

Overarching Executive Summary

A key recommendation of the 1997 *Mortality of Vietnam Veterans: The Veteran Cohort Study* was to monitor the mortality of Vietnam veterans and repeat the study after 2000. In 2002, the then Minister for Veterans' Affairs agreed that the Repatriation Commission should undertake the *Third Vietnam Veterans Mortality Study* and *Cancer Incidence in Vietnam Veterans Study*. The Commission asked the Australian Government Department of Veterans' Affairs (DVA) to conduct these studies which were undertaken with assistance from the Australian Institute of Health and Welfare (AIHW).

This overarching executive summary describes the results of the first three reports of this series of studies on Vietnam veterans. The volumes are:

- *Cancer Incidence in Australian Vietnam Veterans Study 2005*;
- *The Third Australian Vietnam Veteran Mortality Study 2005*; and
- *Australian National Service Vietnam Veterans: Mortality and Cancer Incidence 2005*

Each of the three reports can stand alone as a complete study. However all three should be taken together for a more thorough understanding of the mortality and cancer incidence of this cohort of Australian Vietnam veterans.

Studies Objectives and Design

The broad objective of the series of studies was to assess the mortality and cancer incidence of Australian Vietnam veterans from all three Service branches compared to the Australian community. In addition, results for a subgroup of Army personnel, National Servicemen, was analysed by comparing the mortality and cancer incidence of those who served Vietnam to those who did not serve in Vietnam. The objective of this analysis was to compare the mortality and cancer incidence between two groups who had a similar level of health and fitness at the time of service and thus control for the healthy worker effect. A third objective was to investigate any relationship between cancer incidence and service of Navy veterans in Vietnamese waters.

Cancer incidence was assessed from 1982 to 2000 for veterans from all three Service branches, whereas mortality was assessed from the conclusion of Vietnam service to 2001. Mortality and cancer incidence among the veterans was compared to the mortality and cancer incidence of the same age male Australian

and Standardised Mortality Ratios (SMR) or Standardised Incidence Ratios (SIR) were calculated. In addition, relative mortality and cancer incidence rates (RR) were calculated for National Servicemen who served in Vietnam compared to those National Service personnel who served in Australia during the Vietnam War era. Furthermore, the study developed statistical models to determine whether cancer incidence rates varied by the ship on which Navy Vietnam veterans served or by duration of service in Vietnamese waters.

Features of the studies

The studies have a number of features inherent to retrospective epidemiological studies of a military cohort and other features that are unique to each study.

Among the strengths of these studies is the relatively small proportion of veterans whose vital status could not be ascertained. This allowed for comprehensive coverage of the cohort. These were relatively large studies. Nearly 60,000 men followed for up to 35 years for the mortality study and 19 years for the cancer incidence study. This length of follow-up provided up to 1.9 million person-years for analysis review.

Consideration of the healthy worker effect (HWE) is important for understanding the results of these studies. The cohort at the point of selection for service in Vietnam was much healthier than the general population. This phenomenon has long lasting effects which generally results in lower overall mortality rates for the cohort under study when compared to the general population and may result in a decrease in mortality even if there were specific factors in Vietnam that would increase mortality. Furthermore, the HWE does not affect all causes of death or illness equally. Researchers generally regard the HWE effect as small for cancer and most prominent for cardiovascular diseases, diabetes and respiratory diseases. The National Servicemen report controls for the HWE by directly comparing groups of servicemen who differed only in whether or not they served in Vietnam.

There are many diseases, causes of disability and aspects of health that are not measured by these mortality and cancer incidence studies. Although this cohort was exposed to a range of stresses and toxicants, little is known about the amount of exposure that either individual veterans or groups of veterans experienced although an attempt was made in the cancer incidence study to reconstruct exposure to Vietnamese waters for Navy personnel. In effect, therefore, the reports describe the effects of exposure to the overall Vietnam experience. In addition, any adverse or beneficial health exposures an individual may have experienced following Vietnam service are also not known or quantified.

This study investigates over 60 specific classifications of cancer or non-cancer mortality. Thus, the concept of statistical significance for multiple comparisons needs to be considered. By the conventional definitions used, a statistically significant result has up to a one in twenty probability to be due to chance.

