

THE MORTALITY AND CANCER EXPERIENCE OF NEW ZEALAND VIETNAM WAR VETERANS

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ARTICLE SUMMARY

Article Focus

- Service in the Vietnam war was characterized by defoliant herbicide exposure, including 2-4-5 trichlorophenoxyacetic acid, 2,4 dichlorophenoxyacetic acid, picloram and cacodylic acid. The Institute of Medicine of the US National Academy of Sciences has carried out cumulative reviews of the mechanistic, animal and epidemiological evidence for the relationship between herbicide exposure and health and compiled lists of conditions associated with Vietnam service, adopted as “presumptive lists” compensable by Veterans Affairs New Zealand.
- Those in the cancer “sufficient evidence” list are soft-tissue sarcoma (including heart); non Hodgkin lymphoma (NHL); chronic lymphocytic leukemia (CLL) (including hairy cell leukemia and other chronic B-cell leukemias) and Hodgkin disease, those on the “limited or suggestive” list being laryngeal cancer; cancer of the lung, bronchus, or trachea; prostate cancer and multiple myeloma.
- This report examines whether the mortality and cancer experience of New Zealand veterans is consistent with Vietnam service and the lists of conditions accepted as being compensable.

Key Messages

- CLL is on the “sufficient” list largely because of an increased incidence in the farming occupation and a similarity to non Hodgkin lymphoma in that both are due to malignant transformation of B progenitor cells.
- Our results, along with those of an earlier Australian study, provide epidemiological evidence of an increased risk of CLL in veterans.

Strengths and Limitations.

- The follow up of 83% would tend to minimise bias in the direction of under-estimating disease risks.
- In common with other studies, we do not have exposure data, but the similarity to the Australian veterans experience suggests an ecological effect.
- We also have no information concerning confounding by smoking and alcohol consumption, known to be associated with head and neck cancers.

METHODS

Design

This is a cohort study of New Zealand Vietnam veterans who served in Vietnam between 1964 and 1975.

Cohort enumeration

The original nominal roll for the cohort was compiled in 1972 from pay records and formed the basis of the Veterans Affairs New Zealand (VANZ) Vietnam veterans database, a cohort of 3,394 men and women. VANZ administers all aspects of war service entitlements, including war pensions, and the service list is now regarded as being complete.

Of this cohort of 3,394 service people, 37 died during the war. The remaining 3,357 were followed up through searches based on the National Health Index (NHI) number linking individuals to health data maintained by the New Zealand Ministry of Health (MoH). No match was found for 791 veterans, but searches on the electoral rolls from 1993 to 2009 provided details of 252. We had to exclude 539 individuals who we could not match. Of these, 336 had an overseas address and 203 were lost to follow up. We also had to exclude 34 men who had a date of death listed by VANZ but no official record on the MoH collections and the 32 women who formed too small a sub-group for analysis. Follow up started on the first of January 1988, the first date that data is held electronically on the Mortality Collection database. The end of follow up was the 31st December 2008, the last date that mortality data were available. The Mortality Collection provided the underlying cause of death for all deaths identified. Prior to coding and entry on the Mortality Collection database all the deaths registered by Births Deaths and Marriages New Zealand are subject to verification. The official underlying cause of death recorded is determined after compiling data from a number of additional sources including traffic accident reports, Coroners' inquiries, hospital diagnoses, pathology records and cancer registry entries. The mortality statistics are compiled according to the year the death is registered: deaths before 2000 are recorded in ICD-9-CM-A and have not been mapped forward to ICD-10-AM.

Exposure information

Methodologically, the weakest aspect of the epidemiological studies of Vietnam veterans has been exposure assessment. The simplest approach is ecological, based on Vietnam service, geographical area and branch of service [3] (page 270). As regards service, the New Zealand records are regarded as complete. Defoliation missions are recorded as being flown in the geographical area [3] (page 98) and by far the largest New Zealand contribution was of combat troops, artillerymen and infantry soldiers, acknowledged to be at greater risk of herbicide exposure. The anti-malarial drug of choice was Dapsone, with aerial spraying of organochlorine pesticides to control mosquitoes, but unfortunately the exposure doses of both cannot easily be determined.

Table 1. Cohort information and follow-up.

Available information	Male		Female	
	Number	Percentage	Number	Percentage
Surname	3361	100.0%	33	100.0%
An additional surname	2	0.1%	2	0.1%
Forename initials only	7	2.3%	0	0.0%
An alias available	25	0.7%	2	6.1%
Date of birth not available	52	1.6%	0	0.0%
Alternative date of birth	5	0.1%	0	0.0%
No address	1205	35.9%	12	36.4%
Overseas address	336	10.0%	3	9.1%
Died in Vietnam service	36	1.1%	1	3.0%
Died after Vietnam war and before 1988	3	0.1%	0	0.0%
Male survivors of Vietnam service	3322	98.8%		
Men matched by Ministry of Health	2531			
Men matched with electoral roll	252			
Men followed up	2783	83.8%		
Not matched	539	16.2%		
Unconfirmed date of death	34	6.3%		

Of the 3,322 men of the original cohort of survivors of the Vietnam War, 2,783 men (83.8%) were matched and considered to be alive at the beginning of 1988. Of the 539 records not matched, 57.1% had no address and 29.7% had an overseas address listed by VANZ. In addition, VANZ listed a date of death for 34 men (6.3%) whose death was not confirmed by the MoH. As these deaths were unconfirmed by the official New Zealand records, and no cause of death was listed, the death information recorded by VANZ was not used. Of those without an overseas address 89% were traced, either by the MoH or by the research team using electoral rolls from 1993 to 2009.

