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Australian Burden of Disease Study

Fatal burden of disease

2010

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Number 1

Australian Burden of Disease Study: Fatal burden of disease 2010

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Australian Institute of Health and Welfare

Board Chair
Dr Mukesh C Haikerwal AO

Director
Ms Kerry Flanagan PSM

Any enquiries about or comments on this publication should be directed to:
Digital and Media Communications Unit
Australian Institute of Health and Welfare
GPO Box 570
Canberra ACT 2601
Tel: (02) 6244 1000
Email: info@aihw.gov.au

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Abbreviations

ABDS	Australian Burden of Disease Study
ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
CODURF	cause of death unit record files
DALY	disability-adjusted life year
GBD	Global Burden of Disease Study
ICD	International Classification of Diseases
IHME	Institute for Health Metrics and Evaluation
MCOD	multiple causes of death
UCOD	underlying cause of death
WHO	World Health Organization
YLD	years lived with disability
YLL	years of life lost

Symbols

n.a.	not available
<	less than

Summary

Burden of disease analysis is a way to simultaneously count and compare the fatal and non-fatal impacts of different diseases and injuries. It uses information from multiple data sources to quantify the impact on a population of illness and premature death from all diseases and injuries. It uses a summary measure, the DALY (disability-adjusted life year), to describe the resulting health loss. One (1) DALY represents 1 year of healthy life lost, either through premature death or from living with an illness or injury.

The last Australian national burden of disease study was published in 2007, using 2003 data (Begg et al. 2007). An analysis of the burden of disease in Indigenous Australians was last undertaken for 2003 (Vos et al. 2007). This update of Australian estimates builds on methodological developments in recent global and country burden of disease studies, modified for the Australian context.

This report provides estimates of fatal burden for Australia for 2010; that is, the component of the DALY resulting from premature death. The results in this report are described for broad disease groups, age and sex. The full report for the current study will update and extend this report with 2011 estimates of fatal and non-fatal burden for more specific causes, and is expected to be released in the first half of 2016.

Key findings

There were around 143,500 deaths in Australia in 2010, resulting in 2.25 million years of life lost (YLL).

Cancer and other neoplasms contributed the most fatal burden, accounting for 35% of the total. This was followed by Cardiovascular diseases (23%), Injuries (13%), Neurological conditions (6%) and Respiratory diseases (5%). These 5 disease groups accounted for more than 81% of all YLL in 2010.

Males accounted for more of the burden than females for Injuries, Mental illnesses and behavioural disorders, Cardiovascular diseases and Cancer and other neoplasms. In particular, the high proportion of deaths in males due to Injuries contributed 16% of total male YLL, compared with 9% for females. Neurological conditions accounted for 6% of female YLL and 5% of male YLL.

Deaths in infants (aged under 1) contributed 5% of total YLL, but they made up only 1% of all deaths. This reflects the influence of age at death on the measure of fatal burden. The fatal burden in infants was largely due to pre-term birth complications, birth trauma and congenital defects.

Injuries accounted for the majority of fatal burden in those aged under 45, after which Cancer and other neoplasms and Cardiovascular diseases were more prominent. The relative contribution from Cancer and other neoplasms peaked around age 55–64 then declined. The Cardiovascular diseases group was the major cause of fatal burden among people aged 85 and over.

1 Introduction

What is burden of disease?

Burden of disease analysis is a technique used to assess and compare the impact of different diseases, conditions or injuries (referred to collectively as causes) on a population. It uses information from a range of sources to quantify the fatal and non-fatal effects and combine them into a summary measure of health called the DALY—a disability-adjusted life year. The DALY extends the concept of years of life lost (YLL) due to premature death to include equivalent years of 'healthy' life lost from living with diseases or injuries (quantified as years lived with disability, YLD). Box 1.1 contains definitions of key terms used in burden of disease studies.

Box 1.1: Key terms used in burden of disease studies

Attributable burden: The disease burden attributed to a particular risk factor. It is the reduction in burden that would have occurred if exposure to the risk factor had been avoided.

Disability-adjusted life year: One (1) year of healthy life lost, either through premature death or, equivalently, through living with ill health due to illness or injury.

Incidence: The number of new cases (of an illness or event) occurring during a given period.

Prevalence: The number of cases of a disease or injury in a population at a given time.

Years lived with disability: A measure of the years of what could have been a healthy life that were instead spent in states of less than full health. YLD represent non-fatal burden.

Years of life lost: Years of life lost due to premature death. YLL represent fatal burden.

(Refer to the Glossary for a full list of definitions.)

Burden of disease analysis has become the global standard for collating all useable data on causes of health loss to produce comparable and concise policy-relevant evidence. The ability to use data from a range of sources to construct a comparable measure for all diseases is a key strength of this approach; similar comparisons across different diseases or injuries cannot be produced using separate studies conducted on a disease-by-disease basis.

The first global study—for the reference year 1990—developed the DALY metric and quantified the disease burden (and attribution to risk factors) for eight regions of the world (Murray & Lopez 1996). Since then, additional global and country studies have been undertaken and methods have been further developed. To date in Australia, there have been two major national burden of disease studies and one for Indigenous Australians. Some states and territories have also completed burden of disease work. Table 1.1 provides a summary of global and national Australian studies.

Table 1.1: Summary of global and Australian burden of disease studies

Study	Reference year	Reference
Global study: Harvard School of Public Health in collaboration with The World Bank and the World Health Organization (WHO)	1990	Murray & Lopez 1996
First Australian study: Australian Institute of Health and Welfare (AIHW)	1996	Mathers et al. 1999
Global study: World Bank	2000–2002	Lopez et al. 2006
Global study: WHO	2004 with projections to 2030	WHO 2009
Second Australian study: AIHW and The University of Queensland	2003	Begg et al. 2007
First Indigenous Australian study: The University of Queensland	2003	Vos et al. 2007
Global study: Institute for Health Metrics and Evaluation (IHME)	2010	*The Lancet* 2012
Global study: WHO	2000–2012	WHO 2014a

The Global Burden of Disease Study 2010 (hereafter referred to as the GBD 2010) conducted by the IHME and other academic partners was published in December 2012 (The Lancet 2012). It used updated methods to generate DALYs for 2010 and revised estimates for 1990 and 2005. More recently, the WHO applied these methods (with some modifications) to revise and update global health estimates for 2000–2012 (WHO 2014a). When preparing this current report as part of the Australian Burden of Disease Study (ABDS), the IHME was also updating its estimates for the 2013 reference year (IHME 2014). Further details on the use of methods from these various studies in the current Australian work are provided below.

How are burden of disease studies used?

Burden of disease analysis provides a useful evidence base to support the following:

- **Monitoring of population health**. Burden of disease analysis is particularly valuable for monitoring population health because it simultaneously quantifies the fatal and non-fatal effects of causes of ill health. Further, it also maintains comparability of these metrics between disease groups, individual causes and population groups. The contribution of various risk factors can also be described using the same metrics.
- **Health policy and health service planning**. Burden of disease studies can also provide valuable information to inform health policy formulation and health service planning. For example, they indicate the diseases or injuries that are most likely to have an impact on the health system and services, such as doctor visits, hospital admission or dental care. In addition, estimates of the burden attributable to specific risk factors can be used to target prevention policies.
- **Assessment of the broader impact of diseases and the cost-effectiveness of interventions**. Burden of disease analysis only quantifies the size of a health problem; it does not incorporate information on which interventions will work or which are the most cost effective. Hence these studies should not be used on their own to determine resource allocation. However, burden of disease information can be used to measure the health impact of interventions when undertaking cost-effectiveness analysis. It can be also be useful to compare burden of disease information with disease expenditure estimates.

Australian Burden of Disease Study 2011

In recent years, it has become increasingly clear that the 2003 Australian burden of disease estimates were out of date. Stakeholders highlighted the need for updated information. To build on the AIHW's previous burden of disease studies and disease monitoring work, the Department of Health and the former Australian National Preventive Health Agency funded the Institute to update burden of disease estimates for Australia. The Australian Burden of Disease Study 2011 will include burden of disease estimates for the national and Aboriginal and Torres Strait Islander populations.

In December 2012, the results of a new global burden of disease study (the GBD 2010) were reported in *The Lancet*. The study, conducted by the IHME and academic partners, used further refined methods than those in previous global studies. It produced fatal and non-fatal burden estimates using statistical models of a variety of international and country-specific data. Results were reported for 241 causes, 57 risk factors and 187 countries, including Australia. These results are valuable for comparing burden of disease at an international level.

The country-specific results produced by the GBD 2010 for Australia do not, however, extend to the Indigenous population or to sub-national Australian population groups. Furthermore, the causes of health loss reported by the GBD 2010 do not fully capture the range and breadth of causes of ill health that are important in the Australian context or fully use the high-quality Australian data.

As such, the ABDS 2011 updates burden of disease estimates for the national and Aboriginal and Torres Strait Islander populations. Where valid, and where capacity allows, sub-national estimates will be produced. The study will use and adapt the methods of GBD 2010 using Australian data sources to quantify burden of disease. The resulting estimates will thus be better aligned to the Australian health policy context.

First phase

The first phase of the project explored a range of methodological issues, including the methodological developments of the GBD 2010, to determine the best methods to update the Australian and Indigenous estimates. The methods plan produced from this assessment was reviewed by the project's Expert Advisory Committee as well as other experts. The AIHW has published a working paper—*Assessment of Global Burden of Disease 2010 methods for the Australian context: Australian Burden of Disease Study, working paper no. 1*—that describes various aspects of this assessment (AIHW 2014).

Methods used in other recently published burden of disease studies—notably the WHO's Global Health Estimates (WHO 2014b), hereafter referred to as WHO 2012, and the New Zealand Ministry of Health's Burden of Diseases, Injuries and Risk Factors Study, 2006–2016 (MOH 2012)—are also being reviewed and incorporated into the Australian study where appropriate.

Second phase

The second phase involves updating the burden of disease estimates, including analysis of fatal burden, non-fatal burden and burden attributable to various risk factors. It is important to have a good foundation of data for a burden of disease study. Hence, the chosen reference period for the full reports of the ABDS is 2011, which reflects the data availability from the

key data sources (such as the Australian Health Survey, deaths data, hospitalisations data and various disease registers).

Initially, estimates of the national fatal burden for 2010, which are the focus of this report, have been produced. These estimates use the latest available mortality data that meet the requirements for this analysis (see Chapter 2 for more information). The full report of the study will include estimates of both fatal and non-fatal burden for the reference period 2011.

Purposes and context of this report

The key measure of fatal burden of disease is the YLL—the years of life lost due to disease and injury. It is calculated by counting the number of deaths at each age, multiplied by the remaining life expectancy at that age according to a standard life table.

The purposes of this report are to:

- provide an initial set of estimates of the fatal burden of disease for Australia for 2010 using the YLL measure
- describe the results by disease group
- describe the methodology used to derive the YLL estimates and how it compares with methods in other studies producing Australian results.

A report on mortality burden for the Indigenous population for 2010 is also underway. Following this, reports will be produced containing comprehensive estimates of:

- national total burden of disease (comprising estimates of fatal and non-fatal burden), and risk factor burden
- Indigenous total burden of disease and risk factor burden
- sub-national total burden of disease and risk factor burden.

The full set of estimates is expected to be published in the first half of 2016.

Scope

This report concentrates on national level YLL estimates for the reference period 2010. The 2010 estimates use the average of 3 years of death data combined: 2009–2011. Subsequent reports covering estimates of fatal and non-fatal burden will be prepared for the 2011 reference period.

This report includes estimates and rankings for disease groups by age and sex (Chapter 4). Each disease group (for example, Cardiovascular diseases) comprises a range of individual causes (for example, coronary heart disease and stroke); further examples of the specific causes in each disease group are presented in Chapter 2.

Estimates for specific causes are not included in this report as the cause list and methods may be further refined before full estimates for 2011 are produced. Any changes to the cause list may result in changes to the number of deaths and patterns of YLL estimates by disease group and cause. These changes are less apparent when reporting by disease group than at the finer cause level. As a result, this report presents YLL estimates by disease group rather than by cause.

Sub-national and Indigenous estimates of fatal burden are not included in this report; estimates of fatal burden for Indigenous Australians will be the subject of a separate report.

The full reports from the study will present estimates for fatal and non-fatal burden by individual causes at the national level and for Indigenous Australians. Sub-national estimates will be reported where valid and where capacity allows.

Trends analysis and direct comparison of YLL estimates with other burden of disease studies are not included in this report. This is because the results produced from this study cannot be compared with those from other burden of disease studies (see Box 3.1). However, this report does illustrate how results produced within a single global study can be compared to provide international comparisons of burden of disease (Chapter 5).

As well as the Additional tables contained in Appendix A of this report, supplementary tables are also provided in the 'additional materials' tab for this report on the AIHW website <www.aihw.gov.au>.

2 Data sources and methods

A complete set of mortality data (by age, sex and other key reporting attributes such as cause of death) and a standard life table are the key requirements for producing estimates of YLL for each disease and injury in the cause list.

This chapter describes the data sources and methods used to estimate YLL.

Cause list

Development of the cause list

All deaths, regardless of their cause, are counted when estimating fatal burden. The cause list details the specific diseases and injuries for which estimates of the number of YLL, YLD and DALYs will be made. It is a classification which, in principle, is a set of mutually exclusive and collectively exhaustive categories of disease and injury. Accordingly, it covers all fatal and non-fatal health outcomes (for which health loss is measured).

An Australian cause list was developed specifically for this study to align to the Australian context; that is, the disease and cause groups are tailored to meet the needs of the Australian health-policy and health-monitoring environment. The cause list used in this study was developed with the following considerations:

- coverage of Australian and Indigenous policy interests
- inclusion of specific causes with a potentially large or rapidly increasing burden
- feasibility of measuring mortality and prevalence for each cause.

To help refine the categories, the cause list for this study was developed with reference to the cause lists used for the GBD 2010 (Lozano et al. 2012), the recent New Zealand Burden of Disease study (MOH 2012) and the previous Australian study (Begg et al. 2007).

Structure of the cause list

The resulting cause list is hierarchical and has two levels. The highest level contains 17 disease groups under which around 175 causes are classified. The disease groups and some examples of the types of causes in each disease group are shown in Table 2.1.

For estimating YLL, all categories in the cause list have been mapped to the *International Statistical Classification of Diseases and Related Health Problems*, Tenth Revision (2006 version) (ICD-10) (WHO 1992). Appendix Table A1 provides a list of ICD-10 codes for each disease group used for the 2010 fatal burden estimates in this report.

The cause list plays a pivotal role in developing burden of disease estimates, and its structure and content may have an impact on some components such as data compilation, the application of some disability weights (in estimating YLD) and risk factor attribution. Importantly, when this report was prepared, the cause list was being further refined, with additional input from disease experts. Any refinements to the cause list may result in changes to the number of deaths and to patterns of YLL by disease group and cause. Changes would be more noticeable at finer levels of disaggregation, such as the specific cause level, than at the disease group level. As a result, this report presents YLL estimates by

disease group rather than by cause. The full report produced from the study will present estimates for fatal and non-fatal burden at the cause level.

In this report, the disease group Injuries was constructed based on the external cause of the injury (for example, a fall or road traffic accident) and not the type of injury sustained (for example, a fractured femur or spinal cord injury). The final structure of the cause list for Injuries is still being determined, and may change for the full report from the study. However, as the scope of injury deaths is not likely to differ whether reporting by nature of injury or by external cause, the disease group results are expected to be very similar regardless of the cause list structure.

It is also important to note that the Australian cause list does not fully align with cause lists used in other studies. For example, the disease groups may not always include the same set of causes, and, in some circumstances, different ICD-10 codes may be used to count specific causes of death.

Table 2.1: Disease groups in the ABDS cause list with examples of causes in the disease group

Disease group	Short label	Examples of causes
Infections	Infections	HIV/AIDS, tuberculosis, gastrointestinal infections, pertussis
Infant and congenital conditions	Infant / congenital	Pre-term birth complications, birth trauma and asphyxia, neural tube defects, congenital cardiovascular defects
Cancer and other neoplasms	Cancer	Breast cancer, bowel cancer, lung cancer, prostate cancer
Cardiovascular diseases	Cardiovascular	Coronary heart disease, stroke, rheumatic heart disease, peripheral vascular disease
Respiratory diseases	Respiratory	Asthma, chronic obstructive pulmonary disease, interstitial pulmonary disease, pneumoconiosis
Gastrointestinal diseases	Gastrointestinal	Upper gastrointestinal disorders, appendicitis, chronic liver disease, pancreatitis, non-infective inflammatory bowel disease
Neurological conditions	Neurological	Dementia, Parkinson disease, motor neurone disease
Mental illnesses and behavioural disorders	Mental / behavioural	Unipolar depressive disorders, schizophrenia, alcohol use disorders, drug use disorders, eating disorders
Endocrine disorders	Endocrine	Type 1 and Type 2 diabetes mellitus
Kidney and urinary diseases	Kidney / urinary	Chronic kidney disease, urinary incontinence
Reproductive and maternal conditions	Reproductive / maternal	Maternal haemorrhage, obstructed labour, genital prolapse, infertility
Chronic musculoskeletal disorders	Musculoskeletal	Osteoarthritis, gout, rheumatoid arthritis, chronic musculoskeletal pain syndromes
Sense organ disorders	Sense organs	Cataract and other lens disorders, glaucoma, age-related macular degeneration, hearing loss
Skin disorders	Skin	Psoriasis, acne, dermatitis and eczema, ulcers
Oral disorders	Oral	Dental caries, periodontal disease
Blood and metabolic disorders	Blood/metabolic	Haemophilia, iron deficiency anaemia, cystic fibrosis
Injuries	Injuries	Road traffic accidents, suicide, drowning, falls

Notes

1. The causes shown here are examples; each disease group comprises a broader range of causes than is shown here.
2. For the 2010 estimates, the disease group Injuries reflects deaths that had an external cause as the underlying cause (that is, deaths that implicitly involve injury).
3. The short label for the disease group is used in some parts of this report for convenience.

