

6 Past, present and future burden of disease and injury in Australia

6.1 Overview

This chapter presents trends in population health dynamics over a thirty-year period. The analyses involved consideration of health statistics over the last 25 years or more, although the discussion about the past is linked to health trends over the last decade. Also presented are the projected levels of the burden of disease and injury if these trends were to continue 20 years into the future. Since mortality is the starting point for many of these analyses, observed and projected trends in mortality by broad cause group are summarised in Table 6.1. The methods underlying all analyses presented in this chapter are described in detail in Chapter 2.

Table 6.1: Changes in mortality by broad cause group and sex, Australia, 1993 to 2023

Broad cause group	Rate per 100,000 for 2003		Standardised rate ratio ^(a)							
	Males	Females	Males				Females			
			1993	2003	2013	2023	1993	2003	2013	2023
Infectious	14.8	9.5	0.93	1.00	0.97	0.92	0.95	1.00	0.92	0.83
Acute respiratory ^(b)	16.5	20.9	0.43	1.00	1.00	1.00	0.40	1.00	1.00	1.00
Maternal	—	0.1	—	—	—	—	1.87	1.00	1.26	1.19
Neonatal	3.6	2.7	1.74	1.00	0.63	0.41	1.01	1.00	0.66	0.46
Nutritional	0.2	0.6	2.83	1.00	1.24	1.09	1.72	1.00	0.74	0.65
Cancer	211.1	163.7	1.20	1.00	0.89	0.75	1.12	1.00	0.92	0.82
Other neoplasms	4.3	4.1	1.06	1.00	0.88	0.74	0.92	1.00	0.96	0.91
Diabetes	19.5	16.6	1.01	1.00	0.96	0.90	1.13	1.00	0.88	0.76
Endocrine	5.6	7.0	1.73	1.00	1.00	0.89	0.95	1.00	1.07	1.06
Mental	10.4	3.4	1.18	1.00	0.90	0.75	1.10	1.00	0.91	0.79
Neurological	27.8	41.7	1.10	1.00	0.99	0.91	0.93	1.00	1.04	1.05
Cardiovascular	237.9	252.6	1.61	1.00	0.71	0.47	1.52	1.00	0.76	0.52
Chronic respiratory	48.1	37.7	1.38	1.00	0.82	0.69	1.00	1.00	1.04	1.07
Digestive	14.7	19.4	1.18	1.00	0.74	0.55	1.13	1.00	0.80	0.63
Genitourinary	16.7	20.1	1.01	1.00	0.95	0.87	0.86	1.00	0.98	0.93
Skin	1.2	2.0	1.06	1.00	0.96	0.83	0.88	1.00	1.03	1.04
Musculoskeletal	2.6	5.1	1.29	1.00	0.94	0.79	1.10	1.00	0.95	0.90
Congenital	4.2	3.4	1.17	1.00	0.75	0.60	1.30	1.00	0.75	0.58
Oral	0.0	0.1	1.61	1.00	1.29	1.11	0.39	1.00	0.73	0.74
Ill defined	0.5	0.6	3.13	1.00	0.54	0.25	2.01	1.00	0.69	0.52
Injuries	52.4	27.7	1.13	1.00	0.87	0.73	1.00	1.00	0.87	0.74
All causes	692.1	639.0	1.32	1.00	0.83	0.67	1.22	1.00	0.87	0.73

(a) Ratio of age-standardised mortality rates for year to mortality rates for 2003.

(b) Age-specific rates for pneumonia post-2003 held at 2003 rates due to coding discontinuities between ICD-9 and ICD-10 for this cause.

6.2 Health-adjusted life expectancy

This section begins, as did Chapter 5, by presenting life expectancy and health-adjusted life expectancy, but this time with a temporal dimension rather than with a focus on differentials between subpopulations. Over the last decade, total life expectancy in Australia improved from 78.0 years in 1993 to 80.7 years in 2003. This was an annual growth of 0.35% (or 0.28 of a year per year). If past mortality trends continue into the future as projected (that is, at an exponentially declining rate), life expectancy will increase to 82.6 years in 2013 and 84.6 years in 2023, an increase of 3.9 years from 2003. This represents an annual growth of 0.24% (or 0.20 of a year per year) over the 20-year period (Table 6.2).

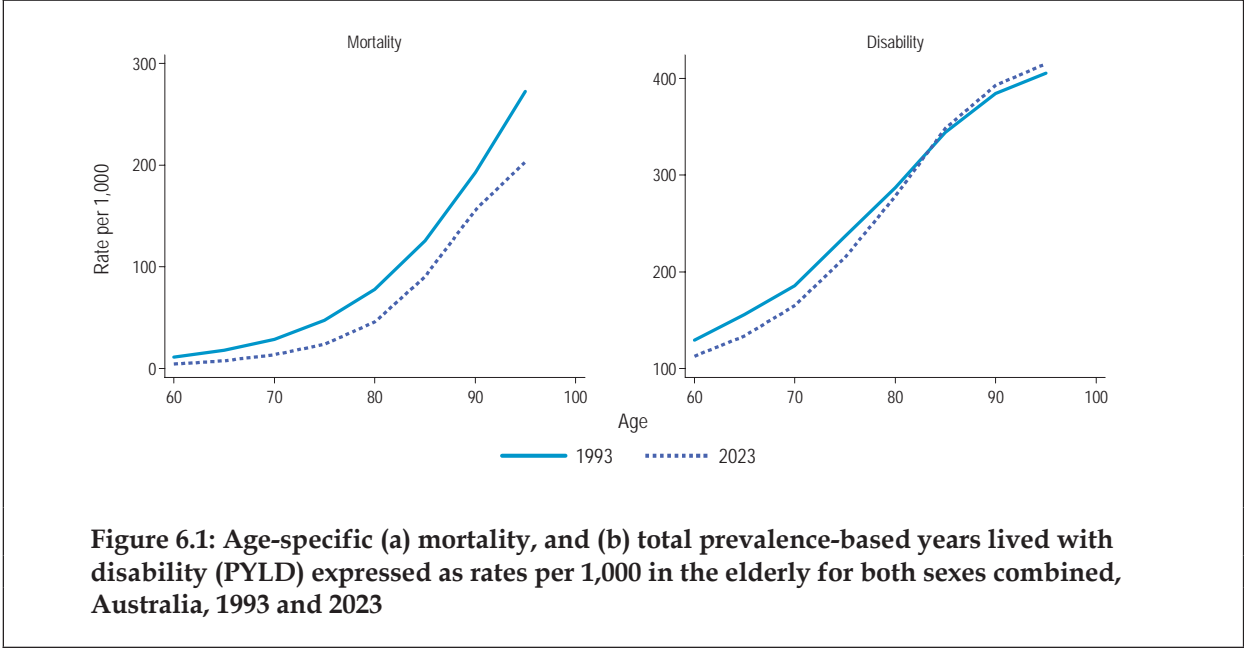
Table 6.2: Life expectancy and health-adjusted life expectancy by sex, Australia, 1993 to 2023

