



# Healthy life expectancy in Australia: patterns and trends 1998 to 2012

## Summary

Life expectancy measures how many years on average a person can expect to live, if current death rates do not change. The term 'health expectancy' is used to describe, within a person's life expectancy, the expected years spent in various health states, such as years with disability. Whether Australians have more years living free of disability as the overall life expectancy is lengthening has important implications for population health and wellbeing and for Australia's health and long-term care systems.

## Australians have more years living free of disability

From 1998 to 2012, life expectancy at birth increased for both sexes, and most of this increase corresponded with an increase in years free of disability and severe or profound core activity limitation (that is, sometimes or always needing personal help with activities of self-care, mobility or communication). The disability-free life expectancy for males increased by 4.4 years, which was more than the gain in male life expectancy (4 years). The increase in years free of disability for females was 2.4 years.

Australian boys born in 2012 could expect to live an average of 62.4 years without disability and another 17.5 years with some form of disability, including 5.6 years with severe or profound core activity limitation. Girls born in 2012 could expect to live 64.5 years without disability and another 19.8 years with some form of disability, including 7.8 years with severe or profound core activity limitation.

The gains in the number of expected years living free of disability were related to a combination of increasing longevity and decreases in disability prevalence rates.

## Older Australians have more years without severe or profound core activity limitation

From 1998 to 2012, there was a clear trend of increasing years free of disability and severe or profound core activity limitation. Along with the increase in life expectancy, Australians at age 65 gained on average more years without severe or profound core activity limitation than with

it: males gained 2.3 limitation-free years and 0.7 years with severe or profound core activity limitation; females gained 2.0 limitation-free years and 0.3 years with severe or profound core activity limitation.

Males at age 65 in 2012 could expect to live an average 8.7 years without disability and another 10.4 years with some form of disability, including 3.7 years with severe or profound core activity limitation. Females at age 65 could expect to live 9.5 years without disability and another 12.5 years with some form of disability, including 5.8 years with severe or profound core activity limitation.

## The gender gaps are narrowing in life expectancy and years living free of disability

Although women could expect to live longer and live more years both with and without disability than men could, gender gaps in life expectancy and years free of disability and severe or profound core activity limitation are narrowing across all ages.

During 1998–2012, the gender gap in years free of disability at birth was almost halved from 4.1 years to 2.1 years. At age 65, the gap was halved from 1.6 years to 0.8 years. The gap in years without severe or profound core activity limitation at age 65 narrowed from 1.2 years to 0.8 years.

The reduced gender gaps in health expectancies were partly associated with gender differences in the decline of disability prevalence rates.

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## Introduction

Australians are living longer, and whether Australians have more years living free of disability as the overall life expectancy is lengthening has important implications for population health and wellbeing and for Australia's health and long-term care systems. This bulletin explores this question and updates key analyses published previously in the report *Changes in life expectancy and disability in Australia 1998 to 2009* (AIHW 2012). It also examines recent changes in gender gaps in life expectancy and health expectancies as well as the contribution of life expectancy and disability prevalence to the changes in health expectancies in Australia. Some results of this analysis were published in *Australia's health 2014* (AIHW 2014).

Life expectancy measures how many years on average a person of a given age can expect to live, if current death rates do not change. While life expectancy is an important indicator of population health, people's health is increasingly being considered in terms of their quality of life and functional status (AIHW 2004; 2014).

The term 'health expectancy' is used to describe, within a person's life expectancy, the expected years spent in various health states from birth to death, such as years with disability.

The expected years of life free of disability, or the expected years of life with disability, is one of the most common measures of health expectancy. It has been estimated for more than 50 countries, including Australia (Robine & Michel 2004; OECD 2011). As this indicator is adjusted for the size and age structure of populations, it allows direct comparison of different population subgroups and analyses of changes over time.

## Methods and data sources

Estimates of health expectancies in this bulletin use the Sullivan method (Sullivan 1971), which is the most widely used method to estimate health expectancies. It requires mortality data taken from period life tables (which show the current probability of death for the population of different ages in the current year) and data on the prevalence of disability or other health states. It modifies the regular life table by applying the age-specific prevalence rates of disability to the number of person years in each age interval of the life table. For more detailed information about the method, see Appendix A of *Changes in life expectancy and disability in Australia 1998 to 2009* (AIHW 2012).

Health expectancies may be expressed in terms of healthy life expectancy such as 'disability-free life expectancy' or 'active life expectancy'. These terms are often used to indicate someone's expected remaining years of life where they do not have limitations or require help with daily activities. Health expectancy may also be expressed in terms of expected years living with disability, or years living with limitations in basic daily activities.

In this bulletin, health expectancies have been estimated and expressed using the following main measures:

- expected years of life lived with disability (capturing all severity levels)
- expected years of life lived with a severe or profound core activity limitation—a subset of the above measure
- expected years of life free of disability
- expected years of life free of a severe or profound core activity limitation
- estimates of each of the above as a proportion of total life expectancy.

Disability does not necessarily equate to poor health or illness. For example, in the early stages of disability associated with paraplegia, the affected persons might be considered in poor health, but once their condition is stable, they might enjoy good health, particularly in the sense that they do not require medical services and can participate in many life areas. Expected years with disability should not be considered as being of less value than years without disability.

Life expectancy has been calculated using mortality data for the three years ending in the year shown in the graphs and tables. Unpublished Australian Bureau of Statistics (ABS) abridged life tables for 1996–1998, 2001–2003, 2007–2009 and 2010–2012 are used together with the age- and sex-specific disability prevalence rates in the calculation of health expectancies. Data on prevalence of disability and severe or profound core activity limitation are from the ABS 1998, 2003, 2009 and 2012 Survey of Disability, Ageing and Carers (SDAC).

ABS disability surveys generally follow the conceptual framework and major concepts of the International Classification of Functioning, Disability and Health (ICF). For details of the SDAC survey definitions of disability and severe or profound core activity limitation, see Appendix B. Detailed disability prevalence data for the Indigenous population are not available from the SDAC.

A summary of the ABS 2012 SDAC data quality declaration can be viewed on the ABS website.

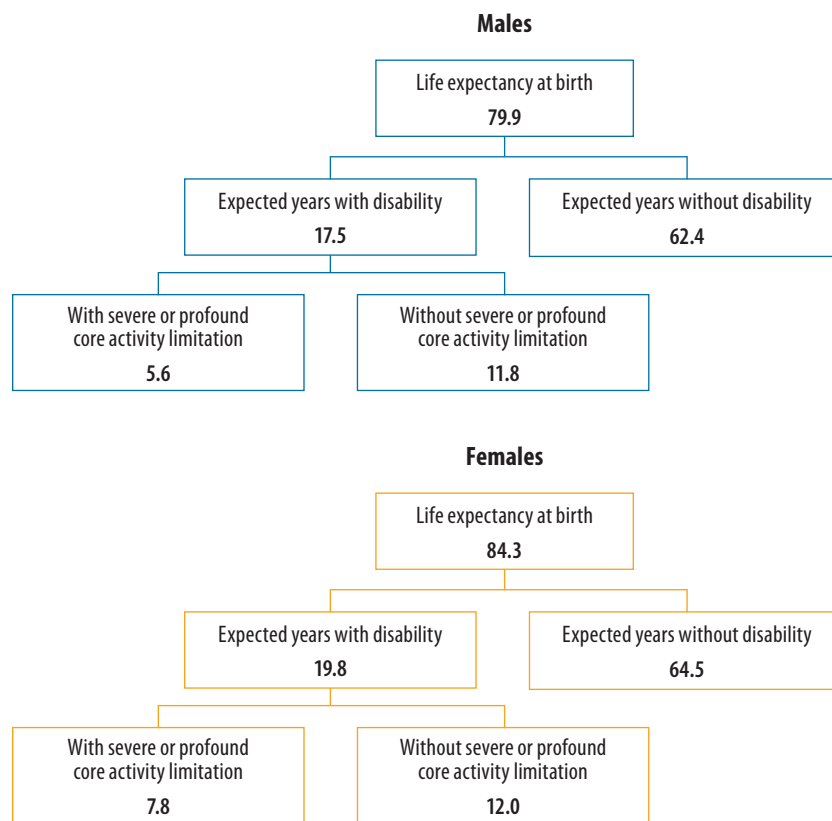
## Health expectancies in 2012

### Health expectancies at birth

In 2012, life expectancy at birth was 79.9 years for Australian males and 84.3 years for females, a difference of 4.4 years (Figure 1).

Males born in 2012 could expect to live 62.4 years without disability and another 17.5 years with some level of disability, including 5.6 years with severe or profound core activity limitation. Females born in 2012 could expect to live an average 64.5 years without disability and another 19.8 years with disability, including 7.8 years with severe or profound core activity limitation (Figure 1).

Years lived with disability account for 22% of total life expectancy for males and 24% of total life expectancy for females. Around 7.1% of total male life expectancy was years with severe or profound core activity limitation, compared with 9% of total female life expectancy (Table A1).



Sources: Table A1; ABS unpublished data table of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 2010–2012.

