3. VETERANS' HEALTH LITERATURE

This literature review provides a guide to the scope of recent health studies with elderly veterans, the types of health outcomes investigated and findings related to these, any associations found with war-related exposures, and the data collection methods employed. This review focuses primarily on health investigations of Korean War and World War II (WWII) veterans from Australia, the United Kingdom (UK) and the United States (US). The WWII veterans' research is included because of the relative age similarity of this veteran group to the Korean War group (the latter group is estimated to average approximately nine years younger),[25] the relative proximity of the two wars in time (compared with other wars), the fact that approximately one third of Australia's Korean War veterans participated in WWII,[19] the apparent larger number of WWII veteran studies compared with Korean War veteran studies, and because, unfortunately, many health studies have combined WWII and Korean War veterans in to the same study group, rather than treating them as separate cohorts.

Most attention in this review is given to research conducted since 1990; the findings from this more recent research considered most relevant to the design of, and findings expected from, this new study of Australia's Korean War veterans. Only a brief summary is provided in relation to earlier (pre 1990) investigations of these veteran groups. Also, only a short introduction is made to investigations of the health of veterans from more recent conflicts such as the Vietnam War and the 1991 Gulf War.

Pre 1990 investigations of Korean War and WWII veterans' health

As early as the 1950's there was already a massive literature debating the syndrome of "combat fatigue" or "stress reaction" in WWII veterans, a condition similar to what today is recognised as posttraumatic stress disorder (PTSD). In 1954, for example, Lewis and Engle reviewed some 1,166 articles on the subject (cited in Archibald & Tuddenham[26]). Whilst the volume of research subsided after the 1950s, studies after that time have continued to note the persistence of symptoms in these combat veterans in to the 1960s,[26, 27] 1970s[28] and 1980s.[29, 30]

Whilst other psychosocial sequelae of war have received less attention than PTSD-type symptomatology, there has still been an extensive literature on excesses of other disorders such as psychoneuroses and schizophrenia,[12] depressive disorders,[31] and alcohol disorders[32] in veterans of WWII and Korea.

Research in relation to physical morbidity, cancer, and mortality, while still substantial, is less abundant in the literature compared with the massive volume of psychiatric research. In terms of veterans' overall mortality, rates have often been found to be low when compared to the general population. Such results are typically explained in terms of a "healthy soldier effect" due to the selective recruiting, by Defence Forces, of very fit, healthy applicants, followed by rigorous fitness programs, ongoing screening for certain diseases and superior access to medical treatment.[19] Seltzer and Jablon (1974) demonstrated a healthy soldier effect in 85,491 US Army WWII veterans, persisting in relation to some causes of death for 23 years after service.[33] The effect varied considerably according to the nature of the cause of death. The largest deficit of observed mortality was for tuberculosis, for which only one-third of the expected deaths occurred in the WWII group. Death from ulcers remained at half of that expected, and death from some cardiovascular diseases including rheumatic heart disease, hypertension and hypertensive heart diseases were two-thirds of that expected, 23 years after war service. Death from diabetes in the WWII group was also much lower than expected, especially in the first 15 years after return from war, but this rose to expected levels by 23 years. Mortality from malignant neoplasms was low for the first 5 years, and rose thereafter to match population expectations. A similar attenuating effect was shown for cerebrovascular

accidents and for arteriosclerotic heart disease. Unlike death from diseases, however, death rates from trauma showed no difference from population levels.[33] In 1977 Seltzer and Jablon re-examined the cohorts' mortality experience according to military rank, and found that it was the mortality of WWII officers and non-commissioned officers that was significantly lower than expected, whilst the mortality of privates was very close to population rates.[34]

In former prisoners of war (POWs), studies show some increases in mortality rates particularly in the first years after repatriation. Deaths from motor vehicle accidents evident up to five years after repatriation, and deaths from suicide, pulmonary tuberculosis and liver cirrhosis up to 18 years after repatriation, have been shown to be elevated in Australian former POWs of WWII.[35] A US study of WWII and Korea POWs found similar patterns of increased mortality during the first decade after imprisonment, particularly deaths from trauma and tuberculosis in WWII POWs, and from trauma in Korea POWs, and an excess of deaths due to liver cirrhosis appearing after about the 10th year of follow-up in both POW groups.[8] In relation to deaths from other disease types, however, such as circulatory diseases[8, 35] and malignant neoplasms,[8] POWs show low death rates compared with comparison groups.

