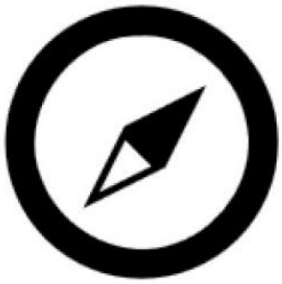
Evidence Compass



Technical Report

Healthy and Active Ageing in the Veteran Population and Factors and Interventions that Achieve Positive Effect:

A Rapid Evidence Assessment

June 2018

Disclaimer

The material in this report, including the selection of articles, summaries, and interpretations, is the responsibility of La Trobe University, and does not necessarily reflect the views of the Australian Government. La Trobe University does not endorse any approach presented here. Evidence predating the year 1990 was not considered in this review. Readers are advised to consider new evidence arising after the publication of this review. It is recommended that the reader source not only the papers described here, but other sources of information if they are interested in this area. Sources of information not included in this review include non-peer-reviewed literature from overseas and information on websites.

Please address any comments or queries about this report to EvidenceCompass@dva.gov.au.

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- Dr Virginia Lewis and Janette Collier: members of the Project Expert Reference Group
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Executive Summary

Aim

- The purpose of the literature review is to inform the Department of Veterans' Affairs (DVA) about:
    - Whether veterans experience different challenges and issues as they age from those of the general population.
    - Factors and interventions that positively affect health and wellbeing outcomes for older people (particularly those from military backgrounds).
- The Statement of Requirements describes two broad age groups of interest (aged 45 to 64 years and 65 to 90 years).
- DVA will use the information gained from the review to inform policy and program development and DVA's response to broader directions in aged care towards healthy and active ageing.
- This project addressed three overarching questions:
    - *Q1: How do the health and wellbeing outcomes of veterans differ from those of non-veterans as they age? ("Challenges")*
    - *Q2: What factors positively affect health and wellbeing outcomes for veterans as they age? ("Determinants")*
    - *Q3: What interventions positively affect health and wellbeing outcomes for veterans? ("Interventions")*
- These three questions were subdivided into domains (physical wellbeing, mental wellbeing, and social wellbeing), and eight questions were addressed separately.

Definitions: Healthy and active ageing

- The terms healthy ageing and active ageing are related and often used jointly or interchangeably in policy documents and the research literature.
- The World Health Organization's (WHO) *World report on ageing and health* (2015) defines healthy ageing as the process of developing and maintaining the functional ability that enables wellbeing in older age; and active ageing more broadly as the

process of optimising opportunities for health, participation and security in order to enhance quality of life as people age.[1] Functional ability is defined in turn as comprising the health-related attributes that enable people to be and do what they have reason to value. Functional ability involves both the intrinsic capacity of individuals, relevant environmental characteristics that support or inhibit and older person, and interactions between the individual and these characteristics.[1] The notion of person-environment fit is used to assess this interaction. The World Health Organization (WHO) report (2015) suggests a "twin-track" approach to policy that emphasises the need for both healthy and active ageing. This literature review was consistent with the WHO definitions of active ageing in focusing on three aspects of wellbeing—physical, mental, and social.

Methodology

- The reviews reported here employed a Rapid Evidence Assessment method. Rapid reviews are evidence syntheses using streamlined versions of methods of full systematic reviews to enable completion in a timely way.
- Five searches were completed for Q1, two searches for Q2, and one search for Q3.
- **Eligibility criteria**: Reviews were undertaken sequentially. Results of literature searches were uploaded into Covidence, a software program that assists with managing systematic reviews.
    - All eligible studies included veterans aged 45 years and over.
    - Studies eligible for Q1 and Q2 also included comparison group of non-veterans.
    - Studies eligible for Q3 were randomised controlled trials (RCTs) of interventions, omitting those that focused on PTSD.
    - All articles were published in English and in 1990 or afterwards.
- **Information sources**: The search was restricted to the MEDLINE database. Results were supplemented with Australian grey literature on veterans' health and wellbeing.
- **Search strategy**: A specific MEDLINE search strategy was formed to address each of the five review questions. Our search strategies were intentionally designed to have a high degree of specificity: that is, we used AND rather than OR to combine search terms.

- **Managing the searches**: Results of the searches were uploaded into Covidence. Manuscripts identified in the search went through a two-stage process to determine if they should be included in the study: title and abstract screening by two people; and full-text screening by two people. In each case, disagreements were resolved by a third member of the team. Some post hoc filtering was then necessary to focus the search results on articles relevant to Australian veterans.
- **Data extraction and analysis***:* Data extraction was completed by all members of the research team. Narrative summaries were compiled by the project lead and reviewed by the project expert panel.
- **Risk of bias** for each article was assessed using the Joanna Briggs Critical Appraisal Checklists. Risk of bias was determined by two researchers independently, and inconsistencies in ratings were resolved by discussion with a third researcher.

Results

- The numbers of studies identified by the literature search and included in the final analysis are:
    - Q1: 6,465 references imported (including duplicates across five searches) and five additional reports screened: 58 articles and four reports included, totalling 62 sources.
    - Q2: 2,239 references imported (including duplicates across two searches) and five additional reports screened: 75 articles and two reports included, totalling 77 sources.
    - Q3: 1,763 references imported (no additional reports, one search, no duplicates), 98 reports included, totalling 98 sources.

The following table sets out the number of included studies by age group.

Table 1: Number of interventions by theme and participants' age group

	Challenges	Determinants	Interventions
Younger (all or most aged ≤ 65)	13	25	37
Older (all or most aged > 65)	12	12	14
Mixed (or not described)	37	40	47
Total	62	77	98

The bulk of studies included veterans of all ages, making comparisons of results for younger and older veterans difficult.

Findings

Challenges

- The literature usually reported poorer health and higher rates of physical health conditions in veterans than matched groups in the general community. However, the results were mixed on obesity, and there were no differences between groups on some health conditions.
- The literature generally reports higher rates of mental health problems in veterans than matched groups in the general community. However, based on only one study, veterans do not appear to be at higher risk than non-veterans for cognitive decline.
- Similarly, most literature highlights disadvantages that veterans experience compared with non-veterans in terms of social engagement.
- Exceptions to the pessimistic picture for veterans come from literature from outside the U.S., and especially the literature specifically on older populations of veterans. In older populations, differences between veterans and non-veterans on health, mental health, and social engagement decrease or disappear.

Determinants

- Veterans, particularly those from the U.S., experience higher prevalence of some risks to future health and mental health outcomes (e.g., adverse life events, smoking,

and obesity). However, differences between veterans and non-veterans are not as strong (or are non-existent) in other countries.

- Female veterans from the U.S. report more childhood adversities, intimate partner violence, and history of sexual assault than non-veterans.
- U.S. veterans also experience higher protective factors than non-veterans, including education, marriage, financial security, having private health insurance, physical activity, and access to services and medications.
- The literature on determinants of social engagement for veterans is relatively small. Veterans are more likely than non-veterans to experience health limitations that may put them at a disadvantage in terms of social engagement, such as deafness or hearing disability and having activity limitations.

Interventions

- Interventions to improve physical wellbeing have included those targeting pain, medical and dental wellbeing, health screening, health behaviours, substance abuse, general health status, and health literacy.
    - In several studies, telemonitoring and web-based tools are found to be as effective as face-to-face delivery (e.g., to provide education on pain, increase confidence to follow treatment for hypertension, and improve compliance with diabetes care plans).
    - Pharmacist-led interventions have proved useful (e.g., to assist patients to reduce their blood pressure).
    - Non-clinicians are as effective as clinicians (e.g., to coach patients on weight loss or sleep problems).
    - Contingency-based interventions (i.e., with rewards for compliance) show some promise for alcohol use and smoking.
    - Assessment alone is sometimes an effective intervention.
    - Educational interventions have proven useful for a range of conditions including chronic obstructive pulmonary disease (COPD), diabetes, and high blood pressure.

    - There is some literature on encouraging self-management of disease. Apart from these studies, there is relatively little evidence on positive health promotion interventions, such as to encourage physical activity or healthy diet.

- Most mental health programs have focused on depression, sometimes in conjunction with anxiety.

    - Behavioural and cognitive interventions are useful for treating depression. Attempts to use educational interventions alone to improve attitudes to treatment have generally not been successful.

- Relatively few interventions have targeted social wellbeing. Some interventions have resulted in improved social activity or perceived social support. Improvements in housing and employment are possible in intensive programs.

Comment

- It cannot be determined whether differences in study results between age groups of veterans in comparison with their non-veteran peers favouring older veterans are due to cohort effects (e.g., different life and combat experiences) or due to positive adjustment with age (e.g., maturity).

- The paucity of literature on positive aspects of physical health and wellbeing in middle-aged and older veterans in comparison with age-matched peers is surprising.

- Even taking into account the limitations of this literature review, the absence of studies with a focus on positive aspects of health, mental health, and social participation is surprising. Most literature on the health and wellbeing of veterans takes a view of health based on the sickness model and focuses on health deficits. This is in stark contrast with the bulk of the recent literature on ageing, much of which takes a 'healthy ageing' perspective. We did not locate any literature comparing veterans with non-veterans on happiness, resilience, mastery, or other strength-based concepts.

- Gaps in the literature on veterans that are apparent in the wider literature on ageing and aged care services include: a salutogenic approach to ageing (i.e., an approach that promotes health rather than focusing on illnesses and deficits), reablement, consumer-directed care, and use of technology. Similarly, the literature is silent on the application of contemporary approaches, including reablement, and use of technology, to veterans' healthy ageing and aged care service provision.

Implications for practice

1. There is ample evidence that some middle-aged and older veterans may require support and assistance to age actively and in optimal health. However, this conclusion does not apply to all groups of veterans or to all measures of wellbeing. Studies from the U.S. generally report worse outcomes than those from the UK, and fewer differences are evident between older veterans and their peers than between younger veterans and their peers.

2. Findings on determinants suggest that there is plenty of scope for focusing on improving the health behaviours of middle-aged and older veterans (i.e., smoking, alcohol use, diet, physical activity, and control of obesity). While this is also true of non-veterans, the studies reviewed indicate that poor health behaviours are more prevalent among veterans than non-veterans.

3. Veterans who have experienced traumatic life events have increased risk of poor health or mental health outcomes in middle-age or later life. Female veterans may be at particular risk of experiencing some kinds of trauma, such as sexual violence. This is likely to be equally true of non-veterans.

4. Potential determinants of healthy ageing that did not emerge from the literature review include social and cognitive activity, which are supported by the wider gerontological literature and should not be neglected.

5. The effectiveness of telephone-based interventions lends hope that use of newer technologies may make interventions more accessible, affordable, and immediate. Interventions that rely on technology have been shown to promote emotional wellbeing in older people living in the community. Given that veterans are geographically dispersed, IT-based interventions are a promising avenue to explore.

6. The effectiveness of self-management for a range of health conditions is broadly compatible with a proactive wellness approach, since it relies on participants taking control of the process of improving their own health, rather than relying on clinicians. Self-management holds promise for assisting veterans to manage their health as they age.

7. Some interventions that have proven useful with older people may need to be amended to suit the special needs of veterans. Reminiscence and life review are a case in point.[2]

8. A growing literature supports the use of person-centred care, consumer-directed care, and restorative (reablement) approaches to home-based and community-based services with people who need assistance due to disability or advanced age. Australian Government policy and service provision have increasingly relied on such approaches. However, the current literature review identified no literature on use of these approaches with veterans. This does not mean that these approaches are irrelevant to veterans; rather, that mainstream or generic community services and supports have not been the focus of research on veterans.

9. Well-designed evaluations are required for new directions and programs to assist veterans to age well, and these should be published in the peer-reviewed academic literature.

10. There is plenty of room for new Australian research to fill gaps in evidence highlighted above. Veteran status could be promoted as a priority area for research in the Australian research funding bodies (i.e., National Health and Medical Research Council and the Australian Research Council (ARC)).

Introduction

Healthy and active ageing

The terms healthy ageing and active ageing are related and often used jointly or interchangeably in policy documents and the research literature. The World Health Organization (WHO) has developed policy frameworks around both terms.

The WHO *World report on ageing and health* (2015) is the more recent of the two frameworks. It defines healthy ageing as the process of developing and maintaining the functional ability that enables well-being in older age.[1] Functional ability is defined in turn as comprising the health-related attributes that enable people to be and do what they have reason to value. Functional ability involves both the intrinsic capacity of individuals, relevant environmental characteristics that support or inhibit and older person, and interactions between the individual and these characteristics.[1] The notion of person-environment fit is used to assess this interaction.

The WHO report suggested that public health strategies targeting people with high and stable levels of intrinsic capacity should be on building and maintaining this capacity for as long as possible. However, interventions targeting the segment of the population with declining capacities need a different approach, with a shift from prevent or cure to minimising the impacts of these conditions on a person's overall capacity.

