

1 Introduction

Background

Considerable progress has been made in improving health over the past 100 years in Australia, evidenced by substantial decreases in age-standardised mortality rates and increases in life expectancy. It is generally believed that these gains have mainly been brought about through:

- improved understanding of environmental factors that affect health and the resulting improvements to public infrastructure (e.g. clean water supply, sewerage, sanitation, housing, and improved food supply);
- improved understanding of the risk factors and beneficial factors that can be changed at the level of individuals, and gains in levels of education within the population leading to changes in behaviour within the community. These have resulted in reduced incidence of some diseases. For example, understanding the association between tobacco smoking and lung cancer and other respiratory diseases has led to anti-smoking campaigns, while understanding exposure to the sun and risk of skin cancer has led to 'sun-safe' campaigns. Also, work safety and road safety campaigns, and improvements in transport infrastructure have aimed at reducing accidents;
- medical and surgical advances (e.g. antibiotics, immunisation, blood pressure lowering drugs, scanning and imaging equipment, and surgical techniques) and improvements in access to medical and other health services. However, differences in socioeconomic status across the population have led to an unequal distribution in access to, and benefits from, some medical and surgical advances.

Over the century the focus of public health has changed. Some major disease epidemics have declined considerably or disappeared. Public health specialists now discuss 'silent' epidemics such as diabetes and obesity. The high cost of available treatments and increasing healthcare budgets are also highlighting the need to focus on prevention of disease in addition to treatment.

Health researchers have shown that some groups of the population have higher mortality from different diseases, raising questions about the equity of health systems.

Advances made in reducing the risk of death for the younger age groups (e.g. from birth complications, infectious disease, accidents and injuries) have contributed to an ageing population. This in turn has changed the patterns in causes of death, so that diseases associated with older age groups are becoming the major causes of death within the population.

Why focus on mortality?

Mortality data are important in the measurement of health and disease, and in the planning of public health care. Measures of incidence (the rate of new cases in a given period) are desirable but involve substantial resources and are only available for a limited number of diseases. This is because routine incidence data are generally collected only for legally notifiable diseases (under State and Territory legislation), which mostly include communicable diseases and cancers. Incidence data are only collected in other areas when

monitoring of disease is required because of disease outbreaks or potential outbreaks, or in high-risk areas.

In contrast, mortality data are collected routinely. This information is recorded by attending medical practitioners who are required to lodge medical certificates of cause of death with their respective State Registrars of Births, Deaths and Marriages. The accuracy of a death certificate will vary among medical practitioners depending on their knowledge of the medical history before death, the complexity of the diseases associated with the death, and the social sensitivity of the cause of death. Nevertheless, mortality data are still the most comprehensive and readily available data to health researchers. The usefulness of mortality data has been strengthened considerably since 1997 by the coding of associated causes of death in addition to the underlying cause of death. In this publication, however, mortality is analysed only by underlying causes of deaths. Future reports will undertake analyses by underlying and multiple causes of death.

Studies of the trends in mortality help explain how the health status of the population is changing and assist in evaluation of the health system. Mortality data also provide a basis for investigating the incidence of disease, its severity and the quality of life before death (see *Measuring the effect of mortality*, p. 4). The patterns of mortality in the community, in terms of cause, age, sex, population group and geographical distribution, inform the work of epidemiologists, medical personnel and those working in health policy, planning and administration.

Comparing mortality rates across populations also helps to highlight health differences among different groups of people (e.g. people of various cultural or social backgrounds, or different age groups). It may also help suggest any inequities in access to health care that may affect some groups.

In discussing mortality it is necessary to identify the effect of reductions in mortality. This effect is often best appreciated through increases in life expectancy. This report also takes a brief look at changes in life expectancy over the past 100 years and how changes in mortality rates directly influence life expectancy.

Collection of mortality data

Death registration has been compulsory in all States and Territories since the mid-1850s and this information is registered with the State and Territory Registrars of Births, Deaths and Marriages. Since 1906, the Australian Bureau of Statistics (ABS), formerly known as the Commonwealth Bureau of Census and Statistics), has compiled the information collected by the Registrars, and has published national and State death information.