POW studies also show excesses in the number of hospital admissions, and also hospital admission rates for non-specified infective and parasitic diseases, diseases of the nervous system and sense organs, pulmonary tuberculosis, and diseases of the gastrointestinal, genitourinary, circulatory and musculoskeletal systems.[12] Excesses in markers of hepatitis B infection,[9] duodenal ulcers[10] and strongyloidiasis[10, 11] have also been demonstrated in former POWs.

More recent investigations of Korean War and WWII veterans' health

In to the 1990s and 2000s only a few researchers have continued to investigate the health of the surviving Korean War and WWII veterans. The relative scarcity of research studies in these elderly groups may be partly because the numbers of surviving veterans from these wars are quickly decreasing as their average age exceeds the average life span for males, and because the health patterns of the survivors are becoming increasingly complicated by age-related illness.

There are several major limitations to the available literature. Unfortunately, recent studies have often relied on small study groups drawn from medical clinics[36-39] or self referred populations,[40] rendering it difficult to generalise their findings to the broader Korean War veteran population. Further, any comparison of results across existing studies is limited by wide heterogeneity in the population groups recruited, and the range of different instruments utilised to measure health outcomes and exposures. Finally, we found few studies which recruited their own non-veteran comparison group against which to compare veterans' results, and few studies make any reference to the expected results in the general population. The reader, therefore, is required to seek alternatives sources of comparable normative data to determine whether Korean War veterans are experiencing better, similar or poorer health than their similarly aged, community peers. Despite these limitations, the findings in these studies generally suggest that adverse health effects of war exposure may be persisting well in to later life.

The recent literature is dominated by studies specifically investigating PTSD and associated variables,[36-38, 41-43] with only a few studies measuring other dimensions of psychological functioning[25, 40, 44-46] including alcohol use,[43, 47-50] a few investigating physical conditions[44, 51] including cancer,[20] self-rated physical functioning or general health,[44, 47] and a few investigating mortality.[19, 52]

Studies of PTSD

Since 1990 the prevalence of current PTSD reported in the health literature, for Korean and/or WWII veterans, has ranged from less than 1% in 921 veterans (67% of whom were Korean War veterans) drawn from the US Normative Aging Study (NAS)[47, 53] to 88% in 26 Korean War POWs.[46] Lifetime prevalence of PTSD for the latter POW group was reported as high as 96%. Other studies report current PTSD prevalences of 59% in 56 WWII Japanese-held POWs,[41] 45% in 108 Australian WWII veterans attending a psychiatric outpatient clinic,[38] 43% in US Korean War veterans (n=30), and 29% in WWII veterans (n=83), attending medical or psychiatric outpatient clinics in a Georgia Veterans' Affairs Medical Clinic,[37] 32% in 363 community based mustard gas-exposed US WWII veterans,[43] 29% in 721 self-referred community drawn British veterans (9% of the recruited group were Korean War veterans)[40] and 30% in US Korean War veterans (n=21), and 18.5% in US WWII veterans (n=113), drawn from non-psychiatric medical units at the Boston Veterans Administration Medical Centre.[54]

PTSD has most commonly been associated with increasing severity of combat or trauma exposure,[40, 41, 46, 53] including level of casualties,[38] and responsibility for killing someone.[25] Various other variables shown to be associated with PTSD include current physical illnesses,[40] self report of poor health status,[47] comorbid anxiety, depressive or alcohol disorders,[38, 46, 47] increased rates of smoking,[38] lower rank,[40] and age at captivity for POWs[41] or weight loss during captivity.[46]

In a US longitudinal study of 165 WWII and 12 Korean War community dwelling POWs, Port et al (2001)[42] reported that 27% of participants met criteria for PTSD at first assessment, and that a larger proportion (34%) met criteria at second assessment; the two assessments averaged 50 months apart (range 33-68 months). A retrospective investigation of subjects who participated in the first assessment, indicated that PTSD symptoms were highest shortly after the war, then declined for several decades and increased in the two decades prior to the study (since the 1980's).[42] The authors speculate that the 'developmental milestone' of retirement could be associated with the PTSD symptom increases in the 1980s for this veteran group.