**Figure 1: Life expectancy and selected health expectancies, by sex, 2012**

## Health expectancies at age 65

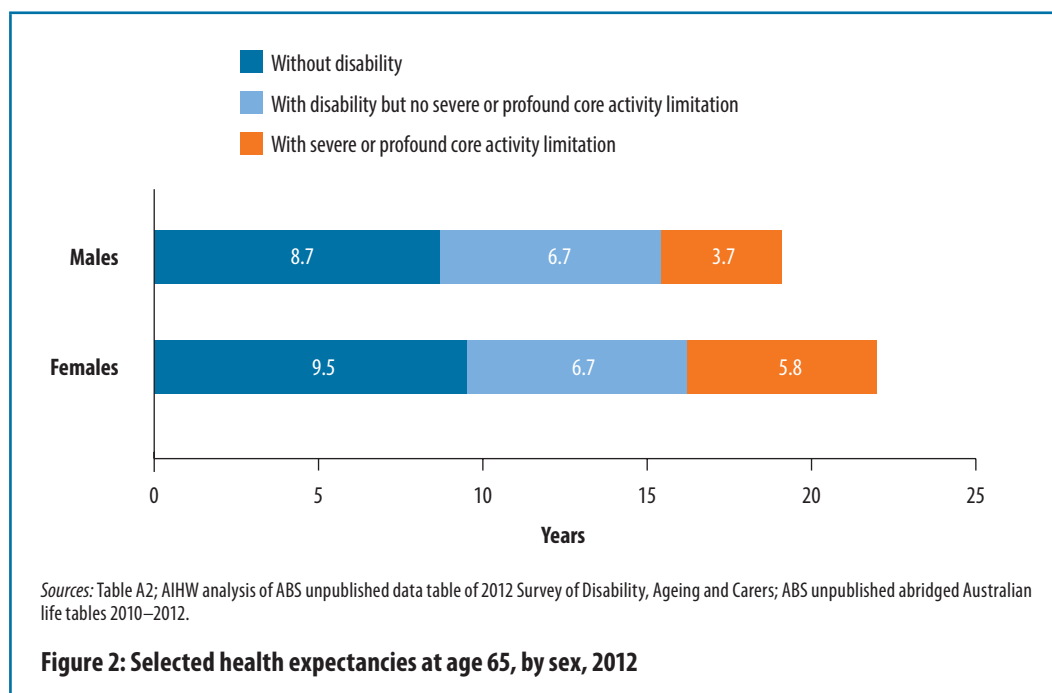
Life and health expectancies at birth are influenced by mortality in early life. Focusing on life and health expectancies at age 65 is more appropriate for monitoring healthy ageing and discussing the issues relating to ‘compression or expansion of morbidity’ (see the section ‘Is morbidity compressing?’).

In 2012, life expectancy at age 65 (that is, the number of additional years a person at age 65 could expect to live) was 19.1 years (to 84.1) for males and 22.0 years (to 87.0) for females.

Males at age 65 in 2012 could expect to live 8.7 years free of disability and 10.4 years with disability, including 3.7 years with severe or profound core activity limitation. Females at age 65 could expect to live 9.5 years free of disability and 12.5 years with disability, including 5.8 years with severe or profound core activity limitation (Figure 2; Table A2).

At age 65, the proportion of remaining years lived with disability was 54.5% for males and 56.8% for females. The proportion of years with severe or profound core activity limitation was 19.4% for males and 26.2% for females (Table A2).

It should be noted that health expectancies at any given age are average estimates for the total population of that age group, including people who already have a disability at the given age. Hence, the expected years of life with disability at age 65 for a person who does not have a disability at age 65 would be fewer than the estimates in Table A2, which average the experience of people with and without disability at 65.



## Trends in health expectancies from 1998 to 2012

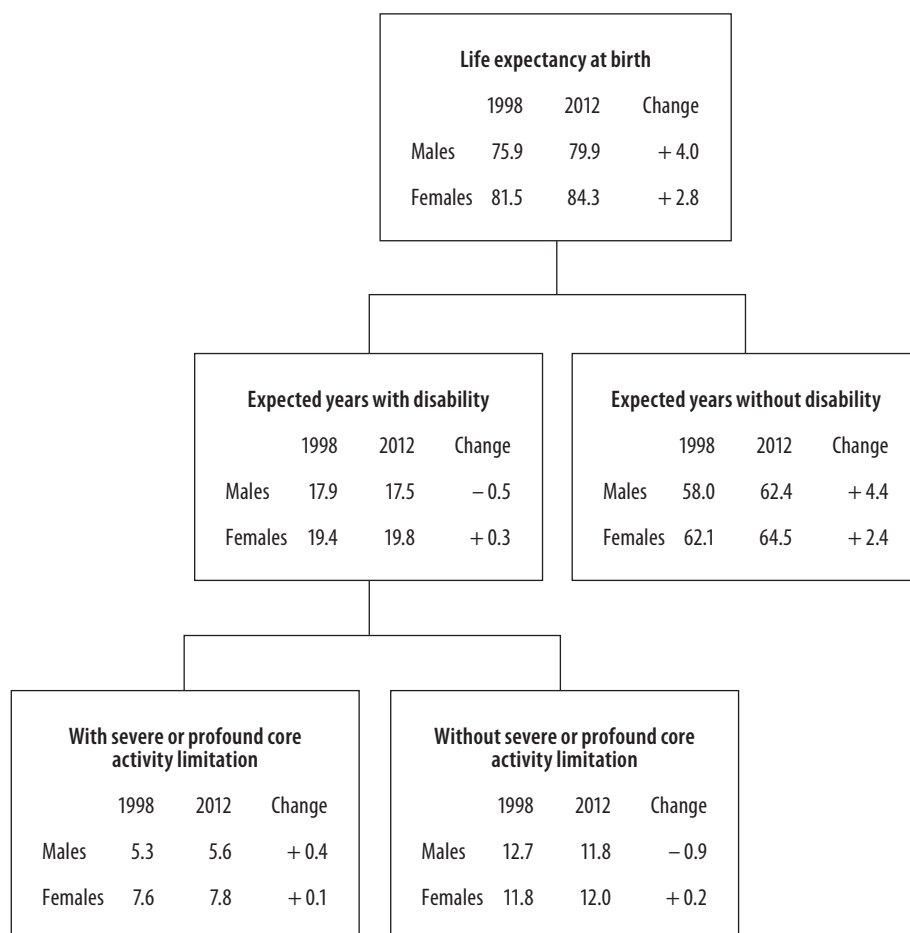
### Changes in health expectancies at birth

From 1998 to 2012, life expectancy at birth increased from 75.9 years to 79.9 years (an extra 4.0 years) for males and from 81.5 years to 84.3 years (an extra 2.8 years) for females (Figure 3). Between each successive survey over this period, the gains in life expectancy declined for both boys and girls (Figure 4).

Most of the increase in life expectancy at birth, for both sexes, was the number of expected years free of disability and severe or profound core activity limitation (Figure 5). The disability-free life expectancy for males increased by 4.4 years—faster than the gain in male life expectancy (by 4 years). The increase in disability-free life expectancy for females was 2.4 years (compared with 2.8 years gain in female life expectancy) (Table A1).

