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A landscape photograph showing a line of trees silhouetted against a sunset sky, with their reflections in a body of water in the foreground. A large, curved graphic element in shades of blue and white is positioned at the top of the page.

Incidence of suicide among serving
and ex-serving Australian Defence
Force personnel 2001–2015

In brief summary report



Australian Government

**Australian Institute of
Health and Welfare**

*Authoritative information and statistics
to promote better health and wellbeing*

Incidence of suicide among serving and ex-serving Australian Defence Force personnel 2001–2015

In brief summary report

Australian Institute of Health and Welfare
Canberra

Cat. no. PHE 213.

The Australian Institute of Health and Welfare is a major national agency that provides reliable, regular and relevant information and statistics on Australia's health and welfare. The Institute's purpose is to provide authoritative information and statistics to promote better health and wellbeing among Australians.

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Australian Institute of Health and Welfare

Board Chair
Mrs Louise Markus

Director
Mr Barry Sandison

Any enquiries about copyright or comments on this publication should be directed to:

Digital and Media Communications Unit
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1000
Email: info@aihw.gov.au

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ADF All-hours Support Line **1800 628 036**

Operation Life Online <<http://at-ease.dva.gov.au/suicideprevention>>

Lifeline **13 11 14**, or <www.lifeline.org.au>

Suicide Call Back Service **1300 659 467**, or <<https://www.suicidecallbackservice.org.au>>

Beyondblue Support Service **1300 22 4636**, or <www.beyondblue.org.au>.

Abbreviations

ABS	Australian Bureau of Statistics
ADF	Australian Defence Force
AIHW	Australian Institute of Health and Welfare
DSD	Defence Suicide Database
DVA	Department of Veterans' Affairs
ICD	International Statistical Classification of Diseases and Related Health Conditions
NDI	National Death Index
NMD	National Mortality Database
PMKeyS	Personnel Management Key Solution
RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
SMR	Standardised Mortality Ratio

Symbols

..	not applicable
=	equals
<	less than
%	per cent

Summary

This report quantifies the level of suicide among serving and ex-serving Australian Defence Force (ADF) personnel and identifies characteristics that may be associated with risk of suicide. It updates preliminary estimates published in November 2016 (AIHW 2016a) using 15 years of data for the years 2001–2015. This is part of an authoritative study on the incidence of suicide among serving and ex-serving ADF personnel that will continue to be updated as new data becomes available.

Key findings

Between 2001 and 2015, there were 325 certified suicide deaths among people with at least 1 day of ADF service since 2001.

Of these deaths:

- 51% (166) were of people no longer serving at the time of their death (ex-serving group)
- 28% (90) were of people serving full time at the time of their death
- 21% (69) were of people serving in the active and inactive reserves at the time of their death.

Men made up the vast majority of these suicide deaths (93% or 303 deaths) and 84% of the ADF populations examined in this study. Women made up the remaining 7% (22 deaths). The smaller number of women in the study meant detailed analysis on ex-serving women was not possible. Hence the report focuses primarily on suicide deaths among ex-serving men.

Ex-serving men have higher suicide rates

The suicide rates of ex-serving men were more than twice as high as for those serving full time or in the reserve (26 suicide deaths per 100,000 people, compared with 11 and 12 per 100,000, respectively). They were also slightly higher than for their counterparts in the general population after adjusting for age (14% higher, however this difference was not statistically significant).

Ex-serving men aged 18–24 were at particular risk—2 times more likely to die from suicide than Australian men of the same age.

Ex-serving men aged 25–29 accounted for slightly more deaths than other age groups and were 1.4 times more likely to die from suicide than Australian men of the same age. This difference was not statistically significant.

Men serving full time or in the reserve had significantly lower suicide rates than for men in the general population (53% and 49% lower, respectively), after adjusting for age.

Risk groups among ex-serving men

Suicide rates for ex-serving men aged 18–49 were between 3 and 4 times as high as for men aged 50–84. In addition to age, certain service-related characteristics were associated with higher suicide rates among ex-serving men:

- Those who were discharged involuntarily (suicide rates were 2.4 times as high as for those discharged for voluntary reasons), particularly if the discharge was for medical reasons (3.6 times as high as for those discharged for voluntary reasons).

- Those who left the ADF after less than 1 year of service (2.4 times as high as for those who had served for 10 years or more).
- All ranks other than commissioned officers (2.8 times as high as for commissioned officers).

This analysis looks only at each service-related characteristic associated with risk of suicide individually. It does not take into account potential interactions between these characteristics, which will be useful analyses to explore in future work on this topic.

Further detailed results are anticipated to be published in a comprehensive technical report in late 2017. This will include a comparison between the risk groups identified here and the general population.

In Brief Summary Report

Background

Box 1: What has changed?

- This report updates the findings reported in the AIHW fact sheet '*Incidence of suicide among serving and ex-serving Australian Defence Force personnel 2001–2014*' which was released in 2016.
- It includes data for 2015 – which is the most recent year for which cause of death information is available. At the time of publication, certified cause of death data were available for deaths up to and including 31 December 2015.
- It also explores service-related characteristics to identify ex-serving personnel who may be at high risk of suicide.

There is strong and increasing public interest in – and concern about – the incidence of suicide among serving and ex-serving Australian Defence Force (ADF) personnel. The incidence of suicide among current ADF personnel serving full time is known, but there has been only limited information available for reserve and ex-serving personnel (Australian Institute for Suicide Research and Prevention 2015; Dunt 2009; Kølves et al. 2012).

In 2016, the Australian Institute of Health and Welfare (AIHW) published preliminary results for three ADF populations – those serving full time, reserve personnel and ex-serving personnel – based on data for the period 2001–2014 (AIHW 2016a; Box 2).

Box 2: ADF populations—definitions

Serving full time: ADF members serving in a regular capacity in the Royal Australian Navy (RAN), Australian Army or Royal Australian Air Force (RAAF) on or after 1 January 2001, on continuous full-time service, or participating in the gap year program.

Reserve: ADF members in the active or inactive reserve forces for the RAN, Australian Army or RAAF, on or after 1 January 2001. Most members leaving full-time service make the transition to the inactive reserve forces, unless there are medical grounds preventing this.

Ex-serving: ADF members in the serving or reserve population on or after 1 January 2001 and who were discharged after 1 January 2001. The ex-serving population increased by around 5,000 per year in the period of study (2001 to 2015).

The preliminary results showed that while men in the serving full time and reserve populations had significantly lower rates of suicide than an age-matched population of Australian men, contemporary ex-serving men – discharged up to 15 years previously – were 13% more likely to die from suicide than men in the Australian population (though the difference was not statistically significant) (AIHW 2016a).

This report quantifies the level of suicide among serving and ex-serving ADF personnel and identifies characteristics that may be associated with risk of suicide. It updates preliminary estimates published in November 2016 (AIHW 2016a) using 15 years of data for the years 2001–2015. This is part of an authoritative study on the incidence of suicide among ex-serving ADF personnel that will continue to be updated as new data becomes available, including revised and final versions of cause of death data. It is the beginning in the collection of a quality data set on suicide in the serving and ex-serving population.

The extent of information available for this study means it is not possible to examine the full range of factors known to increase the risk of suicide in ex-serving ADF personnel. However, some service-related factors for which data are available have been examined including: service (Army, Navy and Air Force), rank, operational service (warlike or non-warlike operations and other designated domestic and international operations), length of service, reason for discharge, and time since discharge.

It is important to note that the results of this study cannot be used to estimate the number of suicide deaths among people who left the ADF before 1 January 2001 – nor can they be extrapolated to the broader veteran/ex-serving population in Australia.

This report presents information on numbers, crude rates and age-adjusted comparative rates. Comparing counts of suicide deaths across different groups helps to identify where the largest number of suicide deaths are occurring.

Crude rates complement information on the number of suicide deaths by taking into account the size of the underlying population to provide information on how often suicide death occurs in that population.

Age-adjusted rates are used to control for the difference in age structures between study populations (the three ADF service status groups) and the comparison (Australian) population. In this report, the standardised mortality ratio (SMR) is used for this purpose (see the section headed ‘Comparisons using the standardised mortality ratio’ on page 6 for more detail).

The technical terminology and measures used in this report are described in Box 3.

Box 3: Measures used in this report—definitions

count of suicide deaths (also referred to as incidence of suicide): The number of ADF deaths from suicide in a given time period.

crude suicide rate: The number of serving and ex-serving ADF suicide deaths divided by the corresponding ADF population and multiplied by a factor – in this case 100,000 – to provide a rate per 100,000 population in a given time period.

standardised mortality ratio (SMR): A ratio to compare the suicide rates in the ADF populations with the Australian population, adjusting for differences in age structure. It is calculated as the observed number of events (suicide deaths) divided by the number of events that would be expected if the study population had the same age and sex-specific rates as those observed in the comparison population. If the age and sex-specific rates are the same in each population, the ratio is 1.0. If the age and sex-specific rates are higher overall in the ADF population than in the Australian population, the ratio will be more than 1.0. If the age and sex-specific rates in the ADF populations are lower overall than the Australian population, the ratio will be less than 1.0.

(continued)

Box 3 (continued): Measures used in this report—definitions

statistical significance: A statistical measure that indicates how likely the observed difference is due to chance alone. If the difference is sufficiently unlikely to be due to chance, the difference is said to be statistically significant. Statistically significant differences are indicated in this report by an asterisk, or described as being 'significantly higher'/'significantly lower'.

Important note: In this study, 95% confidence intervals are provided for each SMR and most crude rates to indicate certainty and precision around these estimates. These may account for the variation in absolute counts of suicide deaths over time (related to the small sample size). Use of confidence intervals is the simplest way to test for significant differences. If confidence intervals do not overlap with each other or 1.0, the difference is statistically significant. If confidence intervals do overlap with each other or 1.0, it is likely but not certain that the difference is not statistically significant. In this study, in cases where confidence intervals overlapped slightly, an additional test of significance was undertaken based on the rate difference.

What is the purpose of this study?

In 2016, the Department of Veterans' Affairs (DVA) commissioned the AIHW to calculate accurate numbers and rates of suicide deaths among three personnel groups: contemporary personnel serving full time in the ADF, reserve, and ex-serving ADF personnel.

This 'In Brief Summary Report' updates and builds on the preliminary results published by the AIHW in 2016. The report:

- updates preliminary results with the most recent year of cause of death information (2015)
- enumerates the incidence of suicide between 2001 and 2015 among serving full time, reserve and ex-serving ADF personnel with contemporary service
- determines if there are differences in the overall rate of suicide death between men in the ADF service groups and the general Australian male population
- identifies service-related characteristics of ex-serving ADF personnel associated with high risk of suicide
- includes counts and crude rates of suicide among serving and ex-serving women compared with all Australian females, by broad age groups.

The information and data in this report may help to inform policy and to develop interventions to reduce suicide rates among ADF personnel.

A more technical report describing the methods and detailed results is expected to be published in late 2017.

Box 4: Factors to consider when reading this report

- Data on suicide deaths presented here are calculated from certified deaths information only; that is, official fact of death and cause of death determination (including suicide death) from the Registrars of Births, Deaths and Marriages in each state and territory and the National Coronial Information System.
- This study may exclude an unknown number of deaths that were suspected to be suicide deaths and officially attributed to another cause after investigation by a coroner.
- Changes in Australian Bureau of Statistics (ABS) coding practices and revisions to data over time may affect the number of deaths attributed to suicide.
- Differences between the results of this study and other publicly reported estimates may be due to the scope of the studies and/or the source of cause of death information.
- The results of this study cannot be used to estimate the number of suicide deaths among people who left the ADF before 1 January 2001 and cannot be extrapolated to the broader veteran/ex-serving population in Australia.
- The analyses are restricted by those variables included in the provided datasets and therefore cannot cover all areas of interest.
- The results can identify groups of people that may be at higher risk of suicide death by examining characteristics that may be associated with suicide. However, it cannot indicate if the particular characteristic is the cause of the suicide death.
- The analyses only look at the service-related characteristics individually and do not take into account interactions between them.
- As this study is based on administrative data, it was not possible to analyse a number of other potentially important social, demographic and psychological factors that may contribute to suicide risk.
- Some of the results are based on small numbers, particularly those involving women, and this should be taken into account when interpreting the findings.

How was the study conducted?

The study was conducted in four broad steps, which are listed here and then briefly described:

- Step 1 – constructing the data set and determining fact and cause of death
- Step 2 – defining the scope
- Step 3 – counting suicide deaths
- Step 4 – comparing suicide rates.

Constructing the data set and determining fact and cause of death

The study population was derived from the Personnel Management Key System (PMKeyS) database (held by the Department of Defence), which was linked with the National Death

Index (NDI) (held by the AIHW). This data set was then supplemented by information from Defence's database of confirmed and suspected suicide deaths – the Defence Suicide Database (DSD) – and cause of death information from the National Mortality Database (NMD).

The number of personnel who have died were determined through linkage to the NDI, or matching to the DSD. Additional information on the data linkage process is in Appendix A.

Cause of death (suicide) data were obtained only from certified sources; that is, official fact of death and cause of death determination (including suicide death) from the Registrars of Births, Deaths and Marriages in each state and territory and the National Coronial Information System.

These data underpin the NMD and DSD, the sources of certified death information used in this study.

Reporting only certified deaths ensures that the results presented here are defensible, comparable over time and can be reproduced. The most recent year of cause of death data available at the time of reporting was 2015.

Differences between the results of this study and other publicly reported estimates may be due to differences in scope and/or the source of cause of death information.

Defining the scope

After data linkage, the scope of the analysis data set was refined to include only those persons with at least 1 day of ADF service from 1 January 2001 to 10 April 2016 (contemporary ADF personnel). To be included in the total analysis set:

- a person's record must have a hire date before the data extract date (10 April 2016)
- the person must be currently serving full time or in the reserve, or
- if discharged from the ADF, must have a termination date after 1 January 2001, and at least 1 day of service between the hire date and termination date (1 day of service).

Analysis data sets were constructed for two time periods:

- The number and crude rate of suicide deaths, identified both through linkage to the NDI and matching to the DSD, are reported for men and women for the entire period 2001–2015.
- The number and comparative rate of suicide deaths, identified through linkage to the NDI only, are reported for men for the period 2002–2015 (see the section headed 'Comparing suicide rates' on page 6 for more detail).

Counting suicide deaths

Analyses of the incidence of suicide include only deaths with a valid date of death and a cause of death from a certified source:

- the NDI, where the underlying cause of death was determined as intentional self-harm (or sequelae of intentional self-harm) (ICD-10 codes X60–X84, Y87.0)
- the DSD with a status of 'Confirmed'.

The age-specific numbers and rates of suicide deaths presented in this report are based on the age of the ADF personnel at the time of death.

Comparing suicide rates

Comparative analysis was restricted to the period 1 January 2002 to 31 December 2015 for two reasons:

- Serving and reserve population data were not available before 2002 due to a change in personnel management systems at that time.
- Population data for the ex-serving group were calculated using the linked PMKeyS–NDI data from 2001 onwards, starting with zero (0) as at 1 January 2001 and increasing by around 5,000 per year. Due to high volatility in estimates obtained when including the 2001 ex-serving population, analysis of ex-serving personnel was restricted to data from 2002 onwards, in line with reporting for serving and reserve groups.

Comparisons using crude rates

In this study, crude suicide rates are used to compare the incidence of suicide in different groups, taking into account the size of the underlying population.

Comparisons using the standardised mortality ratio

In this study, the SMR is used to control for the difference in age structures between study populations (the three ADF service status groups) and the comparison (Australian) population. A summary of this method is provided in Appendix A1.

The SMR is a widely used and robust method of standardisation for analysing statistically rare events, such as suicide data. In this report, the SMR is calculated by multiplying the crude suicide rate in each age group in the Australian population by the number of people in the ADF population in the corresponding age group to get the 'expected' number of suicide deaths in each age group in the ADF population. These expected counts are then summed across all age groups to obtain the total expected number of suicide deaths in the ADF population. The total actual count of suicide deaths in the ADF population is then divided by the total expected number of suicide deaths to calculate the SMR.

