CardiovascularDiseaseSeries
Number 3

Mortality from cardiovascular disease in Australia

Anne-Marie Waters
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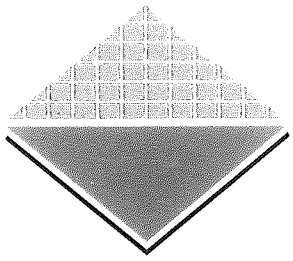
Stan Bennett



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CARDIOVASCULAR DISEASE SERIES
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Preface

Cardiovascular disease, comprising mainly heart attack and stroke, is Australia's greatest health problem. Despite great improvements in mortality in recent decades, cardiovascular disease is still the major cause of death in Australia. Cardiovascular disease also places a heavy burden on society in terms of illness, disability and economic cost. However, there are serious gaps in our knowledge about cardiovascular disease and the groups it affects. This limits our capacity to develop and evaluate cost-effective and equitable strategies for community prevention and treatment. Major health agencies have been concerned about this situation for some time. In 1993, the Cardiovascular Disease Implementation Working Group was established by the Australian Health Ministers' Advisory Committee to consider information on the state of knowledge and practice related to the prevention and treatment of cardiovascular disease, and to develop a set of goals, targets and strategies based on this knowledge. This group has recommended the establishment of a national monitoring system for cardiovascular disease, its risk factors and management.[1]

An integrated monitoring system would include death rates, disease incidence and prevalence, use of pharmaceuticals, rehabilitation, medical and surgical care, prehospital and emergency care, risk factors and prevention. To help develop such a system, a series of reports are being developed by the Australian Institute of Health and Welfare, in collaboration with the WHO MONICA Collaborating Centre at the University of Newcastle and the National Heart Foundation of Australia, which draw together and document existing data on cardiovascular disease and identify areas which need development.

This report on cardiovascular disease mortality is the third in the series. It describes patterns and trends in cardiovascular disease mortality in Australia and identifies some gaps and deficiencies in our current knowledge and measurement of cardiovascular disease mortality. It serves as a benchmark report for the monitoring and surveillance of cardiovascular disease mortality.

The first report in the series addressed risk factors for cardiovascular disease, while the second addressed morbidity from cardiovascular disease. Future reports in the series will address medical care and costs, as well as a discussion document which outlines a proposal for an integrated monitoring system.

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The authors gratefully acknowledge the assistance, support and comments of Annette Dobson and Kate Boyle from the WHO MONICA Collaborating Centre at the University of Newcastle, and Paul Magnus and Susana Senes-Ferrari from the National Heart Foundation of Australia. Thanks also go to several staff members from the Australian Institute of Health and Welfare, in particular to John Donovan, Paul Jelfs and Chris Stevenson for their helpful comments, to Colin Mathers for his support and comments on the final draft, to Melinda Petrie for clerical support, and to Andrew Smith and Amanda Shepherd for final editing of the report.

Summary

- Cardiovascular disease was the major cause of death among Australians in 1993, accounting for 53,240 registered deaths or 43.8% of deaths from all causes.
- Over 63,000 person years of life were lost before age 65 as a result of cardiovascular disease in 1993.
- Coronary heart disease was the major form of cardiovascular death in 1993 with 29,762 registered deaths. It accounted for 55.9% of all cardiovascular disease deaths and 24.5% of deaths from all causes.
- Almost 36,000 person years of life were lost before age 65 as a result of coronary heart disease in 1993.
- Cerebrovascular disease, heart failure and peripheral vascular disease were also major causes of cardiovascular mortality among Australians in 1993.
- Death rates from cardiovascular disease, and its manifestations, tended to be higher for males than females in 1993, however the differentials in death rates between the sexes declined with increasing age.
- For men aged 25–54 years in 1985–87, cardiovascular disease death rates decreased as occupation classification changed from 'blue collar' to 'professional', and as occupational prestige changed from low prestige to high prestige.
- Cardiovascular disease death rates in 1985–87 rose as level of socioeconomic disadvantage increased for men and women aged 25 years and over.
- Men and women aged 25 years and over in 1985–87 who were born overseas had significantly lower cardiovascular disease death rates than their Australian-born counterparts.
- Death rates from cardiovascular disease among Australian men and women have declined rapidly since the late 1960's. Over the period 1981–92, the average annual rates of decline in death rates from all cardiovascular disease were 3.8% for males and 3.3% for females.
- Despite the declines in cardiovascular mortality in recent decades, Australia still compares unfavourably with many other countries. This is particularly true for coronary heart disease for which death rates among Australian men and women in 1990 were higher than for many other developed countries.

1 Introduction

1.1 Sources of death registration data

The State and Territory Registrars of births, deaths and marriages are responsible for the registration of deaths in Australia. Death data are obtained from two sources: information provided by a relative or another person acquainted with the deceased (or by an official of the institution where the death occurred), and information supplied by the medical practitioner certifying the death or by a coroner.[2,3] Registration is a legal requirement and is virtually complete. The State and Territory Registrars then provide the death data to the Australian Bureau of Statistics for processing.

1.2 Scope and coverage

The statistics in this report relate to the year of registration of the death, not the year of occurrence. Usually about 5–6% of deaths, mainly accidents, occurring in one year are not registered until the following year or later.[4] In 1984, abnormal delays in the registration process in New South Wales displaced approximately 2,000 death registrations from 1984 to 1985. These represented about 1.7% of all deaths in Australia and the effect was negligible.

1.3 Classification of cause of death

Since 1950, the Australian Bureau of Statistics has classified causes of death according to the following revisions of the International Classification of Diseases (ICD):[5]

Revision	Period in force	Original codes from ICD in force
ICD-6	1950–1957	330–334, 400–454, 456–468, 782
ICD-7	1958–1967	330–334, 400–454, 456–468, 782
ICD-8	1968–1978	390–458, 782
ICD-9	1979+	390–459

Currently the Australian Bureau of Statistics classifies causes of death according to the Ninth Revision of the International Classification of Diseases (ICD-9) (Box 1.1).[6]

1.4 Data quality

The Australian Bureau of Statistics uses a variety of quality control measures to ensure that causes of death statistics are as reliable as possible.[4] For example, where necessary further information is sought to enable accurate classification of the underlying cause of death. Check-coding of cause of death is undertaken together with detailed computer editing of data, and checks on the statistical output are made at both the individual record and aggregate levels.

Box 1.1: *Ninth Revision of the International Classification of Diseases—cardiovascular disease*

Cardiovascular disease includes all diseases of the heart and the circulatory system. The Ninth Revision of the International Classification of Diseases[6] classifies cardiovascular disease under the chapter 'Diseases of the Circulatory System' (ICD-9 390–459) and includes the following:

- *Rheumatic heart disease (ICD-9 390–398)*
- *Hypertensive disease (ICD-9 401–405)*
- *Ischaemic heart disease (referred to in this report as coronary heart disease) (ICD-9 410–414)*
- *Diseases of pulmonary circulation (ICD-9 415–417)*
- *Other forms of heart disease (ICD-9 420–429)*
- *Cerebrovascular disease (ICD-9 430–438)*
- *Diseases of the arteries, arterioles, and capillaries (ICD-9 440–448)*
- *Diseases of veins and lymphatics, and other diseases of the circulatory system (ICD-9 451–459)*

Source: World Health Organization[6]

Since 1993, the Queensland office of the Australian Bureau of Statistics has been responsible for processing all cause of death data to ensure greater consistency in coding and improved data quality. Before this, cause of death processing was carried out in each of the Australian Bureau of Statistics offices.

Specific attention has also been given, by some researchers, to examining the accuracy of data for specific causes of death.[3] For example, there is evidence that coding of death for acute myocardial infarction (ICD-9 410) and coronary heart disease (ICD-9 410–414) is quite accurate.[7]

1.5 Indicators of mortality

This report uses four types of mortality indicators. These are age-specific death rates, crude death rates, age-standardised death rates, and person years of life lost. All rates are calculated separately for males and females and are expressed per 100,000 population.

Age-specific death rates

Age-specific death rates are death rates relating specifically to a certain age group. For each age group they have been calculated as the number of deaths in that age group divided by the mid-year estimated resident population for that age group.

i.e.

$$r_i = d_i / p_i$$

where: r_i = the age-specific death rate for age group i

d_i = the number of deaths for age group i

p_i = the mid-year estimated resident population for age group i.

Crude death rates

The annual crude death rate is the total number of deaths in a year divided by the total mid-year estimated resident population. The crude death rate is influenced by changes in the age structure of the population.

i.e.

$$CR = \sum_i d_i / \sum_i p_i$$

where: CR = crude rate

d_i = the number of deaths for age group i

p_i = the mid-year estimated resident population for age group i.

Age-standardised death rates

Age-standardisation is a technique for eliminating or reducing the influence of different age distributions on the death rates being compared. This report has used the direct standardisation method, which involves applying the age-specific death rates for a particular year to a standard population. This produces an estimate of the death rate which would have prevailed in the standard population if it had experienced the age-specific death rates in the year under study.

For most of the estimates reported here the standard population used was the estimated 1991 mid-year Australian population. The estimated 1988 mid-year Australian population was used for the trends analysis to maintain consistency with the original trends report by d'Espaignet.[5] This population was also used as the standard by Mathers in his differentials analyses.[8,9] For the international comparisons, the data were standardised to the European Standard Population.

The usual convention of using age-specific death rates for five-year age groups, defined as 0, 1–4, 5–9, ..., 80–84, 85+, was followed for the standardisation according to the formula

$$SR = \sum_i r_i P_i / \sum_i P_i$$

where: SR = the age-standardised rate

r_i= the age-specific death rate for age group i

P_i= the standard population in age group i.

Confidence intervals (CI)

In this report, 95% confidence intervals are given for age-standardised death rates. The confidence interval is given by the rate ± 1.96 multiplied by the standard error of the rate. Standard errors were calculated according to the formula

$$se(SR) = \sqrt{\sum_i (P_i^2 r_i (1 - r_i) / p_i) / (\sum_i P_i)^2}$$

where: r_i = the age-specific death rate for age group i

p_i = the mid-year estimated resident population for age group i

P_i= the standard population in age group i.

Person years of life lost

Person years of life lost is a measure of the impact of premature death on the community. It measures the years of life lost each year due to premature death from a specific cause. In this report, deaths occurring between the ages of 0 and 64 years are considered to be premature. Person years of life lost are estimated for those dying before age 65 by summing the years of life lost between each person's age at death and the age of 65.

2 Cardiovascular disease deaths in 1993

Cardiovascular disease (ICD-9 390–459) was the major cause of death among Australians in 1993, accounting for 53,240 registered deaths or 43.8% of deaths from all causes (Figure 2.1). Deaths from malignant neoplasms (ICD-9 140–208) were the second most common cause of death in 1993, with 32,691 registered deaths (26.9% of deaths from all causes). Diseases of the respiratory system (ICD-9 460–519), and accidents, poisonings and violence (ICD-9 E800–E999) were the third and fourth leading causes of death in 1993 respectively.

While other causes of death were more common among younger persons, cardiovascular disease was the leading cause of death for both men and women aged 65 years and over.[4] In 1993, accidents, poisonings and violence were the major cause of death among males aged 1–44 years. For males aged 45–64 years, malignant neoplasms were the leading cause of death. For females, accidents, poisonings and violence were the major causes of death among women aged 1–24 years, and malignant neoplasms were the major cause of death among women aged 25–64 years.

Of all cardiovascular diseases, coronary heart disease (ICD-9 410–414) was the major cause of death in 1993 with 29,762 deaths registered. This represented 55.9% of all cardiovascular disease deaths and 24.5% of deaths from all causes (Table 2.1). Almost 63% of coronary heart disease deaths were due to acute myocardial infarction (ICD-9 410). Cerebrovascular disease (stroke) (ICD-9 430–438) was the second most common cause of cardiovascular disease death accounting for almost 23% of all cardiovascular disease deaths registered. Heart failure (ICD-9 428) and peripheral vascular disease (ICD-9 441–444) were also major causes of cardiovascular disease mortality in 1993 representing 5.3% and 3.9%, respectively, of all cardiovascular disease deaths in that year.