The term "healthy ageing" is a contested one. Walker's (2015) view is that healthy ageing should be treated as an important subset of active ageing.[3] Walker criticised healthy ageing for being mono-dimensional (i.e., concerned largely with health and health interventions), being institutional in focus, and privileging professional perspectives, whereas active ageing requires a "joined-up" approach that includes health.

A long-term proponent of the concept of active ageing to underscore policy, Walker (2002) defined it as combining "the core element of productive ageing with a strong emphasis on quality of life and mental and physical well-being".[4]

In 2002, WHO released *Active ageing: a policy framework*. This framework defined active ageing as "the process of optimizing opportunities for health, participation and security to enhance quality of life as people age. . . . Active ageing allows people to realize their potential for physical, social, and mental well-being throughout the life course and to

participate in society, while providing them with adequate protection, security and care when they need [it]".[i]

These three aspects of wellbeing—physical, social, and mental—correspond exactly with the dimensions of health that WHO identified: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."[ii] These three dimensions have also been used to frame the questions posed in the current literature review.

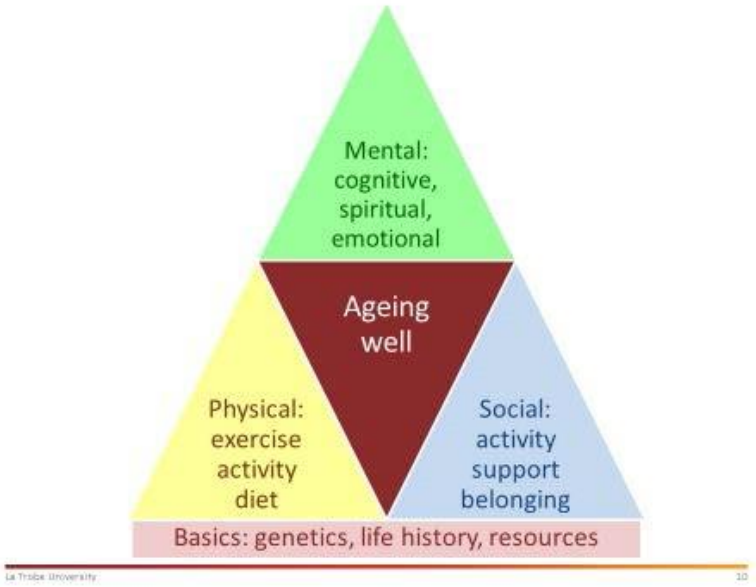


Figure 1: Components and determinants of ageing well (Wells, 2016)[iii]

DVA clients and consumers

The military experience of different age groups within the DVA population varies. The youngest World War II veterans are now 90 years of age or older, and not in scope for this literature review. Groups who may be in scope are listed below:

- People who served in the Korean War, which operated between 1951 and 1959. People who were 18 years of age between those years are now between 76 and 84 years of age: in the middle-old and very-old generations.

[i] http://www.who.int/ageing/active_ageing/en/
[ii] http://www.who.int/about/mission/en/
[iii] Wells, Y. (June, 2016). Healthy ageing: Living well, staying well. Invited address in the Alumni Seminar Series, La Trobe University, Melbourne.

- People who served in the Vietnam War, which occurred between 1964 and 1972. People who were 20 years of age (conscription age) between those years are now aged between 65 and 73: in the young-old generation.
- People involved in the Gulf War in 1991. People aged 18 at the time were born in 1973 and are now aged 44 years. Those aged 19 or over at the time are in scope for the current review.
- People who were involved as adults aged between 30 and 40 years at the time of Australia's involvement in subsequent deployments—East Timor (1999–2013), Afghanistan (2001–2017), Iraq (2003–2011)—are in scope for the current review.

DVA has implemented a wide range of programs to promote wellbeing in veterans, including financial assistance, community care, assistance with employment and accommodation, and programs to promote physical health, mental health, and social participation.

Literature on veterans

The literature on U.S. veterans is much more extensive than that from Australia, the UK, or other western nations. It includes results from the Veterans' Affairs Normative Aging Study, a longitudinal study established in 1963 by the U.S. Department of Veterans' Affairs. The initial sample was 2,280 men who now have an average age of 72 years. Most participants are veterans from World War II and the Korean War. Participants in the study have undergone medical examinations every three to five years and answered questions about health behaviours.

The U.S. national Vietnam Veterans Readjustment Study (NVVRS) was established in 1983.[5] In 1988, this study estimated 31% of this group of veterans had developed post-traumatic stress disorder (PTSD), with a strong dose-response relationship: as duration of combat exposure increases, the prevalence of PTSD increases.[6]

Unfortunately, veterans from the U.S. are not necessarily comparable with those from Australia or elsewhere. One publication summarised studies on rates of PTSD in various nations and concluded that they are lower in the U.K. and Canada than in the U.S., with Australia occupying the middle ground.[7] The publication highlighted demographic and cultural differences, as well as differences in experience, between U.K. and U.S. veterans. The main lesson for the current literature review is that literature from the U.S. may be unduly pessimistic when applied to Australian veterans.

Method

Systematic reviews are the gold standard in evidence-based health care. Policy makers, however, often require evidence reports delivered with a limited timeframe to inform decision-making. Rapid reviews have emerged in response to this demand. There is no standardised description of their methods, literature search strategies, and approaches to evidence synthesis (Ganann et al., 2010).[8]

Rapid reviews are evidence syntheses using streamlined versions of methods of full systematic reviews to enable completion in a timely way. Injecting a note of caution, Watt et al. (2008)[9] has argued that while rapid reviews may be effective in addressing specific policy questions, they should not be considered a replacement for traditional systematic reviews.

DVA required that these reviews were completed within a three-month time frame (early October 2017 through mid-January 2018). However, delays in finalising the detailed project plan led to an extension of the due date for submission of first drafts of reports to mid-February 2018.

The project was supported by regular teleconferences between DVA and the research team and an expert reference group comprising Associate Professor Virginia Lewis (Director, AIPCA and Head, Centre for Health Systems Development) and Janette Collier (Head, e-Health).

Our method and reporting adhered to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Moher et al., 2009).[10]

Aims and objectives

This project addressed three overarching questions:

- *Q1: How do the health and wellbeing outcomes of veterans differ from those of non-veterans as they age? ("Challenges")*
- *Q2: What factors positively affect health and wellbeing outcomes for veterans as they age? ("Determinants")*
- *Q3: What interventions positively affect health and wellbeing outcomes for veterans? ("Interventions")*

These three questions were subdivided into domains (physical wellbeing, mental wellbeing, and social wellbeing), and eight questions were addressed separately. Each question was

defined—as far as possible—using the PICO (Population, Intervention, Comparator, Outcome) framework.

We developed operational definitions for the following key concepts:

- **Veterans**: a person who served (for at least one day) in a *military* service.
- **Physical wellbeing**: a state of *physical* wellbeing and not merely the absence of disease or infirmity (consistent with the World Health Organization definition of health).
- **Mental wellbeing**: a state of wellbeing in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to contribute to her or his community (WHO, 2014).[iv]
- **Social engagement**: encompasses social activity, social support, and social participation.
- **Long-term condition**: a non-communicable disease (NCD) that is not passed from person to person, and is generally of long duration and slow progression (consistent with WHO, 2014).[v]

Protocol and registration

The protocol for this series of reviews was approved by the DVA on 23 October 2017. Because this was a rapid review it was not feasible to submit the protocol to PROSPERO (the National Institute for Health Research registry for systematic reviews). No amendments were made to the protocol after this date. However, significant methodological additions to the protocol were made as the review progressed. These are detailed below. Again, this is a consequence of undertaking a rapid review.

[iv] http://www.who.int/features/factfiles/mental_health/en/
[v] http://www.who.int/topics/noncommunicable_diseases/en/

Eligibility criteria

We anticipated that Q1 and Q2 would be addressed mainly through observational studies comparing veterans with non-veterans, whereas Q3 required robust studies of interventions within the veteran population using a randomised controlled trial. Hence, general criteria for the seven reviews that addressed Q1 and Q2 were:

- Inclusion:
    - Veterans (who have previously been a member of military or defence forces)
    - Participants aged 45 years and over
    - Comparison group of non-veterans
- Exclusion:
    - Not in the English language
    - Published before 1990

Criteria for Q3 were:

- Inclusion:
    - Veterans (who have previously been a member of military or defence forces)
    - Participants aged 45 years and over
    - Randomised controlled trial (RCT)
- Exclusion:
    - Not in the English language
    - Published before 1990
    - A study of PTSD

It was decided not to include studies with a focus on PTSD because several literature reviews have already covered this issue and the evidence base for addressing this mental health problem is well-established.[11] [12] [13]

Reviews were undertaken sequentially and we agreed on specific criteria as a research team prior to undertaking each search. These criteria were then uploaded into Covidence, a software program that assists with managing systematic reviews.

Information sources

As this was a rapid review, we restricted our search to one database. MEDLINE possesses several advantages over other databases: it is the most comprehensive and widely used, and captures most of the medical literature and indexes using MESH terms (whereas databases such as CINAHL and PsychInfo do not).

We initially made no attempt to review the grey literature. This was because the grey literature does not have strict or meaningful bibliographic control in the way peer-reviewed journal articles do. Also, because grey literature has not been through a strict peer review process, it is arguable the work may be of inferior quality. However, on the request of DVA, five reports from the grey literature were scanned for relevance, and four were subsequently included in the review.

Search strategy

To identify relevant literature, we developed a specific MEDLINE search strategy to address each of the five review questions. The search strategy was developed by a specialist information scientist (Hillel) in discussion with the broader research team. Search strategies were not part of the approved protocol.

Our search strategies were intentionally designed to have a high degree of specificity. That is, we used AND rather than OR to combine search terms. Our approach was intended to restrict the number of studies in the search. The advantage of a high specificity search is that it is more likely to generate a manageable number of studies to review. One notable disadvantage is that, as a result, some potentially relevant studies may be missed; however, this is an example of the compromise that is required when undertaking a rapid review.

The search strategies and search terms used are set out in the Evidence Profile.

Study selection

The MEDLINE search for each objective was run by the information scientists and results were uploaded into Covidence (Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia). Covidence is a web-based technology platform that enables reviewers to store search results and manage and track the review process. Searches can be uploaded to Covidence and stored permanently. Title and abstract screening, full-text screening and risk of bias assessment can be completed online. Covidence also generates detailed PRISMA flow diagrams. Quicker than traditional paper-based approaches, Covidence also facilitates third party audit of review.

Manuscripts identified in the search went through a two-stage process to determine whether they should be included in the study.

- The title and abstract of each paper was reviewed by two researchers to determine if the article met the review inclusion and exclusion criteria.
- Where there was ambiguity (i.e., it was not clear that the study should be excluded) researchers were told to err on the side of caution and put the manuscript forward to full-text screening.
- If there was disagreement between the two researchers about whether to include or exclude a study, a third researcher arbitrated and made a final decision.

Papers that made it through initial screening were then subject to full-text screening. During this stage of the study, two researchers read each manuscript to make a final inclusion/exclusion determination. Researchers recorded a reason for exclusion from a set list (e.g., wrong study design, wrong population) that they could add to if necessary.

The flow of papers through the review process (identification, screening, eligibility, inclusion) was summarised in a PRISMA flow diagram for each review.

Data collection processes

Each of the objectives in this rapid review is complex, and there is a substantial risk of bias in data extraction (i.e., data may be selectively extracted to substantiate pre-existing beliefs). Ideally, data extraction should be done independently by two researchers and then compared. That we were not able to do this was a further compromise of undertaking a rapid review. The two researchers undertaking data extraction were instructed to describe results as set out in the manuscript (avoiding interpretation).

The following information was extracted from included manuscripts: author, year of publication, country where fieldwork was undertaken, study design, study setting, methods of data collection, sample size, age, comparison group, data source (where applicable), measures, key observations and additional comments. A summary table was produced capturing these data for each review question.

Risk of bias in individual studies

We used the Joanna Briggs Critical Appraisal Checklists to determine risk of bias in included studies. There are specific checklists for a range of study designs (e.g., cross-sectional, cohort, case-control) and we intend to use the appropriate measure for each included study.

Each measure has eight items covering a comprehensive range of potential sources of bias (e.g., approaches to handling confounding, validity of measures).

Risk of bias was determined by two researchers independently, inconsistencies in ratings were resolved by discussion with a third researcher. Ratings were manually recorded (paper and pen) and then tabulated. We did not have pre-specified plans to undertake meta-analysis. We did not make any attempt to ascertain if there was evidence of publication bias.