An accurate estimation of the expected prevalence of PTSD, across the entire cohort of surviving Australian Korean War veterans, is difficult to gauge from the diverse findings of the studies cited above. The studies utilise quite heterogeneous study populations, none of which would be considered representative of the wider surviving veteran population. For example, Spiro et al (1994) report that their NAS veteran group included fewer combat exposed veterans and more higher ranked veterans than a 1987 US national sample surveyed by Veterans' Affairs, and that as a result of the physical and mental health screening which NAS men underwent at the time of study entry, those most likely to then have or later develop PTSD may have been excluded.[53] Hunt & Robbins (2001) concede that it is unknown whether their self-referred sample was representative of the surviving veteran population, and therefore it was unclear whether their PTSD figures over- or under-represent the population.[40]

The studies cited also utilise heterogeneous measures of PTSD, making it difficult to compare results across populations or to predict expected findings in the wider Australian population. Examples of the different measures include self-administered PTSD questionnaires such as the Impact of Events Scale used by Hunt & Robbins (2001)[40] and the Mississippi Scale for Combat-Related PTSD and the MMPI-2 Pk scale used by Spiro et al (1994),[53] structured clinician administered interviews such as the Clinician-Administered PTSD Scale (CAPS-1) as used by McCranie and Hyer (2000),[37] or combinations of clinical assessment and self-administered data as described by Kidson et al (1993).[38] Within a single study population Spiro et al (1994) reports a PTSD prevalence of less than 1% using the Mississippi Scale and close to 7% using the MMPI-2 Pk scale; this example demonstrating the difficulty of comparing results drawn from different data collection methods.

None of the studies cited include a non-veteran reference population against which to compare results and few make any reference to the prevalence of PTSD expected amongst the veterans' community peers. Eberly and Engdahl (1991)[50] cite a US population study which reported a lifetime PTSD prevalence rate of 0.5% in 965 men aged 18 and older,[55] a figure markedly lower than the 70.9% lifetime PTSD prevalence which Eberly and Engdahl found in their population of 426 former POWs. The Australian 1997 National Study of Health and Well-being (NSHWB) reported the 12-month prevalence of anxiety disorders (of which PTSD is one) in Australian men aged 65 and over, to be 3.5%.[56] This Australian general population figure is also markedly lower than the prevalences of PTSD reported in the vast majority of the veteran literature. Whilst these comparisons with general population data are limited, they suggest that WWII and Korean War veterans are experiencing markedly elevated levels of PTSD in to their later life.

Studies of alcohol use

We found only a few studies since 1990 reporting alcohol problems in WWII or Korean War veterans. Most studies report lifetime estimates of the prevalence of alcohol related disorders or problem drinking. Using a computerised diagnostic interview and criteria from the 3rd edition, revised, of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R),[57] Sutker and Allain (1996) reported lifetime alcohol abuse or dependence in 42% of 26 Korean conflict POWs and in 34% of 112 non-POW combat veterans of Korea and WWII.[46] In a rare study which included its own non-veteran comparison group, Norquist et al (1990)[48] reported lifetime DSM-III alcohol abuse/dependence prevalences of 25.3% in 342 US Korean War era veterans and 23.6% in age-matched non-veteran controls, also using structured diagnostic interviews. The lifetime prevalences in WWII veterans and their controls were 19.1% and 18.1% respectively.[48] A similar lifetime prevalence of 21.1% for alcohol abuse or dependence in US former POWs is reported by Eberly and Engdahl (1991)[50] based on detailed medical histories, and medical and psychiatric examinations. These authors cite a comparable general population study which reported a lifetime prevalence of 18.2% in US men aged 45 and older.[58] Neither Norquist's, nor Eberley's, study found statistically significant differences between the veteran groups and their comparison populations.

