

## 2 Data and methodology

This chapter describes the sources of data and the methods used to produce statistics comparing cancer incidence among male Korean War veterans with the incidence among the male Australian community. Female Korean War veterans were not included in the scope of this study because their numbers were too few to allow statistically reliable results to be obtained.

### 2.1 Data sources

The data sources used in this study are:

- **The Korean War Veterans' Nominal Roll maintained by DVA**

The nominal roll provides a list of names and dates of birth of 17,814 male veterans (there are also 58 female veterans on the roll) who served in the Australian Defence Force (ADF) in Korea during the period 1950–1956. The roll also contains the Service type and all deaths of veterans notified to DVA. This roll forms the basis of the study population. Any individual who was a member of the ADF, or a civilian from an organisation accredited by the ADF, who physically entered the Korean Operational Area during the qualifying period between July 1950 and April 1956, was included in the nominal roll. There was no specific length of time required for a person to have been in Korea to be included on the nominal roll.

- **The National Cancer Statistics Clearing House (NCSCCH) Database**

The NCSCCH database contains notifications of cancer (excluding non-melanocytic skin cancer) diagnosed in Australia for the period 1982–1999 and is located at AIHW. State and territory Cancer Registries contribute these data to the NCSCCH, which currently contains information on 1.3 million cancers experienced by 1.2 million people. The database is updated annually.

- **The National Death Index (NDI)**

The National Death Index is a database, housed at AIHW, containing records of all deaths occurring in Australia since 1980. The data are obtained from the Registrars of Births, Deaths and Marriages in each state and territory. The NDI currently contains information on approximately 2.7 million deaths.

### 2.2 Study methods

A comparison between the incidence of cancer in Korean War veterans and that of the male Australian community was carried out for a range of the most common cancers in the Australian population, as identified in the study protocol. Any cancer identified as having a substantial number of cases in the veteran population was also included in the analysis.

The processes involved in the analysis were:

- The Korean War veteran population was matched to the NCSCCH to identify cancers diagnosed in veterans between 1982 and 1999. Some Korean War veterans would have experienced cancer prior to 1982, but no NCSCCH records exist for this period to enable a comparison of veterans' cancer experience with that of the Australian community.

- The expected number of cancers of veterans in each year was calculated by applying the age and sex-specific cancer incidence rates of males in the Australian community to the veteran population alive at each year from 1982 to 1999. To obtain the number of veterans alive at 30 June each year from 1982 to 1999, deaths of veterans were identified by matching the veteran population to the NDI.
- The observed number of cancers among Korean War veterans was then compared to the expected number of cancers, and tested for any statistically significant differences.

### **2.2.1 The matching process—identifying the cancers and deaths in veterans**

Before undertaking the data match between the DVA nominal roll, and the NDI and the NCSCCH, Ethics Committee approvals were obtained from DVA and AIHW. In addition, for the matching between the nominal roll and the NCSCCH, it was necessary to obtain Ethics Committee approvals from each of the state and territory Cancer Registries.

All data matching was undertaken by AIHW staff using the Integrity probabilistic matching software. Personal information such as full name and date of birth was used in matching the veterans' nominal roll to the NDI and the NCSCCH. In addition, last known date of contact by DVA and, when available, date of death were used to determine exact matches of persons.

The matching strategies used were able to capture different variants of a name, and misspelled and transposed names and dates. The matching program could be set to pick up variation in dates of events (e.g. dates of birth or death). For example, a person aged 65 years in 2000 may be recorded in the NDI as being born in 1934 or 1935. The matching algorithm could be set to allow for such differences in dates.

The matching process against the NDI identified veteran deaths, so that the living veteran population could be calculated for each year from 1982 to 1999. This estimate of the living population is used in the calculation of the expected cases of cancer (see Section 2.2.2).

Matching against the NCSCCH identified all cases of cancer between 1982 and 1999 apart from non-melanocytic skin cancers, which are not routinely reported to the cancer registries. Individual cases are only recorded once on the NCSCCH. However, an individual may experience more than one type of cancer, and each of these is recorded on the NCSCCH, and is included in this analysis.

### **2.2.2 Expected number of cancers in veterans**

The expected number of cases of cancer by type of cancer was calculated for each year by applying the single year of age incidence rates of cancer for the Australian male community to the age-specific number of living Korean War veterans in each year.