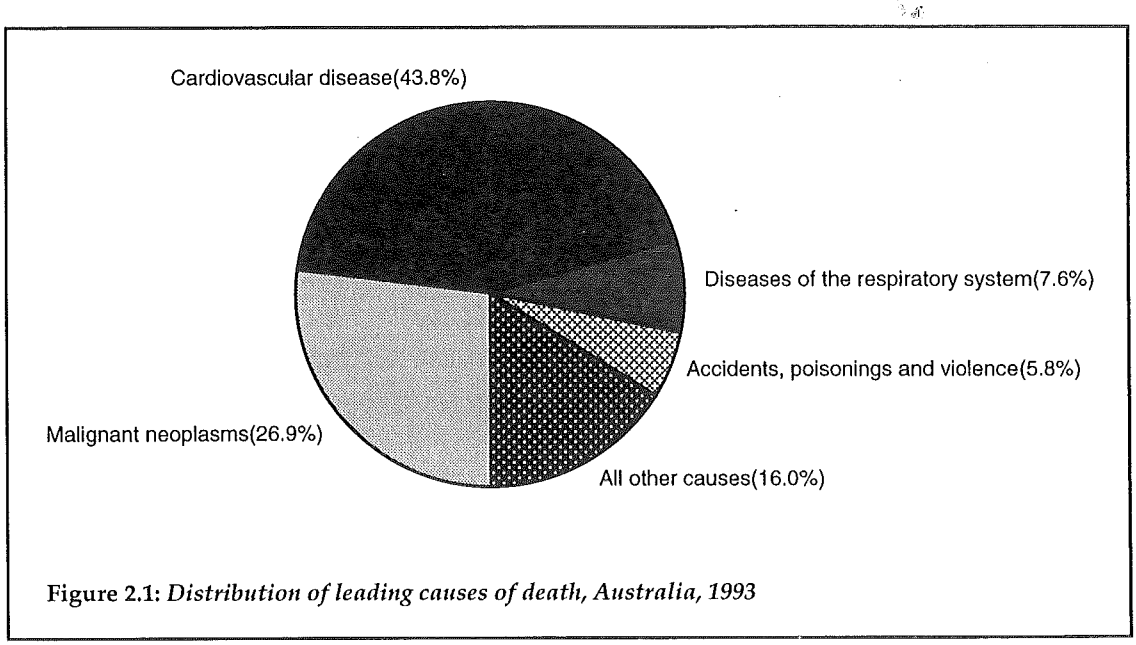


Figure 2.1: *Distribution of leading causes of death, Australia, 1993*

In 1993, 63,150 person years of life were lost before age 65 as a result of cardiovascular disease (Table A1). The person years of life lost before age 65 for other major causes of death in 1993 were 111,850 years for malignant neoplasms, 16,708 years for respiratory disease, and 163,833 years for accidents, poisoning and violence.

Coronary heart disease and cerebrovascular disease were the major contributors to the person years of life lost before age 65 due to cardiovascular disease in 1993, contributing 35,901 years and 9,975 years respectively (Tables A4 and A6).

Table 2.1: *Distribution of cardiovascular disease mortality in Australia, persons, 1993*

Disease	ICD-9	Number of deaths	Percentage of all cardiovascular disease	Percentage of all causes
Rheumatic heart disease	390–398	365	0.7	0.3
Hypertensive disease	401–405	1,137	2.1	0.9
Coronary heart disease	410–414	29,762	55.9	24.5
Aute myocardial infarction	410	18,671	35.1	15.4
Diseases of pulmonary circulation	415–417	228	0.4	0.2
Other forms of heart disease	420–429	6,265	11.8	5.2
Acute pericarditis	420	3	0.0	0.0
Acute and subacute endocarditis	421	84	0.2	0.1
Acute myocarditis	422	41	0.1	0.0
Other diseases of pericardium	423	30	0.1	0.0
Other diseases of endocardium	424	871	1.6	0.7
Cardiomyopathy	425	814	1.5	0.7
Other heart disease	426–429	4,422	8.3	3.6
Conduction disorders	426	55	0.1	0.0
Cardiac dysrhythmias	427	909	1.7	0.7
Heart failure	428	2,819	5.3	2.3
Congestive heart failure	428.0	1,723	3.2	1.4
Ill-defined heart disease	429	639	1.2	0.5
Cerebrovascular disease	430–438	12,138	22.8	10.0
Diseases of arteries, arterioles and capillaries	440–448	3,070	5.8	2.5
Atherosclerosis	440	860	1.6	0.7
Peripheral vascular disease	441–444	2,099	3.9	1.7
Aortic aneurysm	441	1,453	2.7	1.2
Other aneurysm	442	26	0.0	0.0
Other peripheral vascular disease	443	526	1.0	0.4
Arterial embolism and thrombosis	444	94	0.2	0.1
Polyarteritis nodosa and allied conditions	446	61	0.1	0.1
Other disorders of arteries and arterioles	447	47	0.1	0.0
Disease of capillaries	448	3	0.0	0.0
Diseases of veins and lymphatics, and other diseases of circulatory system	451–459	275	0.5	0.2
All cardiovascular disease	390–459	53,240	100.0	43.8
All causes		**121,599**		**100.00**

3 Differentials in cardiovascular disease mortality

Sociodemographic information provided on death certificates enables comparisons of mortality to be made between different groups in the population (Box 3.1).

Box 3.1: ***Data items on the Australian Bureau of Statistics mortality database that are available for examination of mortality differentials***

Sex of deceased

Age of deceased

State or Territory of registration

Month and year of registration of death

Place of usual residence of deceased—State or Territory

- *Statistical Division*
- *Statistical Local Area*

Occupation of deceased—males and females aged 15 years and over (from 1990 only)

- *Males aged 15–64 years only (pre-1990)*
- *Females aged 15–59 years only (1985 to 1990)*

Country of birth of deceased

Duration of residence in Australia (where deceased was not born in Australia)

Marital status of deceased

Aboriginality[a] (for all States except Queensland)

(a) The quality of death registration data for indigenous peoples varies from state to state. Only in South Australia, Western Australia and Northern Territory are death registration data for indigenous peoples considered to be of publishable standard.

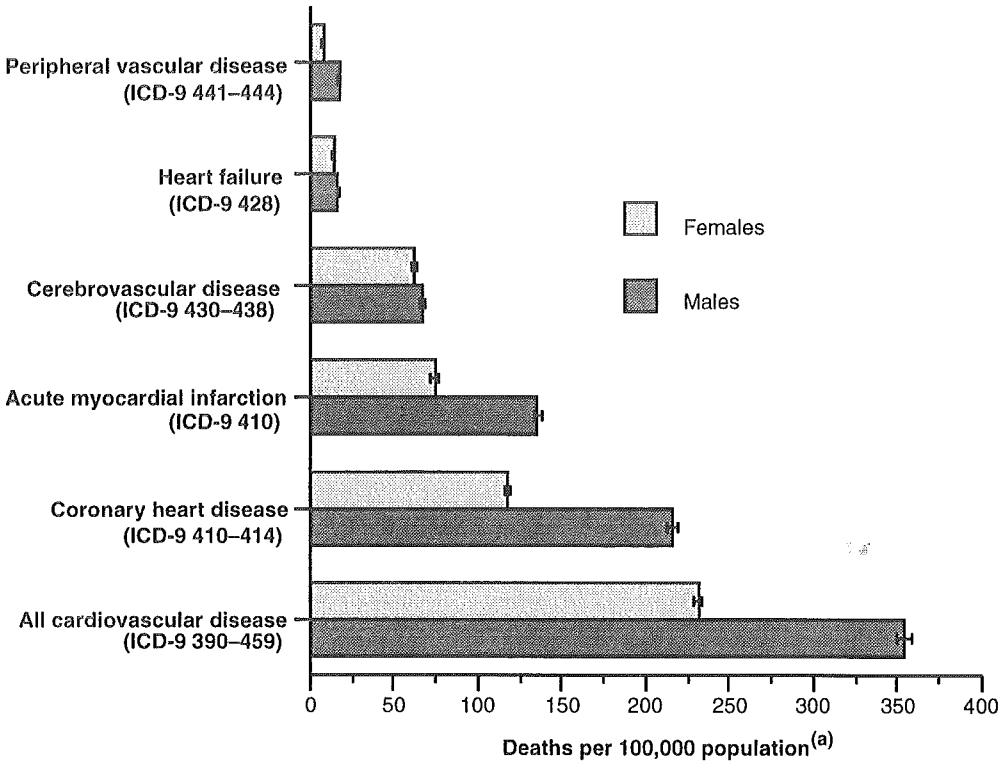
Source: Australian Bureau of Statistics[4]

In 1993, the age-standardised death rate across all ages for all cardiovascular disease among males was 1.5 times the rate for females (Table A1). For peripheral vascular disease the male age-standardised death rate was 2.3 times the female rate, while for coronary heart disease and acute myocardial infarction the male age-standardised death rates were 1.8 times those for females (Tables A7, A4 and A2 respectively). Males also had slightly higher death rates than females for heart failure and cerebrovascular disease (Figure 3.1).

Age-specific death rates for cardiovascular disease and its manifestations were generally higher for males than for females, however the differentials in death rates between the sexes

tended to decline with increasing age (Figure 3.2). For all cardiovascular disease in 1993, the age-specific death rates were higher for males than for females for all age groups except 5–14 years and 85 years and over. The differential was greatest in the 45–54 year age group, where the male death rate was 3.0 times the female rate.

For acute myocardial infarction, the male to female death rate ratio was highest in the 35–44 year age group, where the male death rate was nearly 5.3 times the female rate (Table A2). For both the 35–44 and 45–54 year age groups in 1993, the male death rate for coronary heart disease was 4.8 times the female rate (Table A4). Although the differential in death rates between males and females declined from age 55 onwards, the male age-specific death rates remained higher than the corresponding female rates (Figure 3.2). For heart failure, the largest death rate differential between males and females occurred in the 55–64 year age group, where the male rate was 2.4 times the female rate. For peripheral vascular disease the age-specific death rates for males were consistently higher than for females from the age group 45–54 years onwards. There was little difference between males and females in the age-specific death rates from cerebrovascular disease in 1993.

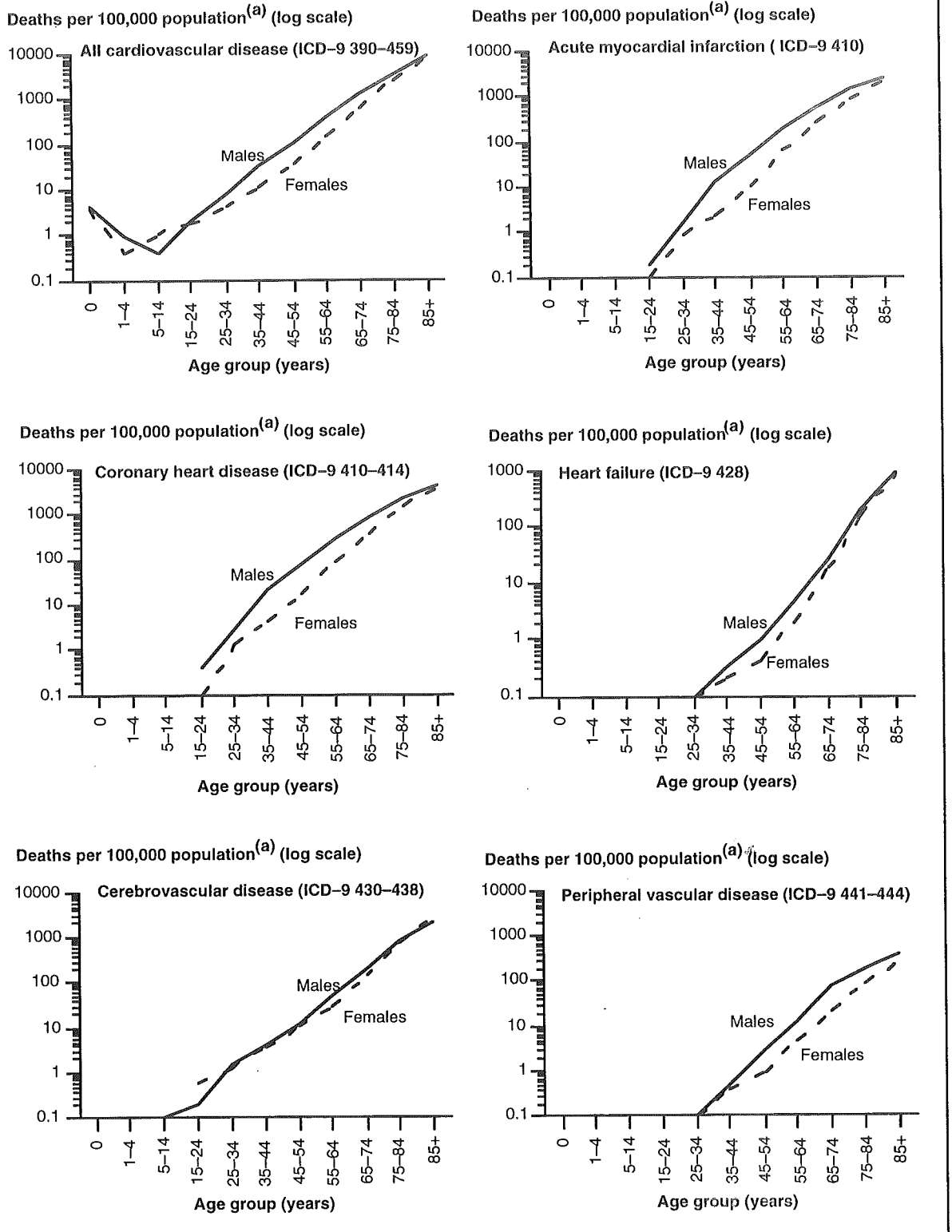


(a) Age-standardised to the mid-1991 total Australian population

Refer to Tables A1–A7

Figure 3.1: *Age-standardised death rates for cardiovascular diseases with 95% confidence interval, Australia, 1993*

Cardiovascular disease continues to be a major cause of death among Aboriginal and Torres Strait Islander peoples.[10] Data for the period 1990–92 show that the age-standardised death rate from cardiovascular disease among Aboriginal males was 2.4 times that of all Australian males. Among Aboriginal females the cardiovascular disease age-standardised death rate was 2.6 times that of all Australian females.



