Morbidity of Vietnam veterans

Adrenal gland cancer, leukaemia and non-Hodgkin's lymphoma

Supplementary report no. 2

Revised edition

(October 2001)

The Australian Institute of Health and Welfare is Australia's national health and welfare statistics and information agency. The Institute's mission is to improve the health and well-being of Australians by informing community discussion and decision making through national leadership in developing and providing health and welfare statistics and information.

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(This edition supersedes the report on this subject published in December 2000)

Australian Institute of Health and Welfare
Canberra

REPATRIATION COMMISSION

9 October 2001

The Hon Bruce Scott MP
Minister for Veterans' Affairs and
    Minister Assisting the Minister for Defence
Parliament House
CANBERRA ACT 2600

Dear Minister

As Chairman of the Advisory Committee for the validation of the results of the Vietnam Veterans' Health Study, I forward the revised report entitled *Morbidity of Vietnam Veterans: A Study of the Health of Australia's Vietnam Veteran Community. Supplementary Report 2. Adrenal gland cancer, leukaemia and non-Hodgkin's lymphoma* for your consideration.

This revised report supersedes its predecessor of the same title that was released in December 2000.

Revision of the report has been necessary due to calculation errors in the original report, principally incorrect values being used for the community norms against which the findings for veterans' children were compared.

The report now advises that adrenal gland cancer and acute myeloid leukaemia in children, which were previously shown as higher than would be expected, are somewhat elevated, but lie within the range that might be expected in the community.

There has been no change to the data on non-Hodgkin's lymphoma in veterans between what is stated in this document and what was shown in the now superseded report. The data on this condition is a result of further examination of leukaemia in veterans after the validation study. During this examination it was found that some instances previously classified as leukaemia should, more correctly, have been classified as non-Hodgkin's lymphoma. This report thus amends Volume 3 of the *"Morbidity of Vietnam Veterans"* study reports by giving the updated levels of validated non-Hodgkin's lymphoma.

These levels now indicate that non-Hodgkin's lymphoma, in veterans, is validated as exceeding the community norm. Treatment and compensation for this condition are already available under the Veterans' Entitlements Act.

Yours sincerely

Paul Stevens

Paul Stevens
Chairman, Morbidity of Vietnam Veterans Study
   Advisory Committee and
Repatriation Commissioner

Contents

List of tables and figures

Foreword

This revised edition of *Morbidity of Vietnam Veterans: Adrenal Gland Cancer, Leukaemia and Non-Hodgkin's Lymphoma (supplementary report no. 2)* corrects information released in December 2000 on adrenal gland cancer and acute myeloid leukaemia in the children of Vietnam veterans.

AIHW found an error in the original report in the calculation of the expected number of cases, based on the prevalence in the Australian community, of adrenal gland cancer and the four main types of leukaemia among veterans' children. This error caused an underestimate of these numbers. As a consequence, the report incorrectly concluded that children of Vietnam veterans face a significantly greater risk of adrenal gland cancer and acute myeloid leukaemia than the general Australian community.

The Institute apologises for any distress caused to veterans and their children by the incorrect conclusions of the original report. However, I would like to stress that this error only affected this report. The accuracy and validity of other published results on the health status of Vietnam veterans and their children are not affected by the changed findings on adrenal gland cancer and acute myeloid leukaemia.

Richard Madden
Director
Australian Institute of Health and Welfare

Introduction

This is a revised edition of the second supplementary report to *Morbidity of Vietnam Veterans: A Study of the Health of Australia's Vietnam Veteran Community Volume 3: Validation Study (AIHW 1999)*. It replaces the original version published in December 2000, which used incorrect community comparisons for adrenal gland cancer and the four main types of leukaemia in veterans' children. The original version should now be disregarded.

This publication reports on three conditions of concern from the Morbidity Study—adrenal gland cancer in veterans' children, the four main types of leukaemia in veterans and their children, and non-Hodgkin's lymphoma.

In the Validation Study the 'other cancer' category for the veterans' children referred to all cancers other than the cancers specifically asked about in the original Morbidity Study (leukaemia, cancer of the nervous system and Wilm's tumour). During the life of the Validation Study it was requested by the Study Advisory Committee that the 'other cancer' category be broken down to reveal the types of cancers it included. This breakdown for the veterans' children's conditions revealed what was considered to be a high number of the relatively rare condition, cancer of the adrenal gland. It was therefore recommended in the Validation Study that:

> 'cancer of adrenal gland in veterans' children be further investigated and compared to a derived community standard' (AIHW 1999).