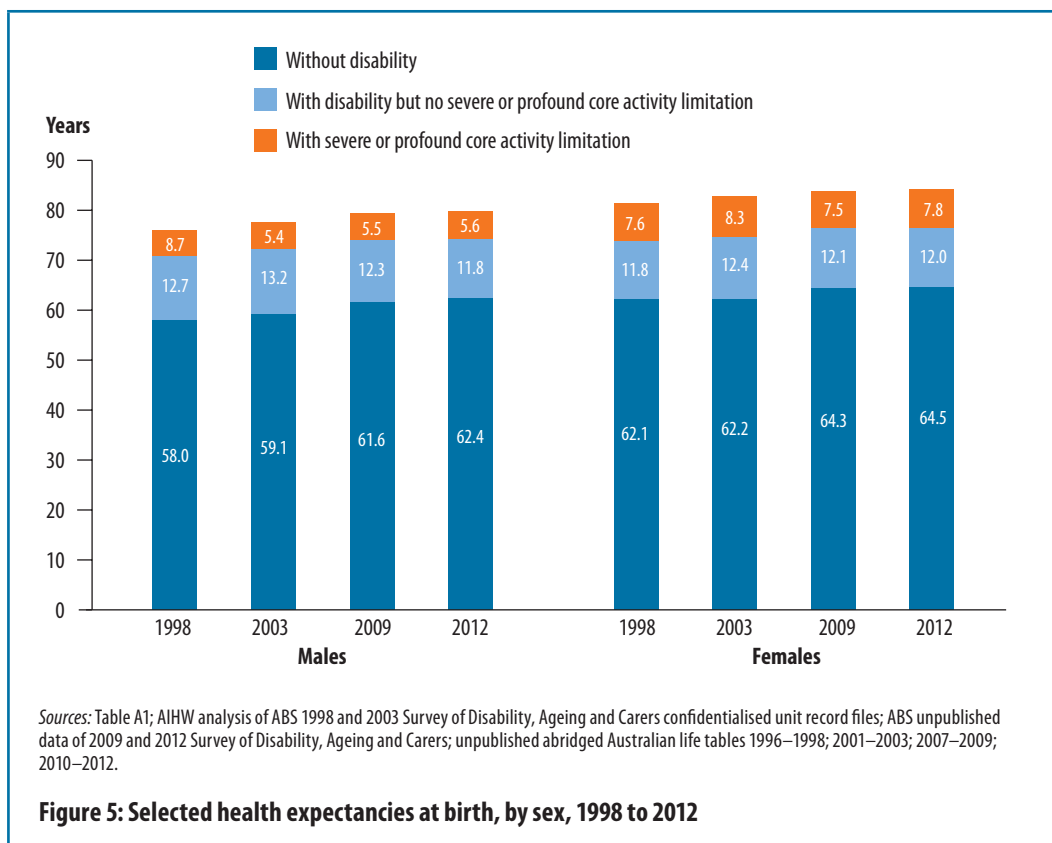
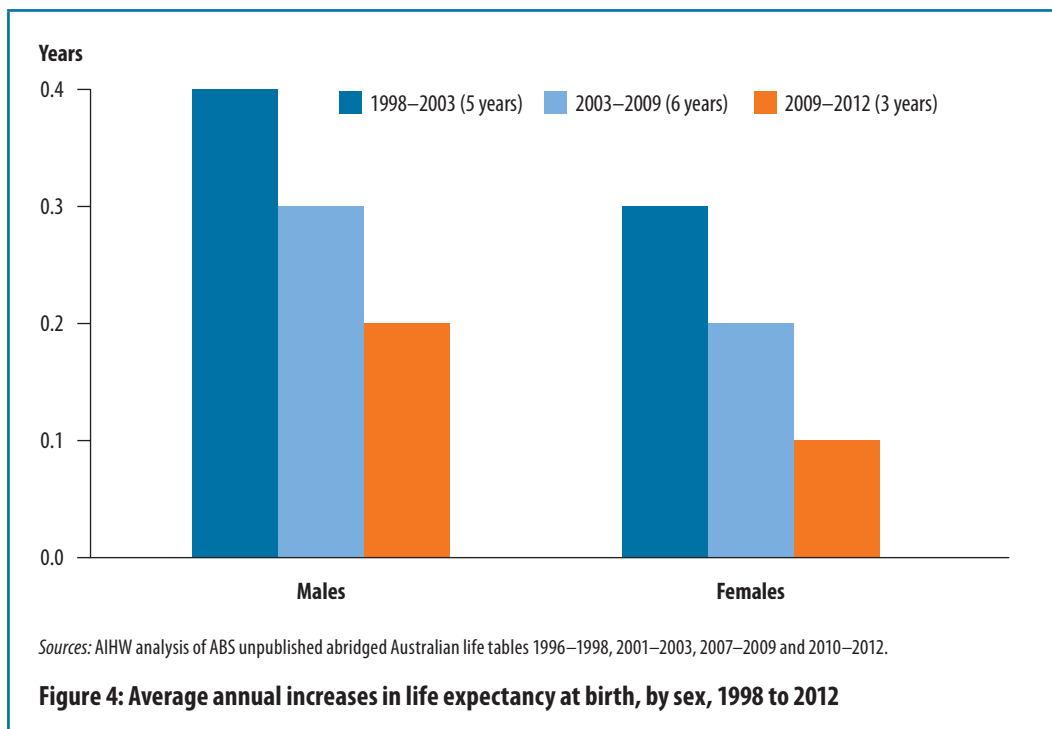
The proportion of disability-free life expectancy rose from 76% to 78% for males and remained at around 76% for females between 1998 and 2012. The proportion of expected years free of severe or profound core activity limitation remained stable at about 93% for males and 91% for females from 1998 to 2012 (Table A1).

Between 1998 and 2012, the expected years of life with disability declined slightly for males, (from 17.9 years to 17.5 years), but increased slightly for females (from 19.4 years to 19.8 years). The expected years with severe or profound core activity limitation increased slightly for both sexes (Figure 3).



Sources: AIHW analysis of ABS 1998 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished data table of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 1996–1998 and 2010–2012.

**Figure 3: Life expectancy and selected health expectancies, by sex, 1998 and 2012**





## Changes in health expectancies at age 65

Life expectancy at age 65 increased by 3.0 years (from 16.1 years to 19.1 years) for males and 2.2 years (from 19.8 years to 22.0 years) for females during 1998–2012 (Table A2). Between each successive survey over this period, the gains in life expectancy declined for both sexes (Figure 6).

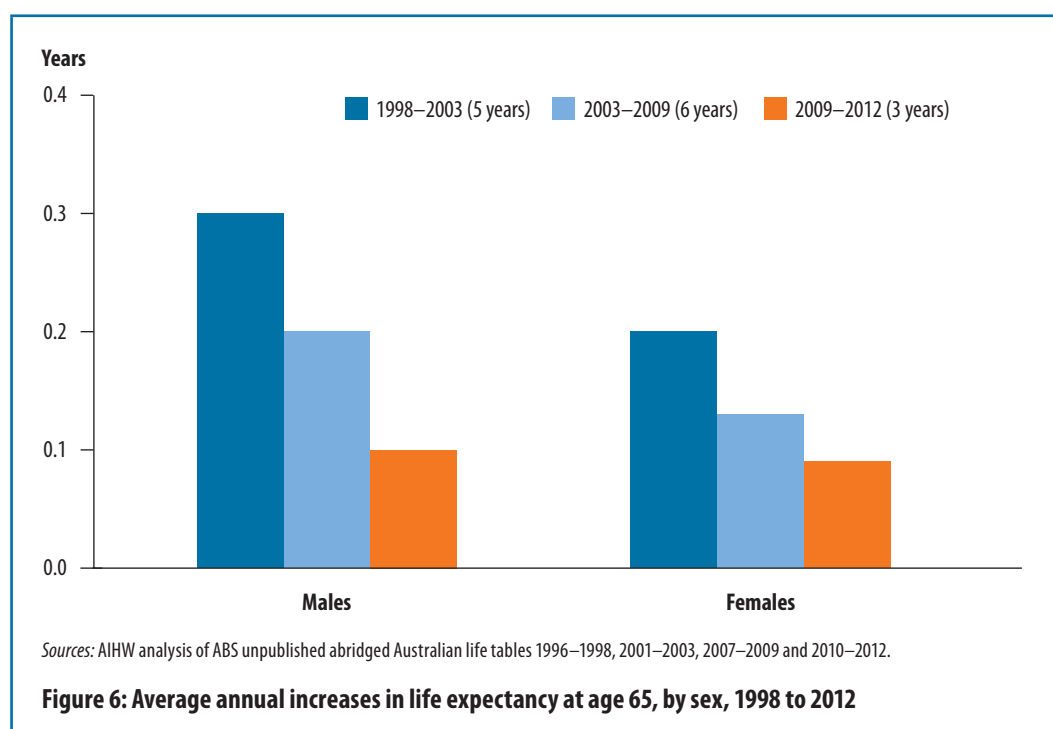
Overall, there was a clear trend of increasing the number of years free of any disability and severe or profound core activity limitation from 1998 to 2012. Along with the increase in life expectancy at age 65, on average, both males and females gained more years without severe or profound core activity limitation than with it: 2.3 years versus 0.7 years for males and 2.0 years versus 0.3 years for females. Males gained more (1.6 years) in the expected years free of disability than females (0.8 years) (Figure 7, Table A2).

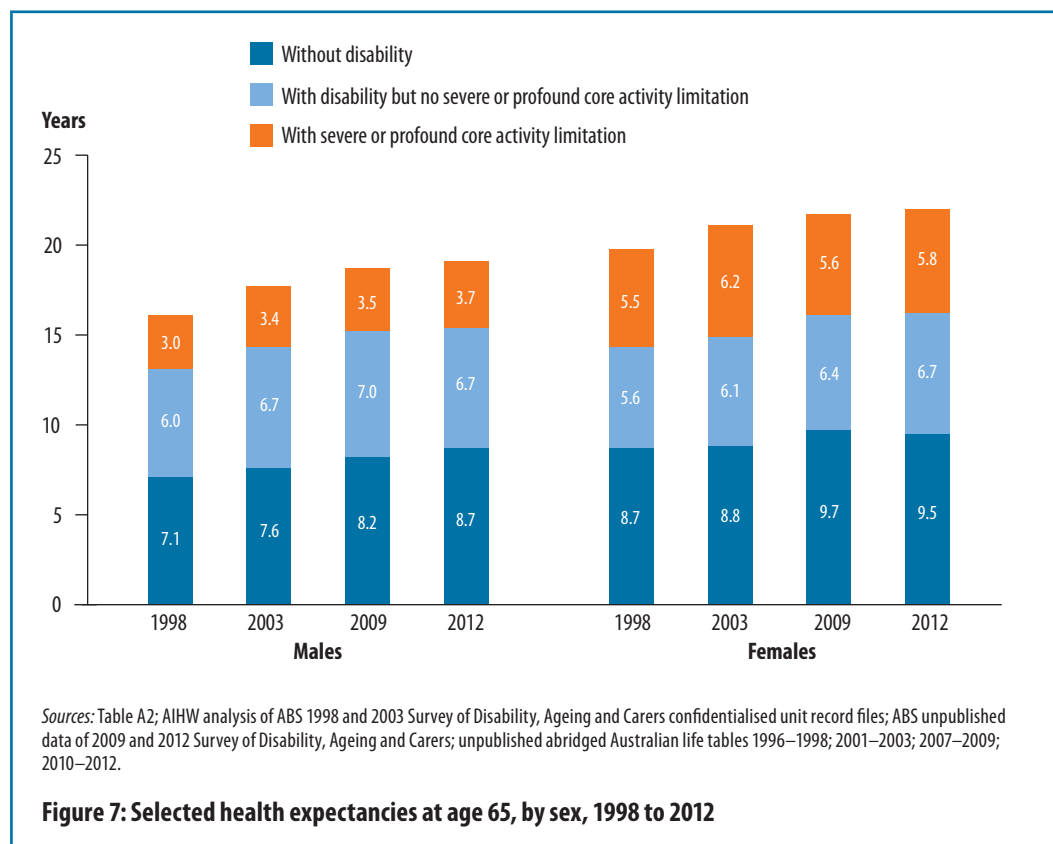
At age 65, 76% of the gains in male life expectancy and almost 90% of the gains in female life expectancy were expected years without severe or profound core activity limitation (Tables A4 and A5).