	1993			2003			2013			2023		
	Males	Females	Both	Males	Females	Both	Males	Females	Both	Males	Females	Both
Population ^(a) (millions)	8.8	8.9	17.7	9.9	10.0	19.9	11.0	11.2	22.2	12.1	12.3	24.5
Proportion of population at selected ages (%)												
0–59 years	85.8	82.8	84.3	84.1	81.6	82.8	79.8	77.6	78.7	75.1	72.7	73.9
60–79 years	12.5	14.1	13.3	13.5	14.2	13.9	16.9	17.3	17.1	20.3	21.1	20.7
80+ years	1.6	3.2	2.4	2.4	4.2	3.3	3.4	5.1	4.2	4.6	6.1	5.4
Life expectancy (years)												
At birth	75.0	81.0	78.0	78.3	83.2	80.7	80.6	84.8	82.6	83.3	86.5	84.6
At age 60	19.5	23.8	21.7	22.1	25.6	23.9	23.7	26.8	25.2	25.9	28.1	26.8
At age 80	7.2	9.1	8.4	8.4	9.9	9.3	9.1	10.5	9.8	10.6	11.3	10.7
Health-adjusted life expectancy (years)												
At birth	68.0	73.5	70.7	70.6	75.2	72.9	72.5	76.6	74.5	74.7	78.0	76.2
At age 60	15.2	19.2	17.3	17.1	20.5	18.9	18.4	21.5	19.9	20.1	22.5	21.2
At age 80	4.7	6.3	5.6	5.4	6.8	6.2	5.9	7.2	6.6	6.8	7.7	7.1
Healthy life expectancy lost due to disability (years)												
At birth	7.0	7.5	7.3	7.7	7.9	7.8	8.0	8.2	8.1	8.6	8.5	8.5
At age 60	4.4	4.6	4.5	5.0	5.1	5.0	5.3	5.3	5.2	5.8	5.6	5.6
At age 80	2.5	2.8	2.7	3.0	3.2	3.1	3.2	3.3	3.3	3.7	3.6	3.5
Healthy life expectancy lost due to disability as proportion of total life expectancy (%)												
At birth	9.4	9.2	9.3	9.8	9.6	9.7	9.9	9.6	9.8	10.3	9.9	10.0
At age 60	22.3	19.3	20.6	22.6	19.8	21.1	22.2	19.7	20.8	22.6	19.9	21.0
At age 80	35.2	31.1	32.5	35.8	31.8	33.2	35.3	31.8	33.1	35.4	31.9	33.3

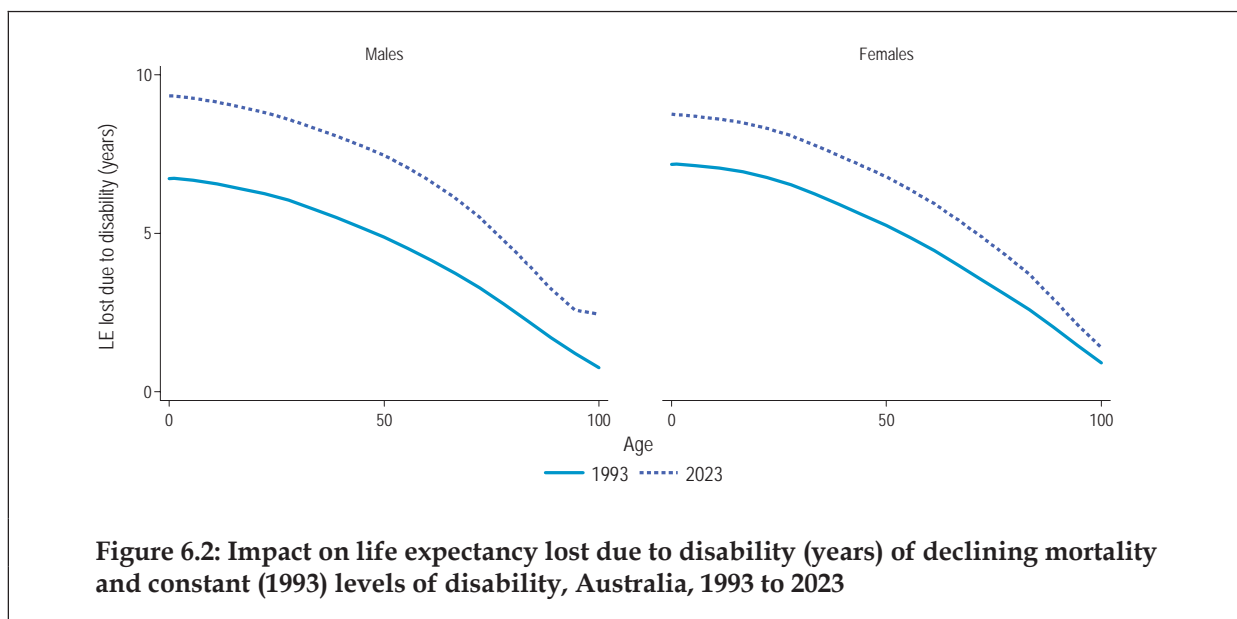
(a) Estimated resident population figures as at 30 June 1993 and 2003 (ABS 2006, Cat. no. 3201.0, Table 9) and ABS population projections series 8 (ABS 2003a, Cat. no. 3222.0).

Health-adjusted life expectancy, on the other hand, increased from 70.7 years to 72.9 years in the decade to 2003, an annual growth of 0.31% (or 0.22 of a year per year). If, in addition to past mortality trends, trends in non-fatal health conditions that give rise to disability continue into the future as projected, health-adjusted life expectancy will increase to 74.5 years in 2013 and 76.2 years in 2023. This represents an annual growth of 0.22% (or 0.16 of a year per year) over the 20-year period.

Complex dynamics in population health will drive the slower gains in health-adjusted life expectancy relative to total life expectancy. The most important of these is the decline in mortality rates between 1993 and 2023 across the life span, but particularly in the elderly (Figure 6.1a). One of the consequences of declining mortality is that, in combination with ongoing declines in fertility, Australia’s population will continue to age. Of particular relevance is the number of people aged 80 years and older. Over the last decade, the proportion of the total population in this age group increased from 2.4% in 1993 to 3.3% in 2003. Based on recent Australian Bureau of Statistics (ABS) projections (ABS 2003a), this is expected to increase to 4.2% in 2013 and 5.4% in 2023 (Table 6.2).