In the Validation Study the condition leukaemia in both the veterans and their children was split into its four types. These are acute lymphatic leukaemia (ALL), chronic lymphatic leukaemia (CLL), acute myeloid leukaemia (AML) and chronic myeloid leukaemia (CML). Because there were no prevalence estimates for the Australian community available for the different types of leukaemia in the Validation Study, it was requested by the Department of Veterans' Affairs that Australian community standards be derived and comparisons be made with the number of validated conditions in both veterans and their children.

In the course of splitting the validated cases of leukaemia into its four main types, the extra information obtained showed that some of the cancers validated as leukaemia in veterans in the Validation Study were non-Hodgkin's lymphoma. As this has an effect on the results of the Validation Study for both non-Hodgkin's lymphoma and leukaemia, revised validation numbers to those in the Validation Study are shown in this report, as well as in the corrigendum to the Validation Study.

Revisions from the original version

This revised version incorporates the following changes from the original report:

- the expected number of cases of adrenal gland cancer and the four types of leukaemia in veterans' children, and the confidence intervals for these expected numbers, have been revised to correct an error in the method of calculation used in the original report. The revised estimates are shown in Tables 1, 3 and 5;

- the number of validated cases of leukaemia among veterans' children has been corrected from 27 in the original report to 28. This is reflected in Table 5;

- the one case of CLL in veterans' children has been reclassified to AML, and one case of AML has been reclassified to ALL since the original report. These changes have a

1

small consequential effect on the validation results for each of the models shown in Tables 3 and 5;

- the number of validated cases of CLL and total leukaemia in veterans shown in Table 2 and for Model 3 in Table 4 have been revised to correct a rounding error. The number of validated cases of CLL has been reduced from 19 to 18, and the number of cases of total leukaemia has been reduced from 23 to 22; and

- two appendices have been added which provide details of the calculations used in deriving the Australian community standards for veterans and veterans' children used in this report.

Definition of conditions

Adrenal gland cancer

Adrenal gland cancer refers to a cancer in the adrenal gland. There are several types of adrenal gland cancer and none are common. The adrenal gland are two secretory organs perched above the kidneys. Each of these consists of two parts, the cortex and medulla, and these have independent functions. The cortex secretes hormones after stimulation from the brain, and these are converted to testosterone and estrogens in the liver. The medulla produces the catecholamines, epinephrine and norepinephrine.

The different types of leukaemia

Acute lymphatic leukaemia (ALL) is a progressive cancer characterised by large numbers of immature cells, closely resembling those cells in the bone marrow, the circulating blood, the lymph nodes, the spleen, the liver and other organs. The number of normal blood cells are reduced. ALL is most common in children, with the greatest number diagnosed between the ages of 2 and 5 years.

Acute myeloid leukaemia (AML) is a cancer of the blood–forming tissues, characterised by the uncontrolled production of immature white blood cells. AML may occur at any age, but it most frequently affects adolescents and young adults. The risk of the disease is increased among people who have been exposed to massive doses of radiation.

Chronic lymphatic leukaemia (CLL) is a cancer of the blood-forming tissue, characterised by the production of small long lived white blood cells in bone marrow, blood liver and lymphoid organs. CLL is rare under the age of 35 years of age, increases in frequency with age and is more common in women than men.

Chronic myeloid leukaemia (CML) is a disorder where the multiplication of bone marrow cells is excessive. Maturation of the cells proceeds fairly normally. The diseases occurs most frequently in mature adults and begins insidiously.

Non-Hodgkin's lymphoma

Non-Hodgkin's lymphoma is a lymphoma which is not of the Hodgkin's type. It results in the enlargement of the lymph nodes and often other more severe symptoms of cancer.

Adrenal gland cancer in veterans' children

In the Validation Study the 'other cancer' category for both the veterans and their children was split into the differing types of cancers it included. The specific cancer types were obtained by determining the ICD–9 codes for each of the cancers from the National Cancer Statistics Clearing House, or where this information was not available, by contacting the validating doctor for the cancer type. Codes were then matched to the particular type of cancer.