Evaluation of the evidence

Three key components contributed to the overall evaluation of the evidence:

- The **strength of the evidence base**, in terms of the quality and risk of bias, quantity of evidence, and level of evidence (study design)
- The **consistency** of the study results
- The **applicability** of the body of the evidence to the Australian context

Most literature reviews focus on either (a) comparing two groups on an outcome, or (b) evaluating the strength of an intervention for a single problem or issue. Hence, the results of the review can readily be summarised in terms of the reliability of the evidence.

This was not the case with the current literature review. The first seven reviews were extremely heterogeneous and compared veterans with non-veterans on a very large range of variables. The eighth review focused on interventions, and included studies varied enormously in terms of interventions trialled and the problems addressed. In most cases, there was only one study with evidence for the use of an intervention for a particular issue within the veteran population.

Results: Challenges

The overarching question for this part of the review is *Q1: How do the health and wellbeing outcomes of veterans differ from those of non-veterans as they age?*

Studies were included in this section of the review if they either: (a) compared veterans with non-veterans on physical health, mental health, or indicators of social engagement (e.g., social activity, social support, and work status), or (b) relied on standard measures of health or mental health, in which veterans were compared directly or indirectly (i.e., through age-standardised norms) with non-veterans. Commonly used measures included the SF-36 and its derivatives, which measure health-related quality of life.

This question was addressed using five sub-questions:

SQ1: What is the physical wellbeing of veterans compared to the general population?

SQ2: what is the prevalence of long-term physical health conditions in veterans compared to the general population?

SQ3: What is the mental wellbeing of veterans compared to the general population?

SQ4: What is the prevalence of mental disorders in veterans compared to the general population?

SQ5: What is the level of social engagement in veterans compared to the general population?

As each of these questions was associated with a separate search, each has an associated PRISMA diagram.

For the current literature review, the results of these literature searches were amalgamated and further culled. Some articles were screened out at the data extraction stage (by the research team) or data analysis stage (by the project lead and the project expert reference group). At the same time, some articles were referred from other searches and relevant grey literature was added. Hence, following the five standard PRISMA diagrams, the results of this post hoc screening are presented. This is followed by a summary of the evidence on the main question. The studies selected to address this question are set out by age group in the Evidence Profile.

Examples of post hoc screening included:

- Studies of invalid comparison (e.g., health-related quality of life of older Taiwanese men living in residential care with population norms for Taiwanese men; health-related quality of life of U.S. veterans with a serious medical condition with population norms for U.S. men).
- Studies of doubtful relevance to Australian veterans (e.g., studies comparing veterans with non-veterans in the U.S. prison system; studies comparing veterans with spinal cord injury with non-veterans with spinal cord injury in Iran).

