Australian and New Zealand Atlas of Avoidable Mortality

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Australian and New Zealand Atlas of Avoidable Mortality

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2006

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Others who contributed to this atlas include:

- The National Public Health Information Working Group, Australia, who were invited to comment on the avoidable mortality conditions during the planning stages of the project.

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Executive summary

Introduction

The *Australian and New Zealand Atlas of Avoidable Mortality* aims to illustrate geographic and social variations in avoidable and amenable mortality rates both within and between Australia and New Zealand.

Avoidable and amenable mortality comprises those causes of death that are potentially avoidable at the present time, given available knowledge about social and economic policy impacts, health behaviours, and health care (the latter relating to the subset of amenable causes). We hope that this atlas will promote the use of 'avoidable mortality' as an indicator to assist in monitoring the quality, effectiveness and productivity of the Australian and New Zealand health systems in the 21st century.

Overall, almost three quarters of all deaths at ages 0 to 74 years in Australia and New Zealand for the period 1997 to 2001 were considered to be avoidable: 71.5% in Australia and 74.4% in New Zealand. In Australia, 40.2% of these avoidable deaths are considered to be amenable to health care. In New Zealand, the proportion is higher, at 43.2%. Total mortality at 0 to 74 years accounted for 41.5% of deaths at all ages in Australia, and 43.7% in New Zealand.

Australia

A higher proportion of male deaths (73.0%) were from conditions considered to be avoidable, compared to female deaths (68.9%): the avoidable male deaths accounted for almost two thirds (64.8%) of total avoidable mortality.

On average, in each year over the period from 1997 to 2001, approximately 665,000 years of life were lost (YLL) from deaths from avoidable conditions. Males aged 0 to 74 years accounted for a larger share (approximately 435,000 YLL per annum), compared with females (approximately 231,000).

Almost half (46.6%) of avoidable mortality at ages 0 to 74 years occurred in the 65 to 74 year age group. The 45 to 64 and 25 to 44 year age groups accounted for 33.9% and 12.8% of avoidable mortality, respectively, with the age groups below 25 years contributing 6.7%.

The highest rates of avoidable mortality in the major condition groups were for cancers, responsible for 32.8% of avoidable mortality and cardiovascular diseases (31.6% of avoidable mortality). Together, these two major condition groups were responsible for over 60% of avoidable mortality at ages 0 to 74 years.

Of the avoidable mortality conditions, ischaemic heart disease ranked the highest (23.0% of avoidable mortality), with lung cancer responsible for 11.2% of avoidable mortality. These were followed by colorectal cancer (6.9%), cerebrovascular diseases (6.6%) and suicide and self inflicted injuries (6.5%).

In the states/ territories, avoidable mortality rates were the highest in Northern Territory, with rates in the states at a notably lower level, and the lowest rate in the Australian Capital Territory. Death rates from avoidable mortality were higher in the rest of state/ territory areas than in the capital cities, except in Tasmania. In the Northern Territory, the rates in the rest of territory areas were twice that for Darwin, with the rates in the rest of state areas in all other states between 10% to 25% higher than in the capital cities, apart from in Tasmania (approximately 9% lower).

Rates of avoidable mortality were approximately 80% higher in the most disadvantaged areas compared to the least disadvantaged areas. There was also a clear socioeconomic gradient in rates for all causes of avoidable mortality and for most conditions examined.

From 1997 to 2001, there were 46,958 excess deaths from avoidable mortality (estimated on the basis that the numbers of avoidable deaths in all socioeconomic groups equalled that of the least disadvantaged group).

The Indigenous rate of deaths from avoidable causes was 3.7 times the rate for the non-Indigenous population. Similarly, the Indigenous rate of death for causes amenable to health care was over 3.8 times the non-Indigenous rate. Ischaemic heart disease was the highest ranked cause of avoidable death for the Indigenous population (21.1%), with diabetes accounting for 10.6% of Indigenous deaths from avoidable causes.

From 1987 to 2001 there was a reduction in the proportion of avoidable deaths for those aged 0 to 74 years, falling from 77.4% of all deaths at these ages in 1987, to 70.6% in 2001. Over one quarter (28.7%) of all deaths at ages 0 to 74 in 2001 were considered to have been amenable to health care, compared to one third (33.3%) in 1987. Of the major avoidable mortality conditions, the rate of ischaemic heart disease fell by 60.0% over the fifteen year period, with the rate of cerebrovascular diseases declining by over 50%.

New Zealand

The proportion of male (74.8%) and female (73.7%) deaths considered to be avoidable were similar. However, male deaths accounted for almost two thirds (61.2%) of total avoidable mortality.

On average, in each year over the period from 1997 to 2001, approximately 151,000 years of life were lost (YLL) from deaths from avoidable conditions. Males aged 0 to 74 years accounted for a larger share (approximately 93,000 YLL per annum), compared with females (approximately 58,000).

Almost half (46.1%) of avoidable mortality at ages 0 to 74 years occurred in the 65 to 74 year age group. The 45 to 64 and 25 to 44 year age groups accounted for 35.0% and 11.1% of avoidable mortality, respectively, with the age groups below 25 years contributing 7.9%.

The highest rates of avoidable mortality at the major condition group level were for cardiovascular diseases, with 35.0% of total avoidable mortality, and for cancers (31.8%). These two major condition groups were responsible for over two thirds (66.8%) of mortality from avoidable causes at ages 0 to 74 years.

Of the avoidable mortality conditions, ischaemic heart disease ranked the highest (24.9% of avoidable mortality), with lung cancer responsible for 10.3% of avoidable mortality. These were followed by colorectal cancer (7.2%), cerebrovascular diseases (6.9%) and suicide and self inflicted injuries (5.9%).

Total avoidable mortality varied considerably by District Health Board, with the highest rate almost one and a half times the average New Zealand rate and the lowest rate 20% below the national average.

The rates of avoidable mortality in the most deprived areas were approximately 2.3 times the rates in the least deprived areas. There were clear gradients in rates of avoidable mortality by deprivation of area for the total population and for both males and females.

From 1997 to 2001, there were 14,015 excess deaths from avoidable mortality (estimated on the basis that the numbers of avoidable deaths in all socioeconomic groups equalled that of the least deprived group).

The Mäori rate of deaths from avoidable causes was approximately two and a half times the rate for the European/ others population, with the rate for Pacific peoples approximately twice the rate for the European/ others. Similarly, the rates of amenable mortality for Mäori and Pacific peoples were over twice the rates for the European/ others.

From 1981 to 2001 there was a reduction in the proportion of avoidable deaths for those aged 0 to 74 years, falling from 79.2% of all deaths at these ages in 1981, to 74.3% in 2001. Of all deaths at these ages in 2001, almost one third (31.9%) were considered to be amenable to health care, again lower than in 1981 (36.0%). Of the major avoidable morality conditions, the rate of ischaemic heart disease fell by 61.8% over the twenty year period, with the rate of cerebrovascular diseases declining by 57.6%. Over this period there were increases in the rates of suicide and self inflicted injuries (41.0%) and diabetes (8.6%).

Glossary/ symbols used

ASR
ASR refers to age standardised rates – the rates in this atlas are per 100,000 population. For further information, refer to Chapter 2, *Methods*.

CC
Capital cities, Australia

ICD-9
International Classification of Diseases, Ninth Revision [WHO]

ICD-10
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision [WHO]

ICD-10-AM
International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification

MUC
'Other' major urban centres, Australia, excluding the capital cities – for further information, refer to Chapter 2, *Methods*

ROS
'Rest of state/ territory' areas, Australia, excluding the capital cities and other major urban centres

RR
Rate ratio – for further information, refer to Chapter 2, *Methods*

Statistical significance

* Statistically significant, at the 5% confidence level
** Statistically significant, at the 1% confidence level

YLL
Years of life lost – for further information, refer to Chapter 2, *Methods*

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1 Introduction

1.1 Background

Over the last thirty years, as health services have greatly expanded their range and scope, interest has grown in attempting to evaluate their performance and to identify areas for improvement. Donabedian (1966) first articulated a model for assessing the quality of health services across three domains: the structure (organisation and inputs) of the service, its process of care, and the outcome for the patient.

While much work has been undertaken since then to develop techniques for evaluating structures and processes of care, methods for assessing health outcomes attributable to the care received have proved more elusive. Yet, there is continuing interest in doing so. This is because there is an ongoing need to ensure that health care investment results in improved health for individuals and populations; to understand the causes of geographic and social variation in practice; and to reduce the frequency of inappropriate, poor quality or unsafe care (Woolf 1990).

One approach to assessing the quality of health care in terms of clinical outcomes has been to identify deaths that should not have occurred, given available health care interventions. This method was initiated in 1976 by Rutstein, who prepared a list of 'amenable' health conditions in consultation with an expert panel. Deaths from these causes represented 'untimely and unnecessary deaths' and their occurrence was 'a warning signal, a sentinel health event, that the quality of care might need to be improved' (Rutstein et al. 1976). The intention was to use the list for the purposes of medical audit.

Further studies followed. In the United Kingdom, Charlton and colleagues chose 14 disease groups from Rutstein's original list for which mortality in a developed country such as the United Kingdom should be wholly avoidable (Charlton et al. 1983). The list included certain conditions such as appendicitis, where prevention of death conferred an all-of-life benefit, and others, such as hypertensive diseases, where intervention might lead only to death being deferred (Jamrozik and Hobbs 2002). The authors calculated standardised mortality ratios to summarise the variations among UK district health authorities in mortality from the selected conditions. As a result of the publication of these indicators, several district health authorities undertook confidential enquiries into implicated services with subsequent improvement in SMRs (Segal and Chen 2001).

'Amenable' mortality as an indicator of the outcome of health care has been widely applied since the pioneering work of Rutstein and Charlton, including studies of time-trends and of geographical and socioeconomic variation in such mortality within and between countries (Westerling and Rosén 2002; Treurniet et al. 2004). A number of atlases of avoidable mortality (see below) for countries of the European Community have been published (Holland 1988, 1991, 1993, 1997). A detailed review, including an annotated bibliography of published studies, has recently been made available by Nolte and McKee (2004).

The concept has also been extended from studies of mortality to studies of morbidity, generally operationalised as avoidable hospitalisations (for example, Weissman et al. 1992; Billings et al. 1996; Jackson and Tobias 2001).

Returning to mortality, there is now a pressing need to monitor not only deaths that indicate the quality of health care, but also those that largely reflect 'upstream' risk factors or determinants of health (eg, deaths attributable to tobacco consumption). The latter causes of death are considered to be responsive to national health policies concerned with prevention rather than to clinical intervention at the individual patient level (Jamrozik and Hobbs 2002). Broadening of the concept from 'amenable' to 'avoidable' mortality through inclusion of 'preventable' mortality has been characteristic of more recent work in this area (for example, Holland 1988; Simonato et al. 1998; Tobias and Jackson 2001). This development has, however, introduced uncertainty regarding causal attribution and has complicated interpretation of the concept as an indicator of the quality of health care.

Jamrozik and Hobbs (2002) have cited the example of smoking and the importance of lag time, where deaths attributable to tobacco may reflect exposure decades earlier (Doll and Peto 1981; Peto et al. 1992). They also highlight the distinction between preventing mortality from acute conditions, so conferring a benefit that persists for the whole of life, versus deferment of death from chronic disease, which also may be associated with an increase in the prevalence of functional limitation. Arguably, it is not only the reduction in mortality that is important; the quality of the years of life gained should (ideally) also be taken into account (Jamrozik and Hobbs 2002).

1.2 Strengths and limitations of the concept

As outcome indicators for monitoring of health system quality, effectiveness and productivity, amenable and avoidable mortality have some advantages. Mortality is the hardest of hard

endpoints, so there can be little questioning of the salience of the outcome or the quality of the data. Furthermore, mortality data are available – at least in developed countries – with relatively little delay, a necessary requirement for meaningful monitoring. Finally, amenable – and especially avoidable – deaths are relatively frequent events that involve all population subgroups and allow most facets of the health system to be assessed, from primary to tertiary care and (in the case of avoidable mortality) public health services and health policy as well.