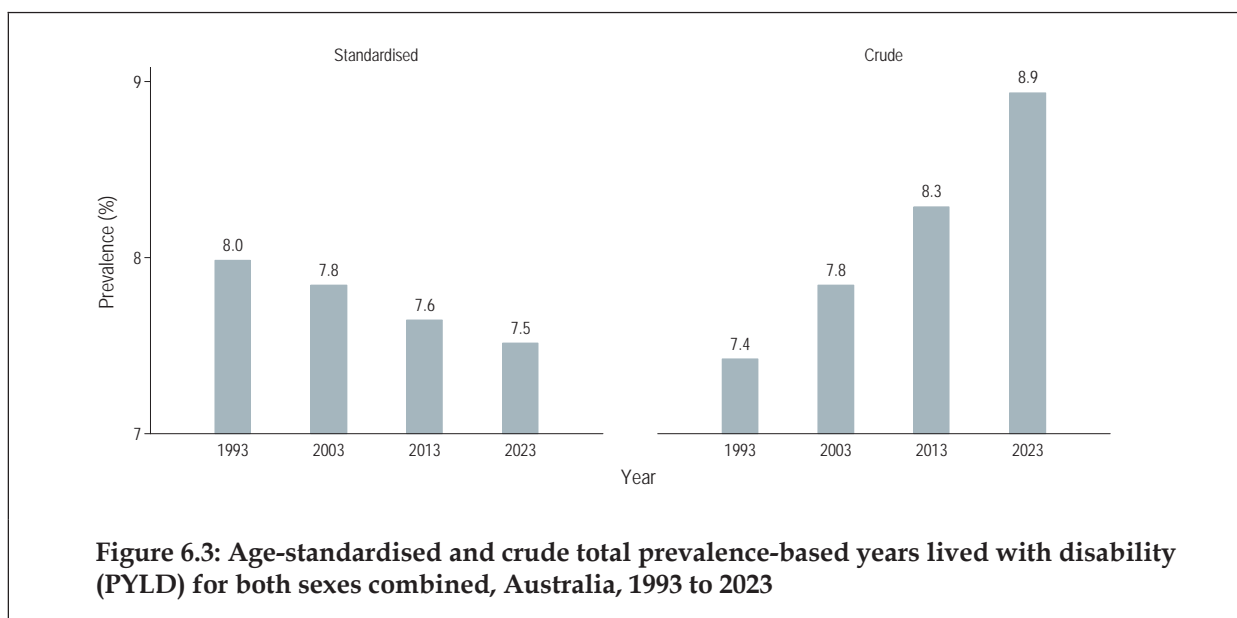


The impact on life expectancy of declining mortality rates is straightforward – it will increase. The impact on health-adjusted life expectancy and its corollary, life expectancy lost due to disability, however, is perhaps less intuitive at first. The key point is that, in most populations, even if the prevalence of disability at each age were to remain at constant levels, a decline in mortality would mean an increase in life expectancy lost due to disability in the future (Figure 6.2). This is because reductions in mortality result in more people surviving through to ages when the probability of being disabled is highest. Ultimately, though, this relationship depends on changes in the rate at which mortality increases with age relative to changes in the rate at which disability increases with age.



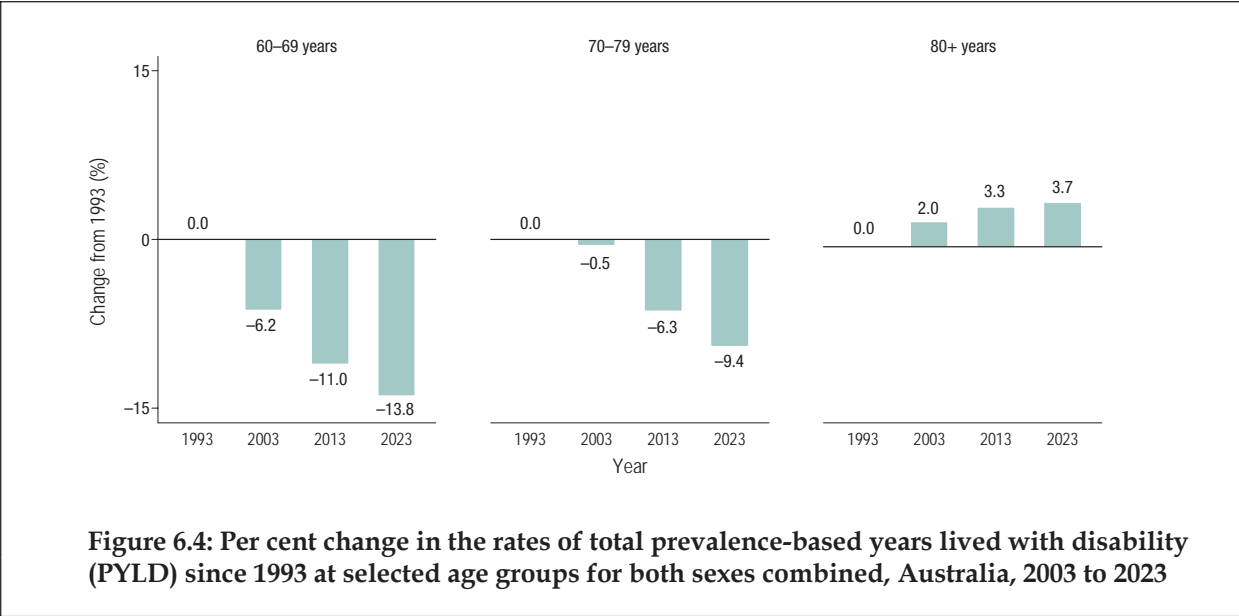
In addition to the increase in the proportion of total life expectancy lost due to disability through reductions in mortality, is the impact of temporal trends in diseases and injuries that give rise to the prevalence of disability. By estimating separately the epidemiology of these causes in a fully temporal model, changes in total prevalence of disability by age, sex and cause can be quantified for the first time over the past as well as into the future.

While the prevalence of overall disability appears to decrease when the effect of population ageing is removed (by standardising for age), it will consistently increase over the next two decades in crude terms (Figure 6.3). In other words, the proportion of overall time lived with disability will increase from 7.8% in 2003 to 8.9% in 2023, an increase of 14.1%.



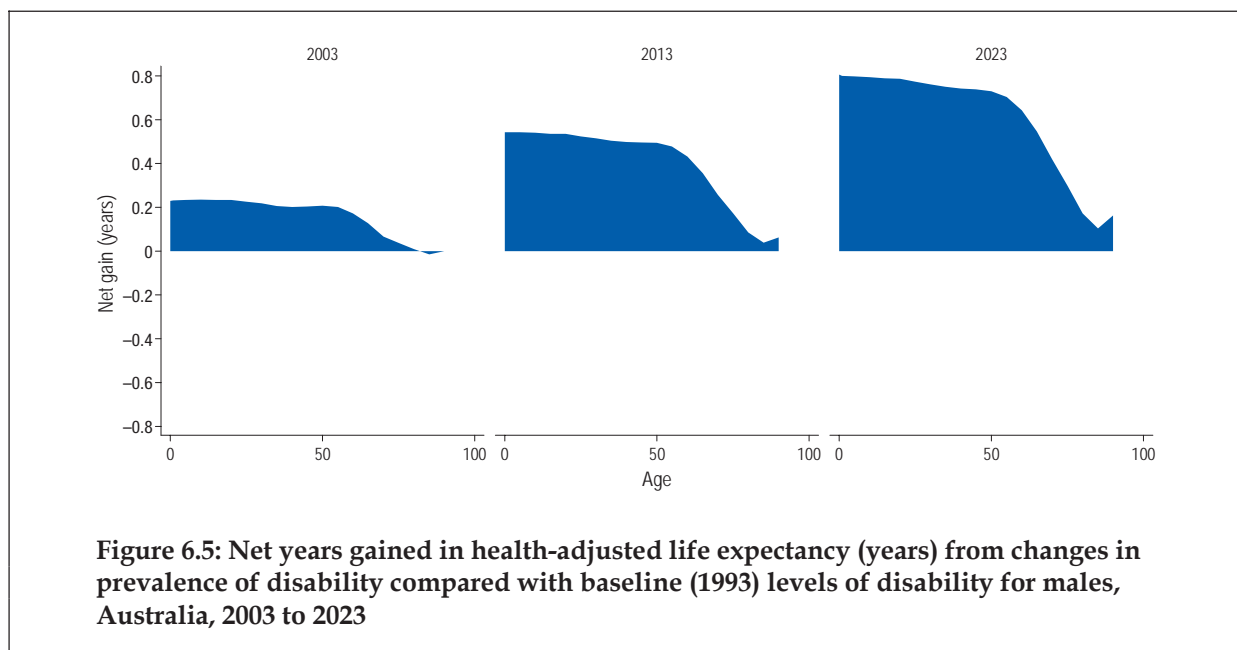
This is for two reasons. First, the number of people aged 80 years and over is set to expand rapidly due to declining mortality (Figure 6.1a). Second, while the prevalence of disability will drop at most ages, it will actually increase in this age group (Figure 6.1b). In the decade