Consistent with previous burden of disease studies, the ABDS uses the underlying cause of death (UCOD) to classify each death to a cause in the cause list. Using the UCOD as the sole source of cause of death information assigns the entire fatal burden for each death to a single cause. This does not explicitly account for situations where more than one disease contributed to the death. Future development work may assess the use of associated causes of death or other information to account for this more complex situation.

Deaths data

Analysis of fatal burden of disease takes into account all deaths that occur in a population during a specified time period. This report provides national level YLL estimates for the reference period 2010. It is based on the annual average number of deaths that occurred during the period 2009–2011.

Mortality data sources

Mortality data come from the AIHW's National Mortality Database. This is a historical register of all deaths in Australia since 1964. The database comprises information about the causes of death and other characteristics about the person, such as sex, age at death, Indigenous status and area of usual residence. The cause of death data are sourced from the Registrars of Births, Deaths and Marriages in each state and territory and the National Coronial Information System, and are coded to the ICD by the Australian Bureau of Statistics (ABS).

Australian deaths data are collected through vital registrations. This is a system for collecting and maintaining records of life events (such as births, deaths and marriages) by a government authority. The AIHW website <http://www.aihw.gov.au/deaths/about-deaths-data/> provides detailed information on the registration of deaths and the coding of causes of death in Australia (AIHW 2013). The completeness, accuracy and coding of these data are also described elsewhere (ABS 2014; AIHW 2013). The deaths data are collated into an administrative data set for statistical analysis. Given the high quality of these data, no adjustment needs to be made to account for completeness for national estimates. Some transformation of the data has been undertaken to reassign some deaths to fit the purposes of burden of disease analysis (see 'Redistribution of deaths' below).

Versions of mortality data

The analyses for this report include all deaths that occurred during 2009–2011 that were captured in the 4 cause of death unit record files (CODURFs) for 2009–2012 (corresponding to deaths registered during 2009–2012). The version of these CODURFs is final for 2009 and 2010, revised for 2011 and preliminary for 2012. This methodology ensures that the latest and most accurate versions of the CODURFs are used for analysis. The process of revisions and the resulting versions of the CODURFs are described elsewhere (ABS 2014; AIHW 2013). Further revisions to the 2011 and 2012 CODURFs can result in changes to the estimates of causes of death, although these changes are expected to have only a small impact on estimates included in this report.

Accounting for late registrations

Using the CODURFs to 2012 for counting deaths that occurred in or before 2011 ensures that a sufficient number of late registrations are captured. On average, 95% of deaths are registered in the year in which they occur. Of the deaths that occurred in 2011, 5% were not registered until 2012 (ABS 2014). The inclusion of the 2012 CODURF enables these late registrations for 2011 to be used in calculating YLL estimates. A similar rationale applies to other years of data. This maximises inclusion of any very late registrations, such as those registered in Queensland in 2010, as described by ABS (2012).

Accounting for year-to-year variation

The number of deaths due to any particular cause varies from year to year. These fluctuations are more noticeable for causes that are less common. To reduce the impact of random fluctuations, 2009–2011 deaths data have been combined to produce the YLL estimates for 2010. This provides some stability in estimates of YLL and rates for:

- causes of death that are rare
- causes that occur episodically
- reporting at disaggregated levels (for example, by the level of cause group and for sub-national estimates).

All deaths occurring in 2009–2011 were used to produce YLL estimates. Results reported for 2010 throughout this report are the average number of deaths or YLL over the 3-year period, unless otherwise stated. Six (6) deaths have been excluded (from the annual average) due to missing age. A comparison of the average number of deaths and the actual 2010 number of deaths is included in Appendix Table A2. Using the average of 3 years of data results in an additional 823 deaths compared with using the actual deaths that occurred in 2010. This equates to less than 1% additional deaths.

Redistribution of deaths

There are a number of ICD-10 codes that are not appropriate or valid causes of death for burden of disease analysis. Some examples are:

- causes that can be considered as implausible as the UCOD, such as hypertension and paraplegia
- intermediate causes: causes that have a precipitating cause such as septicaemia and pneumonitis
- immediate causes: causes that occur in the final stages of dying, such as cardiac arrest and respiratory failure
- causes that are ill-defined or unspecified; for example, ill-defined digestive cancer and ill-defined digestive diseases.

Despite its high quality, the Australian deaths data are affected by these codes.

To quantify their contribution to the fatal burden, deaths coded to these codes must be reassigned to one or more of the conditions defined on the cause list (target causes) according to what could be a more probable underlying cause. This process is referred to as 'redistribution'.

Some simple redistribution was applied in the previous Australian studies; however, the methods for redistribution were further developed for the GBD 2010. These newer approaches have been considered and in some cases the methodology has been used in calculating YLL estimates.

The AIHW has undertaken a series of analyses investigating 4 methods for deriving redistribution algorithms based on direct evidence, direct multiple causes of death (MCOD) analysis, indirect MCOD analysis, and proportionate allocation. A description of each method is provided at Appendix B.

Using the Australian redistribution causes (Appendix Table A3), 10% of deaths were identified for redistribution. This compares with 18% of Australian deaths that were identified using GBD 2010 methods. The difference is largely due to the cause list: some of the causes of death that were redistributed in the GBD 2010 were directly allocated to a cause in the Australian study.

Standard life table

Life expectancy and life tables

Life expectancy measures how long, on average, a person is expected to live, based on current age- and sex-specific death rates in the population. It is a summary measure commonly used to describe the health of a population. It specifies the remaining life expectancy at each age, with life expectancy at birth being the most commonly used—the number of years of life that a person born today can expect to live. These estimates of life expectancy are derived from a life table which summarises the pattern of mortality and survival in the population.

As YLL is a 'health gap' measure, it requires definition of an aspirational life span to be able to quantify the gap between the current mortality and the counterfactual scenario where all mortality is averted until very old age. This is done using a standard life table—a key component of burden of disease studies. A standard life table corresponds to the aspirational or maximum life span for an individual in good health—it is not necessarily the actual life table of the population being studied. It is used to produce estimates of life expectancy at each age to indicate the number of years of life that are lost from dying at a specific age. For example, if the remaining life expectancy of a person aged 55 is 30 years (that is, at age 55 a person can expect to live to 85), a death at age 55 represents a loss of 30 YLL.

Choice of standard life table

The choice of standard life table will have an impact on burden of disease estimates. In general, a life table with longer life expectancy will result in greater YLL.

A standard life table is used to enable comparison between population groups and across time. The Australian study uses the standard life table used in GBD 2010 in calculating YLL. This life table has a longer life span than the Australian life tables produced by the ABS, which are based on the mortality experience in the Australian population (see further information in the following section). The GBD standard life table is also used for Indigenous and sub-national estimates to maintain comparability with national estimates.

Standard life tables used in global studies

GBD standard life table

The GBD 2010 standard life table was derived rigorously using mortality rates from multiple countries (Murray et al. 2012). It is based on the lowest observed age-specific death rates, capturing mortality patterns in all countries except those with very small populations, and covering all age ranges. The life expectancy estimates were assessed for predictive validity, including for countries with different levels of mortality. The result is a hypothetical life table giving estimates of life expectancy at birth to be 86.0 years for both males and females. Appendix Table A4 shows an abridged version of the GBD 2010 standard life table.

Some other features of this life table are that it:

- is a standard; that is, it can be applied across multiple settings to enable comparison between population groups and across time
- is aspirational; that is, it reflects the lowest observed deaths rates to construct a measure of currently observed maximum life span
- applies to all population groups: that is, it assumes the same aspirational life expectancy for any population group. Importantly, it is the same for males and females, and thus assumes no male–female 'biological' differences in survival potential.

The estimates of life expectancy in the GBD 2010 standard life table are, as expected, different from the estimates of life expectancy for the Australian population derived by the ABS. The latter are derived from actual mortality rates based on death registrations and the estimated resident population.

For comparison with the GBD 2010 standard life table, the life expectancy for the Australian population for the period 2008–2010 is shown for selected ages in Table 2.2. The life expectancy for Australian males and females at birth in 2008–2010 was 79.5 and 84.0 years, respectively—lower than the aspirational life expectancy of 86 years in the standard life table used for GBD 2010 estimates.

Table 2.2: Expected years of life remaining at selected ages using the GBD 2010 standard life table and Australian life tables for 2008–2010

	Expected years of life remaining		
Age (years)	GBD 2010 standard	Australian males	Australian females
0	86.0	79.5	84.0
1	85.2	78.9	83.3
15	71.3	65.1	69.4
25	61.4	55.4	59.6
45	41.8	36.3	40.1
65	23.3	18.9	21.8
85	7.6	6.0	7.1
95	3.3	3.1	3.4
100	2.2	2.5	2.7
105	1.6	n.a.	n.a.

Note: Australian life expectancy has been calculated by the ABS using 2008–2010 mortality data.

Sources: ABS 2011; Murray et al. 2012.

WHO standard life table

The WHO 2012 used a different standard life table, with a higher aspirational life expectancy (Table 2.3). They argued that the GBD aspirational life expectancy was too low, as it is known that some level of preventable disease or injury still exists in populations; they also noted that the GBD aspirational life expectancy at birth has already been achieved in some populations (see WHO 2014b). Table 2.3 compares Australian life expectancies for 2008–2010 with those in the WHO standard life table for 2012.

Table 2.3: Expected years of life remaining at selected ages using the WHO 2012 standard life table and Australian life tables for 2008–2010

	Expected years of life remaining		
Age (years)	WHO 2012 standard	Australian males	Australian females
0	91.9	79.5	84.0
1	91.0	78.9	83.3
15	77.0	65.1	69.4
25	67.0	55.4	59.6
45	47.0	36.3	40.1
65	27.9	18.9	21.8
85	10.7	6.0	7.1
95	5.1	3.1	3.4
100	2.8	2.5	2.7
105	1.0	n.a.	n.a.

Note: Australian life expectancy has been calculated by the ABS using 2008–2010 mortality data.

Sources: ABS 2011; WHO 2014a.

Years of life lost

What are YLL?

YLL measure the impact of dying prematurely; that is, the fatal component of burden of disease. YLD represent the non-fatal component.

The analysis presented in this report is for the fatal burden only. A subsequent report will present a full set of estimates for the fatal and non-fatal burden and the composite measure, DALYs. The respective contributions of fatal burden and non-fatal burden to overall burden cannot be assessed until non-fatal estimates are available.

How are YLL calculated?

A critical step for estimating YLL is to compile the total number of deaths by age and sex. Each death record is then weighted according to the remaining life expectancy at that age of death. These are summed and the result is the total number of YLL from all deaths.

The cause list provides a framework for tabulating deaths by cause of death which in turn enables reporting of YLL estimates for any level of the cause list.

Box 2.1: Years of life lost

YLL is calculated by summing the number of deaths at each age, multiplied by the remaining life expectancy at this age according to the standard life table.

YLL = number of deaths × remaining life expectancy at the age of death

1 Year of Life Lost corresponds to 1 year lost due to premature death. It has the same currency as YLD—namely, 1 Year Lived with Disability corresponding to 1 year lost due to ill health. This enables the two components to be summed to measure DALYs: 1 DALY represents the loss of 1 year of healthy life.

The accuracy of the YLL is influenced by the level of detail at which the life expectancy can be applied. That is, finer age granularity and a higher maximum age in the standard life table will result in more accurate YLL estimates than using broader age groups. The calculation of YLL in this report used deaths tabulated by single year of age at death (the finest level that can be aligned with the GBD standard life table) up to the highest age represented in the GBD standard life table (105 years). In this report, all deaths that occurred above age 105 were assigned the life expectancy for age 105.

3 Comparability of YLL estimates between studies

A principle of the ABDS is to maintain as much international comparability as possible, with clarity around any differences. The study follows the approach of the GBD 2010 where possible (for example, it uses the same standard life table) while departing in some aspects, such as data sources. As a result of these departures, it is important to understand that the fatal burden estimates presented in this report cannot be compared with estimates produced for Australia in other burden of disease studies, including the previous Australian and global studies. The methodological differences are outlined in Box 3.1.

Box 3.1: Comparing YLL estimates with those in previous Australian and global studies

The YLL estimates for Australia can vary from study to study. Some reasons for variation are differences in the following factors:

- **Cause list and ICD code allocation**. The cause list provides a framework for which estimates of fatal and non-fatal burden are calculated. The cause list for the ABDS has been tailored to suit the Australian context and definitions used for national reporting. Hence the causes used may not align with those in other studies; in some cases, the cause labels may be the same or similar, but the component causes may differ. In addition, the selection of ICD codes for each cause often differs between studies.
- **Underlying data sources**. The ABDS 2011 produces YLL estimates directly from a single data source—the AIHW National Mortality Database. The results using this data set are not comparable with the estimates for Australia produced by the GBD 2010, which modelled data to account for data gaps and to ensure internal consistency of deaths globally. Australia has a well-established and high-quality national registration system that produces comprehensive and accurate annual causes of death data, which can be used directly in this study. Direct use of this database also ensures more late death registrations are included, the most up-to-date cause of death information is used and that more flexibility is permitted in analysis (for example, use of year of death rather than year of registration).
- **Redistribution methods**. In burden of disease studies, deaths that are not coded to causes defined in the study's cause list are reassigned to other causes to ensure the burden from these deaths is included. In this study, these are referred to as redistribution codes; in some other studies, they are known as 'garbage codes'. Studies that use different methods to reassign deaths do not produce comparable YLL estimates. The current Australian study uses a similar approach for redistribution to that for other studies, but the algorithms (or exact specifications for the reassignment) are different.
- **Standard life table**. The current study uses the GBD 2010 standard life table to quantify the remaining years of life expectancy at any age. This life table has a higher life expectancy than that used for previous Australian studies, which will contribute to higher YLL estimates. Note that the WHO 2012 study used a life table with a longer life expectancy than other studies, and thus produces higher estimates of YLL.

(continued)

Box 3.1 (continued): Comparing YLL estimates with those in previous Australian and global studies

- **Methods of calculating YLL**. Estimates in the current study do not apply age weighting or discounting (see Glossary). Discounting was applied in the 1996 and 2003 Australian studies. As a result, the YLL estimates produced in this report will not be comparable with those from earlier Australian studies. As part of its refinement of methods, the GBD 2010 study did not apply age-weighting or discounting.

Similar issues will affect YLD estimates. Thus estimates of YLD and DALYs from the current Australian study will not be directly comparable with estimates from other studies.

However, the GBD 2010 study can be used to compare the GBD 2010 Australian estimates with GBD 2010 estimates for other countries and regions. This is the focus of Chapter 5.

4 Results

As outlined in Chapter 2, deaths data from 2009–2011 have been combined and averaged to reduce the impact of random fluctuations. The number of deaths and YLL reported for 2010 are the annual average number of deaths or YLL for 2009–2011, unless otherwise stated. Rates and percentages are derived using the 3 years of data combined.

In 2009–2011, there was an annual average of 143,527 deaths in Australia. This results in 2.25 million YLL; that is, the total fatal burden experienced in Australia from premature deaths. Both the number of deaths and the life expectancy at the age of death (the expected remaining years of life) determine the YLL estimates.

Does fatal burden differ by age and sex?

In 2010, males experienced the majority of the total fatal burden (59%), equating to 1.3 million YLL, compared with 0.9 million YLL for females.

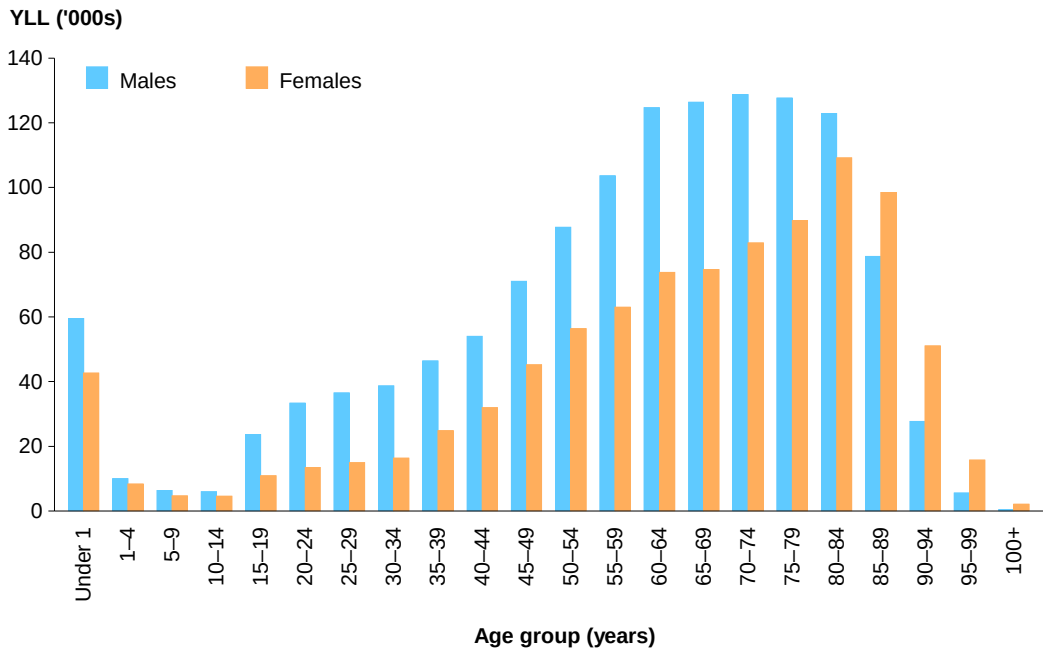
Fatal burden also differs across age groups, being influenced by both the number of deaths and life expectancy (in the standard life table) at that age. A considerable component of the fatal burden in Australia is experienced in older age groups due to the much higher number of deaths occurring in these age groups compared with younger age groups. For 2010, 58% of male deaths and 73% of female deaths were among people aged 75 and over. Deaths at these ages contributed 28% of the male burden and 39% of the female burden.