PRISMA diagrams

Figure 2: PRISMA Flowchart for SQ1 Physical wellbeing

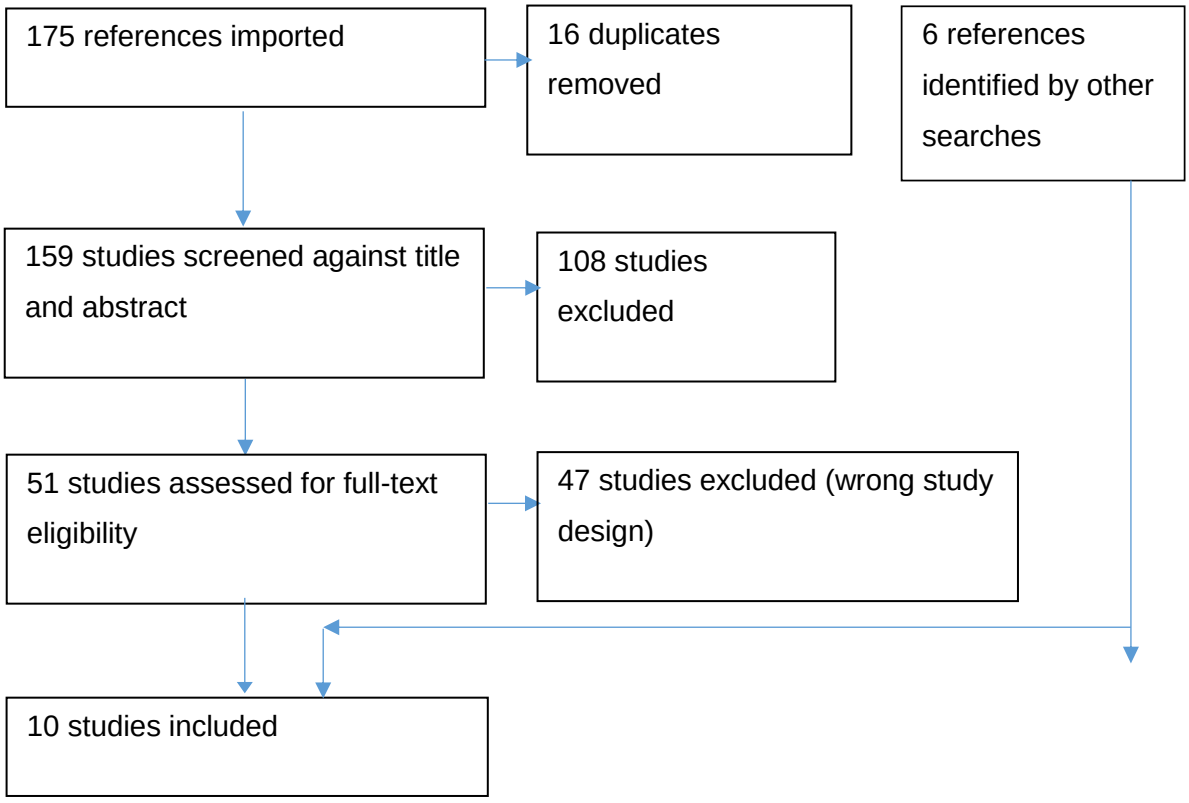


Figure 3: PRISMA Flowchart for SQ2 Health conditions

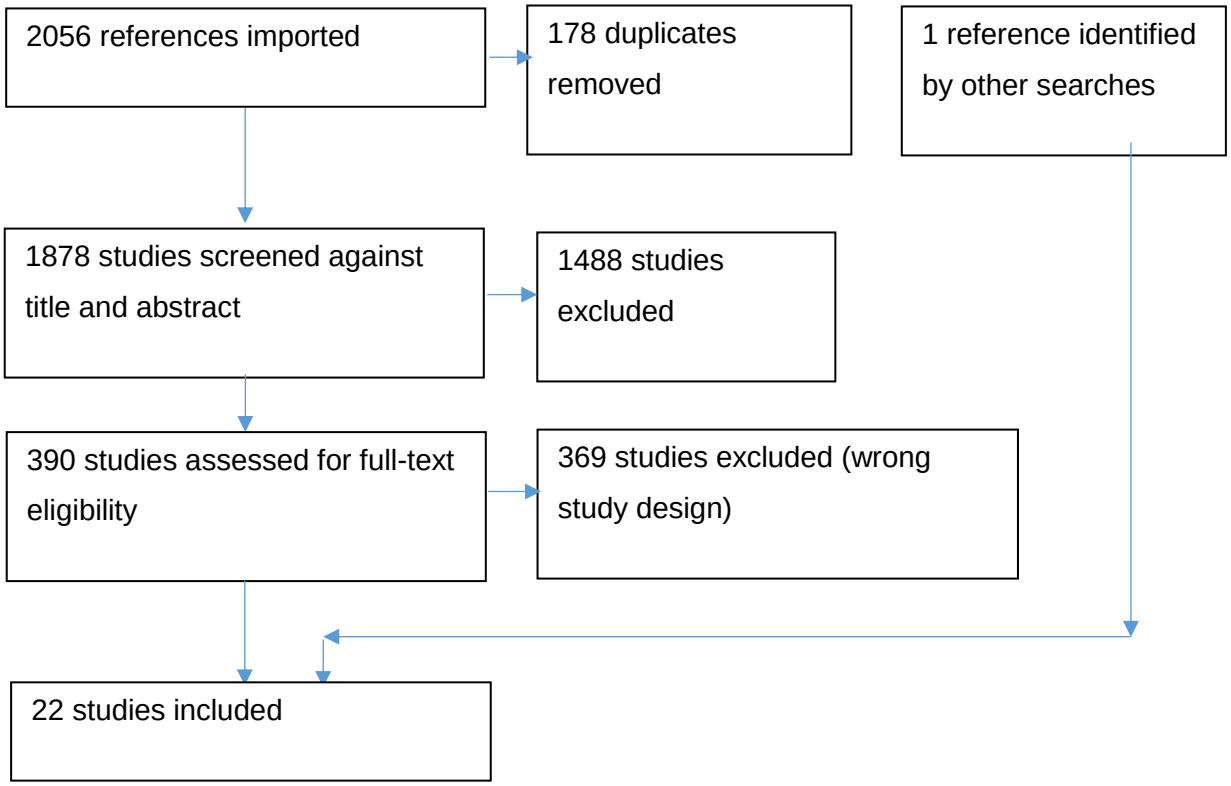


Figure 4: PRISMA Flowchart for SQ3 Mental health

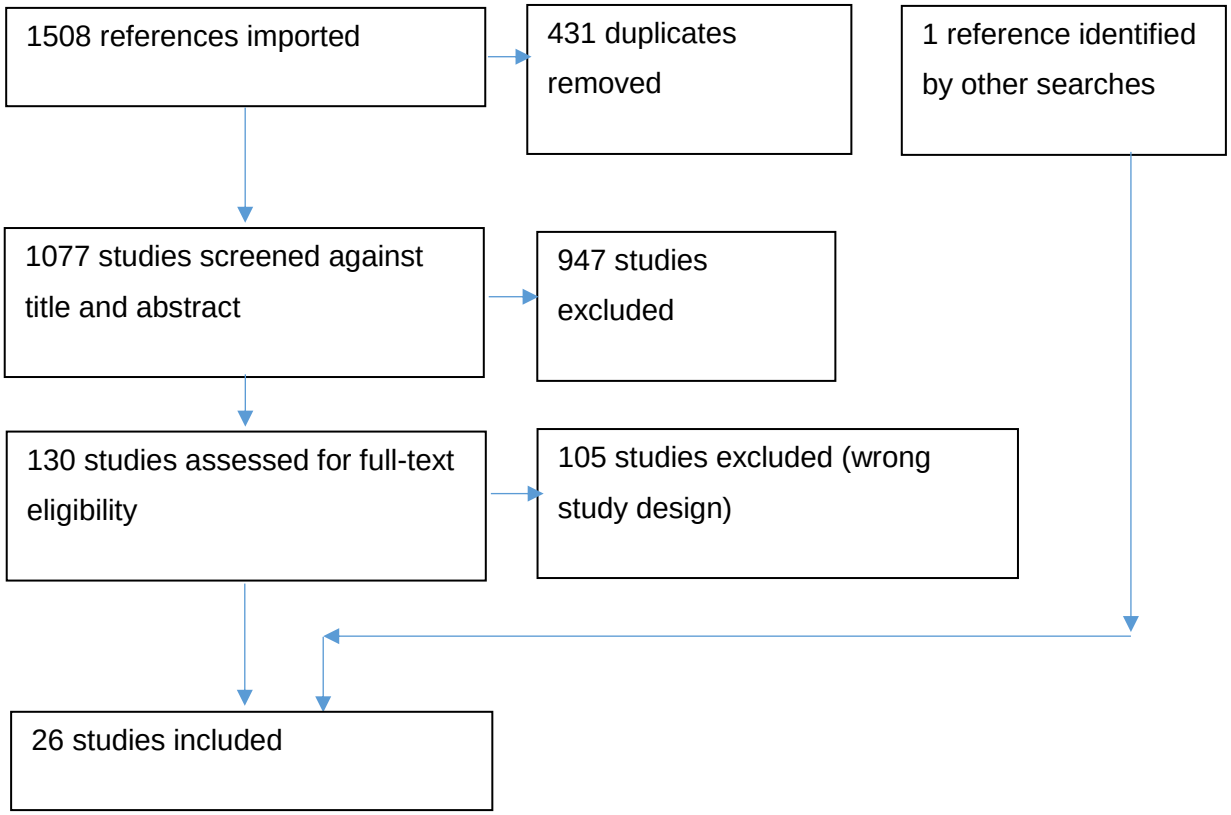


Figure 5: PRISMA Flowchart for SQ4 Mental health conditions

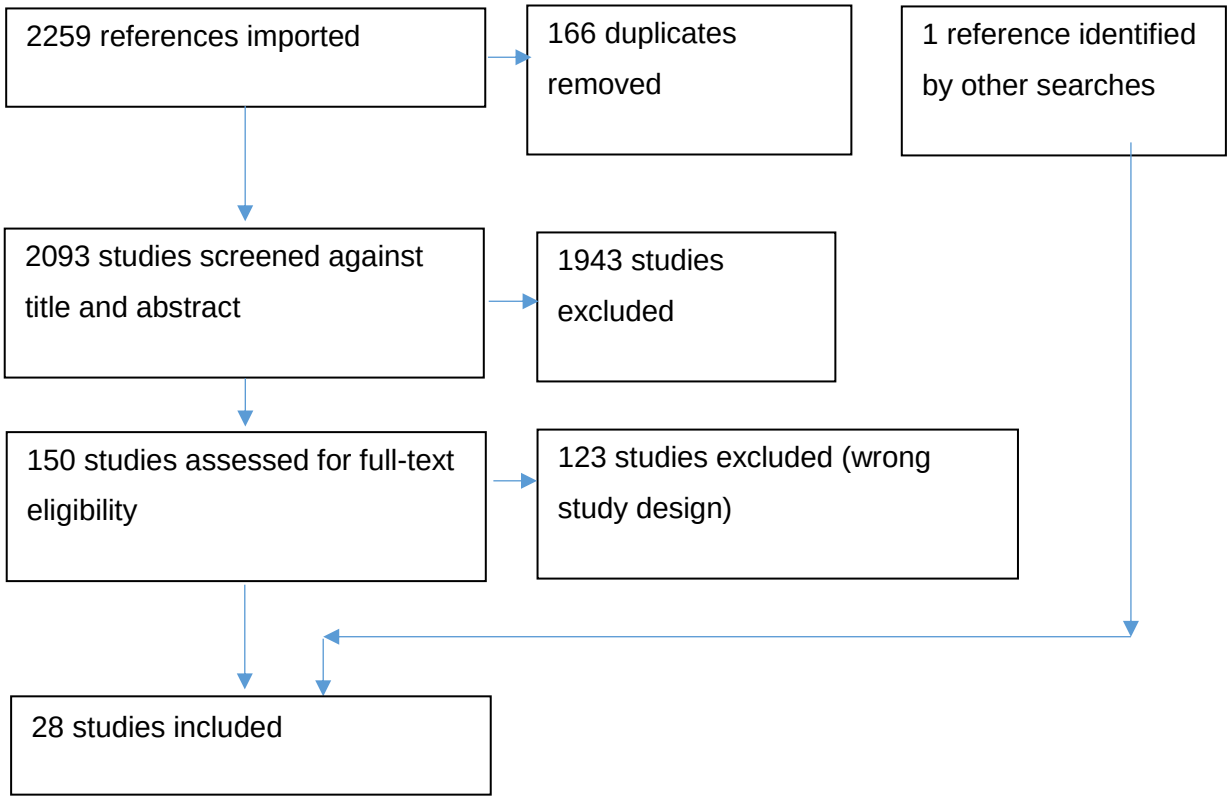
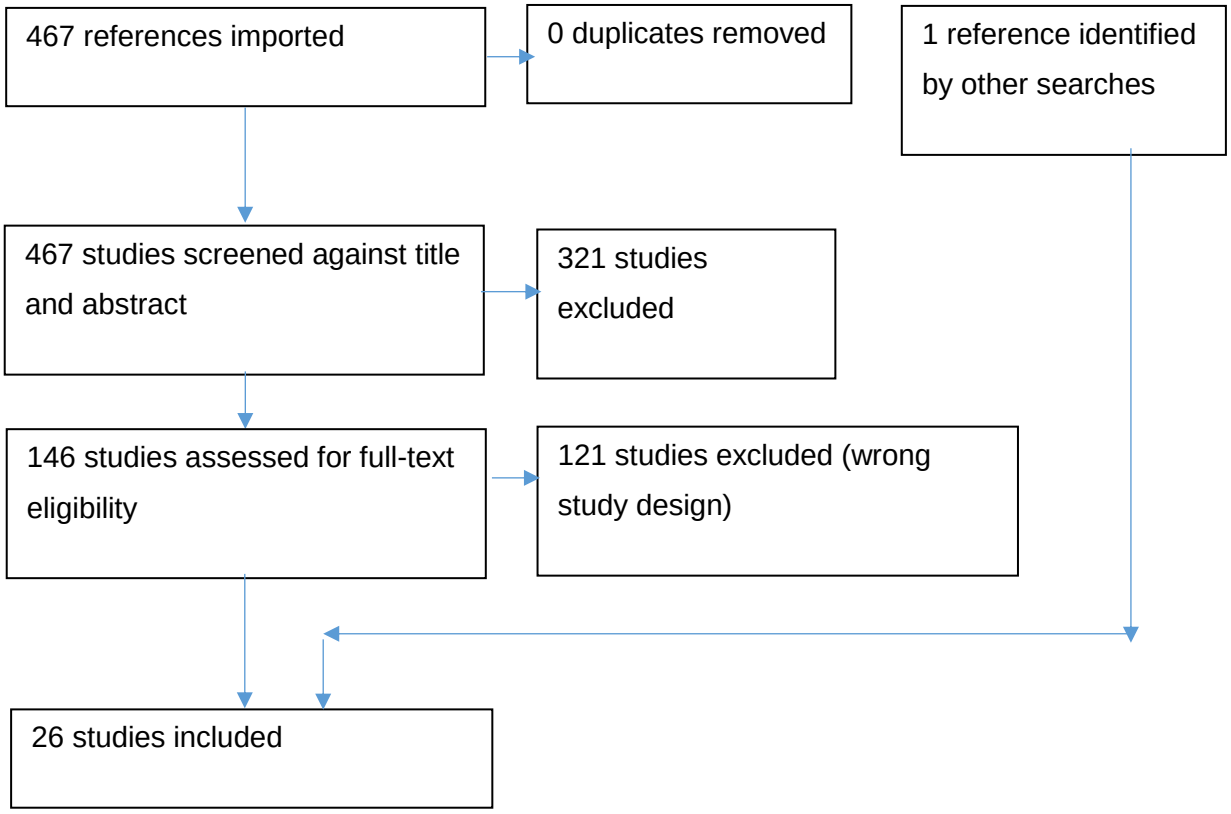
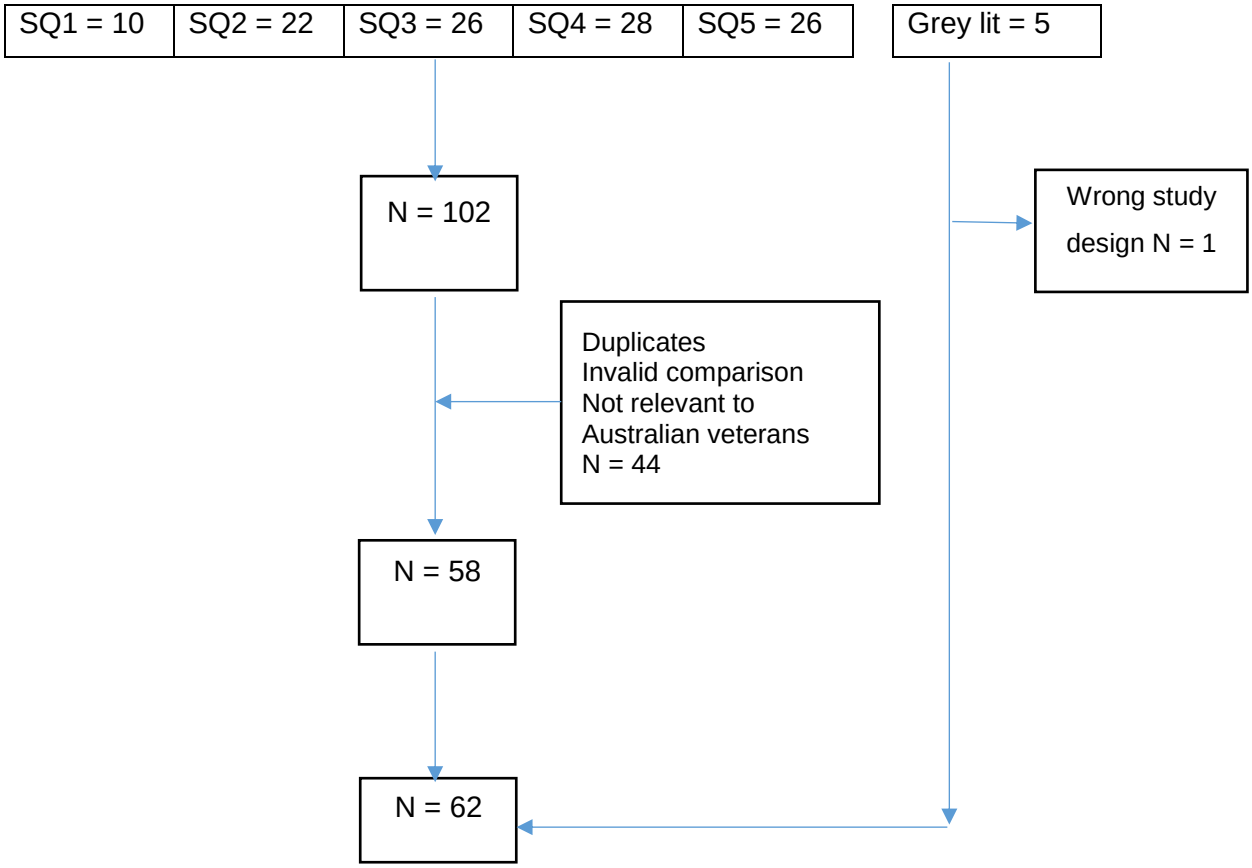


Figure 6: PRISMA Flowchart for SQ5 Social engagement



Post hoc screening and analysis

Figure 7: Flowchart for post hoc analysis of Q1[vi]



Summary of the studies

Country of origin: 43 (69%) of the 62 included studies were from the U.S.; eight were from Australia; six were from the U.K.; three were from Canada; and one each was from The Netherlands and Croatia respectively.

Over half of the studies (n = 37, 60%) involved mixed aged groups and it was not possible to tell whether their results applied more to younger or older veterans.

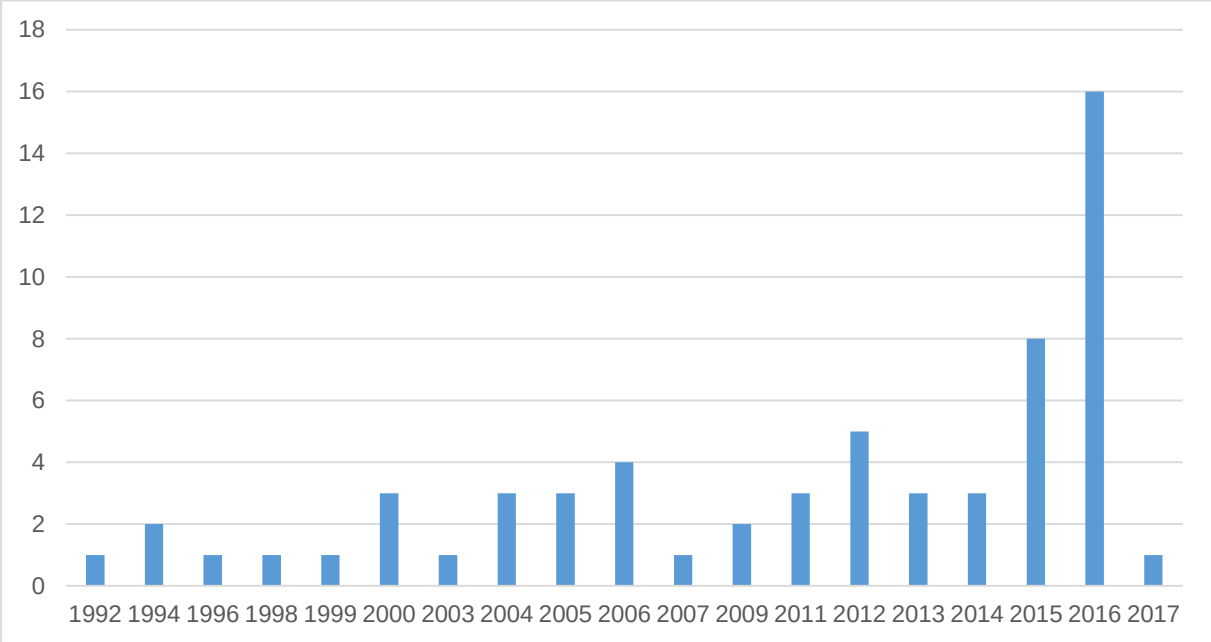
[vi] Note that the number of studies identified in each search sums to a number smaller than the number of studies included in the review. This is because some studies were identified in more than one search.