There was no Australian community standard for adrenal gland cancer in veterans' children in the Validation Study. It was therefore necessary to derive this standard to enable a comparison between the number of cases among veterans' children and the expected number of cases based on the prevalence in the Australian community. Appendix 1 describes the method used to derive the Australian community standard for adrenal gland cancer.

For the veterans' children there were ten cases of cancer of the adrenal gland in the 'other cancer' category. This appeared to be quite a high number of a relatively rare condition. To ensure that these validations were correct a further check was made for each of them based on the morphology (i.e. type) of the cancers, as different cancer sites have particular morphologies associated with them. This check was undertaken by examining the morphology codes assigned by State and Territory cancer registries to each of the 10 cases. All cases were verified as adrenal gland cancer.

Table 1: Number of adrenal gland cancers validated in veterans' children

Condition	Validated	Expected (confidence interval)
Adrenal gland cancer	10	6 (1–11)

A comparison of the number of validated cases of adrenal gland cancer among veterans' children with the derived Australian community comparison shows that the prevalence among veterans' children is higher than expected, and suggestive of increased risk, but is not significantly different from that of the general community (Table 1). The Australian community comparison is the expected number of cases in veterans' children if they had experienced the age-sex prevalence rates for this condition of the total Australian population.

Leukaemia in veterans and their children

In the Validation Study, the type of leukaemia was determined by the same method as for adrenal gland cancer. The ICD–9 codes from the National Cancer Statistics Clearing House were determined, or where this information was not available, the validating doctor was contacted for the leukaemia type. For cases where the type of leukaemia could not be determined, the type of leukaemia was imputed according to the proportion of each type in the determined cases. As there were no Australian community standards available for the four types of leukaemia in the Validation Study, they were calculated in this study in order to make comparisons. Appendixes 1 and 2 describe the methods used to calculate the Australian community standards for veterans' children and veterans respectively.

Comparison of validated results – veterans

Comparisons of the number of validated cases among the veterans with the expected number, based on the Australian community standard (Table 2), show no significant difference for all types of leukaemia. However, the number of CLL cases is on the upper limit of the confidence interval.

Table 2: Number of leukaemias validated in veterans

Condition	Validated	Expected (confidence interval)
ALL	0	2 (0–5)
CLL	18	12 (5–19)
AML	3	6 (1–11)
CML	1	5 (1–9)
Total leukaemia	**22**	**26 (16–36)**

Note: Based on the number of estimated validated conditions in the Validation Study.
* After further investigation, 4 of the conditions validated as leukaemia in the Validation Study were actually cancer of the lymphatic tissue.

Comparison of validated results – veterans' children

A comparison of the number of validated cases among the veterans' children with the expected number, based on the Australian community standard (Table 3), show:

- the number of cases of AML is higher than expected and suggestive of an increased risk, although it is not raised to a statistically significant extent;

- the number of cases of CLL and CML show no significant difference from the expected number of conditions; and

- the number of cases of ALL is significantly lower than the expected number, based on the Australian community standard.

Table 3: Number of leukaemias validated in veterans' children

Condition	Validated [a]	Expected (confidence interval)
ALL	23	41 (28–54)
CLL**	0	0
AML	12	9 (3–15)
CML	2	3 (0–6)
Total leukaemia	**36**	**57 (42–72)**

(a)   The four leukaemia types do not sum to total leukaemia because of rounding differences.

Note: Based on number of estimated validated cases in Validation Study.
 * After further investigation, 2 of the cases validated as leukaemia were actually cancer of the lymphatic tissue.
** The zero cases of CLL reflect the rarity of CLL under the age of 35 years.

Impact of method of allocation of non-respondents and 'not able to be validated' responses

In the validation process responses from veterans and their children were classified as validated, not validated, not able to be validated, or non-responding (AIHW 1999). Five models have been used to illustrate the effect of including some of the 'not able to be validated' and non-responding responses into the validated category. The five models decrease in their level of strictness for the validation of responses. Model 3 was adopted for the Validation Study, and for the results shown in Tables 2 and 3 above.

The components included to determine the estimated number of validated responses for each model are:

Model 1

(a)   counting only positively validated responses; but

(b)   excluding non-respondents.