Figure 4.1 shows the total YLL by age for males and females in 2010. After infancy, there is a general increase in the number of YLL with increasing age (to around 84 years). While the years of life remaining at older ages is smaller than at younger ages, a greater proportion of deaths occur at older ages, giving rise to the greater fatal burden in the older age groups.

The YLL was highest for males aged 70–74 (128,623) and for females aged 80–84 (109,136). Deaths among infants (aged under 1 year) also contributed a substantial proportion of fatal burden (4.5% for males and 4.6% for females). This is due to the relatively high number of deaths in this age group and to these deaths incurring the largest number of potential YLL.

Figure 4.2 shows the YLL rates for males and females; that is, the YLL per 1,000 persons in each age–sex group.

It shows that, from age 1, YLL rates generally increased with age. The YLL rate among infants was high (394 per 1,000 for males and 298 per 1,000 for females), consistent with the relatively high number of deaths in this age group. For males, the rate of fatal burden increased steadily to a peak at age 95–99 of 990 per 1,000. For females, the rate of fatal burden was consistently lower than for males until the oldest age group (100+) where it was 894 per 1,000 compared with 836 per 1,000 for males.

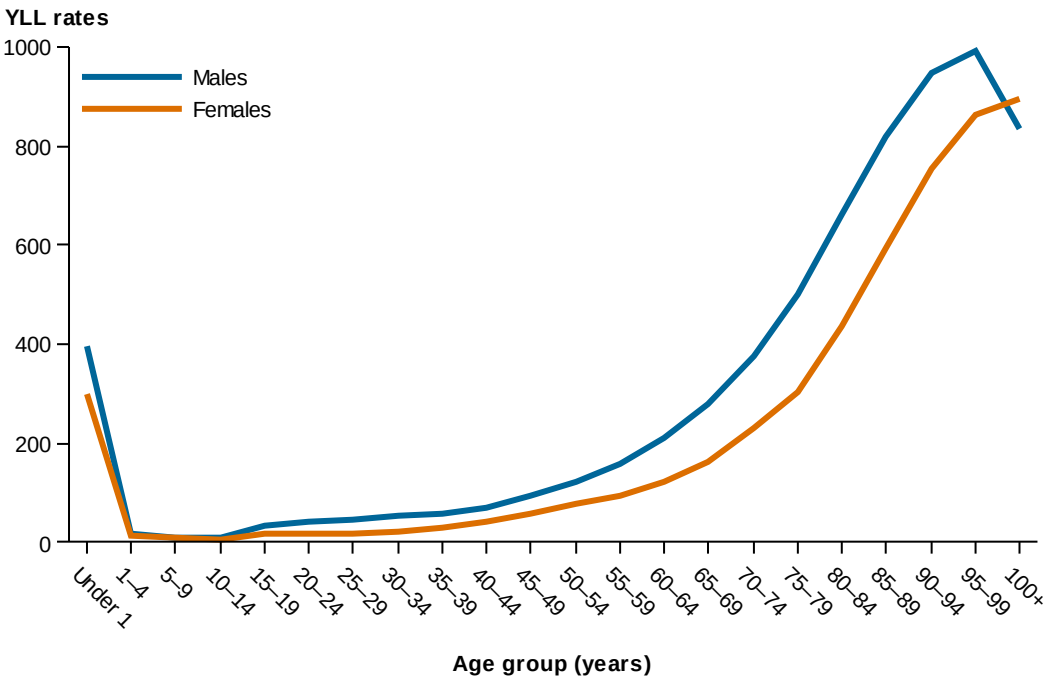


Notes

1. YLL for 2010 are the annual average of 2009–2011.
2. Additional table online–Table S4.1.

Source: AIHW National Mortality Database.

Figure 4.1: YLL by sex and age, 2010



Notes

1. YLL rates are based on 2009–2011 mortality data combined.
2. Additional table online–Table S4.2.

Source: AIHW National Mortality Database.

Figure 4.2: Age-specific rates of YLL by sex and age, 2010

How does fatal burden differ by disease group?

For males and females, Cancer contributed most to the fatal burden (33% and 36%, respectively; 35% of total), followed by Cardiovascular diseases (23% for both sexes). These two disease groups caused more than half (58%) of the total fatal burden. Injuries was clearly the third leading disease group (16% of male burden and 9% of female burden). Neurological conditions (6%) and Respiratory diseases (5%) were the next highest ranked causes of fatal burden. These five disease groups were estimated to account for 81% of all YLL in 2010 (Table 4.1).

The proportions of total YLL for males and females were similar for most disease groups, including Infections (2%), Cardiovascular diseases (23%) and Respiratory diseases (5%). In contrast, there were differences in the proportion of fatal burden for males and females for some other disease groups. For Injuries, there was a 7 percentage point difference (with males having a higher proportion), and for the Cancer and Neurological disease groups a 3 percentage point difference (with females higher).

Table 4.1: Per cent of YLL and rank by disease group and sex, 2010

	Males		Females		Persons	
Disease group	Per cent	Rank	Per cent	Rank	Per cent	Rank
Infections	1.9	10	2.1	9	2.0	9
Infant and congenital conditions	4.5	6	4.7	6	4.6	6
Cancer and other neoplasms	33.3	1	36.3	1	34.5	1
Cardiovascular diseases	23.1	2	22.9	2	23.0	2
Respiratory diseases	4.7	5	5.3	5	4.9	5
Gastrointestinal diseases	3.9	7	3.8	7	3.9	7
Neurological conditions	4.9	4	7.6	4	6.0	4
Mental illnesses and behavioural disorders	1.9	9	1.0	13	1.6	11
Endocrine disorders	2.5	8	2.7	8	2.6	8
Kidney and urinary diseases	1.5	11	2.1	10	1.7	10
Chronic musculoskeletal disorders	0.4	13	1.1	12	0.7	13
Skin disorders	0.2	14	0.3	14	0.2	14
Blood and metabolic disorders	1.2	12	1.4	11	1.3	12
Injuries	16.0	3	8.7	3	13.0	3
All other disease groups	0.0	15	0.1	15	0.1	15
All diseases	**100.0**	**120**	**100.0**	**120**	**100.0**	**120**

Notes

1. Number of YLL for 2010 are the annual average of 2009–2011. The numbers may not add to total for all diseases due to rounding.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.
3. Analysis excludes 6 deaths (annual average) due to missing age.

Source: AIHW National Mortality Database.

The proportion of deaths due to a disease group may not equate to the proportion of YLL caused by the disease group. Although the numbers of deaths due to Cancer and Cardiovascular diseases are nearly equal (31% and 32% of total deaths, respectively), Cancer contributed more YLL than Cardiovascular diseases (35% compared with 23%, respectively).

This is due to people dying from Cancer, on average, at younger ages, resulting in more YLL than for people dying from Cardiovascular diseases. Similarly, the proportion of YLL for Injuries (13%) was markedly higher than its proportion of deaths (6%); this is influenced by a younger average age at death for these deaths. Infant and congenital conditions had a similar pattern, contributing a noticeable proportion of YLL (5% for males and females), while they made up only 1% of male and female deaths.

Differences by sex

For most disease groups, males experienced a greater share of the fatal burden than females. Most notably, males contributed 72% of fatal burden due to Mental illnesses and behavioural disorders, and 72% of the fatal burden due to Injuries. Females contributed more of the fatal burden than males for Chronic musculoskeletal disorders (63%), Skin disorders (55%) and Neurological conditions (53%) (Table 4.2).

Table 4.2: Number and per cent of YLL by sex within disease groups, 2010

	Male		Female		Persons	
Disease group	**Number**	**Per cent**	**Number**	**Per cent**	**Number**	**Per cent**
Infections	25,285	56.3	19,611	43.7	44,897	100.0
Infant and congenital conditions	59,491	57.4	44,189	42.6	103,680	100.0
Cancer and other neoplasms	439,041	56.4	339,294	43.6	778,335	100.0
Cardiovascular diseases	304,888	58.8	213,698	41.2	518,586	100.0
Respiratory diseases	61,951	55.7	49,185	44.3	111,136	100.0
Gastrointestinal diseases	51,810	59.6	35,169	40.4	86,979	100.0
Neurological conditions	64,088	47.5	70,822	52.5	134,910	100.0
Mental illnesses and behavioural disorders	25,511	72.2	9,809	27.8	35,320	100.0
Endocrine disorders	32,488	56.1	25,373	43.9	57,861	100.0
Kidney and urinary diseases	19,276	50.0	19,239	50.0	38,515	100.0
Chronic musculoskeletal disorders	5,754	36.8	9,863	63.2	15,617	100.0
Skin disorders	2,310	44.6	2,869	55.4	5,179	100.0
Blood and metabolic disorders	15,776	54.3	13,265	45.7	29,041	100.0
Injuries	210,845	72.2	81,161	27.8	292,006	100.0
All other disease groups	296	23.6	957	76.4	1,254	100.0
All diseases	**1,318,810**	**58.5**	**934,506**	**41.5**	**2,253,316**	**100.0**

Notes

1. YLL for 2010 are the annual average of 2009–2011. The numbers may not add to total for all diseases due to rounding.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.
3. Analysis excludes 6 deaths (annual average) due to missing age.

Source: AIHW National Mortality Database.

While comparisons of the proportion of burden by sex within a disease group are useful, they do not take into account differences in the age structure and size of the population. This is particularly important for some disease groups since the risk of dying varies with age. Age-standardised YLL rates are used to account for variation in risk associated with age. YLL rates have been age-standardised to the Australian population as at 30 June 2001 and

are expressed as YLL per 1,000 population (Table 4.3). Further information on age-standardisation, rate ratio and other technical matters is at Appendix C.

The rate ratio of age-standardised YLL rates measures the relative difference in these rates between males and females adjusted for differences in their age structures. Ratios greater than 1 indicate proportionally higher YLL among males, while ratios less than 1 indicate proportionally higher YLL among females. Note that this comparison differs conceptually to that in Table 4.1 which compares the proportions of total YLL between males and females.

Overall, the age-standardised YLL rates were 60% higher for males than females (rate ratio of 1.6). Comparison of the age-standardised YLL rates by disease group indicates that males have:

- almost 3 times the fatal burden than females for Mental illness and behavioural disorders (rate ratio of 2.8) and Injuries (2.7); almost 2 times the fatal burden of Cardiovascular diseases (1.8), Gastrointestinal diseases (1.7) and Infections (1.6); and 50% higher fatal burden for Respiratory diseases (1.5) and Endocrine disorders (1.5)
- lower fatal burden than females for Chronic musculoskeletal disorders (0.7).

Table 4.3: Age-standardised YLL rates (YLL per 1,000 population) by sex and disease groups, 2010

Disease group	Males (rate)	Females (rate)	Male/female rate ratio
Infections	2.3	1.5	1.6
Infant and congenital conditions	5.2	4.0	1.3
Cancer and other neoplasms	38.9	27.5	1.4
Cardiovascular diseases	27.9	15.3	1.8
Respiratory diseases	5.7	3.8	1.5
Gastrointestinal diseases	4.7	2.7	1.7
Neurological conditions	6.0	5.1	1.2
Mental illnesses and behavioural disorders	2.3	0.8	2.8
Endocrine disorders	3.0	1.9	1.5
Kidney and urinary diseases	1.8	1.4	1.3
Chronic musculoskeletal disorders	0.5	0.8	0.7
Skin disorders	0.2	0.2	1.0
Blood and metabolic disorders	1.4	1.1	1.3
Injuries	19.3	7.2	2.7
All other disease groups	<0.1	0.1	0.3
All diseases	**119.4**	**73.4**	**1.6**

Notes

1. YLL rates are expressed per 1,000 population. The rates were directly age-standardised to the Australian population as at 30 June 2001. Age-standardised YLL rates are based on 2009–2011 mortality data combined.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.

Source: AIHW National Mortality Database.

Difference by age

Figures 4.3a and 4.3b show the YLL for each disease group by age for males and females. Figures 4.4a and 4.4b show the percentage contribution of each disease group to the fatal

burden within each age group for males and females. In these figures, different disease groups are indicated by different colours. These figures provide a general presentation on the contribution of each disease group to the fatal burden.

Males had higher YLL than females for most disease groups. For both sexes, the majority of YLL occur between 55 and 84 years. Among males and females aged 45 and over, YLL were largely associated with Cancer and Cardiovascular diseases.

YLL for males and females aged 1–44 were largely due to Injuries, with Cancer the second largest contributor. In this age range, females had higher YLL (36,889) than males (33,890) for Cancer, and males had more than 3 times the YLL (140,679) than females (47,044) for Injuries.

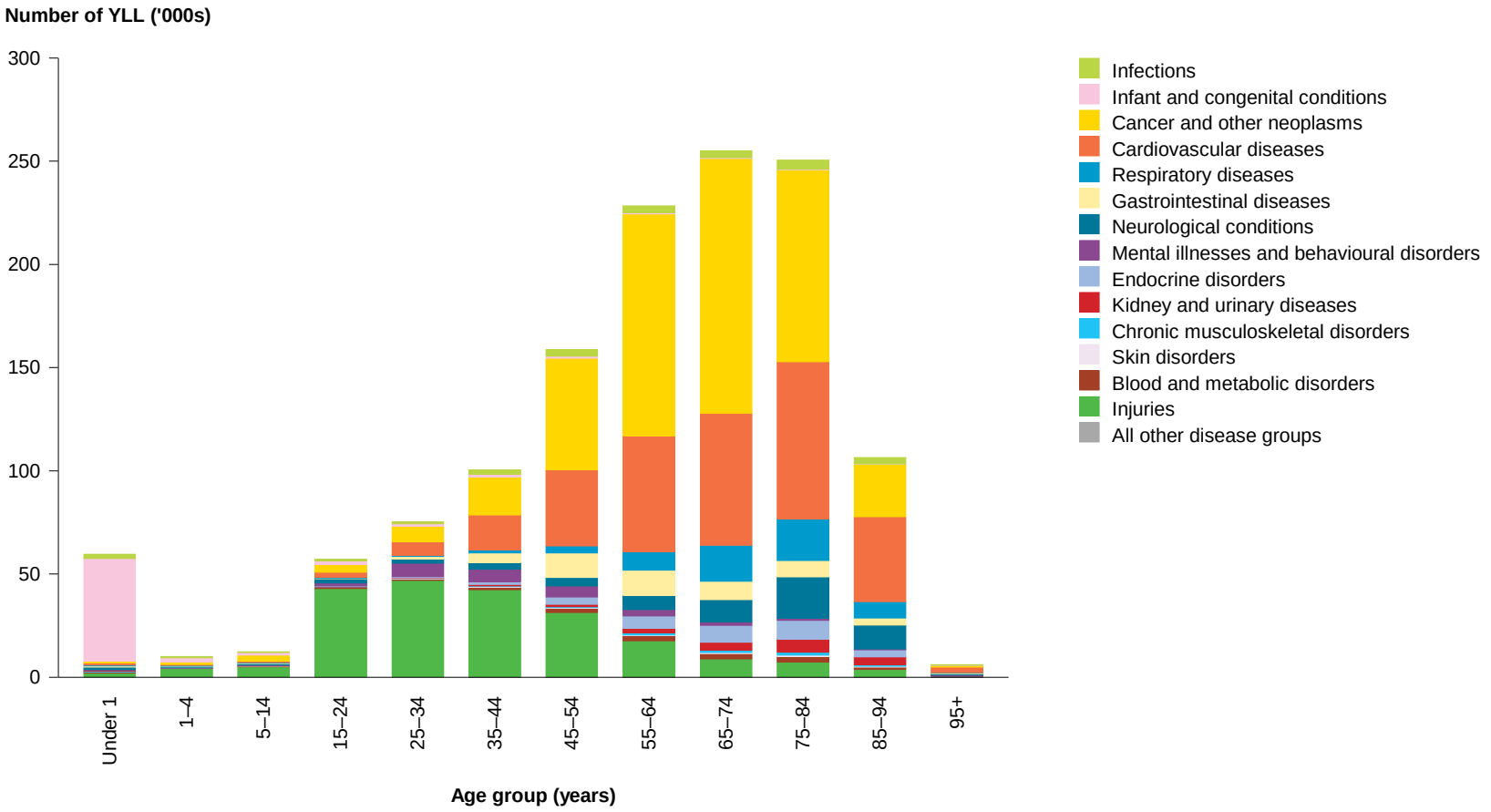
The contribution of Injuries to the fatal burden in males aged under 45 is clearly illustrated in Figure 4.4a. Seventy-five per cent (75%) of YLL among males aged 15–24 and 62% for males aged 25–34 were attributed to Injuries.