Table 2: Challenges by age group of participants

	Challenges
Younger groups (all or most participants aged ≤ 65)	13
Older (all or most participants aged > 65)	12
Mixed groups (or not described)	37
Total	62

A large number of the studies were recent, with 50% (n = 31) published in 2013 or later.

Figure 8: Challenges by year of publication



Summary of the evidence

SQ1 Physical wellbeing

Most of the 10 studies included in response to this objective reported poorer physical health on average among veterans than among non-veterans. However, the groups were not strictly comparable in some of these studies, as the veterans sampled were older, and it was not always clear whether age was controlled for in analyses. Two studies found that older veterans were similar to age-matched non-veterans on self-rated health and physical and functional health trajectories.

Most studies relied on the SF-36 to measure physical wellbeing, but combined the SF-36 with other measures of health or wellbeing. Self-rated health is a powerful predictor of

outcomes: it has “consistently [been] found to predict older adults’ physical, mental and cognitive health” (Choi, DiNitto, & Marti, 2016)[14] and all-cause mortality (e.g., DeSalvo et al., 2006).[15] While it is inherently a subjective judgement, it relies on biological and physiological status.[16]

SQ2 Health conditions

Most of the studies included in the reviews addressing these themes were from the U.S. Study findings were relatively consistent: most studies comparing veterans with the general population found higher risk of health conditions in the veterans than in comparison population groups. This was true for several categories of diseases including cancer, circulatory diseases, digestive diseases, musculoskeletal problems and diabetes (several studies). However, there were no differences in rates of tuberculosis, stroke, alcoholic liver disease or alcohol-related death (possible slightly reduced risk). Also, Vietnam veterans and older groups were no more likely to have elevated rates of mortality from cause-specific cancer or cardiovascular disease, and there were mixed results for obesity.

SQ3 Mental health and SQ4 Mental illness

Again, most of the studies included in the reviews addressing these themes were from the U.S. Study findings were relatively consistent: most studies comparing veterans with the general population found higher risk of poor mental health in veterans than in a comparison population group. This was true for: mental health in general, psychological problems, adverse mental health days, the mental health subscale of the SF-36, any lifetime mental disorder, and depression and anxiety (especially PTSD).

However, not all studies reported consistently worse results for veterans than non-veterans. As far as can be determined, veterans are at no higher risk than non-veterans for cognitive decline (only one study included in the review assessed cognitive decline, and this indicated better outcomes for veterans than non-veterans). One Canadian study reported higher psychological distress in non-veterans (age group 60+ years) than veterans. Further, Scottish studies reported the longest serving veterans have a lower risk of mental health disorder than non-veterans, women veterans have no increased risk of a mental health disorder, and older veterans do not differ from non-veterans on cognitive or mental health.

In Australia, the AIHW (Australian Institute of Health and Welfare) has shown that young veterans have a higher risk of suicide than non-veterans, but there is little difference in middle age, and older veterans have a lower risk of suicide.

Even among the studies from the U.S., some studies found no difference in mental health between veterans or non-veterans, or else veterans had some advantage over non-veterans. Advantages for the veteran sample were especially evident when older age groups were sampled.

Only one study explicitly examined the potential for veterans to experience healthy ageing, and this focused only on older women (LaCroix, 2016).[17] This study found that older female veterans did not differ on the health metrics related to effective ageing (resilience, self and environmental mastery, self-control), nor did they differ in average levels of several optimal ageing indicators including emotional wellbeing, happiness, enjoyment of life, or personal growth scores.

SQ5 Social engagement

Veterans are more likely to have a social disability (i.e., limitation in participating in social, recreational or family activities because of an impairment or problem) than non-veterans.

Some studies show no difference in frequency of receiving social or emotional support, but others show lower levels in veterans than non-veterans. In a study of older women, heterosexual veterans reported lower social support than heterosexual non-veterans, but also slightly lower levels of social strain.[18]

Work disability is higher in veterans than non-veterans of the same age and most older veterans have experienced greater work-life discontinuity in their working lives than non-veterans. One study showed that among people with disabilities, veterans are less likely to be employed than non-veterans.[19]

Summary tables

Table 3: Poor physical health in veterans compared with non-veterans

Domains with more than one study indicating poorer outcomes for veterans	Domains with mixed evidence	Domains where veterans do as well as or better than non-veterans
Health-related QoL: Physical[20]	Alcoholic liver disease[25 26]	Tuberculosis[31]
Chronic health conditions:[21 22] includes arthritis, coronary heart disease, deafness, diabetes, hypertension, kidney disease, cancers (lung and prostate), migraine, Motor Neurone Disease, obesity	Mortality[18, 27]	Dementia[32 33]
	Self-rated health[14 28]	Circulatory diseases, respiratory diseases, and infectious disease[34]
	Function and activity limitation[23 29]	
	Change in physical and functional health over time[29, 30]	
Disability and physical function[23]		
Falls[24]		

Notes: Of the 17 individual studies featured in this table, 10 are from the U.S., three from Australia, three from the U.K., and one from Canada.

Table 4: Mental health in veterans compared with non-veterans

Domains with more than one study indicating poorer outcomes for veterans	Domains with mixed evidence	Domains where veterans do as well as or better than non-veterans
Mental health[35]	Depression[39 36]	Indicators of optimal ageing (emotional wellbeing, happiness, enjoyment of life)[17]
Self-rated happiness[36]	Anxiety[40 41]	
Alcohol dependence[37]	Suicide risk[42]	
Life satisfaction[36]		
Psychological distress[38]		

Notes: Of the nine individual studies featured in this table, six are from the U.S. and three from Australia.

Table 5: Social engagement in veterans compared with non-veterans

Domains with more than one study indicating poorer outcomes for veterans	Domains with mixed evidence	Domains where veterans do as well as or better than non-veterans
Health-related QoL: Social functioning[43]	Social support[46] [47]	Social participation[14]
Social disability[19]		Homelessness[47]
Work disability[44]		
Work discontinuity[45]		

Notes: Of the seven individual studies featured in this table, five are from the U.S. and one from the U.K.

Results: Determinants

The overarching question for this part of the review is: Q2: What factors positively affect health and wellbeing outcomes for veterans as they age?

- SQ6: What are the determinants of physical and mental wellbeing in veterans, compared with non-veterans?
- SQ7: What are the determinants of social engagement in veterans, compared with non-veterans?

As each of these questions was associated with a separate search, each has an associated PRISMA diagram.

For the current literature review, the results of these literature searches were amalgamated and further culled. Some articles were screened out at the data extraction stage (by the research team) or data analysis stage (by the project lead and the project expert reference group). At the same time, some articles were referred from other searches and relevant grey literature was added. Hence, following the two standard PRISMA diagrams, the results of this post hoc screening are presented. This is followed by a summary of the evidence on the main question. The studies selected to address this question are set out by age group in the Evidence Profile.

Examples of post hoc screening included:

- Studies of invalid comparison (e.g., differences between Croatian veterans with PTSD and Croatian non-veterans on sleep quality).
- Studies of doubtful relevance to Australian veterans (e.g., a study of risks for homelessness among U.S. veteran and non-veteran prisoners who were about to be released; a study comparing history of drug use in veteran and non-veteran U.S. patients with HIV/AIDS).

PRISMA diagrams

Figure 8: PRISMA Flowchart for SQ6 Determinants of physical and mental wellbeing

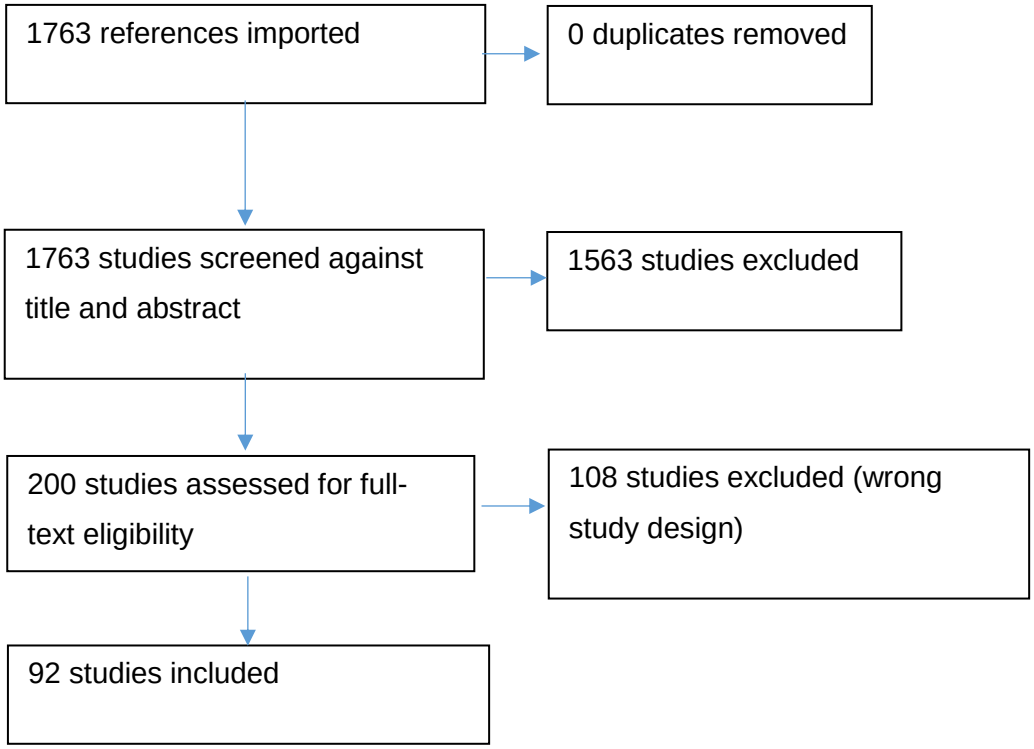


Figure 9: PRISMA Flowchart for SQ7 Determinants of social participation

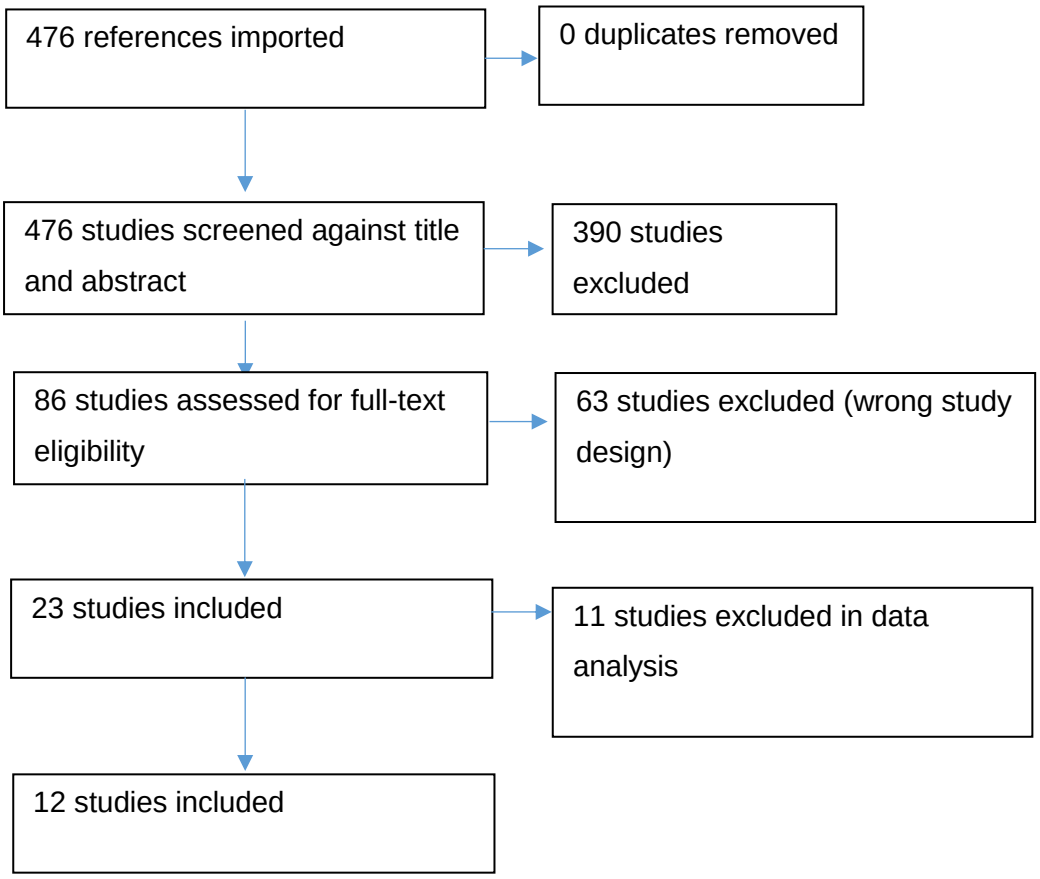
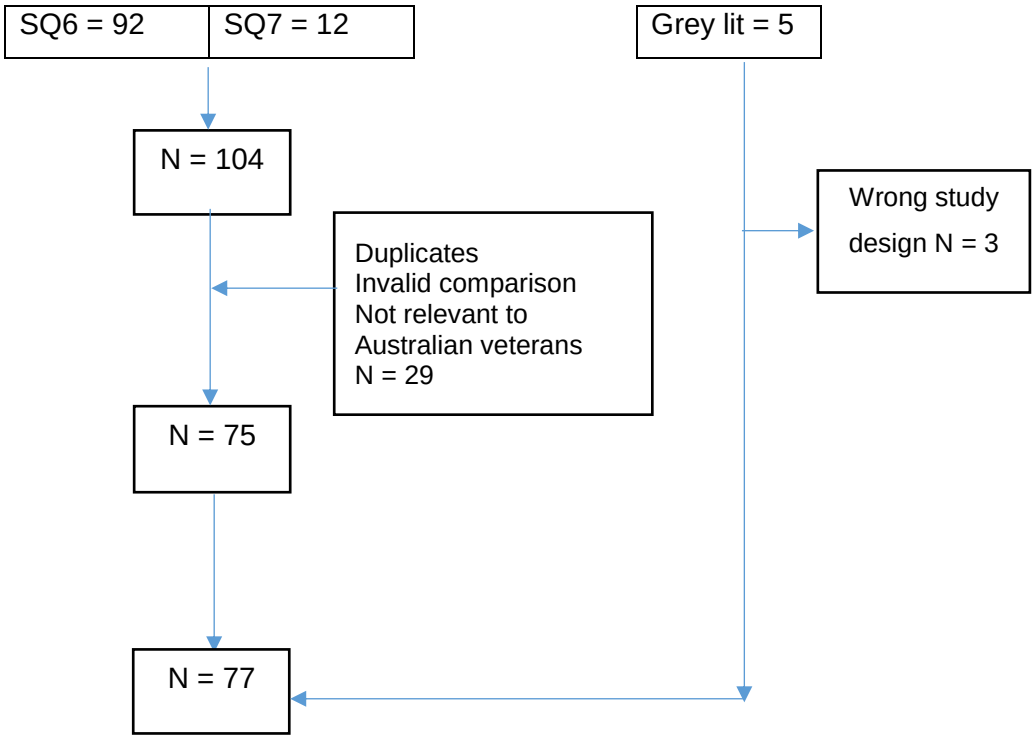