At age 65, 46% of the extra years in life expectancy for males and 64% for females were years with disability (Tables A4 and A5). The expected years with disability at age 65 increased by 1.4 years for both males and females (Figure 7).

The proportion of expected years with disability at age 65 dropped from 56.0% to 54.5% for males but increased slightly from 56.0% to 56.8% for females (Table A2).

The proportion of expected years with severe or profound core activity limitation remained about the same (around 19%) for males in 1998–2012, while the proportion for females fell from 28% to 26% (Table A2).





## Age and sex differences in health expectancies in 2012

Overall, females could expect to live more years both with and without disability and severe or profound core activity limitation than males could (figures 1 and 8).

The gender difference in life expectancy narrowed with age, from 4.4 years at birth to 2.9 years at age 65, and to 1.1 years at age 85 or over (Figure 9).

### Differences in expected years living with disability

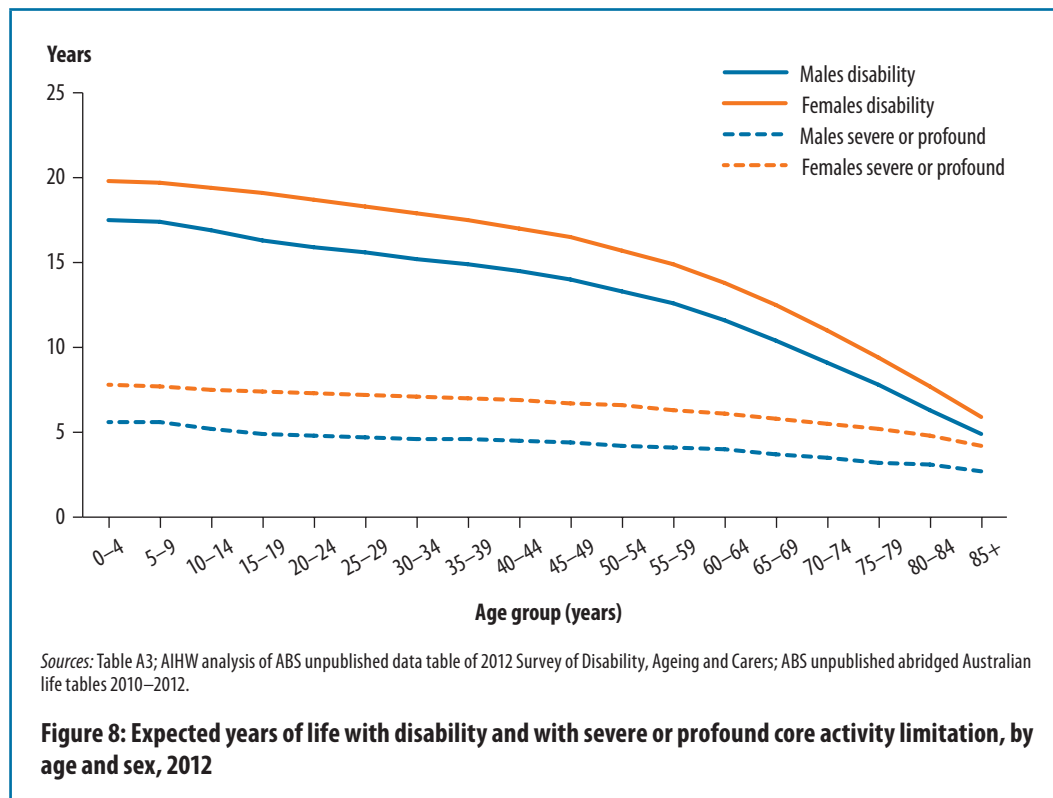
Females had more expected years with disability than males had at all ages (Figure 8). The sex difference was around 2.5 to 2.8 years for people at ages 10 to 54, and then it gradually declined among people at older ages, with a minor difference of 1 year for people at age 85 or older (Figure 9).

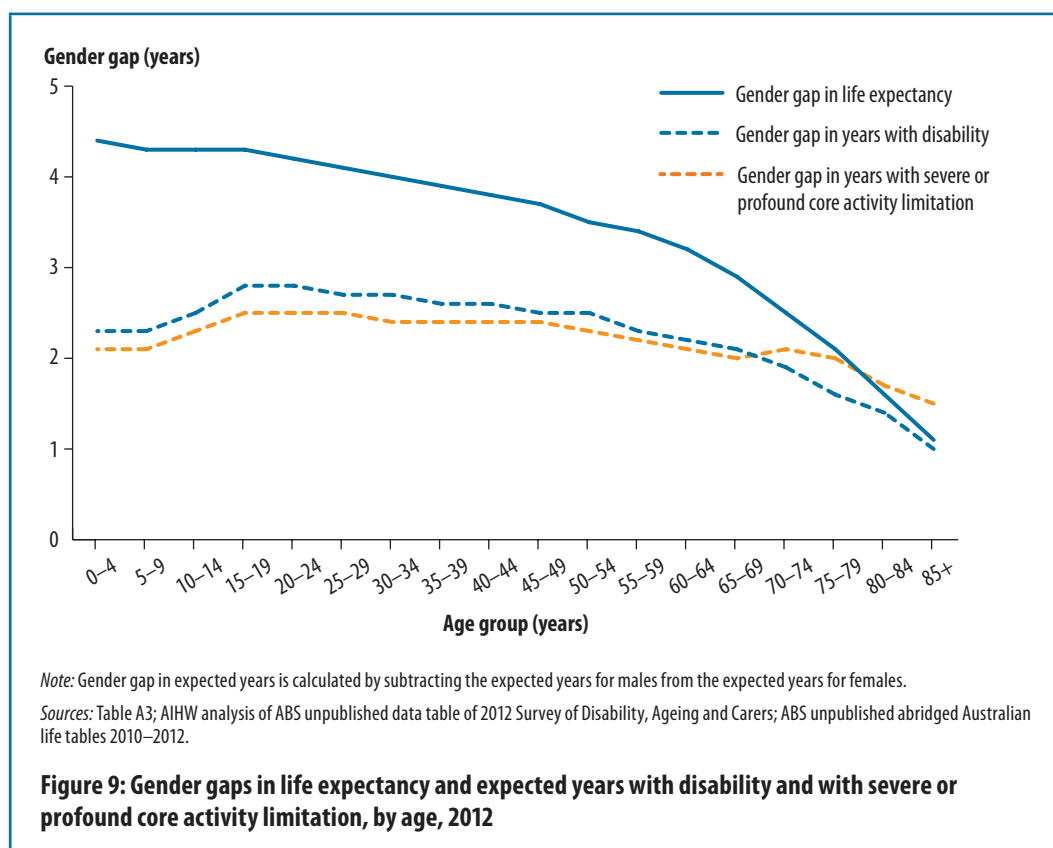
The sex difference in the expected years with disability was proportionally larger than that for years with severe or profound core activity limitation among people at age under 70 (Figure 9).

In contrast, the difference in the years with severe or profound core activity limitation was proportionally larger than that for years with disability among people aged 70 and over, and it was even larger than the difference for life expectancy among those at age 85 or older (Figure 9). This was partly related to higher prevalence rates of severe or profound core activity limitation for older females than for older males (see the section 'Sex differences in disability prevalence rates 2012').

The relatively high expected years with disability for females was mainly related to their higher life expectancy, as there were no substantial sex differences in age-specific prevalence rates of disability in most age groups except for children aged 5 to 14 (see the section ‘Sex differences in disability prevalence rates 2012’).