For Chronic musculoskeletal conditions, females aged 45 and over had markedly higher YLL (8,713) than males (4,987).

Among males aged 45 and over, the contribution of YLL from Cancer and Cardiovascular diseases becomes more prominent. The proportion of YLL attributed to Cardiovascular diseases increased with increasing age group. It peaked at age 95+, contributing 44% of the YLL in this age group. The proportion of YLL due to Cancer peaked in males aged 65–74 (48%).

Similar patterns can be seen for females where, for those aged 45 and over, the majority of YLL were due to Cancer and Cardiovascular diseases. The proportion of YLL attributed to Cardiovascular diseases peaked at age 95+, contributing 49% of YLL in this age group. For Cancer, it peaked at age 55–64, contributing 59% of YLL in this age group (figures 4.4a and 4.4b).

The proportion of total YLL due to Neurological conditions increased with increasing age (more noticeably among females), as did Respiratory diseases to a lesser extent. The Neurological conditions group was the third largest contributor for females aged 75 and over (contributing between 11% and 18% in each age group) (Figure 4.4b).

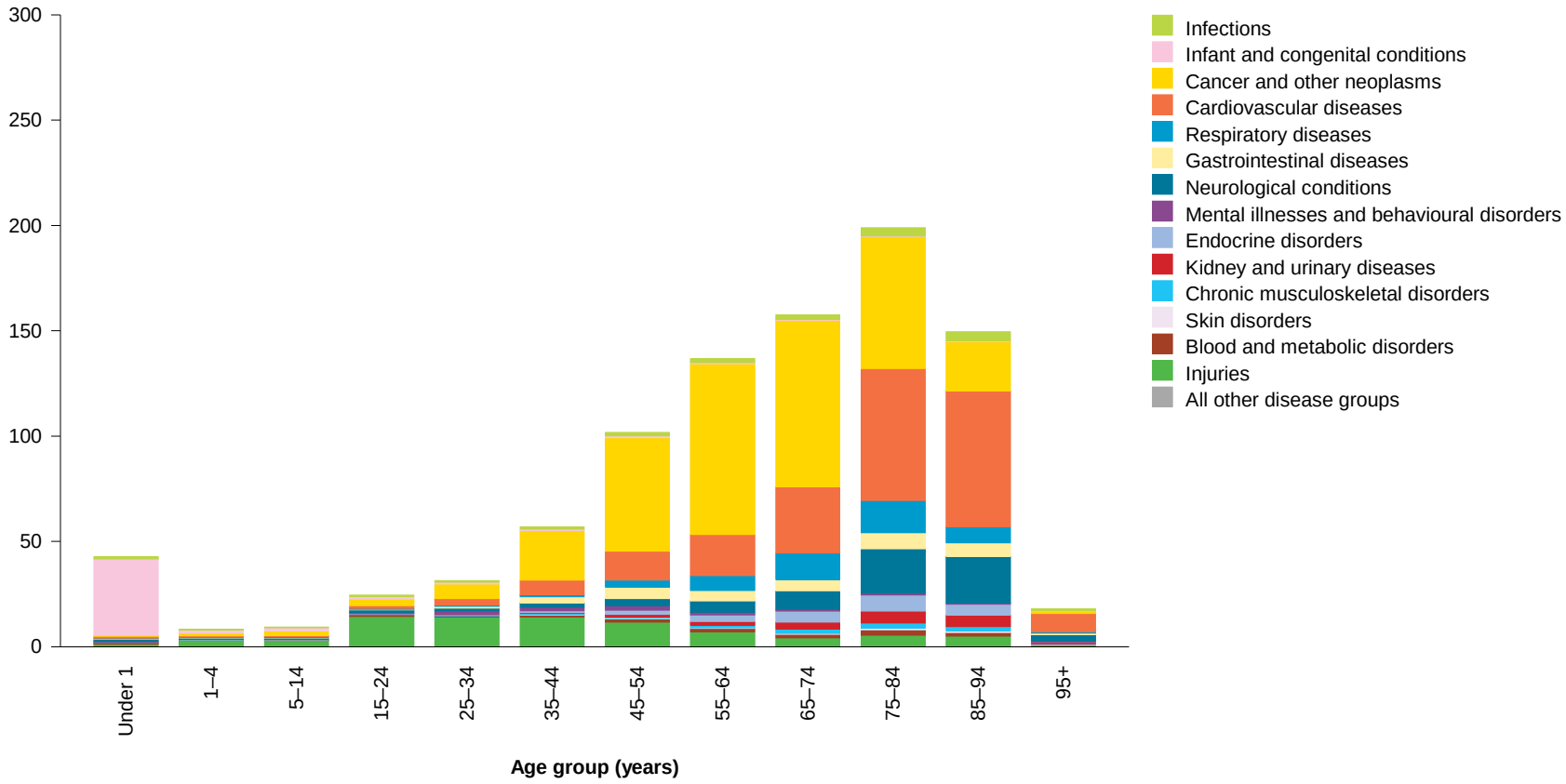


Notes

1. YLL for 2010 are the annual average of 2009–2011.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.
3. Additional table online–Table S4.4.

Source: AIHW National Mortality Database.

Figure 4.3a: Years of life lost (number of YLL) by age and disease group, males, 2010

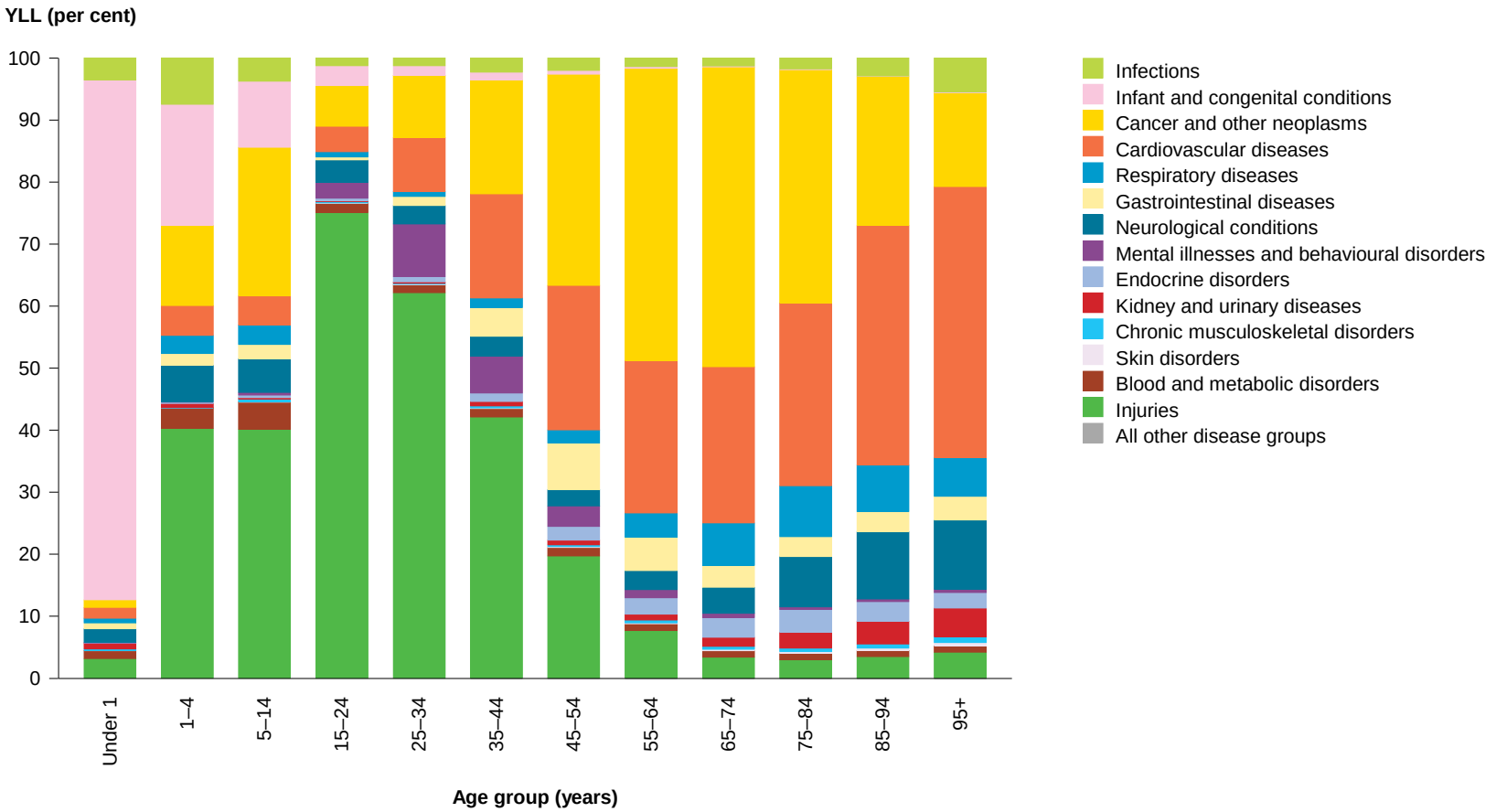


Notes

1. YLL for 2010 are the annual average of 2009–2011.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.
3. Additional table online–Table S4.5.

Source: AIHW National Mortality Database.

Figure 4.3b: Years of life lost (number of YLL) by age and disease group, females, 2010

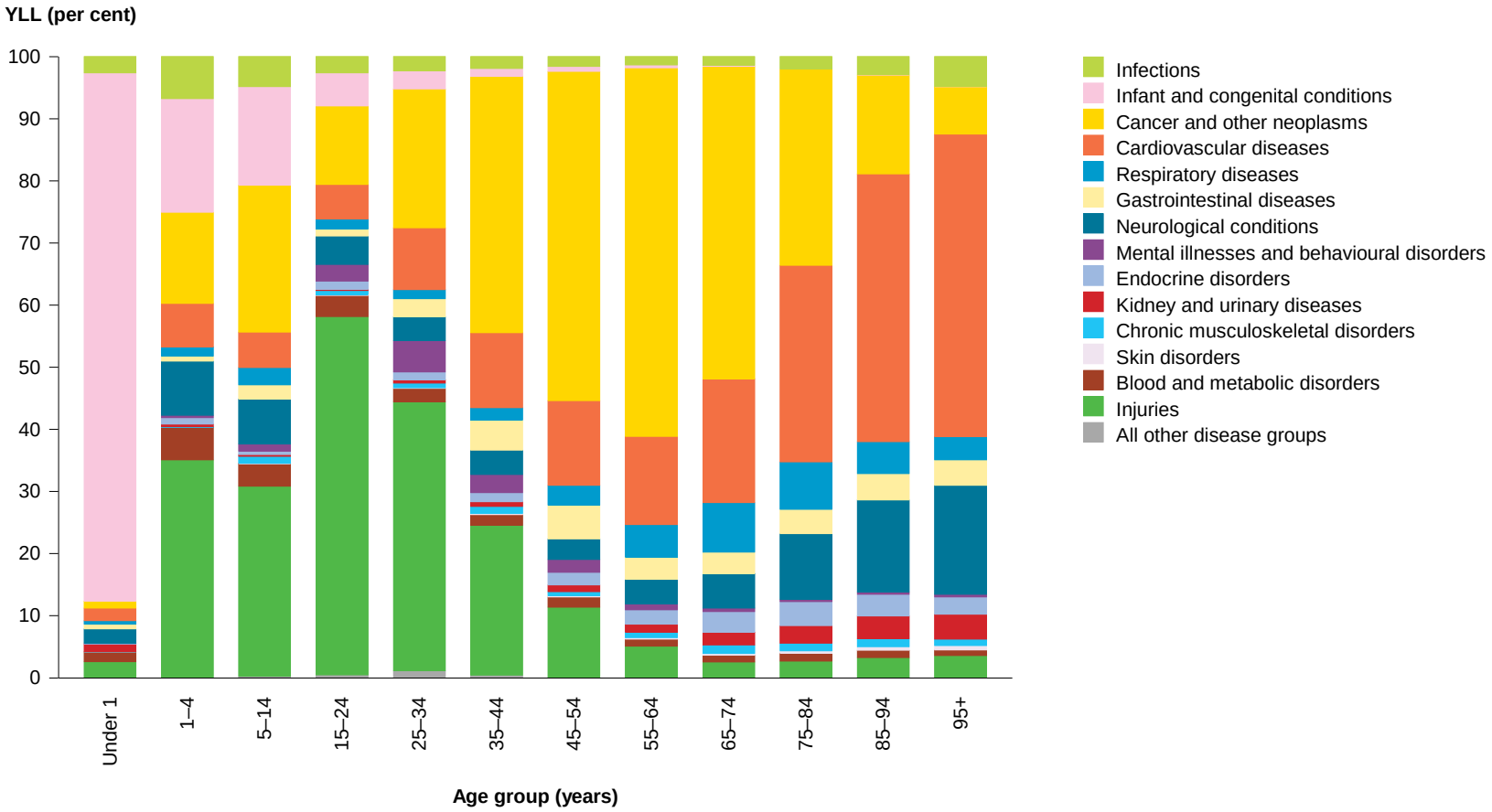


Notes

1. YLL for 2010 are the annual average of 2009–2011.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.
3. Additional table online–Table S4.6.

Source: AIHW National Mortality Database.

Figure 4.4a: Years of life lost (per cent of YLL) by age and disease group, males, 2010



Notes

1. YLL for 2010 are the annual average of 2009–2011.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.
3. Additional table online–Table S4.7.

Source: AIHW National Mortality Database.

Figure 4.4b: Years of life lost (per cent of YLL) by age and disease group, females, 2010

What are the leading causes of fatal burden?

As described previously, the causes of fatal burden vary by age and sex. This section reports the 5 leading causes of fatal burden for each age group for males and females (figures 4.5a and 4.5b, respectively). Different colours are used for each disease group. The ranking of the disease group within each age group is indicated by the position on the vertical axis.

The leading causes of fatal burden were similar among males and females. Chronic diseases, such as Cancer and Cardiovascular diseases, featured as leading causes of fatal burden in almost all age and sex groups. Cancer ranked among the 3 leading causes in all age groups except infants for both males and females. The ranking of Cardiovascular diseases increased with increasing age group. Injuries featured prominently as a leading cause of fatal burden in all age groups under 65 years.

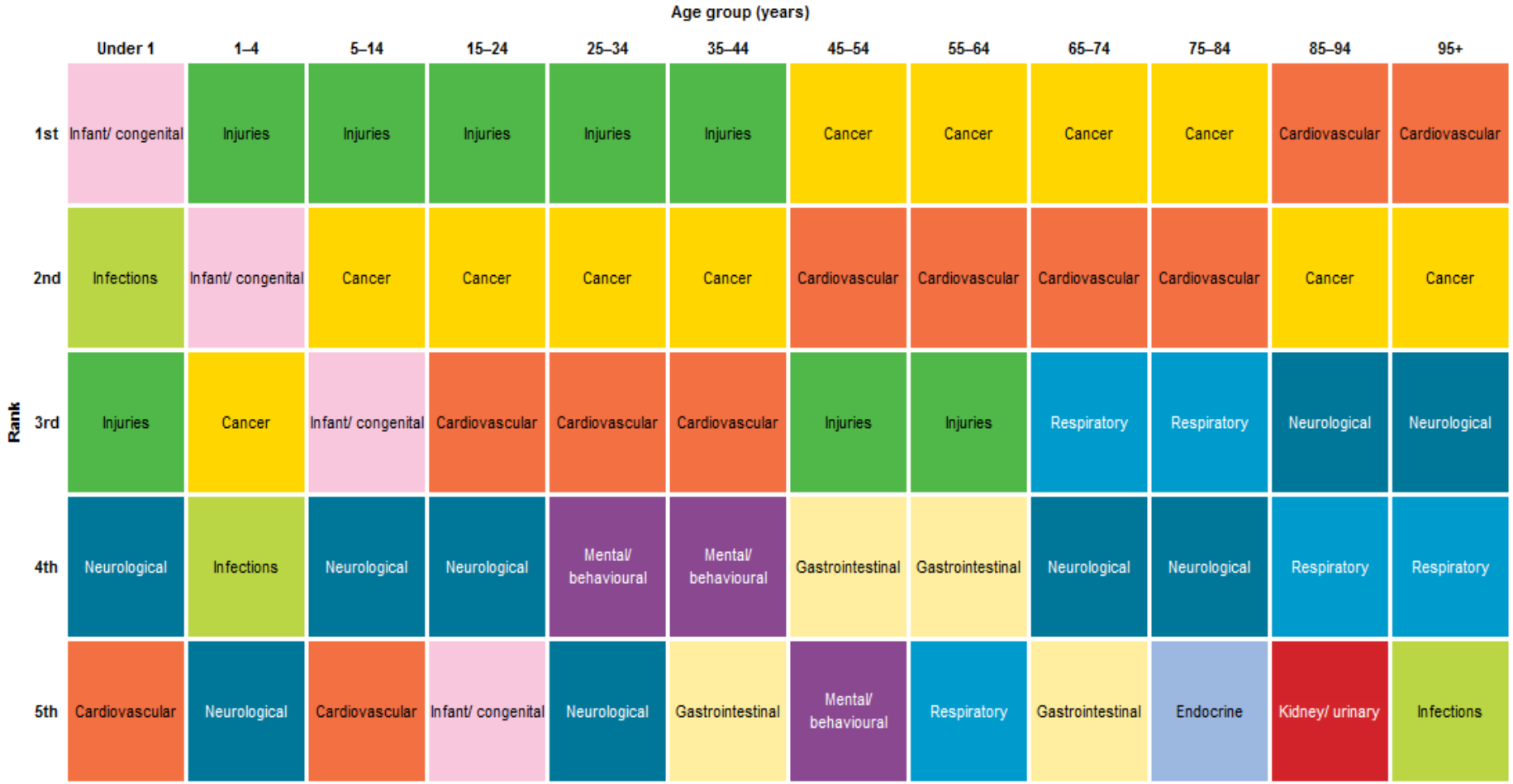
The leading disease groups among infants was quite different from those for other ages, and was attributed primarily to Infant and congenital conditions and Infections—but also featuring Injuries, Neurological conditions and Cardiovascular diseases. Infant and congenital conditions as a leading cause of fatal burden was found only among those aged under 25 years.