Figure 10: Flowchart for post hoc analysis of Q2



Summary of the studies

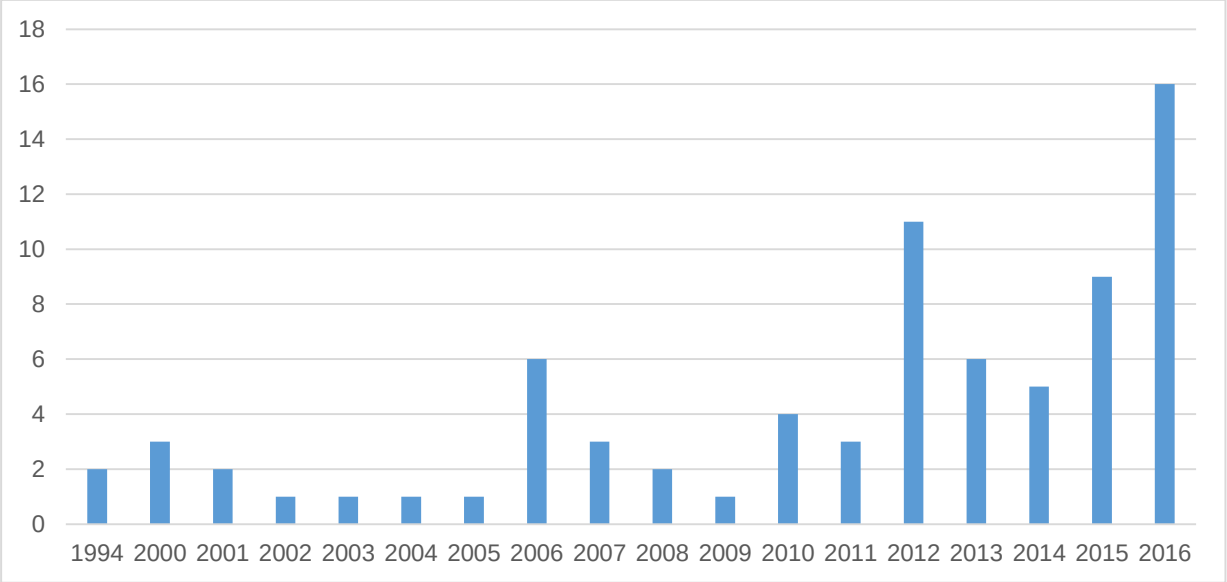
Country of origin: 62 (79%) of the 77 included studies were from the U.S. (one of these included data from Italy), six were from the U.K., four were from Australia, four were from Canada, and one was from The Netherlands.

Table 6: Determinants by age group of participants

	Determinants
Younger groups (all or most participants aged ≤ 65)	25
Older (all or most participants aged > 65)	12
Mixed groups (or not described)	40
Total	77

Over half of the studies (n = 40) involved mixed aged groups and it was not possible to tell whether their results applied more to younger or older veterans.

Figure 11: Determinants by year of publication



Over one-half of the studies on determinants included in this review (n = 47, 61%) were published in 2012 or later.

Summary of the evidence

As would be expected, several of the articles listed in these two reviews also appeared in previous reviews. The large body of literature retrieved on determinants of physical, mental,

and social wellbeing in veterans (compared with non-veterans) comprises three broad types of study:

- Studies comparing veterans with non-veterans on factors that are likely to have consequences for physical, mental, or social health in middle and later life, even though these consequences were not necessarily measured directly in the study (e.g., smoking, alcohol use, exercise).
- Studies exploring predictors (or correlates) of a wellbeing outcome in veterans only (though the study included some comparison of veterans' health status with national norms, to meet inclusion criteria).
- Studies using statistical moderation (i.e., interaction effects) to explore differences between veterans and non-veterans in correlates of wellbeing outcomes (for example, an interaction effect between veteran status and education in predicting survival may indicate that education predicts survival in one group but not the other).

Participant sociodemographic characteristics: Male veterans have higher access to resources than non-veterans in many studies. These resources include education, financial resources, and being married/partnered. Results are less consistent for female veterans. In contrast, U.S. patients in veterans' services are more likely to be unemployed or have low income than patients in non-veteran-specific services.

Adverse life events: Veterans in the U.S. and U.K. are more likely than non-veterans to report a major trauma in adulthood. U.S. veterans have higher rates than non-veterans of adverse events in childhood (in both women and men), but this is not true of U.K. veterans. Again, in the U.S., but not the U.K., veteran status is associated with increased risk of homelessness among both men and women. U.S. veteran women are more likely than non-veteran women to report lifetime intimate partner violence.

Health behaviours: U.S. veterans (both women and men) are more likely to be current smokers and to have a history of smoking than non-veterans. In the U.S., but not the U.K., veteran status is associated with risk of alcohol abuse in both men and women; and with illicit drug use in men. U.S. veterans are more likely to report problems with sleep than non-veterans and are more likely to be overweight or obese than non-veterans. On the positive side, U.S. veterans (both men and women) are less likely to report lack of physical exercise. Nutritional status in U.S. veterans is as good as, or better than, that of non-veterans.

Health treatment: In the U.S., veterans report better access to health care (including vaccination and screening) than non-veterans, among both men and women. U.S. veterans

are more likely to have health insurance and experience fewer financial barriers to health care than non-veterans.

Other health and wellbeing risks: Some U.S. studies show excess risk of functional dependence and falls in veterans. Women veterans report a higher number of sexual partners than non-veteran women and have a higher risk of contracting sexually transmitted infections (STIs). On the positive side, one study shows veteran households are better prepared for emergencies than non-veteran households.

In **studies of veterans only**, predictors of health outcomes or health risks are diverse. Risks include having experienced combat exposure or being wounded in action, having taken part in the Vietnam War, low rank, and being an "early service leaver" in the U.K. (but having been deployed for longer in Australia). Risks for poor health/mental health or health behaviours include: belonging to a racial minority group (in the U.S.), while protective factors among veterans include education, high subjective social standing, absence of pain or trauma, and positive health behaviours (especially regular exercise, being a non-smoker, and drinking alcohol in moderation). Social factors are protective, and include being in an intimate relationship, having support from family or friends, living in a socially cohesive environment, and living in an urban (rather than rural) environment. Age is a risk for some outcomes (e.g., dental problems) but protective against others (e.g., life issues, suicide risk).

Studies of moderation identify conditions that apply differently to veterans and non-veterans to affect health or mental health outcomes. Almost all the studies in this group come from the U.S. The following moderators have been identified as having a larger impact on the wellbeing of non-veterans than veterans: racial/ethnic minority status (three studies); adverse childhood experience; smoking and binge drinking; older age (compared with younger); and education. On the other hand, some factors exacerbate poor outcomes in veterans: for example, female gender appears to exacerbate the risk of suicide in veterans.

Table 7: Sociodemographic factors and life events that may hinder healthy ageing

Domains with more than one study indicating poorer outcomes for veterans	Domains with mixed evidence	Domains where veterans do as well as or better than non-veterans
Adult traumatic life event[48]	Marital status (single)[29] [17]	Education[55]
Intimate partner violence in women[49]	Low income[29] [47]	Socio-economic status[56]
Childhood adversity[50]	Minority race/ethnicity[39] [52]	
Living in a non-metropolitan area[51]	Homelessness[53] [47]	
	Age / cohort[37] [54]	

Notes:

1. Of the 14 individual studies featured in this table, 12 are from the U.S. and two are from the U.K.
2. Adult traumatic life events were defined in the study referenced here as events since age 16 that had endangered participants' lives or the lives of someone close, or had put them at serious risk, such as a natural disaster, seeing people killed, or being raped.
3. Childhood adverse events include: household alcohol abuse, exposure to domestic violence, physical abuse, emotional abuse, and sexual abuse.
4. Minority race and ethnicity (i.e., being Black or Hispanic in the U.S.) were stronger predictors of low wellbeing in non-veterans than in veterans.
5. Some studies show risks or benefits of veteran status varies by age group.

Table 8: Health conditions, health behaviours and low use of services that may hinder healthy ageing

Domains with more than one study indicating poorer outcomes for veterans	Domains with mixed evidence	Domains where veterans do as well as or better than non-veterans
Smoking[50]	Alcohol use and abuse[37 21]	Nutrition[63]
Poor sleep[57]	Drug use[60 61]	Vaccination[52]
Overweight and obesity[58]	Physical activity and sedentariness[17 62]	Health treatment[64]
Sexual history[59]		Mental health treatment[55]
		Health screening[65]
		Health insurance[66]
		Ability to afford health care[67]
		Health-related internet use[68]
		Preparedness for emergencies[69]

Notes: Of the 19 individual studies featured in this table, 17 are from the U.S. and two are from Australia.

Results: Interventions

The overarching question for this part of the review is: *Q3: What interventions positively affect health and wellbeing outcomes for veterans as they age?* This question has no sub-question (i.e., SQ8 is identical to Q3).