If the age and sex-specific rates are:

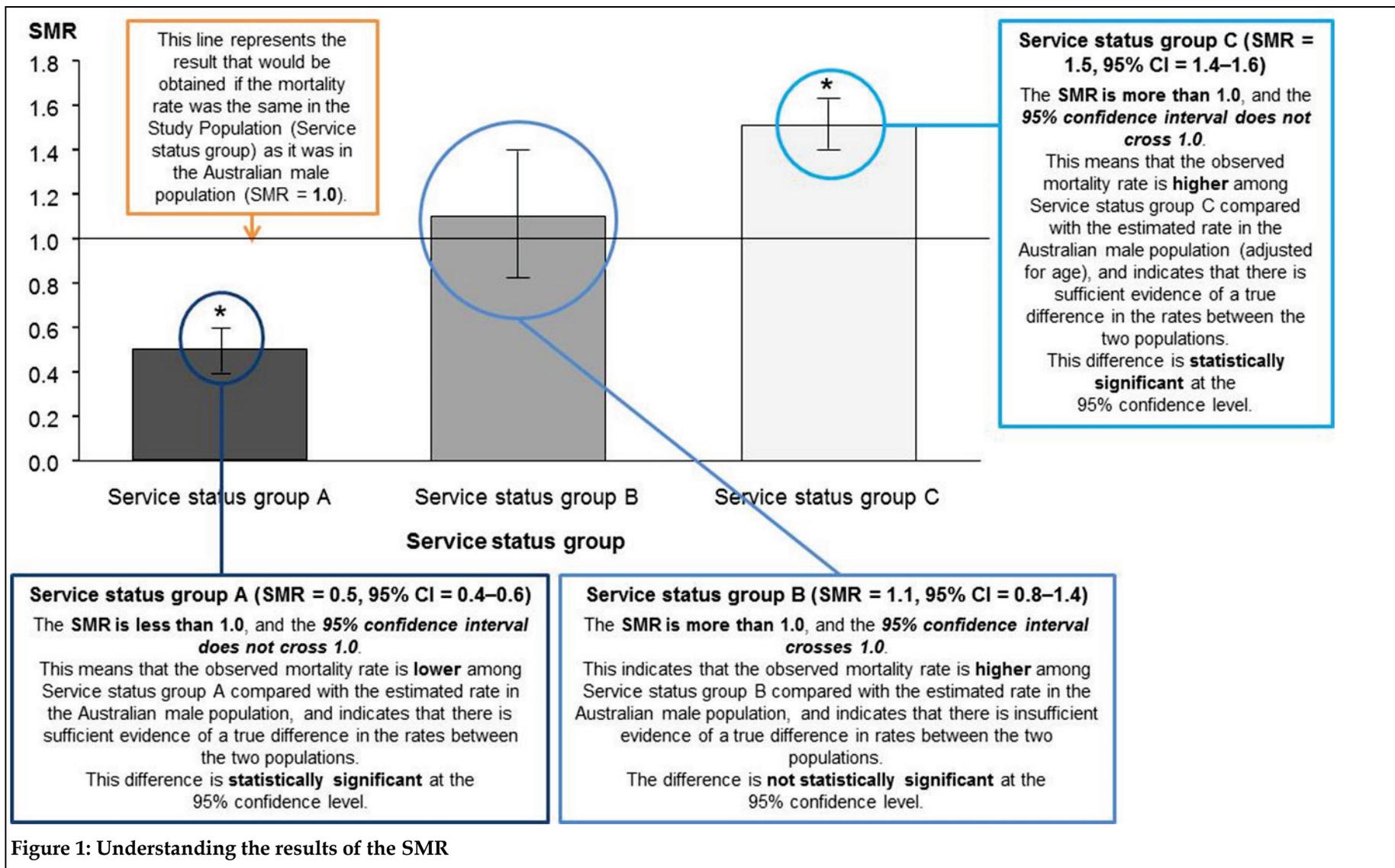
- the same in each population, the SMR is 1.0
- on the whole, higher in the ADF service group than in the Australian population, the SMR will be more than 1.0
- on the whole, lower in the ADF service group than in the Australian population, the SMR will be less than 1.0.

Figure 1 shows how these results will be presented in this report.

It is important to note that SMRs cannot be compared with each other because different weighting is used to generate each result (AIHW 2011).

More information about the data sources, statistical measures and methods used in this study are in appendixes A and B.

Detailed statistical tables can be found in Appendix C.



What are the key findings of this study?

Incidence of suicide 2001–2015

This study identified 325 certified suicide deaths between 2001 and 2015 among serving, reserve and ex-serving personnel with at least 1 day of ADF service in that period. This total comprises 90 suicide deaths in the population serving full time, 69 in the reserve population and 166 in the ex-serving population.

Men accounted for more than 9 in 10 suicide deaths (303 deaths, 93%) and 84% of the ADF populations examined in this study. Women accounted for 22 deaths (7%).

The largest number of suicide deaths occurred in serving, reserve and ex-serving personnel aged 18–29 (132, 41%). There were 92 suicide deaths (28%) in serving, reserve and ex-serving personnel aged 30–39 and 101 suicide deaths in those aged 40–69 (31%).

Comparative suicide rates 2002–2015

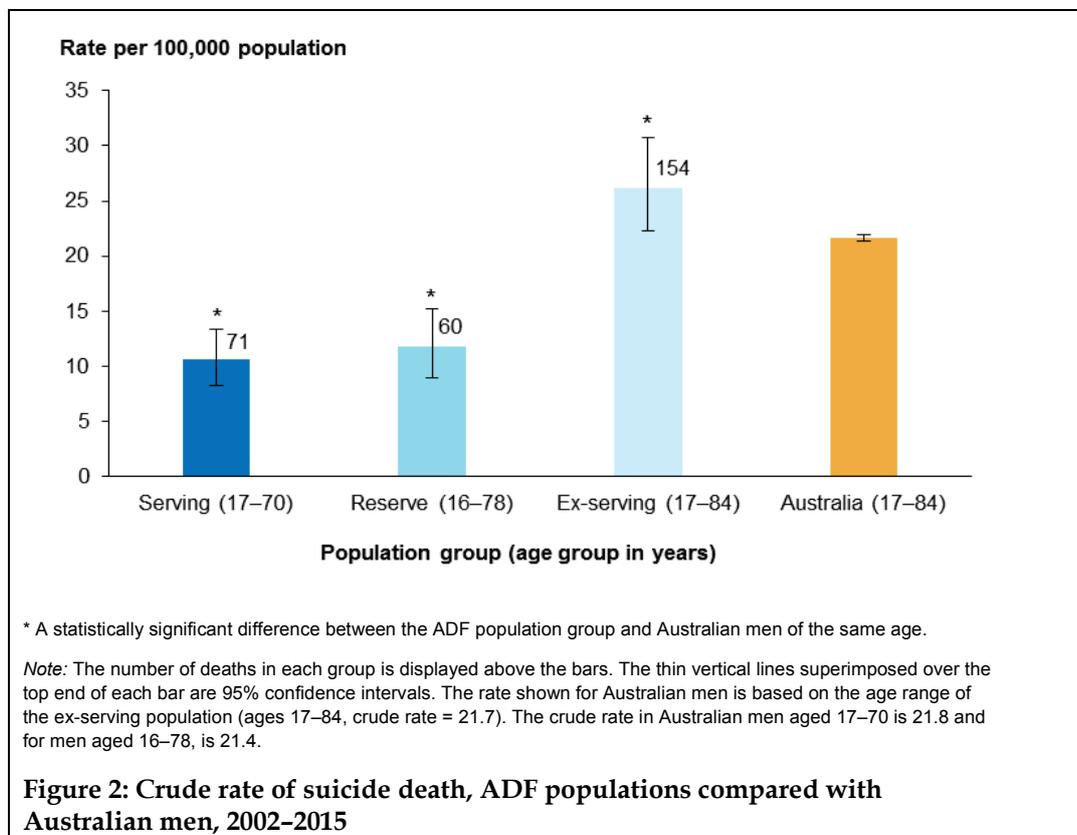
To examine whether ADF service has an impact on the risk of suicide in serving full time, reserve and ex-serving personnel, it is important to consider rates of suicide across these groups within the context of suicide rates in the wider community. In other words, it is necessary to examine whether suicide rates in each service group are significantly higher than, lower than or the same as rates in the Australian population from which the defence forces have been drawn—and hence whether there is evidence of service being associated with suicide risk.

Crude suicide rates for men and women are now presented, followed by an analysis by age across service groups, and compared with the Australian population.

Men: crude rates

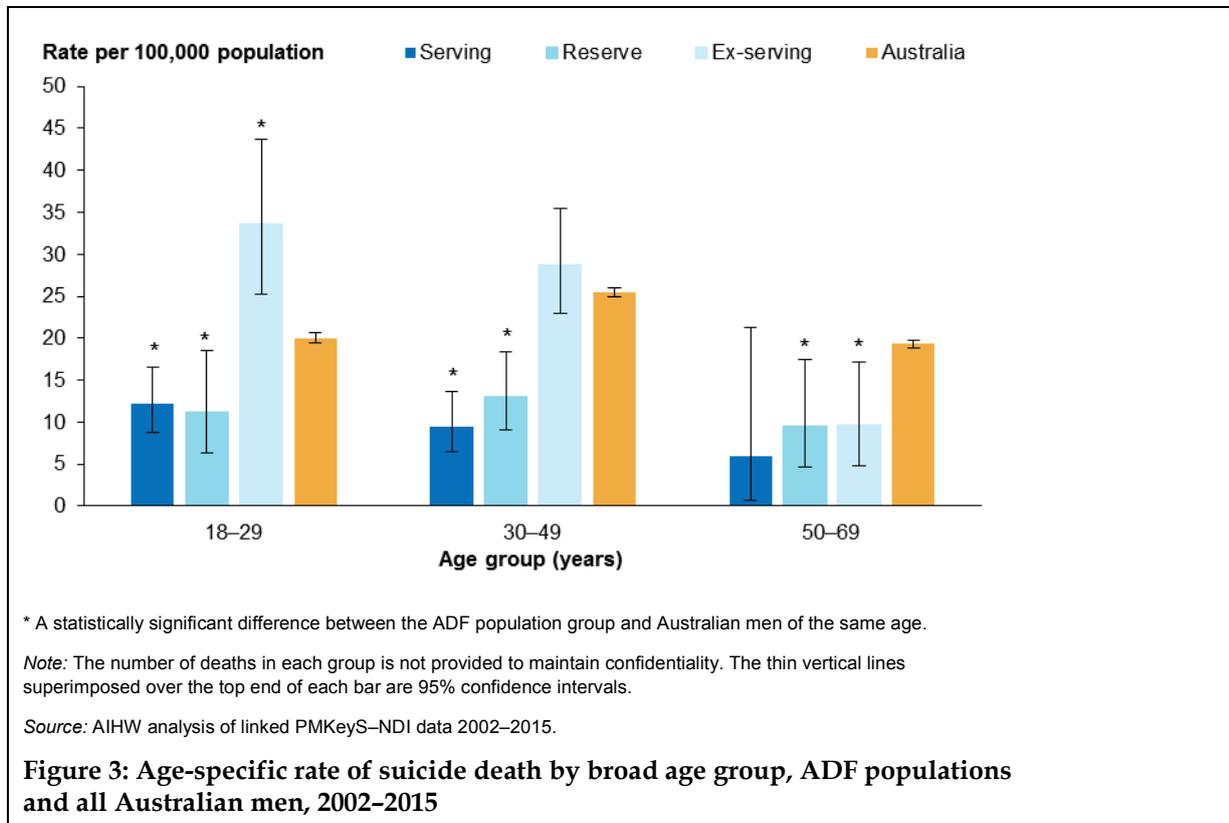
Between 2002 and 2015, there were:

- 71 suicide deaths among serving men (a crude rate of 11 per 100,000 population) and 60 suicide deaths among men in the reserve (a crude rate of 12 per 100,000 – see Figure 2). Both these rates were significantly lower than crude suicide rates for men in the Australian population (22 per 100,000 population)
- 154 suicide deaths among the ex-serving population, a crude rate of 26 per 100,000 population. This rate was more than twice as high as rates in the serving full time and reserve populations and 1.18 times as high as (18% higher than) crude suicide rates for men in the Australian population (22 per 100,000 population). This difference is statistically significant but does not take into account differences in the age structure between the two populations.



ADF populations by age

Between 2002 and 2015, younger ex-serving men had a higher risk of suicide death than Australian men of the same age (Figure 3).



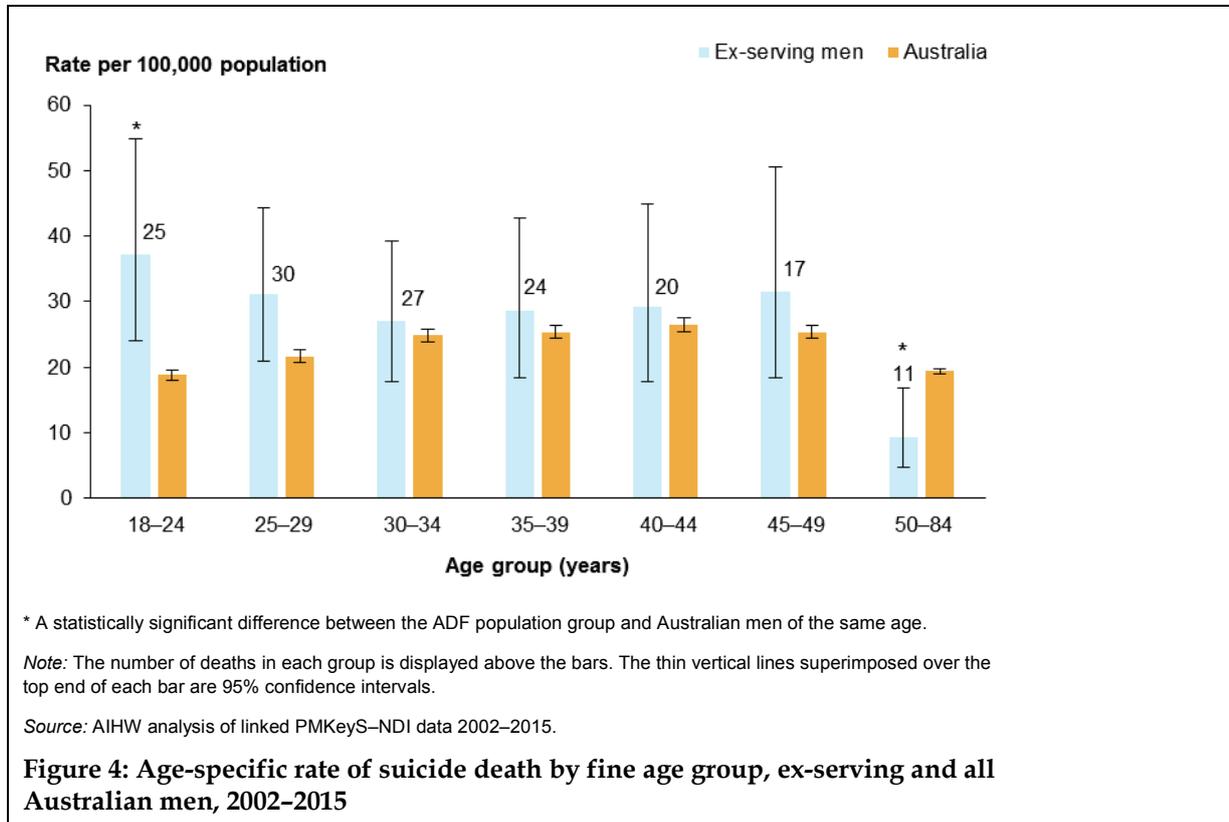
The rate of suicide among ex-serving men aged 18–29 was 1.7 times as high as the rate in men of the same age in the Australian population (34 per 100,000 population compared with 20 per 100,000 for Australian men). The age-specific rate in the 30–49 age group was also higher than that for the Australian population (29 per 100,000 population compared with 26 per 100,000 for Australian men) but the difference was not statistically significant.

Compared with Australian men of the same age, age-specific rates were significantly lower for the following groups: men serving full time aged 18–49; men in the reserves aged 18–69; and ex-serving men aged 50–69.

The smaller number of suicide deaths in the serving full time and reserve populations prevented any more detailed analysis by age.

Ex-serving men by age

Between 2002 and 2015, there was little difference in the age-specific rates of suicide among ex-serving men aged under 50 (ranging from 27 per 100,000 population in the 30–34 age group to 37 per 100,000 population in the 18–24 age group) (Figure 4). Suicide rates were much lower among ex-serving men aged 50–84 (9 per 100,000), where rates in the other age groups were between 3 and 4 times as high.



In the period 2002–2015, younger ex-serving men were at higher risk of suicide death than all Australian men of the same age.