Three additional veteran studies used a cut-point of two or more endorsed items in the self-report CAGE questionnaire[59, 60] to identify subjects with a history of problematic alcohol use. In mustard gas-exposed US WWII veterans, a history of alcohol problems were reported in 16% of veterans who also had PTSD, 15% of those with partial PTSD and 9% of those without PTSD.[43] Amongst the WWII and Korean War veterans drawn from the NAS, 16% had a CAGE score indicating a history of problem drinking.[47] Further, Reid et al (2003) found that 19% of 303 Veterans' Affairs Primary Care Clinic patients classified as current drinkers (average age 73.1 years, 97% men), met CAGE criteria for lifetime problem drinking.[49] Reid et al, however, also employed a non-veteran community dwelling comparison group and reported lifetime problem drinking in only 4% of 511 US Medicare beneficiaries, (average age 75.8 years, 40% men), using the CAGE at the same cut-point described above.[49] Whilst this community prevalence would presumably be higher if the study population had been limited to male subjects, Reid's study nonetheless casts doubt over previous suggestions that lifetime alcohol related disorders do not differ between WWII or Korean War veterans, and their community peers.

Of the studies cited above, only Norquist et al[48] and Sutker and Allain[46] estimated 'current' prevalence of alcohol disorders. Norquist et al reported six-month prevalences of 6.6% and 7.4% respectively for Korean War era veterans and their controls, and 5.3% and 4.8% respectively for WWII era veterans and their controls; in neither comparison did the veteran groups differ statistically significantly from their controls.[48] The figures are higher than the one year prevalence of 2.6% (95%CI 2.2-3.0) reported for the US general population aged

These elevated cancer rates were evident in both Army and Navy personnel, but not in those who served in the Air Force. These cancers are believed to be partly, but not fully, explained by a higher smoking prevalence in the veteran population compared with their community peers. Army veterans also demonstrated elevated rates of prostate cancer, whilst Air Force veterans demonstrate elevated rates of melanoma.

Few other recent studies, however, continue to measure physical conditions in elderly WWII and Korea War veterans. Villa et al (2002) investigated self-reported medical conditions and found that 94% of US WWII veterans and 93% of Korean War veterans reported being diagnosed with at least one disease from a provided list of ten common conditions.[44] The authors, however, did not suggest what the expected prevalence would be in the similarly aged non-veteran US community. In the Australian NSHWB, 74% of community-based men aged 65 and above reported having at least one condition, from a similar list of 12 common chronic and current physical conditions.[56]

Hovens et al (1998) investigated the presence of chronic diseases in 147 Dutch WWII Resistance veterans (aged 60-65 years) and compared them to 252 men (aged 54-65) who participated in Holland's 1984 Central Bureau of Statistics Study.[51] 95% of the veterans, compared with 61% of the population subjects, reported at least one chronic disease. Individual diseases reported significantly more often by veterans ($p<0.01$) included haemorrhoids, stomach complaints, migraines or headaches, prostate problems, skin diseases, heart disease, varicosis, large bowel problems, hypertension, arthrosis, back pain, bronchitis and inguinal hernia. Physician-prescribed medication was more often used by veterans ($p<0.001$). Weekly tobacco use was comparable between study groups, and alcohol use was lower in the veteran group, and therefore these lifestyle measures could not explain the differences in medical conditions reported by the two study groups. The authors, however, discuss several weaknesses in the study which limit their ability to conclude that the WWII veteran population is suffering poorer health than their community peers. The authors recognise that the population subjects are younger than the veteran group. Also, the authors point out that the Resistance veteran group, by definition, includes only WWII veterans who received a special war pension based on demonstrated physical disabilities and, in later years, on psychological problems. Thus, this veteran group may be a biased sample in which the prevalence of illness is higher than among other Dutch WWII veterans.[51] Further, the study is limited by the reliance on self-reported medical conditions, and no evidence of a physician's diagnosis was sought or other objective evidence collected.