Information about a death is recorded on a death certificate, and includes demographic and administrative information as well as the disease or condition leading directly to death and the other contributing diseases or conditions. From this the ABS determines the underlying and multiple (or contributing) causes of death, which are recorded with the accompanying demographic information in the mortality database. Death certification can be completed in three ways:

1. If a medical practitioner had treated the deceased recently and the medical practitioner was certain of the cause of death, then the medical practitioner can provide the required certificate.
2. If no medical practitioner can certify the cause of death (e.g. unexplained deaths), then the case is referred to the government pathologist to conduct an autopsy to determine the cause of death.

3. In many cases referred to the government pathologist, the coroner determines the cause of death (e.g. many deaths resulting from accidents are referred to the coroner).

The information collected on death certificates has been standardised to a large degree and guidance for completion of death certificates is outlined in *Cause of Death Certification Australia* produced by the ABS (ABS 1997b).

Classification of diseases

In this publication, 'disease' has been used as a general term to describe all causes of death. A cause of death can be a particular disease (such as ischaemic heart disease), a disorder (such as a mental disorder) or an injury (accidental or intentional).

The modern system of disease classification began with the work of Dr William Farr, and was first used in England in 1839 (Cumpston 1989). The Farr system was modified over time, and in 1881 was completely modified by Dr William Ogle, becoming known as the Farr-Ogle system. This modified system was adopted at varying times during the 1880s by each of the Australian colonies. The Farr-Ogle system of classification of death was phased out between 1903 and 1906, with the States substituting for a classification being used by the Registrar General of England, making comparisons between States difficult for this period.

In 1906 the Commonwealth and the States adopted the International Classification of Diseases (ICD) to classify causes of death. In doing so, the Commonwealth Statistician began the production of a set of internationally consistent information on causes of death. Consequently many of the statistical series begin in 1907 (Cumpston 1989).

Since 1906 the ICD has changed nine times. The most recent revision was the 10th revision, implemented with the 1999 mortality data (with backcoding for 1997 and 1998 mortality data). The revisions are a response to the recognition of new diseases (e.g. AIDS), increased knowledge of diseases and changing terminology in the description of disease. This report bases its analysis on the 9th revision.

The ICD encompasses the entire range of disease and injury within chapters that are based on body systems, disease types and external causes of injury. For example, *diseases of the circulatory system* includes rheumatic heart disease and ischaemic heart disease.

In a clinical or epidemiological setting, many of these entities are grouped as they have similar symptoms, outcomes or risk factors. This occurs in the disease profiles used in this publication. For example, ischaemic heart disease consists of four different conditions – acute myocardial infarction, other acute and subacute forms of ischaemic heart disease, old myocardial infarction and other forms of chronic ischaemic heart disease.

Measuring the effect of mortality

In trying to measure and compare the effect of mortality in populations, two important concepts are used:

- mortality rates; and
- life expectancy.

In analysing mortality rates, three major measures are used:

1. Crude mortality rates present the total number of deaths in relation to the population at risk. The crude mortality rates calculated for this report are expressed as number of deaths per million population. These rates do not take into account that different populations may have different age and sex structures and consequently different risks of dying.

2. Age- and sex-specific mortality rates are expressed for narrow age bands and separated for males and females which can make for more direct comparisons. These rates are expressed as number of deaths per million population.
3. Age-standardised mortality rates (ASMR) allow populations to be compared more meaningfully by eliminating the effect of differences in their age structures. They combine and summarise the age- and sex-specific rates using a comparative population as the standard population. In this publication these rates are simply referred to as the mortality rate. These rates are standardised to the estimated resident population of Australia at 30 June 1991 and are expressed as number of deaths per million population.