On the other hand, these indicators also have several weaknesses (Jamrozik and Hobbs 2002). Being confined to mortality, services not associated with significant case fatality (eg orthopaedic services) or the opposite (eg palliative care) cannot be evaluated using these indicators. Furthermore, in the absence of additional information, interpreting a change or difference in a mortality rate is problematic, as the change or difference could reflect variation in disease incidence, survival (case fatality) or both. Even more seriously, such a change or difference could be entirely artefactual, reflecting nothing more than a change in diagnostic criteria or coding rules.

Beyond such technical and interpretational difficulties, the extent of change in avoidable or amenable mortality is influenced by the selection of both the particular causes of death and the age range used (most studies have been restricted to people under the age of 65 years). Some conditions that were previously not preventable or treatable may have become so in the interim (Jamrozik and Hobbs 2002), so the list of avoidable and amenable conditions needs to be regularly updated to reflect preventive and therapeutic advances (Nolte and McKee 2003; Treurniet et al. 2004).

In addition, while categorical attribution of cause may be appropriate for some causes of avoidable mortality (those that are clearly either responsive to health care intervention or not), this approach is simplistic for others, as it takes no account of the counterfactual. That is, for the latter causes of death what should be modelled is the *fraction* of the deaths from each cause that may have been prevented under a specified counterfactual exposure scenario (eg, 85% of lung cancer deaths this year would have been avoided if no-one had smoked in the preceding three to four decades). Use of categorical attribution (rule-based all-or-none classification) provides only a very approximate estimate of avoidable mortality. However, the necessary data on risk exposure and exposure–outcome relationships required for counterfactual modelling may not be available.

Finally, avoidable mortality as a performance indicator has often been criticised in that it does not link clearly to other indicators of health service provision, whether of process or input. So knowing the level or distribution of avoidable mortality does not directly indicate to the politician or health service manager what corrective action needs to be taken to improve the unsatisfactory situation vis a vis health outcomes.

As Nolte and McKee (2004) have pointed out, however, critics of the avoidable / amenable mortality concept have frequently asked it to do more than it is capable of doing. Avoidable mortality cannot provide a definitive indicator of the performance of a health service or of the health system as a whole, and indeed was never intended to be used as such. Rather, it provides an indication that poor performance may exist in one or more services or other health system functions, and points the way to more focussed evaluation research and audit to uncover the precise causes of the problem and identify the necessary corrective action. Even such a limited role is not trivial, however, especially given the ease and low cost with which avoidable and amenable mortality can be monitored.

1.3 Condition lists

Rutstein et al.'s (1976) original list included 90 conditions which could be considered clear-cut causes of 'unnecessary untimely deaths' amenable to medical interventions available at that time. The list was designed for use internationally, rather than only in economically developed countries, and as such encompassed many conditions rarely, if ever, seen in the latter countries.

In 1983, Charlton et al. selected 14 of Rutstein et al.'s (1976) indicators for use in small area studies. The criteria involved selecting conditions thought to be responsive to medical or surgical treatment and which were sufficiently common to allow analysis at small area level in the United Kingdom. Age limits were set for each cause, and a maximum upper age limit of 64 years was defined. Charlton et al.'s list of indicators was not intended to be comprehensive, but rather to highlight where a problem might exist and to stimulate further inquiry. The stated research aim was that "if they proved useful as indicators of inadequacies in health-care provision they would provide an inexpensive, valuable, and readily available tool for health-care planners and managers". Charlton et al.'s (1983) list was the first to be widely adopted by other researchers.

In 1988, a European Community (EC) working group produced the 'European Community Atlas of Avoidable Death' using an alternative list of 17 causes of avoidable mortality (see Holland 1988). The avoidable mortality conditions were described as indicators of health policy for primary prevention

(3 indicators) and medical care indicators (14 indicators). Strict age limits were again imposed. The atlas highlighted differences between the European countries and also showed within-country variations at the small area level. Subsequent revisions of the lists followed in the 2nd and 3rd editions of the EC atlases (see Holland 1991 (vol. I and 1993 (vol. II); 1997).

Most of the subsequent research has used these early lists of Charlton et al. (based on Rustein et al.), or Holland, including monitoring or research studies in Europe, Scandinavia, Japan, the United States, Canada, New Zealand and Greenland. Some recent studies following the EC approach of Holland, with some minor modifications, include Logminiene et al. (2004), who examined avoidable mortality trends in Lithuania from 1970 to 1999, and Treurniet et al. (2004), who compared trends in fifteen European countries from 1980 to 1997.

Other researchers have also based their condition list on that of the EC working group but have incorporated more extensive changes. For example, Andreev et al.'s (2003) research into avoidable mortality in Russia from 1965 to 2000 included accidental alcohol poisoning and tuberculosis, due to their importance as causes of premature death in that country.

While the majority of research and monitoring in this area has maintained a focus on amenable mortality, the thrust of much recent research has been to include a wider set of avoidable conditions (i.e., 'preventable' conditions responsive to prevention at the individual and especially the population level, through lifestyle change, environmental modification, or health policy and regulation more generally) . A study by Simonato et al. (1998) into avoidable mortality trends in Europe from 1955 to 1994 examined causes of death amenable to intervention by primary, secondary and tertiary prevention (the latter corresponding to the classical concept of 'amenable' mortality). Simonato's avoidable mortality condition list included 23 conditions, comprising seven allocated to the subcategory of primary prevention (various cancers, chronic liver disease, and injury and poisonings); four cancer-related conditions in the secondary prevention subcategory; and the remaining twelve allocated to tertiary prevention. A subsequent analysis by Tobias and Jackson (2001) examined avoidable mortality trends in New Zealand from 1981 to 1997 under these same three categories, but expanded the list to include 56 condition groupings, reflecting advances in population-based and individual-based preventive interventions as well as health care technology. In addition, the upper age limit used to examine avoidable mortality was extended from 64 to 74 years.

1.4 Age limits

Most earlier studies used the upper age limit of 64 years for the majority of conditions, following either Charlton et al.'s (1983) or the EC working group lists (Holland 1988; 1991; 1993; 1997). However, as mentioned earlier, strict age groups were specified for some avoidable mortality conditions: for example, in the EC list (2nd edition, vol. I, 1991), the age range for asthma was specified as 5 to 44 years. Research by Albert et al. (1996) included a category of total avoidable mortality up to the age of 75 years, but the main analysis retained the 64 year age limit.

Most recent research, notably by Tobias and Jackson (2001), followed by Andreev et al. (2003) and Nolte and McKee (2003), has adopted an upper age limit of 74 years in order to reflect changes in life expectancy (now about 80 years in developed countries), as well as improvements in coding which have allowed a single cause of death to be coded for most deaths among older people, despite their higher prevalence of multiple co-morbidities.

However, other recent studies continue to follow the age limits set by Holland. For example, Logminiene et al. (2004) and Treurniet et al. (2004) reported that a decision was made to maintain the 64 year age limit (and follow the standard EC condition list) in order to compare findings with earlier research, allowing for assessment of trends in avoidable mortality over time.

Consistency of definitions over time has to be weighed against considerations of validity, however. The latter would favour regular updating of both coverage (i.e., condition list) and age range of the indicator, reflecting advances in prevention practice and health care technology.

1.5 Using avoidable mortality data

To date, most studies using avoidable and amenable mortality indicators have involved examination of the relationships between these causes of mortality (individually or more usually, collectively), socio-economic conditions, and health service factors on a small area basis, in order to evaluate the performance of specific health services from the perspectives of quality, effectiveness, or productivity.

Other studies have involved the analysis of variations in health system performance (using avoidable mortality as the sole or as one among several outcome measures) across different countries, different health administrative areas, or over time. More recent analyses have included variations in avoidable mortality by socioeconomic

position and ethnicity (Westerling and Rosén 2002; Tobias and Jackson 2001). Mackenbach et al. (1988) has used the concept to quantify the contribution of health care to life expectancy gain in The Netherlands over the twentieth century.

However, the key limitation of all these studies, as outlined above, has been their inability – shared with all studies based on aggregate indexes – to identify what corrective action needs to be taken once poor system or service performance has been identified. This requires the capability to drill down into the detail, so highlighting issues of process and input mix. Nolte and McKee (2004) have proposed a solution to this conundrum, "in which analyses of amenable mortality identify areas of potential concern that are then examined in more detail by studying the processes and outcomes of care for tracer conditions, selected on the basis of their ability to assess a wide range of health system components". The use of tracer conditions alongside avoidable or amenable mortality indicators may represent a powerful methodology, one that could illuminate health care performance across the continuum from inputs through processes to outcomes.

1.6 Previous Australian and New Zealand research

Australian research

The first main studies of avoidable mortality are included in the New South Wales Chief Health Officer's reports (NSW Department of Health 2002; 2004) which include an examination of avoidable mortality in New South Wales, following Tobias and Jackson's (2001) methodology. Deaths from potentially avoidable causes accounted for 80 per cent of all premature deaths (before the age of 75 years) in 1983, falling to 70% of all premature deaths in 2002. Over the 20 year period, rates of avoidable death fell by 56%. The reduction in avoidable death rate was higher for males (58%) than for females (55%) (NSW Department of Health 2004).

The earlier analysis of socioeconomic inequalities in the change in rates of avoidable deaths between 1980 and 2000 in New South Wales found that the decrease in rates for those from the highest socioeconomic group (62% in males and 55% in females) was greater than those from the lowest group (53% in males and 48% in females) (NSW Department of Health 2002; see also Hayen et al. 2002).

In the period 1996 to 2000, the death rate from 'avoidable' causes in New South Wales increased with remoteness, and was three times higher in the Very Remote areas than in Highly Accessible areas. Similar gradients were observed when avoidable deaths were divided into primary, secondary and tertiary classifications (NSW Department of Health 2002).

The National Health Performance Committee (2004) examined potentially avoidable deaths in Australia from 1980 to 2001, following methods derived from the NZ Ministry of Health (NZ) (1999) and NSW Department of Health (2002). Between 1980 and 2001, avoidable mortality decreased by 54.6% for males and 48.0% for females. Over the period, the largest decrease for males was for tertiary avoidable mortality (58.7%), followed by secondary avoidable mortality (57.2%) and primary avoidable mortality (51.9%). For females, the largest decrease was for secondary avoidable mortality (53.7%), tertiary avoidable mortality (49.5%) and then primary avoidable mortality (43.3%). The avoidable death rate for males in the most disadvantaged areas was 60.5% higher than males in the least disadvantaged areas. For females, the rates were 47.1% higher in the most disadvantaged areas.

The Victorian DHS (2005) analysed avoidable and unavoidable mortality in Victoria from 1979 to 2001, following the earlier work by Tobias and Jackson (2001). Over the period, mortality rates declined for all categories of avoidable mortality, with primary avoidable mortality showing a greater decline than secondary and tertiary. Ischaemic heart disease was the leading cause of avoidable deaths among males and females during the study period, followed by lung and breast cancers in males and females, respectively.

Recent research by Korda and Butler (2004; 2006) examined the effect of health care on mortality between 1968 and 2001, partitioning avoidable causes into three categories – those amenable to medical care; those mainly responsive to health policy, and ischaemic heart disease. They found that total avoidable death rates fell by 68% in females and 72% in males over the period. Korda and Butler concluded that the Australian trends in avoidable mortality indicated the effectiveness of the Australian healthcare system in improving population health, with Australia's experience comparing favourably with that of the nine European countries studied.

New Zealand research

Variations of Charlton et al.'s (1983) indicator list have been used in previous studies of avoidable mortality in New Zealand (Marshall and Keating 1989; Malcolm and Salmond 1993; Malcolm 1994; Jackson et al. 1998).