(a) Deaths per 100,000 1993 mid-year population for each age group

Refer to Tables A1–A7

Figure 3.2: *Age-specific death rates for cardiovascular disease by sex, Australia, 1993*

Mathers[8] has undertaken a detailed analysis of mortality differentials for the period 1985 to 1987 (Appendix 3). This analysis included age-standardised mortality differentials for all cardiovascular disease, coronary heart disease and cerebrovascular disease for persons aged 25–64 years. The differentials between population subgroups were expressed in terms of rate ratios, where the age-standardised death rate for each subgroup was expressed as a multiple of the age-standardised death rate for a reference group, chosen either to be the largest sub-group (such as Australian-born for country of birth differentials) or the sub-group with the best health status (such as professionals for occupational differentials). Among men and women aged 25–64 years in 1985–87, those groups with significantly higher cardiovascular disease death rates included (Table A8, Figures 3.3 and 3.4):

- never married men—2.1 times higher death rate than married men (i.e. 297.1/139.4—refer to Table A8)
- never married women—1.9 times higher death rate than married women
- 'blue collar workers' (men aged 25–54 years)—1.6 times higher death rate than 'professionals'
- men (aged 25–54 years) in low prestige occupations—1.9 times higher death rate than men in high prestige occupations
- men living in areas of greatest socioeconomic disadvantage—1.7 times higher death rate than men living in areas of least socioeconomic disadvantage
- women living in areas of greatest socioeconomic disadvantage—2.0 times higher death rate than women living in areas of least socioeconomic disadvantage
- men and women in the Northern Territory—both 1.5 times higher death rates than the national average
- non-metropolitan men and women—both 1.2 times higher death rates than their metropolitan counterparts

For men aged 25–54 years in 1985–87, cardiovascular disease death rates displayed clear occupational gradients and were inversely related to occupational prestige (Figure 3.3). Death rates for cardiovascular disease rose as level of socioeconomic disadvantage increased for men and women aged 25–64 years (Figures 3.3–3.4).

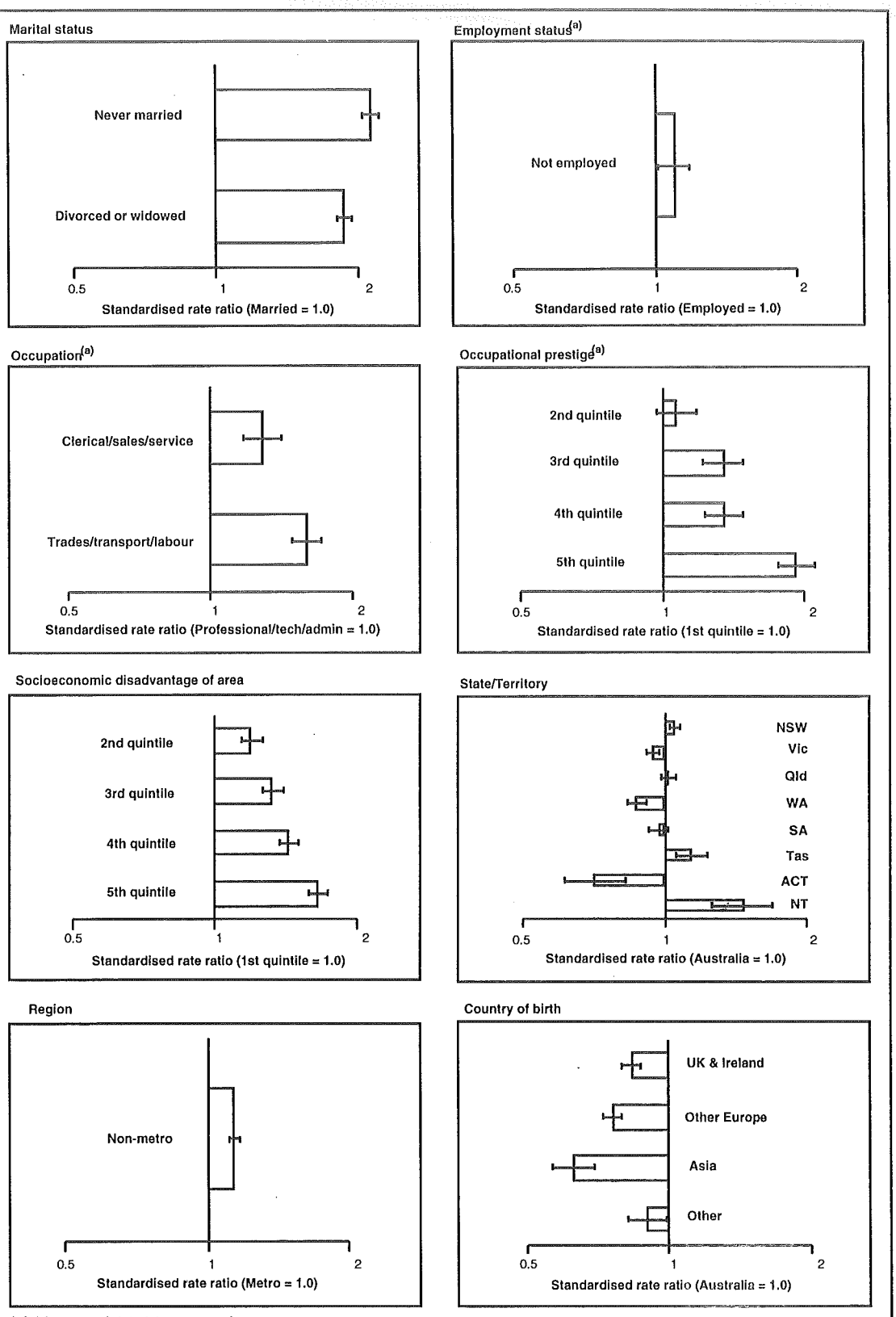
Persons born overseas had significantly lower cardiovascular disease death rates than their Australian-born counterparts (Figures 3.3–3.4).

Differentials in coronary heart disease mortality and cerebrovascular disease mortality generally reflected those observed for all cardiovascular disease (Tables A9–A10).

More recently, Mathers[9] has examined health differentials among Australians aged 65 years and over. Comparison of age-standardised death rates for cardiovascular disease showed that divorced or widowed males were 1.4 times more likely to die from cardiovascular disease than their married counterparts (Table A11). Never married females were 1.5 times more likely to die from cardiovascular disease than married females. Both men and women from areas of greatest socioeconomic disadvantage had significantly higher cardiovascular disease death rates than those from areas of least socioeconomic disadvantage. Males from New South Wales and females from Tasmania both had cardiovascular disease death rates that were 1.1 times the national average.

As for those aged 25–64 years, older persons born overseas had significantly lower cardiovascular disease death rates than their Australian-born counterparts.[9]

The differentials for coronary heart disease mortality, and for cerebrovascular disease mortality, among older persons were generally similar to those observed for all cardiovascular disease mortality (Tables A12–A13).



(a) Men aged 25–64 years only

Notes: Rates directly age-standardised to the 1988 total Australian population.

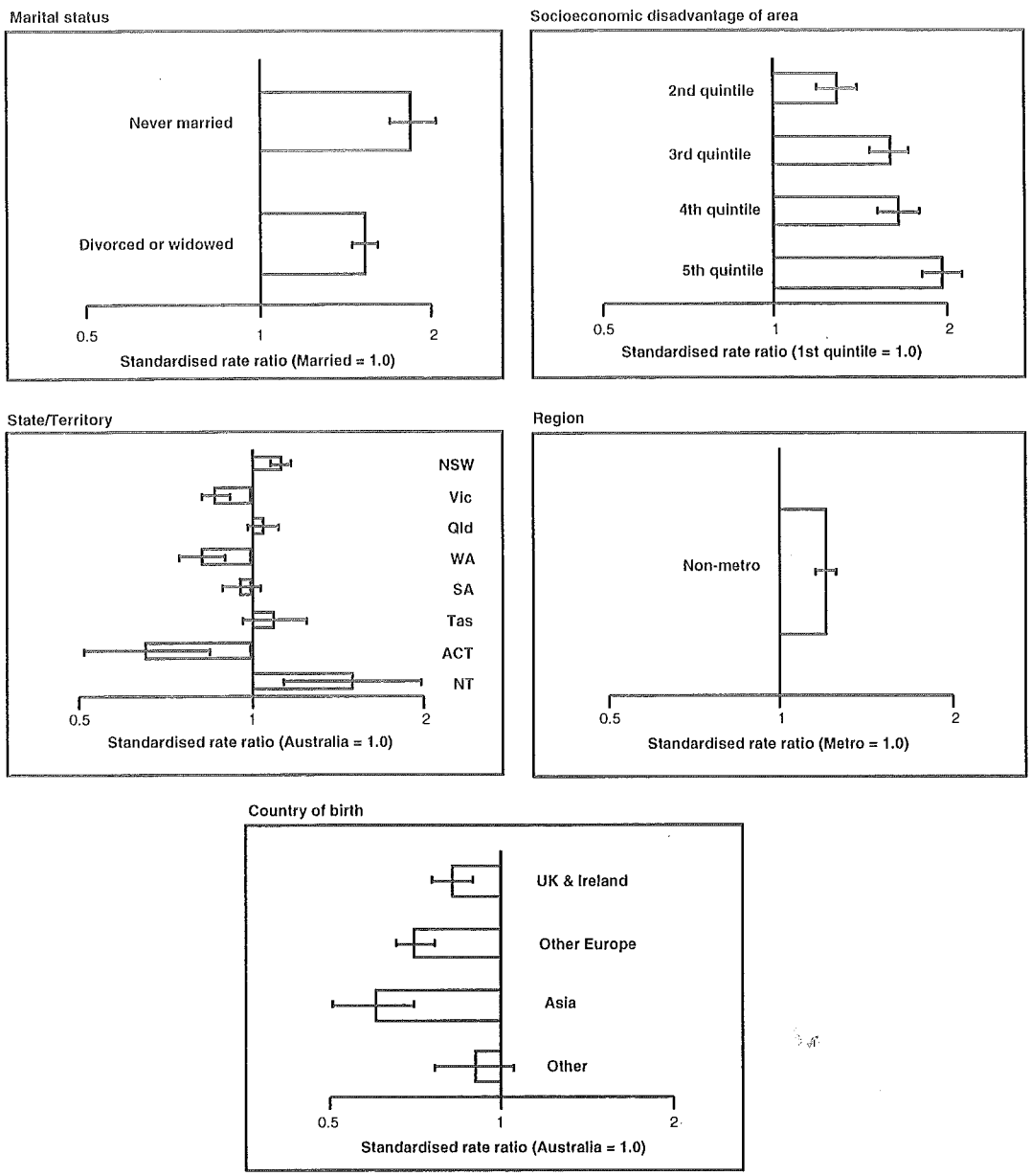
Rate ratios are presented graphically using a logarithmic scale—the vertical axis represents a rate ratio of 1.0 and rate ratios of 0.5 and 2.0 are represented by equal length bars extending outwards from the vertical axis in opposite directions.

Error bars represent the 95% confidence intervals for the rate ratios.

Source: Mathers[8]

Refer to Table A8

Figure 3.3: ***Differentials in cardiovascular disease mortality by various sociodemographic variables, men aged 25–64 years, 1985–87***



Notes: Rates directly age-standardised to the 1988 total Australian population.

Rate ratios are presented graphically using a logarithmic scale—the vertical axis represents a rate ratio of 1.0 and rate ratios of 0.5 and 2.0 are represented by equal length bars extending outw ds from the vertical axis in opposite directions.

Error bars represent the 95% confidence intervals for the rate ratios.

Source: Mathers[8] Refer to Table A8

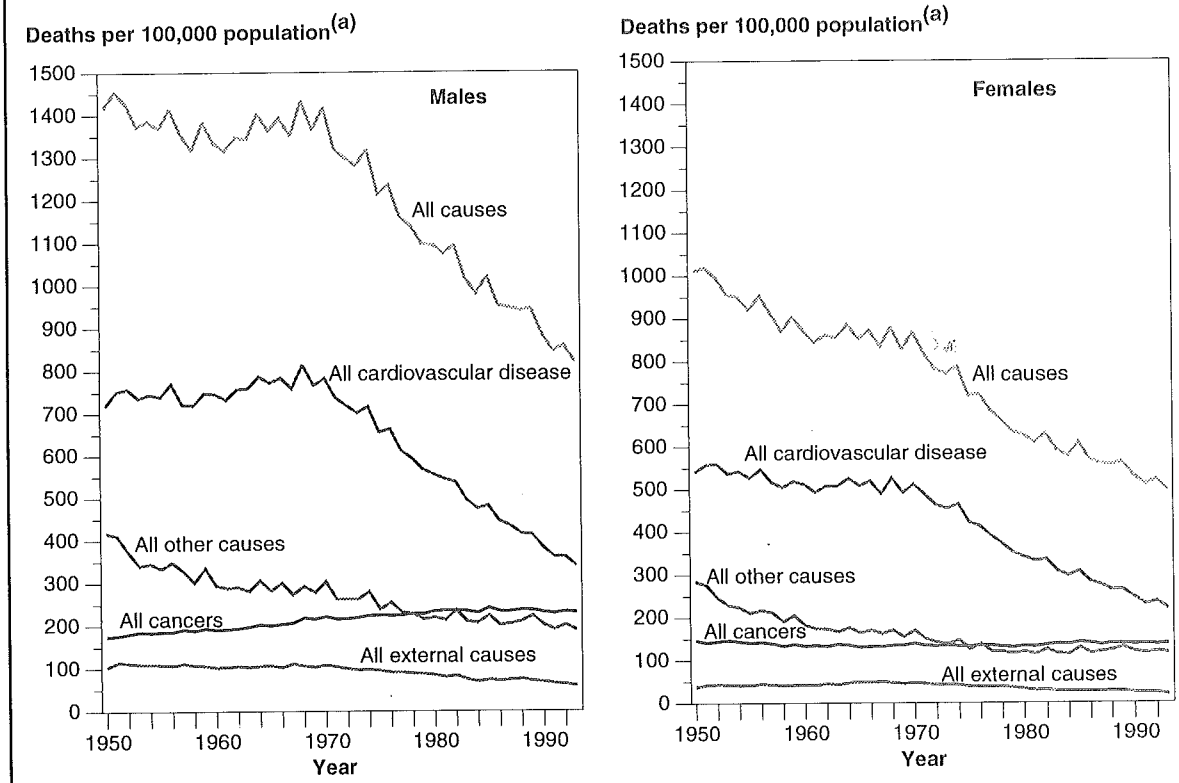
Figure 3.4: *Differentials in cardiovascular disease mortality by various sociodemographic variables, women aged 25–64 years, 1985–87*

4 Trends in cardiovascular disease mortality

4.1 All cardiovascular disease

Australia has experienced a marked decline in mortality from cardiovascular disease over recent decades (Figure 4.1). This decline is the focus of a report that examined trends in mortality from cardiovascular disease in Australia from 1950 to 1991.[5] This trend analysis has been extended here to include the years 1992 and 1993.