In summary, cancer incidence appears to be clearly higher in Australian Korean War veterans compared to their community peers, however there is no reliable research from which conclusions about other physical conditions can be drawn.

Studies of physical functioning or general health

Useful recent studies of physical functioning or general health in WWII or Korean War veterans appear to be even more scarce than studies of physical conditions. In their NAS veteran population, Schnurr and Spiro (1999)[47] reported that mean Short Form-36 (SF-36) scores were approximately 0.5 of a standard deviation (SD) higher (healthier) than comparable normative scores for US men aged 65-69.[65] This global SF-36 score includes both physical functioning and psychological functioning components. Further, Korean War veterans participating in the Villa et al (2002) study self-rated their health as very good or excellent in 47% of cases, good in 31% of cases and only poor or fair in 22% of cases. These authors do not provide comparable US population data. Their results, however, could be loosely compared to the Australian Institute of Health and Welfare's (AIHW) analysis of the NSHWB data, which showed that a larger proportion of elderly Australian men, 30% of those aged 65-74 years and 34% of those aged 74+ years, self-rated their health as poor or fair.[66]

Both of these veteran studies weakly imply that the general physical functioning of these elderly, surviving veteran groups may be better than that expected amongst their peers.

Studies of mortality

Of considerable interest to this review are the results of the first mortality study of all Australian Korean War veterans, completed in 2003 by the Australian Government Department of Veterans' Affairs in collaboration with the AIHW.[19] Because only 58 Australian women served in the Korean War, mortality rates were derived for male veterans only. Overall, the Korean War veterans experienced a 21% higher mortality rate than an equivalent Australian population. Elevated mortality rates for specific causes of death were found for a number of conditions; the death rate from diseases of the circulatory system was elevated by 13%, cancer by 31%, external causes (homicides, accidents and suicides) by 37%, respiratory diseases by 32% and digestive diseases by 35%. Among the cancers, lung cancer was elevated by 47%, head and neck by 96%, gastrointestinal by 18%, larynx by 95%, oesophagus by 59%, and cancer of unknown primary site by 51%. Of the three Services, Army veterans experienced the highest level of mortality followed by Navy then Air Force. Air Force veterans showed a statistically significantly lower mortality rate than the Australian male population.

Investigating mortality by period of service revealed that Australian Army veterans who completed their service prior to 1952 (when the offensive and counter offensive phase of the war ended) had a significantly lower mortality rate from suicide compared with Australian males. However, those who served in Korea after the start of 1952 (after the static defensive phase commenced) had a higher mortality rate from suicide compared to Australian males. The authors describe this as an unexpected and possibly chance post hoc finding.[19] The study, however, did not have data on exposure to occupational and environmental hazards, or risk factors such as cigarette smoking and alcohol intake, and therefore the contribution of these factors to increases in mortality could not be determined.

Other large studies of mortality in overseas veterans have demonstrated elevated rates of death related to external causes. In a study of 40,681 US Korean War Navy technicians with potential exposure to high-intensity radar, Groves et al (2002) found elevated mortality rates from air transportation accidents and war-related injuries. In contrast to the Australian findings, however, overall veteran deaths from diseases and cancers were significantly below mortality rates for comparable white US men, more than 40 years after the war (standardised mortality ratio (SMR) 0.74, 95%CI 0.73-0.76).

A study of 30,619 UK servicemen who were serving abroad in the 1950's and 1960's also found a significant increase in deaths from accidents and violence but, like Groves et al,[52] this UK study found deficits in death rates from cancers of the lung (SMR=73; $p<0.001$), stomach (SMR=66; $p=0.002$), bladder (SMR=53; $p=0.02$), other specified neoplasms (SMR=48; $p=0.001$), coronary heart disease (SMR=76; $p<0.001$), bronchitis, emphysema, and chronic obstructive lung disease (SMR=42; $p<0.001$), and for five further groups of diseases unrelated to smoking or alcohol. There were two cancer related causes of death which were in significant excess; these were deaths from cancers of the oesophagus (SMR=146; $p=0.03$) and prostate (SMR=156; $p=0.03$).[67]

Veterans of more recent conflicts

Literature in relation to more recent conflicts is dominated by studies of Vietnam War veterans, and veterans of the 1991 Gulf War. These are reviewed briefly below.