to 2003, disability in people aged 80 years and over increased by 2.0%; if past trends continue, by 2023 disability will have increased a further 1.7% (Figure 6.4). This lends support to the hypothesis which predicts that as population health improves, disability is increasingly concentrated towards the end of the life span.

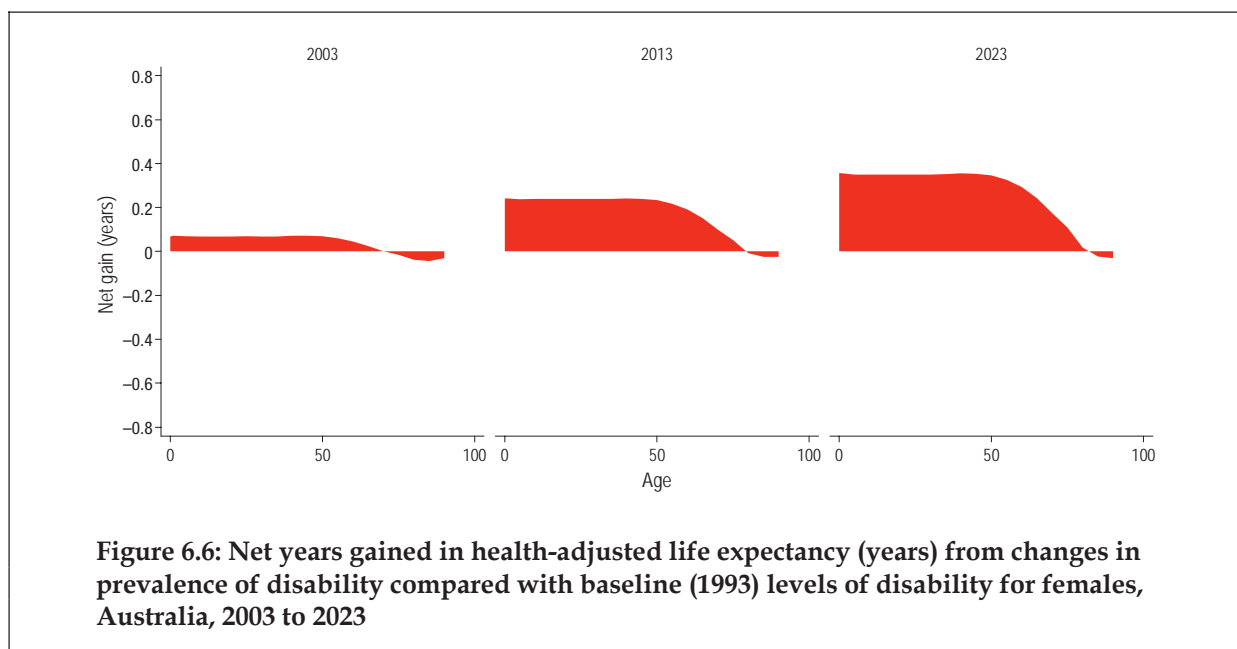


The effect on health-adjusted life expectancy of the increasing concentration of disability towards the end of life, which until now has been largely unexplored using empirical data, can be illustrated by gains in expectation of life in a model in which disability is included as a dynamic force over time, compared with a counterfactual scenario in which the probability of disability is held constant (Figure 6.5 and Figure 6.6). Such a comparison provides insights into the question ‘What impact will concentration of disability towards the end of the lifespan have on health-adjusted life expectancy?’

Health-adjusted life expectancy at birth is the most commonly cited measure, and summarises mortality and disability risks across the life span. In males, this will increase at a rate faster than would have been observed through reductions in mortality alone, with the net effect of morbidity being increasingly concentrated towards the end of life. From 1993 to 2003 the gain was about 0.2 years. Over the longer term, however, the gain will be larger, at around 0.8 years of healthy life for males born in 2023. At adult ages, the gains are less and, in the elderly, where gains in health expectancy due to declines in mortality are more easily offset by increases in disability, there were losses in healthy life due to this dynamic in the decade to 2003, but these disappear in the subsequent decade (Figure 6.5).



In females, the impact of morbidity being increasingly concentrated towards the end of life is not readily apparent in the decade to 2003. Over the next two decades this dynamic will start to have an impact, although the gains in health expectancy at birth will be smaller than for males (around 0.3 years in 2023) and the losses in the elderly will be greater and will be experienced earlier in life.



The correct answer to the question ‘What impact will the concentration of disability in the latter part of the lifespan have on health-adjusted life expectancy?’, therefore, is: ‘It depends’. This is because health expectancy at any particular age is a summary measure based on the

combination of mortality and disability risks at that age and all subsequent ages. While a detailed decomposition of the drivers of this complex dynamic is beyond the scope of this report, growth in prevalent disability in the elderly is likely to come from increases in diabetes and neurological conditions. Disability from diabetes, in particular, grew 10.4% in the decade to 2003, and will grow a further 29.3% over the next two decades if current trends in obesity continue (Figure 6.7). Neurological conditions grew 2.5% in the decade to 2003, and are likely to grow a further 6.6% in the 20 years to 2023. Most other causes of prevalent disability are likely to decline.