During the 1950s and 1960s there was little change in the age-standardised death rates from cardiovascular disease among males (Figure 4.1). The peak occurred in 1968 with an age-standardised death rate of 814 cardiovascular disease deaths per 100,000 population, and since then the male death rates for cardiovascular disease have declined rapidly. The age-standardised cardiovascular disease death rates for females declined slowly until the late 1960s and have also declined rapidly since.



(a) Age-standardised to the 1988 total Australian population

Refer to Tables A14 & A15

Source: d'Espaignet,[5] updates to 1993

Figure 4.1: *Age-standardised rates for all causes, all cardiovascular disease, all external causes, all cancers, and all other causes of death, Australia, males and females, 1950–1993*

The National Heart Foundation's *Heart Facts 1992*[11] examined trends in cardiovascular disease among 20–69-year-old Australians over the period 1968 to 1992. For this age group, it is estimated that there were almost 260,000 fewer deaths from cardiovascular disease in 1992 than would have occurred if the 1967 rate had prevailed.

Bennett et al.[3] estimated that during the more recent period from 1981 to 1992, the average annual rates of decline in cardiovascular disease death rates among males and females were 3.8% and 3.3% respectively (Table 4.1).

Table 4.1: *Estimated annual rates of change in cardiovascular disease death rates for the period 1981–1992, Australia*

	Estimated annual rate of change with 95% confidence interval			
Disease	**Males**		**Females**	
Chronic rheumatic heart disease (ICD-9 393–389)	−3.5	(−4.5, −2.5)	−2.9	(−3.7, −2.0)
Hypertensivbe disease (ICD-9 401–405)	−5.2	(−5.7, −4.6)	−4.2	(−4.7, −3.6)
Acute myocardial infarction (ICD-9 410)	−4.6	(−4.7, −4.5)	−3.3	(−3.4, −3.1)
Coronary heart disease (ICD-9 410–414)	−3.6	(−3.7, −3.5)	−2.6	(−2.7, −2.4)
Pulmonary embolism (ICD-9 415.1)	−7.3	(−8.6, −6.0)	−3.8	(−5.1, −2.4)
Cardiomyopathy (ICD-9 425)	1.9	(1.4, 2.5)	3.4	(2.4, 4.5)
Cardiac dysrhythmias (ICD-9 427)	0.9	(0.2, 1.6)	2.4	(1.6, 3.2)
Heart failure (ICD-9 428)	−3.7	(−4.0, −3.4)	−1.8	(−2.2, −1.5)
Ill-defined descriptions and complications of heart disease (ICD-9 429)	−11.2	(−11.7, −10.7)	−10.4	(−10.9, −9.8)
Cerebrovascular disease (ICD-9 430–438)	−4.6	(−4.8, −4.5)	−4.7	(−4.9, −4.6)
Atherosclerosis (ICD-9 440)	−10.6	(−11.0, −10.1)	−9.6	(−10.1, −9.1)
Aortic aneurysm (ICD-9 443)	−0.8	(−1.2, −0.4)	0.8	(0.1, 1.5)
Other peripheral vascular disease (ICD-9 443)	2.3	(1.5, 3.1)	2.2	(1.2, 3.2)
Phlebitis, thrombophlebitis, venous embolism and thrombosis (ICD-9 451–453)	−8.4	(−9.6, −7.1)	−5.0	(−6.3, −3.7)
All cardiovascular diseases (ICD-9 390–459)	−3.8	(−3.9, −3.7)	−3.3	(−3.4, −3.2)

Source: Bennett et al.[3]

4.2 Coronary heart disease

Between 1950 and 1968, the age-standardised death rate from coronary heart disease among males increased by an average of 3.7% per annum—from 242 to 467 deaths per 100,000 population (Figure 3.2). From 1969 to 1993, the male age-standardised death rate decreased by an average of 3.2% per annum—from 449 to 208 deaths per 100,000 population. The trend for females was similar, with an average annual increase in the age-standardised death rate from coronary heart disease of 4.0% between 1950 and 1968 (115 to 231 deaths per 100,000 population), and a 2.8% annual decrease since 1968 (221 to 112 deaths per 100,000 population). Despite these declines in coronary heart disease death rates, the proportion of cardiovascular disease deaths among males that were attributable to coronary heart disease in 1993 (60.9%) was slightly more than the proportion in 1968 (57.4%). For females the proportion of cardiovascular disease deaths attributable to coronary heart disease increased from 43.9% in 1968 to 50.9% in 1993.

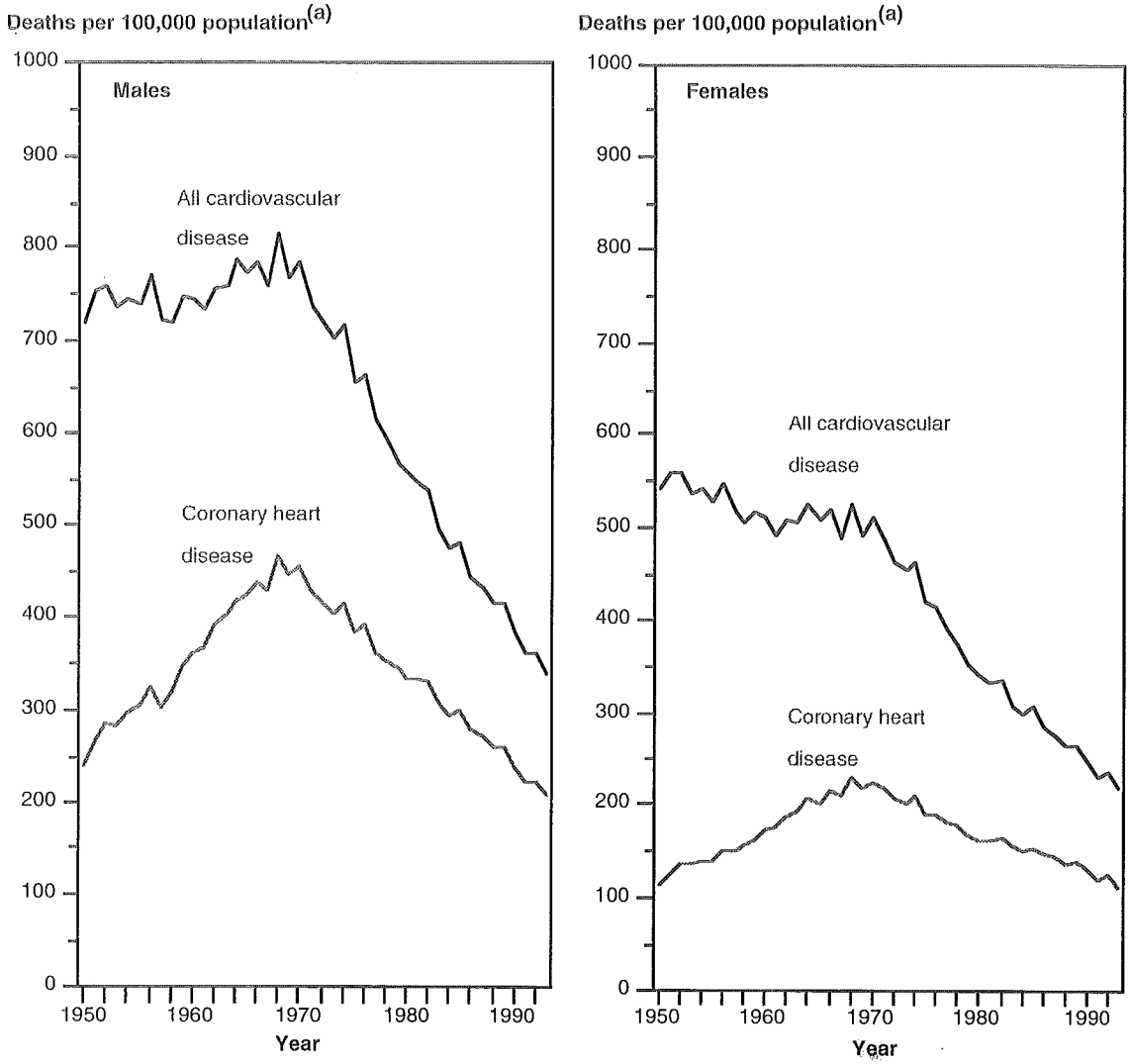
The National Heart Foundation[11] compared age-specific death rates from coronary heart disease over two five-year periods, 1965–69 and 1988–92. For age groups in the range 20–69 years, the fall in death rates occurred fairly uniformly. The fall amongst the age groups over 70 years was smaller but was still substantial.

The National Heart Foundation[11] estimated that, during the period 1968 to 1992, almost 170,000 lives were 'saved' as a result of the falling death rate from coronary heart disease among persons aged 20–69 years.

The declines in coronary heart disease death rates are reflected in declines in total person years of life lost from all causes. Jain estimated that in 1971, premature deaths from all causes resulted in 526,505 person years of life lost before age 65 for males and 323,889 person years of life lost before age 65 for females.[12] By 1989, these estimates had declined to 333,061 person years of life lost before age 65 for males and 188,846 person years of life lost before age 65 for females. In 1971, heart disease (primarily coronary heart disease) among males accounted for 18.9% (99,380 years) of person years of life lost before age 65 compared to 13.9% (46,287 years) in 1989. Among females, heart disease contributed to 10.9% (35,311 years) of total person years of life lost before age 65 in 1971, and to 7.9% (14,869 years) in 1989.

In a similar exercise, d'Espaignet[5] noted that, of those who died from coronary heart disease in 1971, 43.0% of men and 31.0% of women were aged less than 70. By 1991 these proportions had reduced to 33.6% and 21.6% respectively. These absolute improvements, in the level of premature mortality from coronary heart disease, over the 21-year period were greater than equivalent figures for all causes mortality.

Over the period 1981–89, the total expectation of life at birth increased by 2.1 years for males and by 1.3 years for females.[12] The reduction in coronary heart disease mortality over this period was a major contributor to this gain in the expectation of life at birth, contributing 1.1 years (52.4%) for men and 0.6 years (47.2%) for women.



