

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

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.

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 subclassification 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 classification²) 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 deprivation⁴. Records prior to 1997 were less detailed.

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 HealthWIZ⁵ 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

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.

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.

Data analysis: New Zealand

Ethnic groups

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

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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