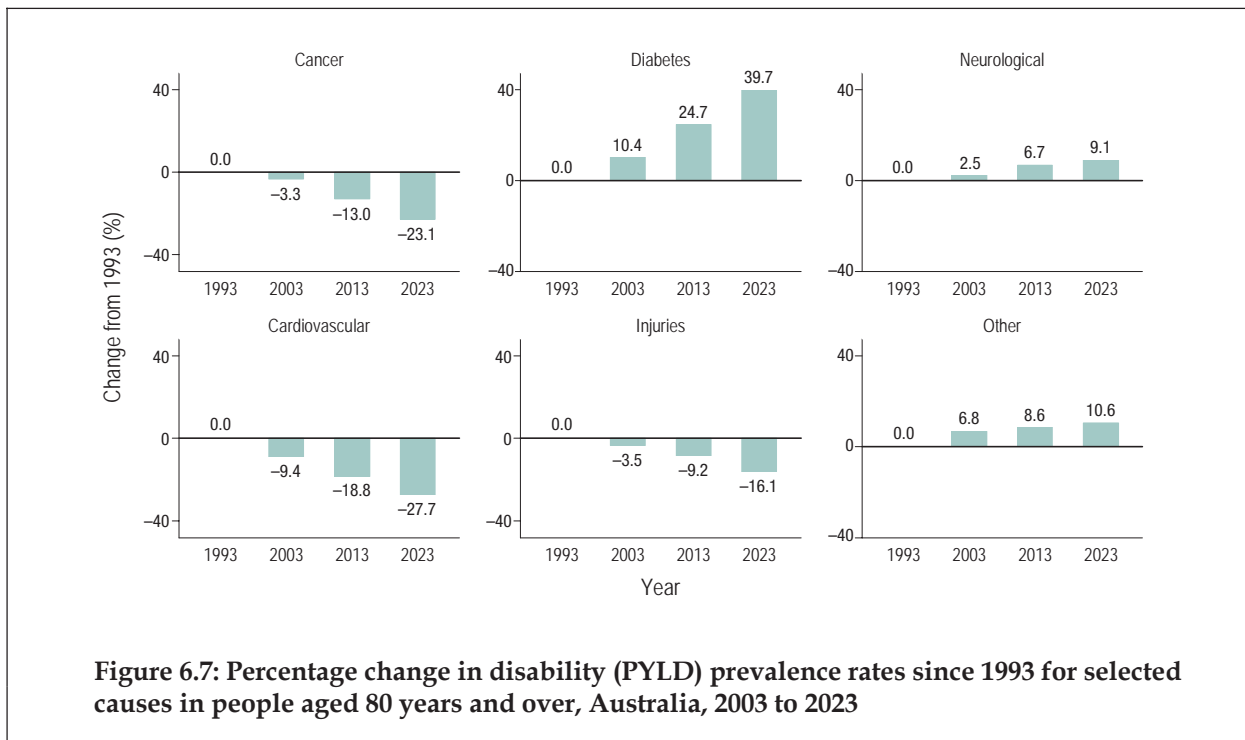
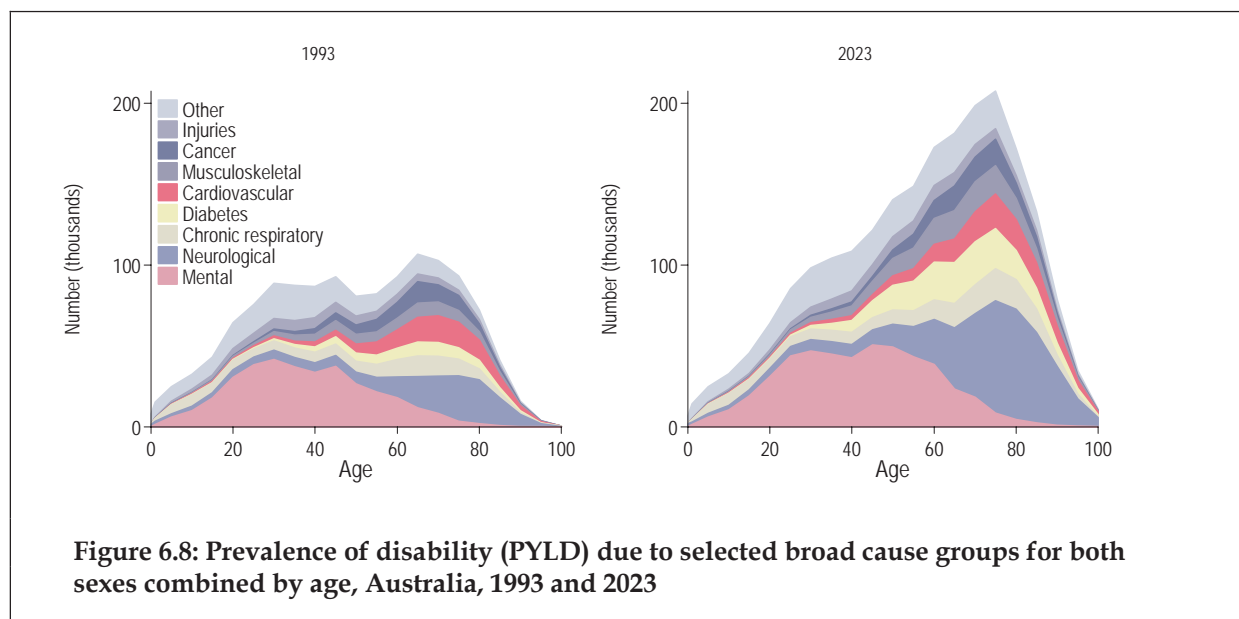


Figure 6.8 shows the number of healthy years lost due to prevalent disability (PYLD) by cause and age for 1993 and 2023. This figure demonstrates the absolute growth in PYLD that is expected to occur over this period due to increases in population size. It also shows the shift in the distribution of PYLD towards older ages that will occur as a result of population ageing. Trends in epidemiology will interact with these demographic factors to influence the composition of causes of prevalent disability at each age. Neurological conditions will grow substantially over the period 1993 to 2023 and will remain the largest contributor to disability prevalence at older ages. Mental disorders, on the other hand, will grow only slightly from 1993 levels but will remain the largest contributor to disability prevalence until age 60. Disability from cardiovascular disease is expected to decline from middle age onwards over this period but this decline will be more than offset by increases from diabetes.



Changes in the age-specific trends described above reflect changes in the prevalence of disability experienced at all ages (Figure 6.9). Mental disorders decreased from 26% to 25% of total prevalence of disability in the decade to 2003. The effects of population ageing will mean that mental disorders, which are largely experienced in early to middle adulthood, will further decline to 22% of total prevalent disability in 2023, although they will remain the leading cause of overall prevalent disability. Neurological & sense disorders, on the other hand, will increase as a consequence of population ageing because they are experienced later in life. In the decade to 2003 this group increased from 15% to 17% of total prevalent disability in 2003, and over the next two decades, through population ageing alone, will increase to 21% in 2023.