The Mental illnesses and behavioural disorders group was found to be a leading cause of fatal burden among males aged 25–54 and females aged 25–34. Respiratory diseases featured as a leading cause only among those aged over 55. The Gastrointestinal diseases group was a leading cause only among males and females aged 35 and over, and more prominently among females.

Neurological conditions ranked in the top 5 causes of fatal burden for males aged under 35 and 65 and over, and across all ages for females. Among older females, the ranking of Neurological conditions as a cause of fatal burden increased with increasing age.

Some of the specific causes influencing the leading disease groups are described below:

- The ranking of YLL by disease groups for infants was largely driven by pre-term birth complications, birth trauma and asphyxia and congenital cardiovascular defects. The leading fatal burden among children (aged 1–15) largely arose from road traffic accidents, drowning, brain and central nervous system cancers, leukaemia, congenital cardiovascular defects and cerebral palsy.
- Among young adults aged 15–24, the leading disease groups of fatal burden arose from road and other transport accidents, suicide, poisoning, drowning, homicide and violence, leukaemia, cerebral palsy and epilepsy.
- During adulthood for ages 25–44, the leading disease groups of fatal burden resulted from deaths due to road traffic accidents, suicide, poisoning, coronary heart disease, stroke, bowel cancer, breast cancer and drug use disorders (excluding alcohol).
- Among older adults aged 45–64, the leading disease groups of fatal burden arose from deaths due to breast, lung and bowel cancers, coronary heart disease, stroke, suicide, chronic obstructive pulmonary disease and chronic liver disease.
- Among adults 65 and over, the causes influencing the leading disease groups were coronary heart disease, lung cancer, stroke and dementia.



Note: YLL for 2010 are the annual average of 2009–2011.

Source: AIHW National Mortality Database.

Figure 4.5a: Leading causes of fatal burden, males, 2010

Note: YLL for 2010 are the annual average of 2009–2011.

Source: AIHW National Mortality Database.

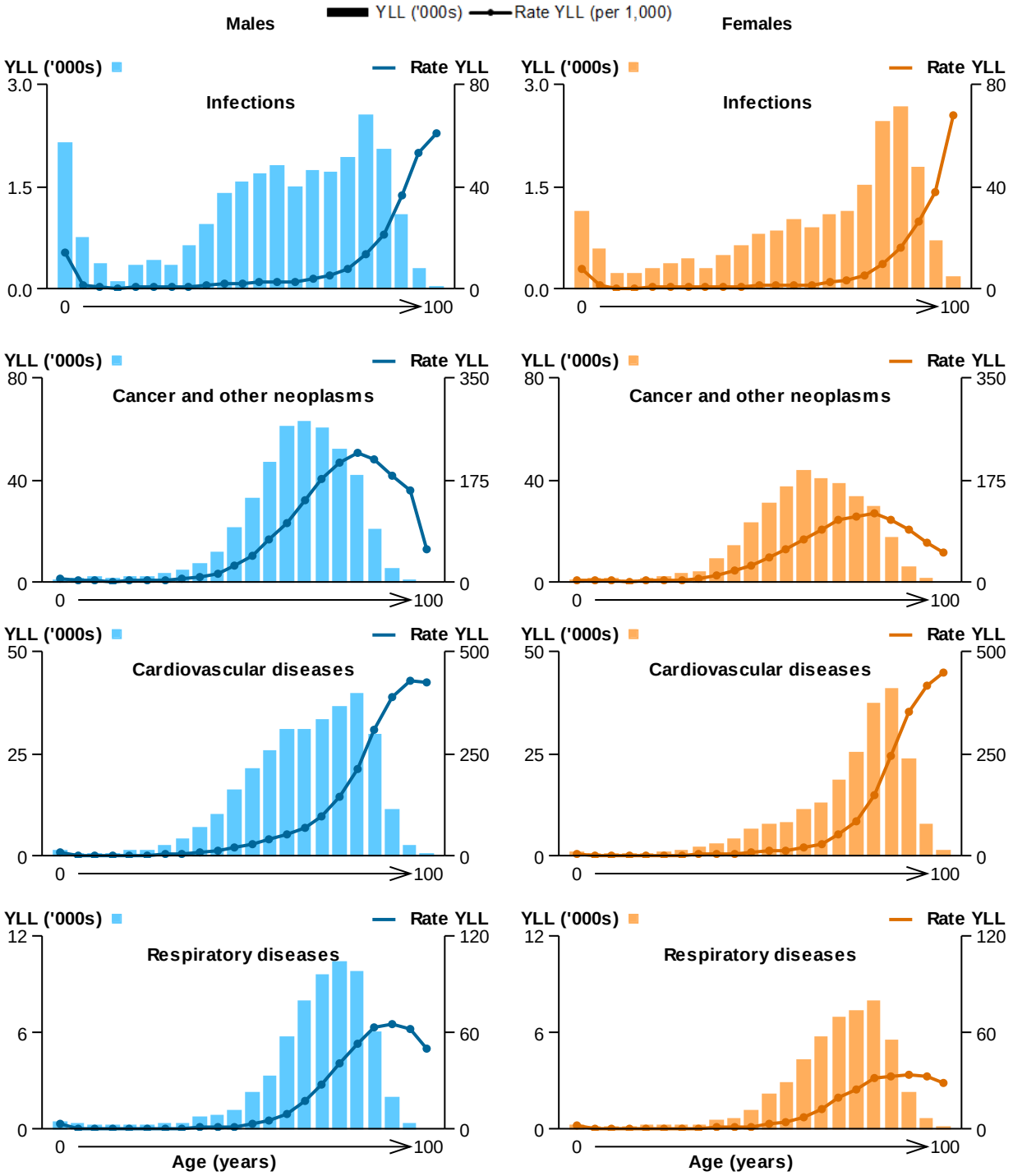
Figure 4.5b: Leading causes of fatal burden, females, 2010

Age patterns in YLL for selected disease groups

This section describes the YLL results for selected disease groups in more detail. For these disease groups, Figure 4.6 provides a visual comparison of the fatal burden (YLL) and age-specific rates (YLL per 1,000) by age and sex. It compares the general shape of the age pattern between disease groups. The results depend upon the number of deaths, the age at death and, for rates, the sex- and age-specific population. (Note that the scales of the number of YLL and the rate of YLL vary between disease groups, but remain the same for males and females for each disease group.)

Some observations from Figure 4.6 include those listed below:

- The rate of YLL generally increased with age. For some disease groups, YLL rates increased consistently with age; for example, Infections, Cardiovascular and Neurological.
- For the disease groups shown here, the YLL rate peaked at older ages (above age 75) while the peak number of YLLs occurred at an earlier age. For example, for Cancer the most YLL occurred among males aged 65–69 and females aged 60–64, while the rates (YLL per population) were highest in the 80–84 age groups for males and females.
- There is a relatively high fatal burden among infants compared with other age groups for some disease groups. This is most noticeable for Blood and metabolic disorders and Infections.
- The highest burden per head of population tends to occur in the oldest age groups (80+ years). For Cancer and Cardiovascular diseases, higher rates are apparent from around age 60+ and for Endocrine and Respiratory disorders, from around age 70+.
- Burden due to Injuries has multiple high points—infancy, ages 20–24 and 95+ for males; and infancy, and ages 80–84 and 95+ for females.
- The Mental illnesses and behavioural disorders group also shows a high point in the burden per population among young to middle adult males.



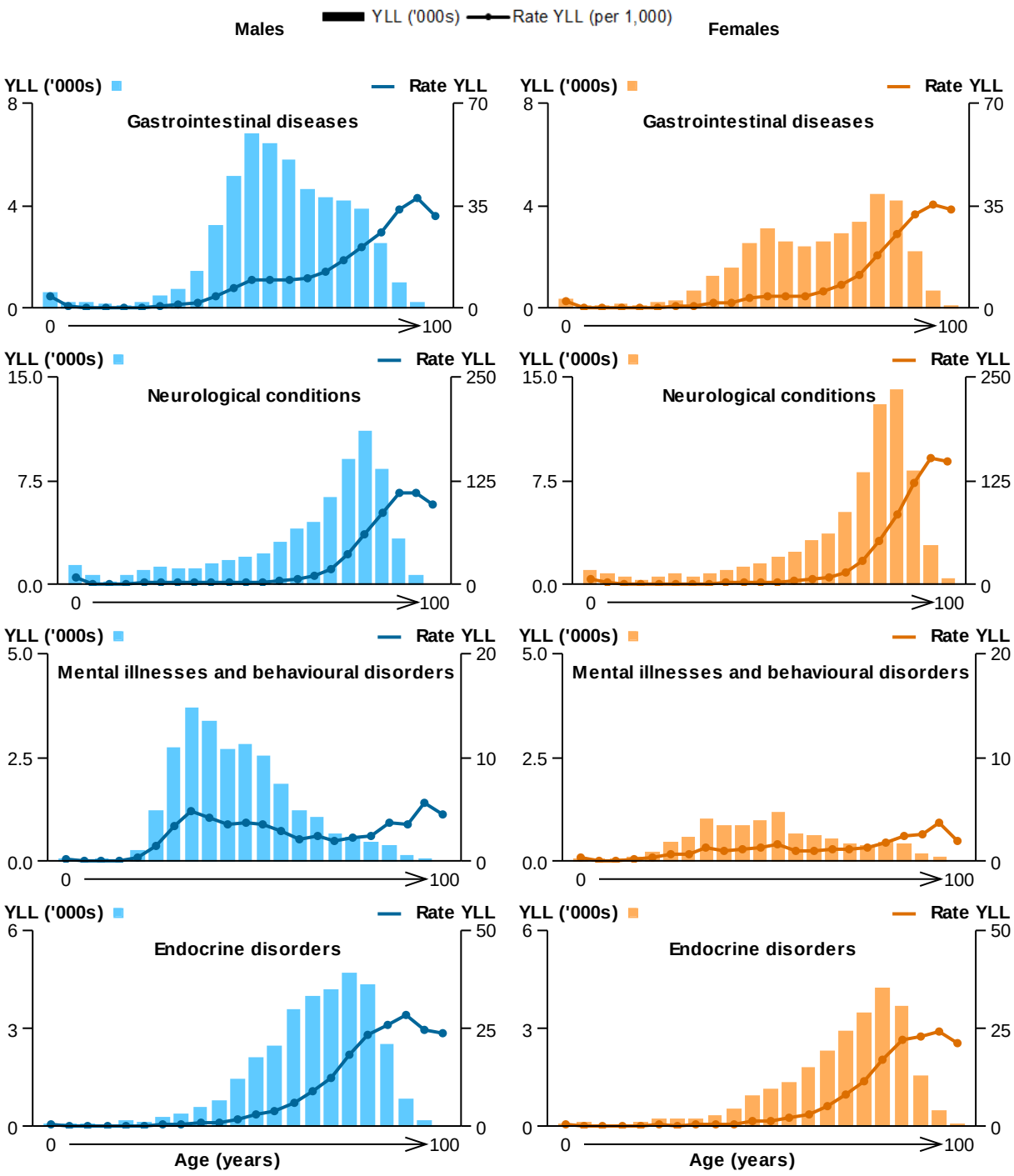
Notes

1. YLL for 2010 are the annual average of 2009–2011; YLL rates are based on 2009–2011 mortality data combined.
2. Additional tables online–Tables S4.8, S4.9, S4.10 and S4.11.

Source: AIHW analysis of the AIHW National Mortality Database.

Figure 4.6: YLL ('000s) and age-specific YLL rates (YLL per 1,000) for selected disease groups, 2010

(continued)



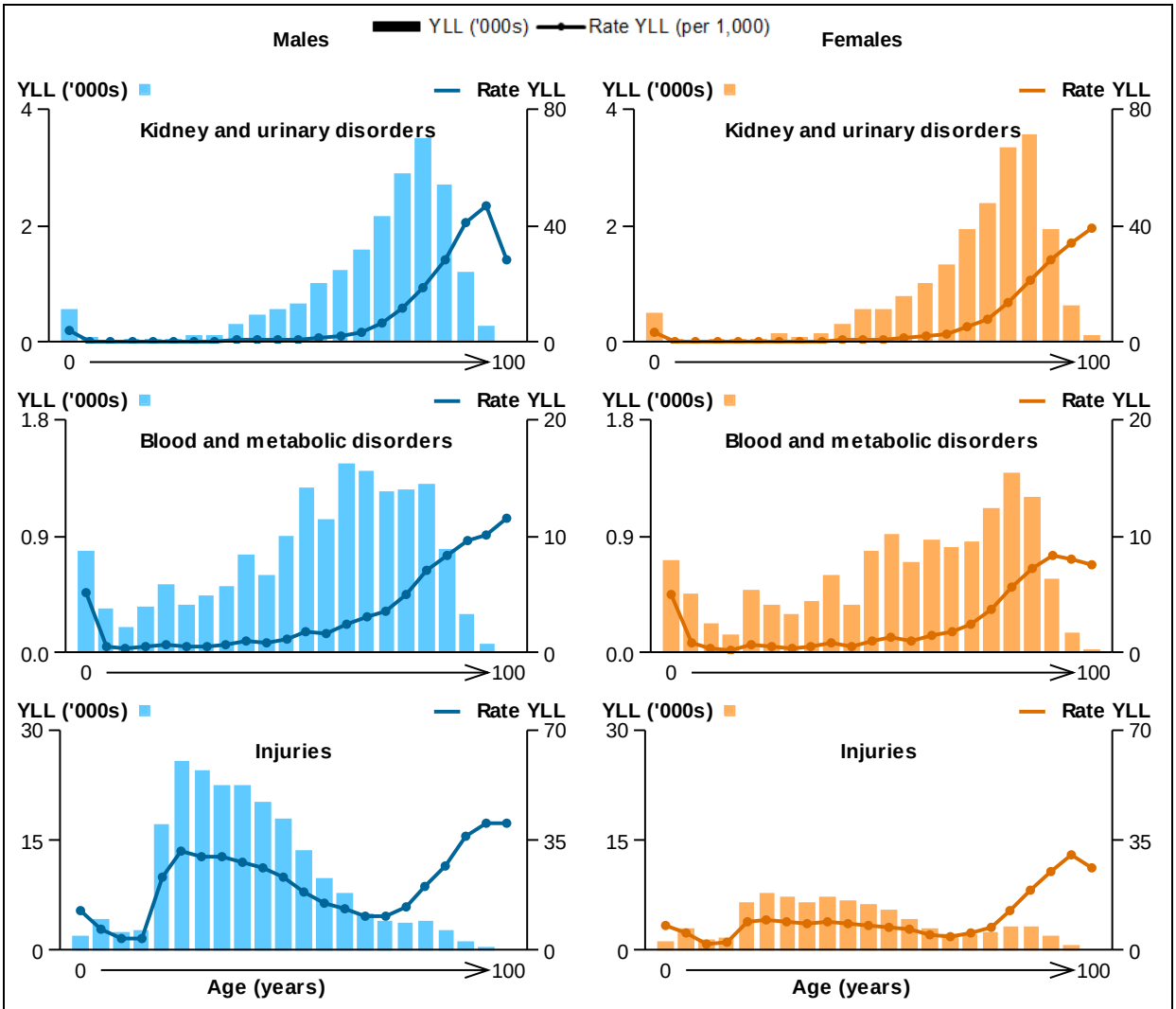
Notes

1. YLL for 2010 are the annual average of 2009–2011; YLL rates are based on 2009–2011 mortality data combined.
2. Additional tables online–Table S4.8, S4.9, S4.10 and S4.11.

Source: AIHW analysis of the AIHW National Mortality Database.

Figure 4.6 (continued): YLL ('000s) and age-specific YLL rates (YLL per 1,000) for selected disease groups, 2010

(continued)



Notes

1. YLL for 2010 are the annual average of 2009–2011; YLL rates are based on 2009–2011 mortality data combined.
2. Additional tables online–Table S4.8, S4.9, S4.10 and S4.11.

Source: AIHW National Mortality Database.