Vietnam War veterans

A brief review of the medical literature on veterans of the Vietnam War reveals a massive volume of scientific research covering a broad array of health outcomes and exposures. The

55+,[61] and comparable to Australian population estimates of current risky alcohol consumption in 7.7% and 3.3% of Australian men aged 65-74 and 75+ respectively.[62] Sutker and Allain, however, report current DSM III-R alcohol abuse or dependence in 0% of their 26 Korean conflict POWs and in only 1% of their 112 non-POW combat veterans.[46] This latter study does not utilise a non-veteran comparison group.

Studies of other psychological functioning

In addition to measuring PTSD, Hunt and Robbins (2001)[40] measured psychiatric caseness using the 20-item version of the General Health Questionnaire (GHQ). The authors found that approximately one third (35%) of their self-referred study participants scored above the standard cut-off point (> 4) for the GHQ; a figure well in excess of the 8-21%, of people in this age group, reported by Goldberg (1978)[63] as expected to meet criteria for GHQ caseness. As with PTSD in this study, psychiatric caseness was associated with lower rank, current war-related physical illnesses and "high" combat exposure.[40]

Villa et al (2002)[44] report mean SF-12 mental component summary (MCS) scores of 47 (standard deviation (SD) not given) in both Korean War (N=983) and WWII veterans (N=674) from the US. This mean is approximately 0.5 of a standard deviation below (less healthy than) US population norms reported for 65-74 year olds (mean SF12 MCS 52.10, SD 9.53) and those aged 75+ years (mean SF-12 MCS 50.06, SD 10.95).[64]

Sutker and Allain (1996) investigated a number of current DSM-III-R mental disorders in 112 US combat veterans of WWII or Korea.[46] The authors diagnosed 10% with dysthymia, 8% major depression, 8% simple phobia, 7% somatoform pain, 4% social phobia, 3% generalised anxiety disorder, 3% agoraphobia and 1% or less with bipolar disorder, panic, obsessive-compulsive disorder or somatization. 71% of this veteran group had no diagnosis of a mental disorder. To loosely compare these figures with general community figures, in the Australian 1997 NSHWB only 3% of men aged 55-64, and less than 1% of men aged 65 and over, met criteria for affective disorders including depression and dysthymia.[56] Furthermore, 94% of Australian men aged 65 or above had no diagnosis of a mental disorder.

Whilst none of the three veteran studies described above recruited a comparison group, their results all suggest that WWII and Korean War veterans are, in their later life, experiencing poorer psychological functioning than their community peers. In an exception, however, O'Donnell (2000)[45] reports no statistically significant difference in self-assessed mental health between veterans and non-veterans recruited as part of a national US survey of the non-institutionalised population. The study included approximately 641 veterans (71% WWI or WWII, and 23% Korean War of whom one-third also served in WWII) and approximately 427 non-veterans, all male and aged 65 or above, who were asked to rate their mental health on a Likert scale of 1 (excellent) to 5 (poor). The results suggested no independent association between self-appraised mental health and service in the armed forces, after adjustment for demographic, socio-economic and other health-related characteristics. Instead, the authors conclude that mental well-being in later life is largely a function of an individual's economic circumstances and health status.[45]

Studies of physical conditions

The Cancer Incidence Study 2003 of Australian Veterans of the Korean War[20] provides a comprehensive investigation of the cancer incidence pattern from 1982 to 1999 amongst Australian male Korean War veterans who were alive in 1982, and compares these patterns to those experienced by Australian population males of the same age. The overall incidence of cancer experienced by veterans ranged from between 13% and 23% higher than the expected population incidence based on two analysis scenarios described by the authors. Head and neck, lung, oesophagus and larynx cancers were all elevated using both analysis scenarios.