As introduced in Section 1.3 above, Tobias and Jackson's (2001) research described avoidable mortality in New Zealand from 1981 to 1997,

including trends and variations between groups by age, gender, ethnicity and degree of deprivation. Avoidable mortality declined 38% from 1981 to 1997; unavoidable mortality declined only 9%. In 1996-97 almost 70% of deaths in the 0 to 74 age range were considered to be potentially avoidable. Almost 80% of avoidable deaths occurred in the 45 to 74 age group. These deaths were dominated by the emergence of chronic diseases, such as ischaemic heart disease, diabetes and smoking-related cancers.

In younger age groups, injury (including suicide) dominated avoidable mortality. Males experienced a greater burden of avoidable mortality than females – a relative excess of 54% (approximately 2,000 deaths) in 1996-97. The gender difference was largely attributed to diseases and injuries amenable to primary prevention, with the largest single contribution coming from ischaemic heart disease. The gap between ethnic groups in avoidable mortality remains wide: rates for Mäori and Pacific peoples were 2 to 2.5 times higher than European rates in 1996-97. Similar gradients were found with deprivation, using a census-based small area index.

1.7 Guide to this report

Purpose and provenance

With these considerations in mind, this volume, *Australian and New Zealand Atlas of Avoidable Mortality,* aims to illustrate the geographic and social variation in avoidable and amenable mortality rates both within and between Australia and New Zealand.

Explanations of the variations, however, are likely to be complex and multi-faceted, and to depend on many factors beyond the control of health care systems. The purpose of this atlas is to highlight the differences and serve as an indicator of areas where additional research may be warranted.

The list of conditions used in this atlas draws on the previous studies undertaken, but updates them to reflect recent advances in preventive and therapeutic technologies (see chapter 2, *Methods*). We believe it contains those causes of death that are potentially avoidable at the present time, given available knowledge about social and economic policy impacts, health behaviours, and health care (the latter relating to the subset of amenable causes). We hope that this atlas will promote the use of 'avoidable mortality' (including within this rubric the subset of 'amenable mortality') as an indicator to assist in monitoring the quality, effectiveness and productivity of the Australian and New Zealand health systems in the 21st century.

1.8 Contents

The atlas has 9 chapters and an appendix. The chapters are:

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2 Methods

2.1 Selection of causes of death

The approach adopted was to critically review and update Tobias and Jackson's 2001 list. This involved:

- Review of the literature to identify conditions that have recently (since 2000) become preventable and/ or treatable as a result of advances in prevention or health care technology
- Review of condition lists used by authors of recently published (post 2000) studies of avoidable or amenable mortality, to identify any conditions previously missed or excluded.
- The resulting draft list of conditions, together with justifications for their inclusion and references for their use, was subjected to peer review by experts in Australia, New Zealand and Europe. A number of revisions were made to the list as a result.
- The revised draft list was then sent to the members of the (Australian) National Public Health Information Working Group for further review, following which several further changes were made to the list.

We are confident that the final list of avoidable conditions accurately represents those conditions whose associated mortality is substantially avoidable today, given existing health and social systems in Australasia, either through incidence reduction (prevention) or case fatality reduction (treatment) or a combination of both.

For computational ease, rare causes of avoidable mortality – those accounting for less than 0.1% of all deaths (assessed over the period 1997-99 for Australia and 1996-99 for New Zealand) – were excluded (note that these rare causes may be considered causes of 'avoided' rather than 'avoidable' mortality). The conditions excluded are shown in Table A2, *Appendix 1.1*.

2.2 Subclassification of avoidable causes of death

The approach used by Simonato (1998) and Tobias and Jackson (2001), of classifying avoidable causes according to level of intervention (primary, secondary and tertiary) was not adopted, as it was considered to be too reliant on expert judgement.

Instead, following Nolte and McKee (2004), the selected avoidable causes were classified into two subgroups:

- Amenable causes
- Preventable causes

Amenable causes were defined as those causes whose case fatality could be substantively reduced by currently available health care technologies. For example, for cancers this was operationalised as a five year relative survival rate greater than 60% (given existing age and stage distribution at diagnosis).

All other causes on the list were classified as 'preventable', in that their associated mortality could be substantially reduced by preventing the condition from occurring in the first place, ie incidence reduction.

This classification system worked well for most conditions on the list, which clearly sorted themselves into 'amenable' or 'preventable' categories. However, there were three important exceptions: ischaemic heart disease (IHD), cerebrovascular diseases (stroke), and diabetes. For these diseases, studies such as the MONICA and ARIC studies indicate that amelioration of their fatal burdens is currently about equally split (in developed countries such as Australia and New Zealand) between incidence reduction and treatment of established disease.

For these conditions only, the decision was made, following Nolte and McKee (2004), to split them randomly on a 50:50 basis between the 'amenable' and 'preventable' categories. This decision contravenes the basic rule of categorical attribution (ie all-or-none classification) and is more akin to a counterfactual modelling approach. However, the alternative – excluding these major causes of death from the amenable category entirely – would seriously undervalue the contribution of health care to survival gain.

2.3 Coding of avoidable causes of death

Assigning ICD codes to conditions deemed 'avoidable' as identified through the process described above, was not a trivial exercise. This involved allocation of ICD-9 codes for Australia to 1997 and New Zealand to 1998, and ICD-10 and ICD-10-AM codes thereafter.

Initial coding assignments were made independently by coding experts in both countries, and differences then resolved internally where possible. The draft sets of codes were then reviewed by the (Australian) National Centre for Classification in Health, and revised accordingly.

2.4 Age restriction

Only deaths in the age range 0 to 74 years (excluding stillbirths) were deemed to be potentially avoidable. Deaths at ages 75 or older were excluded because of the high prevalence of multiple co-morbidities (including but not restricted to chronic diseases) in this age group.[1] Co-morbidity makes assignment of a single cause to a death problematic, so limiting the validity of categorical attribution of deaths as 'avoidable' or not.

Note, however, that extension of the upper age limit from the conventional 64 to 74, following Tobias and Jackson (2001) and Nolte and McKee (2004), still captures improvements in cause of death coding, and in life expectancy, that have characterised mortality among older adults in Australia and New Zealand (and other developed countries) over the past decade.

For two conditions only – asthma and chronic obstructive pulmonary disease (COPD) – different age restrictions were applied. Because of difficulty in distinguishing these diagnoses as causes of death among middle aged and older adults, asthma deaths were included only within the age range of 0 to 44 years, and COPD deaths only from 45 to 74 years of age. This may lead to under-estimation of the fatal burden of asthma in particular, but was considered necessary to avoid the opposite bias.

Readers should note the unconventional method of showing avoidable mortality for infants (under one year of age). In order to be able to calculate rates for the population of all ages on a consistent basis, rates for infants were also calculated per 100,000 population, and not per 1,000 live births, as is usually the case. In addition, maternal and infant conditions (eg birth defects) were not restricted to deaths of infants only, but to death at any age.

2.5 Final condition list

Table 2.1 (page 13, overleaf) records the final list of avoidable conditions and the percentage of all deaths they represent in both countries for the periods 1997-99 for Australia and 1996-99 for New Zealand. Approximately 70% of all deaths in Australia and 73% in New Zealand are considered to have been avoidable over this three or four year period (Table 2.1). The proportions considered amenable were 34% and 37%, respectively. These proportions are higher if only 'premature' deaths (i.e., deaths occurring under 75 years of age) or years of life lost are considered (see *Sections 4.1* for Australia and *5.1* for New Zealand).

Table A1 in *Appendix 1.1* includes the list of avoidable conditions, with the ICD-9 and ICD-10/ ICD-10-AM codes, their subclassifcation as amenable or preventable, and any non-standard age or sex restrictions.

Appendix 1.2 provides details of the justification for inclusion of each listed condition, as well as arguments for their classification as 'amenable' or 'preventable' or both.

2.6 Data sources

Data sources: Australia

Estimated resident population and mortality data for Australia for the years 1987 to 2001 were purchased from the Australian Bureau of Statistics (ABS). The de-identified unit record data for 1997-2001 included underlying cause of death (five digit level) coded to ICD-9 for 1997 and to ICD-10 thereafter; age; sex; Indigenous status; and SLA of usual address.

Measures of remoteness (using the ASGC remoteness classification[2]) and disadvantage (using the ABS Index of Relative Socio-Economic Disadvantage (IRSD)[3]) were added subsequently by matching these measures at the Statistical Local Area (SLA) level to the address of the deceased.

Data sources: New Zealand

Estimated resident population data for New Zealand for the years 1981 to 2001 were supplied by Statistics New Zealand. Mortality data were supplied by the New Zealand Health Information Service.

The de-identified unit record data for 1997-2001 included underlying cause of death (five digit level) coded to ICD-9 for 1997 to 1998 and to ICD-10-AM thereafter; geographic region; prioritised ethnicity; and the NZDep96 index of deprivation[4]. Records prior to 1997 were less detailed.

[1] Note that this does not imply that some deaths in people aged 75 years or older cannot be postponed, whether through preventive or therapeutic interventions.

[2] The ASGC remoteness classification allocates areas (eg. SLAs) to one of five classes, based on road distances to service centres (towns).

[3] The IRSD is an area-based, summary measure of disadvantage and is comprised of variables relating to education, labour force status, occupation, Indigenous status, etc., of individuals and families.

[4] The NZDep is an area based summary measure of deprivation derived from nine census variables, including measures of income, education and labour force status.

2.7 Data methods and analysis

Calculation of rates and mapping

Mortality rates were age standardised, with the WHO World population as the reference, by the direct method for the country comparisons in Chapter 3, and by the indirect method for the analysis presented in the remaining chapters.

The data were set up in HealthWIZ[5] to allow for production of counts, rates, years of life lost and excess deaths by age, sex, condition, condition group, area, population and period.

Data were aggregated into five-year periods for detailed analysis and mapping; a trend analysis was undertaken on a combination of single and five-year groupings of data.

The results were then exported as required from HealthWIZ to HealthMap (a proprietary mapping package developed by PHIDU) for production of maps.

The rates were mapped by Statistical Subdivision for Australia and by District Health Board for New Zealand. For further information, refer to the 'Introduction to map and text pages' in *Section 4.4* (for Australia) and *Section 5.4* (for New Zealand).

Data analysis: general

Excess deaths

Excess deaths are calculated by obtaining the 'observed-indirect expected' which gives the observed number for the data minus the expected number for the local population. The expected number is calculated using the indirect method of age standardisation, based on the first quintile population. It is the number one would expect if the whole population had had the same age-related rates as the rates for the population in the 1st quintile (the 'standard population'), calculated for Australia and New Zealand, respectively.

Rate ratios

'Rate ratios' show the differential between the standardised rate for two groups – for example between males and females; Indigenous and non-Indigenous; and between the most disadvantaged/ deprived areas (Quintile 5/ Decile 10) and the least disadvantaged/ deprived areas (Quintile 1/ Decile 1). The statistical significance of rate ratios is shown with an asterisk(s). A single asterisk indicates that the ratio is statistically significant at the 5% confidence level, that is, that the likelihood of the observed ratio being due to change or random error is less than 5%. A double asterisk indicates that the observed ratio is statistically significant at the 1% confidence level.

Years of life lost (YLL)

Years of life lost (YLL) were calculated using the remaining life expectancy method (this provides an estimate of the average time a person would have lived had he or she not died prematurely). For both Australia and New Zealand, the reference life table was the Coale and Demeny Model Life Table West level 26 female (for both males and females), with the YLL discounted to net present value at a rate of 3 per cent per year.

Data analysis: Australia

ASGC remoteness classification

The ASGC remoteness classification has five remoteness classes to which SLAs can be allocated: Major Cities of Australia, Inner Regional, Outer Regional, Remote and Very Remote.