The steps involved in these calculations were:

- calculate incidence rates for the Australian male population for each cancer being studied, by single year of age, for each year from 1982 to 1999;
- derive the population of living Korean War veterans (population at risk) by single year of age for each year from 1982 to 1999, from the nominal roll of Korean War veterans; and
- for each year 1982 to 1999, calculate the expected number of cases of the cancer being studied had veterans experienced the cancer incidence rates of the general Australian community. This was done by multiplying the age-specific incidence rates for the Australian population by the corresponding veteran population by age, of that year.

The calculation of the expected number of cases for head & neck cancer for 1999 is illustrated in Table 1. It should be noted that the observed and expected numbers for particular cancers can be aggregated to whatever group of cancers required. For example, the observed and expected numbers for colon cancer can be added to the observed and expected numbers for rectum cancer to obtain the observed and expected cases of colorectal cancer.

It should also be noted that the illustration in Table 1 is only for one year. Comparisons between observed and expected cases of cancer in this study are made for the 1982–99 period, by summing the annual expected and actual cases.

**Table 1: Comparison of incidence of head & neck cancer between male Korean War veterans and the total Australian male population, 1999**

<b>Age</b>	<b>Living Korean War veteran population 1999</b>	<b>New cases of head &amp; neck cancer per 100,000 population, Australia, 1999</b>	<b>Expected cases of head &amp; neck cancer among Korean War veterans, 1999</b>	<b>Observed cases of head &amp; neck cancer among Korean War veterans, 1999</b>	<b>Standardised incidence ratio</b>
62 <sup>(a)</sup>	14	35.8	0.0050	0	
63	71	44.4	0.0315	0	
64	326	37.7	0.1230	1	
65	625	39.6	0.2474	1	
66	927	51.4	0.4761	1	
67	896	45.4	0.4064	1	
68	1,102	48.5	0.5348	1	
69	1,138	44.4	0.5058	1	
70	1,002	56.3	0.5639	1	
71	1,053	64.6	0.6803	1	
72	745	47.5	0.3536	1	
73	581	62.9	0.3656	0	
74	428	61.0	0.2609	0	
75	312	57.0	0.1779	0	
76	255	34.9	0.0890	0	
77	172	60.3	0.1037	0	
78	167	47.7	0.0796	0	
79	126	61.3	0.0772	0	
80	78	44.5	0.0347	0	
81	71	56.3	0.0400	0	
82	60	57.0	0.0342	0	
83	41	39.9	0.0163	0	
84	32	61.3	0.0196	0	
85	19	77.3	0.0147	0	
86	20	78.1	0.0156	0	
87	14	9.6	0.0013	0	
88	7	60.1	0.0042	0	
89	4	74.9	0.0030	0	
90	10	39.4	0.0039	0	
91	4	78.0	0.0031	0	
92	4	69.6	0.0028	0	
93	2	0.0	0.0000	0	
94	0	65.4	0.0000	0	
95	6	0.0	0.0000	0	
<b>Total</b>	<b>10,312</b>		<b>5.3</b>	<b>9</b>	<b>1.7</b>

(a) Age 62 is the youngest age group comprising living Korean War veterans in 1999.

## Veteran population at risk

To calculate the expected number of cases of cancer in the Korean War veteran population it was necessary to estimate the living Korean War veteran population, that is, the population at risk of developing cancer, by single year of age for each year from 1982 to 1999. To estimate these populations, it was first necessary to identify all deaths of Korean War veterans since war service. A number of processes were undertaken to identify deaths not already recorded on the nominal roll by DVA:

- The list of all names on the nominal roll was matched to the NDI to identify deaths of veterans since 1980. The NDI holds information on deaths of all persons who died in Australia from 1980 onwards.
- To identify pre-1980 deaths, the AIHW contacted the Australian state and territory Registrars of Births, Deaths and Marriages.
- AIHW also contacted the Registrar of Births, Deaths and Marriages in New Zealand to identify veterans who may have migrated to New Zealand and subsequently died.
- Trial matching against the web-based USA Social Security Death Index (SSDI) was conducted but was found unfeasible for large dataset matching.