(a) Age-standardised to the 1988 total Australian population

Refer to Tables A14–A17

Source: d'Espaignet,[5] updates to 1993

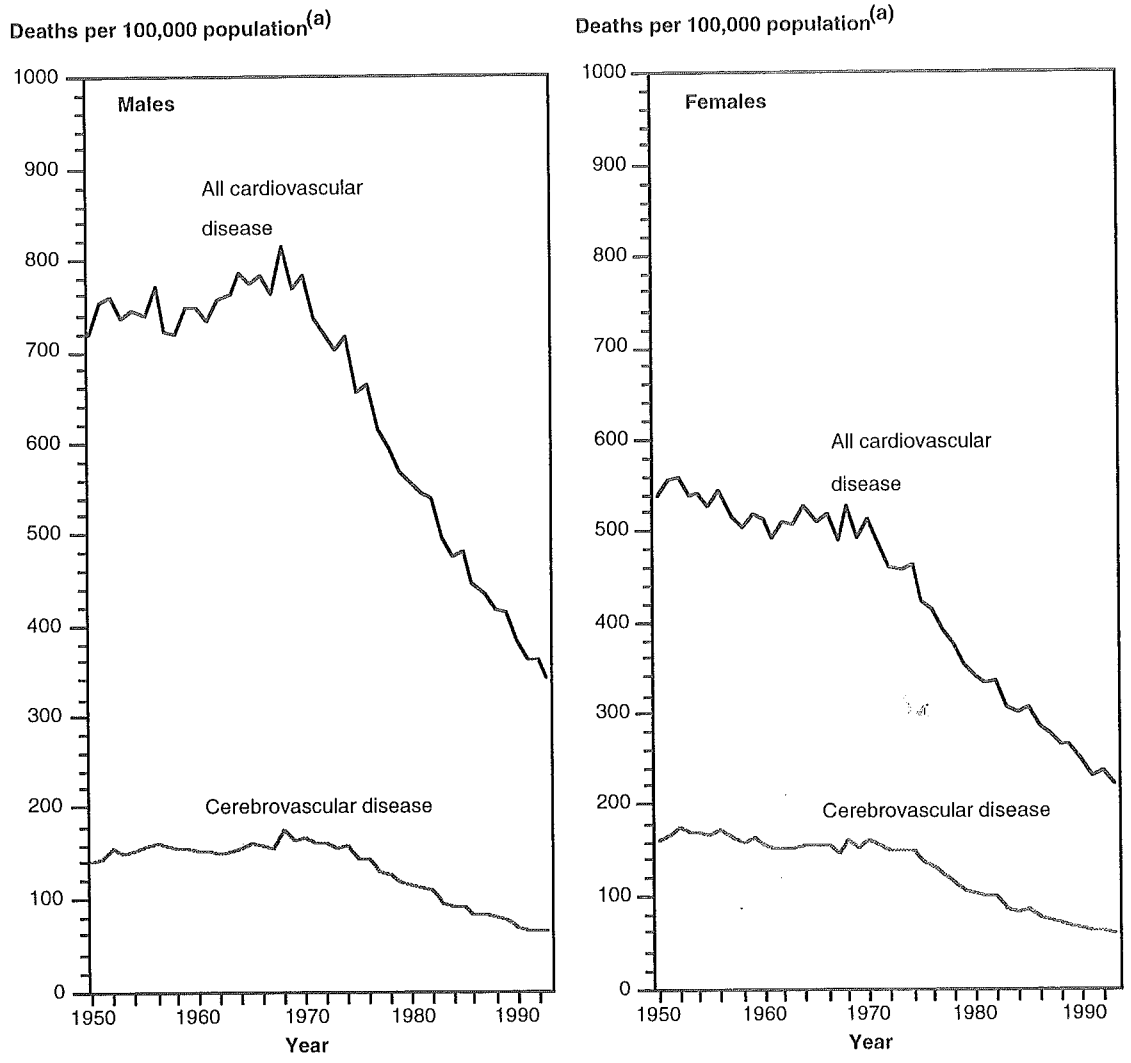
Figure 4.2: ***Age-standardised rates for coronary heart disease and for all cardiovascular disease, Australia, males and females, 1950–93***

4.3 Cerebrovascular disease

From 1950 to 1973, there was relatively little change in age-standardised death rates from cerebrovascular disease (Figure 4.3). Between 1974 and 1993, however, the age-standardised death rate from cerebrovascular disease among males decreased from 159 to 64 deaths per 100,000 population—an average fall of 4.7% per year. The corresponding decline for females, from 150 to 59 deaths per 100,000 population, represented an average annual decrease of 4.8%. Despite the declines in cerebrovascular disease mortality since the mid-1970s, there was very little change in the proportion of deaths from cardiovascular disease that could be attributed to cerebrovascular disease.

In 1971, cerebrovascular disease among males accounted for 3.4% (17,929 years) of total person years of life lost before age 65 compared with 2.1% (6,881 years) in 1989.[12] For females, cerebrovascular disease contributed to 6.0% (19,377 years) of total person years of life lost before age 65 in 1971, and 3.0% (5,707 years) in 1989. Over the period 1981–89, reduction in cerebrovascular disease mortality was a major contributor to the gain in the expectation of life at birth, contributing 0.3 years (16.2%) to the total gain for men and 0.5 years (40.1%) to the total gain for women.[12]

The National Heart Foundation estimated that the falling death rate from cerebrovascular disease among persons aged 20–69 years resulted in more than 53,000 lives saved during the period 1968 to 1992.[11]



(a) Age-standardised to the 1988 total Australian population

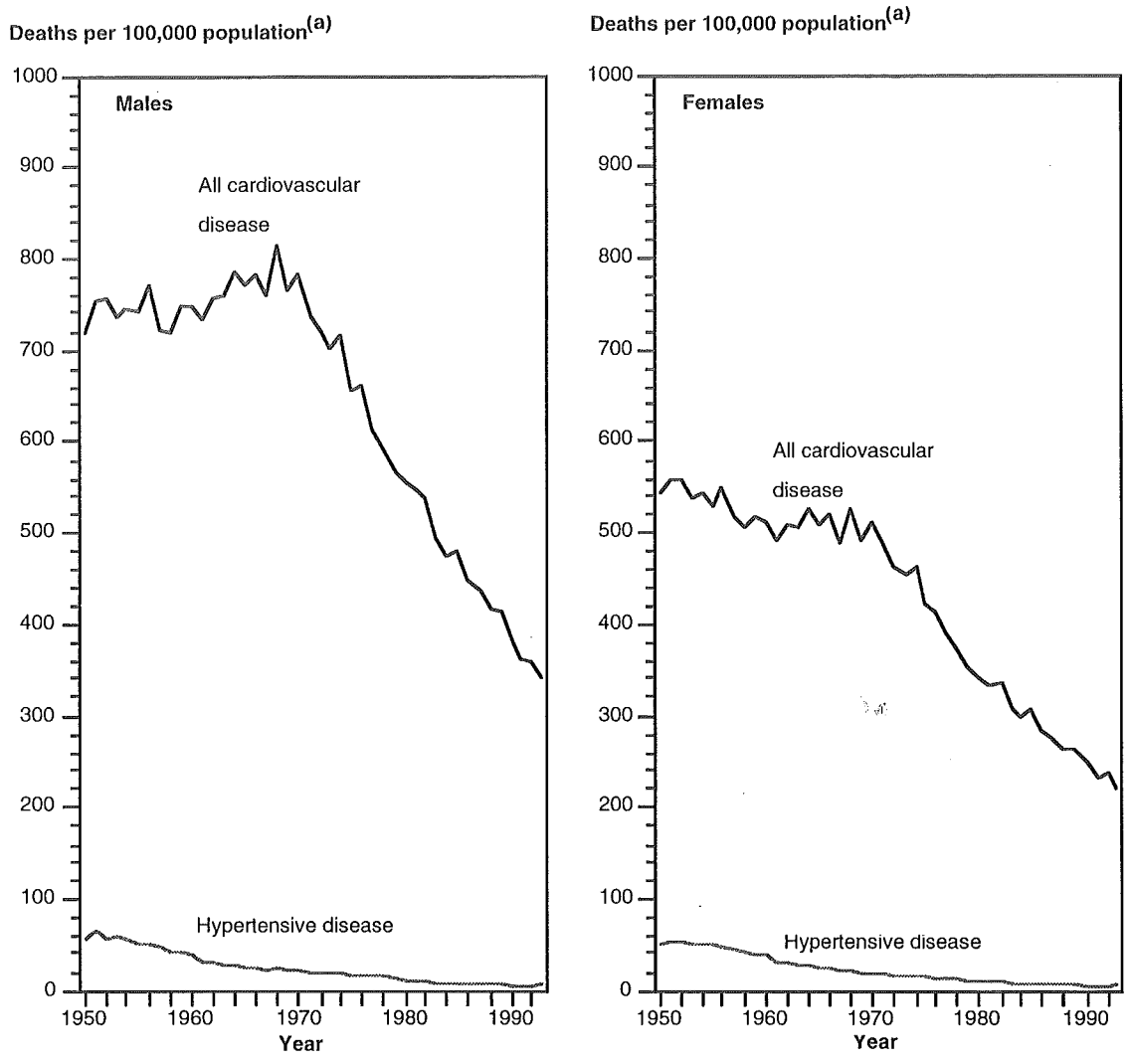
Source: d'Espaignet,[5] updates to 1993

Refer to Tables A14–A17

Figure 4.3: ***Age-standardised rates for cerebrovascular disease and all cardiovascular disease, Australia, males and females, 1950–93***

4.4 Hypertensive disease

There has been a steady decline in the age-standardised death rates from hypertensive disease for both males and females during the period 1950 to 1993 (Figure 4.4). In 1950 the male age-standardised death rate was 57 per 100,000 population and by 1993 it had dropped to 6 per 100,000 population—an average annual decline of 5.1%. For females, the death rate from hypertensive disease declined from 51 deaths per 100,000 population in 1953 to 6 deaths per 100,000 population in 1993, an average annual decrease of 4.9%. The proportion of cardiovascular disease deaths attributable to hypertensive disease among males fell from 7.9% in 1950 to 1.8% in 1993. The corresponding proportion for females decreased from 9.4% in 1950 to 2.7% in 1993.



(a) Age-standardised to the 1988 total Australian population

Source: d'Espaignet,[5] updates to 1993

Refer to Tables A14–A17

Figure 4.4: *Age-standardised rates for hypertensive disease and all cardiovascular disease, Australia, males and females, 1950–93*

4.5 Rheumatic heart disease

Since 1950, there have also been substantial declines in the male and female death rates from rheumatic heart disease.[5] For males, the age-standardised death rate declined from 22 per 100,000 population in 1950 to 1 per 100,000 population in 1993. The corresponding rates for females were 18 in 1950 and 2 in 1993.

5 International comparisons of cardiovascular disease mortality

Mortality data compiled by the World Health Organization enable international comparisons of death rates from different causes. However such comparisons should be interpreted with caution as death certification and coding methodologies can differ from country to country.[13,14]

Despite the declines in cardiovascular disease mortality, Australia still compares unfavourably with many other countries. In 1990, the age-standardised cardiovascular disease death rate among Australian males of all ages was 399.9 per 100,000 and ranked 10th lowest of the 28 countries compared (Figure 5.1).[15,16] The age-standardised cardiovascular disease death rate among Australian females was 11th lowest at 258.7 per 100,000. France had the lowest age-standardised cardiovascular disease death rates in 1990 (267.3 per 100,000 for males and 159.3 per 100,000 for females); Hungary had the highest rates (807.5 per 100,000 for males and 525.1 per 100,000 for females).

For coronary heart disease, the death rate among Australian males (249.9 per 100,000) in 1990 was 12th highest of the 28 countries compared (Figure 5.2). Australian females had the 11th highest coronary heart disease death rate (134.2 per 100,000). Japan had the lowest coronary heart disease death rates (50.6 per 100,000 for males and 28.6 per 100,000 for females); Northern Ireland had the highest rate among males (371.7 per 100,000) and Malta had the highest rate among females (188.8 per 100,000).

The death rate from cerebrovascular disease in 1990 among Australian males was 73.3 per 100,000 and ranked 6th lowest of the 28 countries compared (Figure 5.3). The United States of America had the lowest age-standardised cerebrovascular disease death rate among males (53.6 per 100,000) and Portugal had the highest rate (248.5 per 100,000). For Australian females, the death rate from cerebrovascular disease 11th lowest at 68.1 per 100,000. Canadian females had the lowest cerebrovascular death rate in 1990 (45.1 per 100,000) and Portuguese females had the highest rate (193.6 per 100,000).

Thom[14] compared trends in 27 countries using mortality statistics reported to the World Health Organization for ages 45 to 64 and the years 1950 to 1985. The trend in mortality from coronary heart disease was generally upward in most industrialised countries until the 1960s, although in Japan rates were falling from as early as 1950. The decline began during the early 1960s in the United States and Canada, and in the late 1960s in Australia, New Zealand, Finland and Portugal. In the early 1970s, Israel, Belgium, the Netherlands, Scotland, Northern Ireland and Norway joined those countries where mortality from coronary heart disease was on the decline. By the 1980s, only Czechoslovakia, Yugoslavia, Hungary and Poland still experienced increasing death rates among men aged 45–64 years. Peaks in coronary heart disease mortality generally occurred earlier in women than in men. Countries with the largest falls (around 20%) in mortality in men and women during 1979 to 1985 were Australia, Canada, Finland, Israel, Japan, New Zealand and the United States.

(a) Age-standardised to the European Standard Population

Refer to Table A18

Note: Relative position is different between males and females.