The Index of Relative Socio-Economic Disadvantage (IRSD)

The Index of Relative Socio-Economic Disadvantage was used to allocate deaths to either five or ten groups (quintiles/ deciles) of similar socioeconomic status (referred to as quintiles/ deciles of socioeconomic disadvantage of area). SLAs (to which deaths data are coded) were ranked by their IRSD score and then allocated to one of five/ ten groups, each with approximately 20%/ 10% of the population aged 0 to 74 years. The IRSD for 2001 was allocated to SLAs for the period 1999-2001; the 1996 index was allocated to SLAs for the period 1997-1998.

Indigenous rates

The analysis of deaths of Australia's Aboriginal and Torres Strait Islander people is restricted to the four jurisdictions for which data are generally accepted as having the most complete coverage of Indigenous deaths. This is discussed in the introduction to *Section 4.6.*

Other major urban centres

The category 'other major urban centres' includes the major urban centres (cities with populations of 100,000 and over) other than the capital cities. The other major urban centre SSDs in this analysis are as follows:

NSW:	Newcastle, Wollongong
Vic:	Geelong
Qld:	Gold Coast-Tweed Heads, Sunshine Coast, Townsville-Thuringowa.

[5] HealthWIZ is a publicly available database for exploring statistical data. It is produced by Prometheus Information Pty Ltd for the Australian Government Department of Health and Ageing. This project, and the data on which it is based, is not available on the public release version.

Data analysis: New Zealand

Ethnic groups

Deaths of Mäori and Pacific peoples were corrected for under-reporting by application of adjustors from the New Zealand Census Mortality Study (NZCMS). The NZCMS is a record linkage study that anonymously and probabilistically links census records to mortality records for the three years following each census, since 1981. This allows ethnicity as recorded on the census (the 'gold standard') to be compared with ethnicity as recorded on the mortality collection. Under-reporting of Mäori and Pacific deaths results from differences in ethnicity definitions and methods of collection of ethnicity data between the census and mortality records.

Index of deprivation

The NZDep96 index was used to stratify deaths by level of deprivation (as a proxy for socioeconomic status). The NZDep96 score is derived from a principal components analysis of nine socioeconomic variables from the 1996 Census, based on small areas with a median of 90 people (mesh blocks). The NZDep96 scores were then grouped into quintiles.

Table 2.1: Avoidable mortality and amenable mortality conditions

Condition group and cause	Per cent of all deaths at all ages[1]	
	Aust	NZ
Infections		
Tuberculosis	0.05	0.11
Selected invasive bacterial and protozoal infections	2.21	2.01
Hepatitis	0.06	0.07
HIV/AIDS	0.13	0.09
Viral pneumonia and influenza	0.01	0.17
Neoplasms		
Lip, oral cavity and pharynx	0.49	0.37
Oesophagus	0.74	0.67
Stomach	0.95	1.09
Colorectal	3.61	4.05
Liver	0.51	0.43
Lung	5.23	5.14
Melanoma of skin	0.74	0.78
Nonmelanotic skin	0.28	0.23
Breast	2.01	2.34
Cervix	0.20	0.28
Uterus	0.20	0.26
Bladder	0.64	0.62
Thyroid	0.06	0.07
Hodgkin's disease	0.05	0.06
Lymphoid leukaemia – acute/ chronic	0.31	0.32
Benign	0.10	0.12
Nutritional, endocrine and metabolic conditions		
Thyroid disorders	0.06	0.06
Diabetes	2.30	2.47
Drug use disorders		
Alcohol related disease	0.83	0.51
Illicit drug use disorders	0.42	0.13
Neurological disorders		
Epilepsy	0.19	0.23
Cardiovascular diseases		
Rheumatic and other valvular heart disease	0.21	0.51
Hypertensive heart disease	0.38	0.58
Ischaemic heart disease	22.19	23.30
Cerebrovascular diseases	9.60	9.53
Aortic aneurysm	1.13	1.55
Genitourinary disorders		
Nephritis and nephrosis	1.73	1.08
Obstructive uropathy & prostatic hyperplasia	0.08	0.09
Respiratory diseases		
DVT with pulmonary embolism	0.41	0.17
COPD	4.39	5.44
Asthma	0.37	0.61
Digestive disorders		
Peptic ulcer disease	0.36	0.43
Acute abdomen, appendicitis, intestinal obstruction, cholecystitis/ lithiasis, pancreatitis, hernia	0.23	0.40
Chronic liver disease (excluding alcohol related disease)	0.23	0.14
Maternal & infant causes		
Birth defects	0.58	0.65
Complications of perinatal period	0.24	0.44
Unintentional injuries		
Road traffic injuries	1.43	1.84
Falls	0.37	0.83
Fires, burns	0.08	0.10
Accidental poisonings	0.55	0.07
Drownings	0.21	0.24
Intentional injuries		
Suicide and self inflicted injuries	2.14	2.05
Violence	0.24	0.22

[1] **Percentages were calculated from total deaths over a three or four year period: for Australia - 1997-99; for NZ - 1996-99**

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3 Avoidable mortality overview: Australia and New Zealand, 1997-2001

3.1 Total avoidable and unavoidable mortality

Almost three quarters (74.4%) of all deaths in New Zealand at ages 0 to 74 years over the period 1997 to 2001 are considered to be avoidable, marginally higher than the proportion for Australia (71.5%) (Figure 3.1, Table 3.1). Total mortality at 0 to 74 years accounted for 41.5% of deaths at all ages in Australia, and 43.7% in New Zealand.

The age-standardised death rate (ASR)[1] from avoidable mortality for New Zealand was 219.3 deaths per 100,000 population, approximately 24% higher than the rate of 176.6 for Australia. The New Zealand death rate for the remaining, or 'unavoidable' deaths, was 75.4 deaths per 100,000 population, approximately 7.4% higher than the rate for Australia of 70.2.

Deaths amenable to health care (amenable mortality, a subset of avoidable mortality) accounted for 28.7% of all deaths at ages 0 to 74 years in Australia and 32.1% in New Zealand. The ASR was 94.2 for New Zealand, one third higher than the rate for Australia of 70.4.

[1] Directly standardised to the WHO population

Figure 3.1: Avoidable mortality (0 to 74 years), Australia and New Zealand, 1997-2001

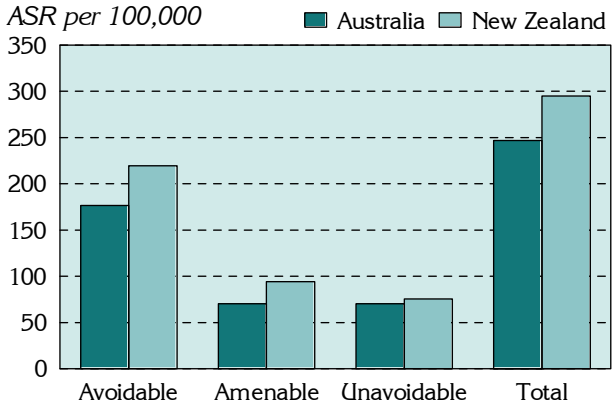


Table 3.1: Avoidable mortality (0 to 74 years), Australia and New Zealand, 1997-2001

Mortality category	Number		Per cent of total		ASR per 100,000		Rate ratio
	Aust	NZ	Aust	NZ	Aust	NZ	Aust:NZ
Avoidable mortality	189,845	44,272	71.5	74.4	176.6	219.3	0.81**
(Amenable mortality)	(76,249)	(19,130)	(28.7)	(32.1)	(70.4)	(94.2)	(0.75)**
Unavoidable mortality	75,582	15,249	28.5	25.6	70.2	75.4	0.93**
Total mortality	**265,427**	**59,521**	**100.0**	**100.0**	**246.8**	**294.7**	**0.84****

Another way of measuring premature mortality is to calculate the number of years of life lost (YLL),[2] which takes into account the years a person could have expected to live at each age of death based on the average life expectancy at that age.

The numbers of YLL for Australia and New Zealand over the observation period are shown in Table 3.2 by mortality category. However, given the significant variance in the Australian and New Zealand population sizes, a comparison of the proportion of YLL for each country is also shown.

YLL from avoidable mortality accounted for 71.9% of total YLL (0 to 74 years) for Australia, less than the 74.4% for New Zealand (a ratio of 0.97**). Similarly, the proportion of YLL from amenable mortality of 28.0% for Australia was lower than the 31.9% for New Zealand (a ratio of 0.88**). At the same time, the proportion of YLL from unavoidable mortality in Australia (28.1%) was higher when compared to New Zealand (25.6%; a ratio of 1.10**).

[2] See Chapter 2, *Methods*

Table 3.2: Years of life lost (0 to 74 years), Australia and New Zealand, 1997-2001

Mortality category	Number ('000)		Per cent of total YLL		Ratio
	Aust	NZ	Aust	NZ	Aust:NZ
Avoidable mortality	3,327.4	756.7	71.9	74.4	0.97**
(Amenable mortality)	(1,298.4)	(324.1)	(28.0)	(31.9)	(0.88**)
Unavoidable mortality	1,303.3	260.7	28.1	25.6	1.10**
Total mortality	**4,630.7**	**1,107.4**	**100.0**	**100.0**	**..**

3.2 Avoidable mortality by age and sex

By sex

ASRs for avoidable mortality were higher for males than for females in both Australia and New Zealand (Figure 3.2, Table 3.3). The ASR for Australian males was 232.1 deaths per 100,000 males, almost twice the rate for females of 121.1 (a rate ratio of 1.92**). In New Zealand, the rate differential was smaller, with 274.2 deaths per 100,000 males and a rate of 164.4 for females (a rate ratio of 1.67**). The Australian rates were lower than those in New Zealand for both males (0.85**) and females (0.74**).

The proportion of male deaths from avoidable causes in Australia was 64.8%, notably higher than the 35.2% for females. Similarly, the proportion of male deaths in New Zealand was higher than that for females, at 61.2% and 38.8%, respectively.

Figure 3.2: Avoidable mortality (0 to 74 years) by sex, Australia and New Zealand, 1997-2001

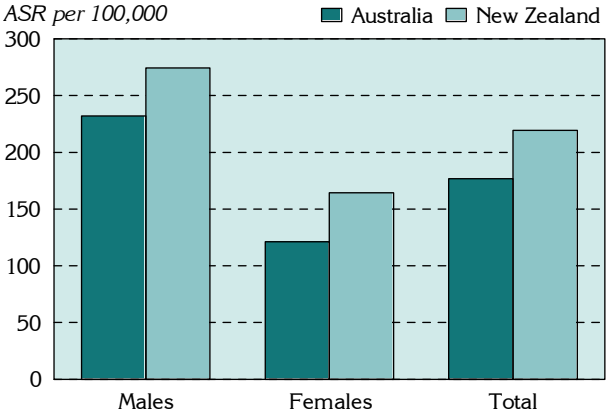


Table 3.3: Avoidable mortality (0 to 74 years) by sex, Australia and New Zealand, 1997-2001

Sex	Number		Per cent of total		ASR per 100,000		Rate ratio
	Aust	NZ	Aust	NZ	Aust	NZ	Aust: NZ
Males	123,026	27,089	64.8	61.2	232.1	274.2	0.85**
Females	66,819	17,183	35.2	38.8	121.1	164.4	0.74**
Total	**189,845**	**44,272**	**100.0**	**100.0**	**176.6**	**219.3**	**0.81****
Rate ratio–M:F	..	..	..	..	**1.92****	**1.67****	..

By age

In both Australia and New Zealand, almost half of avoidable mortality at ages 0 to 74 years occurred in the 65 to 74 year age group (46.6% and 46.1%, respectively) (Table 3.4, Figure 3.3). The 45 to 64 year age group accounted for around one third of avoidable deaths (33.9% and 35.0%, respectively) in both countries, while the 25 to 44 year age group contributed just over one tenth (12.8% and 11.1%). The age groups below 25 years comprised 6.7% of avoidable mortality in Australia and 7.9% in New Zealand.

Death rates varied from 1,338.8 deaths per 100,000 population (Australia) and 1,640.4 (New Zealand) in the 65 to 74 year age group to 10.2 (Australia) and 16.5 (New Zealand) in the 1 to 14 year age groups.