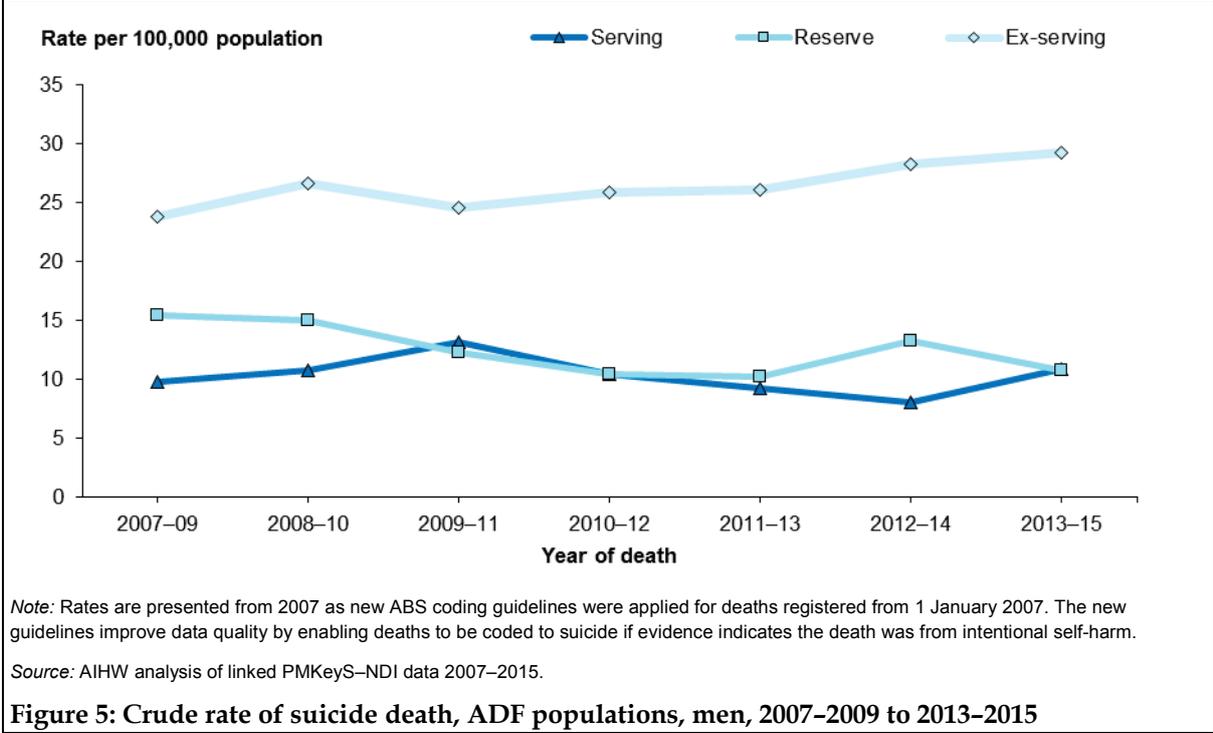
Ex-serving men aged 18–24 had a suicide rate twice that of Australian men of the same age (37 per 100,000 population compared with 19 per 100,000 population). This difference was statistically significant.

Ex-serving men aged 25–29 had a suicide rate 1.4 times as high as that for Australian men of the same age (31 per 100,000 population compared with 22 per 100,000 population). However, the difference was not statistically significant.

Changes over time

There were 28 suicide deaths among ex-serving men in the 3-year period from 2007 to 2009, 42 between 2010 and 2012, and 60 between 2013 and 2015. While this suggests an increase in the number of suicides over the period (2007–2009 to 2013–2015), the ex-serving population was increasing by around 5,000 people per year and this increase in the number of suicides was only marginally higher than would be expected from increases in the ex-serving population during this time. Therefore it is important to look at rates to account for the increasing size of the study population.

Rates of the number of suicides per 100,000 population (crude rates) are now presented. These are considered a better measure to assess changes over time than the number of deaths as they take into account changes in the size of the underlying population. Due to changes in ABS coding guidelines for suicide deaths, rates in this section are presented from 2007.



Between 2007–2009 and 2013–2015, the crude rate of suicide among:

- serving men, fluctuated around 10 per 100,000 population
- the reserve population, fluctuated between 10 and 15 per 100,000 population
- the ex-serving population, gradually increased from 24 per 100,000 in 2007–2009 to 29 per 100,000 in 2013–2015 (but this increase was not statistically significant based on overlapping confidence intervals) (Figure 5).

It is too early to tell whether the increase observed in the ex-serving crude suicide rate in the latter part of the period is greater than what you would expect due to chance as these rates are based on a small number of deaths. This will continue to be monitored as more years of data become available.

From 2010–2012 onwards, crude suicide rates in the ex-serving population were significantly higher than those for the serving population. They were also significantly higher than those for the reserve population across the same period, except for 2012–2014.

Women: crude rates

In 2002–2015, there were 19 suicide deaths among women with at least 1 day of service on or after 1 January 2001; 11 were ex-serving personnel.

The suicide rate in younger women (18–29) across all service groups (serving full time, reserve and ex-serving) was 1.8 times as high as the rate for women aged 30–69.

The rate of suicide death among women in all service groups (serving, reserve and ex-serving) aged 18–29 was 8.5 per 100,000 population, which is higher than the rate in Australian women of the same age (5.7 per 100,000 population). This difference was not statistically significant.

The rate of suicide death among women across all service groups aged 30–69 was 4.6 per 100,000 population, which is lower than the rate in Australian women of the same age (6.8 per 100,000 population). This difference was not statistically significant.

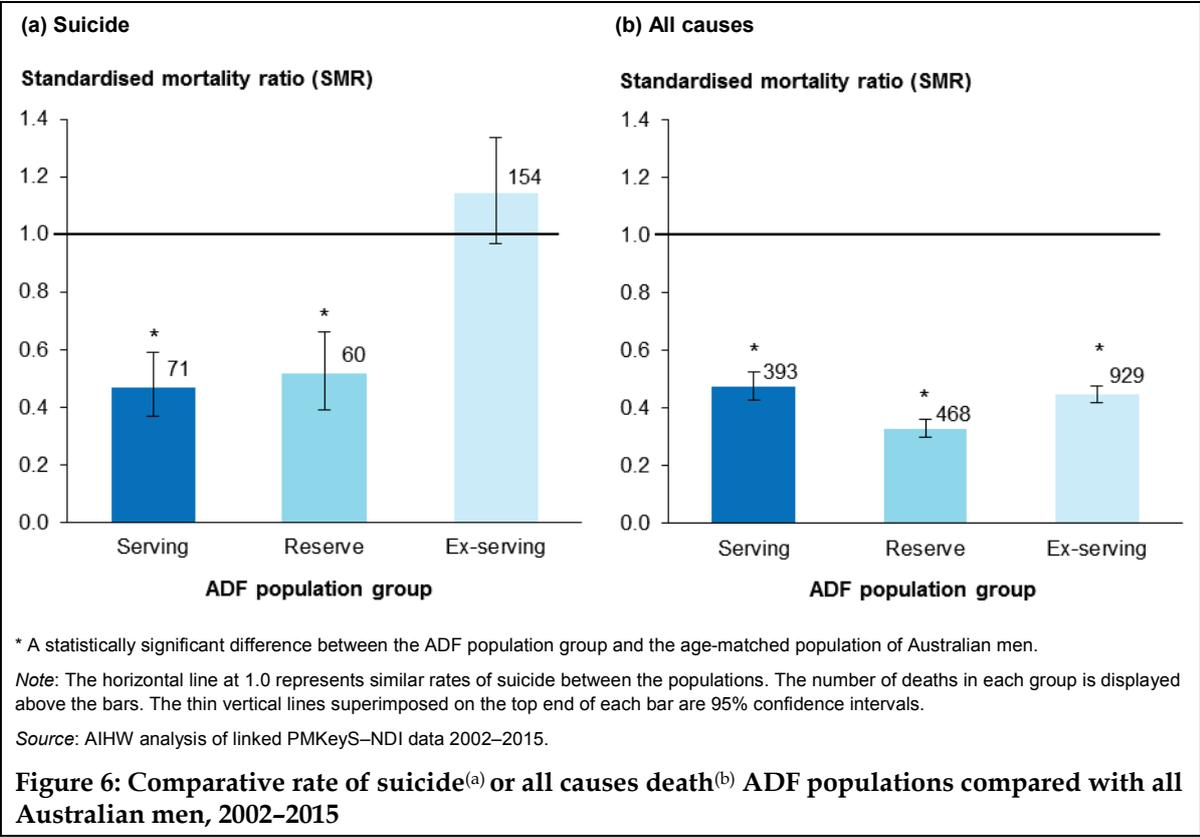
It is important to note that these findings are based on small numbers of deaths. Due to the small number of women in the study, it was not possible to perform any further analysis of this group.

Taking into account different age structures in overall rates

Overall crude rates do not take into account differences in age structure between populations. The ADF study populations (that is, the three ADF service status groups) and the Australian population have different age structures; the ADF populations have a younger age profile than the Australian population (see Appendix Table C1).

In this study, the SMR is used to control for the difference in age structures between study populations and the comparison (Australian) population.

In the period 2002–2015, compared with all Australian men, the suicide rate was 53% lower (SMR = 0.47) among men serving full time and 49% lower (SMR = 0.51) among men in the reserve population, after adjusting for age (Figure 6). These differences were statistically significant.



The rate of suicide was 14% higher (SMR = 1.14) among ex-serving men than among all Australian men, after adjusting for age. This difference was not statistically significant.

This finding is more precise than the significant finding based on crude rates (18% higher) reported earlier in the section headed 'Men: crude rates' on page 9 as it takes into account the different age structures across the two populations.

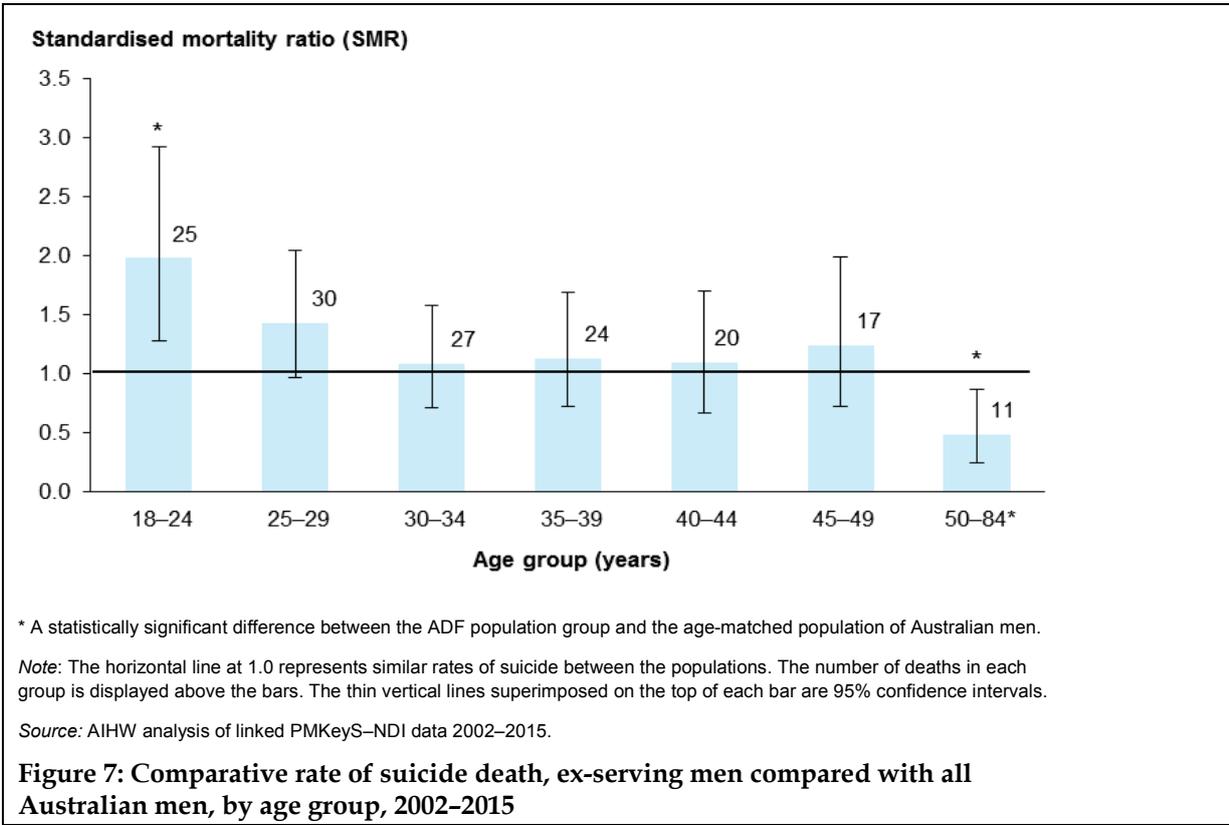
In the period 2002–2015, all-cause mortality rates were similar in men across each of the ADF service groups (serving full time, in the reserves and ex-serving), and significantly lower when compared to all-cause mortality rates in Australian men of the same age. The all-cause mortality rate was 53% lower (SMR = 0.47) among men serving full time, 67% lower (SMR = 0.33) among men in the reserve and 55% lower (SMR = 0.45) among ex-serving men. These differences were all statistically significant.

Standardised mortality ratios by age

In the period 2002–2015, younger ex-serving men were at higher risk of suicide death than all Australian men of the same age (Figure 7).

Among ex-serving men, those aged 18–24 accounted for 1 in 6 suicide deaths (25 deaths, 16%) and had a suicide rate twice that of Australian men of the same age (SMR = 2.0). This difference was statistically significant.

Ex-serving men aged 25–29 accounted for slightly more deaths overall (30 deaths, 19%) and had a suicide rate 1.4 times as high as that for Australian men of the same age (SMR = 1.4). However, the difference was not statistically significant.



Men serving full time and in the reserve across all age groups had lower rates of suicide death compared with all Australian men of the same age.

Service-related characteristics associated with suicide death in ex-serving men

This section presents more detailed analysis of suicide among the ex-serving ADF population discharged after 1 January 2001. It explores service-related factors that may indicate groups at higher risk of suicide death in this population. Crude rates are compared across groups of ex-serving men with different service characteristics to identify those characteristics that may be influencing the higher overall rate of suicide in the ex-serving population. Service-related factors examined include service, rank, operational service (warlike or non-warlike operations and other designated domestic and international operations), length of service, and reason for discharge.

Where a higher rate is found in one group, age-specific rates are examined for that group and compared with age-specific rates in men in the Australian population. This highlights specific age groups that may be influencing higher overall crude suicide rates in each group.

It is important to note that while crude rates adjust for differences in population size, they do not adjust for differences in characteristics between groups. Therefore, it is possible that higher crude suicide rates may be associated with characteristics that have not been accounted for in the analysis, such as age or marital status.

As well as an analysis of service-specific characteristics, this report also presents an analysis of the timing of suicide death in relation to the date of separation from the ADF.

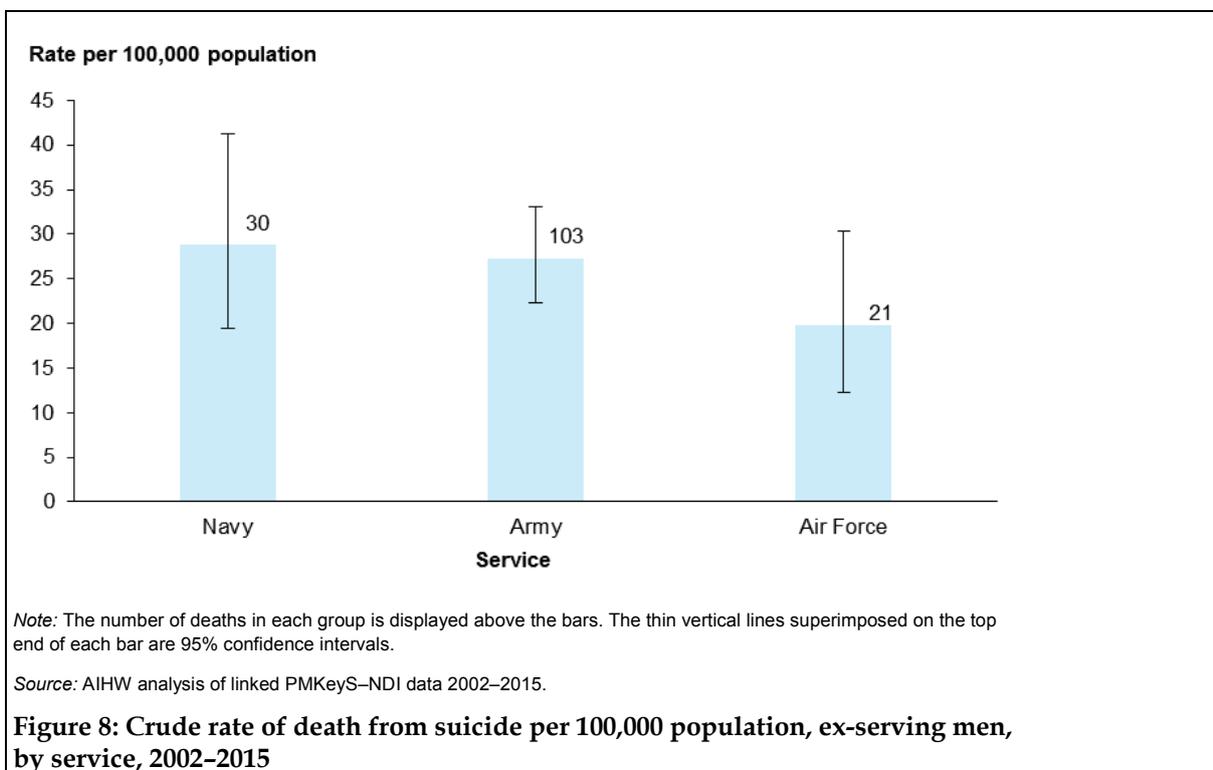
Service

The ADF has three services: the Navy, Army and the Air Force. An individual can serve in more than one service during their ADF employment, but only the service at time of separation is available for this study.