For SQ8, the search strategy led to the following:

- Identified articles: 1763
- Title and Abstract screening: 1763 articles
- Full-text screening: 200 articles

Subsequently, on closer examination, at the data extraction, risk of bias, and analysis stages, several studies were found not to be eligible for inclusion. These studies included several that:

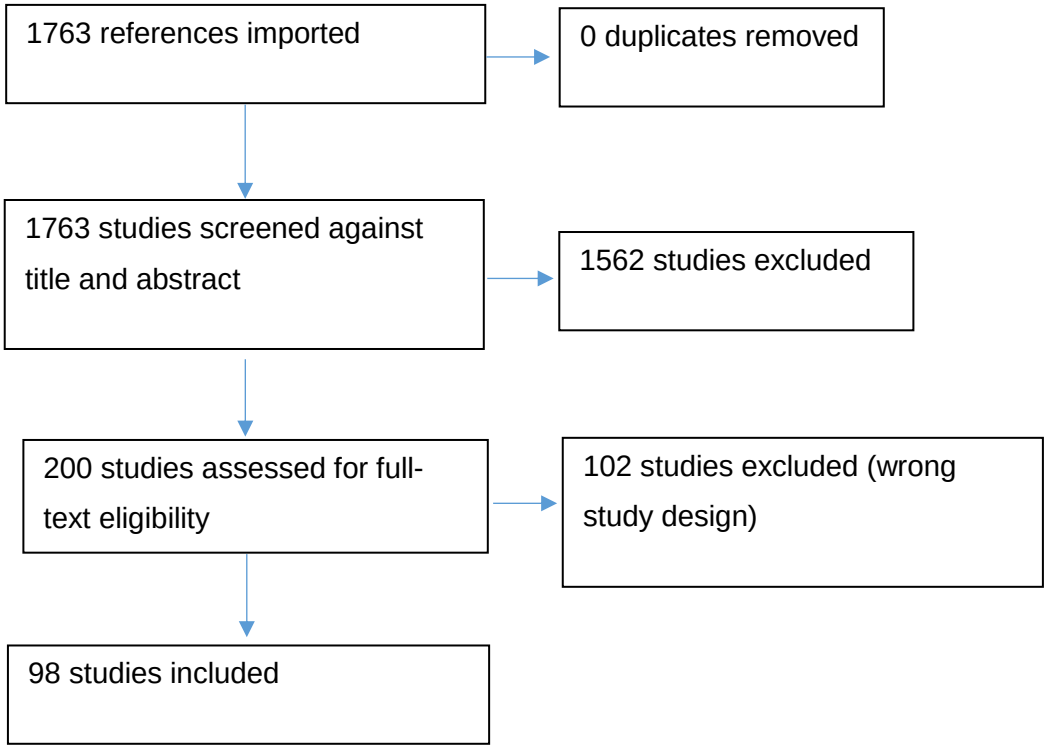
- Were not RCTs
- Were about treating post-traumatic stress disorder (PTSD)
- Were economic evaluations only
- Were process evaluations only
- Were studies of caregivers
- Published only interaction effects between the intervention and subgroups
- Included no outcome data for veterans

This left 98 studies clearly in scope. These studies were then analysed to address the research question.

The studies selected to address this question are set out by age group in the Evidence Profile of this report.

PRISMA diagram

Figure 10: PRISMA Flowchart for SQ8 Interventions



Summary of the studies

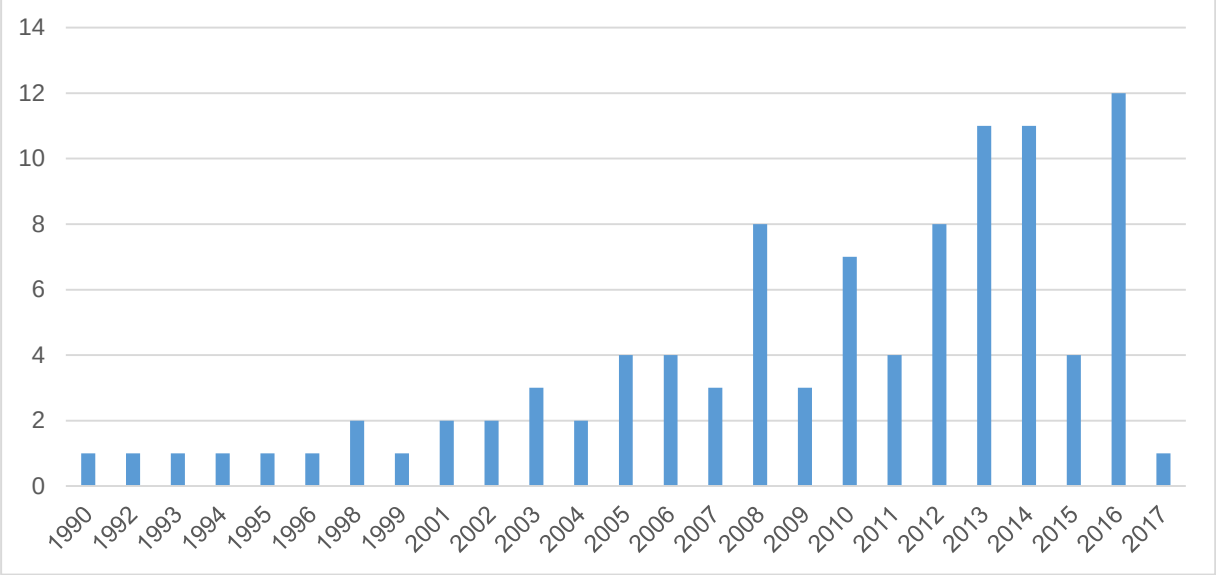
Country of origin: 87 (89%) of the 98 included studies were from the U.S. six were from Australia, and the remainder were from Taiwan (n = 3) or Iran (n = 2).

Table 9: Intervention studies by age group of participants

	Intervention studies
Younger groups (all or most participants aged ≤ 65)	37
Older (all or most participants aged > 65)	14
Mixed groups (or not described)	47
Total	98

Just under half of the studies involved mixed aged groups and it was not possible to tell whether their results applied more to younger or older veterans. Few of the studies (only 15%) included mainly older groups of veterans.

Figure 11: Intervention studies by year of publication



One-half (52%) of the studies on interventions included in this review were published in 2011 or later.

Summary of the evidence

Interventions to improve physical wellbeing have included those targeting pain, medical and dental wellbeing, health screening, health behaviours, substance abuse, general health status, and health literacy.

- In most studies, telemonitoring and web-based tools were found to be as effective as face-to-face delivery.
- Pharmacist-led interventions proved useful, but other studies have shown non-clinicians are as effective as clinicians in delivering some interventions.
- Contingency-based interventions have shown some promise for helping people with alcohol use and smoking.
- Assessment alone is sometimes an effective intervention.

Most mental health programs have focused on depression, sometimes in conjunction with anxiety. Behavioural and cognitive interventions are useful for treating depression, but interventions addressing other issues (such as pain, sleep, and chronic health conditions) tend not to have an impact on depression. Attempts to use educational interventions to improve attitudes to treatment have generally not been successful.

Relatively few interventions have targeted social wellbeing. Some interventions have resulted in improved social activity or perceived social support. Improvements in housing and employment are possible in intensive programs.

The summary of the evidence presented here uses the standard format for DVA evidence compass reviews.

Table 10: Interventions for physical health and health conditions

SUPPORTED (Two or more studies)	PROMISING (One study only)	UNKNOWN Conflicting	NOT SUPPORTED No improvement
Pharmacist-led interventions for reducing blood pressure[70 71] In home health assessment for general health and function[72 73] Telephone-delivered: • CBT and manualised education for pain[74] • Nurse-led intervention to increase confidence to follow treatment for hypertension[75] • Advanced Comprehensive Diabetes Care (ACDC)[76] Self-management for: • medication adherence[77] • stroke risk factors[78] • Hepatitis C virus[79] bipolar disorder and cardiovascular disease risk factors[80]	Web-based tool to reduce inappropriate medications (TRIM)[81] Group and individual physical therapy for arthritis[82] Hospital-based Home Care (HBHC) Program for improved cognitive functioning[83] Geriatric outpatient management (GEM) for older veterans[84] Integrated outpatient treatment for ill alcoholic men[85] Multimodal intervention to improve medication adherence and blood pressure control[86] Mindfulness-based stress reduction (MBSR)[87] Emotional Freedom Technique (EFT)[88] Structured education program to improve pressure ulcer prevention knowledge[89] Pharmacist outreach to improve glycaemic control[90] Enhanced outreach program to improve clinic attendance in rural areas[91] Work therapy for homeless veterans[92]		Telehealth for pain[93 74] Telephone-supported care coordination for congestive heart failure[94] UPBEAT (in-depth geriatric assessment and proactive mental health care coordination) no better than standard care for general health status among older veterans[95] Hospital-based Home Care (HBHC) Program vs. usual care did not lead to improvement in self-care (ADL)[83] Peer-led self-management for hypertension no better than standard care[96]

Table 11: Interventions for screening and immunisation

SUPPORTED (Two or more studies)	PROMISING (One study only)	UNKNOWN Conflicting	NOT SUPPORTED No improvement
Mailing faecal immunochemical tests (FITs) to improve colorectal screening rate[97] [98]	Healthcare provider intervention for colorectal cancer screening[99] Telephone counselling for mammograms[100] In-home-preventative assessment program for immunisation rates[100] Screening of hearing loss for hearing aid use and hearing-related function[101]	Tailored or targeted mail outs for mammogram uptake[102] [103]	

Table 12: Interventions for health behaviours

SUPPORTED (Two or more studies)	PROMISING (One study only)	UNKNOWN Conflicting	NOT SUPPORTED No improvement
CBT for sleep (including telephone-based and nonclinical sleep coaches)[104 105 106] Home-based physical activity counselling via telephone or in-person[107 108]	Educational DVD for physical activity[109] ASPIRE: non-clinician via telephone or in-person groups for weight loss[110] Wellness coaching for weight loss[111] Multicomponent smoking treatment[112] Proactive outreach and choice of smoking cessation services to reduce smoking[113] Flinders Program™ of chronic condition management to reduce alcohol consumption and dependence[114] Auricular acupuncture to reduce craving for alcohol, heroin and cocaine[115] Residential care unit for homeless, addicted veterans[116] Contingency management (rewards for abstinence) to improve retention and outcomes for alcohol and drug use[117] Pharmacist-led interventions for exercise and foot care in diabetes[71]	A brief alcohol intervention with a clinician prompted participants to use more outpatient medical services, but there were no long-term effects[118]	MOVE! Program involving individual and group sessions and designed to improve physical activity and eating habits and reduce weight was no more effective than providing monthly brochures and handouts[119] Auriculotherapy (a stop smoking class) did not reduce smoking[120] UPBEAT Psychogeriatric assessment and proactive mental health care coordination did not reduce alcohol abuse[95] Offering homeless alcohol-dependent veterans injections to reduce heavy drinking[121] Telephone-based disease management (TDM) for at-risk drinking[122]

Table 13: Interventions for mental health

SUPPORTED (Two or more studies)	PROMISING (One study only)	UNKNOWN Conflicting results	NOT SUPPORTED No improvement
Telemedicine is equally effective as in-person treatment • Telephone-delivered CBT for pain management reduced depression[93] • Telephone-delivered behavioural activation reduced depression[123] Telephone-based disease management to reduce alcohol use reduced depression[122]	Brief alcohol intervention with personalized feedback for depression[124] Collaborative care depression treatment[125] Pain management for depression[126] Behavioural activation delivered at home by videoconferencing[127] Peer-led mental health recovery group[128] Dual-disorder specific CBT and 12-step group for depression[129] Acupuncture to treat cravings for alcohol or drugs and reduce anxiety[115] Geriatric outpatient management (GEM)[72] Problem solving therapy[130] Emotional freedom technique[88] Weight loss for quality of life[119] Intervention for bipolar disorder medical care on quality of life[80] Mifepristone for verbal learning[131] Behavioural interventions combined with cognitive techniques for suicide ideation[132] Health buddy via telehealth for suicide ideation[133]	UPBEAT intervention was no more effective than usual care in reducing symptoms of depression except among those with more physical health problems[95] Sleep intervention for depression[104] Critical Time intervention to improve quality of care after psychiatric impatient hospitalisation (modest improvement only in quality of life)[134]	Problem solving for depression[130] Sleep intervention for depression[104] Diabetes care (ACDC) did not reduce depression[76] Chronic condition management did not reduce depression[93] Illness management and Recovery (IMR) is no more effective than problem solving in reducing symptoms of schizophrenia[135] Telephone-based psychiatric referral-care management (similar to usual care)[136]

Table 14: Interventions to improve social engagement

SUPPORTED (Two or more studies)	PROMISING (Two study only)	UNKNOWN Conflicting results	NOT SUPPORTED No improvement
	Offering opportunities to work contingent on work performance and health behaviour[137] Twelve-step facilitation for community affiliation[129] Emotional Freedom technique for social dysfunction[88] GEM clinic attendance for social activity[72] A Critical Time Intervention to promote continuity of care post-hospitalisation for more family contact and community connections[134] Combining intensive care management with provision of rent subsidy vouchers improved housing[138] Supported employment group to assist veterans with spinal cord injury to gain competitive employment[139]		Neither integrated, dual disorder-specific cognitive behavioural therapy (ICBT) nor Twelve-step facilitation improved perceived social support[129]

Discussion

To summarise: The literature review identified considerable challenges to healthy and active ageing in veterans, including increased risk of poor physical health, poor mental health, and low social participation. Determinants included having experienced traumatic life events, either as an adult or as a child, and poor health behaviours (higher smoking and alcohol use, poor sleep, and increased risk of obesity), while protective factors included education and ability to access health care. A wide range of intervention types have been implemented to improve the wellbeing of veterans. Some that show promise include interventions using telemedicine and telephone-based support, in-home health assessment, and self-management of chronic health conditions. Some conditions, especially chronic alcohol use in conjunction with other problems (such as homelessness or mental health problems), appear to be particularly resistant to intervention and effective interventions for these problems need to be very intensive, including residential care and contingency-based programs incorporating rewards.