The sex differences in the expected years with severe or profound core activity limitation among the older population were related to both higher life expectancy and higher prevalence rates of severe or profound core activity limitation for females than for males, especially those aged 75 or over (see the section ‘Sex differences in disability prevalence rates 2012’).





## Differences in expected years living free of disability

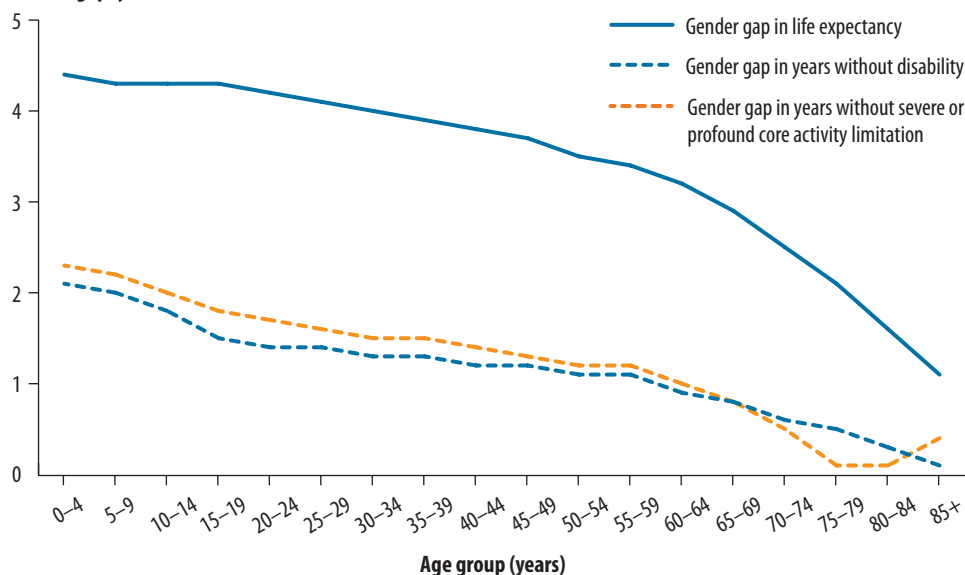
Although overall life expectancy was higher for females than for males, the sex difference in disability-free years was smaller (Figure 10).

The sex difference in the expected years free of disability and severe or profound core activity limitation decreased gradually with age. This was associated with a decreasing gender gap in life expectancy and increasing disability prevalence rates with age for both sexes (Figure 10).

The proportion of years free of disability to total life expectancy for males (78%) was slightly higher than females (77%) at birth and at age 65 (46% versus 43%) (tables A1 and A2).

The sex difference was marked in the proportion of years free of severe or profound core activity limitation among people at age 65: 81% for males and 74% for females (Table A2).

**Gender gap (years)**



Note: Gender gap in expected years is calculated by subtracting the expected years for males from the expected years for females.

Sources: Table A3; AIHW analysis of ABS unpublished data table of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 2010–2012.

**Figure 10: Gender gaps in life expectancy and expected years without disability and without severe or profound core activity limitation, by age, 2012**

The literature does not provide a full understanding about whether behavioural factors explain most of the gender gaps or whether biological and social differences contribute more to the gender gaps in mortality (life expectancy) and health expectancies (Oksuzyan et al. 2010). Overseas analyses of longitudinal survey data have suggested that the greater proportion of years lived with disability or daily activity limitations by women could be explained by the longer survival of women after the development of these problems (Robine et al. 1999). It is also possible that, for any morbidity level, males are more active, displaying less disability (for example, less likely to report disability) as well as engaging in risky behaviours that shorten their life (Robine & Jagger 2005)(also see the next section ‘Changes in sex differences in health expectancies’).

## Change in gender gap in health expectancies 1998 to 2012

From 1998 to 2012, the gender gap in life expectancy narrowed across all ages, especially among people at ages younger than 70 years (Table 1). This was attributable to the greater gains in life expectancy for males than females across all ages. Life expectancy for people at ages younger than 70 increased by 3.0 to 4.0 years for males, and by 2.2 to 2.8 years for females (tables A5 and A6).

The gender gap in the expected number of years living free of disability and severe or profound core activity limitation also reduced across most ages (Table 1), which was due to larger gains for males than females in these health expectancies (tables A5 and A6).

The reduction in the gender gap in disability-free life expectancy was greater at younger ages. The gender gap in the expected years free of disability at birth was almost halved, from 4.1 years to 2.1 years (Table 1). For people in age brackets under 65, the reduction in the gap in disability-free life expectancy was greater than the reduction in the gap in overall life expectancy (Table 1).

Among older Australians, the gender gap narrowed in life expectancy and the expected years both with and without disability and severe or profound core activity limitation (tables 1 and 2). At age 65, the gender gap in years living free of disability was halved, from 1.6 years to 0.8 years, and the gap in years without severe or profound core activity limitation reduced from 1.2 years to 0.8 years (Table 1).

**Table 1: Changes in gender gap in life expectancy (LE), expected years without disability (DFLE) and without severe or profound core activity limitation (SPFLE), between 1998 and 2012, by age**

Age	Gender gap in LE		Change in 1998–2012	Gender gap in DFLE		Change in 1998–2012	Gender gap in SPFLE		Change in 1998–2012
	1998	2012		1998	2012		1998	2012	
0–4	5.6	4.4	–1.2	4.1	2.1	–2.0	3.2	2.3	–0.9
5–9	5.5	4.3	–1.2	3.9	2.0	–1.9	3.0	2.2	–0.9
10–14	5.5	4.3	–1.2	3.7	1.8	–2.0	2.9	2.0	–0.9
15–19	5.5	4.3	–1.2	3.4	1.5	–1.9	2.7	1.8	–0.9
20–24	5.4	4.2	–1.2	3.2	1.4	–1.8	2.6	1.7	–0.9
25–29	5.2	4.1	–1.1	3.0	1.4	–1.6	2.4	1.6	–0.8
30–34	5.0	4.0	–1.0	2.8	1.3	–1.5	2.2	1.5	–0.7
35–39	4.8	3.9	–1.0	2.6	1.3	–1.3	2.1	1.5	–0.6
40–44	4.7	3.8	–0.9	2.4	1.2	–1.2	2.0	1.4	–0.6
45–49	4.6	3.7	–0.9	2.3	1.2	–1.1	1.9	1.3	–0.6
50–54	4.4	3.5	–0.9	2.3	1.1	–1.2	1.9	1.2	–0.7
55–59	4.3	3.4	–0.9	2.2	1.1	–1.1	1.8	1.2	–0.6
60–64	4.1	3.2	–0.9	2.1	0.9	–1.2	1.5	1.0	–0.5
65–69	3.7	2.9	–0.8	1.6	0.8	–0.8	1.2	0.8	–0.3
70–74	3.1	2.5	–0.6	1.1	0.6	–0.5	0.7	0.5	–0.2
75–79	2.5	2.1	–0.4	0.7	0.5	–0.2	0.2	0.1	–0.1
80–84	1.9	1.6	–0.2	0.2	0.3	0.0	0.1	0.1	–0.1
85+	1.2	1.1	–0.1	0.2	0.1	–0.1	0.3	0.4	0.1

Sources: AIHW analysis of ABS 1998 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished tables of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 1996–1998 and 2010–2012.

The relatively small reduction in gender gap in the expected years with severe or profound core activity limitation (Table 2) was partially attributable to a larger increase for males than females in the expected years with this limitation across ages, along with the relatively large gains in the overall life expectancy for males compared with females (tables A5 and A6).

Although the gender gap in the expected years with disability widened among people at ages under 65 (Table 2), this was partly related to a decline in expected years with disability among males at ages under 35 and a greater increase for females than males in the years with disability among people at ages under 65 (tables A5 and A6).

**Table 2: Changes in gender gap in expected years with disability (DLE) and with severe or profound core activity limitation (SPLE), between 1998 and 2012, by age**

Age	Gender gap in DLE		Change in 1998–2012	Gender gap in SPLE		Change in 1998–2012
	1998	2012		1998	2012	
0–4	1.5	2.3	0.8	2.4	2.1	–0.3
5–9	1.6	2.3	0.7	2.5	2.1	–0.4
10–14	1.8	2.5	0.7	2.6	2.3	–0.3
15–19	2.1	2.8	0.7	2.8	2.5	–0.3
20–24	2.2	2.8	0.7	2.8	2.5	–0.3
25–29	2.2	2.7	0.5	2.8	2.5	–0.3
30–34	2.2	2.7	0.5	2.7	2.4	–0.3
35–39	2.2	2.6	0.4	2.8	2.4	–0.4
40–44	2.3	2.6	0.3	2.7	2.4	–0.3
45–49	2.3	2.5	0.2	2.7	2.4	–0.3
50–54	2.1	2.5	0.3	2.6	2.3	–0.2
55–59	2.1	2.3	0.2	2.5	2.2	–0.3
60–64	1.9	2.2	0.3	2.6	2.1	–0.5
65–69	2.1	2.1	0.0	2.5	2.0	–0.5
70–74	2.1	1.9	–0.1	2.5	2.1	–0.4
75–79	1.8	1.6	–0.2	2.3	2.0	–0.3
80–84	1.6	1.4	–0.3	2.0	1.7	–0.3
85+	1.0	1.0	0.0	1.5	1.5	–0.1

Sources: AIHW analysis of ABS 1998 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished tables of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 1996–1998 and 2010–2012.