Model 2

(a)   counting positively validated responses; and

(b)   including a prorated component of those responses not able to be validated due to a non-response from the clinician, or a clinician indicating they had insufficient information to confirm the condition—prorated according to the ratio of validated to not validated responses; but

(c)   excluding non-respondents.

Model 3

(a)   counting positively validated responses; and

(b)   including a prorated component of those responses not able to be validated regardless of reason— prorated according to the ratio of validated to not validated responses; but

(c)   excluding non-respondents.

Model 4

(a) counting positively validated responses; and

(b) including a prorated component of those responses not able to be validated due to a non-response from the clinician, or a clinician indicating they had insufficient information to confirm the condition—prorated according to the ratio of validated to not validated responses; and

(c) redistributing cases from non-responding veterans or children between validated, not validated and not able to be validated responses.

Model 5

(a) counting positively validated responses; and

(b) including a prorated component of those responses not able to be validated regardless of reason— prorated according to the ratio of validated to not validated responses; and

(c) including a prorated component of non responses—prorated according to the ratio of validated to not validated responses.

The results for veterans show that the assumptions made regarding the allocation of some of the 'not able to be validated' conditions and the non respondent cases only affects the statistical significant difference between veterans and the Australian community standard for CLL (Table 4). If a proportion of either or both of the 'not able to be validated' and non respondent cases are included (Models 4 and 5), the estimated number of cases of CLL among veterans becomes significantly higher than expected.

Total leukaemia, ALL, AML and CML all show no significant difference under each assumption between the estimated number of cases among veterans and the expected number based on the Australian community standard.

Table 4: Validation results for leukaemia in veterans using selected reallocation models

Condition	Model 1	Model 2	Model 3	Model 4	Model 5 [a]	Expected (confidence interval)
ALL	0	0	0	0	0	2 (0–5)
CLL	17	18	18	25	25	12 (5–19)
AML	3	3	3	4	4	6 (1–11)
CML	1	1	1	1	1	5 (1–9)
Total leukaemia	**21**	**22**	**22**	**30**	**31**	**26 (16–36)**
ALL	—	—	—	—	—	
CLL	—	—	—	High	High	
AML	—	—	—	—	—	
CML	—	—	—	—	—	
Total leukaemia	**—**	**—**	**—**	**—**	**—**	

(a) The four leukaemia types do not sum to total leukaemia because of rounding differences.

Notes
1. High—The estimated validated conditions are statistically significantly higher than the Morbidity Study derived community standard at the 95% confidence level.
2. Low—The estimated validated conditions are statistically significantly lower than the Morbidity Study derived community standard at the 95% confidence level.
3. Dashes indicate no statistically significant differences from the Morbidity Study derived community standards.

For veterans' children, the assumptions regarding the allocation of non respondents make a substantial difference to comparisons for ALL, AML and total leukaemia (Table 5). If a proportion of non respondent cases is included (Model 5), the estimated number of cases of AML among veterans' children becomes significantly higher than the expected number based on the Australian community standard. Under Model 5, the estimated number of cases of ALL and total leukaemia changes from being significantly lower than the expected number of cases based on the Australian community standard, to showing no difference.

Table 5: Validation results for leukaemia in veterans' children using selected reallocation models

Condition	Model 1	Model 2	Model 3 [a]	Model 4	Model 5 [a]	Expected (confidence interval)
ALL	18	18	23	27	35	41 (28–54)
CLL	0	0	0	0	0	0
AML	9	9	12	14	18	9 (3–15)
CML	1	1	2	2	3	3 (0–6)
Total leukaemia	**28**	**28**	**36**	**43**	**55**	**57 (42–72)**
ALL	Low	Low	Low	Low	—	
CLL	—	—	—	—	—	
AML	—	—	—	—	High	
CML	—	—	—	—	—	
Total leukaemia	**Low**	**Low**	**Low**	**Low**	**—**	

(a)   The four leukaemia types do not sum to total leukaemia because of rounding differences.

Notes
1.   High—The estimated validated conditions are statistically significantly higher than the Morbidity Study derived community standard at the 95% confidence level.
2.   Low—The estimated validated conditions are statistically significantly lower than the Morbidity Study derived community standard at the 95% confidence level.
3.   Dashes indicate no statistically significant differences from the Morbidity Study derived community standards.