Between 2002 and 2015, among ex-serving personnel at the time of separation, there were:

- 30 suicide deaths among those serving in the Navy, a crude suicide rate of 29 per 100,000 population
- 103 suicide deaths among those serving in the Army, a crude rate of 27 per 100,000
- 21 suicide deaths among those serving in the Air Force at the time of separation, a crude rate of 20 per 100,000 (Figure 8).

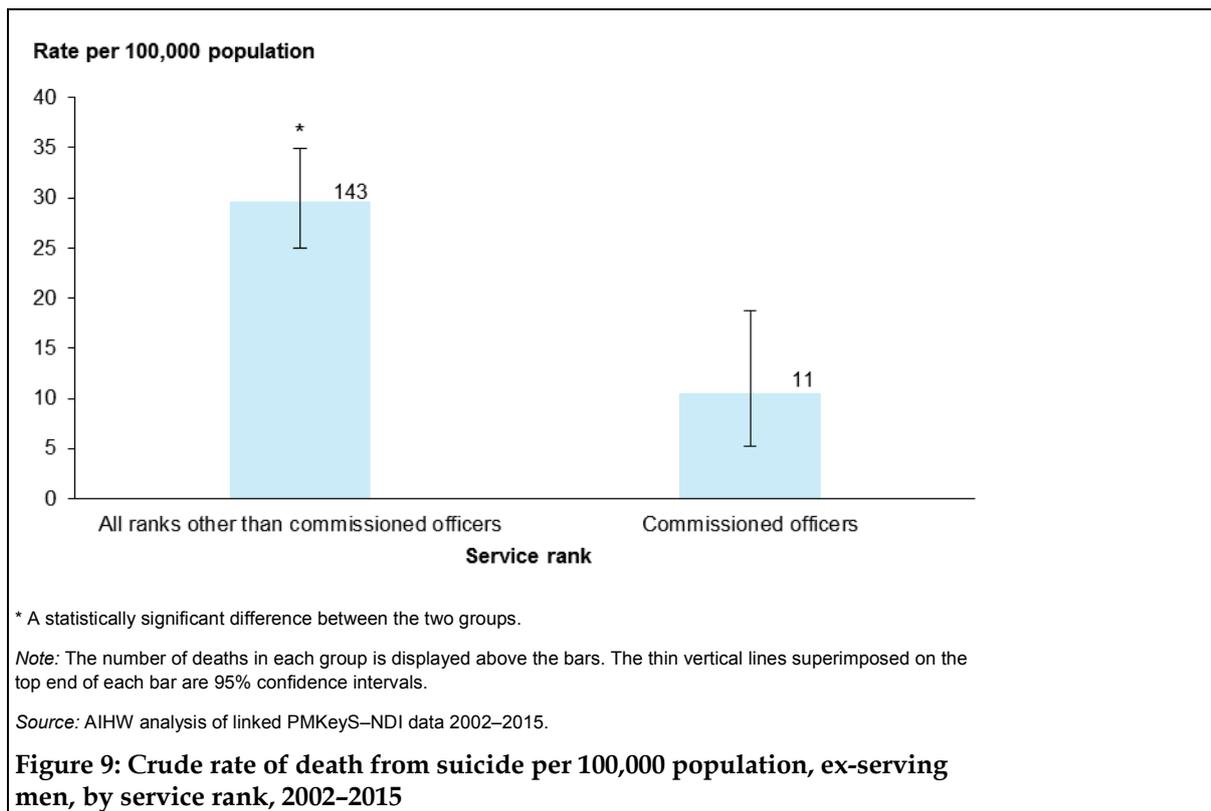
There was no significant difference in crude suicide rates between the different services.



Rank

Rank describes positions in the ADF operational hierarchy and is a proxy measure for socioeconomic status, including education, training and income. Analysis by rank is presented by two broad groups: Commissioned officers (such as Midshipman, Major and Wing Commander) and all other ranks (such as Aircraftman, Sergeant and Warrant Officer), and may indicate that personnel serving at different ranks in the ADF are at higher or lower risk of suicide.

Between 2002 and 2015, there were 11 suicide deaths among ex-serving personnel who were ranked as commissioned officers at the time of separation, a crude suicide rate of 11 per 100,000 population (Figure 9). Among ex-serving personnel serving in all other ranks at the time of separation, the number of suicide deaths was 143, a crude rate of 30 per 100,000.



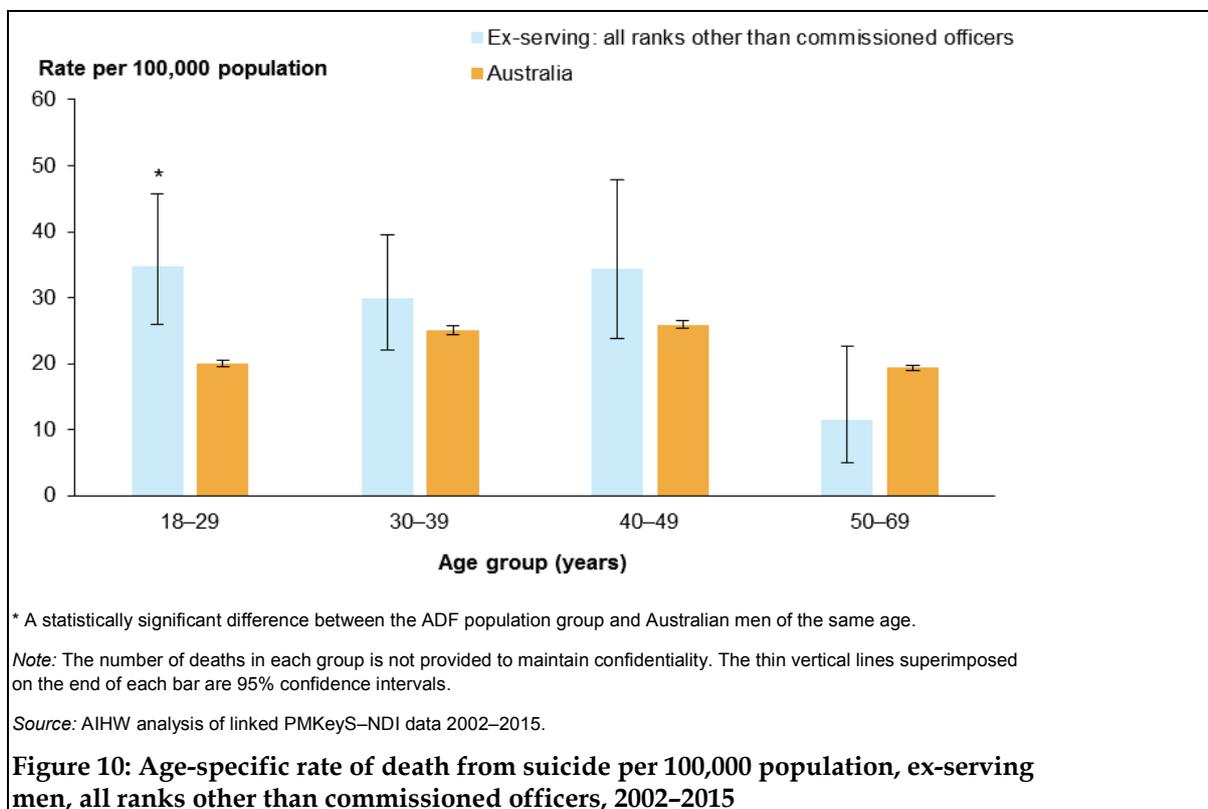
The crude suicide rate for those in all other ranks was 2.8 times as high as the rate for officers. This difference was statistically significant. These findings show that discharge in all ranks other than commissioned officers may be associated with higher crude rates of suicide in the ex-serving population.

All ranks other than commissioned officers by age

Age-specific suicide rates among ex-serving men ranked as commissioned officers are not presented due to the very small number of deaths in each age group.

There was no significant difference in suicide rates by age for ex-serving men aged 18–49 in all other ranks. Suicide rates were significantly lower among ex-serving men in all other ranks aged 50–69 than rates in those age 18–49. These findings are consistent with the overall pattern of crude suicide rates in the ex-serving population by age.

When compared with men in the Australian population of the same age, suicide rates tended to be higher in those aged 18–49 (Figure 10). Men in all other ranks aged 18–29 had rates that were 1.7 times as high as Australian men of the same age (35 compared with 20 per 100,000). This difference was statistically significant and in line with findings for ex-serving men aged 18–29 overall. The highest number of deaths was in the 18–29 age group.

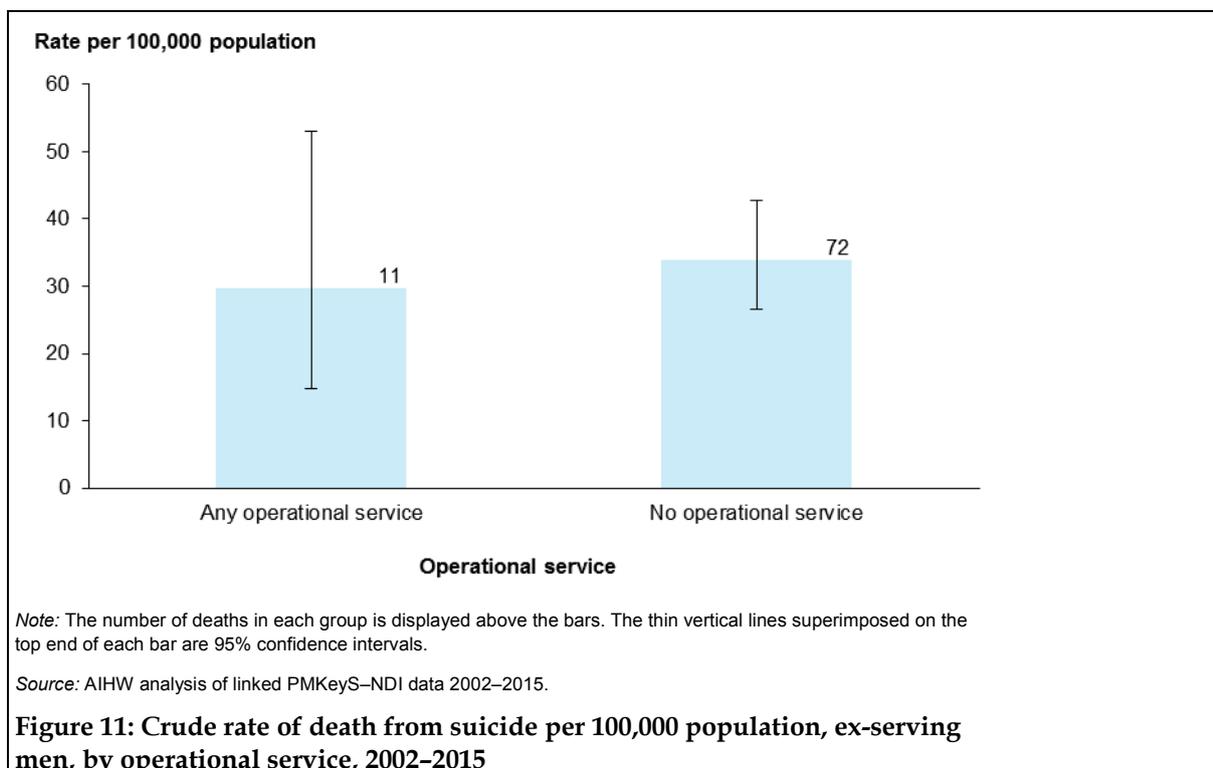


Operational service

Operational service refers to four broad categories of deployment or operations: warlike operational service relates to war-like/active service deployments; non-warlike operational service relates to non-warlike (for example, peace-keeping, peace-monitoring, UN assistance missions) deployments; overseas operational service relates to humanitarian/disaster relief (International) or Border protection deployments; and, domestic operational service relates to deployment of Defence aid to the civil community. Individuals with at least one type of operational service are counted in 'Any', and those with no operational service are counted in 'None'. Only operational service since 1 January 1999 has been consistently identified across the four operational service categories. To ensure comparability, analysis of operational service only includes personnel hired on or after 1 January 1999. Analysis by operational service may indicate both protective factors (increased training, experience and resilience) and risk factors (physical injury, exposure to high stress and traumatic environments and events).

Between 2002 and 2015, there were 11 suicide deaths among ex-serving personnel with any operational service, a crude suicide rate of 30 per 100,000 population (Figure 11). Among ex-serving personnel with no operational service the number of suicide deaths was 72, a crude rate of 34 per 100,000. There was no statistically significant difference in rates between these groups.

Due to the reduced scope of this analysis to include only contemporary ex-serving personnel hired on or after 1 January 1999, the number of ex-serving personnel with operational service is small. As such, it is not possible to perform further analysis on this group.



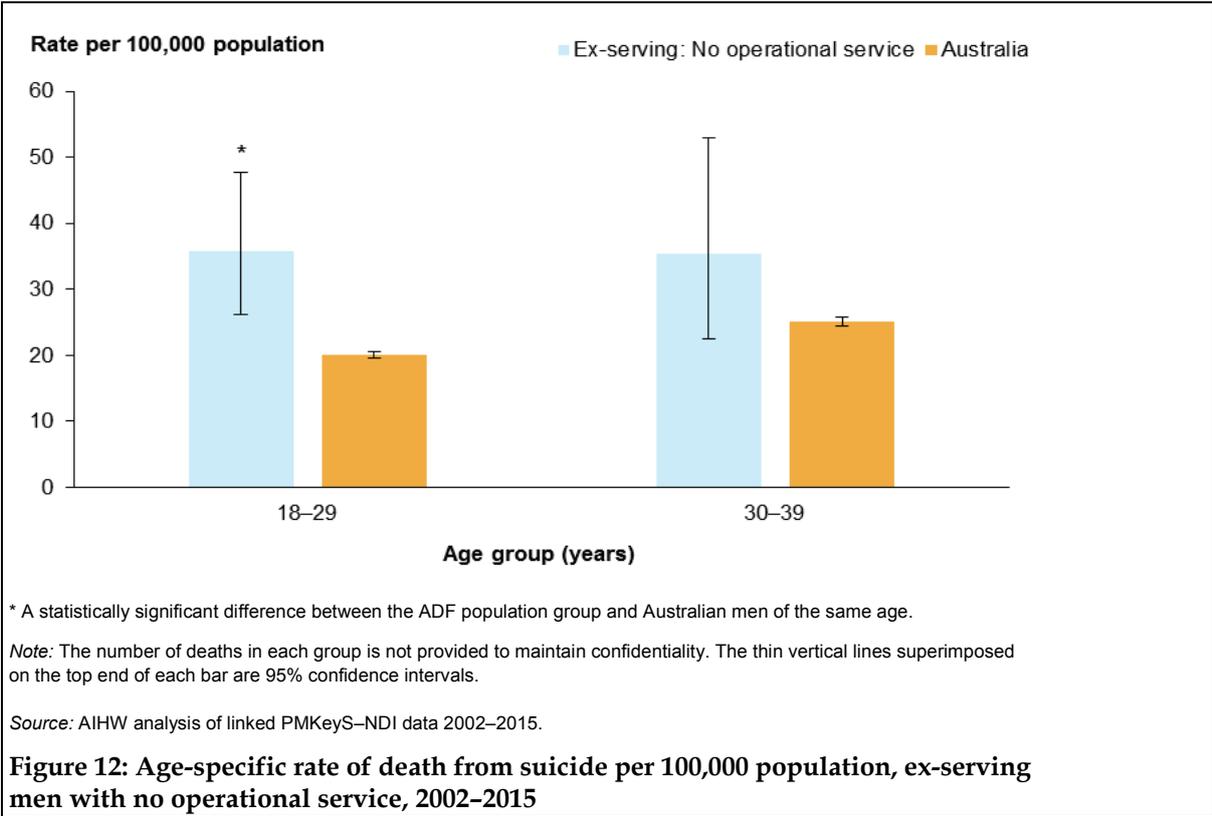
Note: Under the *Veterans' Entitlements Act (VEA) 1986*, the definition of operational service differs substantially to how it is defined and presented within this report. To ensure all operations could be included within this study, the term operational service was deemed

the most appropriate. There are no changes to the legislative and policy definitions of the term operational service under the VEA. A full definition of operational service as it is utilised in this study is described in Appendix A3.