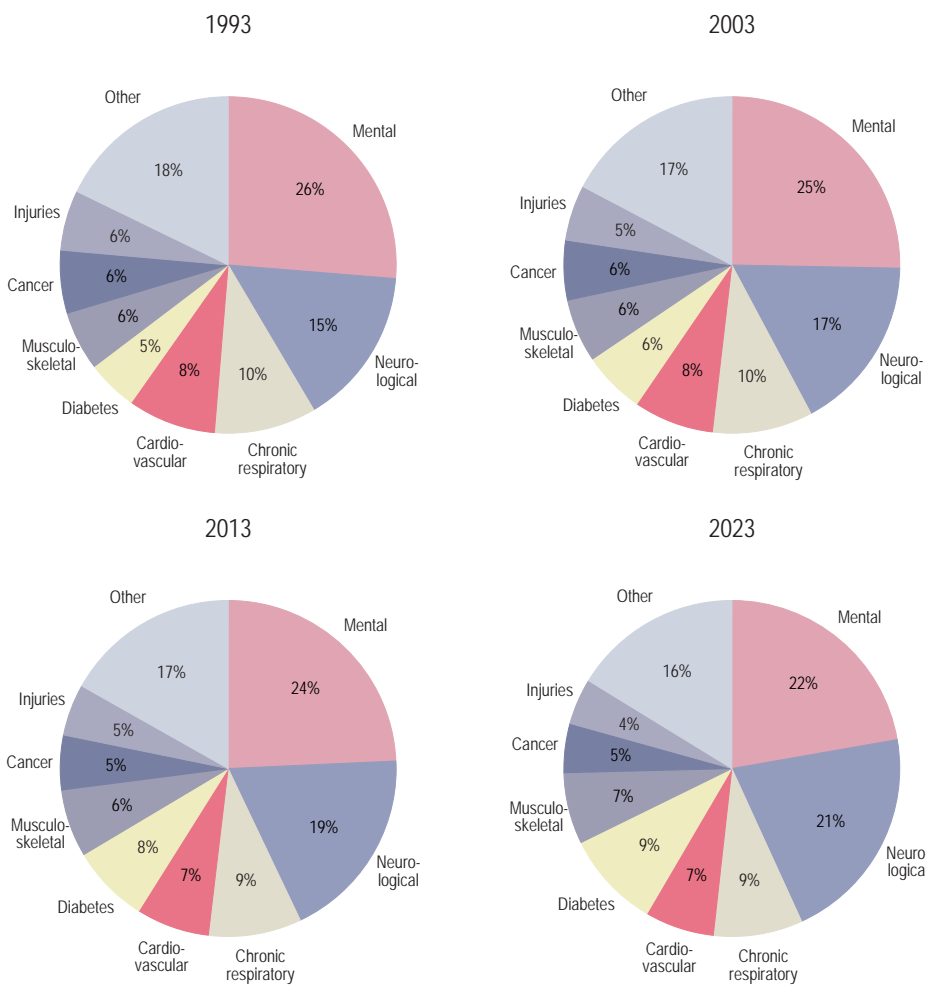


Figure 6.9: Proportion of total prevalence of disability (PYLD) due to selected broad cause groups, Australia, 1993 to 2023

Diabetes was the other strong growth area at all ages, increasing from 5% of total prevalent disability in 1993 to 6% in 2003. If current trends in obesity continue, this figure is set to increase by a further 50% to 9% of total prevalent disability in 2023.

6.3 Burden

The remainder of this chapter presents past, present and future burden using the standard burden measure – DALYs. It is worth reiterating at this point that, unlike prevalent years lived with disability (PYLD), DALYs are incidence-based and include, in addition to non-fatal health outcomes, time lost due to premature mortality. Observed and projected trends in burden (DALYs) by broad cause group are summarised in Table 6.3. The methods underlying these figures are described in detail in Chapter 2. More detailed data on past,

present and future burden by age, sex and cause is available on the web at <www.aihw.gov.au/bod>.

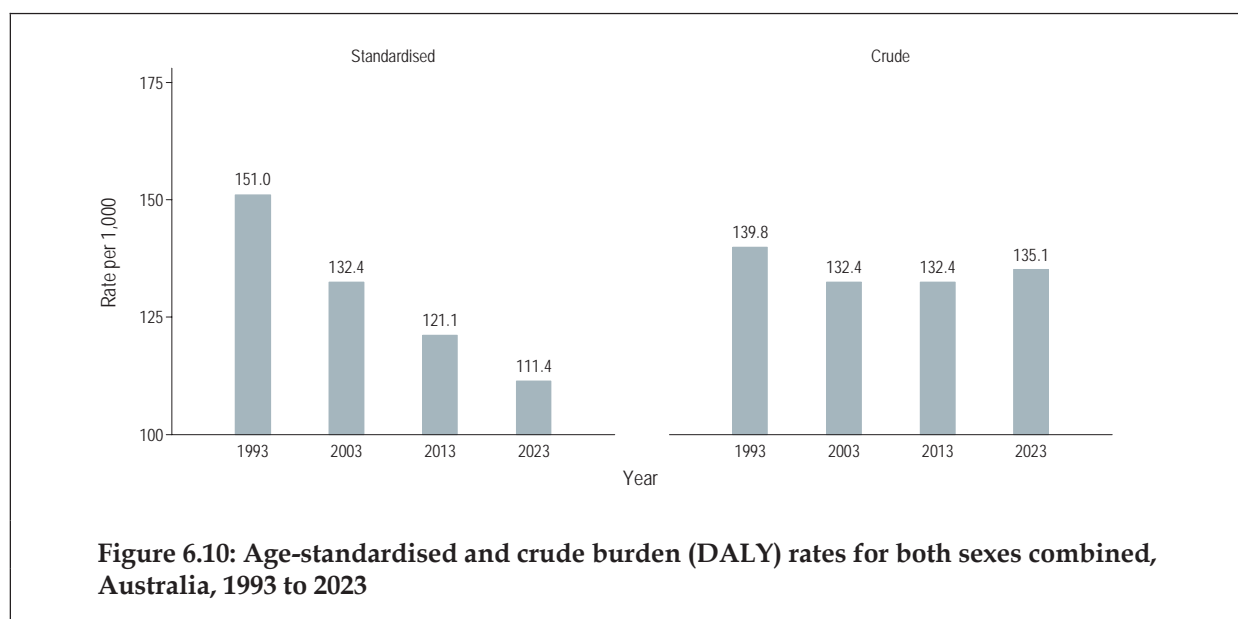
Table 6.3: Changes in burden rates (DALYs) by broad cause group and sex, Australia, 1993 to 2023

Broad cause group	Rate per 1,000 for 2003		Standardised rate ratio ^(a)							
			Males				Females			
	Males	Females	1993	2003	2013	2023	1993	2003	2013	2023
Infectious	2.8	1.7	0.93	1.00	1.02	0.99	0.99	1.00	0.93	0.85
Acute respiratory ^(b)	1.7	1.8	0.67	1.00	1.00	1.00	0.61	1.00	1.00	1.00
Maternal	—	0.2	—	—	—	—	1.09	1.00	1.03	1.02
Neonatal	1.9	1.6	1.32	1.00	0.80	0.68	1.00	1.00	0.82	0.71
Nutritional	0.1	0.5	1.12	1.00	1.03	1.02	1.03	1.00	0.99	0.98
Cancer	26.8	23.5	1.20	1.00	0.85	0.70	1.16	1.00	0.88	0.74
Other neoplasms	0.5	0.6	1.03	1.00	0.83	0.68	0.94	1.00	0.89	0.81
Diabetes	7.8	6.6	0.87	1.00	1.15	1.32	0.89	1.00	1.18	1.40
Endocrine	1.5	1.4	1.88	1.00	1.08	1.03	0.89	1.00	1.16	1.31
Mental	16.8	18.5	1.03	1.00	1.01	0.99	0.99	1.00	1.01	1.01
Neurological	14.9	16.6	0.96	1.00	1.02	1.03	0.96	1.00	1.03	1.05
Cardiovascular	25.6	22.1	1.56	1.00	0.69	0.48	1.51	1.00	0.74	0.53
Chronic respiratory	10.0	8.8	1.22	1.00	0.83	0.73	1.04	1.00	0.96	0.93
Digestive	2.9	2.9	1.01	1.00	0.81	0.71	1.03	1.00	0.85	0.75
Genitourinary	2.9	3.7	0.97	1.00	0.97	0.96	0.97	1.00	0.98	0.95
Skin	1.0	1.0	1.00	1.00	1.00	0.99	1.00	1.00	1.00	0.99
Musculoskeletal	4.5	6.1	0.98	1.00	1.03	1.05	0.97	1.00	1.02	1.02
Congenital	1.9	1.4	1.11	1.00	0.84	0.74	1.19	1.00	0.84	0.72
Oral	1.2	1.3	0.99	1.00	1.02	1.03	0.98	1.00	1.01	1.02
Ill defined	0.5	0.7	1.70	1.00	0.83	0.73	1.31	1.00	0.93	0.89
Injuries	13.1	5.5	1.16	1.00	0.91	0.79	1.08	1.00	0.89	0.76
All causes	138.2	126.7	1.18	1.00	0.90	0.81	1.11	1.00	0.93	0.87