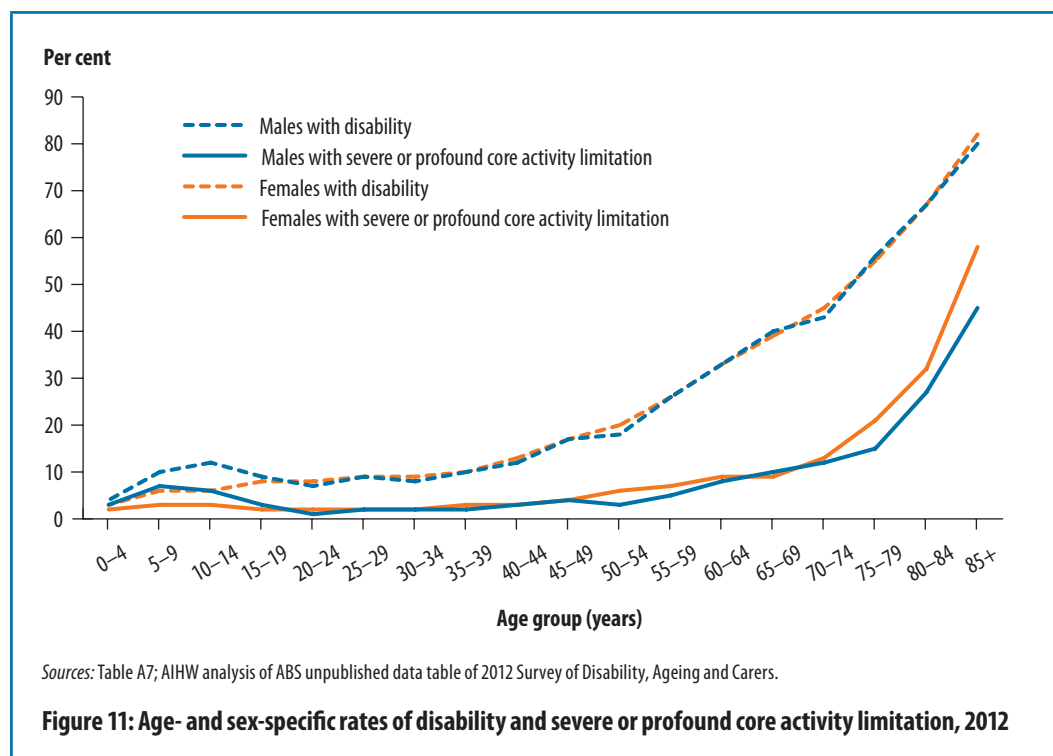
## Disability prevalence rates 1998 to 2012

The expected years of life living with or without disability have been estimated using combined data sources of mortality (life tables) and disability prevalence rates. Hence, an examination of patterns and changes in disability prevalence rates could shed light on the patterns and trends in health expectancies.

### Sex differences in disability prevalence rates in 2012

In 2012, there were no substantial sex differences in age-specific rates of disability in most age groups except for children aged 5 to 14 (Figure 11). The relatively high expected years of life with disability for females was mainly related to their higher life expectancy.

However, among the older population, the relatively high expected years of severe or profound core activity limitation for older females was related to both higher life expectancy and higher prevalence rates of severe or profound core activity limitation for females than for males, especially those aged 75 or over (Figure 11).



## Changes in disability prevalence rates 1998 to 2012

The main findings of the analysis show that the gains in expected years living free of disability and severe or profound core activity limitation were associated with increasing longevity of people and a decrease in disability rates as reported in the SDAC. The reduced gender gaps in health expectancies were partly associated with sex differences in the decline in disability rates.

The overall crude rate (that is, the rate that has not be adjusted for differences in age structures) of disability for males fell by 1.6 percentage points (from 19.6% to 18.0%) between 1998 and 2012. The decline in the rates occurred among males both aged under 65 (from 15.5% to 12.9%) and 65 or over (from 54.0% to 51.3%) (Table A7, Figure 12).

The decline in male disability rates (Figure 12) partly explains the larger increase in the expected years living free of disability for younger males and the slight decline in the expected years with disability for males at ages under 35 (Table A5).

Between 1998 and 2012, the overall crude rate of disability for females remained at 19%. However, the rate fell slightly for females aged under 65 from 13.6% to 12.7% (Table A7, Figure 13). This might partly explain the smaller increase in expected years with disability among younger females compared with older females (Table A6).

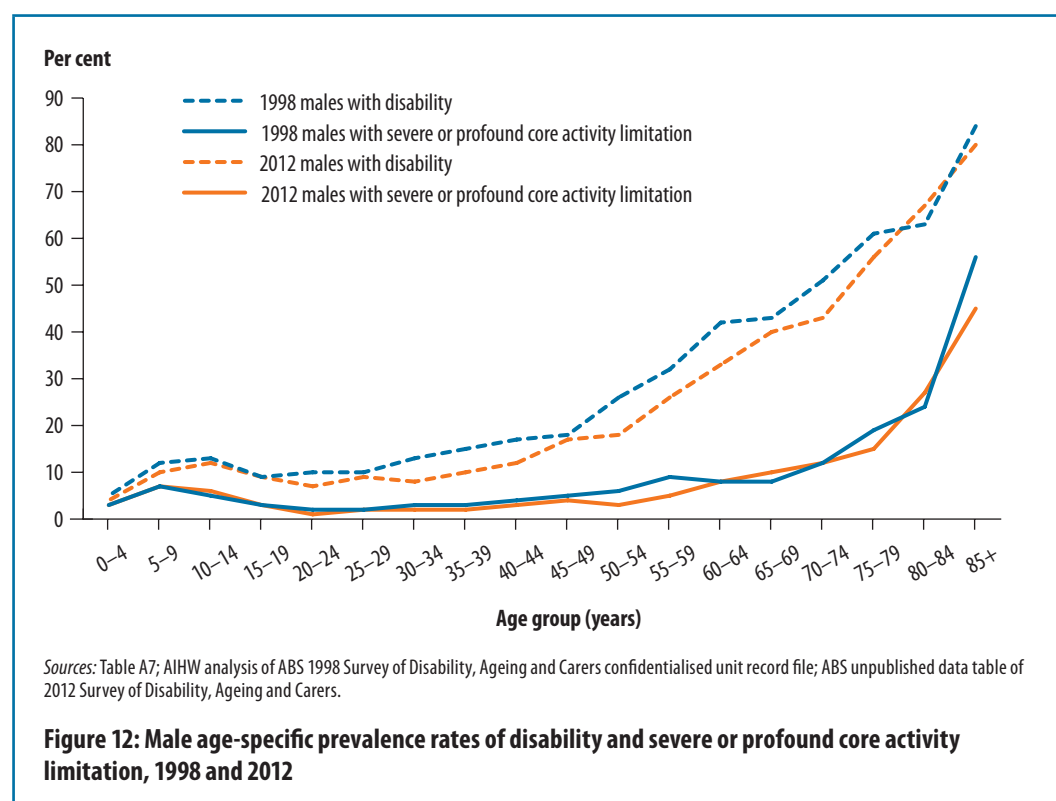
The overall crude rates of severe or profound core activity limitation remained stable for both males (5.4%) and females (6.7%) from 1998 to 2012. However, the rate for females aged 65 and over declined from 24.9% to 23.1%, while the rate for males of the same age increased slightly, from 16.3% to 17.1% (Table A7, figures 12 and 13). These contrasting trends in rates partly account for the larger increase for older males than older females in expected years with severe or profound core activity limitation (tables A5 and A6).