No operational service by age

Given the high number and rate of suicide in the no operational service group, crude rates by age group were calculated to determine if a particular age group was at higher risk.

There was no significant difference in suicide rates by age for ex-serving men aged 18–39 with no operational service (Figure 12). This finding is consistent with the overall pattern of crude suicide rates in the ex-serving population by age.



However, suicide rates for ex-serving men aged 18–39 with no operational service tended to be higher than rates for all men in the Australian population of the same age. For ex-serving men with no operational service, suicide rates in those aged 18–29 were 1.8 times as high as Australian men of the same age (36 compared with 20 per 100,000). This difference was statistically significant and in line with findings for ex-serving men aged 18–29 overall. The number of deaths was also the highest in this age group.

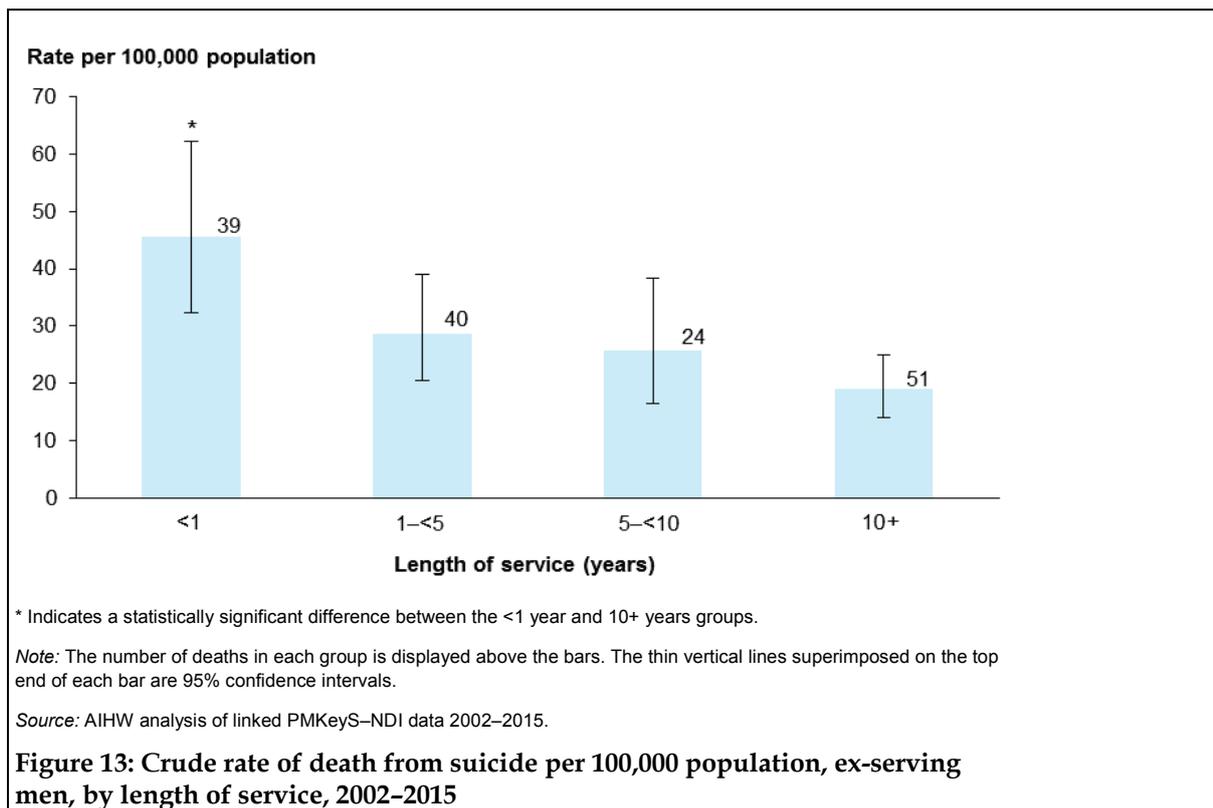
The suicide rate for those aged 30–39 was 1.4 times as high as for Australian men of the same age (35 compared with 25 per 100,000). This difference was not statistically significant and was in line with overall findings for ex-serving men aged 30–39.

Length of service

Length of service describes the period of time between enlistment in the ADF and separation (discharge), and is presented in four groups: less than 1 year of service (<1), 1 to less than 5 years (1–<5), 5 to less than 10 years (5–<10), and 10 or more years of service (10+). These groupings represent early discharge, short and mid-term service and longer periods of service, respectively, and reflect different service experiences and career pathways. Analysis by length of service may identify subgroups of men who may be at higher or lower risk of suicide death.

Between 2002 and 2015, among ex-serving personnel with:

- less than 1 year of service, there were 39 suicide deaths, a crude suicide rate of 46 per 100,000 population
- 1 to less than 5 years of service, there were 40 suicide deaths, a crude rate of 29 per 100,000
- 5 to less than 10 years of service, there were 24 suicide deaths, a crude rate of 26 per 100,000
- 10 or more years of service, there were 51 suicide deaths, a crude rate of 19 per 100,000 (Figure 13).



The crude suicide rate for those with a length of service less than 1 year was 2.4 times as high as the rate for those with 10 or more years of service. This difference was statistically significant. These findings suggest that shorter length of service may be associated with higher crude rates of suicide in the ex-serving population.

The crude suicide rate for those with a length of service less than 1 year was also significantly higher than the overall rate of suicide in the ex-serving population. This suggests this group may be particularly vulnerable and at risk of death by suicide.

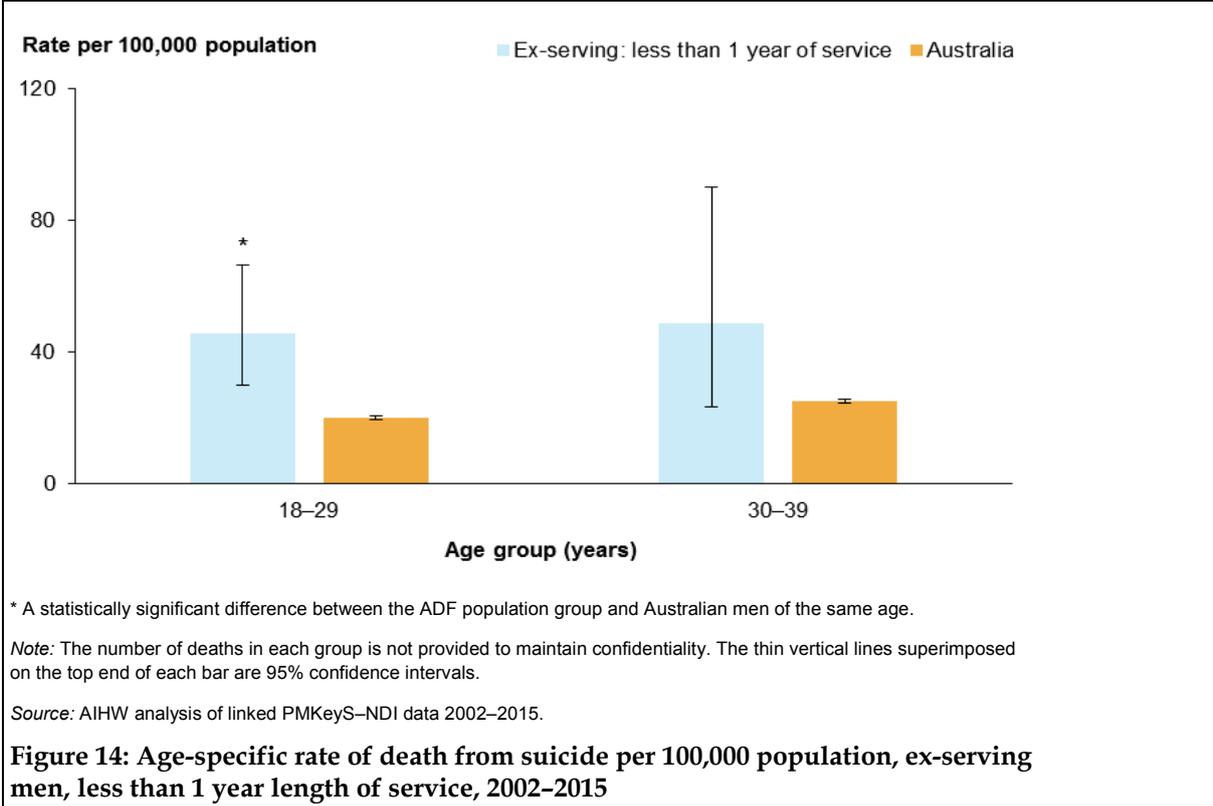
Less than 1 year length of service by age

In ex-serving men with less than 1 year of service at the time of discharge, there was no significant difference in suicide rates by age in men aged 18–39 (Figure 14). This finding is consistent with the overall pattern of crude suicide rates in the ex-serving population by age.

Compared with rates in all men in the Australian population of the same age, suicide rates were significantly higher in ex-serving men aged 18–39 with less than 1 year of service. The suicide rate for those aged 18–29 was 2.3 times as high as for Australian men of the same age (46 compared with 20 per 100,000). This difference was statistically significant and in line with overall findings for ex-serving men aged 18–29. The suicide rate for those aged 30–39 was 1.9 times as high as for Australian men of the same age (49 compared with 25 per 100,000). This difference was not statistically significant and was in line with overall findings for ex-serving men aged 30–39.

The number of deaths was also the highest in the 18–29 age group.

It is worth noting that ex-serving men with less than 1 year of service are much more likely to be younger than ex-serving men with 10 or more years of service.



Reason for discharge

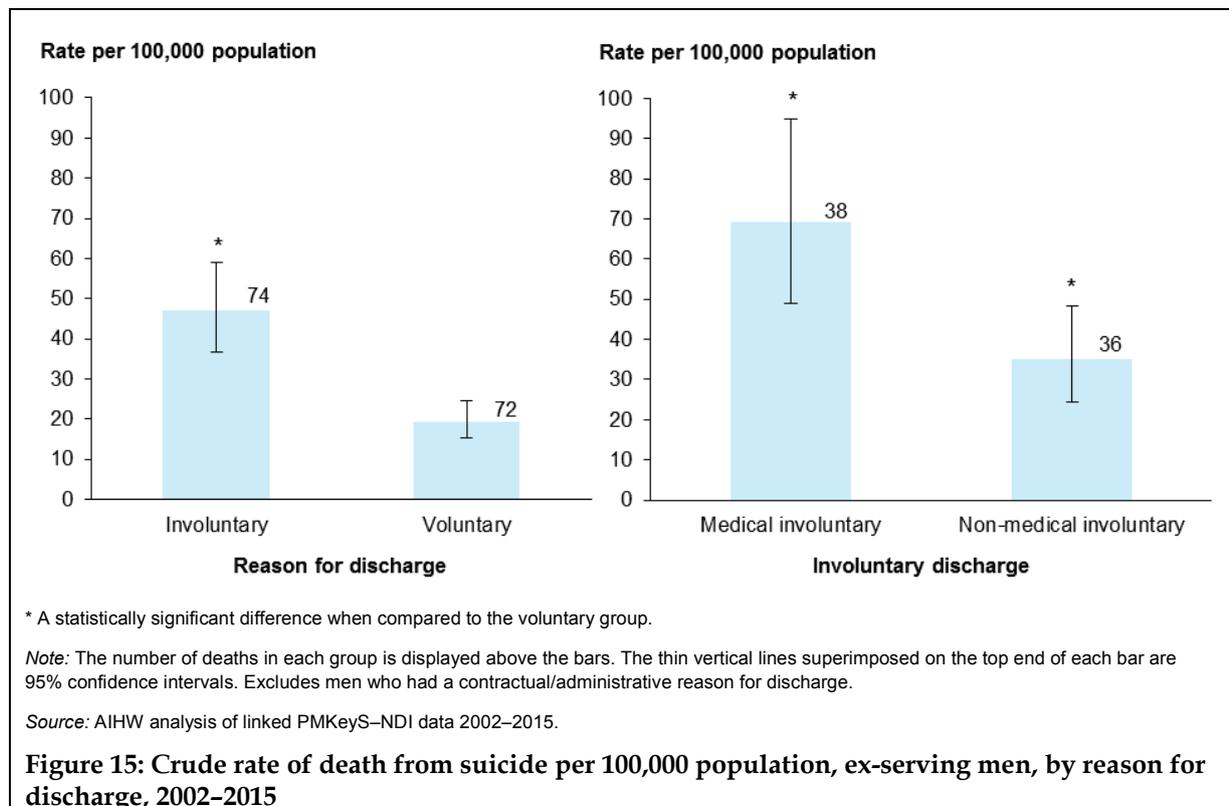
The reason for discharge from the ADF may be voluntary or involuntary. The means and process of discharge may reflect transition pathways associated with increased risk of suicide death. Voluntary discharge includes voluntary redundancies and resignations. Those discharged involuntarily comprise two groups: those discharged for medical reasons (including those deemed medically unfit) and those discharged for non-medical reasons (including those discharged for disciplinary reasons).

Between 2002 and 2015, crude suicide rates were significantly higher among ex-serving men who were discharged involuntarily (including for medical and for non-medical reasons) compared to those with a voluntary reason for discharge.

The crude suicide rate for men discharged for involuntary reasons was 2.4 times as high as for those discharged voluntarily (Figure 15). This difference was statistically significant. There were 74 suicide deaths among ex-serving men discharged for involuntary reasons (a crude suicide rate of 47 per 100,000 population), and 72 suicide deaths (a crude rate of 19 per 100,000) among those discharged for voluntary reasons.

Amongst those discharged involuntarily, the crude suicide rate for men discharged for medical reasons was 3.6 times as high (significantly different) as the rate for men discharged voluntarily. There were 38 suicide deaths in ex-serving men discharged for medical reasons (a crude rate of 69 per 100,000).

There were 36 suicide deaths in those involuntarily discharged for non-medical reasons. This represented a crude rate of 35 suicide deaths per 100,000 which was 1.8 times as high as the rate in men discharged voluntarily (statistically different).



These findings suggest that involuntary discharge may be associated with higher crude rates of suicide in the ex-serving population.

The crude suicide rate for personnel discharged for medical reasons was also significantly higher than the overall rate of suicide in the ex-serving population. This suggests this group may be particularly vulnerable and at risk of death by suicide.