Source: Australian Institute of Health and Welfare, derived from the World Health Organization[15,16]

Figure 5.1: *Cardiovascular disease rate ratios of age-standardised[(a)] death rates for various countries relative to Australia's rate, 1990*

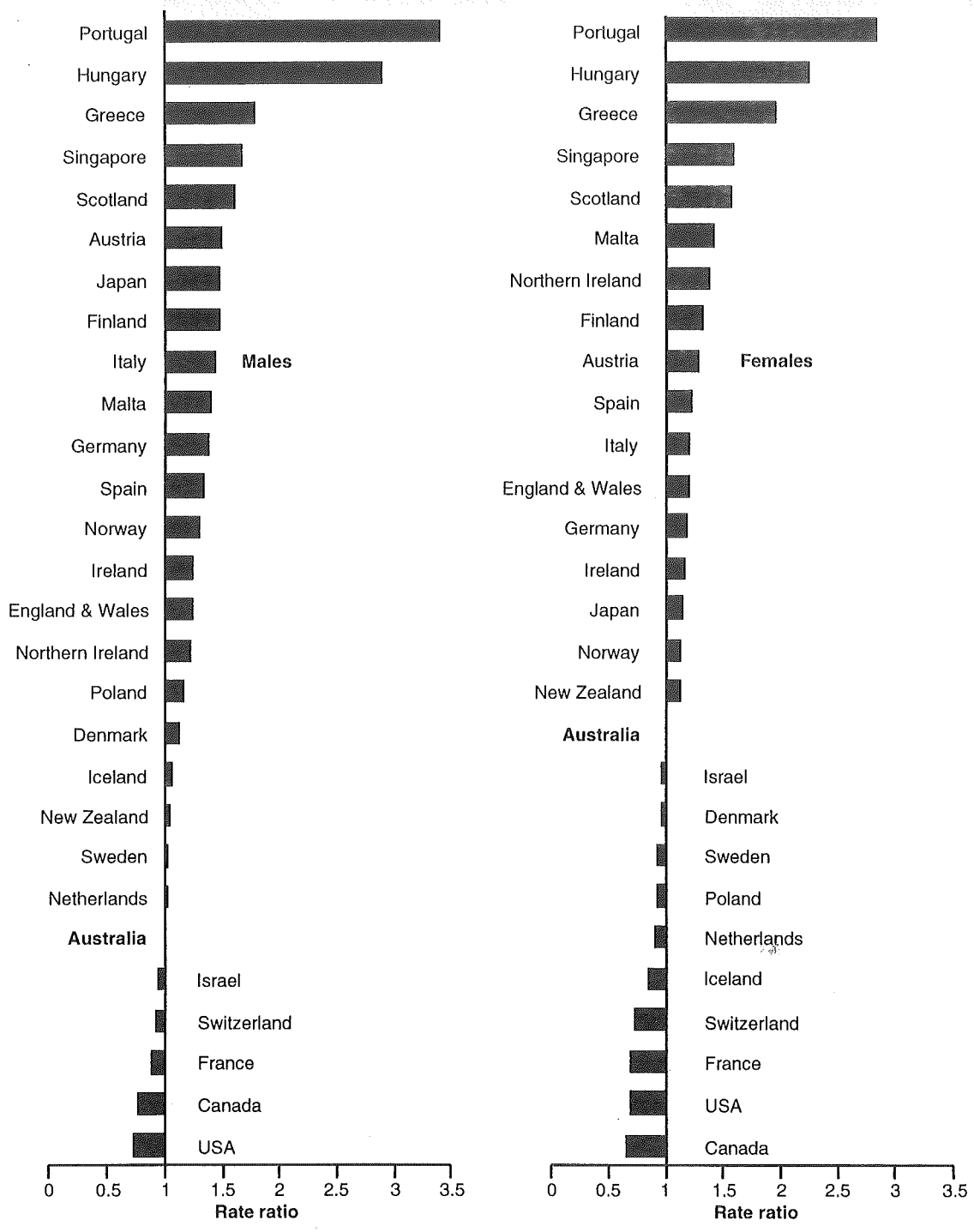
(a) Age-standardised to the European Standard Population

Refer to Table A18

Note: Relative position is different between males and females.

Source: Australian Institute of Health and Welfare, derived from the World Health Organization[15,16]

Figure 5.2: *Coronary heart disease rate ratios of age-standardised[(a)] death rates for various countries relative to Australia's rate, 1990*



(a) Age-standardised to the European Standard Population

Refer to Table A18

Note: Relative position is different between males and females.

Source: Australian Institute of Health and Welfare, derived from the World Health Organization[15,16]

Figure 5.3: *Cerebrovascular disease rate ratios of age-standardised[(a)] death rates for various countries relative to Australia's rate, 1990*

6 Goals and targets

The following goals and targets were proposed by the cardiovascular disease Implementation Working Group,[1] and have now been endorsed by the Australian health ministers. The State and Territory Governments will be examining these goals and targets, and the proposed strategies to achieve them, over the next year.

Primary goal	Improve cardiovascular health by reducing coronary heart disease and its impact on the population
Indicators	Premature mortality rates for coronary heart disease for adults aged 25–74 years Mortality rates for coronary heart disease for the total population
Targets for the year 2000	Men aged 25–74 years: 110 deaths per 100,000 population Women aged 25–74 years: 40 deaths per 100,000 population
Baseline data	1992 age-standardised death rate for persons aged 25–74 years Men: 179.5 deaths per 100,000 population Women: 67.8 deaths per 100,000 population *Source:* Australian Institute of Health and Welfare
Goal	Reduce the differences in cardiovascular health between identified priority populations and the wider Australian community • Aboriginal and Torres Strait Islander communities • socioeconomically disadvantaged Australians • rural and remote residents • certain immigrant groups
Indicator	The relative rate of mortality from cardiovascular disease among Aboriginal men and women of all ages
Targets for the year 2000	Aboriginal men: 120 deaths per 100,000 Aboriginal women: 100 deaths per 100,000
Baseline data	Aboriginal men: 238 deaths per 100,000 (1992) Aboriginal women: 200 deaths per 100,000 (1992) *Source:* Australian Institute of Health and Welfare[10]

7 Gaps and deficiencies

The quality of mortality data in Australia is generally very good. For example, with respect to acute myocardial infarction (ICD-9 410) and coronary heart disease (ICD-9 410–414), Boyle and Dobson[7,17] have compared mortality data with MONICA data and found that the coding of death is quite accurate. However there is a need to validate causes of cardiovascular death other than coronary heart disease. The validity, reliability and coverage of some sociodemographic characteristics such as Aboriginality and occupation also need to be addressed.

Currently goals and targets for cardiovascular disease mortality only address coronary heart disease, so there is a need to develop targets for other manifestations of cardiovascular disease.

Finally there is a lack of current data and research relating to trends in socioeconomic inequalities for cardiovascular disease mortality.

Appendix 1

Figure tables

Table A1: *Deaths from all cardiovascular disease (ICD-9 390–459) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	6	4.4	5	3.9
1–4	5	0.9	2	0.4
5–14	5	0.4	12	1.0
15–24	30	2.1	24	1.8
25–34	115	8.1	63	4.5
35–44	436	32.6	162	12.2
45–54	1,187	112.8	385	38.2
55–64	3,036	411.0	1,158	158.1
65–74	7,419	1,276.9	4,142	628.2
75–84	9,461	3,683.4	10,111	2,600.2
85+	4,670	9,022.9	10,804	8,772.0
Unknown age	2	0.0	0	0.0
Total	**26,372**		**26,868**	
$PYLL_{0-64}$[b]	45,051 years		18,099 years	
Crude death rate[c]		299.8		303.1
Age-standardised death rate[d]		354.0		231.4
95% confidence interval		349.8–358.2		228.7–234.2

(a) Deaths per 100,000 mid-1993 population for each age group

(b) Person years of life lost before age 65 years

(c) Deaths per 100,000 mid-1993 total Australian population

(d) Age-standardised to the mid-1991 total Australian population

Table A2: *Deaths from acute myocardial infarction (ICD-9 410) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	0	0.0	0	0.0
1–4	0	0.0	0	0.0
5–14	0	0.0	1	0.1
15–24	3	0.2	1	0.1
25–34	23	1.6	11	0.8
35–44	169	12.6	32	2.4
45–54	502	47.7	100	9.9
55–64	1,393	188.6	452	61.7
65–74	3,217	553.7	1,674	253.9
75–84	3,618	1,408.6	3,369	866.4
85+	1,374	2,654.7	2,732	2,218.2
Unknown age	0	0.0	0	0.0
Total	**10,299**		**8,372**	
$PYLL_{0-64}$[b]	17,326 years		4,338 years	
Crude death rate[c]		117.1		94.4
Age-standardised death rate[d]		135.5		73.9
95% confidence interval		132.9–138.1		72.3–75.5

(a) Deaths per 100,000 mid-1993 population for each age group
(b) Person years of life lost before age 65 years
(c) Deaths per 100,000 mid-1993 total Australian population
(d) Age-standardised to the mid-1991 total Australian population

Table A3: *Deaths from other coronary heart disease (ICD-9 411–414) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	0	0.0	0	0.0
1–4	0	0.0	0	0.0
5–14	0	0.0	0	0.0
15–24	2	0.1	0	0.0
25–34	18	1.3	6	0.4
35–44	116	8.7	27	2.0
45–54	350	33.2	70	6.9
55–64	805	109.0	240	32.8
65–74	1,759	302.8	801	121.5
75–84	1,969	766.6	1,817	467.3
85+	1,017	1,965.0	2,092	1,698.5
Unknown age	2	0.0	0	0.0
Total	**6,038**		**5,053**	
$PYLL_{0-64}$[b]	11,395 years		2,689 years	
Crude death rate[c]		68.6		57.0
Age-standardised death rate[d]		80.2		43.5
95% confidence interval		78.2–82.2		42.3–44.7

(a) Deaths per 100,000 mid-1993 population for each age group
(b) Person years of life lost before age 65 years
(c) Deaths per 100,000 mid-1993 total Australian population
(d) Age-standardised to the mid-1991 total Australian population

Table A4: *Deaths from all coronary heart disease (ICD-9 410–414) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	0	0.0	0	0.0
1–4	0	0.0	0	0.0
5–14	0	0.0	1	0.1
15–24	5	0.4	1	0.1
25–34	41	2.9	17	1.2
35–44	285	21.3	59	4.4
45–54	852	80.9	170	16.9
55–64	2,198	297.6	692	94.5
65–74	4,976	856.5	2,475	375.4
75–84	5,587	2,175.2	5,186	1,333.7
85+	2,391	4,619.7	4,824	3,916.7
Unknown age	2	0.0	0	0.0
Total	**16,337**		**13,425**	
$PYLL_{0-64}$[b]	28,864 years		7,037 years	
Crude death rate[c]		185.7		151.5
Age-standardised death rate[d]		215.7		117.4
95% confidence interval		212.4–219.0		115.4–119.4

(a) Deaths per 100,000 mid-1993 population for each age group
(b) Person years of life lost before age 65 years
(c) Deaths per 100,000 mid-1993 total Australian population
(d) Age-standardised to the mid-1991 total Australian population

Table A5: *Deaths from heart failure (ICD-9 428) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	0	0.0	1	0.8
1–4	0	0.0	0	0.0
5–14	0	0.0	0	0.0
15–24	0	0.0	0	0.0
25–34	1	0.1	2	0.1
35–44	4	0.3	2	0.2
45–54	10	0.9	4	0.4
55–64	35	4.7	15	2.0
65–74	155	26.7	111	16.8
75–84	462	179.9	558	143.5
85+	443	855.9	1,016	824.9
Unknown age	0	0.0	0	0.0
Total	**1,110**		**1,709**	
$PYLL_{0-64}$[b]	294 years		187 years	
Crude death rate[c]		12.6		19.3
Age-standardised death rate[d]		16.5		13.7
95% confidence interval		15.5–17.5		13.0–14.4

(a) Deaths per 100,000 mid-1993 population for each age group
(b) Person years of life lost before age 65 years
(c) Deaths per 100,000 mid-1993 total Australian population
(d) Age-standardised to the mid-1991 total Australian population

Table A6: *Deaths from cerebrovascular disease (ICD-9 430–438) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	1	0.7	0	0.0
1–4	0	0.0	0	0.0
5–14	1	0.1	0	0.0
15–24	3	0.2	8	0.6
25–34	21	1.5	17	1.2
35–44	54	4.0	46	3.5
45–54	136	12.9	117	11.6
55–64	349	47.2	220	30.0
65–74	1,148	197.6	896	135.9
75–84	1,999	778.3	2,861	735.8
85+	1,107	2,138.8	3,154	2,560.8
Unknown age	0	0.0	0	0.0
Total	**4,819**		**7,319**	
$PYLL_{0-64}$[b]	5,417 years		4,558 years	
Crude death rate[c]		54.8		82.6
Age-standardised death rate[d]		66.9		62.0
95% confidence interval		65.0–68.8		60.6–63.4

(a) Deaths per 100,000 mid-1993 population for each age group
(b) Person years of life lost before age 65 years
(c) Deaths per 100,000 mid-1993 total Australian population
(d) Age-standardised to the mid-1991 total Australian population

Table A7: *Deaths from peripheral vascular disease (ICD-9 441–444) by age and sex, Australia, 1993*

	Males		Females	
Age group (years)	Number of deaths	Age-specific death rate[a]	Number of deaths	Age-specific death rate[a]
0	0	0.0	0	0.0
1–4	0	0.0	0	0.0
5–14	0	0.0	0	0.0
15–24	0	0.0	0	0.0
25–34	1	0.1	2	0.1
35–44	7	0.5	5	0.4
45–54	30	2.8	9	0.9
55–64	94	12.7	37	5.1
65–74	416	71.6	145	22.0
75–84	503	195.8	318	81.8
85+	210	405.7	322	261.4
Unknown age	0	0.0	0	0.0
Total	**1,261**		**838**	
$PYLL_{0-64}$[b]	917 years		457 years	
Crude death rate[c]		14.3		9.5
Age-standardised death rate[d]		17.0		7.3
95% confidence interval		16.1–18.0		6.8–7.8

(a) Deaths per 100,000 mid-1993 population for each age group
(b) Person years of life lost before age 65 years
(c) Deaths per 100,000 mid-1993 total Australian population
(d) Age-standardised to the mid-1991 total Australian population

Table A8: *Differentials in cardiovascular disease mortality by various sociodemographic variables, men and women aged 25–64 years, 1985–87*

