 | -.10*** | |
| Has a carer | .65 | .08 | .17*** | |
| Informal social participation | .11 | .02 | .12*** | |
| Too little participation | -.79 | .06 | -.26*** | |
| *Model 5: Self-efficacy* | | | | .21*** |
| Sex (male) | -.29 | .06 | -.09*** | |
| Gold (*vs* White) Card | -.38 | .06 | -.13*** | |
| Has a carer | .63 | .08 | .16*** | |
| Informal social participation | .09 | .02 | .10*** | |
| Too little participation | -.60 | .07 | -.20*** | |
| Self-efficacy (alcohol) | -.40 | .09 | -.09*** | |
| Self-efficacy (social) | -.48 | .07 | -.15*** | |
| Self-efficacy (weight) | -.78 | .34 | -.05* | |
| *Model 6: Physical health* | | | | .30*** |
| Sex (male) | -.21 | .06 | -.07*** | |
| Gold (*vs* White) Card | -.22 | .06 | -.07*** | |
| Has a carer | .37 | .08 | .09*** | |
| Informal social participation | .06 | .02 | .07*** | |
| Too little participation | -.44 | .06 | -.15*** | |
| Self-efficacy (alcohol) | -.35 | .09 | -.08*** | |
| Self-efficacy (social) | -.43 | .06 | -.14*** | |
| Self-efficacy (weight) | -.75 | .33 | -.05* | |
| Self-rated health | .44 | .03 | .32*** | |

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

[12] Using the participation index; higher scores = more frequent participation.
[13] Areas that respondent has tried to improve were all non-significant in this model.