The death rates from avoidable mortality in New Zealand were higher than the rates for Australia in each age group in the analysis. The highest rates for both Australia and New Zealand were in the 65 to 74 age group, where the Australian rate of 1,338.8 deaths per 100,000 population was 18.0% lower than the New Zealand rate of 1,640.4 (a rate ratio of 0.82**).

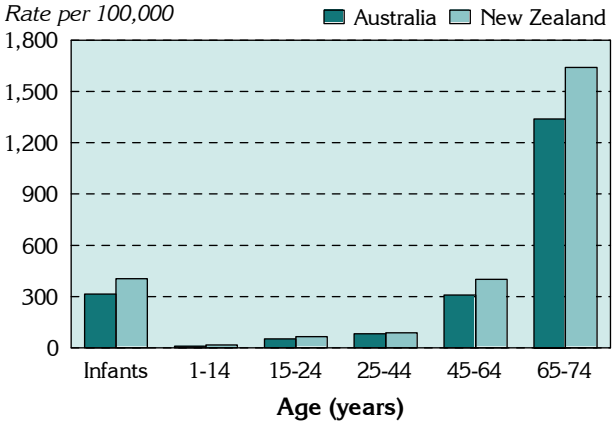
However, the greatest differential in the Australian and New Zealand rates was in the 1 to 14 year age group, where the Australian rate of 10.2 deaths per 100,000 population was 38% lower than the rate for New Zealand of 16.5 (a rate ratio of 0.62**).

Table 3.4: Avoidable mortality by age, Australia and New Zealand, 1997-2001

Age (years)	Number		Per cent of total		Rate per 100,000[1]		Rate ratio
	Aust	NZ	Aust	NZ	Aust	NZ	Aust: NZ
Infants (<1)	3,791	1,109	2.0	2.5	315.4	405.8	0.78**
1-14	1,878	644	1.0	1.5	10.2	16.5	0.62**
15-24	7,045	1,712	3.7	3.9	52.0	66.4	0.78**
25-44	24,356	4,900	12.8	11.1	83.1	88.4	0.94**
45-64	64,282	15,511	33.9	35.0	309.6	401.5	0.77**
65-74	88,493	20,396	46.6	46.1	1,338.8	1,640.4	0.82**
Total	**189,845**	**44,272**	**100.0**	**100.0**	**176.6**	**219.3**	**0.81****

[1] **Rates are age standardised within age categories, except under 1 year**

Figure 3.3: Avoidable mortality by age, Australia and New Zealand, 1997-2001



By age and sex

In each age group in the analysis, death rates from avoidable causes for both males and females were higher for New Zealand than for Australia (Table 3.5, Figure 3.4). The rates for males were higher than for females in each age group in both countries. The highest rates for both sexes were in the 65 to 74 year and 45 to 64 year age groups, and in infants under one year of age.

In Australia, the highest death rates for both sexes were in the 65 to 74 year age group, with the male rate of 1,760.4 per 100,000 males compared to 917.3 for females. The next highest rate for Australian males was in the 45 to 64 year age group, with an rate of 395.4 deaths per 100,000 males, compared to 223.8 (the third highest rate) for females. Infants also had high rates, with 349.7 deaths per 100,000 infant males and 281.1 for infant females.

Lower rates for avoidable mortality in Australia were in the 25 to 44 year age group, with 116.4 deaths per 100,000 males and 49.7 for females. In the 15 to 24 year age group, the rate for Australian males was 77.2 deaths per 100,000 males compared to 26.8 for females. The lowest rates were in the 1 to 14 year age group, with males having a rate of 12.0 deaths per 100,000 males, and females 8.3.

In New Zealand, the pattern of rates for both males and females was similar to that for Australia, with the highest rates for both sexes in the oldest and youngest age groups, and lower rates in the 1 to 44 year age groups.

The highest rates in New Zealand were in the 65 to 74 year age group, with rates of 2,075.1 deaths per 100,000 males and 1,205.6 for females. The next highest rate for New Zealand males was in the 45 to 64 year age group, with a rate of 479.6 deaths per 100,000 males. For females in this age group, the rate was 323.5 deaths per 100,000 females. Infants had rates of 448.0 deaths per 100,000 males and 363.5 for females.

Lower rates for avoidable mortality in New Zealand were in the 25 to 44 year age group, with 119.5 deaths per 100,000 males and 57.4 for females. In the 15 to 24 year age group, the rates for New Zealand were 95.9 deaths per 100,000 males and 36.8 for females. The lowest rates in New Zealand were in the 1 to 14 year age group, with 18.4 deaths per 100,000 males and 14.5 for females.

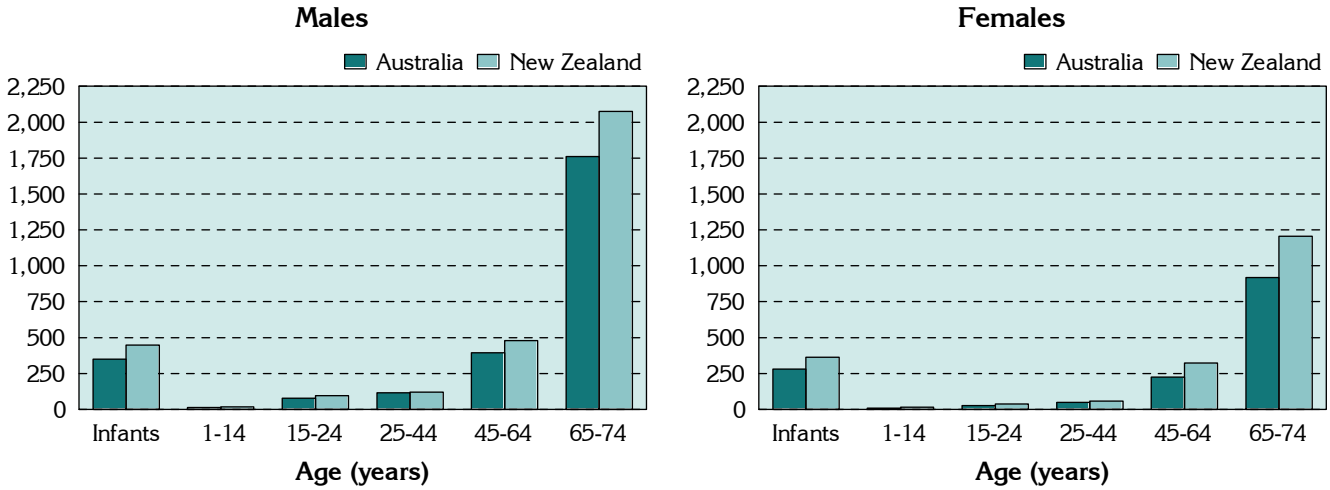
Table 3.5: Avoidable mortality by age and sex, Australia and New Zealand, 1997-2001

Age (years)	Number				Rate per 100,000 population[1]			
	Australia		New Zealand		Australia		New Zealand	
	Males	Females	Males	Females	Males	Females	Males	Females
<1	2,151	1,640	628	482	349.7	281.1	448.0	363.5
1-14	1,132	746	369	276	12.0	8.3	18.4	14.5
15-24	5,289	1,756	1,239	473	77.2	26.8	95.9	36.8
25-44	16,967	7,389	3,211	1,688	116.4	49.7	119.5	57.4
45-64	41,251	23,031	9,181	6,330	395.4	223.8	479.6	323.5
65-74	56,236	32,257	12,461	7,935	1,760.4	917.3	2,075.1	1,205.6
Total	**123,026**	**66,819**	**27,089**	**17,183**	**232.1**	**121.1**	**274.2**	**164.4**

[1] **Rates are age standardised within age categories, except under 1 year**

Figure 3.4: Avoidable mortality by age and sex, Australia and New Zealand, 1997-2001

Rate per 100,000 population



3.3 Avoidable mortality by cause

The ten top causes of avoidable mortality over the period from 1997 to 2001 were similar in both countries. Ischaemic heart disease, which accounted for almost one quarter of deaths in Australia (23.0%) and New Zealand (24.9%) was the major cause of death from avoidable mortality (Table 3.6). However, the rate of deaths per 100,000 population from ischaemic heart disease was notably higher (52.1) in New Zealand than in Australia (38.4), with the difference in IHD rates accounting for almost one third (32.1%) of the overall difference in avoidable mortality rates between Australia and New Zealand (of 42.7 deaths per 100,000 population). Lung cancer was the next major cause, responsible for just over one tenth of deaths in both Australia (11.2%, a rate of 18.9 deaths per 100,000 population) and New Zealand (10.3%, 21.6).

The proportion of deaths from suicide and self inflicted injuries was slightly higher in Australia (6.5%, a rate of 13.0 deaths per 100,000 population) than in New Zealand (5.8%, 14.9), while for colorectal cancer the reverse was the case (6.9%, a rate of 11.7 and 7.2%, 15.2, respectively).

Cerebrovascular diseases were the fifth rated cause of avoidable mortality in both Australia and New Zealand, resulting in similar proportions of death: 6.6% (a rate of 10.8 deaths per 100,000 population) for Australia, and 6.9% (a rate of 14.3) for New Zealand.

The rate of deaths from road traffic injuries in Australia (9.0 deaths per 100,000 population, 4.3%) was two thirds that for New Zealand (12.9, 5.0%). Similarly, the rate of deaths from COPD for Australia (8.9, 5.5%) was just over two thirds the rate for New Zealand (12.4, 6.2%).

The proportion of deaths from breast cancer was similar for both countries (4.5% and 4.8%), however the rate of deaths in Australia was lower than the rate for New Zealand (7.9, compared to 10.4 deaths per 100,000 females). The ninth rated cause of avoidable deaths was diabetes, which resulted in 3.2% of deaths in Australia (a rate of 5.4) and 4.1% in New Zealand (8.7).

Deaths from alcohol related disease show a different pattern from the top nine rated causes, with Australia having a higher proportion (2.4%) and a higher rate (4.4 deaths per 100,000 population) of mortality compared to New Zealand (1.3% of deaths and a rate of 2.9).

The proportion of deaths from birth defects was similar in both countries (1.7% and 1.9%), with the Australian rate (4.2 deaths per 100,000 population) lower than that for New Zealand (5.2).

Table 3.6: Major causes of avoidable mortality (0 to 74 years), Australia and New Zealand, 1997-2001

Cause	Number		Per cent of total		ASR		Rank[1]	
	Aust	NZ	Aust	NZ	Aust	NZ	Aust	NZ
Ischaemic heart disease	43,712	11,030	23.0	24.9	38.4	52.1	1	1
Lung cancer	21,208	4,543	11.2	10.3	18.9	21.6	2	2
Suicide and self inflicted injuries	12,393	2,588	6.5	5.8	13.0	14.9	3	4
Colorectal cancer	13,008	3,193	6.9	7.2	11.7	15.2	4	3
Cerebrovascular diseases	12,558	3,073	6.6	6.9	10.8	14.3	5	5
Road traffic injuries	8,138	2,198	4.3	5.0	9.0	12.9	6	6
COPD (45-74 years)	10,395	2,734	5.5	6.2	8.9	12.4	7	7
Breast cancer	8,550	2,147	4.5	4.8	7.9	10.4	8	8
Diabetes	6,169	1,821	3.2	4.1	5.4	8.7	9	9
Alcohol related disease	4,621	579	2.4	1.3	4.4	2.9	10	15
Birth defects	3,278	843	1.7	1.9	4.2	5.2	11	10
All causes	**189,845**	**44,272**	**100.0**	**100.0**	**176.6**	**219.3**	**..**	**..**

[1] **Rank is the rank order of the ASRs for the top ten causes of death for each country**

By sex

The major causes of avoidable deaths (apart from breast cancer in women) were similar for males and females in both Australia and New Zealand (Table 3.7). Ischaemic heart disease was the leading cause of avoidable mortality for males (25.9% and 29.6% of total avoidable deaths) and females (17.7% and 17.6%) in both countries.