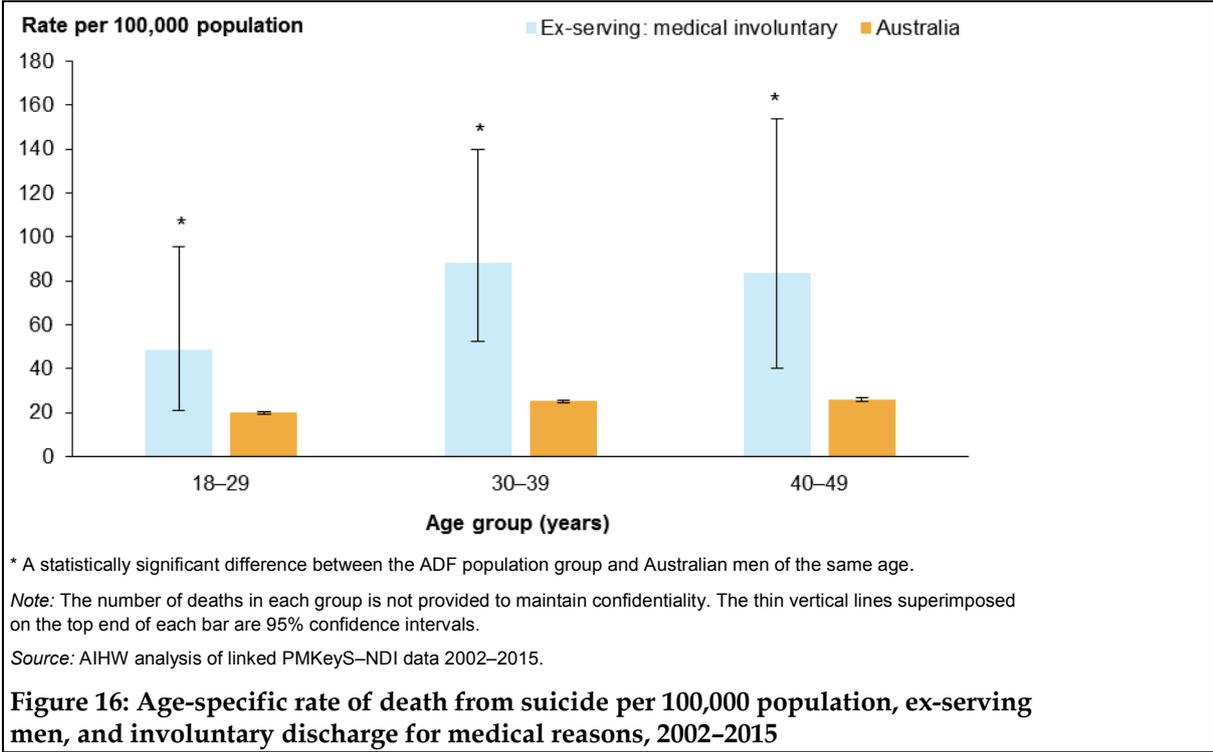
Involuntary discharge for medical reasons by age

Among men discharged involuntarily for medical reasons, there was no significant difference in suicide rates by age, for those aged under 50 (Figure 16). This finding is consistent with the overall pattern of ex-serving suicide rates by age.

Suicide rates were significantly higher in all age groups examined compared with rates in all Australian men of the same age. This differs slightly from findings comparing age-specific rates in ex-serving men, overall, with those for Australian men of the same age, where non-significant differences were found in men aged 30–49 (Figure 3).

- In men aged 18–29, the suicide rate was 2.4 times as high as for Australian men of the same age (49 compared with 20 per 100,000 population).
- In men aged 30–39, the suicide rate was 3.5 times as high as Australian men of the same age (88 compared with 25 per 100,000). This age group had the highest number of suicides.
- In men aged 40–49, the rate was 3.2 times as high (84 compared with 26 per 100,000).

These differences were all statistically significant.



It is important to note, however, that rates in the groups aged 18–29 and 40–49 are based on a small number of suicide deaths and may be sensitive to small changes in counts over time, as shown in Figure 16 by the width of the confidence intervals.

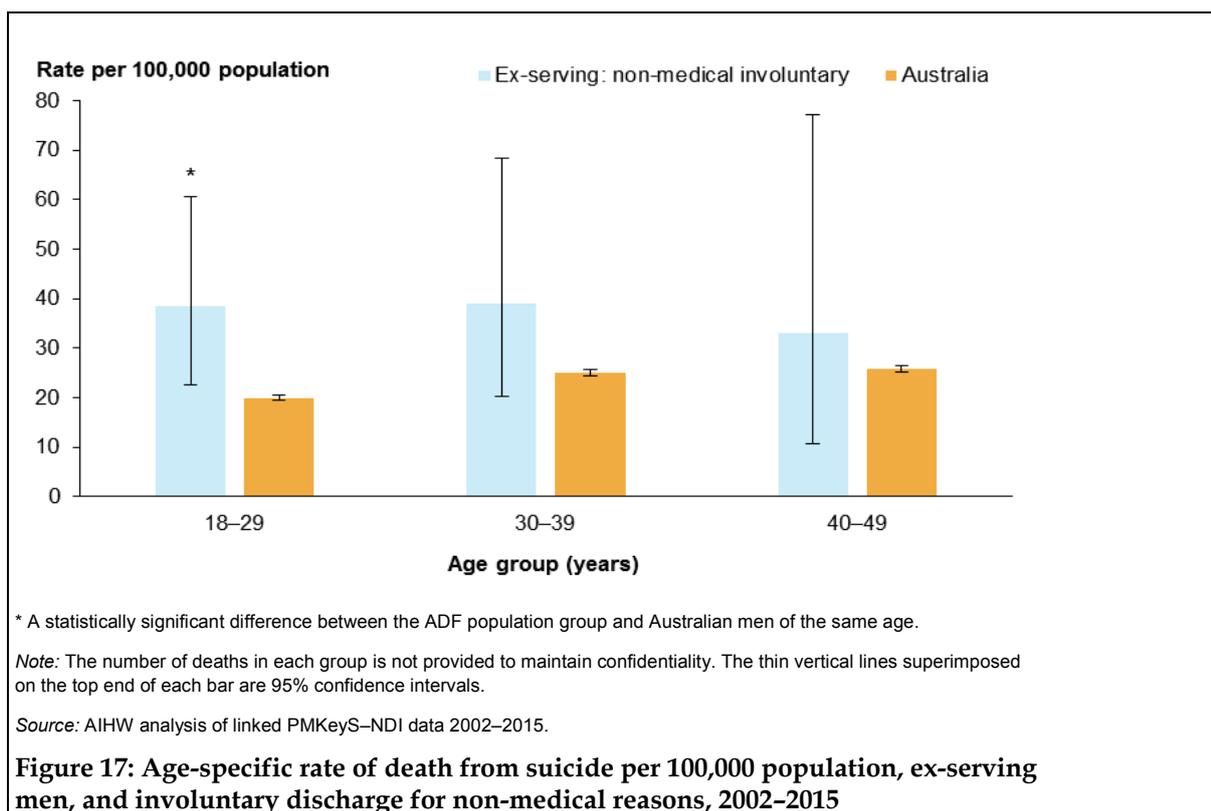
Involuntary discharge for non-medical reasons by age

The highest number of suicide deaths in ex-serving men discharged involuntarily for non-medical reasons was in the 18–29 age group.

Among men who were involuntarily discharged for non-medical reasons, there was no significant difference in suicide rates by age for those aged under 50 (Figure 17). These findings are consistent with the overall pattern of ex-serving suicide rates by age.

Suicide rates in men discharged involuntarily for non-medical reasons tended to be higher than rates in Australian men across all age groups examined.

- When compared with Australian men of the same age, the suicide rate was 1.9 times as high in men aged 18–29 (38 compared with 20 per 100,000 population). This difference was statistically significant and in line with findings for ex-serving men aged 18–29 overall.
- Men aged 30–39 had a suicide rate 1.6 times that of Australian men of the same age (39 compared with 25 per 100,000). This difference was not statistically significant.
- Men aged 40–49 had a suicide rate that was 1.3 times as high as that of Australian men of the same age (33 compared with 26 per 100,000). This difference was not statistically significant.



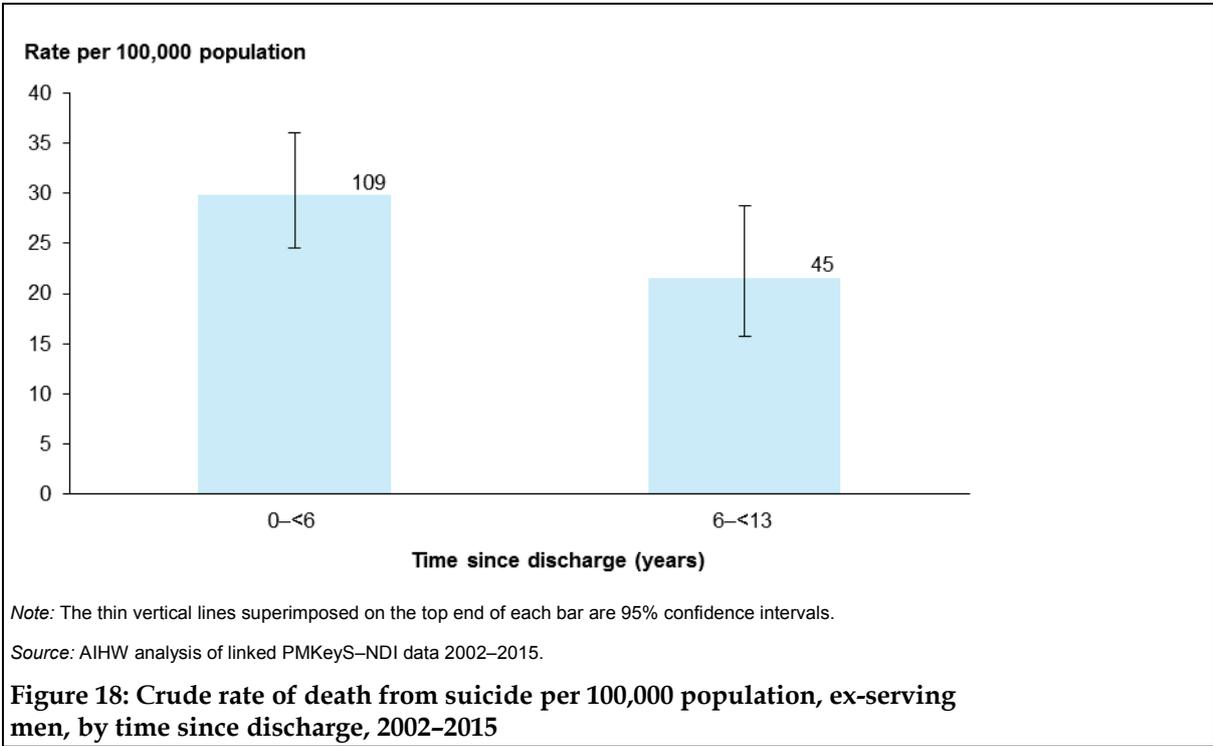
It is important to note, however, that the rate in the group aged 40–49 is based on a small number of suicide deaths and may be volatile over time, as shown by the width of the confidence intervals in Figure 17.

Timing of suicide death

Time since discharge is the time between discharge from the ADF and death. The maximum length of time since discharge that could be observed in this study was 15 years, due to the scope of the study – a focus on contemporary ex-serving personnel. Analysis by time since discharge may identify periods after discharge where ex-serving men may be at higher or lower risk of suicide death.

Between 2002 and 2015, there were 23 suicide deaths among men who had been discharged from the ADF for less than 1 year at the time of death (15% of total suicide deaths) and 86 deaths among men who had been discharged from the ADF for between 1 and less than 6 years at the time of death. Overall, 71% of ex-serving suicide deaths occurred in men discharged from the ADF for less than 6 years at the time of death (109 suicides out of a total of 154). There were 45 deaths among men who had been discharged from the ADF for between 6 and less than 13 years.

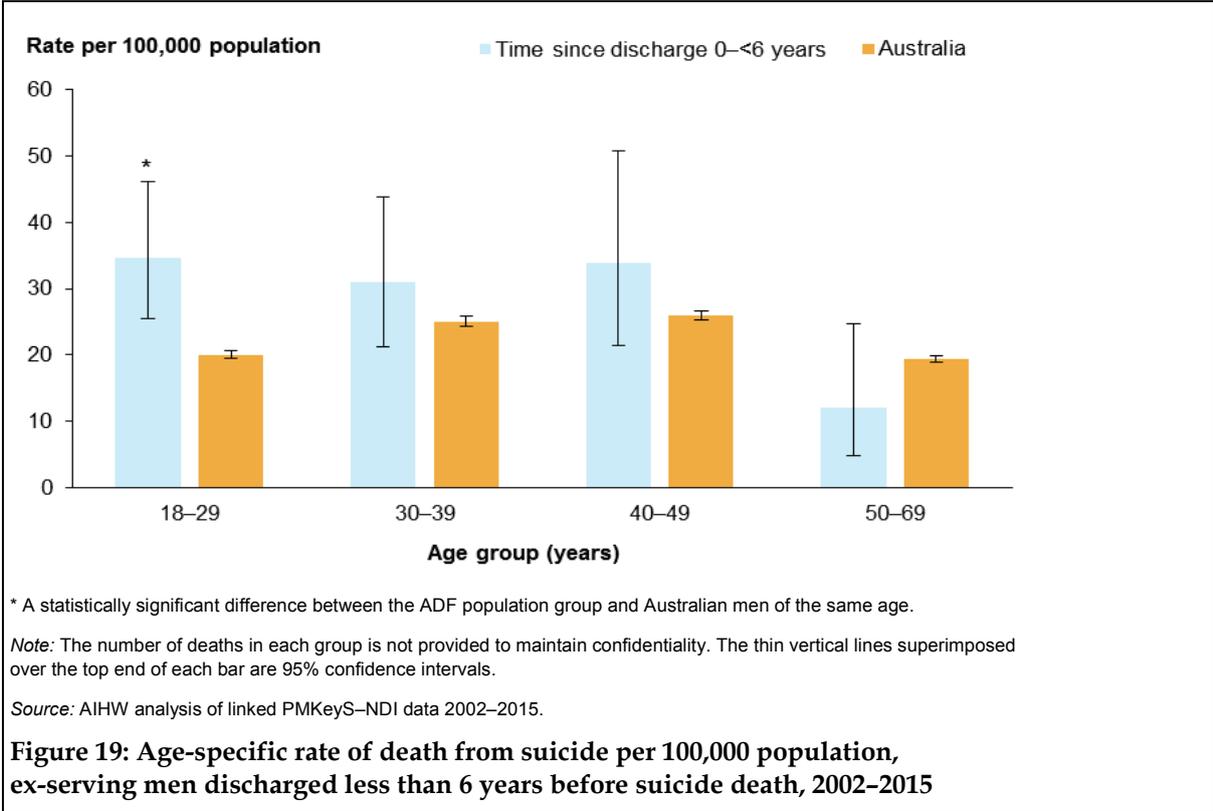
At the time of death, men who had been discharged from the ADF for less than 6 years had crude suicide rates 1.4 times as high as men discharged for between 6 and less than 13 years (30 compared with 22 per 100,000 population) (Figure 18). This difference was not statistically significant.



Suicide death less than 6 years after discharge by age

There was no significant difference in suicide rates by age for ex-serving men aged under 50 who had been discharged from the ADF for less than 6 years at the time of their death (Figure 19). Suicide rates were significantly lower among men aged 50–69. These findings are consistent with the overall pattern of ex-serving suicide rates by age.

For ex-serving men who had been discharged from the ADF for less than 6 years at the time of their death, suicide rates tended to be higher in those aged 18–49 than for men in the Australian population of the same age. For men aged 18–29 the suicide rate was 1.7 times as high as the rate in Australian men of the same age (35 compared with 20 per 100,000). This difference was statistically significant and in line with findings for ex-serving men aged 18–29 overall. The number of deaths was also the highest in this age group.



Discussion

Contribution of key findings to the evidence base and policy analyses

Australian studies of ex-serving ADF personnel to date have not examined factors that may be associated with increased risk of suicide death beyond ADF service or deployment to a particular conflict zone (AIHW 2016a; DVA & AIHW 2005; Jelfs et al. 2003; Sim et al. 2015). This report complements and extends existing studies to compare suicide and all-cause mortality rates between current serving, reserve and contemporary ex-serving ADF personnel – less than 15 years after discharge – and the Australian population. The report explores in detail the demographic and service-specific characteristics of ex-serving personnel who have died by suicide to identify characteristics that may be associated with suicide death.

Suicide and all-cause mortality in serving and reserve personnel

This study has shown that between 2002 and 2015, the suicide rate was 53% lower for men serving full time and 49% lower for men in the reserve than for men in the Australian population of a similar age. These differences are statistically significant and are consistent with significantly lower mortality from all causes of death in these groups. Together, these results suggest there is no excess in suicide mortality in men currently serving full time or in the reserve in the ADF.

Lower all-cause mortality in these populations compared with an age-matched population of Australian men provides evidence of a healthy worker effect, which could be the result of the rigorous selection and training processes employed by the ADF. The healthy worker effect for the ADF is also referred to as the 'healthy soldier effect'. It is a protection afforded to serving ADF personnel above what exists for the general employed population, due mainly to the ongoing need to maintain fitness, and the ready access to health care provided during ADF service. The interaction between the healthy worker effect and suicide risk in the serving ADF population is complex: the high physical, medical and mental health standards for service act as protective factors in opposition to the risks to physical (including loss of life) and mental health (exposure to psychological trauma) inherent in ADF service and deployment. The healthy worker effect in military personnel is recognised in numerous studies both in Australia and internationally (DVA & AIHW 2005; Jelfs et al. 2003; Kang et al. 2015; Kapur et al. 2009).