Figure 4.6 (continued): YLL ('000s) and age-specific YLL rates (YLL per 1,000) for selected disease groups, 2010

5 International comparisons of fatal burden

Comparing the health of populations between countries is complex. Comparisons are best made with data based on consistent definitions, with similar collection methods and population coverage. All these aspects must be carefully considered when interpreting the results (AIHW 2012). Thus, comparisons between regions and countries need to be made using internally consistent data and methods.

International comparisons are important and can provide a useful perspective of global burden. For example, they can be used to provide information relevant to health-related questions, particularly where countries share similar health goals and face similar challenges.

Estimates of disease burden—not comparable between studies

As outlined in Box 3.1, estimates from the current study are not comparable with estimates produced by other burden of disease studies. This is illustrated in more detail in Table 5.1 and described further below. Note that there will also be other aspects that differ between the studies, such as the level of data aggregation in the input data.

Table 5.1: Comparison of key YLL method choices in the ABDS, the GBD 2010 and the WHO 2012 burden of disease studies

	ABDS	GBD 2010	WHO 2012
Impacts on total deaths and YLL results			
Data sources	AIHW National Mortality Database	Modelled from various sources	WHO mortality database
Standard life table	GBD 2010	GBD 2010	WHO 2012
YLL calculation	No age weighting or discounting	No age weighting or discounting	No age weighting or discounting
Impacts on disease-specific results			
Cause list and ICD code allocation	Australian specific	GBD specific	WHO specific
Redistribution	Australian specific	GBD specific	WHO specific

Aggregate results

Data sources of Australian deaths differ between the three studies as summarised in Table 5.1. Both the ABDS and WHO 2012 studies source data directly from a database of vital registration data. In contrast, the GBD 2010 models its death data from various data sources.

For some level of consistency of input data between studies, there would need to be similar total numbers of deaths for Australia. The ABDS number of deaths for 2010 is 143,527 (average of 2009–2011 data), the GBD 2010 number is 154,565 deaths and the WHO 2012 number is 146,981. The 8% higher number of deaths in the GBD study compared with the ABDS for a similar reference period suggests that the statistical modelling used to fill gaps for other countries results in overestimation of the number of deaths for Australia.

The WHO 2012 study used deaths data for a later time period for which more deaths are expected to occur due to increasing population over time. This is confirmed by the WHO 2010 number of deaths being 143,473, which is very close to the ABDS estimate for the same reference period. This is not surprising as both the AIHW National Mortality Database and the Australian data on the WHO mortality database come from the same original source—death registrations in Australia.

The *standard life tables* used in the ABDS and the GBD 2010 are the same, and have a life expectancy at birth of 86.0 years. The WHO 2012 study used a different standard life table, with a longer life expectancy—91.9 years at birth (see Chapter 2 for more information).

The final process of *calculating YLL* is equivalent between the three studies: they all applied the simple method of counting YLL based on the number of deaths multiplied by the life expectancy at the age at death. None of the studies applied discounting or age weighting (see Glossary) which had been the practice in earlier studies.

The final outcome from these differences is reflected in the total YLL. The 2010 estimate in the ABDS is 2.25 million YLL, and the Australian estimate from GBD 2010 is 2.28 million. The WHO 2012 estimate (2.75 million YLL) had the largest difference from the ABDS estimate; this is likely due to the longer life expectancy in the WHO standard life table.

Cause-specific results

Table 5.1 indicates that all three studies used different cause lists (and ICD code allocation), and all used different methods for redistributing some causes of death not matching their cause list.

Each study developed its own *cause list* (for which burden of disease estimates were produced) and used different *disease groups* for aggregating the cause-specific estimates. There are also differences in the ICD codes allocated to the various causes. Diabetes is an example of a condition that was placed into different disease groups depending on the study:

- GBD 2010: *Diabetes, urogenital, blood, endocrine*
- WHO 2012: *Diabetes*
  - WHO used another 2 disease groups related to the GBD group above: *Endocrine, blood, immune* and *Genitourinary*
- ABDS: *Endocrine* (which includes diabetes)
  - ABDS has another 3 disease groups related to the GBD group above: *Kidney and urinary*, *Reproductive and maternal* and *Blood and metabolic*.

Differences in ICD code allocation also create potential differences between studies; however, those variations mostly have an impact at the cause rather than the disease group level so have less effect on results in this report. However, there are differences that do have an impact at the disease group level. An example is Kaposi sarcoma, which is included in the Infections disease group (as part of HIV/AIDS) in GBD 2010, but in the Cancer disease group in the ABDS (as not all Kaposi sarcomas are due to HIV/AIDS).

Each study also used its own specific method for *redistributing* selected causes of death. The differences occur in both the ICD codes redistributed and the method used to redistribute them.

An indication of these differences can be seen in the variations in the volume of Australian deaths redistributed: 10% in the ABDS estimates for 2010, 18% in the GBD 2010 and 5–6% in WHO 2012 (WHO 2014b).

The outcome of all these variations between studies can result in different rankings of the disease groups. For example, in the ABDS estimates for 2010, Endocrine disorders (which includes diabetes) is the eighth leading cause of fatal burden. The WHO 2012 study also ranked diabetes as eighth for Australia while the GBD 2010 study ranked the Diabetes, urogenital, blood and endocrine group as third for Australia.

Estimates of disease burden can be compared within the same study

International comparisons can be made between countries when the data and methods used to derive the estimates are comparable. That is, when the data have been compiled systematically, using the same cause list, and the results are made using the same methods and standard life table.

In practice, this means that results are comparable within a study but not between studies. That is, the GBD results cannot be compared with results produced in the current Australian study, nor are they comparable with the WHO 2012 results. However, the GBD estimates for Australia can be compared with the GBD estimates for other countries and regions because the estimates are internally consistent, and use a common cause list and standard life table to produce estimates for all countries. Similarly, the WHO 2012 estimates for Australia can be compared with the WHO estimates for other countries and regions.

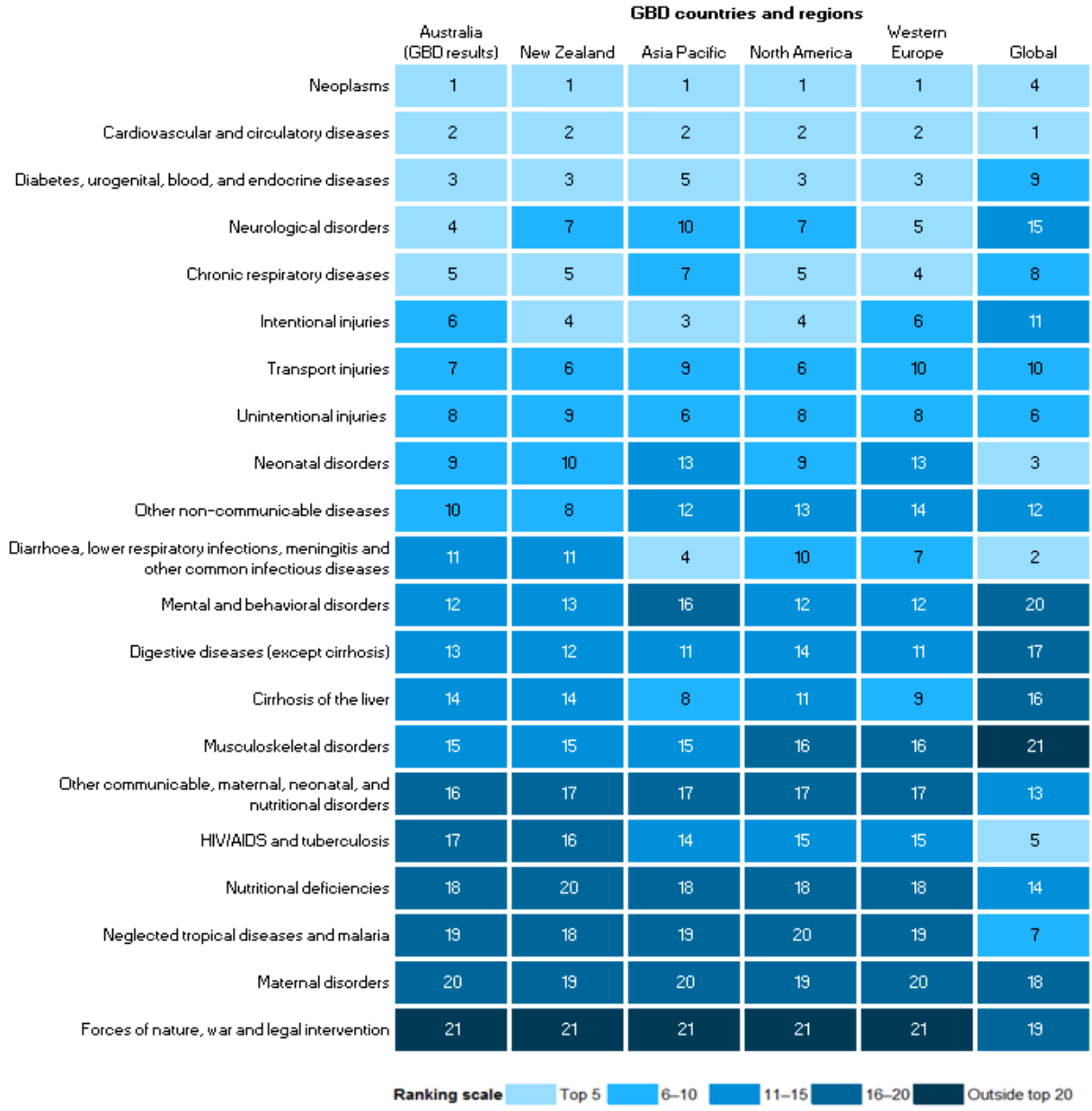
An example of an international comparison of burden of disease is shown in Figure 5.1. Here GBD 2010 results are used to compare the leading causes of fatal burden in Australia with those in selected other countries and regions, as well as globally (IHME 2013). Different shadings are used to represent the level of ranking within the country or region. The lightest shade indicates the leading 5 causes of YLL in the country or region, with successively darker shades use to indicate the next 5 leading causes. The darkest shade indicates that the cause fell outside the top 20. The numbers indicate the rank of that cause of fatal burden in the country or region. The disease group labels used in GBD 2010 differ to those used in the ABDS and the WHO 2012.

According to the GBD 2010 results, Neoplasms and Cardiovascular and circulatory diseases were among the leading causes of fatal burden in all countries and regions. Similarly, Maternal disorders and Forces of nature, war and legal intervention were among the causes of least fatal burden. Chronic respiratory diseases were the fifth leading cause of fatal burden in Australia, New Zealand and North America. Chronic respiratory diseases were ranked seventh in Asia–Pacific, fourth in Western Europe and eighth globally.

It should be noted that ranking of summary measures such as total YLL by cause does not allow for comparison of actual burden. For example, the rank of a cause may be lower in one country than in another; however, due to the number of deaths and the ages at which the deaths occur, it may have higher YLL.

As stated at the start of this chapter, international comparisons are complex, and variations between countries and regions for fatal burden of disease are driven by multiple and complex factors. These factors are often broader than the level of development, and include but are not limited to health spending, life expectancy, geography, the type and amount of

public health interventions and other societal characteristics. The GBD 2010 and WHO 2012 data enable comparisons that show how health challenges differ globally, while also highlighting similarities, such as the prominence of fatal burden due to chronic diseases among these highly developed countries and regions.



Source: AIHW analysis of GBD 2010 (IHME 2013).

Figure 5.1: GBD 2010 ranking of the leading 20 causes of fatal burden (YLL) for Australia and the ranking of these causes in selected other countries and regions

6 Discussion

This report provides national estimates of fatal burden for 2010 at the disease group level, updating detailed Australian estimates last produced for 2003 (Begg et al. 2007). Mortality data for 2009–2011 were analysed, and the annual average over the 3-year period was used to estimate the 2010 fatal burden. In 2009–2011, there was an annual average of 143,527 deaths in Australia. These deaths resulted in 2.25 million YLL. Males experienced a greater proportion of the total fatal burden (59%) than females.

In the current study, Cancer was the leading cause of fatal burden, followed by Cardiovascular diseases. Cardiovascular diseases and Cancer had the highest number of deaths (contributing 32% and 31% of all deaths, respectively) and 23% and 35% of the fatal burden, respectively. The higher burden from Cancer relative to the proportion of deaths was primarily due to people dying (on average) at younger ages from Cancer than from Cardiovascular diseases.

Injuries were the third leading cause of fatal burden. This disease group accounted for the majority of fatal burden in those aged under 45, after which Cancer and Cardiovascular diseases were more prominent. The contribution from Cancer peaked around age 55–74 then declined, and Cardiovascular disease was the major cause of fatal burden among people aged 85 and over.

The current study uses the GBD 2010 methods framework (with some changes to data sources and methods)—undertaken in consultation with the study's Expert Advisory Group and disease-specific expert panels—to provide estimates tailored to suit the Australian context. The GBD 2010 standard life table was used to quantify the remaining life expectancy at any age and, like the GBD 2010, discounting and age weighting were not applied. Notable differences between the two studies are that the Australian death registration data were used directly in this current study (rather than modelling the number of deaths), and Australian-specific methods were used to redistribute deaths not matching the study's cause list.

A recent assessment by the IHME (Phillips et al. 2014) described its development of an index for assessing the quality (at country level) of mortality and cause of death data. The index comprises measures of:

- completeness, which is assessed against expected numbers of deaths for a country's age and population structure
- quality of cause of death information, such as the level of detail of ICD codes used and the proportion of deaths coded to a redistribution cause
- the quality of age and sex data
- the timeliness and availability of cause of death data.

In their assessment, Australia ranked eighth best out of approximately 190 countries assessed. The WHO has also produced a usability score for deaths data, in which Australia's score was 95%, the fourth highest score (WHO 2014b).

Methodological developments

In this ABDS, new analytical approaches and methods have been developed and applied. These include a new cause list as well as enhanced redistribution methods that incorporate detailed information available for Australia. Methods for redistribution had been further developed in the GBD 2010 study compared with earlier studies. The AIHW further refined these methods for the Australian context, investigating four potential approaches: direct evidence, direct MCOD analysis, indirect MCOD analysis, and proportionate allocation (see Appendix B). Three of these methods were used in this report. The direct MCOD analysis approach did not provide useful information and so was not used.

The direct evidence redistribution method was used for three groups of redistribution causes in this report as follows:

- ill-defined digestive cancers—based on (unpublished) information sourced from deaths coded independently by cancer registries
- cancers with unspecified site—also based on (unpublished) information sourced from deaths coded independently by cancer registries
- unspecified digestive diseases—based on the algorithm used to produce the 2003 Australian burden of disease estimates.

This enabled more specific coding of cause of death than information from death certificates alone. Future iterations of burden of disease analysis may employ redistribution by direct evidence for more conditions where evidence becomes available.

The indirect MCOD redistribution method is based on empirical evidence using MCOD data. This method was applied for septicaemia, pneumonitis, hypertension, heart failure and renal failure redistribution codes.

The proportional allocation redistribution method was used for redistribution groups with a low number of deaths. This method simply reallocates the deaths to a defined set of target disease groups in proportion to the total number of deaths observed across those target causes in the death registration data.

Further application of these redistribution approaches will be reviewed by disease experts before the 2011 estimates of fatal burden are published in the full report for the current study.

Limitations

Consistent with previous burden of disease studies, the ABDS used the UCOD to classify each death to a cause in the cause list. Use of the UCOD alone (that is, without the associated causes) assigns the entire fatal burden to one cause, and thus cannot account for the more complex situation where more than one disease contributed to the death. For example, chronic kidney diseases and diabetes have causal pathways that are complex and interwoven with many other diseases, and are often listed as associated causes of death rather than as a UCOD. This may mean that the total fatal burden of these diseases cannot be fully ascertained from burden of disease estimates alone. Future development work may assess the use of associated causes of death or other information to account for this more complex situation. Another potential approach is to use 'diseases-as-risks' in the risk factor

component of the analysis, an approach used in the most recent New Zealand burden of disease study (New Zealand Ministry of Health 2012).

The disease group results presented here rely on the accurate recording of the cause of death on the death certificate. Australia follows the rules and processes established by the WHO for recording cause of death on death certificates. However, the accuracy of each of these records relies on the certifying doctor's (or coroner's) assessment and recording of the cause of death. It is not straightforward to correct for any such inaccuracies. Even if data were available on the level and nature of any misclassification, they would need to cover all diseases and injuries to be able to be incorporated into burden of disease analysis.

Future work

The analysis presented in this report highlights the variation of fatal burden by disease group, age and sex. The AIHW is undertaking additional work to:

- refine the cause list and assess disease groupings, with additional input from disease experts
- further refine the redistribution methods, with input from experts.

Alterations to the cause list may potentially change the number of deaths and patterns of YLL estimates, particularly at the cause level, but also potentially at the disease group level. As a result, this report presents YLL estimates by disease group rather than cause. The full report produced from the ABDS, expected to be released in the first half of 2016, will extend this report and present estimates for fatal and non-fatal burden at the cause level, as well as their attribution to various risk factors. Further, reporting of sub-national estimates (that is, by state, remoteness area and socioeconomic status), where valid, will be included in the full report produced for the project.