Death rates in New Zealand were higher than the rates in Australia (with the exception of lung cancer in males, for which there was little variation). The differentials between the Australian and New Zealand rates were higher for females, ranging from 0.60** for COPD to 0.82** for suicide and self inflicted injuries. Road traffic injuries ranked higher for males in New Zealand (fourth) compared to males in Australia (seventh).

Table 3.7: Major causes of avoidable mortality (0 to 74 years) by sex, Australia and New Zealand, 1997-2001

Cause and sex	Number		Per cent of total in sex group		ASR		Rank[1]	
	Aust	NZ	Aust	NZ	Aust	NZ	Aust	NZ
Males								
Ischaemic heart disease	31,881	8,006	25.9	29.6	57.2	77.5	1	1
Lung cancer	14,563	2,725	11.8	10.1	26.2	26.3	2	2
Suicide and self inflicted injuries	9,808	1,995	8.0	7.4	20.6	23.2	3	3
Colorectal cancer	7,823	1,821	6.4	6.7	14.2	17.7	4	5
Cerebrovascular diseases	7,213	1,633	5.9	6.0	12.8	15.6	5	6
COPD (45 to 74 years)	6,513	1,517	5.3	5.6	11.3	14.0	6	7
Road traffic injuries	5,893	1,522	4.8	5.6	13.1	18.0	7	4
Diabetes	3,752	1,083	3.0	4.0	6.8	10.6	8	8
Alcohol related disease	3,658	446	3.0	1.6	6.9	4.5	9	13
Accidental poisonings	2,433	71	2.0	0.3	5.2	0.8	10	33
Stomach cancer	2,232	568	1.8	2.1	4.0	5.5	11	9
Birth defects	1,803	446	1.5	1.6	4.6	5.5	19	10
Females								
Ischaemic heart disease	11,831	3,025	17.7	17.6	19.5	26.8	1	1
Breast cancer	8,550	2,147	12.8	12.5	15.7	20.8	2	2
Lung cancer	6,645	1,818	9.9	10.6	11.6	16.8	3	3
Cerebrovascular diseases	5,345	1,440	8.0	8.4	8.9	13.0	4	4
Colorectal cancer	5,185	1,372	7.8	8.0	9.1	12.7	5	5
COPD (45 to 74 years)	3,882	1,217	5.8	7.1	6.4	10.7	6	6
Suicide and self inflicted injuries	2,585	593	3.9	3.5	5.4	6.6	7	9
Diabetes	2,417	738	3.6	4.3	4.1	6.8	8	8
Road traffic injuries	2,245	676	3.4	3.9	5.0	7.7	9	7
Birth defects	1,475	397	2.2	2.3	3.9	4.9	10	10

[1] **Rank is the rank order of ASRs for the top ten causes of death for each country within the relevant sex group**

By age

Table 3.8 shows the variation in avoidable mortality by the top three causes in selected age groups.

The top three causes of death for infants under one year of age were the same for both countries, although the top two rankings differed.

Birth defects were the top ranked cause of infant death in Australia, responsible for 52.6% of avoidable deaths (a rate of 166.2 deaths per 100,000 population) and the second highest in New Zealand (35.5% of deaths, a rate of 144.2). Complications of the perinatal period were the highest cause of infant mortality in New Zealand, resulting in more than half (54.3%) of infant deaths (a rate of 220.5), and more than one third (39.5%) of deaths (second to birth defects) in Australia, (a rate of 124.3).

In the 1 to 14 year age group, deaths from road traffic injuries were the major cause of mortality in both countries, resulting in 29.4% of deaths in Australia (a rate of 3.0), with a similar proportion in New Zealand (29.0%, a rate of 4.7). The proportion of deaths from drownings was higher in Australia for this age group (15.5%) compared to New Zealand (10.9%), but the death rates were similar (1.6 and 1.8, respectively).

Birth defects were a principal cause of mortality for children (as with infants), resulting in 14.9% of deaths in Australia (a rate of 1.5), and 16.3% in New Zealand (a rate of 2.7).

Deaths from road traffic injuries resulted in more than one third of deaths of young people in the 15 to 24 year age group in both Australia (35.0%, a rate of 18.3 deaths per 100,000 population) and New Zealand (37.6%, a rate of 24.9). The proportion and rate of deaths from suicide and self inflicted injuries were lower in Australia (29.5%, a rate of 15.2) compared to New Zealand (36.9%, 24.5). Accidental poisonings were responsible for a notably higher proportion of deaths in Australia (8.5%, a rate of 4.4) than New Zealand (1.4%, 0.9).

Suicide and self inflicted injuries, and road traffic injuries, were again the top causes of avoidable mortality in the 25 to 44 year age group in both countries. One quarter of deaths in Australia (25.6%) and New Zealand (25.1%) resulted from suicide and self inflicted injuries, with similar death rates (21.6 and 23.1, respectively). The proportion and rate of deaths from road traffic injuries was higher in New Zealand (16.1%, a rate of 14.9) than in Australia (11.8%, 10.0). Deaths from accidental poisonings were again much more prevalent in Australia (8.6%, a rate of 7.3) than New Zealand (0.9%, 0.8).

In the 45 to 64 year age group, the top three ranked causes of avoidable mortality – ischaemic heart disease, lung cancer and colorectal cancer – were the same for both countries. Ischaemic heart disease resulted in a slightly higher proportion of deaths in New Zealand (26.6%) than Australia (23.5%), but the rate was substantially higher in New Zealand (107.1 deaths per 100,000 population) compared to Australia (72.9). Deaths from lung cancer contributed similar proportions for both countries (13.2% and 12.0%, respectively), but the rate was notably higher in New Zealand (48.4) than Australia (41.1). The proportion of deaths resulting from colorectal cancer in this age group was similar for both Australia (8.8%, a rate of 27.4) and New Zealand (8.6%, 34.7).

Ischaemic heart disease and lung cancer were again the top two causes of death in the 65 to 74 year age group in both Australia and New Zealand. Ischaemic heart disease resulted in just under one third of deaths in each country (30.1% and 31.3%, respectively), but the rate was notably higher in New Zealand (515.4, compared to 402.1 in Australia).

Lung cancer was responsible for 13.8% of deaths (a rate of 187.8) in Australia, and 12.5% (a rate of 206.7) in New Zealand in this age group. Both cerebrovascular diseases and COPD accounted for around one tenth of deaths in both countries (9.3% and 8.9%, respectively, in Australia, and 9.1% and 10.0% in New Zealand).

Table 3.8: Major causes of avoidable mortality by age, Australia and New Zealand, 1997-2001

Cause and age	Number		Per cent of total in age group		Rate[1]		Rank[2]	
	Aust	NZ	Aust	NZ	Aust	NZ	Aust	NZ
Infants (<1 year)								
Birth defects	1,995	394	52.6	35.5	166.2	144.2	1	2
Complications of perinatal period	1,497	602	39.5	54.3	124.3	220.5	2	1
Selected invasive bacterial and protozoal infections	131	58	3.5	5.2	10.9	20.9	3	3
1-14 years								
Road traffic injuries	552	187	29.4	29.0	3.0	4.7	1	1
Drownings	292	70	15.5	10.9	1.6	1.8	2	3
Birth defects	280	105	14.9	16.3	1.5	2.7	3	2
15-24 years								
Road traffic injuries	2,468	643	35.0	37.6	18.3	24.9	1	1
Suicide and self inflicted injuries	2,075	631	29.5	36.9	15.2	24.5	2	2
Accidental poisonings	600	24	8.5	1.4	4.4	0.9	3	10
Birth defects	164	57	2.3	3.3	1.2	2.2	6	3
25-44 years								
Suicide and self inflicted injuries	6,245	1,229	25.6	25.1	21.6	23.1	1	1
Road traffic injuries	2,863	788	11.8	16.1	10.0	14.9	2	2
Accidental poisonings	2,095	43	8.6	0.9	7.3	0.8	3	22
Ischaemic heart disease	1,960	523	8.0	10.7	6.4	9.0	4	3
45-64 years								
Ischaemic heart disease	15,118	4,120	23.5	26.6	72.9	107.1	1	1
Lung cancer	8,468	1,865	13.2	12.0	41.1	48.4	2	2
Colorectal cancer	5,658	1,337	8.8	8.6	27.4	34.7	3	3
65-74 years								
Ischaemic heart disease	26,594	6,382	30.1	31.3	402.1	515.4	1	1
Lung cancer	12,235	2,548	13.8	12.5	187.8	206.7	2	2
Cerebrovascular diseases	8,207	1,859	9.3	9.1	121.7	147.4	3	4
COPD	7,864	2,033	8.9	10.0	118.4	161.5	4	3

[1] **Rates are age standardised within age categories, except under 1 year**

[2] **Rank is the rank order of ASRs for the top three causes of death for each country within the relevant age group: more than three causes are listed where the rank order differs between countries**

3.4 Avoidable mortality by geographic area

An overview of the rates of avoidable mortality in Australia, by Statistical Subdivision, and in New Zealand, by District Health Board, are shown in Map 3.1.

In Australia, ASRs of avoidable mortality were substantially highest in the Northern Territory (a rate of 361.3 deaths per 100,000 population), with the remaining state/ territory rates ranging from 150.2 in the Australia Capital Territory to 192.0 in Tasmania (see Table 4.8, *Section 4.4*).

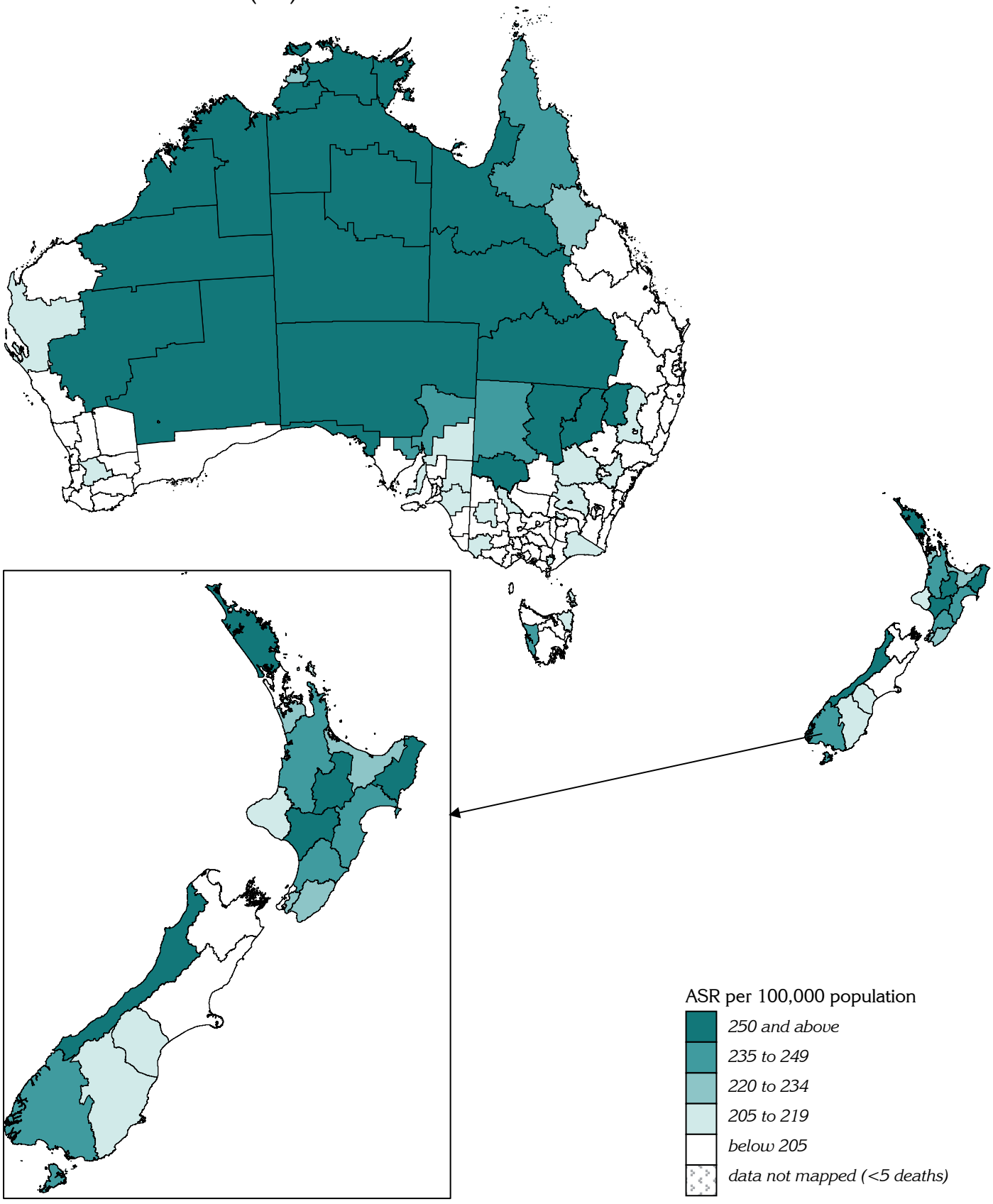
The differential in rates between the rest of the state/ territory areas and the capital cities and other major urban centres was also largest in the Northern Territory, with the rest of territory areas being more than twice the rate in Darwin (a rate ratio of 1.99**). Tasmania was the only area with fewer avoidable deaths in the rest of the state than in Hobart (7.0% fewer, a rate ratio of 0.93*).