Non-Hodgkin's lymphoma in veterans and their children

As previously mentioned, in the course of this study it was discovered that some of the cancers validated as leukaemia in the Validation Study were non-Hodgkin's lymphoma. The revised results of the Validation Study are shown in Tables 6 and 7 for veterans and their children respectively.

Comparisons of the number of validated conditions among the veterans with the expected number, based on the Australian community standard, show that the number of conditions of non-Hodgkin's lymphoma is significantly higher than expected.

Table 6: Number of non-Hodgkin's lymphomas reported by veterans by validation status

Condition	No. of conditions validated	No. of conditions not validated	No. of conditions not able to be validated	No. of conditions with no response	No. of estimated validated conditions	Expected no. of conditions (confidence interval)
Non-Hodgkin's lymphoma	61	40	9	30	66	48 (34–62)

For veterans' children, non-Hodgkin's lymphoma was not a specific cancer studied in the Morbidity Study, and was part of the 'other cancer' category. As such, no comparison was made with the expected number, based on the Australian community standard. The number of 'other cancers' among veterans' children verified as being non-Hodgkin's lymphoma has been revised from thirteen in the Validation Study (see page 98 of that study) to fifteen (Table 7 below).

Table 7: Number of non-Hodgkin's lymphoma in veterans' children

Condition	No. of cancers
Non-Hodgkin's lymphoma	15

Conclusion

From this report, the following conclusions can be made:

- the prevalence of adrenal gland cancer among veterans' children, while higher than expected and suggestive of increased risk, shows no statistically significant difference from the expected number of conditions, based on the Australian community standard;

- the number of conditions for all types of leukaemia among veterans show no significant difference from the expected numbers of conditions, though the number of chronic lymphatic leukaemia (CLL) conditions is on the upper limit of the confidence interval;

- the number of conditions of acute myeloid leukaemia (AML) in veterans' children , while higher than might be expected and suggestive of increased risk, is not raised to a statistically significant extent.

- the number of conditions of acute lymphatic leukaemia (ALL) among veterans' children is significantly lower than the expected number of conditions. Chronic lymphatic leukaemia (CLL) and chronic myeloid leukaemia (CML) in veterans' children show no significant difference from the expected numbers of conditions; and

- the number of conditions of non-Hodgkin's lymphoma in veterans is significantly higher than expected.

Appendix 1 Derivation of Australian community standards for veterans' children

The number of cases of adrenal gland cancer and leukaemia reported in the 1997 Morbidity Study referred to the number of veterans' children who had ever suffered from either or both of these conditions. Therefore, to calculate the expected number of cases of adrenal gland cancer and the four types of leukaemia, based on Australian community rates, it is necessary to apply age-specific incidence rates from birth to the age of each child cohort at the time of the 1997 Morbidity Study. For example, the expected number of cases of a condition suffered by veterans' children in the 15-19 age-group is obtained by summing the expected number of cases suffered at age 0, 1, 2 and so on up to age 17, the mid point of the 15-19 age group.

Tables A1 to A5 provide the 1986-88 incidence rates and the expected number of cases for each age group at the time of the 1997 Study for adrenal gland cancer and the four types of leukaemia. The years 1986-88 were chosen to match the years used to calculate each of the cancer Australian community standards in the Morbidity Study.

The derivation of the community standards for children is different from that for veterans (Appendix 2) in that mortality rates impact on the community standard for veterans but not for children. This is because mortality reduces the number of veterans who can report having suffered from a condition, whereas for children, even if a child has died, their father can still report that the child had experienced a condition.

Hence the calculation of the expected number of cases for children in Table A1 to A5 involves applying a cumulative incidence rate, from birth to the current age group, to the child population. In contrast, the calculation of the expected number of cases for veterans in Table A6 also involves the application of a cumulative incidence rate from birth to the current age group. However, for veterans a cumulative mortality rate from birth to the current age is then subtracted from the expected number based on the cumulative incidence rate, to obtain an expected number of living veterans who have had the condition.