Findings

Mortality

- Overall mortality for Australian Vietnam veterans averaged over the more than 30 years of observation was 6% lower than expected compared to the Australian male population.
- Specifically, veterans experienced a lower than expected mortality from circulatory diseases (12%), respiratory diseases (23%) and infectious diseases (38%).
- However, mortality from alcoholic liver disease and neoplasms was higher than expected, 19% and 6% respectively. Specifically, mortality from lung cancer and cancers of the head and neck region was significantly higher than expected, 18% and 34 – 44% respectively.
- Overall, mortality amongst Navy veterans was not significantly different from the Australian population however their mortality from cancer was 19% higher than expected.
- Specifically, Navy veterans had a higher than expected mortality from lung cancer (39%), and melanoma (56%), whereas mortality from non-Hodgkin's lymphoma was 48% lower than expected. Mortality from mesothelioma was also higher than expected based on small numbers.
- Overall mortality amongst Army veterans was 7% lower than expected and no single non-cancer cause of death analysed was significantly elevated, whereas mortality from infectious disease, nervous system diseases, circulatory system diseases and respiratory system diseases were significantly lower than expected
- Nevertheless, mortality from some specific cancers was higher than expected amongst Army veterans. These include head and neck cancer and eye cancer.
- Air Force veterans had a 9% lower than expected overall mortality with mortality from circulatory system diseases and respiratory diseases lower than expected. Mortality from neoplasms did not differ significantly from community rates.

Cancer incidence

- Australian Vietnam veterans had a significantly elevated overall cancer incidence rate that was 15% higher than expected compared to the Australian male population.
- Veterans experienced a higher than expected incidence for Hodgkin's disease, chronic lymphoid leukaemia, melanoma and cancers of the prostate, eye, lung and head and neck.

- A lower than expected incidence amongst veterans compared to the Australian population was observed for multiple myeloma, non-Hodgkin's lymphoma, liver cancer and thyroid cancer.
- The pattern of cancer varied between the Service branches. Navy veterans had the highest rate of cancer, higher than expected by 26%, followed by Army veterans, higher than expected by 13%. In comparison Air Force veterans had a 8% higher than expected rate of cancer, although this was not statistically significant.
- Within the limitations of the service details available for Navy personnel, the higher than expected cancer incidence among this group could not be attributed to either the ship on which they served or the time spent in Vietnamese waters.
- Taken together with the Mortality Study, there were several cancers for which both the incidence and mortality were higher than expected. These include lung cancer, cancers of the oral cavity and head and neck and in recent times prostate cancer. There were also several cancers for which incidence was higher than expected but mortality was not different from community rates. These include colon cancer, cancers of the genitourinary system, melanoma and Hodgkin's disease. Furthermore there was one cancer, non-Hodgkin's lymphoma, for which both mortality and incidence were lower than expected.

National Service

- When veterans were compared to non-veterans, National Service veterans who served in Vietnam experienced a 23% higher overall mortality than non-veterans who did not serve in Vietnam.
- Specific causes of death that were significantly higher amongst veterans include mortality from digestive system diseases (primarily alcoholic liver disease), lung and pancreatic cancer, motor vehicle accidents and suicide.
- National Service veterans had a significant 14% elevation in their rate of cancer incidence compared to non-veterans. Specifically, cancer incidence was higher for lung cancer, head and neck cancer, and cancer of the pancreas.
- There were no causes of death analysed for which National Service veterans had a statistically significant lower mortality rate than National Servicemen who did not serve in Vietnam. Furthermore, no specific cancer cause had a statistically significant lower than expected incidence or mortality among veterans compared to non-veterans.
- However, National Servicemen of the Vietnam War era exhibit a strong healthy worker effect. Overall mortality was 27% lower than expected compared to the Australian community, 19% lower for those that served in Vietnam and 33% lower for those who did not serve in Vietnam.

- For the over 60 specific causes of mortality investigated, no cause of death was significantly more common than expected within the Australian community and many were significantly less common than expected. Mortality from neoplasms was 14% lower than expected, circulatory system diseases 28% lower and respiratory system diseases 55% lower.

Summary and Conclusion

Taken together the results show that due to the HWE, Vietnam veterans as a group generally had lower mortality compared to the Australian community. However there were a number of diseases for which mortality or incidence were more common amongst veterans. These include neoplasms and diseases of the digestive system, primarily alcoholic liver disease. Cancers which were more common amongst veterans include cancers of the lung, head and neck, prostate, melanoma, chronic lymphoid leukaemia and Hodgkin's disease. Rates varied between the Services with Navy veterans generally having higher rates of mortality or cancer incidence followed by Army and then Air Force.

The National Service study controlled for the HWE and demonstrated that veterans who served in Vietnam experienced a higher than expected mortality and cancer incidence compared to their colleagues who did not serve in Vietnam. Specific causes of death that contributed to the higher than expected mortality include death from diseases of the digestive system (primarily liver diseases), lung and pancreatic cancer and death from external causes such as suicide and motor vehicle accidents. The incidence of lung, pancreatic and head and neck cancers was also higher than expected.

Several of the conditions which show a higher than expected mortality or incidence amongst veterans are associated with mental health issues, smoking, alcohol consumption or excessive exposure to the sun. Other exposures, such as asbestos or other chemicals, as well as the role of chance with multiple comparisons, could also contribute to the statistically significant results observed.