(a) Ratio of age-standardised DALY rates for year to DALY rates for 2003.

(b) Age-specific rates for pneumonia post-2003 held at 2003 rates due to coding discontinuities between ICD-9 and ICD-10 for this cause.

As observed with PYLD, total burden will most likely decrease after the effect of population ageing is removed (that is, age-standardisation) over the next two decades, yet in crude terms it will most likely increase (Figure 6.10). Again, this is due to a larger proportion of the population alive at older ages.



Chapter 3 described the decline of cardiovascular disease relative to cancer as a proportion of overall burden, and stated that for the first time, cancer accounted for the largest share of overall burden experienced by the Australian population in 2003. This is primarily because Australia has been relatively successful at curbing the impact of the cardiovascular disease epidemic, but not nearly as successful to date with cancer. If these trends continue, the burden of cardiovascular disease will further decline to about 13% of the total burden in 2023. The age-standardised rates of cancer mortality and disability are expected to fall somewhat in the future but cancer as a whole will retain its share of around 19% of total burden two decades from now and will remain the largest contributor to total burden in 2023 (Figure 6.11).

Despite the steady decline in cardiovascular disease burden over the next two decades, there is likely to be a strong increase in burden due to diabetes, primarily as a consequence of the obesity epidemic. If current trends in obesity continue unabated, diabetes will account for around 9% of total burden in 2023, up from around 5% in 2003 (Figure 6.11).

A major consequence of population ageing will be the steady growth in burden from neurological & sense disorders, up from 12% in 2003 to around 16% in 2023. The main contributors here will be dementia and adult-onset hearing loss, both causes for which current treatments are largely ineffectual. The economic consequences of the former in terms of the provision of appropriate care services are likely to be significant and will be evident in the home and community sectors before they are felt in the residential aged care sector.

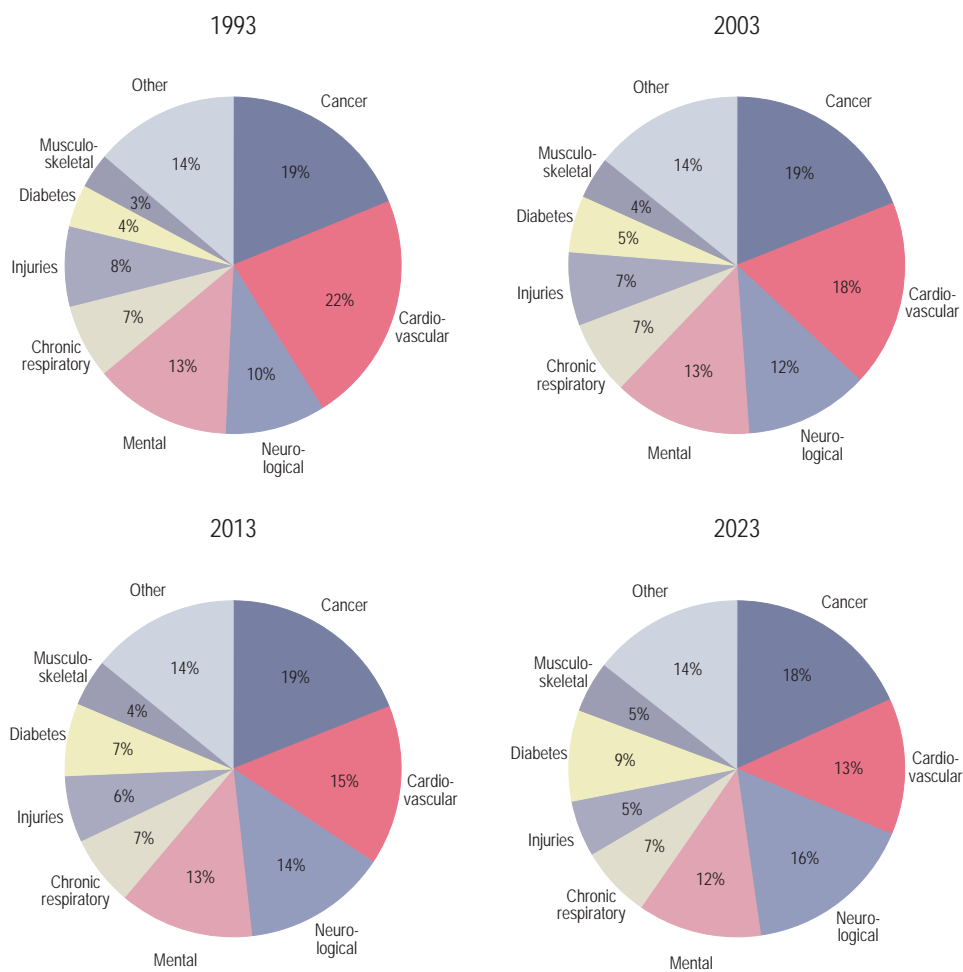
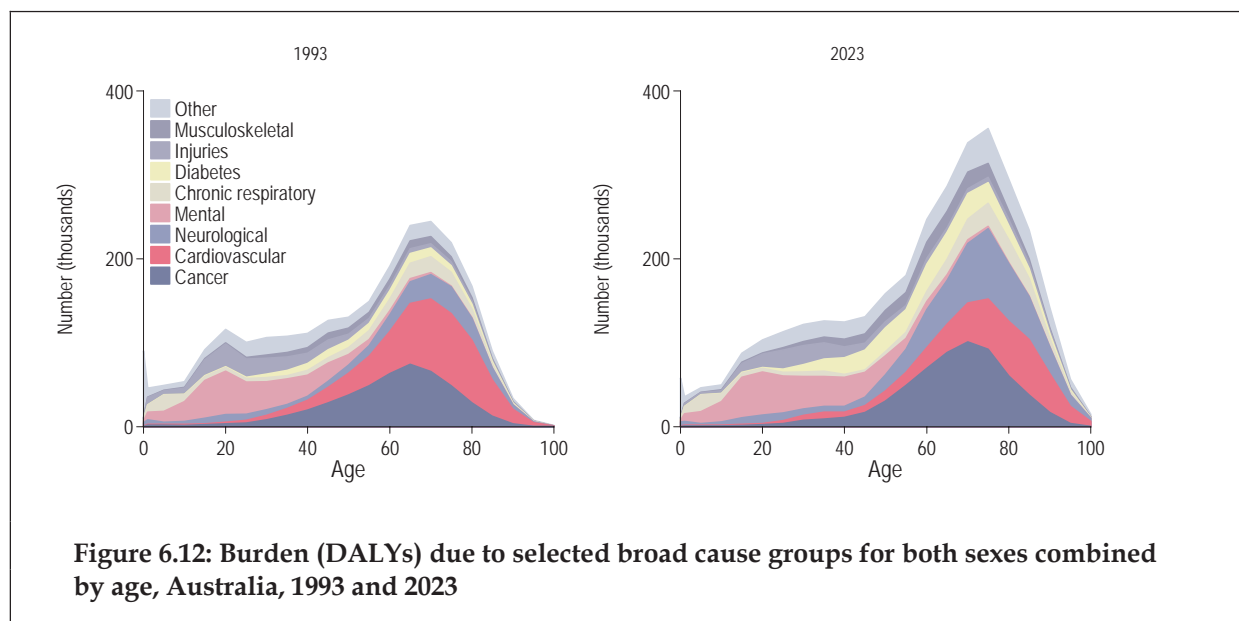