Suicide and all-cause mortality in contemporary ex-serving personnel

Previous Australian studies of suicide in ex-serving personnel have focused on deaths among men who served in specific conflicts, such as the Vietnam and Korean wars (Adena et al. 1985; DVA & AIHW 2005; Fett et al. 1987; Jelfs et al. 2003; Sim et al. 2015). The findings of these studies have not always been consistent or conclusive. They have also varied by conflict, method of cohort construction, comparison population and duration of follow-up.

The current study finds that, after adjusting for age, suicide rates in ex-serving men were 14% higher than rates for all Australian men. This difference was not statistically significant but should be considered in the context of significantly lower mortality from all causes of death within this group.

The lower all-cause mortality rate in ex-serving men compared with an age-matched population of Australian men suggests that some of the protective factors associated with the healthy soldier effect (for example, good physical health) may still be present to some degree in the ex-serving ADF population. However, the higher suicide rate found in ex-serving men when compared with Australian men suggests that the protective factors (individual or systemic) that may be associated with the lower suicide rates in men serving full time and in the reserve are compromised.

Extra challenges in the transition from full-time or reserve service to ex-serving – such as those associated with loss of employment – are also likely to contribute to the higher suicide rate in the ex-serving group (National Mental Health Commission 2017).

Characteristics associated with high rates of suicide in ex-serving men

Despite several methodological differences, key findings from this study related to the influence of age, rank, length of service and time since discharge on rates of suicide are consistent with findings from studies of ex-serving defence personnel across the United Kingdom, Canada and the United States (Kang et al. 2015; Kapur et al. 2009; Knapik et al. 2009; Rolland-Harris et al. 2015).

The suicide rate for ex-serving men varied by service characteristic. Service characteristics associated with higher crude suicide rates among ex-serving men were all ranks other than commissioned officers, short length of service (less than 1 year) and involuntary discharge (particularly medical discharge). These characteristics were associated with high suicide rates in ex-serving men across all age groups up to age 50. This suggests that no one age group is driving the higher suicide rates in ex-serving men with these service characteristics.

Ex-serving personnel aged 18–29 had significantly higher crude rates of suicide compared with Australian men of the same age. This finding persisted in the analysis of each of the service characteristics examined in this report. This suggests that ex-serving men aged 18–29 are at high risk of suicide death, regardless of individual service characteristics.

Recent analysis from the United States has shown that non-routine discharge from military service (including those discharged with a disability, and those disqualified or discharged for misconduct) was associated with higher risk of suicide (Brignone et al. 2017). The research suggests that reason for discharge could be an important indicator in identifying people at higher risk, and this warrants further investigation. Results of this analysis suggest that reason for discharge may also be a key factor associated with higher risk in the Australian context. This finding could be further explored in future work on this topic.

Australian and international studies are divided on the effect of deployment on the risk of suicide with insufficient statistical evidence in most cases to unequivocally associate deployment with increased risk of suicide death (Sim et al 2015; Kapur et al 2009; Kang et al 2015; Rolland-Harris et al 2015). Due to the reduced scope of operational service analysis to include only contemporary ex-serving personnel hired on or after 1 January 1999, the number of ex-serving personnel with operational service is small. As such, it was not possible to perform further analysis on this group at this time. As the study progresses and data for more years is added, it may be possible to explore suicide rates within this group in more detail.

Timing of suicide death after discharge

It is recognised that the transition from service to civilian life after discharge – particularly involuntary discharge – requires substantial adjustment (Dunt 2009; National Mental Health Commission 2017). Negative experiences during this period such as failure to find employment, and difficulties in redefining a sense of identity and in accepting the circumstances of discharge could be seen to increase suicide risk, particularly in the short term.

This study examined the length of time between discharge and death by suicide but could look only at ADF personnel recently discharged – over the 15-year study period from 1 January 2001 to 31 December 2015. The analysis found that men who had been discharged from the ADF for less than 6 years at the time of their death were more likely to die by suicide than those discharged for between 6 and less than 13 years. However, this difference was not statistically significant.

Methodological factors to consider

There are several methodological factors and data issues that should be considered when interpreting the results presented in this report.

Small number of deaths

Some of the results presented in this report are based on small numbers of deaths. Rates produced using small numbers can be sensitive to small changes in counts of deaths over time and will therefore have wide confidence intervals. This should be taken into account when interpreting the findings.

Potential underestimation of intentional self-harm (suicide) deaths

Analysis of deaths data in this report for the calculation of SMRs is based on year of occurrence of death; however, this can result in an underestimate for the last year of data as some deaths in each year are not registered until later years. This is often the case where a death is being investigated by a coroner and more up-to-date information becomes available. There are also a few instances where a suicide death may not be included in the current study; namely, where confirmed suicides on the DSD could not be identified on the NDI (comparative analyses only), and where the death occurred overseas.

Interpreting the standardised mortality ratio

The SMR is a relative measure. It shows whether the rate of deaths due to suicide was higher in the study population than in the Australian population after taking account of the difference in population age structures (rather than the number of deaths). Results of the SMR should be interpreted in the context of information on counts of deaths to support decisions about where intervention may have the most impact. The SMR also does not consider differences in the underlying all-cause mortality rate of the study and general population.

Factors not accounted for in this study

As this study is based on administrative data, it was not possible to analyse a number of other potentially important social, demographic and psychological factors (such as death of a loved one, history of substance abuse or difficulties finding employment) that may

contribute to suicide risk. Further, as this study looked only at service characteristics individually, it does not take into account potential interactions between them which may be important. As well, only a relatively crude measure of operational service was available for analysis. As such, it was not possible to explore potential differences due to length and intensity of operational service, type of war (if served in warlike operations), or the number of times an individual was exposed to traumatic events. There was also limited potential within the dataset to identify an individual's complete pathways in and out of service. This was because service status and service were determined as at 10 April 2016 when data were extracted and movement between services or changes in service status could not be completely captured.

Future directions

This study is the first to examine several individual service-related characteristics of the ex-serving population to determine which ones may be associated with increased risk of suicide among this population.

Future work using modelling techniques, such as multivariate regression analysis, to highlight which service characteristics are most strongly associated with suicide rates after controlling for other factors would be beneficial. This type of analysis would help to understand the interrelated nature of the service-related characteristics explored in this report, and could help to potentially identify people at increased risk of suicide who can then be targeted for specific intervention (McCarthy et al. 2015).

Further work could seek to investigate any differences in the ex-serving population for those who have had experience serving full time and those who have had reserve experience only.

Additionally, since July 2003 all personnel who joined the ADF have been routinely required to transfer to the inactive reserves for a period of at least five years if they resign from the ADF. Most inactive reservists will not provide any further ADF service and from a connection to the ADF perspective may be closer to 'ex-serving' members than active reservists. A better reflection of the rate of suicide in personnel no longer providing ADF service may be to consider the 'ex-serving' and 'inactive reservists' together in future reporting.

Within Australia, living in remote areas with limited access to services is known to have an impact on both all-cause and suicide mortality rates (AIHW 2016b). Analysis of location at death may provide extra information that is useful in helping to identify key areas where more support may be required.

A more comprehensive report is expected to be released in late 2017. It will include a comparison between the high risk groups identified in this report and the general population in which differences in age structure will be taken into account.

Conclusion

Overall, ex-serving men who may be at higher risk of suicide include those with a rank other than a commissioned officer; those with a short length of service (less than 1 year); or those discharged for involuntary reasons, particularly medical discharge. Personnel with one or more of these characteristics before discharge may be at higher risk of death by suicide.

Within ex-serving men, suicide rates were high across all ages between 18 and 49. When compared with men in the Australian population, ex-serving personnel aged 18–29 had significantly higher crude rates of suicide: they were 1.7 times more likely to die from suicide than Australian men of the same age. This finding persisted in the analysis of each of the service characteristics examined in this report. This suggests that ex-serving men aged 18–29 are at high risk of suicide death, regardless of individual service characteristics.

This analysis looks only at each service-related characteristic associated with higher risk of suicide individually. It does not consider potential interactions between them, which may be useful analyses to explore in future work on this topic.

Appendix A Methods and technical notes

A1 Statistical measures used in this report

A summary of the measures used in this report and how they are calculated is provided in Figure A1.1.

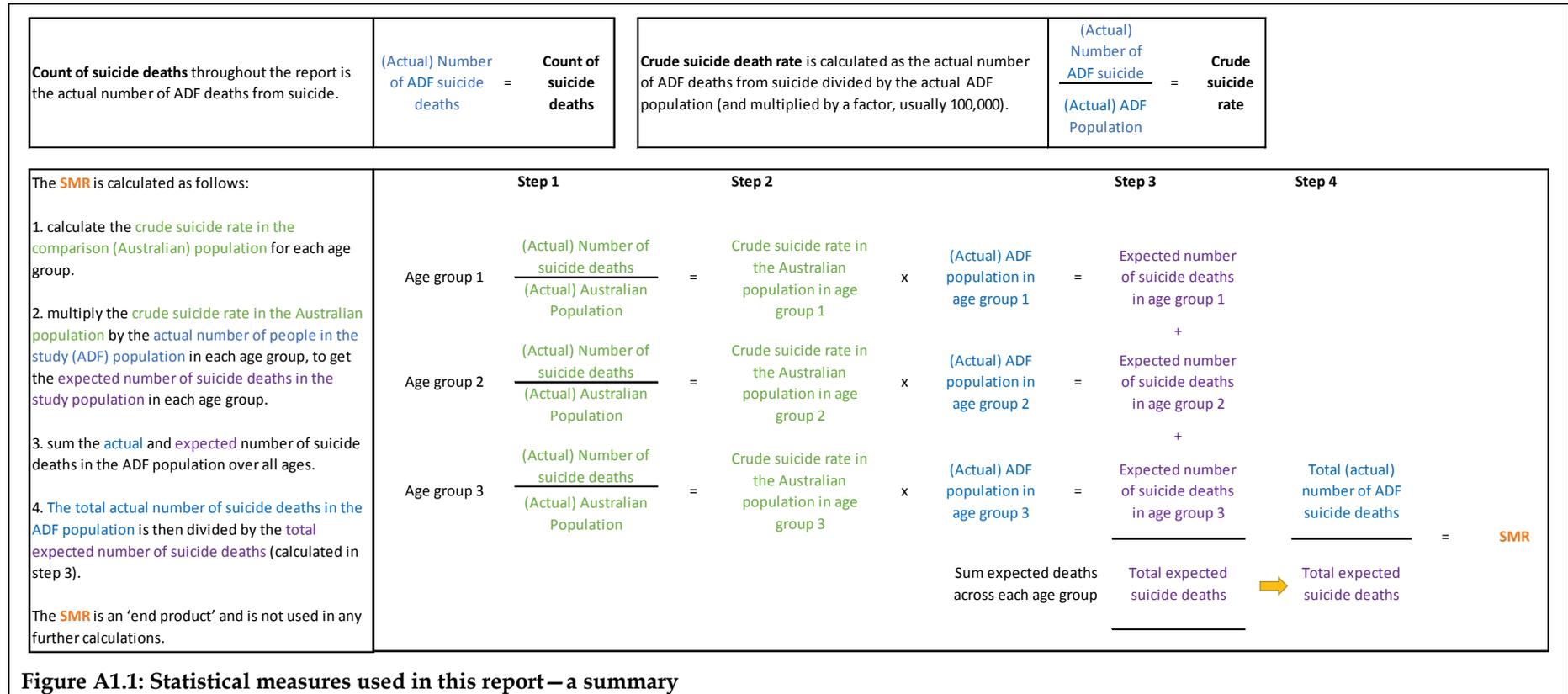


Figure A1.1: Statistical measures used in this report – a summary

A2 Data linkage

Data linkage, also known as data integration, is a process that brings together information relating to an individual from more than one source.

An extract of PMKeyS data on 10 April 2016 provided records of all persons with ADF service on or after 1 January 2001. The file that was transferred to the AIHW contained 200,499 records. A total of 76,487 records were for personnel known by Defence to be alive and were de-identified before transfer. The remaining 124,012 records were in-scope for linkage to the NDI.

The AIHW undertook data linkage between the PMKeyS and NDI to determine the number of in-scope personnel who have died, and to confirm the cause(s) of death. This linkage was done using a probabilistic linkage procedure, based on the Fellegi and Sunter methodology, matching name, sex, date of birth, date of death and address, followed by a manual clerical review (Fellegi & Sunter 1969).

A total of 2,144 links between the NDI and PMKeyS data were identified.

All data linking was carried out by the Data Linkage Unit at the AIHW – one of only three accredited Commonwealth Integrating Authorities. This accreditation requires the AIHW to adhere to stringent criteria and abide by the National Statistical Service High level principles for data integration involving Commonwealth data for statistical and research purposes and Best practice guidelines. As well as operating within these guidelines, data linkage at the AIHW is carried out under the protections of the *Privacy Act 1988*, and the *Australian Institute of Health and Welfare Act 1987* (which carries additional privacy protections for companies and deceased people).

Strict separation of identifiable information and content data is maintained within the Data Linkage Unit in accordance with the AIHW linkage protocols, so that no one person will ever have access to both. Summary results from the linked data set are presented in aggregate format. Personal identifying information is not released and no individual can be identified in any reporting. The linked data set created for this study will be stored securely on site at the AIHW for 7 years.

A3 Classifications used for reporting

Service status

The PMKeyS data was used to group people by service status using the *employment_status* and *service_type_banding* variables. If the *employment_status* was 'Terminated' then they were included in the ex-serving group. If the *employment_status* was 'Active', 'Suspended' or 'Deceased' and *service_type_banding* was 'Regular', 'CFTS' or 'Gap Year' then they were included in the serving group. If the *employment_status* was 'Active', 'Suspended' or 'Deceased' and *service_type_banding* was 'Active Reserve' or 'Inactive Reserve' then they were included in the reserve group. Table A3.1 provides a summary of these groupings.

Table A3.1: Classification of service status groups

Employment_status	Service_type_banding				
	Regular	Continuous full-time service	Active reserve	Inactive reserve	Gap year
Active	Serving full time	Serving full time	Not serving full time (Reserve)	Not serving full time (Reserve)	Serving full time
Suspended	Serving full time	Serving full time	Not serving full time (Reserve)	Not serving full time (Reserve)	Serving full time
Deceased	Serving full time	Serving full time	Not serving full time (Reserve)	Not serving full time (Reserve)	Serving full time
Terminated	Not serving full time (ex-serving)				

The classifications used for reporting are described in Box A3.1.

Box A3.1: Classifications used in this report

Service: the three broad arms of the ADF – RAN, Australian Army and RAAF.

Service status groups: the three broad groups describing the nature of an individual's employment with the ADF, namely:

- *serving full-time ADF personnel:* those serving in a permanent/regular capacity (usually full time) in the RAN, Army or RAAF, on continuous full-time service, or participating in the gap year program
- *reserve ADF personnel:* those rendering service (or available for service) in the Naval Reserve, Army Reserve or Air Force Reserve, and those in the standby (or inactive) reserve for each service
- *ex-serving ADF personnel:* those who rendered service in any of the serving full-time or reserve forces on or after 1 January 2001 and who were discharged from the ADF after 1 January 2001.

(Continued)

Box A3.1 (continued): Classifications used in this report

Rank: one's position in the ADF operational hierarchy. Analysis by rank is presented for two broad groups:

- a Commissioned *Officer* is an appointed Defence member who holds a rank of Midshipman or Officer Cadet, or higher
- all other ranks are a Defence member who holds a Sailor, Other Ranks or Airman/ Airwoman rank.

Operational service: four broad categories of deployment or operations:

- *warlike operational service* – warlike/ active service deployments
- *non-warlike operational service* – non-warlike deployments (for example, peace-keeping, peace-monitoring, United Nations assistance missions)
- *overseas operational service* – humanitarian/ disaster relief (international) or border protection deployments
- *domestic operational service* – deployment of Defence aid to the civilian community.

Individuals with at least one type of operational service are counted in 'Any'; those with no operational service are counted in 'None'. The study's scope includes those discharged from the ADF after 1 January 2001. While discharged at this time, individuals may have had operational service at any time before this during their career. Only operational service since 1 January 1999 has been consistently identified across these four broad categories. Before this time, only warlike service was identified. To ensure comparability, analysis of operational service includes only those personnel hired on or after 1 January 1999.