	Men		Women	
Socioeconomic variable	Age-standardised death rate[a]	Rate ratio	Age-standardised death rate[a]	Rate ratio
Sex (reference group—women)	167.05	2.70*	61.94	1.00
Marital status				
Never married	297.11	2.13*	99.47	1.86*
Married[b]	139.44	1.00	53.50	1.00
Divorced or widowed	261.20	1.87*	81.93	1.53*
Employment status[c]				
Employed[b]	60.84	1.00	–	–
Not employed	66.58	1.09	–	–
Occupation[c]				
Professional/tech/admin[b]	43.73	1.00	–	–
Clerical/sales/service	56.60	1.29*	–	–
Trades/transport/labour	70.69	1.62*	–	–
Occupational prestige[c]				
1st quintile[b]	45.16	1.00	–	–
2nd quintile	48.53	1.07	–	–
3rd quintile	60.94	1.35*	–	–
4th quintile	61.14	1.35*	–	–
5th quintile	86.92	1.92*	–	–
Socioeconomic disadvantage				
1st quintile[b]	125.75	1.00	41.05	1.00
2nd quintile	150.71	1.20*	52.93	1.29*
3rd quintile	166.62	1.33*	65.53	1.60*
4th quintile	180.81	1.44*	68.17	1.66*
5th quintile	207.83	1.65*	80.77	1.97*
State/Territory				
Australia[b]	167.05	1.00	61.94	1.00
NSW	176.13	1.05*	69.70	1.13*
Vic	158.52	0.95*	53.56	0.86*
Qld	170.85	1.02	64.95	1.05
WA	146.35	0.88*	50.79	0.82*
SA	162.47	0.97	59.50	0.96
Tas	190.88	1.14*	67.98	1.10
ACT	118.85	0.71*	40.71	0.66*
NT	245.74	1.47*	93.12	1.50*
Region				
Metropolitan[b]	158.29	1.00	57.73	1.00
Non-metropolitan	181.47	1.15*	69.21	1.20*
Country of birth				
Australia[b]	177.69	1.00	66.55	1.00
UK & Ireland	148.50	0.84*	54.70	0.82*
Other Europe	135.41	0.78*	46.94	0.71*
Asia	112.01	0.63*	39.89	0.60*
Other	159.15	0.90	59.47	0.89

(a) Rates age-standardised to the mid-1988 total Australian population; (b) Reference group; (c) Age group 25–54 years

* $p < 0.01$

– data not available

Source: Mathers[8]

Table A9: *Differentials in coronary heart disease mortality by various sociodemographic variables, men and women aged 25–64 years, 1985–87*

Socioeconomic variable	Men		Women	
	Age-standardised death rate[a]	Rate ratio	Age-standardised death rate[a]	Rate ratio
Sex (reference group—women)	122.43	3.53*	34.67	1.00
Marital status				
Never married	202.56	1.93*	49.92	1.65*
Married[b]	104.73	1.00	30.28	1.00
Divorced or widowed	185.30	1.77*	46.17	1.52*
Employment status[c]				
Employed[b]	44.00	1.00	–	–
Not employed	44.23	1.01	–	–
Occupation[c]				
Professional/tech/admin[b]	33.05	1.00	–	–
Clerical/sales/service	41.97	1.27*	–	–
Trades/transport/labour	50.00	1.51*	–	–
Occupational prestige[c]				
1st quintile[b]	34.38	1.00	–	–
2nd quintile	35.14	1.02	–	–
3rd quintile	44.24	1.29*	–	–
4th quintile	44.02	1.28*	–	–
5th quintile	60.94	1.77*	–	–
Socioeconomic disadvantage				
1st quintile[b]	96.03	1.00	21.20	1.00
2nd quintile	111.91	1.17*	28.80	1.36*
3rd quintile	121.89	1.27*	36.78	1.73*
4th quintile	131.60	1.37*	38.47	1.81*
5th quintile	149.01	1.55*	47.07	2.22*
State/Territory				
Australia[b]	122.43	1.00	34.67	1.00
NSW	128.07	1.05*	40.48	1.17*
Vic	116.81	0.95	28.36	0.82*
Qld	126.76	1.04	36.58	1.06
WA	107.71	0.88*	28.56	0.82*
SA	119.73	0.98	34.58	1.00
Tas	141.91	1.16*	33.43	0.96
ACT	85.03	0.69*	20.03	0.58*
NT	149.72	1.22	36.63	1.06
Region				
Metropolitan[b]	117.70	1.00	32.62	1.00
Non-metropolitan	130.21	1.11*	38.17	1.17*
Country of birth				
Australia[b]	129.20	1.00	36.97	1.00
UK & Ireland	113.39	0.88*	32.42	0.88
Other Europe	100.96	0.78*	26.49	0.72*
Asia	86.64	0.67*	21.67	0.59*
Other	116.93	0.91	30.99	0.84

(a) Rates age-standardised to the mid-1988 total Australian population; (b) Reference group; (c) Age group 25–54 years

* $p < 0.01$

– data not available

Source: Mathers[8]

Table A10: *Differentials in cerebrovascular disease mortality by various sociodemographic variables, men and women aged 25–64 years, 1985–87*

Socioeconomic variable	Men		Women	
	Age-standardised death rate[a]	Rate ratio	Age-standardised death rate[a]	Rate ratio
Sex (reference group—women)	20.33	1.33*	15.30	1.00
Marital status				
Never married	43.06	2.74*	24.28	1.83*
Married[b]	15.71	1.00	13.29	1.00
Divorced or widowed	36.71	2.34*	20.48	1.54*
Employment status[c]				
Employed[b]	7.58	1.00	–	–
Not employed	8.28	1.09	–	–
Occupation[c]				
Professional/tech/admin[b]	5.13	1.00	–	–
Clerical/sales/service	5.91	1.15	–	–
Trades/transport/labour	9.36	1.82*	–	–
Occupational prestige[c]				
1st quintile[b]	5.14	1.00	–	–
2nd quintile	5.96	1.16	–	–
3rd quintile	7.59	1.48*	–	–
4th quintile	7.24	1.41*	–	–
5th quintile	11.79	2.29*	–	–
Socioeconomic disadvantage				
1st quintile[b]	13.13	1.00	10.79	1.00
2nd quintile	18.13	1.38*	13.56	1.26*
3rd quintile	19.10	1.45*	15.80	1.46*
4th quintile	23.03	1.75*	17.67	1.64*
5th quintile	27.54	2.10*	18.41	1.71*
State/Territory				
Australia[b]	20.33	1.00	20.33	1.00
NSW	22.81	1.12*	22.81	1.11
Vic	18.41	0.91	18.41	0.95
Qld	20.81	1.02	20.81	1.05
WA	17.14	0.84	17.14	0.68*
SA	17.59	0.87	17.59	0.91
Tas	22.53	1.11	22.53	1.26
ACT	15.03	0.74	15.03	0.72
NT	34.38	1.69	34.38	0.93
Region				
Metropolitan[b]	18.65	1.00	13.93	1.00
Non-metropolitan	23.08	1.24*	17.65	1.27*
Country of birth				
Australia[b]	22.10	1.00	16.61	1.00
UK & Ireland	15.94	0.72*	12.68	0.76*
Other Europe	15.17	0.69*	11.35	0.68*
Asia	13.75	0.62*	11.31	0.68
Other	20.46	0.93	14.44	0.87

(a) Rates age-standardised to the mid-1988 total Australian population; (b) Reference group; (c) Age group 25–54 years

* $p < 0.01$

– data not available

Source: Mathers[8]

Table A11: *Differentials in cardiovascular disease mortality by various sociodemographic variables, men and women aged 65+ years, 1985–87*

	Men		Women	
Socioeconomic variable	Age-standardised death rate[a]	Rate ratio	Age-standardised death rate[a]	Rate ratio
Sex (reference group—women)	33.74	1.43*	23.59	1.00
Marital status				
Never married	38.45	1.29*	25.81	1.47*
Married[b]	29.90	1.00	17.50	1.00
Divorced or widowed	41.63	1.39*	25.42	1.45*
Socioeconomic disadvantage				
1st quintile[b]	31.78	1.00	22.32	1.00
2nd quintile	32.61	1.03	23.20	1.04
3rd quintile	34.14	1.07*	23.94	1.07*
4th quintile	34.86	1.10*	23.80	1.07*
5th quintile	35.06	1.10*	24.70	1.11*
State/Territory				
Australia[b]	33.74	1.00	23.59	1.00
NSW	35.77	1.06*	24.81	1.05*
Vic	32.55	0.96*	23.14	0.98
Qld	32.46	0.96*	22.83	0.97*
WA	31.61	0.94*	21.01	0.89*
SA	33.79	1.00	22.86	0.97
Tas	35.01	1.04	26.63	1.13*
ACT	29.73	0.88	21.36	0.91
NT	23.54	0.70*	20.30	0.86
Region				
Metropolitan[b]	33.80	1.00	23.70	1.00
Non-metropolitan	33.69	1.00	23.43	0.99
Country of birth				
Australia[b]	34.34	1.00	23.94	1.00
UK & Ireland	32.09	0.93*	22.10	0.92*
Other Europe	30.67	0.89*	21.49	0.90*
Asia	24.54	0.71*	17.73	0.74*
Other	32.19	0.94	22.23	0.93

(a) Rates age-standardised to the mid-1988 total Australian population

(b) Reference group

* $p < 0.01$

Source: Mathers[9]

Table A12: *Differentials in coronary heart disease mortality by various sociodemographic variables, men and women aged 65+ years, 1985–87*

	Men		Women	
Socioeconomic variable	Age-standardised death rate[a]	Rate ratio	Age-standardised death rate[a]	Rate ratio
Sex (reference group—women)	20.29	1.69*	11.98	1.00
Marital status				
Never married	22.26	1.22*	12.42	1.35*
Married[b]	18.28	1.00	9.19	1.00
Divorced or widowed	24.76	1.35*	13.03	1.42*
Socioeconomic disadvantage				
1st quintile[b]	19.25	1.00	11.01	1.00
2nd quintile	19.48	1.01	11.62	1.06*
3rd quintile	20.70	1.08*	12.30	1.12*
4th quintile	20.76	1.08*	12.29	1.12*
5th quintile	21.12	1.10*	12.63	1.15*
State/Territory				
Australia[b]	20.29	1.00	11.98	1.00
NSW	21.20	1.04*	12.46	1.04*
Vic	19.49	0.96*	11.45	0.96*
Qld	20.17	0.99	12.15	1.01
WA	19.56	0.96	11.19	0.93*
SA	20.19	1.00	12.04	1.01
Tas	20.90	1.03	12.54	1.05
ACT	17.14	0.85	10.02	0.84*
NT	10.75	0.53*	9.02	0.75
Region				
Metropolitan[b]	20.39	1.00	12.08	1.00
Non-metropolitan	20.15	0.99	11.81	0.98
Country of birth				
Australia[b]	20.56	1.00	12.10	1.00
UK & Ireland	19.51	0.95*	11.43	0.94*
Other Europe	18.74	0.91*	10.99	0.91*
Asia	15.26	0.74*	9.60	0.79*
Other	19.66	0.96	11.51	0.95

(a) Rates age-standardised to the mid-1988 total Australian population

(b) Reference group

* $p < 0.01$

Source: Mathers[9]

Table A13: *Differentials in cerebrovascular disease mortality by various sociodemographic variables, men and women aged 65+ years, 1985–87*

Socioeconomic variable	Men		Women	
	Age-standardised death rate[a]	Rate ratio	Age-standardised death rate[a]	Rate ratio
Sex (reference group—women)	6.94	1.06*	6.52	1.00
Marital status				
Never married	8.08	1.32*	7.54	1.54*
Married[b]	6.10	1.00	4.91	1.00
Divorced or widowed	8.69	1.42*	6.96	1.42*
Socioeconomic disadvantage				
1st quintile[b]	6.45	1.00	6.46	1.00
2nd quintile	6.70	1.04	6.35	0.98
3rd quintile	6.77	1.05	6.56	1.02
4th quintile	7.21	1.12*	6.43	1.00
5th quintile	7.50	1.16*	6.86	1.06*
State/Territory				
Australia[b]	6.94	1.00	6.52	1.00
NSW	7.84	1.13*	7.10	1.09*
Vic	6.31	0.91*	6.29	0.96
Qld	6.64	0.96	6.34	0.97
WA	6.09	0.88*	5.39	0.83*
SA	6.79	0.98	6.09	0.93*
Tas	6.80	0.98	7.46	1.14*
ACT	6.41	0.92	5.61	0.86
NT	4.76	0.69	3.19	0.49*
Region				
Metropolitan[b]	7.04	1.00	6.62	1.00
Non-metropolitan	6.80	0.97	6.35	0.96*
Country of birth				
Australia[b]	7.14	1.00	6.70	1.00
UK & Ireland	6.14	0.86*	5.77	0.86*
Other Europe	6.45	0.90*	5.77	0.86*
Asia	5.22	0.73*	4.85	0.72*
Other	6.41	0.90	5.90	0.88

(a) Rates age-standardised to the mid-1988 total Australian population

(b) Reference group

* $p < 0.01$

Source: Mathers[9]

Table A14: *Age-standardised[(a)] death rates for major causes of death, males, 1950–93*