Figure 6.11: Proportion of total burden (DALYs) due to selected broad cause groups, Australia, 1993 to 2023

The proportion of burden due to major causes experienced at different ages throughout the life span is unlikely to change dramatically over the next two decades (Figure 6.12). The decline of cardiovascular disease as a proportion of total burden will be experienced at all ages, although, in absolute terms, most notably in the elderly. This will be partially offset by the increase in the proportion due to diabetes at all ages. The proportion of total burden due to cancer at different ages is unlikely to change.



In terms of specific causes of disease burden, ischaemic heart disease is the leading cause in males across three of the four time periods. Its share of burden declined from 14.7% in 1993 to 11.1% in 2003 (Table 6.4). If this trend continues, ischaemic heart disease will decline a further 36% to 7.1% of the total burden in 2023. Type 2 diabetes, on the other hand, rose from sixth place to second in the decade to 2003, and is likely to increase a further 65% to first place or 8.6% of the total burden in 2023. Anxiety & depression will retain its third place, at around 4.5% of the total burden in 2023, but lung cancer will drop to sixth place, largely because of the dramatic decline in smoking prevalence in males over the last two decades. In its place, dementia will occupy fourth position in 2023, up from 11th place in 2003.

Table 6.4 Leading causes of burden (DALYs) in males, Australia, 1993 to 2023

Specific cause	Rank ^(a)				Per cent of total			
	1993	2003	2013	2023	1993	2003	2013	2023
Ischaemic heart disease	1	1	1	2	14.7	11.1	8.9	7.1
Type 2 diabetes	6	2	2	1	3.6	5.2	6.8	8.6
Anxiety & depression	2	3	3	3	4.5	4.8	4.7	4.5
Lung cancer	3	4	4	6	4.4	4.0	3.8	3.4
Stroke	5	5	6	7	4.2	3.9	3.5	3.2
COPD	4	6	9	11	4.4	3.6	2.9	2.2
Adult-onset hearing loss	11	7	5	5	2.5	3.1	3.7	4.2
Suicide & self-inflicted injuries	8	8	10	10	2.9	2.8	2.8	2.4
Prostate cancer	10	9	8	8	2.5	2.7	3.0	3.1
Colorectal cancer	9	10	11	9	2.6	2.5	2.6	2.4
Dementia	14	11	7	4	1.8	2.5	3.3	4.4
Road traffic accidents	7	12	14	18	3.0	2.3	1.8	1.3
Asthma	12	13	12	12	2.2	2.1	2.0	1.9
Alcohol dependence & harmful use	13	14	13	14	2.0	2.0	1.9	1.6
Personality disorders	16	15	17	19	1.1	1.2	1.2	1.2
Schizophrenia	15	16	20	23	1.1	1.1	1.1	1.0
Osteoarthritis	24	17	15	15	0.8	1.1	1.3	1.6
Back pain	23	18	18	17	0.9	1.1	1.2	1.3
Melanoma	20	19	21	20	0.9	1.0	1.1	1.1
Parkinson's disease	25	20	16	13	0.8	1.0	1.3	1.6

(a) Sorted according to the leading specific causes for Australia in the year 2003.

Anxiety & depression is ranked first in females across three of the four time periods, although in percentage terms its share of the total burden will decrease from 10.0% in 2003 to 8.7% in 2023 (Table 6.5). Ischaemic heart disease will remain in second place over the next decade, but fall to fourth place by 2023. In its place will be dementia, which increased by 1.1 percentage points to 4.8% of the total burden in the decade to 2003, and, if current projections of population ageing eventuate, will be ranked third at 7.4% of the total burden in 2023. As with males, Type 2 diabetes is set to increase steadily and is likely to occupy second position in 2023, at around 8% of the total burden.

Table 6.5 Leading causes of burden (DALYs) in females, Australia, 1993 to 2023

Specific cause	Rank ^(a)				Per cent of total			
	1993	2003	2013	2023	1993	2003	2013	2023
Anxiety & depression	2	1	1	1	9.8	10.0	9.6	8.7
Ischaemic heart disease	1	2	2	4	12.4	8.9	7.5	6.1
Stroke	3	3	5	5	5.9	5.1	4.4	3.8
Type 2 diabetes	6	4	3	2	3.7	4.9	6.4	8.0
Dementia	5	5	4	3	3.7	4.8	5.9	7.4
Breast cancer	4	6	6	6	5.1	4.8	4.3	3.5
COPD	7	7	8	8	3.1	3.0	2.9	2.8
Lung cancer	10	8	7	7	2.3	2.7	3.1	3.5
Asthma	8	9	9	9	2.9	2.7	2.5	2.4
Colorectal cancer	9	10	10	12	2.6	2.3	2.2	1.9
Adult-onset hearing loss	11	11	11	11	1.5	1.8	2.0	2.2
Osteoarthritis	12	12	12	10	1.4	1.6	1.9	2.2
Personality disorders	15	13	14	16	1.2	1.3	1.3	1.3
Migraine	14	14	17	18	1.3	1.3	1.2	1.1
Back pain	16	15	15	15	1.1	1.2	1.3	1.3
Lower respiratory tract infections	38	16	13	13	0.5	1.1	1.3	1.6
Falls	20	17	18	19	0.9	1.0	1.1	1.1
Parkinson's disease	19	18	16	14	0.9	1.0	1.2	1.5
Schizophrenia	17	19	20	25	1.0	1.0	1.0	0.9
Rheumatoid arthritis	21	20	19	20	0.9	1.0	1.0	1.0

(a) Sorted according to the leading specific causes for Australia in the year 2003.