Please note: Under the Veterans' Entitlements Act (VEA) 1986, the definition of Operational Service differs significantly to how it is defined and presented within this report. To ensure all operations could be included within this study, the term 'Operational service' was deemed the most appropriate. There are no changes to the legislative and policy definitions of the term 'Operational service' under the VEA.

Length of service: the time between the date of hire and date of separation (discharge) from the ADF. Analysis by length of service is presented for four broad groups: less than 1 year (<1), 1-<5 years, 5-<10 years, and 10 years or more (10+).

Time since discharge: the period between separation (discharge) from the ADF and death for ex-serving personnel who have died. Analysis by the time since discharge is presented for two broad groups: 0 to <6 (0-<6) years and 6 to <13 (6-<13) years.

Reason for discharge: the main reason recorded for a person's separating (discharging) from the ADF. Analysis by reason for discharge is presented for two broad groups:

- *voluntary discharge* – includes voluntary redundancies and resignations
- *involuntary discharge* – comprises personnel deemed unsuitable for further duty for disciplinary, medical and operational reasons. Involuntary discharge is further divided into discharge for medical reasons, and non-medical involuntary discharge (which includes being physically unfit for service, training failure and disciplinary reasons).

Reason for discharge: additional detail

The *last_termination_reason* variable in the PMKeyS data was used to group people by two broad reasons for discharge: voluntary or involuntary. Table A3.2 shows how the values for the *last_termination_reason* variable were allocated to the two groups.

Table A3.2: Grouping of reasons for discharge using the PMKeyS *last_termination_reason* variable

Voluntary	Involuntary
APS resignation	Appointment cancelled
Discharge	Appointment terminated
Discharged in absence	Discharged
Discharge—open ended engagement	Discharged—unqualified
Elective	Dismissed
Military—Failed to enlist ^(a)	Marriage
Military—In absence	Medically unfit ^(b)
Military—Resignation	Military—Below fitness standard
Military—Voluntary redundancy	Military—Civil offence
Military—withdrawal within 90 days of enlistment	Military—Disciplinary
Optional	Military—False statement on enlistment
Own requirement	Military—Irregular enlistment ^(a)
Regulation instrument 088–4–5	Military—Management initiated retirement
Resigned	Military—Medically unfit for service ^(b)
Voluntary redundancy	Military—Retention not in service interest
	Military—Training failure
	Military—Unsuitable for service (defence personnel regulation 87–1-e)
	Not in interest
	Not required
	Physical standard
	Physically unfit
	Separated in service interest (defence personnel regulation 70-SR)

(a) Excluded from dataset where length of service was less than 1 year.

(b) Included in the 'Involuntary discharge for medical reasons' group.

Appendix B Data sources and classifications

B1 Data sources

Australian Defence Force populations

The Department of Defence supplied ADF population data for the serving full-time and reserve study groups. Populations were available from 2002 onwards. Population data for the ex-serving group were calculated using the linked PMKeyS–NDI data from 2001 onwards, starting with zero (0) as at 1 January 2001. Due to the high level of volatility observed in estimates run including the 2001 ex-serving population, the analysis of ex-serving personnel was restricted to data from 2002 onwards, in line with reporting for serving and reserve groups. The populations used for analysis in this report were estimated as at 30 June each year.

It is important to note that the annual population size for each of the service status groups differs. While the serving and reserve populations are relatively stable over time at around 55,000 and 42,000 persons per year, the ex-serving population in the analysis set starts at zero (0) on 1 January 2001 and increases by around 5,000 persons per year. Unlike the serving and reserve populations, the ex-serving population is also ageing over time.

For these reasons, population rates have been used in addition to counts of suicide deaths to illustrate the difference between service status groups.

Australian population

Australian population data used in this report were sourced from the ABS using the most up-to-date estimates available at the time of analysis (ABS 2016).

Defence Suicide Database

Defence has maintained a database of suspected or confirmed deaths due to suicide of personnel serving full-time since 1 January 2000. Suspected or confirmed suicide deaths are included on the database only on the advice of the ADF Investigative Service. Cases are assigned as a 'confirmed' suicide on receipt of a coronial finding of suicide.

National Death Index

The NDI, housed at the AIHW, contains information on all Australian registered deaths since 1980. This information includes cause of death sourced from the Cause of Death Unit Record File provided to the AIHW by the Registries of Births, Deaths and Marriages and the National Coronial Information System (managed by the Victorian Department of Justice), and causes of death coded by the ABS. This data set exists solely for data linkage purposes, and ethics approval is required to use the NDI for research purposes. The Data Quality Statement for the NDI is available on the AIHW website at <<http://meteor.aihw.gov.au/content/index.phtml/itemId/480010>>.

National Mortality Database

Cause of Death Unit Record File data were provided to the AIHW by the Registries of Births, Deaths and Marriages and the National Coronial Information System (managed by the Victorian Department of Justice) and included cause of death coded by the ABS. The data are maintained by the AIHW in the NMD.

At the time of analysis, the causes of death data were final for 2012, revised for 2013 and preliminary for 2014 and 2015. Cause of death for a small number of deaths occurring in 2013, 2014 and 2015 may be revised in future years, pending the outcome of coronial investigations.

Analysis in this report is based on year of occurrence of death. Year of death is an underestimate for the preliminary data in the most recent years of death (2014 and 2015), as some deaths are not registered until later years. Historical analysis of the NMD shows that this lag in registration results in around 5% late registrations. The NDI is updated monthly with fact of death information, and so registration lag is not a factor for this data set. Hence, it can be expected that the total number of deaths would be 5% lower in the NMD-derived comparison populations compared with the NDI-linked ADF service status groups. This is expected to have minimal impact on results.

The data quality statements underpinning the NMD can be found in the following ABS publications:

- ABS quality declaration summary for Deaths, Australia
<<http://www.abs.gov.au/ausstats/abs%40.nsf/mf/3302.0/>>
- ABS quality declaration summary for Causes of Death, Australia
<<http://www.abs.gov.au/ausstats/abs%40.nsf/mf/3303.0/>>.

Personnel Management Key Solution (PMKeyS) data

The PMKeyS is a staff and payroll management system that contains information on all people with ADF service on or after 1 January 2001, when the system was introduced. This database contains demographic and service information at a point in time. Defence provided the AIHW with an extract from the PMKeyS of 200,499 records of people with ADF service on or after 1 January 2001 up to the point of data extract (10 April 2016).

B2 Classifications

International Classification of Diseases

The International Statistical Classification of Diseases and Related Health Conditions (ICD) is used to classify diseases and other health problems (including symptoms and injuries) in clinical and administrative records. In Australia, mortality cause of death data are coded according to the ICD. Data from 1997 are based on the 10th revision (ICD-10).

Appendix C Statistical tables

Table C1: Demographic profile of people aged 16–85 with ADF service from 1 January 2001, by service status, as at 10 April 2016

Characteristic	Serving ^(a)		Reserve ^(b)		Ex-serving ^(c)		Australia (16–85)	
	Number	%	Number	%	Number	%	Number	%
Sex								
Men	50,276	84.4	38,705	85.4	79,821	84.4	8,248,274	49.6
Women	9,292	15.6	6,638	14.6	14,733	15.6	8,384,591	50.4
Age group (years)								
16–24	15,138	25.4	3,342	7.4	5,426	5.7	2,647,207	15.9
25–34	22,968	38.6	14,928	32.9	26,963	28.5	3,064,980	18.4
35–44	12,212	20.5	11,144	24.6	27,572	29.2	3,087,714	18.6
45–54	7,698	12.9	9,302	20.5	18,469	19.5	2,902,529	17.5
55–64	1,526	2.6	6,279	13.8	10,229	10.8	2,338,376	14.1
65–85	26	0.0	348	0.8	5,896	6.2	2,592,058	15.6
Median age	30	..	38	..	40	..	43	..
Total^(d)	59,568	100.0	45,343	100.0	94,555	100.0	16,632,865	100.0

(a) Includes individuals serving in a regular capacity in the RAN, Australian Army or RAAF; those on continuous full-time service; and those participating in the gap year program, as at 10 April 2016 (or at the time of their death).

(b) Includes individuals in the active or inactive reserve forces for the RAN, Australian Army or RAAF, as at 10 April 2016 (or at the time of their death).

(c) Includes individuals discharged from the ADF, as at 10 April 2016 (or at the time of their death).

(d) Includes individuals with missing sex.

Note: Columns may not add to total due to rounding.

Sources: ABS 2016; AIHW analysis of PMKeyS data.

Table C2: Crude rate of suicide in the ADF service groups, men, 2002–2015

ADF population	Number of suicides	Rate	Confidence interval		Statistically significant	Direction of difference ^(a)
			Lower	Upper		
Serving	71	10.6	8.3	13.4	Yes	Lower
Reserve	60	11.8	9.0	15.2	Yes	Lower
Ex-serving	154	26.2	22.3	30.7	Yes	Higher
Total	285	..	..	..	..	..

(a) When compared with an age-matched Australian population.

Source: AIHW analysis of linked PMKeyS–NDI and NMD data.

Table C3: Crude rate of suicide in the ADF service groups, men, by age, 2002–2015

Population/ Age group (years)	Rate	Confidence interval		Statistically significant	Direction of difference ^(a)
		Lower	Upper		
Serving					
18–29	12.2	8.7	16.6	Yes	Lower
30–49	9.5	6.4	13.7	Yes	Lower
50–69	5.9	0.7	21.2	No	..
Reserve					
18–29	11.2	6.3	18.5	Yes	Lower
30–49	13.1	9.1	18.3	Yes	Lower
50–69	9.5	4.6	17.5	Yes	Lower
Ex-serving					
18–29	33.6	25.3	43.7	Yes	Higher
30–49	28.7	23.0	35.4	No	..
50–69	9.6	4.8	17.2	Yes	Lower
Australia					
18–29	20.0	19.5	20.6	..	..
30–49	25.5	25.0	26.0	..	..
50–69	19.4	18.9	19.8	..	..

(a) When compared with an age-matched Australian population.

Source: AIHW analysis of linked PMKeyS–NDI and NMD data.

Table C4: Trends in crude rates of suicide in the ADF service groups, men, 2007–2009, 2010–2012, 2013–2015

ADF population	2007–2009	2010–2012	2013–2015
Number of suicides			
Serving	14	16	16
Reserve	17	12	13
Ex-serving	28	42	60
<i>Total</i>	59	70	89
Crude suicide rate (deaths per 100,000 population)			
Serving	9.8	10.5	10.9
Reserve	15.4	10.4	10.8
Ex-serving	23.8	25.9	29.2

Source: AIHW analysis of linked PMKeyS–NDI and NMD data.

Table C5: Crude rate of suicide in the ADF service groups combined, women, by age, 2002–2015

Age group (years)	Number of suicides	Rate	Confidence interval		Statistically significant
			Lower	Upper	
18–29	10	8.5	4.1	15.7	No ^(a)
30–69	9	4.6	2.1	8.8	No ^(a)
Total	19	6.1	3.7	9.5	..

(a) When compared with an age-matched Australian population.

Source: AIHW analysis of linked PMKeyS–NDI and NMD data.

Table C6: Comparative standardised rate of suicide between ADF service groups and the Australian population, men, 2002–2015

ADF population	SMR	Confidence interval		Statistically significant	Direction of difference ^(a)
		Lower	Upper		
Serving	0.47	0.37	0.59	Yes	Lower
Reserve	0.51	0.39	0.66	Yes	Lower
Ex-serving	1.14	0.97	1.34	No	..

(a) When compared with an age-matched Australian population.

Source: AIHW analysis of linked PMKeyS–NDI and NMD data.

Table C7: Comparative standardised rate of suicide between the ex-serving and the Australian populations, men, by age, 2002–2015

Age group (years)	SMR	Confidence interval		Statistically significant	Direction of difference ^(a)
		Lower	Upper		
18–24	1.98	1.28	2.92	Yes	Higher
25–29	1.43	0.97	2.04	No	..
30–34	1.09	0.72	1.58	No	..
35–39	1.13	0.73	1.69	No	..
40–44	1.10	0.67	1.70	No	..
45–49	1.24	0.72	1.99	No	..
50–84	0.49	0.24	0.87	Yes	Lower

(a) When compared with the Australian population.

Source: AIHW analysis of linked PMKeyS–NDI and NMD data.

Table C8: Crude rate of suicide in ex-serving men, by service-related characteristics, 2002–2015

Characteristic	Crude rate	Confidence interval		Statistically significant	Direction of difference
		Lower	Upper		
Service					
Army	27.3	22.3	33.1	No	..
Navy	28.8	19.5	41.2	No	..
Air Force	19.8	12.3	30.3	No	..
Rank					
Commissioned Officer	10.5	5.2	18.8	..	..
All other ranks	29.7	25.0	34.9	Yes ^(a)	Higher
Operational Service					
Any	29.7	14.8	53.1	No	..
None	33.9	26.5	42.7	No	..
Length of service (years)					
<1	45.6	32.4	62.3	Yes ^(b)	Higher
1–<5	28.6	20.4	39.0	..	..
5–<10	25.8	16.5	38.3	..	..
10+	19.0	14.1	25.0	..	..
Reason for discharge					
Voluntary	19.4	15.2	24.5	..	..
Involuntary	46.9	36.8	58.9	Yes ^(c)	Higher
Involuntary discharge reason					
Medical	69.2	48.9	94.9	Yes ^(c)	Higher
Non-medical	35.0	24.5	48.4	Yes ^(c)	Higher
Time since discharge (years)					
0–<6	29.8	24.5	36.0	No	..
6–<13	21.6	15.7	28.8	No	..

(a) Compared with the Commissioned Officer rank rate.

(b) Compared with the rate for those with 10+ years length of service.

(c) Compared with the rate for those with a voluntary reason for discharge.

Source: AIHW analysis of linked PMKeyS–NDI data.

Table C9: Number of suicides in ex-serving men, by time since discharge (years), 2002–2015

Time since discharge (years)	Number of suicides	Population
0	23	70,697
1	14	69,082
2	19	63,590
3	17	58,913
4	15	54,439
5	21	48,805
6	6	43,432
7	10	38,834
8	11	34,858
9	5	30,440
10+	13	61,212
Total	154	574,302

Source: AIHW analysis of linked PMKeyS–NDI data

Glossary

ADF personnel: ADF personnel refers to serving and ex-serving ADF members. It does not include civilian personnel employed by the Department of Defence.

age-specific rate: A rate for a specific age group. The numerator and denominator relate to the same age group.

confidence interval: A range determined by variability in data, within which there is a specified (usually 95%) chance that the true value of a calculated parameter lies.

crude suicide rate: The number of suicide deaths divided by the corresponding population multiplied by 100,000 to provide a rate per 100,000 population in a given time period.

incidence of suicide: The number of suicide deaths in a population in a given time period.

Personnel Management Key System (PMKeyS): The personnel administrative database for the Australian Defence Force and the Department of Defence.

standardised mortality ratio (SMR): A comparison of the **suicide death rates** in the Australian Defence Force populations with the Australian population, adjusting for differences in age structure. An SMR of 1.0 indicates similar rates in each population. An SMR more than 1.0 indicates the ADF population has a higher rate than the Australian population, and an SMR less than 1.0 indicates the ADF population has a lower rate than the Australian population.

statistical significance: A statistical measure indicating how likely the observed difference is due to chance alone. Rates are deemed to be statistically significantly different when their **confidence intervals** do not overlap, since their difference is greater than what could be explained by chance. In this report, statistically significant differences are indicated by an asterisk, or described as being 'significantly higher' / 'significantly lower'.

suicide death rate: Number of suicide deaths occurring between 2002 and 2015, divided by the total population in that period. Comparative analyses adjust for differences in age structure between the Australian Defence Force populations and the Australian population.

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This in brief report summarises results on the incidence of suicide among serving and ex-serving Australian Defence Force (ADF) personnel using 15 years of data and identifies characteristics that may be associated with risk of suicide. In 2001–2015 there were 325 certified suicide deaths among people with at least 1 day of ADF service since 2001. Of these deaths 166 occurred in the ex-serving population. Ex-serving men aged 18–24 were at particular risk—2 times more likely to die from suicide than Australian men of the same age. Service characteristics that may be associated with the higher rate of suicide in ex-serving men included: involuntary discharge—particularly medical discharge, short length of service (<1 year) and rank other than a commissioned officer.