Table A1: Derivation of Australian community standard for adrenal gland cancer in veterans' children

Age group	Veteran child population	Incidence rate	Cumulative incidence rate to current age [a]	Expected number of cases [b]
Males				
0–4	751	1.39	3.47	0.03
5–9	1,297	0.33	7.76	0.10
10–14	3,412	0.05	8.70	0.30
15–19	7,799	0.09	9.06	0.71
20–24	13,310	0.00	9.30	1.24
25–29	8,948	0.05	9.42	0.84
30–34	659	0.05	9.67	0.06
35–39	119	0.26	10.45	0.01
40 and over	0	0.12	11.40	0
Total males	**36,295**	**—**	**—**	**3.29**
Females				
0–4	708	1.40	3.50	0.02
5–9	1,212	0.23	7.58	0.09
10–14	3,132	0.00	8.15	0.26
15–19	7,237	0.00	8.15	0.59
20–24	12,895	0.05	8.28	1.07
25–29	8,558	0.15	8.77	0.75
30–34	543	0.26	9.79	0.05
35–39	110	0.21	10.96	0.01
40 and over	0	0.31	12.28	0
Total females	**34,395**	**—**	**—**	**2.85**
Total persons	**—**	**—**	**—**	**6.14**

(a)   Calculated by multiplying the sum of the previous five-year incidence rates by five plus 2.5 times the current five-year age group.

(b)   Calculated by multiplying the cumulative incidence rate to current age by the veteran child population.

Table A2: Derivation of Australian community standard for acute lymphatic leukaemia in veterans' children

Age group	Veteran child population	Incidence rate	Cumulative incidence rate to current age [a]	Expected number of cases [b]
Males				
0–4	751	6.36	15.89	0.12
5–9	1,297	2.61	38.30	0.50
10–14	3,412	2.09	50.05	1.71
15–19	7,799	1.88	59.99	4.68
20–24	13,310	1.09	67.42	8.97
25–29	8,948	0.57	71.58	6.40
30–34	659	0.72	74.81	0.49
35–39	119	0.31	77.40	0.09
40 and over	0	0.77	80.11	0
Total males	**36,295**	**—**	**—**	**22.97**
Females				
0–4	708	6.11	15.28	0.11
5–9	1,212	2.63	37.14	0.45
10–14	3,132	1.29	46.94	1.47
15–19	7,237	0.84	52.26	3.78
20–24	12,895	0.46	55.50	7.16
25–29	8,558	0.39	57.62	4.93
30–34	543	0.41	59.63	0.32
35–39	110	0.37	61.60	0.07
40 and over	0	0.44	63.62	0
Total females	**34,395**	**—**	**—**	**18.29**
Total person	**—**	**—**	**—**	**41.26**

(a)   Calculated by multiplying the sum of the previous five-year incidence rates by five plus 2.5 times the current five-year age group.

(b)   Calculated by multiplying the cumulative incidence rate to current age by the veteran child population.

Table A3: Derivation of Australian community standard for chronic lymphatic leukaemia in veterans' children

Age group	Veteran child population	Incidence rate	Cumulative incidence rate to current age [a]	Expected number of cases [b]
		Males		
0–4	751	0.00	0.00	0.00
5–9	1,297	0.00	0.00	0.00
10–14	3,412	0.00	0.00	0.00
15–19	7,799	0.00	0.00	0.00
20–24	13,310	0.00	0.00	0.00
25–29	8,948	0.00	0.00	0.00
30–34	659	0.10	0.26	0.00
35–39	119	0.63	2.09	0.00
40 and over	0	0.77	5.59	0.00
Total males	**36,295**	—	—	**0**
		Females		
0–4	708	0.00	0.00	0.00
5–9	1,212	0.00	0.00	0.00
10–14	3,132	0.00	0.00	0.00
15–19	7,237	0.00	0.00	0.00
20–24	12,895	0.00	0.00	0.00
25–29	8,558	0.00	0.00	0.00
30–34	543	0.00	0.00	0.00
35–39	110	0.21	0.53	0.00
40 and over	0	0.25	1.69	0.00
Total females	**34,395**	—	—	**0**
Total persons	—	—	—	**0**

(a)   Calculated by multiplying the sum of the previous five-year incidence rates by five plus 2.5 times the current five-year age group.

(b)   Calculated by multiplying the cumulative incidence rate to current age by the veteran child population.