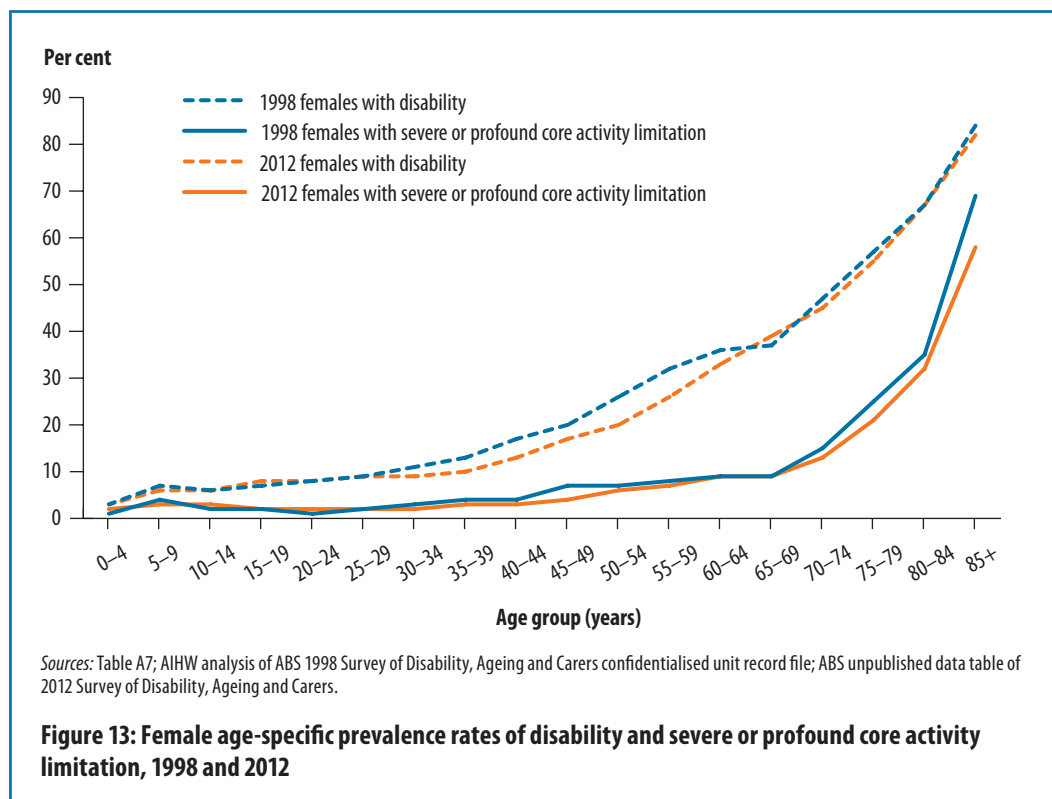


The age-standardised rates take into account the changes in population age structures over time. The age-standardised rates of disability and severe or profound core activity limitation declined more significantly than crude rates for both sexes from 1998 to 2012. The differences between the age-standardised disability rates and crude disability rates were mainly related to the increase in the proportion of older people in the population:

- The age-standardised disability rate declined by 3.4 percentage points (1.6 percentage points for the crude rate) for males and by 1.8 percentage points (the crude rate was stable) for females (tables A7 and A8).
- Among people aged 65 and over, the age-standardised rates of disability declined by 3.9 percentage points for males (2.7 percentage points for the crude rate) and by 0.7 percentage points for females (the crude rate was stable) (tables A7 and A8).
- The age-standardised rates of severe or profound core activity limitation declined by 1.2 percentage points for males aged 65 and over (increased by 0.8 percentage points in the crude rate) and by 3 percentage points for females of that age (1.8 percentage points in the crude rate) (tables A7 and A8).

This suggests that the ageing of the Australian population has increased disability prevalence rates and expected years of life with disability.





## Is morbidity compressing?

### Proposed health scenarios and related measures of health expectancies

The relationships among mortality, morbidity and disability are complex. Three broad health scenarios have been proposed to describe the evolution of mortality, morbidity and disability and thus the health consequences of increasing life expectancy at older ages (Box 1). The three scenarios have been expressed in terms of changes in various relationships between life expectancy and the expected years of life with disability. Any particular situation can be classified as a combination of absolute compression or expansion of morbidity (according to the change in the number of years lived with or without disability), combined with relative compression or expansion of morbidity (according to changes in the proportion of expected life lived with or without disability). For a detailed review of the proposed health scenarios and international literature, see AIHW 2012.

Evidence and conclusions in the international literature are contradictory about trends in the relationships among longevity, morbidity and disability in the older population (for example, Robine et al. 2009).

The conflicting evidence of the literature indicates that measuring the relationship between longevity and morbidity and disability is much more complicated than each of the basic scenarios and individual studies might suggest. Apart from variations in the definitions and data sources, various studies often attempt to fit the data into one of the proposed health scenarios and do not reflect a full picture of the relationships. It might be necessary to consider a framework that allows a comprehensive description of both positive and negative changes in the relationship between longevity and health status.

## Box 1: Health scenarios and related measures of health expectancies

### Compression of morbidity

- In this scenario, the period living with ill-health and disability before death is shortened because of a delay in onset of chronic disease or disability and a slowdown in the rate of increase in life expectancy.
- If the number of expected years of life with disability falls, there is an absolute compression of morbidity.
- If the proportion of expected years of life with disability falls without the number of expected years of disability decreasing (it could even rise), there is a relative compression of morbidity.

### Expansion of morbidity

- In this scenario, increasing longevity is accompanied by more survivors who are frail and suffer from chronic conditions, resulting in a longer period living with disability before death.
- If the number of expected years of life free of disability falls, there is an absolute expansion of morbidity.
- If the proportion of expected years free of disability falls without the number of expected disability-free years decreasing (it could even rise) there is a relative expansion of morbidity.

### Dynamic equilibrium

- In this scenario, the overall level of diseases or disability increases largely due to the increase of less severe diseases or disability, while the prevalence of severe diseases or disability falls or remains stable, due to the rate of progression of disease or disability slowing down.
- If the ratio of disability-free life expectancy to total life expectancy is constant, there is an equilibrium.
- For the severity of disability, if the number of years with disabilities—all levels combined—increases, while the number of years with severe disability remains constant or even falls within life expectancy, there is said to be ‘dynamic equilibrium’.

Sources: Robine et al. 2000; Howse 2006.

## Recent Australian evidence relating to the proposed health scenarios

This analysis found no evidence of absolute expansion of disability for older Australians from 1998 to 2012, because the gains in life expectancy at age 65 years were accompanied by increases in the expected years both with and without disability or severe or profound core activity limitation. Both sexes gained more years without severe or profound core activity limitation than with it.

There is also no consistent evidence suggesting the ‘dynamic equilibrium’ scenario for older Australians, because the expected years with severe or profound core activity limitation continued to increase slightly in 1998–2012, along with the increase in the years with disability as a whole.

During 1998–2012, there is also no evidence of absolute compression of disability among older Australians, irrespective of the level of disability. At age 65, gains in the expected years free of disability and severe or profound core activity limitation were not greater than the gains in life expectancy. Gains in longevity were accompanied by increases in the expected years of disability as well as severe or profound core activity limitation (Table A2).

These current findings confirm that no single scenario applies in Australia over the study period; rather, a combination of positive and negative changes is evident, consistent with recent international experience.

## Appendix A: Appendix tables

**Table A1: Expected years of life at birth without disability, with disability and with severe or profound core activity limitation, by sex, 1998 to 2012**

	Number of expected years				Per cent of total life expectancy			
	1998	2003	2009	2012	1998	2003	2009	2012
<b>Males</b>								
<b>Expected years of life:</b>								
With disability (all severity levels)	17.9	18.6	17.7	17.5	23.6	24.0	22.3	21.9
With severe or profound core activity limitation	5.3	5.4	5.5	5.6	6.9	7.0	6.9	7.1
Without disability	58.0	59.1	61.6	62.4	76.4	76.0	77.7	78.1
Without severe or profound core activity limitation	70.7	72.3	73.9	74.2	93.1	93.0	93.1	92.9
<b>Total life expectancy at birth</b>	<b>75.9</b>	<b>77.8</b>	<b>79.3</b>	<b>79.9</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Females</b>								
<b>Expected years of life:</b>								
With disability (all severity levels)	19.4	20.7	19.6	19.8	23.8	24.9	23.4	23.5
With severe or profound core activity limitation	7.6	8.3	7.5	7.8	9.4	10.0	9.0	9.2
Without disability	62.1	62.2	64.3	64.5	76.2	75.1	76.6	76.5
Without severe or profound core activity limitation	73.9	74.6	76.4	76.5	90.6	90.0	91.0	90.8
<b>Total life expectancy at birth</b>	<b>81.5</b>	<b>82.8</b>	<b>83.9</b>	<b>84.3</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Sources: AIHW analysis of ABS 1998 and 2003 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished data of 2009 and 2012 Survey of Disability, Ageing and Carers; unpublished abridged Australian life tables 1996–1998; 2001–2003; 2007–2009; 2010–2012.

**Table A2: Expected years of life at age 65 without disability, with disability and with severe or profound core activity limitation, by sex, 1998 to 2012**

	Number of expected years				Per cent of total life expectancy			
	1998	2003	2009	2012	1998	2003	2009	2012
<b>Males</b>								
<b>Expected years of life:</b>								
With disability (all severity levels)	9.0	10.0	10.5	10.4	56.0	57.0	56.1	54.5
With severe or profound core activity limitation	3.0	3.4	3.5	3.7	18.6	19.0	18.8	19.4
Without disability	7.1	7.6	8.2	8.7	44.0	43.0	43.9	45.5
Without severe or profound core activity limitation	13.1	14.3	15.2	15.4	81.4	81.0	81.2	80.6
<b>Total life expectancy at age 65</b>	<b>16.1</b>	<b>17.6</b>	<b>18.7</b>	<b>19.1</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Females</b>								
<b>Expected years of life:</b>								
With disability (all severity levels)	11.1	12.2	12.1	12.5	56.0	58.2	55.5	56.8
With severe or profound core activity limitation	5.5	6.2	5.6	5.8	27.9	29.4	25.8	26.2
Without disability	8.7	8.8	9.7	9.5	44.0	41.8	44.5	43.2
Without severe or profound core activity limitation	14.3	14.8	16.1	16.3	72.1	70.6	74.2	73.8
<b>Total life expectancy at age 65</b>	<b>19.8</b>	<b>21.0</b>	<b>21.8</b>	<b>22.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Sources: AIHW analysis of ABS 1998 and 2003 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished data of 2009 and 2012 Survey of Disability, Ageing and Carers; unpublished abridged Australian life tables 1996–1998; 2001–2003; 2007–2009; 2010–2012.