In analysing life expectancy four major measures are also used:

1. Life expectancy is the average number of years a person is expected to live given the current mortality rates. It can be specified as life expectancy at birth or as years remaining at different ages.
2. Person years of life lost (PYLL) is a measure of premature death if a person is expected to live to a specified age (in this report, the age of 75 years). This measure takes into account the number of deaths that take place and the ages at which they occur. It counts the number of potential years of life lost for each death occurring before the age of 75 years. A death at a younger age would have a greater PYLL than a death at an older age.
3. Adjusted life years is a measure of life expectancy adjusted for long term disability. These are known as quality adjusted life years (QALYs) or, conversely, disability adjusted life years (DALYs). The latter is based on an adjusted value for life expectancy to allow for long-term disability. It is used to calculate burden of disease (AIHW: Mathers et al. 1999).
4. Lifetime risk is a measure that approximates the risk of dying of a particular disease or condition in a lifetime, if the mortality risks at the time of estimation prevail.

Hundreds of statistical measurements have been calculated in the analyses for this report, but we have presented only those that show statistical significance. To limit repetitive description of these statistics, the term 'significantly' has been used to describe measurements that are statistically significantly different.

Scope of the report

For this report 174 mortality profiles were produced and are published in Excel spreadsheets on the web site of the Australian Institute of Health and Welfare (AIHW) (<http://www.aihw.gov.au>). From these, 16 disease profiles, and all deaths, were selected for detailed analysis. The disease profiles were selected because they were major causes of death, creating a particular concern in the health field, or conditions amenable to reduction due to modifiable risk factors. This report analyses death by socioeconomic status, country of birth, State/Territory and geographic area, Indigenous status and international comparisons. The disease profiles were analysed over a 12-year period (1987–1998), using the ICD 9th revision for cause of death codes.

A break in time series has been created with the change over from manual to automatic coding of deaths by the ABS in 1997. The automated coding applies cause of death rules differently from the previous manual coding. To minimise the effect of this change, comparability factors have been applied to the affected causes of death for 1997 and 1998.

The 17 disease profiles reported in this publication are:

All conditions	ICD-9 codes: 001–799, E800–E999
Cardiovascular disease	
Ischaemic heart disease	ICD-9 codes: 410–414 (ischaemic heart disease)
Cerebrovascular disease	ICD-9 codes: 430–438 (cerebrovascular disease)
Cancers	
Lung cancer	ICD-9 code: 162 (malignant neoplasm of trachea, bronchus and lung)
Prostatic cancer	ICD-9 code: 185 (malignant neoplasm of the prostate)
Breast cancer	ICD-9 code: 174 (malignant neoplasm of female breast)
Colorectal cancer	ICD-9 codes: 153 (malignant neoplasm of colon), 154 (malignant neoplasm of rectum) and 159 (malignant neoplasm of other and ill-defined sites within the digestive organs and peritoneum)
Respiratory disease	
Chronic obstructive pulmonary disease	ICD-9 codes: 491 (chronic bronchitis), 492 (emphysema) and 496 (chronic obstruction, not elsewhere specified)
Asthma	ICD-9 code: 493 (asthma)
Injuries	
Suicide	ICD-9 codes: E950–E959 (suicide and self-inflicted injury)
Motor vehicle traffic accidents	ICD-9 codes: E810–E819 (motor vehicle traffic accidents)
Homicide	ICD-9 codes: E960–E969 (homicide and injury purposely inflicted by other persons)
Diabetes	
Diabetes	ICD-9 code: 250 (diabetes mellitus)
Mental health	
Mental disorders	ICD-9 codes: 290–319 (mental disorders)
Dementia and related disorders	ICD-9 codes: 290 (senile and pre-senile organic psychotic conditions), 294.1 (other organic psychotic conditions (chronic—dementia in conditions classified elsewhere) and 331 (other cerebral degenerations)
Other	
Smoking-related diseases	Application of the attributable fractions according to English et al. (1995).
Alcohol-related diseases	Application of the attributable fractions according to English et al. (1995).

Mortality data appendix at the AIHW web site

Supporting this publication are two presentations of death data. They are presented as self-contained Excel spreadsheets located at the AIHW web site <http://www.aihw.gov.au>.

- A series of 174 mortality profiles based on the codes and categories used in the ICD-9 (see Appendix E for listings).
- A series of long-term spreadsheets containing data from when cause of death was first coded nationally in Australia (mostly from 1907). For selected causes of death, these contain numbers of deaths, age-specific and age-standardised rates, and cohort analyses.