The deaths of 407 members of the cohort were recorded in New Zealand during this period. The SMRs for various causes of death are shown in Table 2. The SMR for all causes of death was 0.85 (95% CI 0.77-0.94) suggesting lower overall mortality in the cohort. There were 159 (39.1%) "all cancer" deaths with a significantly higher SMR for cancers of the head and neck (SMR 2.20, 95% CI 1.09 - 3.93), in particular cancers of the oral cavity, pharynx and larynx (SMR 2.13, 95% CI 1.06-3.81). There were more deaths from multiple myeloma and Hodgkin disease than expected, but based on small numbers and the SMRs were not significantly raised.

The SIRs for cancer incidence over the period are shown in table 3. We found no statistically significant excess of cancer incidence for the 1988-2008 time period (SIR=1.06, 95% CI 0.97-1.16). The incidence of CLL was however significantly higher. The SIRs for cancer of the prostate, lung, larynx, multiple myeloma, non-lymphoid leukaemia and bone and cartilage were increased, but not significantly so.

Table 3. Standardised incidence ratios of cancer for the 1988-2008 time period.

Cancer site	Observed	Expected	SIR	95%CI*
All cancer	458	431	1.06	0.97-1.16
Prostate cancer	136	116.2	1.17	0.98-1.39
Lung cancer	58	51.1	1.13	0.86-1.47
Stomach	9	10.9	0.82	0.38-1.56
Pancreas	6	8.3	0.72	0.26-1.57
Colorectal cancer	63	66.6	0.95	0.73-1.21
Head and neck**	19	14.2	1.34	0.81-2.09
Oral cavity, pharynx & larynx†	18	13.7	1.32	0.78-2.08
Larynx	5	4.2	1.18	0.38-2.77
Melanoma	33	44.8	0.74	0.51-1.04
Multiple myeloma	9	6	1.51	0.69-2.86
Hodgkin Disease	3	1.4	2.08	0.42-6.09
NHL	14	16.6	0.85	0.46-1.42
All leukaemia	21	12.8	1.64	1.02-2.51
Non-lymphoid leukaemia	7	5.4	1.29	0.52-2.66
Lymphoid leukaemia	14	7.3	1.91	1.04-3.20
Connective & soft tissue	3	2.9	1.04	0.21-3.04
Bone and cartilage	2	0.7	2.78	0.31-10.0
All other cancers††	82	78.6	1.04	0.83-1.29

* 95% confidence interval

** Excludes cancer of the larynx or oesophagus

† Head and neck without cancer of the lip, sinus cavities, or salivary glands but includes cancer of the larynx

†† All cancer except; lung, prostate, stomach, pancreas, colon and rectum, oral cavity, pharynx, larynx, melanoma, multiple myeloma, Hodgkin disease, non-Hodgkin lymphoma, and all leukaemia (includes connective and soft tissue).

comparison group. At the time of the study this would have required manual selection from paper files, a process which was not logistically possible.

The most comprehensive body of comparative evidence comes from American Vietnam veterans studies, the largest of which is the “Vietnam Experiences Study” (VES).[7] The base for this cohort was 48,513 individuals randomly selected from service records. After applying inclusion criteria and excluding those who had died in-service, it yielded 9,324 Vietnam veterans and 8,989 in a non-Vietnam cohort. There was no overall increase in mortality when comparing these two groups, and both groups of veterans showed the healthy soldier effect in SMR analyses.

The other relevant epidemiological study is the Air Force Health Study of United States Air Force personnel who took part in operation “Ranch Hand” and deployed herbicides including Agent Orange. This group originally consisted of 1,261 Ranch Hand veterans who were initially matched to 19,080 comparison Air Force personnel who were followed up for mortality and morbidity.[8] The mortality follow up ceased in 2002, by which time there was a statistically increased risk of all causes mortality for all participants (relative risk (RR) 1.3, 95%CI 1.0-1.3) but a statistically increased risk of death from circulatory diseases (RR=1.7, 95% CI 1.2-2.4).[9]

The most similar comparison group is the Australian Vietnam veterans cohort, a much larger group of 59,179 individuals, consisting of 23% Navy, 69% Army and 8% Air Force personnel.[10-11] (http://www.dva.gov.au/aboutDVA/publications/health_research/vietnam_vets/Pages/index.aspx) The main points of comparison between the two are a similar healthy soldier effect, with significantly fewer deaths from all causes in both cohorts but a contrast in the 6% significant excess of all cancer deaths in the Australian cohort, cancer also being the single most common cause of death. There are proportionately, though not significantly, more deaths from suicide in New Zealand veterans. Lung cancer contributed the greatest burden of deaths in the New Zealand and Australian cohorts, with excesses of 15% and 18% respectively, only the latter being significant. Other significant causes of cancer related deaths in the Australian cohort, all head and neck along with oral cavity, pharyngeal, and laryngeal cancers, were similar to those found in New Zealand veterans. Cancer incidence showed a non-significant overall excess of 6% in the New Zealand cohort, the excess of 15% being significant for Australian veterans. The SIR for CLL was 1.68, 95% CI 1.18-2.19 in Australian Army Vietnam veterans,[11] (page 91) less than the SIR of 1.91, 95% CI 1.04-3.20 which we found.

As they operated in the same area, the exposures of New Zealand and Australian veterans would have been the same, and the patterns of disease are similar. The mortality and morbidity experience in these cohorts are neither at odds with the IOM classification nor the “presumptive list” adopted as being compensable by VANZ. Further work should include the selection a serving, but non-deployed, comparison group, which will reduce the healthy soldier

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