Table A4: Derivation of Australian community standard for acute myeloid leukaemia in veterans' children

Age group	Veteran child population	Incidence rate	Cumulative incidence rate to current age [a]	Expected number of cases [b]
Males				
0–4	751	1.07	2.67	0.02
5–9	1,297	0.22	5.88	0.08
10–14	3,412	0.51	7.70	0.26
15–19	7,799	0.47	10.16	0.79
20–24	13,310	0.64	12.94	1.72
25–29	8,948	1.10	17.30	1.55
30–34	659	1.34	23.40	0.15
35–39	119	0.84	28.83	0.03
40 and over	0	1.78	35.38	0.00
Total males	**36,295**	**—**	**—**	**4.61**
Females				
0–4	708	0.78	1.96	0.01
5–9	1,212	0.40	4.93	0.06
10–14	3,132	0.75	7.81	0.24
15–19	7,237	0.69	11.41	0.83
20–24	12,895	0.51	14.41	1.86
25–29	8,558	0.78	17.64	1.51
30–34	543	1.34	22.94	0.12
35–39	110	1.28	29.50	0.03
40 and over	0	1.49	36.44	0.00
Total females	**34,395**	**—**	**—**	**4.67**
Total persons	**—**	**—**	**—**	**9.28**

(a)   Calculated by multiplying the sum of the previous five-year incidence rates by five plus 2.5 times the current five-year age group.

(b)   Calculated by multiplying the cumulative incidence rate to current age by the veteran child population.

**Table A5: Derivation of Australian community standard for chronic myeloid leukaemia in veterans' children**

Age group	Veteran child population	Incidence rate	Cumulative incidence rate to current age [a]	Expected number of cases [b]
Males				
0–4	751	0.16	0.40	0.00
5–9	1,297	0.16	1.21	0.02
10–14	3,412	0.15	2.00	0.07
15–19	7,799	0.14	2.74	0.21
20–24	13,310	0.49	4.32	0.58
25–29	8,948	0.77	7.48	0.67
30–34	659	0.57	10.80	0.07
35–39	119	0.89	14.45	0.02
40 and over	0	1.01	19.20	0.00
Total males	**36,295**	**—**	**—**	**1.63**
Females				
0–4	708	0.17	0.42	0.00
5–9	1,212	0.06	0.98	0.01
10–14	3,132	0.16	1.53	0.05
15–19	7,237	0.10	2.18	0.16
20–24	12,895	0.31	3.19	0.41
25–29	8,558	0.34	4.81	0.41
30–34	543	0.31	6.44	0.04
35–39	110	0.91	9.48	0.01
40 and over	0	0.93	14.08	0.00
Total females	**34,395**	**—**	**—**	**1.09**
Total persons	**—**	**—**	**—**	**2.72**

(a)   Calculated by multiplying the sum of the previous five-year incidence rates by five plus 2.5 times the current five-year age group.
(b)   Calculated by multiplying the cumulative incidence rate to current age by the veteran child population.

Appendix 2 Derivation of Australian community standards for veterans' leukaemia

The calculation of the Australian community standards for each of the four types of leukaemia was determined by the AIHW from the software program DISMOD©. DISMOD© was developed by the Burden of Disease Unit at the Centre for Health and Population Studies, Harvard, to assist disease experts to arrive at internally consistent estimates of incidence, duration and case fatality rates for the Global Burden of Disease Study (Murray & Lopez 1996). The underlying model is shown in Figure A1.