literature is dominated by investigations of PTSD symptoms and associated severity of combat exposure. Indeed, Vietnam conflict research is said to have led to the inclusion of PTSD as a specific diagnostic entity in the American Psychiatric Association's 1980 DSM version III.[68, 69] Also, the Combat Exposure Scale (CES) was constructed specifically as a systematic assessment of Vietnam veterans' combat experiences.[70]

The US National Vietnam Veterans Readjustment Study (1990), cited in Schnurr et al (2003),[71] estimated that over 960,000 men (30.6%) who served in the Vietnam War had experienced PTSD at some point since the war and that 15.2% currently had the disorder. In a preliminary investigation of 375 Australian help-seeking Vietnam veterans, Creamer et al (1996) estimated the prevalence of PTSD to fall somewhere between their own findings of 42% diagnosed by counsellors and 67% identified through self-report diagnostic questionnaire.[72]

Alcohol and other substance use have also been widely studied in Vietnam veterans. In an early study by Goodwin et al (1975) nearly one-third of surveyed Vietnam veterans had problems related to excessive drinking within eight to twelve months of their return from war.[73] Within two years of return, Nace et al (1977) observed that 39% of veterans had developed at least one alcohol related problem and that 16% could be diagnosed as alcoholic.[74] This latter research also indicated that 85% of veterans who were problem drinkers had been addicted to heroin in Vietnam.

In regard to other behavioural disturbances, Vietnam veterans returning from combat have been found to have higher levels of depression, anxiety, irritation, and feelings of helplessness, than non-combat peers.[75]

The herbicide mixture Agent Orange was widely used in the Vietnam conflict[76] and a vast literature has been generated investigating the possible health outcomes amongst veterans exposed to this mixture. They particularly include studies of possible adverse reproductive health outcomes such as birth defects[77] and miscarriages[75] and studies of various malignancies.[76, 78, 79] Results have frequently been inconclusive.

The Vietnam War medical literature also includes many studies of treatment methods for, and long term health effects of, physical trauma such as amputation,[80] shrapnel injury,[81] and head trauma.[82, 83]

Vietnam War veteran researchers have been assisted by the establishment of large registries of monozygotic and dizygotic male-male twin pairs, such as the Vietnam Era Twin registry[84] where both twins served in the military during the Vietnam War era. The recruitment of veterans from these registries have assisted researchers to better explore associations between exposures and health (for example, in pairs where one twin was exposed to an agent of interest and the other was not) and also to explore familial and genetic factors.[85-87]

1991 Gulf War veterans

It has been suggested that veterans of the 1991 Gulf War represent one of the most studied adult populations.[88] The vast literature is being reviewed by teams at the US Institute of Medicine (for example [89]). Soon after returning from deployment, Gulf War veterans were reporting a variety of symptoms and illnesses which could not readily be explained.[90] The media coined the term "Gulf War Syndrome" shortly after.[91] Most early research was carried out on US veterans,[92-94] however other Coalition nations have followed with studies of veterans of the United Kingdom,[95] Canada,[96] Denmark[97] and Australia.[98-101]

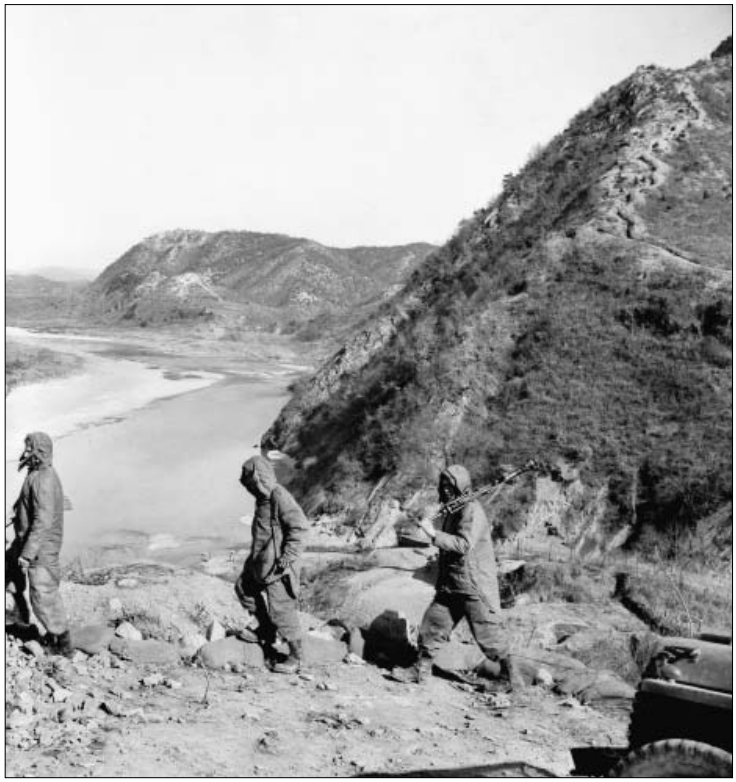
The health complaints reported by veterans have been varied; the most common symptoms being fatigue, rash, headache, muscle and joint aches, difficulty concentrating, forgetfulness and irritability.[93] Cross-sectional studies have consistently found increased symptom