In New Zealand the highest rates of death from avoidable causes were in the North Island, with the Tairawhiti District Health Board having the highest rate (319.1 deaths per 100,000 population), and the remaining District Health Board rates varying from 177.4 deaths per 100,000 population in Waitemata to 283.5 in Lakes (see Table 5.8, *Section 5.4*.

Map 3.1 is included as a summary map only – detailed maps of avoidable mortality and descriptions are provided in *Sections 4.4* (Australia) and *5.4* (New Zealand). Maps of amenable mortality are included in *Sections 6.3* (Australia) and *7.3* (New Zealand).

Map 3.1
All causes: avoidable mortality (0 to 74 years), Australia and New Zealand, 1997-2001

age standardised deaths per 100,000 population by Statistical Subdivision (Aust); District Health Board (NZ)



Details of map boundaries are in Appendix 1.4

3.5 Avoidable mortality by socioeconomic status/ deprivation

This section examines avoidable mortality by socioeconomic disadvantage for Australia (measured using the IRSD) and deprivation for New Zealand (measured using the NZDep96 index). The calculation of age-standardised death rates by quintile and the relevant indexes are described in Chapter 2, *Methods*.

By sex

There is a clear socioeconomic gradient in the rates of avoidable mortality for the total populations in Australia and New Zealand and for both males and females in each country (Table 3.9, Figure 3.5). The highest ASR for the Australian population was 213.9 deaths per 100,000 population in Quintile 5 and the lowest was 131.8 in Quintile 1, a differential in rates of 1.62** between the most disadvantaged areas and the least disadvantaged areas. For New Zealand, the differential in ASRs between quintiles was 2.30**, varying from 325.4 deaths per 100,000 population in the most deprived areas (Quintile 5) to 141.5 in the least deprived areas (Quintile 1).

For Australian males, the highest ASR was 281.2 deaths per 100,000 males in Quintile 5, and the lowest was 168.2 in Quintile 1, a differential of 1.67**. The range in ASRs for females was from 146.6 deaths per 100,000 females in the most disadvantaged areas to 95.4 in the least disadvantaged areas, a differential of 1.54**.

The ASRs for males in New Zealand varied from 405.6 deaths per 100,000 males in Quintile 5 to 175.4 in Quintile 1, a differential of 2.31**. The differential of 2.28** for ASRs for females in New Zealand was similar to that for males, with rates varying from 245.2 deaths per 100,000 females in the most deprived areas to 107.6 in the least deprived areas.

In both countries there were marked increases in the number of excess deaths[3] by disadvantage/ deprivation, for the total population as well as for males and females.

For the Australian population, if mortality in all socioeconomic groups equalled that of the least disadvantaged group (those in Quintile 1), there would have been 46,958 fewer avoidable deaths over the five year observation period (accounting for 24.7% of total avoidable mortality). Under this measure, there would have been 14,015 fewer avoidable deaths (31.7% of total avoidable mortality) in New Zealand.

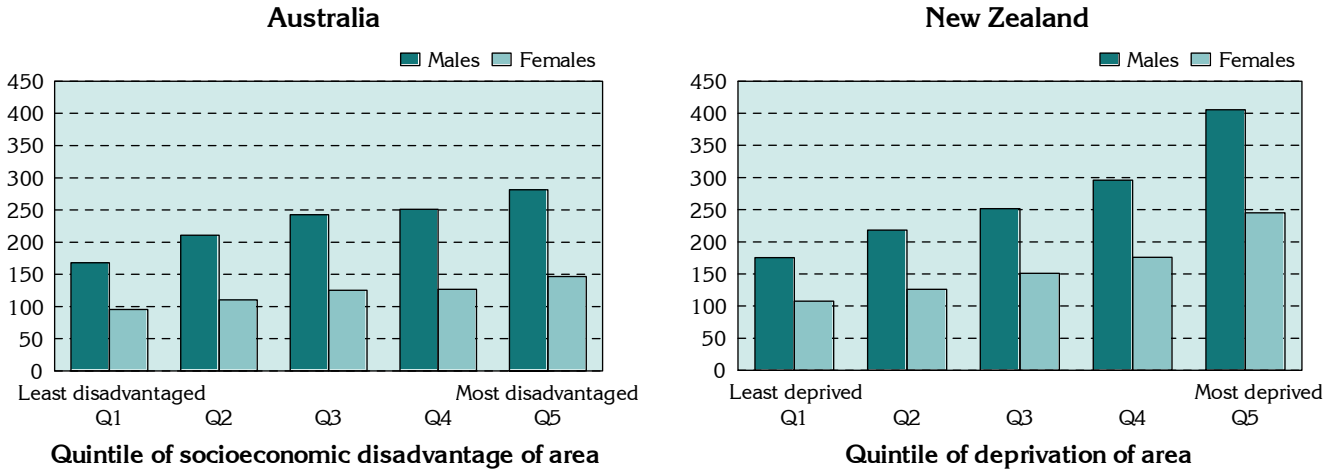
[3] See Chapter 2, *Methods*

Table 3.9: Avoidable mortality (0 to 74 years) by socioeconomic status/ deprivation and sex, Australia and New Zealand, 1997-2001

Quintile and sex	Number		ASR per 100,000		Excess deaths	
	Aust	NZ	Aust	NZ	Aust	NZ
Males						
1: Least disadvantaged/ deprived	17,381	3,132	168.2	175.4	(0)	(0)
2	21,546	4,116	210.6	218.1	4,309	794
3	25,903	4,921	242.8	251.7	7,861	1,461
4	27,567	6,275	251.0	296.0	8,894	2,473
5: Most disadvantaged/ deprived	30,203	7,176	281.2	405.6	11,949	4,002
Total	**123,026**	**27,089**	**232.1**	**274.2**	**33,013**	**8,730**
Rate ratio–Quintile 5:Quintile 1	..	..	**1.67****	**2.31****	..	..
Females						
1: Least disadvantaged/ deprived	10,606	2,001	95.4	107.6	(0)	(0)
2	11,783	2,510	110.5	126.3	1,630	360
3	13,668	3,142	125.1	150.8	3,193	881
4	14,467	4,033	126.9	175.8	3,543	1,503
5: Most disadvantaged/ deprived	16,202	4,610	146.6	245.2	5,579	2,541
Total	**66,819**	**17,183**	**121.1**	**164.4**	**13,945**	**5,285**
Rate ratio–Quintile 5:Quintile 1	..	..	**1.54****	**2.28****	..	..
Total persons						
1: Least disadvantaged/ deprived	27,987	5,133	131.8	141.5	(0)	(0)
2	33,329	6,626	160.5	172.2	5,939	1,154
3	39,571	8,064	184.0	201.2	11,054	2,342
4	42,034	10,309	188.9	325.9	12,437	3,976
5: Most disadvantaged/ deprived	46,405	11,785	213.9	325.4	17,528	6,543
Total	**189,845**	**44,272**	**176.6**	**219.3**	**46,958**	**14,015**
Rate ratio–Quintile 5:Quintile 1	..	..	**1.62****	**2.30****	..	..

Figure 3.5: Avoidable mortality (0 to 74 years) by socioeconomic status/ deprivation and sex, Australia and New Zealand, 1997-2001

ASR per 100,000 population



3.6 Avoidable mortality by Indigenous status and ethnicity

Indigenous people comprise 2.4% of the Australian population (ABS 2002), and 14.7% of the New Zealand population. Results are also included for the Pacific population, who are an important ethnic minority group, comprising a further 6.5% of the New Zealand population (Statistics New Zealand 2002).

In Australia, the ASR for deaths from avoidable causes for the Indigenous population (616.7 deaths per 100,000 population) is more than triple that for the non-Indigenous population (171.9), a rate ratio of 3.59** (Figure 3.6, Table 3.10). Both the Indigenous rate and the differential with the non-Indigenous population are above those for the comparable groups in New Zealand.

The differential in rates of avoidable deaths in New Zealand for Mäori compared to European/ others is 2.88** (533.3 deaths per 100,000 population compared to 184.9). For Pacific peoples the rate is 2.15** times the rate for European/ others (398.1 deaths per 100,000 population compared to 184.9).

In both Australia and New Zealand, years of life lost (YLL) from avoidable mortality accounted for over seventy per cent of total YLL at ages 0 to 74. In Australia, the per cent of YLL from avoidable mortality was higher for the Indigenous population (75.5%) than the non-Indigenous (72.1%). In New Zealand, the proportion of YLL from avoidable mortality was highest for Mäori (76.5%), followed by Pacific peoples (75.2%) and European/ others (73.7%).

Figure 3.6: Avoidable mortality (0 to 74 years) by Indigenous status/ ethnicity, Australia and New Zealand, 1997-2001

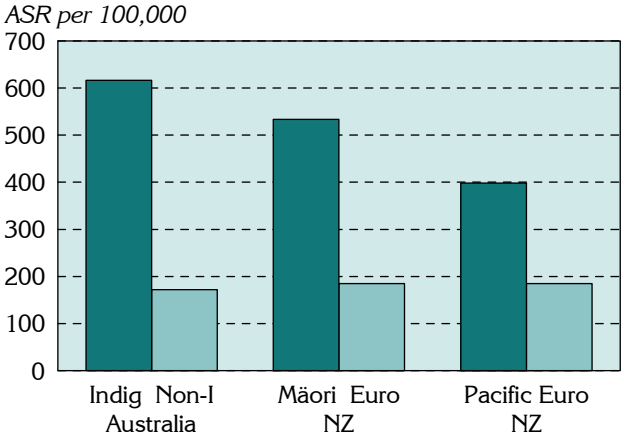


Table 3.10: Avoidable mortality (0 to 74 years) by Indigenous status/ ethnicity, Australia (Qld, SA, WA, NT)[1] and New Zealand, 1997-2001

Country and Indigenous status/ ethnicity	Number	Per cent of total deaths[2]	ASR	YLL ('000)	Per cent of total YLL[3]
Australia					
Indigenous	4,838	76.2	616.7	104.6	75.5
Non-Indigenous	65,793	71.9	171.9	1,152.5	72.1
Rate ratio–Indigenous:Non-Indigenous	..	..	**3.59****	..	..
New Zealand					
Mäori	8,449	77.4	533.3	163.2	76.5
Pacific peoples	2,332	76.1	398.1	44.8	75.2
European/ others	33,491	73.5	184.9	548.8	73.7
Rate ratio–Mäori:European/ others	..	..	**2.88****	..	..
Rate ratio–Pacific:European/ others	..	..	**2.15****	..	..