One striking characteristic of the literature on veterans' health and wellbeing is the lack of a salutogenic approach (i.e., an approach that promotes health rather than focusing on illnesses and deficits) that characterises much of the general gerontological literature, where healthy and active ageing have been influential frameworks for theory and research for several decades. Sufficient evidence now supports interventions such as exercise, music, enjoyable activity, and reminiscence to promote wellbeing in general populations of older adults.[140] The current literature review struggled to identify a body of literature on veterans with a salutogenic focus.

The paucity of literature on positive aspects of physical health and wellbeing in middle-aged and older veterans in comparison with age-matched peers is surprising. Most literature on the health and wellbeing of veterans takes a view of health based on the sickness model and focusing on health deficits. This was most acute in the literature on mental health, which was almost always defined and measured in terms of mental illness. We identified very little peer-reviewed literature comparing veterans with non-veterans on happiness, resilience, mastery, or other strength-based concepts. Only one study specifically compared veterans with non-veterans on indicators of healthy ageing.[17] However, some of the intervention studies did focus on exercise and diet as ways of improving physical wellbeing.

It should be recognised that this literature review by design incorporated limitations that might have had a bearing on this absence.

1. Questions on veterans' health, mental health, and social engagement were all framed in terms of comparison with populations of non-veterans. This meant that the review missed articles on factors such as resilience that we know from informal searches have been published, but none of which employed a non-veteran comparison.[118] It also meant that the review did not capture many studies that focus on features of veterans' war experience as predictors of their health and mental health in later decades.
2. Questions on interventions were framed in terms of randomised controlled trials (RCTs).

Again, while in the general gerontological literature, evidence is growing on contemporary approaches such as reablement,[141] consumer-directed care,[142] and interventions that rely on technology,[140] studies on these topics are largely missing from the literature on veterans. Again, this is surprising.

Other characteristics of the literature identified in this review are important to note. The first is a heavy reliance on evidence from the United States (U.S.). However, U.S. veterans are not the same as those from other countries,[7] and caution needs to be exercised in generalising results across nations that differ in this respect.

Secondly, most of the literature features male veterans. Women are often intentionally excluded from population-based analyses of veterans and have required their own studies.

Thirdly, while many studies have focused on physical and mental health, relatively few have focused on social participation. The few studies in this area have resulted in contradictory findings.

Fourth, rurality has rarely been explored. It is not known whether location has previously been identified as having little bearing on outcomes for veterans. Rurality is certainly likely to be an issue in Australia, either positively (in promoting a sense of community) or negatively (in restricting access to services).

Fifth, the review on interventions was characterised by many studies that were one-offs, with little evidence that positive findings supporting an approach had been applied in other contexts or other groups of veterans.

Finally, the review identified few high-quality, peer-reviewed Australian studies (n = 10), and was supplemented by studies from selected grey literature (n = 5).

Conclusions

There is ample evidence that some middle-aged and older veterans may require support and assistance to age actively and in optimal health. However, this conclusion does not apply to all groups of veterans or to all measures of wellbeing. Studies from the U.S. generally report worse outcomes than those from the U.K., and fewer differences are evident between older veterans than their peers than between younger veterans and their peers.

Findings on determinants suggest that there is plenty of scope for focusing on improving the health behaviours of middle-aged and older veterans (i.e., smoking, alcohol use, diet, physical activity, and control of obesity). While this is also true of non-veterans, the studies reviewed indicate that poor health behaviours are more prevalent among veterans than non-veterans.

Veterans who have experienced traumatic life events have increased risk of poor health or mental health outcomes in middle-age or later life. This is likely to be equally true of non-veterans.

Potential determinants of healthy ageing that did not emerge from the literature review include social and cognitive activity, which are supported by the wider gerontological literature and should not be neglected.

The effectiveness of telephone-based interventions lends hope that use of newer technologies may make interventions more accessible, affordable, and immediate. Interventions that rely on technology have been shown to promote emotional wellbeing in older people living in the community.[140] Given that veterans are geographically dispersed, IT-based interventions are a promising avenue to explore.

The effectiveness of a self-management for a range of health conditions is broadly compatible with a proactive wellness approach, since it relies on participants taking control of the process of improving their own health, rather than relying on clinicians. Self-management holds promise for assisting veterans to manage their health as they age.

Some interventions that have proven useful with older people may need to be amended to suit the special needs of veterans. Reminiscence and life review are a case in point.[2]

A growing literature supports the use of person-centred care, consumer-directed care, and restorative (reablement) approaches to home-based and community-based services with people who need assistance due to disability or advanced age. Australian Government policy and service provision have increasingly relied on such approaches. However, the current

literature review identified no literature on use of these approaches with veterans. This does not mean that these approaches are irrelevant to veterans; rather, that mainstream or generic community services and supports have not been the focus of research on veterans. Well-designed evaluations are required for new directions and programs to assist veterans to age well, and these should be published in the peer-reviewed academic literature.

There is plenty of room for new Australian research to fill gaps in the evidence highlighted above. Veteran status could be promoted as a priority area for research in the Australian research funding bodies (i.e., National Health and Medical Research Council and the Australian Research Council (ARC)).

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Appendix 1

Search strategy for each study objective

SQ1 What is the physical wellbeing of veterans compared to the general population?

1 (veteran* or 'retired soldier*' or 'former military personnel' or 'former armed service* personnel' or 'military service' or 'armed service' or 'army service' or defence or personnel or forces).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (39817)

2 ('physical well-being' or 'physical well being' or 'physical wellbeing' or 'physical health' or well-being or wellbeing or 'well being' or health or 'health of veteran* or 'veteran* health' or well being of veteran*' or 'veteran* well being').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (2591179)

3 1 and 2 (17470)

4 Veterans/ (13965)

5 Veterans Health/ (878)

6 4 and 5 (367)

7 3 and 6 (367)

8 limit 7 to (yr="1990 -Current" and ("middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")) (175)

SQ2 What is the prevalence of long-term physical health conditions in veterans compared to the general population?

1 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel' or 'military service' or 'armed service' or 'army service' or defence or personnel or forces).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (39817)

2 ('Long-term health problem*' or 'Long term health problem*' or 'Long-term illness*' or 'Long term illness*' or 'Long-term sickness*' or 'Long term sickness*' or 'Long-term disease*' or 'Long term disease*' or 'Long-term disorder*' or 'Long term disorder*' or 'Long-term disabilit*' or 'Long term disabilit*' or 'Chronic health problem*' or 'Chronic problem*' or 'Chronic illness*' or 'Chronic sickness*' or 'Chronic disease*' or 'Chronic disorder*' or 'Chronic disabilit*' or 'Life-long health problem*' or 'Life long problem*' or 'Life-long illness*' or 'Life long illness*' or 'Life-long sickness*' or 'Life long sickness*' or 'Life-long disease*' or 'Life long disease*' or 'Life-long disorder*' or 'Life long disorder*' or 'Life-long disabilit*' or 'Life long disabilit*' or 'permanent health problem*' or 'permanent problem*' or 'permanent illness*' or 'permanent sickness*' or 'permanent disease*' or 'permanent disorder*' or 'permanent disabilit*' or 'persist* health problem*' or 'persist* problem*' or 'persist* illness*' or 'persist* sickness*' or 'persist* disease*' or 'persist* disorder*' or 'persist* disabilit*' or 'continuing health problem*' or 'continuing problem*' or 'continuing illness*' or 'continuing sickness*' or 'continuing disease*' or 'continuing disorder*' or 'continuing disabilit*' or 'recurring health problem*' or 'recurring problem*' or 'recurring illness*' or 'recurring sickness*' or 'recurring disease*' or 'recurring disorder*' or 'recurring disabilit*' or 'long standing health problem*' or 'long standing problem*' or 'long standing illness*' or 'long standing sickness*' or 'long standing disease*' or 'long standing disorder*' or 'long

standing disabilit*').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms (327693)

3 1 and 2 (6009)

4 Veterans/ or Veterans, Health/ (14518)

53 and 4 (637)

6 limit 5 to yr="1990 -Current" (607)

What is the mental wellbeing of veterans compared to the general population?

SQ3 What is the mental wellbeing of veterans compared to the general population?

1 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (37353)

2 ('mental well-being' or 'mental health' or 'psychological well-being' or 'psychological health').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (173904)

3 1 and 2 (3463)

4 Veterans/ or Veterans, Health/ (14550)

5 3 and 4 (2009)

6 limit 5 to (english language and yr="1990 -Current" and ("middle age (45 to 64 years)" or "middle aged (45

plus years)" or "all aged (65 and over)" or "aged (80 and over)")) (1188)

SQ4 What is the prevalence of mental disorders in veterans compared to the general population?

1 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel' or 'military service' or 'armed service' or 'army service' or defence or personnel or forces).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (485731)

2 ('mental problem*' or 'mental illness*' or 'mental disease*' or 'mental disorder*' or 'mental disabilit*' or morbid* or comorbid* or 'co morbid*' or 'co-morbid*' or 'psychological problem*' or 'psychological illness*' or 'psychological disease*' or 'psychological disorder*' or 'psychological disabilit*').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (748575)

3 1 and 2 (21904)

4 Veterans/ or Veterans, Health/ (14550)

5 3 and 4 (3324)

6 limit 5 to (english language and yr="1990 -Current" and ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")) (2295)

SQ5 What is the level of social engagement in veterans compared to the general population?

6 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel').mp. [mp=title, abstract, original title, name of substance word, subject heading

word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (37840)

7 ('mental well-being' or 'mental health' or 'psychological well-being' or 'psychological health').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (177170)

8 6 and 7 (3552)

9 Veterans/ or Veterans, Health/ (14756)

10 8 and 9 (2066)

11 5 or 10 (7275)

12 ('determin* of health' or factor* or 'social determin* of health' or 'physical determin* of health' or 'health determin*').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (5309648)

13 "Social Determinants of Health"/ (1482)

14 12 or 13 (5309648)

15 11 and 14 (2641)

SQ6 What are the determinants of physical and mental wellbeing of veterans compared to the general population?

1 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (37840)

2 ('physical well-being' or 'physical health' or well-being or health).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (2630706)

3 1 and 2 (16982)

4 Veterans/ or Veterans, Health/ (14756)

5 3 and 4 (7275)

6 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (37840)

7 ('mental well-being' or 'mental health' or 'psychological well-being' or 'psychological health').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (177170)

8 6 and 7 (3552)

9 Veterans/ or Veterans, Health/ (14756)

10 8 and 9 (2066)

11 5 or 10 (7275)

12 ('determin* of health' or factor* or 'social determin* of health' or 'physical determin* of health' or 'health determin*').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (5309648)

13 "Social Determinants of Health"/ (1482)

14 12 or 13 (5309648)

15 11 and 14 (2641)

16 limit 15 to (yr="1990 -Current" and ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)")) (1959)

SQ7 What are the determinants of social engagement in veterans compared to the general population?

6 (veteran* or 'retired soldier*' or '*former military personnel' or 'former armed service* personnel').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (37840)

7 ('mental well-being' or 'mental health' or 'psychological well-being' or 'psychological health').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (177170)

8 6 and 7 (3552)

9 Veterans/ or Veterans, Health/ (14756)

10 8 and 9 (2066)

11 5 or 10 (7275)

12 ('determin* of health' or factor* or 'social determin* of health' or 'physical determin* of health' or 'health determin*').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (5309648)

13 "Social Determinants of Health"/ (1482)

14 12 or 13 (5309648)

15 11 and 14 (2641)

SQ8 What interventions promote healthy ageing in veterans?

1 (veteran* or 'retired soldier*' or 'former military personnel' or 'former armed service* personnel' or 'military service' or 'armed service' or 'army service' or defense or personnel or forces).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (565344)

2 Veterans/ or Veterans, Health/ (14760)

3 1 and 2 (14760)

4 ('physical well-being' or 'physical wellbeing' or 'physical well being' or 'physical health' or well-being or wellbeing or 'well being' or health or 'health of veteran* or 'veteran* health' or well being of veteran*' or 'veteran* well being').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (2638674)

5 ('mental well-being' or 'mental health' or 'psychological well-being' or 'psychological health').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (177544)

6 ('social well-being' or 'social health' or 'social well-being' or 'social health').mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (3846)

7 4 or 5 or 6 (2638674)

8 3 and 7 (7280)

9 limit 8 to (english language and ("middle age (45 to 64 years)" or "middle aged (45 plus years)" or "all aged (65 and over)" or "aged (80 and over)") and (clinical trial, all or controlled clinical trial or meta analysis or randomized controlled trial or systematic reviews)) (711)