reporting across a wide range of body systems by Gulf War veterans compared to non-Gulf War control groups.[95, 99, 102] However, factor analyses indicate that only the frequency or degree of expression of the symptom reporting, and not the pattern, varies between Gulf War veterans and controls[101, 103, 104] suggesting that a unique Gulf War syndrome does not exist.

Increased risk of psychological disorders have consistently been demonstrated.[94, 96, 98, 105] Australian Gulf War veterans, for example, demonstrated considerably greater risk of developing post-Gulf War anxiety disorders (adj OR 2.9; 95% CI 2.0-4.2) including posttraumatic stress disorder (adj OR 3.9; 95% CI 2.3-6.5), affective disorders (adj OR 1.7; 95% CI 1.3-2.1) and substance-use disorders (adj OR 1.5; 95% CI 1.2-2.0) compared to an age-matched military comparison group who did not deploy to that war. The prevalence of these disorders remained elevated in the Gulf War group a decade after deployment. Further, increased risk of psychological disorders within the Australian Gulf War veterans was associated with increased reporting of war-related stressors.[98] Commonly reported stressors included fear of death or injury, and threat of attack including biological or chemical weapons attack.[106] Other studies of overseas veterans have also associated increased psychological morbidity with stressful war-related experiences including combat severity,[107] injury, dealing with prisoners of war, and seeing maimed soldiers and dismembered bodies,[95] or seeing friends killed or wounded,[96] and the sounding of chemical alarms.[95, 96]

Other Australian health findings include increased reporting by veterans of medical conditions diagnosed after 1991, poorer self-perceived physical health status and increased functional impairment,[99] and poorer self-perceived mental health status.[100] Australian Gulf War veterans also reported more neuropathic symptoms than the comparison group, however a medical examination of the neurological system showed little difference between the two study groups.[108] Some respiratory symptoms were also reported more often by veterans, wheeze was more commonly found on examination, but spirometry revealed no consistent differences between veterans and controls.[109] There were also few differences between groups in regard to laboratory tests of blood cells, function of the liver and of the kidneys, biochemical indicators in the blood, measures of chronic inflammation and indicators of previous infection.[110]

Chemical and environmental agents, implicated in various Gulf War veteran studies as possible causes of ill-health, include smoke and oil from burning oil wells, airborne particulate matter such as sand and dust, immunisations received by veterans upon deployment, prophylactic medications including the anti-nerve agent pyridostigmine bromide, personal insecticides and pesticides used in living quarters and on bedding and clothes, chemical weapons including sarin and mustard gas, and biological weapons including anthrax and botulinum. A review of all of these agents can be found in the Australian Gulf War veterans' Health Study report to the Department of Veterans' Affairs.[110]



Korea, 20th October 1953. Troops from 2RAR, in their winter protective gear move into position during training exercise Scram. *(AWM image 157770)*

Korea, June 1952. Several jeeps towing trailers laden with supplies have pulled up in a camp in Korea. 1RAR are unloading equipment and supplies. Dugouts have been built into the surrounding hillside and reinforced with sandbags, ammunition boxes and wooden crates. (AWM image HOBJ3232)