[1] **This analysis has been limited to data from the jurisdictions considered by the ABS to have the most complete coverage of Indigenous deaths (refer to *Section 4.6*)**

[2] **Avoidable mortality as a percentage of total deaths at ages 0 to 74 for the relevant ethnic group**

[3] **YLL from avoidable mortality as a per cent of total YLL at ages 0 to 74 for the relevant ethnic group**

By sex

Indigenous males in Australia had a markedly higher ASR for deaths from avoidable causes than both Indigenous females and non-Indigenous males (Table 3.11, Figure 3.7). However, because of the relatively high rate of deaths of Indigenous females, the ratio of male to female rates was lower for the Indigenous than for the non-Indigenous population.

The ASR for Indigenous males in Australia (754.7 deaths per 100,000 males) was more than three times (3.31**) that for non-Indigenous Australian males (227.8 deaths per 100,000 males). For Indigenous females, the ASR (478.8 deaths per 100,000 females) was more than four times (4.13**) that for non-Indigenous Australian females (115.9 deaths per 100,000 females).

Māori males had an ASR of 625.8 deaths per 100,000 population (17.8% of avoidable male deaths) compared to 440.8 for Māori females (a rate ratio of 1.42**), and 234.4 for European/ other New Zealand males (a rate ratio of 2.67**). The ASR for Māori females (440.8 deaths per 100,000 population) was more than three times (3.26**) the rate for European/ other females of 135.4.

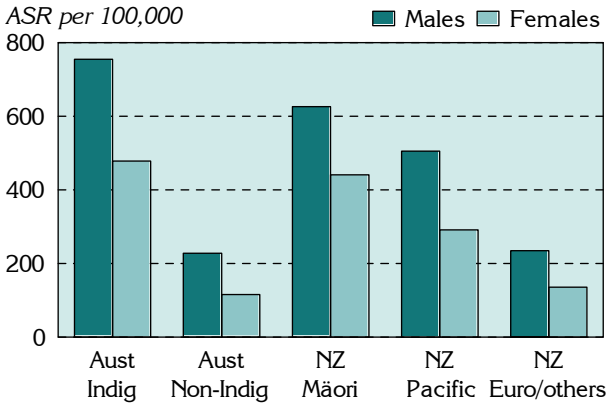
The male Pacific peoples ASR of 505.1 deaths per 100,000 males was notably higher than those for female Pacific peoples (291.0 deaths per 100,000 females, a rate ratio of 1.74**) and European/ other males (234.4, a rate ratio of 2.15**).

Table 3.11: Avoidable mortality (0 to 74 years) by Indigenous status/ ethnicity and sex, Australia (Qld, WA, SA, NT)[1] and New Zealand, 1997-2001

Country and Indigenous status/ ethnicity	Number		ASR		Rate ratio
	Males	Females	Males	Females	M:F
Australia					
Indigenous	2,888	1,950	754.7	478.8	**1.58****
Non-Indigenous	43,282	22,511	227.8	115.9	**1.97****
Rate ratio–Indigenous:Non-Indigenous	..	..	**3.31****	**4.13****	..
New Zealand					
Māori	4,870	3,579	625.8	440.8	**1.42****
Pacific peoples	1,412	919	505.1	291.0	**1.74****
European/ others	20,806	12,685	234.4	135.4	**1.73****
Rate ratio–Māori:European/ others	..	..	**2.67****	**3.26****	..
Rate ratio–Pacific:European/ others	..	..	**2.15****	**2.15****	..

[1] **This analysis has been limited to data from the jurisdictions considered by the ABS to have the most complete coverage of Indigenous deaths (refer to *Section 4.6*)**

Figure 3.7: Avoidable mortality (0 to 74 years) by Indigenous status/ ethnicity and sex, Australia and New Zealand, 1997-2001



3.7 Amenable mortality

By sex

ASRs for amenable mortality were higher for males than for females in both Australia and New Zealand (Table 3.12, Figure 3.8).

The ASR for Australian males was 79.4 deaths per 100,000 males, 30.0% higher than the rate for females of 61.4 deaths per 100,000 females (a rate ratio of 1.29**).

In New Zealand, the differential in rates between the sexes was smaller (1.21**), with 103.1 deaths per 100,000 males and 85.4 for females. The Australian rates were around 25% lower than in New Zealand for both males (0.77**) and females (0.72**).

Over half (55.8%) of male deaths in Australia were from amenable causes, compared to 44.2% for females.

In New Zealand, the gap was slightly smaller, with amenable mortality accounting for 53.8% of male deaths and 46.2% of female deaths.

Figure 3.8: Amenable mortality (0 to 74 years) by sex, Australia and New Zealand, 1997-2001

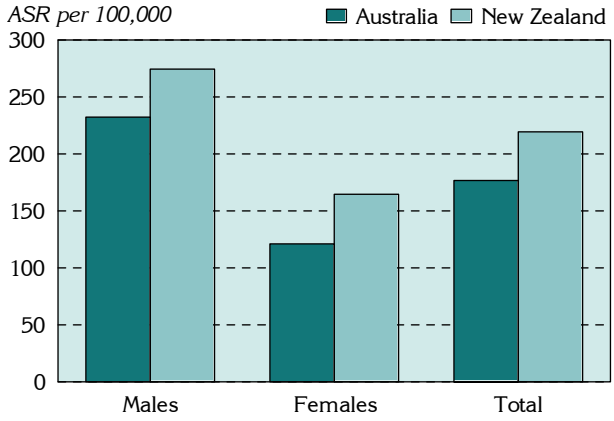


Table 3.12: Amenable mortality (0 to 74 years) by sex, Australia and New Zealand, 1997-2001

Sex	Number		Per cent of total		ASR		Rate ratio
	Aust	NZ	Aust	NZ	Aust	NZ	Aust:NZ
Males	45,568	10,300	55.8	53.8	79.4	103.1	0.77**
Females	33,682	8,830	44.2	46.2	61.4	85.4	0.72**
Total	**76,249**	**19,130**	**100.0**	**100.0**	**70.4**	**94.2**	**0.75****
Rate ratio–M:F	**..**	**..**	**..**	**..**	**1.29****	**1.21****	**..**

By age

In Australia and New Zealand, almost half of amenable deaths at ages 0 to 74 years occurred in the 65 to 74 year age group (49.5% and 46.1%, respectively) (Table 3.13, Figure 3.9). The 45 to 64 year age group accounted for just over one third of amenable mortality in both countries (36.0% and 38.0%, respectively), and the 25 to 44 year age group contributed one in twelve amenable deaths (7.8% and 8.1%, respectively). The age groups below 25 years comprised 6.7% of amenable mortality in Australia and 7.8% in New Zealand.

Death rates from amenable mortality in New Zealand were higher than the rates for Australia in each age group in the analysis. The highest rates for both Australia and New Zealand were in the 65 to 74 age group, where the Australian rate of 567.6 deaths per 100,000 population was 20.0% lower than the New Zealand rate of 707.7 (a rate ratio of 0.80**).

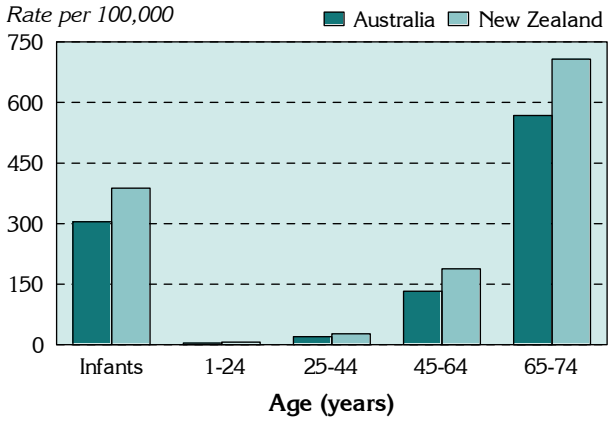
The largest differential in the Australian and New Zealand rates was in the one to 24 year age group, where the Australian rate of 4.4 deaths per 100,000 population was 34.3% lower than the rate for New Zealand of 6.7 (a rate ratio of 0.66**).

Table 3.13: Amenable mortality by age, Australia and New Zealand, 1997-2001

Age (years)	Number		Per cent of total		Rate per 100,000[1]		Rate ratio
	Aust	NZ	Aust	NZ	Aust	NZ	Aust:NZ
Infants (<1)	3,661	1,060	4.8	5.5	304.5	387.9	0.78**
1-24	1,422	433	1.9	2.3	4.4	6.7	0.66**
25-44	2,946	1,557	7.8	8.1	19.8	26.9	0.74**
45-64	27,464	7,261	36.0	38.0	132.6	187.7	0.71**
65-74	37,756	8,819	49.5	46.1	567.6	707.7	0.80**
Total	**76,249**	**19,130**	**100.0**	**100.0**	**70.4**	**94.2**	**0.75****

[1] **Rates are age standardised within age categories, except under 1 year**

Figure 3.9: Amenable mortality by age, Australia and New Zealand, 1997-2001



By age and sex

In each age group in the analysis, rates of death for both males and females for amenable mortality were higher for New Zealand than for Australia (Table 3.14, Figure 3.10). With the exception of the 25 to 44 year age group (where rates for females were marginally higher), the rates for males were higher than for females in each age group in both countries. The highest rates for both sexes were at the oldest and youngest ages.

In Australia, the highest death rates for males and females from amenable mortality were in the 65 to 74 year age group. The rate for males in this age group was 684.8 deaths per 100,000 males, compared to a rate of 450.4 for females. The next highest rates were for infants, with rates of 338.7 deaths per 100,000 infant males and 270.4 for infant females. Males in the 45 to 64 year age group had rates of 143.4 deaths per 100,000 males, compared to 121.7 for females.

There were notably lower rates in Australia for amenable mortality in the 24 to 44 year age group, with 20.8 deaths per 100,000 females and 18.8 for males. The lowest rates were in the 1 to 24 year age group, with males having a rate of 5.1 deaths per 100,000 males, and females a rate of 3.8.

In New Zealand, the pattern of rates for amenable mortality for males and females was similar to that for Australia, with the highest rates in the two oldest age groups, and for infants.

The highest rates for both males and females in New Zealand were in the 65 to 74 year age group, with a rate for males of 838.5 deaths per 100,000 males and for females of 576.9. The next highest rates were for infants, with rates of 423.1 deaths per 100,000 infant males and 352.8 for infant females in this age group. In the 45 to 64 year age group, the rate for males was 194.0 deaths per 100,000 males, compared to 181.4 for females.

There were much lower rates for amenable mortality in the 25 to 44 year age group, with 27.9 deaths per 100,000 females and 25.9 for males. The lowest rates in New Zealand were in the 1 to 24 year age group, with males having a rate of 7.2 deaths per 100,000 males, and females a rate of 6.2.

Table 3.14: Amenable mortality by age and sex, Australia and New Zealand, 1997-2001

Age (years)	Number				Rate per 100,000 population[1]			
	Australia		New Zealand		Australia		New Zealand	
	Males	Females	Males	Females	Males	Females	Males	Females
<1	2,083	1,577	593	467	338.7	270.4	423.1	352.8
1-24	827	596	235	198	5.1	3.8	7.2	6.2
25-44	2,804	3,142	724	833	18.8	20.8	25.9	27.9
45-64	14,934	12,531	3,712	3,549	143.4	121.7	194.0	181.4
65-74	21,920	15,837	5,036	3,783	684.8	450.4	838.5	576.9
Total	**42,568**	**33,683**	**10,300**	**8,830**	**79.4**	**61.4**	103.1	**85.4**

[1] **Rates are age standardised within age categories, except under 1 year**

Figure 3.10: Amenable mortality by age and sex, Australia and New Zealand, 1997-2001

Rate per 100,000 population