Figure A1: DISMOD© modelling of incidence, prevalence and duration of disease
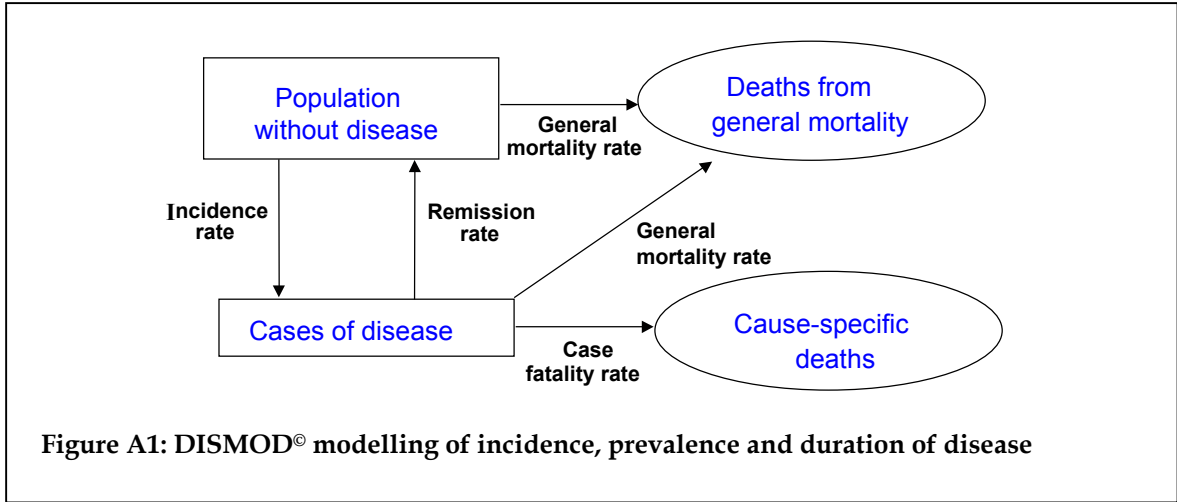
The program is based on a multi-state life table and uses various input parameters to derive consistent epidemiological estimates of disease prevalence, duration and case fatality. Some of the input parameters are general (such as the age composition of the male or female population and the general mortality risk at each age) and others specific to the disease under consideration (such as instantaneous incidence and remission rates and cause-specific mortality risk). Outputs from the program include estimates of prevalence, average duration (before remission or death) and cause-specific mortality by age.

Incidence and case fatality rates (survival rate) for 1986 to 1988 for those males aged over 20 were entered for the four types of leukaemia, together with the age structure of the population in 1988. The years 1986 to 1988 were chosen to match those used to calculate the Australian community comparisons for the Morbidity Study. The prevalence and mortality rates of these cancers were the outputs of the program.

Total age-specific prevalence rates and the derived Australian community standard for each of the four types of leukaemia are shown in Table A6.

Table A6: Derivation of Australian community standards for each of the four main types of leukaemia in veterans

Age group	Prevalence per 1,000 population from DISMOD	Veteran population	Expected number of cases [a]
Acute lymphatic leukaemia (ALL)			
35–39	0.02757	7	0.00
40–44	0.03725	564	0.02
45–49	0.04509	13,205	0.60
50–54	0.04904	16,569	0.81
55–59	0.05270	4,368	0.23
60–64	0.03877	2,467	0.10
65–69	0.04613	1,735	0.08
70 and over	0.02763	1,108	0.03
Total	—	**40,023**	**1.87**
Chronic lymphatic leukaemia (CLL)			
35–39	0.01542	7	0.00
40–44	0.03334	564	0.02
45–49	0.07507	13,205	0.99
50–54	0.17511	16,569	2.90
55–59	0.35238	4,368	1.54
60–64	0.67845	2,467	1.67
65–69	1.22286	1,735	2.12
70 and over	2.46105	1,108	2.73
Total	—	**40,023**	**11.97**
Acute myeloid leukaemia (AML)			
35–39	0.05730	7	0.00
40–44	0.07117	564	0.04
45–49	0.08590	13,205	1.13
50–54	0.11689	16,569	1.94
55–59	0.17366	4,368	0.76
60–64	0.24124	2,467	0.60
65–69	0.35785	1,735	0.62
70 and over	0.56325	1,108	0.62
Total	—	**40,023**	**5.71**

(a)   Calculated by multiplying the prevalence rate by the veteran population.

Table A6 (continued): Derivation of Australian community standards for each of the four main types of leukaemia in veterans

Age group	Prevalence per 1,000 population from DISMOD	Veteran population	Expected number of cases [a]
		Chronic myeloid leukaemia (CML)	
35–39	0.05604	7	0.00
40–44	0.07265	564	0.04
45–49	0.07986	13205	1.05
50–54	0.09291	16569	1.54
55–59	0.12637	4368	0.55
60–64	0.22036	2467	0.54
65–69	0.35088	1735	0.61
70 and over	0.64295	1108	0.71
Total	—	**40023**	**5.05**
		Total leukaemia	
35–39	0.16625	7	0.00
40–44	0.22885	564	0.13
45–49	0.30421	13205	4.02
50–54	0.45064	16569	7.47
55–59	0.73266	4368	3.20
60–64	1.27127	2467	3.14
65–69	2.03599	1735	3.53
70 and over	3.80639	1108	4.22
Total	—	**40023**	**25.70**

(a)   Calculated by multiplying the prevalence rate by the veteran population.

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