Appendix A: Additional tables

Table A1: Disease group and ICD-10 codes used for this report

Disease group	ICD-10 codes
Infections	A00–A39, A42–A46, A481, A482, A484, A488, A49–A99, B00–B17, B19–B92, B940, B941, B948, B949, B95–B97, B99, D849, G00–G07, G09, H65–H66, H70, J00–J22, J85, J86, N290, N330, N740, N741, N742, N743, N744, O98, P23, P350, P353, P370, P373, P374
Infant and congenital conditions	G80, P00–P22, P24–P29, P351, P352, P358, P359, P36, P371, P372, P375, P378, P379, P38–P96, Q00–Q07, Q20–Q28, Q35–Q37, Q380, Q382, Q383, Q384, Q385, Q386, Q387, Q388, Q39–Q60, Q62–Q64, Q75–Q81, Q85–Q87, Q890, Q891, Q892, Q893, Q894, Q897, Q898, Q90–Q98, Q990, Q991, Q992, Q998, R95
Cancer and other neoplasms	C00–C25, C30–C75, C77–C79, C81–C85, C88–C96, D00–D24, D26–D48
Cardiovascular diseases	G45, I00–I09, I11, I20–I45, I47–I48, I491–I499, I51–I52, I60–I69, I700–I702, I708, I71–I84, I86–I99
Respiratory diseases	D860, D862, D869, J30–J68, J70–J84, J90–J95, J98–J99
Gastrointestinal diseases	B18, I85, K20–K63, K67–K70, K710, K711, K713, K714, K715, K716, K717, K718, K719, K72–K91, K928, K93
Neurological conditions	F00–F03, G08, G10–G13, G20–G44, G46–G73, G90–G99
Mental illnesses and behavioural disorders	F04–F33, F340, F341, F40–F98, X41–X42, X45
Endocrine disorders	E03–E07, E100, E101, E103–E109, E110–E111, E113–E119, E120–E121, E123–E129, E130–E131, E133–E139, E140–E141, E143–E149, E15–E27, E280, E281, E283, E288, E289, E29–E35, E89, O240, O241, O242, O243
Kidney and urinary diseases	E102, E112, E122, E132, E142, I12, N00–N16, N18, N20–N28, N291, N298, N30–N32, N338, N34–N42, Q61
Reproductive and maternal conditions	D25, E282, N43–N50, N62–N64, N75–N83, N91–N99, O00–O23, O244, O249, O25–O92, O95–O97, O99
Chronic musculoskeletal disorders	M00–M99
Sense organ disorders	H25–H27, H30–H35, H40, H43–H47, H48–H54, H60–H61, H68–H69, H71–H74, H80–H83, H90, H91, H92–H93
Skin disorders	L00–L05, L08, L10–L14, L20–L30, L40, L41–L45, L50–L60, L62–L68, L70–L75, L80–L95, L97–L99
Oral disorders	K00–K14
Blood and metabolic disorders	D50–D64, D66–D83, D840, D841, D848, D861, D863, D868, D89, E00–E02, E40–E67, E70–E84, E850–E852, E88, E90
Injuries	V01–V99, W00–W99, X00–X40, X43, X44, X46–X58, X60–X99, Y00–Y09, Y35–Y86, Y870, Y871, Y88, Y890, Y891

Notes

1. The ICD-10 codes used for allocating deaths to a disease group are presented here in ranges of ICD-10 codes. These code ranges may include a ICD-10 code that is not used for coding the UCOD (that is, an asterisk code). All analyses in this report are based on the UCOD only and therefore there will be no YLL reflecting causes with an asterisk code.
2. The disease group Cancer and other neoplasms includes some malignant, in situ and benign neoplasms. For some cancers, such as breast and bowel cancer, this group covers malignant neoplasms only.
3. The disease group Reproductive and maternal conditions includes causes of ill health that affect males and females. Consequently, some burden for this disease group will be apparent for males. However, due to the nature of maternal conditions, burden will be noticeably larger for females than for males.
4. The disease group Injuries uses the external cause of death to identify deaths that implicitly involve injury.

Table A2: Number of deaths by disease group and sex: 2010 and annual average for 2009–2011

	2010			Average of 2009-2011				
Disease group	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**	**Absolute difference (persons)**	**Percentage difference (persons)**
Infections	1,504	1,696	3,200	1,470	1,652	3,122	-78	-2.4
Infant and congenital conditions	739	551	1,290	724	565	1,288	-2	-0.1
Cancer and other neoplasms	22,142	16,646	38,788	22,015	16,637	38,651	-137	-0.4
Cardiovascular diseases	19,816	21,144	40,960	20,146	21,256	41,402	442	1.1
Respiratory diseases	4,362	3,760	8,122	4,393	3,739	8,133	11	0.1
Gastrointestinal diseases	2,328	2,259	4,587	2,358	2,274	4,632	45	1.0
Neurological conditions	4,685	7,461	12,146	4,828	7,489	12,317	171	1.4
Mental illnesses and behavioural disorders	703	412	1,115	738	399	1,136	21	1.9
Endocrine disorders	1,965	2,002	3,967	2,045	2,051	4,097	130	3.3
Kidney and urinary diseases	1,287	1,583	2,870	1,371	1,600	2,971	101	3.5
Chronic musculoskeletal disorders	378	791	1,169	358	783	1,141	-28	-2.4
Skin disorders	149	247	396	156	251	407	11	2.8
Blood and metabolic disorders	748	739	1,487	744	779	1,522	35	2.4
Injuries	5,079	2,527	7,606	5,116	2,545	7,661	55	0.7
All other disease groups	7,094	7,854	14,948	7,148	7,835	14,984	36	0.2
Redistribution	18	35	53	22	40	61	8	15.7
All disease groups	**72,997**	**69,707**	**142,704**	**73,632**	**69,895**	**143,525**	**0.6**	**0.6**

Notes

1. Deaths are based on CODURFs to 2012 and include deaths occurring between 2009 and 2011 that have been registered in or before 2012.
2. Numbers of deaths and YLL for 2010 are the annual average of 2009–2011.
3. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.

Source: AIHW National Mortality Database.

Table A3: ICD-10 codes used to identify deaths for redistribution

	ICD-10 codes
Redistribution	A40, A41, A480, A483, B942, C26, C76, C80, C97, D65, E68, E853–E859, E86–E87, F348, F349, F38–F39, F99, G81–G83, H00–H05, H06–H22, H28, H36, H42, H55–H59, H62, H67, H75, H94–H95, I10, I13–I15, I46, I490, I50, I709, J30, J69, J96, K65–K66, K712, K920, K921, K922, K929, N17, N19, N51, N60–N61, N70–N73, N748, N84–N90, O94, Q10–Q18, Q30–Q34, Q381, Q65–Q74, Q82–Q84, Q899, Q999, R00–R94, R96–R99, X59, Y10–Y34, Y872, Y899, Y90–Y98

Note: Injury-related redistribution causes are identified on the basis of the external cause of injury.

Table A4: GBD 2010 abridged standard life table

Age (years)	Life expectancy (years)
0	86.02
1	85.21
5	81.25
10	76.27
15	71.29
20	66.32
25	61.40
30	54.46
35	51.53
40	46.64
45	41.80
50	37.05
55	32.38
60	27.81
65	23.29
70	18.93
75	14.80
80	10.99
85	7.64
90	5.05
95	3.31
100	2.23
105	1.63

Source: Murray et al. 2012.

Appendix B: Methods used for redistribution of deaths

How are deaths redistributed?

The AIHW undertook a series of analyses investigating four methods for redistribution:

- **Direct evidence**—this approach uses direct evidence about the particular deaths identified for redistribution (that is, those with a particular UCOD) from data linkage studies or sources other than the National Mortality Database.
- **Direct MCOD method**—this method uses the tabulation of associated causes of death for death records where the redistribution code is the underlying cause. As the associated causes of death for redistribution causes are often also redistribution codes, this is likely to limit the usefulness of this method.
- **Indirect MCOD method**—this method uses the tabulation of the UCOD where the redistribution code is reported as an associated cause of death. The corresponding UCODs and their proportional distribution provide the redistribution algorithm.
- **Proportional redistribution**—this method reassigns deaths across a specified range of target causes according to the existing distribution of causes in the selected disease groups. This has the advantage of being a conceptually simple approach; however, it is a relatively blunt method as the distribution of existing causes may not necessarily reflect more probable underlying causes of death for the particular situation. Because of this, it was considered to be appropriate only for selected cases, such as low-volume redistribution causes.

As a general guide, where direct evidence was available and expert advice had been sought, the algorithm from the direct evidence was applied. Failing this, where the redistribution cause was a frequently occurring cause of death, the indirect MCOD method was applied. Where the indirect MCOD did not suit the redistribution purposes or where the redistribution cause was infrequent, a proportionate allocation was carried out using the GBD algorithms to guide the target cause categories. The direct MCOD method was not used for any redistribution in this report.

Identifying potential direct evidence for redistribution causes is being assisted by the expert panels for the disease groups. Similarly, further application of the indirect MCOD and other redistribution approaches will be reviewed by disease experts before the full reports from this study are published.

As described in Chapter 2, refining the cause list may change the number of deaths and patterns of YLL by disease group and cause. A similar effect can arise from changing the set of causes of death marked for redistribution and the range of causes selected as target causes. Changes would be more noticeable at finer levels of disaggregation, such as at the specific cause level rather than at the disease group level.

The redistribution causes and the methods applied for this report are described in Table B1.

Table B1: Summary of redistribution methods by cause

Redistribution methods and cause groups	Target disease groups and causes
Proportional allocation	
All cardiac conduction disorders, disorders of electrolyte and fluid imbalance, all encephalopathy and cerebral oedema, all hydrocephalus, cardiogenic shock and other shock, cardiac arrest, respiratory failure, different paralytic and palsy syndromes, fever, malaise, febrile convulsion, unknown origin, gastrointestinal signs and symptoms, other ill-defined causes, peritonitis, senility, sequelae of different diseases and injury, unspecified liver disease	All
Events of undetermined intent, exposure to unspecified factor	Injuries
Amyloidosis, cachexia, respiratory signs and symptoms	Non-communicable and communicable disease groups
Atherosclerosis, cardiac signs and symptoms, unspecified congenital malformations, unspecified chromosomal abnormality	Non-communicable disease groups excluding Cancer
Ill-defined cancers	Cancer
Direct evidence	
Disease of digestive system unspecified	Digestive diseases—selected causes only
Ill-defined digestive cancers	Cancer—selected digestive cancers
Unspecified site cancer	Cancer
Indirect MCOD methods	
Septicaemia, pneumonitis	All
Hypertension, heart failure	All excluding Injuries
Renal failure	2-step method: Unspecified renal failure to acute and chronic renal failure and then acute renal failure over all disease groups excluding Injuries

Redistribution results

In this report, the 2009–2011 deaths data were combined to produce deaths and YLL estimates. Results for 2010 are reported as annual average number of deaths, or YLL for 2009–2011. This can reduce year-to-year fluctuations and provide greater stability for YLL estimates. Redistribution was undertaken for deaths that occurred in 2009–2011 and the results shown here reflect the annual average, referred to as the 2010 reference period.

Deaths identified for redistribution were classified to one of the redistribution cause groups shown in Table B1. The classification of causes to these groups followed as closely as possible the GBD 2010 classification of redistribution codes.

In 2010, a total of 14,984 deaths were identified for redistribution (Table B2). That is, they were coded with a cause that could not be ascribed to a burden of disease cause for one of the reasons outlined in Chapter 2. These deaths represented 10% of all deaths used in the mortality analysis (10% of all male and 11% of all female deaths).

Deaths identified for redistribution equated to 196,290 YLL in 2010 or 9% of total YLL (8% of all male and 9% of all female YLL). Of these deaths, more were among males (52%) than among females (48%) but fewer YLL were associated with redistributed male deaths (44%) compared with redistributed female deaths (56%).

Table B2: Number of deaths and YLL from deaths identified for redistribution, 2010

	Deaths			YLL		
Age group (years)	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
0–14	76	44	120	6,446	3,723	10,169
15–24	44	21	65	2,906	1,388	4,295
25–44	242	136	378	12,210	6,792	19,002
45–64	979	561	1,539	30,446	17,485	47,931
65–84	3,296	2,659	5,955	44,966	34,547	79,512
85–94	2,187	3,401	5,587	12,655	18,945	31,600
95 and over	325	1,014	1,339	951	2,830	3,781
All ages	**7,148**	**7,835**	**14,984**	**110,580**	**85,709**	**196,290**

Note: Number of deaths and YLL for 2010 are the annual average of 2009–2011. Totals may not add due to rounding.

Source: AIHW analysis of the AIHW National Mortality Database.

Impact of redistribution

This section describes the changes in the number of deaths and YLL at the disease group level pre- and post-redistribution (tables B3 and B4 and figures B1 and B2). The biggest proportional change in the number of deaths from redistribution was for Kidney and urinary diseases, which increased by 23% for males and 28% for females. Large proportional increases in the number of deaths post-redistribution were also seen for Skin disorders (21% for males and 25% for females), Injuries (12% and 23%), Gastrointestinal diseases (16% and 23%) and Cancer (14% and 16%). The largest proportional increases in YLL also occurred for these disease groups.

In absolute terms, the highest number of redistributed deaths were for cancer causes (3,101 male and 2,638 female deaths) largely due to the high frequency of ill-defined and unspecified site cancers being selected as the UCOD.

Figures B1 and B2 provide a visual representation of these differences (for number of deaths and YLLs) for each disease group pre- and post-redistribution.

Table B3: Number of deaths pre- and post-redistribution by disease group and sex, 2010

	Males				Females			
Disease group	**Pre-**	**Post-**	**Absolute change**	**Per cent change**	**Pre-**	**Post-**	**Absolute change**	**Per cent change**
Infections	1,470	1,583	113	7.7	1,652	1,795	143	8.7
Infant and congenital conditions	724	778	55	7.5	565	599	35	6.2
Cancer and other neoplasms	22,015	25,116	3,101	14.1	16,637	19,275	2,638	15.9
Cardiovascular diseases	20,146	21,764	1,618	8.0	21,256	23,533	2,277	10.7
Respiratory diseases	4,393	4,674	281	6.4	3,739	4,007	268	7.2
Gastrointestinal diseases	2,358	2,745	387	16.4	2,274	2,794	520	22.8
Neurological conditions	4,828	5,155	327	6.8	7,489	7,960	471	6.3
Mental illnesses and behavioural disorders	738	776	38	5.2	399	422	24	5.9
Endocrine disorders	2,045	2,201	156	7.6	2,051	2,255	203	9.9
Kidney and urinary diseases	1,371	1,692	321	23.4	1,600	2,052	452	28.2
Chronic musculoskeletal disorders	358	400	42	11.7	783	862	79	10.1
Skin disorders	156	189	33	21.2	251	313	62	24.7
Blood and metabolic disorders	744	794	50	6.8	779	847	69	8.8
Injuries	5,116	5,743	627	12.3	2,545	3,140	595	23.4
All other disease groups	22	22	0	0.0	40	40	0	0.0
Redistribution	7,148		–7,148	–100.0	7,835		–7,835	–100.0
All diseases	**73,633**	**73,633**	**0**	**0**	**69,894**	**69,894**	**0**	**0**

Notes

1. Numbers of deaths for 2010 are the annual average of 2009–2011. The numbers may not add to total for all diseases due to rounding.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders.

Source: AIHW National Mortality Database.