Year	All cardiovascular disease	Neoplasms (cancer)	All external causes	All other causes	All causes
			Deaths per 100,000 population		
1950	719	176	104	418	1,417
1951	752	177	115	411	1,455
1952	758	182	113	373	1,426
1953	736	186	110	341	1,373
1954	745	185	110	346	1,386
1955	740	186	109	334	1,369
1956	771	187	107	349	1,414
1957	722	192	112	329	1,355
1958	720	189	107	302	1,318
1959	748	194	106	335	1,383
1960	746	191	102	295	1,334
1961	733	192	103	289	1,317
1962	757	194	106	291	1,348
1963	760	198	103	282	1,343
1964	787	203	106	307	1,403
1965	773	201	107	283	1,364
1966	784	204	103	301	1,392
1967	760	207	111	274	1,352
1968	814	219	106	293	1,432
1969	767	216	103	279	1,365
1970	783	222	108	304	1,417
1971	737	216	104	263	1,320
1972	719	217	99	263	1,298
1973	702	220	97	263	1,282
1974	716	224	98	280	1,318
1975	656	225	95	239	1,215
1976	664	224	91	255	1234
1977	612	225	91	232	1,160
1978	593	229	88	229	1,139
1979	567	228	87	215	1,097
1980	556	235	84	220	1,095
1981	545	236	80	214	1075
1982	538	236	83	236	1,093
1983	496	235	74	210	1,015
1984	475	230	69	207	981
1985	482	242	73	224	1,021
1986	446	234	71	202	953
1987	435	234	73	205	947
1988	417	238	75	211	941
1989	414	237	70	223	944
1990	383	232	68	202	885
1991	362	229	64	192	847
1992	361	233	62	202	858
1993	340	231	59	190	820

(a) Rates age-standardised to the mid-1988 total Australian population

Source: d'Espaignet[5] updated to 1993

Table A15: *Age-standardised[(a)] death rates for major causes of death, females, 1950–93*

Year	All cardiovascular disease	Neoplasms (cancer)	All external causes	All other causes	All causes
			Deaths per 100,000 population		
1950	541	147	38	284	1,010
1951	558	142	43	276	1,019
1952	560	145	44	247	996
1953	537	147	43	230	957
1954	542	144	41	224	951
1955	527	141	42	211	921
1956	547	143	45	218	953
1957	516	140	43	212	911
1958	505	134	41	191	871
1959	518	138	42	205	903
1960	512	134	43	183	872
1961	493	135	42	175	845
1962	508	133	46	174	861
1963	507	138	43	167	855
1964	525	136	48	177	886
1965	509	131	49	165	854
1966	519	133	49	171	872
1967	489	133	50	163	835
1968	526	135	47	171	879
1969	492	136	45	155	828
1970	511	140	47	170	868
1971	488	135	45	151	819
1972	463	134	43	143	783
1973	455	136	43	138	772
1974	465	133	42	148	788
1975	422	133	39	126	720
1976	413	135	38	138	724
1977	391	135	38	121	685
1978	374	132	38	120	664
1979	353	131	36	116	636
1980	342	134	33	120	629
1981	333	133	30	115	611
1982	336	137	31	126	630
1983	308	140	28	116	592
1984	298	138	27	114	577
1985	308	143	28	130	609
1986	284	141	28	117	570
1987	277	137	27	120	561
1988	265	140	28	124	557
1989	266	139	27	131	563
1990	248	138	25	121	532
1991	231	139	24	117	511
1992	238	138	24	122	522
1993	221	139	20	117	497

(a) Rates age-standardised to the mid-1988 total Australian population

Source: d'Espaignet[5] updated to 1993

Table A16: *Age-standardised[(a)] death rates for major components of cardiovascular disease, males, 1950–93*

Year	Rheumatic heart disease	Hypertensive disease	Cerebrovascular disease	Coronary heart disease	All other cardiovascular disease
			Deaths per 100,000 population		
1950	22	57	140	242	259
1951	21	66	145	266	254
1952	19	59	157	287	237
1953	18	61	152	284	221
1954	17	58	154	295	221
1955	15	48	158	305	213
1956	17	52	161	324	218
1957	15	46	160	301	199
1958	15	42	155	319	189
1959	15	40	158	348	188
1960	15	37	155	362	176
1961	14	29	153	368	168
1962	14	30	152	393	168
1963	11	26	155	404	164
1964	13	28	155	421	170
1965	11	24	161	424	152
1966	13	24	160	439	149
1967	13	23	155	433	137
1968	5	24	177	467	141
1969	5	21	164	449	128
1970	5	22	168	457	131
1971	6	18	163	427	122
1972	4	19	163	416	117
1973	4	18	157	403	120
1974	4	19	159	413	121
1975	4	17	142	382	110
1976	4	17	141	392	110
1977	3	16	130	361	102
1978	3	15	125	353	97
1979	3	12	116	344	92
1980	3	11	115	334	94
1981	3	9	112	332	89
1982	2	10	109	329	88
1983	2	8	96	309	81
1984	2	8	92	294	78
1985	2	8	92	300	80
1986	2	7	84	280	74
1987	2	6	83	271	73
1988	2	7	79	259	69
1989	2	7	77	259	69
1990	2	6	70	239	66
1991	2	6	68	224	62
1992	2	5	67	225	62
1993	1	6	64	208	61

(a) Rates age-standardised to the mid-1988 total Australian population

Source: d'Espaignet[5] updated to 1993

Table A17: *Age-standardised[(a)] death rates for major components of cardiovascular disease, females, 1950–93*

Year	Rheumatic heart disease	Hypertensive disease	Cerebrovascular disease	Coronary heart disease	All other cardiovascular disease
			Deaths per 100,000 population		
1950	18	51	161	115	196
1951	17	55	169	126	191
1952	18	55	176	135	176
1953	16	51	169	136	165
1954	15	50	171	138	167
1955	14	49	166	140	158
1956	14	47	172	151	162
1957	14	43	164	149	146
1958	12	41	158	156	139
1959	13	39	164	162	140
1960	13	38	156	172	133
1961	12	30	153	175	124
1962	13	30	152	187	126
1963	13	27	154	193	121
1964	13	26	157	206	123
1965	12	24	157	202	113
1966	13	23	158	214	111
1967	11	20	147	208	103
1968	7	22	162	231	104
1969	6	19	153	221	93
1970	7	19	162	227	96
1971	5	19	156	218	90
1972	5	16	151	208	84
1973	5	15	150	202	83
1974	5	17	150	209	84
1975	5	14	137	190	76
1976	5	14	131	189	75
1977	4	13	123	181	70
1978	4	12	114	177	67
1979	4	11	105	167	67
1980	4	10	103	161	64
1981	3	9	100	160	60
1982	3	9	99	163	61
1983	3	7	87	155	56
1984	3	7	84	149	54
1985	3	8	87	153	57
1986	3	7	77	147	50
1987	3	6	74	144	50
1988	3	6	71	137	48
1989	3	6	70	138	49
1990	2	6	65	129	45
1991	3	5	61	120	42
1992	2	6	60	125	45
1993	2	6	59	112	42

(a) Rates age-standardised to the mid-1988 total Australian population

Source: d'Espaignet[5] updated to 1993

Table A18: *Age-standardised[(a)] death rates for all cardiovascular disease, coronary heart disease and cerebrovascular disease, selected countries, 1990*

Country	Males			Females		
	Cardio-vascular disease	Coronary heart disease	Cerebro-vascular disease	Cardio-vascular disease	Coronary heart disease	Cerebro-vascular disease
	Deaths per 100,000 population					
Australia	399.9	249.9	73.3	258.7	134.2	68.1
Austria	477.9	215.8	109.8	317.2	107.9	87.8
Canada	356.4	223.1	56.5	209.0	112.5	45.1
Denmark	472.8	293.1	81.8	280.3	148.0	65.5
England & Wales	459.2	299.3	90.5	273.5	141.0	81.5
Finland	551.0	351.1	108.0	308.7	156.3	89.6
France	267.3	91.2	65.5	159.3	39.5	48.0
Germany	510.4	225.4	99.9	326.9	107.0	80.1
Greece	420.4	137.3	131.1	321.9	59.1	133.2
Hungary	807.5	332.7	211.2	525.1	171.3	153.0
Iceland	360.1	232.9	78.4	224.6	118.3	58.7
Ireland	547.2	338.9	91.0	318.6	156.9	79.6
Israel	359.6	188.5	69.5	272.9	118.1	65.7
Italy	374.3	135.0	105.1	249.5	63.1	82.0
Japan	276.9	50.6	108.0	189.1	28.6	77.4
Malta	473.6	280.4	102.2	382.7	188.8	96.4
Netherlands	391.0	194.0	75.1	217.1	82.1	61.5
New Zealand	440.7	287.0	76.8	280.6	145.5	76.4
Northern Ireland	540.2	371.7	89.8	329.5	176.4	93.9
Norway	464.0	277.8	94.9	251.9	115.6	76.7
Poland	768.1	194.0	85.3	462.2	64.6	63.6
Portugal	485.7	119.2	248.5	346.7	60.2	193.6
Scotland	555.5	363.3	117.8	346.4	182.7	107.1
Singapore	410.6	229.1	122.2	295.1	137.6	108.8
Spain	337.1	106.2	97.4	246.1	48.0	83.1
Sweden	446.0	269.9	75.5	255.8	120.2	63.6
Switzerland	377.3	162.7	67.4	224.7	70.8	50.7
USA	422.4	240.1	53.6	259.7	128.5	47.1

(a) Rates age-standardised to the European Standard Population

Sources: World Health Organization[15,16]

Appendix 2

Population estimates

Table A19: *Population estimates for 1988, 1991, 1992 and 1993, Australia*

Age group (years)	1988 Persons	1991 Persons	1992		1993	
			Males	Female	Males	Female
0	245,459	259,085	130,292	123,812	135,350	128,424
1–4	980,347	1,012,618	525,710	499,450	527,356	500,629
5–14	2,464,761	2,513,827	1,298,005	1,230,546	1,303,167	1,236,214
15–24	2,736,011	2,760,838	1,405,341	1,351,222	1,401,143	1,344,975
25–34	2,729,836	2,825,398	1,417,177	1,412,627	1,413,283	1,409,409
35–44	2,446,880	2,622,658	1,327,742	1,317,882	1,336,138	1,333,058
45–54	1,669,247	1,876,079	1,008,509	963,016	1,052,699	1,007,491
55–64	1,467,481	1,462,818	735,345	730,362	738,675	732,507
65–74	1,103,614	1,182,145	564,242	645,610	581,001	659,324
75–84	555,094	614,323	250,775	380,938	256,854	388,850
85+	139,423	154,247	47,821	116,169	51,757	123,164
Total	16,538,153	17,284,036	8,710,959	8,771,634	8,797,423	8,864,045

Sources: Australian Bureau of Statistics[18,19]

Appendix 3

Description of sociodemographic variables used in the differentials analyses

Marital status	never married—includes never married persons in a de facto relationship married—includes married persons who are separated divorced or widowed—includes divorced or widowed persons in a defacto relationship
Employment status*	employed—occupation stated on death certificate? not employed—student, so described home duties other not in work force, including unemployed
Occupation*	Professional/tech/admin (professional)—CCLO major occupation groups 0 and 1 Clerical/sales/service ('white collar')—CCLO major occupation groups 2, 3 and 9 Trades/transport/labour ('blue collar')—CCLO major occupation groups 4, 5, 6 and 7/8
Occupational prestige*	Data from the 1986 Census were used to calculate the mean ANU2 score for each of the occupation categories. The occupation categories were then ranked by mean ANU2 score and grouped into population quintiles. The ANU2 scale ranks occupations (defined by three-digit CCLO classification) according to occupational prestige as perceived by the community. First quintile—highest prestige occupations Fifth quintile—lowest prestige occupations
Socioeconomic disadvantage of area	Men and women aged 25–64 years were classified into quintiles of socioeconomic disadvantage according to the value of the Index of Relative Socioeconomic Disadvantage (IRSD) for their SLA of usual residence as follows: 1st quintile 1066.0 ≤ IRSD (least disadvantage) 2nd quintile 1021.6 ≤ IRSD < 1066.0 3rd quintile 990.1 ≤ IRSD < 1021.6 4th quintile 963.0 ≤ IRSD < 990.1 5th quintile IRSD < 963.0 (greatest disadvantage)
State/Territory	State or Territory of usual residence

Region	Metropolitan—capital city statistical divisions for the six States. All of the Australian Capital Territory Non-metropolitan—other (including all of the Northern Territory)
Country of birth	Country of birth categories are defined in terms of country groups used in the Australian Standard Classification of Countries for Social Statistics (Australian Bureau of Statistics Catalogue No. 1269.0, Canberra, 1990) Australia UK, Ireland—United Kingdom and Ireland (Eire) Other Europe—Includes Eastern Europe, USSR and Baltic States Asia—Middle East, Northern Africa and Asia Other—Southern Africa, the Americas, New Zealand and the Pacific region

Source: Mathers[8,9]

* For 1985–87, the information recorded on occupation of female decedents was so incomplete that the analyses by employment status, occupation and occupational prestige have only been undertaken for men.

Not all States and Territories ask for the former occupation (or occupation during working life) of retired people to be recorded. To minimise the effects of possible misclassification of retired decedents, analyses by employment status, occupation and occupational prestige are restricted to men aged 25–54 years.

For the analysis by occupation, members of the armed forces and men whose occupation was not stated, inadequately described or vague were excluded.

Men whose occupation was not stated, inadequately described or vague were also excluded from the analysis by occupational prestige.

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Mortality from cardiovascular disease in Australia is the third in a series of publications monitoring cardiovascular disease in Australia. The report describes patterns and trends in cardiovascular disease mortality, and identities some gaps and deficiencies in current knowledge and measurement of cardiovascular disease mortality.

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