**Table 2: Veteran population by age at the end of the Korean War, 1956, at the beginning of the study, 1982, and at the end of the study, 1999**

Age group	1956	1982	1999
15–19	20	0	0
20–24	3,950	0	0
25–29	7,940	0	0
30–34	3,352	0	0
35–39	1,235	0	0
40–44	520	0	0
45–49	215	2,448	0
50–54	106	7,090	0
55–59	32	3,605	0
60–64	10	1,173	411
65–69	1	464	4,688
70–74	0	178	3,809
75–79	0	59	1,032
80–84	0	20	282
85+	0	4	90
<b>Ages 15 and over</b>	<b>17,381</b>	<b>15,041</b>	<b>10,312</b>

Of the 17,814 male veterans who served in the ADF in Korea, 17,381 were alive at the end of the Korean War in 1956<sup>1</sup>. Of these veterans the total population at risk of developing cancer at the beginning of the study period (1982), after excluding veterans who had died, was calculated to be 15,041 (Table 2). In this population, 884 veterans had not been in contact with

<sup>1</sup> This number includes all veterans who left Korea alive after their service but excludes those with missing date of birth and date of death.

DVA since the Korean War, and were not found on the Australian Electoral Roll. For these veterans, it was therefore not possible to determine whether they were still alive and residing in Australia or if they had died or moved permanently overseas. This group is referred to as the 'veterans whose status is unknown' for the purpose of this study.

To identify the impact of the veterans whose status is unknown, the veteran population at risk was estimated using two Scenarios:

- Scenario 1 excludes veterans whose status is unknown from the at-risk population. The effect of excluding veterans whose status is unknown is that the expected number of veterans with cancer may be under-estimated if some of these veterans are still alive and residing in Australia.
- Scenario 2 includes veterans whose status is unknown in the at-risk population, and assumes that they are still alive and residing in Australia. The effect of including veterans whose status is unknown is that the expected number of veterans with cancer may be over-estimated. This is because the veteran population under Scenario 2 is not adjusted for their possible death or migration out of Australia.

The findings from both Scenarios are presented in this report.

### **2.2.3 Observed cases of cancer in veterans compared with expected cases**

The actual number of cancers experienced by the veteran population (observed cases) was compared to the expected number, by dividing the former figure by the latter. The resulting ratio (standardised incidence ratio) is above one if the actual cases of cancer among the veterans are higher than the expected number, and vice versa.

Table 1 illustrates how the standardised incidence ratio is calculated. In Table 1 there are nine new cases of head and neck cancer in 1999 which were identified by matching the living Korean War veteran population in 1999 to the NCSCCH database. The expected number of cases of 5.3 in the fourth column is obtained by summing the expected number of cases for each age. The ratio of actual to expected cases of cancer in this example is 1.7 (9/5.3), which means that the veterans experienced 70% more cancers in 1999 than expected if they had experienced the same cancer incidence pattern as the total Australian community.

The process illustrated in Table 1 was repeated for each year from 1982 through to 1999. The results presented in this report are the comparison of the sum of the actual and expected cancers for the entire period 1982–1999. Comparison of annual numbers is less reliable due to the small number of cancers occurring in each year, and the resultant statistical instability in rates.

The standardised incidence ratio is not sufficient to say whether the veterans experienced higher or lower rates of cancer than might be expected. A statistical test is required to test whether the actual number of cancers experienced by veterans was statistically different from those expected. The test involves calculating a 95% confidence interval around the standardised incidence ratio.

Given that a standardised incidence ratio of 1.0 means that there is no difference in cancer incidence between Korean War veterans and the Australian community, a confidence interval which does not include 1.0 indicates a significant difference. For example, a standardised incidence ratio of 1.22 with a confidence interval of 1.02 to 1.42 is significantly different because the interval does not include 1.0. If the confidence interval was 0.92 to 1.52, the difference would not be significant because the confidence interval includes 1.0.



**A mortar crew of 3 RAR in action at Pakchan, 5 November 1950. In the background is an M4A3E8 Sherman tank of the US Army. AWM 146949**



**A wounded Australian soldier is strapped into a litter on a US Army Bell Model 47D H-13B helicopter before his evacuation for medical treatment. AWM P1479/19**



The officers of the watch taking a bearing during a patrol off the Korean coast, HMAS *Warramunga*, 1952. AWM 306774