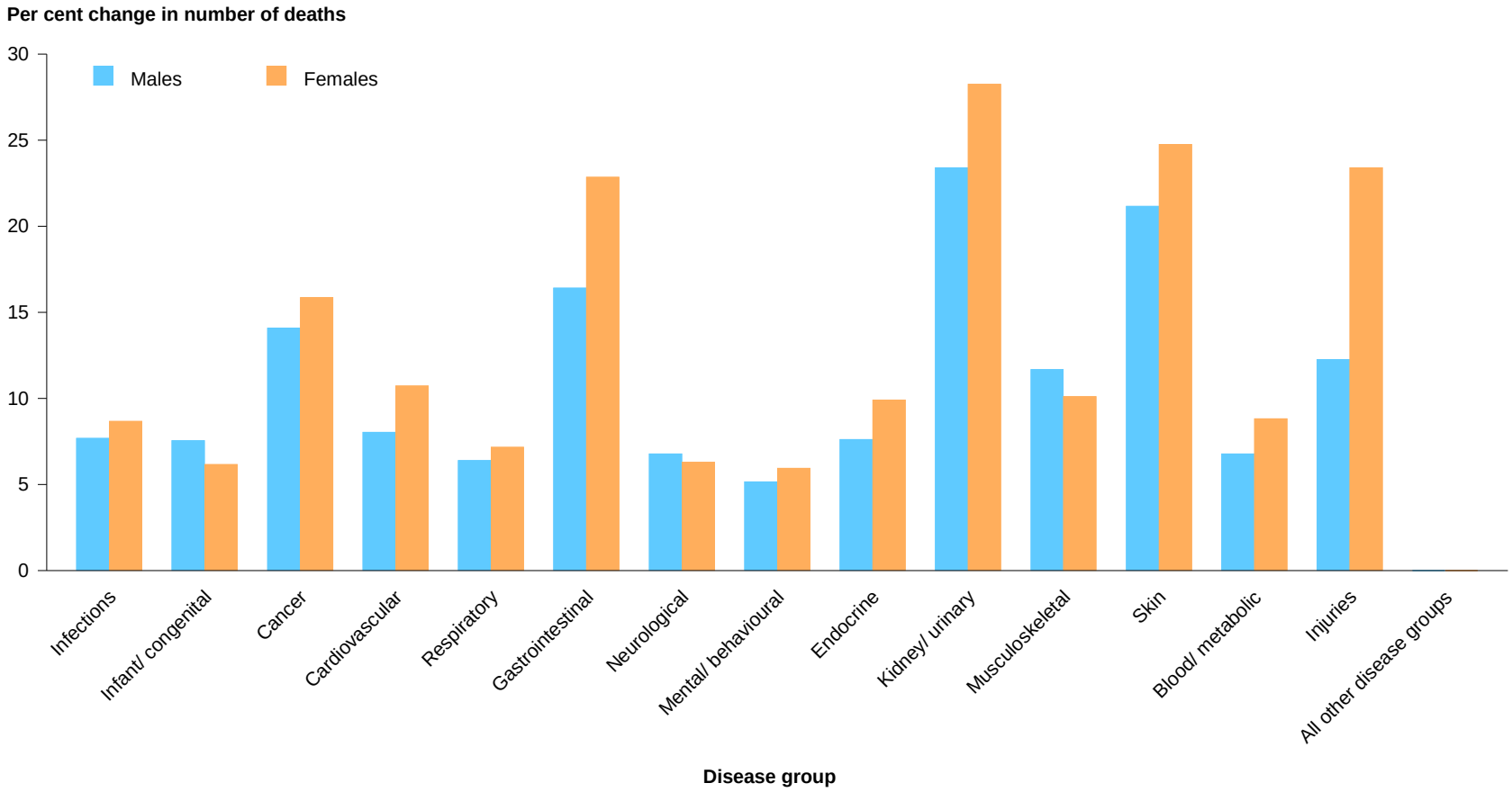
Table B4: YLL pre- and post- redistribution by disease group and sex, 2010

	Males				Females			
Disease group	**Pre-**	**Post-**	**Absolute change**	**Per cent change**	**Pre-**	**Post-**	**Absolute change**	**Per cent change**
Infections	23,669	25,285	1,616	6.8	18,242	19,611	1,370	7.5
Infant and congenital conditions	55,408	59,491	4,083	7.4	41,826	44,189	2,362	5.6
Cancer and other neoplasms	388,774	439,041	50,268	12.9	302,052	339,294	37,241	12.3
Cardiovascular diseases	287,274	304,888	17,614	6.1	197,133	213,698	16,565	8.4
Respiratory diseases	58,740	61,951	3,211	5.5	46,619	49,185	2,567	5.5
Gastrointestinal diseases	46,811	51,810	4,999	10.7	30,549	35,169	4,621	15.1
Neurological conditions	60,438	64,088	3,650	6.0	67,079	70,822	3,743	5.6
Mental illnesses and behavioural disorders	24,627	25,511	884	3.6	9,441	9,809	369	3.9
Endocrine disorders	30,530	32,488	1,958	6.4	23,511	25,373	1,862	7.9
Kidney and urinary diseases	16,073	19,276	3,202	19.9	15,675	19,239	3,565	22.7
Chronic musculoskeletal disorders	5,253	5,754	500	9.5	9,107	9,863	756	8.3
Skin disorders	1,954	2,310	355	18.2	2,379	2,869	490	20.6
Blood and metabolic disorders	14,901	15,776	875	5.9	12,441	13,265	825	6.6
Injuries	193,480	210,845	17,365	9.0	71,786	81,161	9,374	13.1
All other disease groups	296	296	0	0.0	957	957	0	0.0
Redistribution	110,580		–110,580	–100.0	85,709		–85,709	–100.0
All diseases	**1,318,810**	**1,318,810**	**0**	**0.0**	**934,506**	**934,506**	**0**	**0.0**

Notes

1. Numbers of deaths for 2010 are the annual average of 2009–2011.The numbers may not add to total for all diseases due to rounding.
2. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders. Deaths were not redistributed to any of these disease groups.

Source: AIHW National Mortality Database.

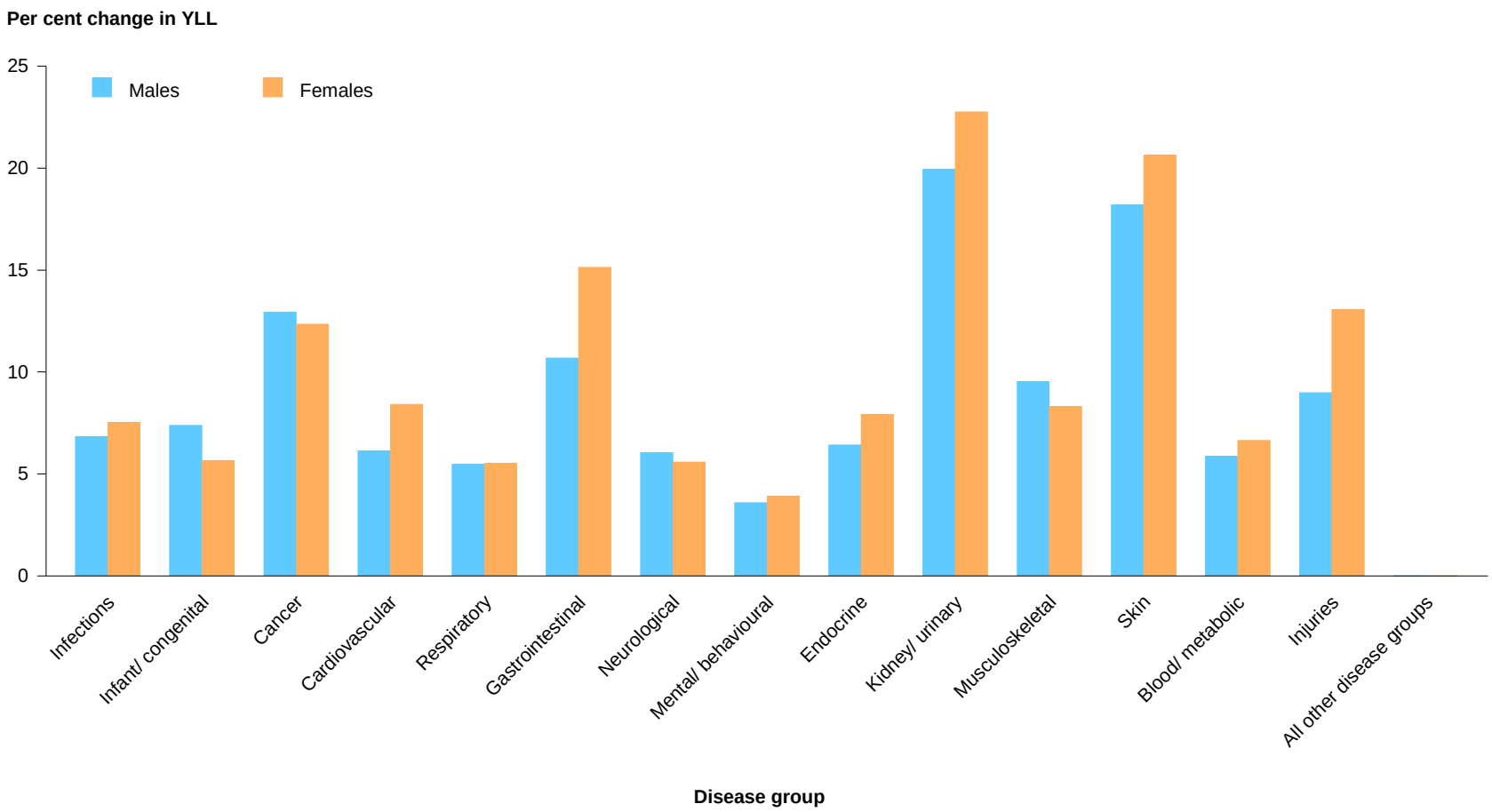


Notes

1. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders. Deaths were not redistributed to any of these disease groups.
2. Numbers of deaths for 2010 are the annual average of 2009–2011.

Source: AIHW National Mortality Database.

Figure B1: Per cent change in number of deaths by disease group and sex, pre- and post-redistribution, 2010



Notes

1. 'All other disease groups' comprise Reproductive and maternal conditions, Sense organ disorders and Oral disorders. Deaths were not redistributed to any of these disease groups.

2. Number of YLL for 2010 are the annual average of 2009–2011.

Source: AIHW National Mortality Database.

Figure B2: Per cent change in number of YLL by disease group and sex, pre- and post-redistribution, 2010

Appendix C: Statistical methods and technical notes

Age-specific rates

Age-specific rates provide information on the incidence of a particular event in an age group relative to the total number of people at risk of that event in the same age group. It is calculated by dividing the number of events occurring in each specified age group by the corresponding 'at-risk' population in the same age group and then multiplying the result by a constant (for example, 1,000) to derive the rate. Age-specific rates are often expressed per 1,000 or 100,000 population.

Age-standardised rates

A crude rate provides information on the number of events; for example, deaths or YLL from a condition (or all conditions) divided by the population at risk in a specified period. No age adjustments are made when calculating a crude rate. The pattern of some conditions or injuries is strongly related to age. Hence, overall (that is, not age-specific) crude rates are not suitable for looking at trends or making comparisons across groups in mortality or fatal burden due to differences in the age structure of populations over time and across population groups.

More meaningful comparisons can be made by using age-standardised rates, with such rates adjusted for age in order to facilitate comparisons between populations that have different age structures; for example, between Indigenous people and other Australians. This standardisation process effectively removes the influence of age structure on the summary rate.

Calculating age-standardised rates

There are two methods commonly used to adjust for age: direct and indirect standardisation. In this report, the direct standardisation approach presented by Jensen and colleagues (1991) is used. To age-standardise using the direct method, the first step is to obtain population numbers and numbers of deaths (or YLL) in age ranges—typically 5-year age ranges. The next step is to multiply the age-specific population numbers from a standard population (in this case, the Australian population as at 30 June 2001) by the age-specific death rates (or YLL rates) for the population of interest (such as males and females). The next step is to sum across the age groups and divide this sum by the total of the standard population to give an age-standardised rate for the population of interest. Finally, this is expressed per 1,000 or 100,000 as appropriate.

Rate ratio

The rate ratio measures the relative difference between two population groups (for example, males and females). It can be calculated based on crude rates, age-standardised rates and cumulative rates. The ratio is calculated by dividing the rate of population group A by the rate of population group B. Ratios greater than 1 indicate an excess in population group A, while ratios less than 1 indicate an excess in population group B.

Glossary

Age weighting: A method used to adjust the relative value of years lived at different ages; for example, to value a year lived by a young adult more highly that a year lived at older ages. Age weighting means that events in some age groups will have greater influence on the results than others.

Associated cause(s) of death: All causes listed on the death certificate, other than the **underlying cause of death**.

Attributable burden: The burden attributed to a particular risk factor. It is the reduction in burden that would have occurred if exposure to the risk factor had been avoided. Compare with **avoidable burden**.

Avoidable burden: The reduction in future burden that would occur if current and/or future exposure to a particular risk factor were avoided. Compare with **attributable burden**.

Burden of disease and injury: Term referring to the quantified impact of a disease or injury on an individual or population, using the **disability-adjusted life year** (DALY) measure.

Condition (health condition): A broad term that can be applied to any health problem, including symptoms, diseases and certain risk factors, such as high blood cholesterol and obesity. Often used synonymously with disorder or problem.

Data linkage (also referred to as data integration): The bringing together (linking) of information from two or more different data sources that are believed to relate to the same entity—for example, the same individual or the same institution. The term is used synonymously with 'record linkage' and 'data integration'.

Disability: In burden of disease analysis, any departure from an ideal health state.

Disability-adjusted life year (DALY): A year of healthy life lost, either through premature death or equivalently through living with ill health due to illness or injury. It is the basic unit used in burden of disease and injury analysis.

Disability weight: A factor that reflects the severity of health loss from a particular health state on a scale from 0 (perfect health) to 1 (equivalent to death).

Discounting: A method used to adjust the relative value of years lived (or lost) in the future. It is based on the assumption that a year lived in the future is of less 'value' than a year lived now. 'Discounting for future benefits' is standard practice in economic analysis.

Health states: Groups of **sequelae** reflecting key differences in symptoms and functioning.

Incidence: The number of new cases (of an illness or event) occurring during a given period.

Life expectancy: How many years a person can expect to live, on average, given prevailing mortality rates.

Life table: A table that shows, for each age, the probability that a person of that age will die before their next birthday.

Multiple causes of death: All causes listed on the death certificate. This includes the **underlying causes of death** and **the associated cause(s) of death**.

Prevalence: The number (of cases or instances) in a population at a given time.

Redistribution causes: Causes of death that require allocation to other causes because the original **underlying cause of death** does not suit burden of disease analysis.

Risk factor: Any factor that represents a greater risk of a health disorder or other unwanted condition or event. Some risk factors are regarded as causes of disease, others are not necessarily so. Along with their opposites, protective factors, risk factors are known as determinants.

Sequelae: Consequences of diseases and injuries.

Underlying cause of death: The disease or injury that initiated the chain of events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury.

Vital registration: A system of recording important events in human life, such as births and deaths, including causes of death. This is usually maintained by a government authority.

Years of life lost (YLL): Years of life lost due to premature mortality, calculated as the difference between the age at death and the standard **life expectancy** at that age.

Years lived with disability (YLD): A measure of non-fatal disease burden, weighted for the severity of the condition.

References

ABS (Australian Bureau of Statistics) 2011. Life tables, Australia, 2008–2010. ABS cat. no. 3302.0.55.001. Canberra: ABS.

ABS 2012. Causes of death, Australia, 2012. ABS cat. no. 3302.0. Canberra: ABS.

ABS 2014. Causes of death, Australia, 2012. Canberra: ABS. Viewed 25 June 2014, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Latestproducts/3303.0Quality%20Declaration02012?opendocument&tabname=Notes&prodno=3303.0&issue=2012&num=&view=>.

AIHW (Australian Institute of Health and Welfare) 2012. A working guide to international comparisons of health. Cat. no. PHE 159. Canberra: AIHW.

AIHW 2013. About deaths data. Canberra: AIHW. Viewed 25 June 2014, <http://www.aihw.gov.au/deaths/about-deaths-data/>.

AIHW 2014. Assessment of Global Burden of Disease 2010 methods for the Australian context: Australian Burden of Disease Study. Working paper no. 1. Canberra: AIHW.

Begg S, Vos T, Barker B, Stevenson C, Stanley L & Lopez A 2007. The burden of disease and injury in Australia 2003. Cat. no. PHE 82. Canberra: AIHW.

IHME (Institute for Health Metrics and Evaluation) 2013. GBD compare. Washington: IHME. Viewed 22 June 2014, < http://vizhub.healthdata.org/gbd-compare >.

IHME 2014. About GBD. Washington: IHME. Viewed 21 June 2013, <http://www.healthdata.org/gbd/about>.

Jensen O, Parkin D, MacLennan R, Muir C & Skeet R (eds) 1991. Cancer registration: principles and methods. IARC scientific publications no. 95. Lyon: IARC.

Lopez A, Mathers C, Ezzati M et al. (eds) 2006. Global burden of disease and risk factors. Washington DC: World Bank.

Lozano R, Naghavi M, Foreman K et al. 2012. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. The Lancet 380: 2095–128.

Mathers C, Vos T & Stevenson C 1999. The burden of disease and injury in Australia (1996). Cat. no. PHE 17. Canberra: AIHW. Viewed 26 June 2014, <http://www.aihw.gov.au/publication-detail/?id=6442467088>.

MOH (New Zealand Ministry of Health) 2012. Ways and means: a report on methodology from the New Zealand Burden of Diseases, Injuries and Risk Factors Study, 2006–2016. Wellington: New Zealand Ministry of Health.

Murray CJL, Ezzati M, Flaxman AD et al. 2012. GBD 2010: design, definitions, and metrics. The Lancet 380: 2063–6.

Murray C & Lopez A 1996. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Harvard: Harvard School of Public Health.

The Lancet 2012. Global burden of disease study 2010. London: The Lancet. Viewed 21 June 2013, <http://www.thelancet.com/themed/global-burden-of-disease>.

Phillips DE, Lozano R, Naghavi M et al. 2014. A composite metric for assessing data on mortality and causes of death: the vital statistics performance index. Population Health Metrics 12: 14.

Vos T, Barker B, Stanley L & Lopez AD 2007. The burden of disease and injury in Aboriginal and Torres Strait Islander peoples 2003. Brisbane: School of Population Health, The University of Queensland. Viewed 26 June 2014, <http://www.sph.uq.edu.au/docs/BODCE/Indigenous_BoD_Report.pdf>.

WHO (World Health Organization) 1992. International statistical classification of diseases and related health problems, Tenth Revision. Volume 1. Geneva: WHO.

WHO 2009. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: WHO.

WHO 2014a. Disease and injury regional estimates, 2000–2011. Geneva: WHO. Viewed 23 June 2014. <http://www.who.int/healthinfo/global_burden_disease/estimates_regional_2000_2011/en/>.

WHO 2014b. WHO methods and data sources for global causes of death 2000–2011 (Global Health Estimates). Geneva: WHO. Viewed 30 October 2014. <http://www.who.int/healthinfo/global_burden_disease/en/>.

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This is the first report in the Australian Burden of Disease Study series. It provides estimates of fatal burden for 2010 showing the contribution of each disease group by age and sex. The three leading disease groups were Cancer (35%), Cardiovascular diseases (23%) and Injuries (13%), and these contributed more than 70% of total fatal burden.