**Table A3: Life expectancy and disability, by age and sex, Australia, 2012 (years)**

Age	Males					Females				
	LE	DLE	SPLE	DFLE	SPFLE	LE	DLE	SPLE	DFLE	SPFLE
0–4	79.9	17.5	5.6	62.4	74.2	84.3	19.8	7.8	64.5	76.5
5–9	75.3	17.4	5.6	57.9	69.8	79.6	19.7	7.7	59.9	71.9
10–14	70.4	16.9	5.2	53.5	65.1	74.6	19.4	7.5	55.2	67.1
15–19	65.4	16.3	4.9	49.1	60.5	69.7	19.1	7.4	50.6	62.3
20–24	60.5	15.9	4.8	44.6	55.8	64.7	18.7	7.3	46.0	57.5
25–29	55.7	15.6	4.7	40.1	51.0	59.8	18.3	7.2	41.5	52.6
30–34	50.9	15.2	4.6	35.7	46.3	54.9	17.9	7.1	37.0	47.8
35–39	46.1	14.9	4.6	31.2	41.6	50.0	17.5	7.0	32.5	43.0
40–44	41.4	14.5	4.5	26.9	36.9	45.2	17.0	6.9	28.1	38.3
45–49	36.7	14.0	4.4	22.7	32.3	40.4	16.5	6.7	23.9	33.6
50–54	32.1	13.3	4.2	18.8	27.9	35.6	15.7	6.6	19.9	29.1
55–59	27.6	12.6	4.1	15.0	23.5	31.0	14.9	6.3	16.1	24.7
60–64	23.3	11.6	4.0	11.7	19.3	26.4	13.8	6.1	12.6	20.4
65–69	19.1	10.4	3.7	8.7	15.4	22.0	12.5	5.8	9.5	16.3
70–74	15.3	9.1	3.5	6.2	11.8	17.8	11.0	5.5	6.8	12.3
75–79	11.7	7.8	3.2	3.9	8.5	13.8	9.4	5.2	4.4	8.6
80–84	8.6	6.3	3.1	2.3	5.5	10.2	7.7	4.8	2.6	5.5
85+	6.1	4.9	2.7	1.2	3.4	7.2	5.9	4.2	1.3	3.0

Sources: AIHW analysis of ABS unpublished data of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 2010–2012.

**Table A4: Life expectancy and disability, by age and sex, Australia, 1998 (years)**

Age	Males					Females				
	LE	DLE	SPLE	DFLE	SPFLE	LE	DLE	SPLE	DFLE	SPFLE
0–4	75.9	17.9	5.3	58.0	70.7	81.5	19.4	7.6	62.1	73.9
5–9	71.4	17.8	5.1	53.6	66.3	77.0	19.4	7.6	57.5	69.3
10–14	66.5	17.3	4.8	49.2	61.7	72.0	19.0	7.4	53.0	64.6
15–19	61.6	16.7	4.6	44.9	57.0	67.0	18.8	7.3	48.3	59.7
20–24	56.8	16.3	4.5	40.5	52.3	62.1	18.4	7.2	43.7	54.9
25–29	52.1	15.9	4.4	36.2	47.7	57.2	18.0	7.2	39.2	50.1
30–34	47.4	15.4	4.3	31.9	43.0	52.3	17.6	7.1	34.7	45.3
35–39	42.6	14.9	4.2	27.7	38.4	47.5	17.1	7.0	30.3	40.5
40–44	37.9	14.3	4.1	23.7	33.8	42.6	16.6	6.8	26.1	35.8
45–49	33.3	13.6	4.0	19.7	29.3	37.8	15.8	6.6	22.0	31.2
50–54	28.7	12.8	3.8	15.9	24.9	33.1	14.9	6.3	18.2	26.8
55–59	24.2	11.7	3.5	12.5	20.7	28.5	13.8	6.1	14.7	22.4
60–64	20.0	10.5	3.2	9.5	16.8	24.1	12.5	5.8	11.6	18.3
65–69	16.1	9.0	3.0	7.1	13.1	19.8	11.1	5.5	8.7	14.3
70–74	12.7	7.8	2.9	4.9	9.8	15.9	9.9	5.4	6.0	10.5
75–79	9.7	6.5	2.9	3.2	6.8	12.2	8.4	5.2	3.8	7.1
80–84	7.2	5.2	2.7	2.0	4.4	9.0	6.8	4.8	2.2	4.3
85+	5.2	4.4	2.9	0.8	2.3	6.4	5.4	4.4	1.0	2.0

Sources: AIHW analysis of ABS unpublished data of 1998 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 1996–1998.

**Table A5: Increase in life expectancy and selected health expectancies, by age, males, between 1998 and 2012**

Age	Increases in LE (years)	Change in expected years of				Change relative to increase in LE (per cent)			
		DLE	SPL	DFLE	SPFLE	DLE	SPL	DFLE	SPFLE
0-4	4.0	-0.5	0.4	4.4	3.6	-11.7	9.8	111.7	90.2
5-9	3.9	-0.4	0.4	4.3	3.5	-11.5	10.6	111.5	89.4
10-14	3.9	-0.4	0.4	4.3	3.5	-10.3	10.3	110.3	89.7
15-19	3.8	-0.4	0.3	4.2	3.5	-9.4	8.9	109.4	91.1
20-24	3.8	-0.4	0.3	4.1	3.5	-9.7	7.9	109.7	92.1
25-29	3.7	-0.2	0.3	3.9	3.4	-6.8	8.2	106.8	91.8
30-34	3.6	-0.2	0.3	3.8	3.3	-5.7	8.6	105.7	91.4
35-39	3.5	0.0	0.4	3.5	3.1	-0.1	10.4	100.1	89.6
40-44	3.5	0.2	0.4	3.3	3.1	5.5	10.7	94.5	89.3
45-49	3.4	0.4	0.4	3.0	3.0	12.3	11.7	87.7	88.3
50-54	3.4	0.5	0.5	2.9	3.0	14.0	13.4	86.0	86.6
55-59	3.4	0.9	0.6	2.5	2.8	25.4	17.2	74.6	82.8
60-64	3.3	1.1	0.7	2.2	2.5	32.4	22.5	67.6	77.5
65-69	3.0	1.4	0.7	1.6	2.3	46.2	23.7	53.8	76.3
70-74	2.5	1.3	0.5	1.3	2.0	50.0	20.9	50.0	79.1
75-79	2.0	1.3	0.4	0.7	1.6	64.0	18.3	36.0	81.7
80-84	1.4	1.1	0.3	0.3	1.1	77.5	21.8	22.5	78.2
85+	0.9	0.5	-0.2	0.4	1.1	55.4	-22.4	44.6	122.4

Sources: AIHW analysis of ABS 1998 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished tables of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 1996-1998 and 2010-2012.

**Table A6: Increase in life expectancy and selected health expectancies, by age, females, between 1998 and 2012**

Age	Increases in LE (years)	Change in expected years of				Change relative to increase in LE (per cent)			
		DLE	SPL	DFLE	SPFLE	DLE	SPL	DFLE	SPFLE
0-4	2.8	0.3	0.1	2.4	2.6	12.3	4.2	87.7	95.8
5-9	2.6	0.3	0.0	2.4	2.6	10.4	1.6	89.6	98.4
10-14	2.6	0.3	0.1	2.3	2.5	13.0	3.1	87.0	96.9
15-19	2.6	0.3	0.0	2.3	2.6	12.3	1.6	87.7	98.4
20-24	2.6	0.3	0.0	2.3	2.6	11.1	1.4	88.9	98.6
25-29	2.6	0.3	0.0	2.3	2.6	10.8	0.4	89.2	99.6
30-34	2.6	0.3	0.0	2.3	2.6	11.5	-0.3	88.5	100.3
35-39	2.5	0.4	0.0	2.2	2.5	14.5	0.5	85.5	99.5
40-44	2.5	0.5	0.1	2.1	2.4	18.8	3.3	81.2	96.7
45-49	2.5	0.6	0.1	1.9	2.4	25.7	4.3	74.3	95.7
50-54	2.5	0.8	0.2	1.7	2.3	32.6	9.4	67.4	90.6
55-59	2.5	1.1	0.2	1.4	2.2	43.5	9.7	56.5	90.3
60-64	2.3	1.3	0.3	1.0	2.1	57.4	11.8	42.6	88.2
65-69	2.2	1.4	0.2	0.8	2.0	63.6	10.3	36.4	89.7
70-74	1.9	1.1	0.1	0.8	1.8	59.6	6.3	40.4	93.7
75-79	1.6	1.1	0.1	0.5	1.5	66.2	5.1	33.8	94.9
80-84	1.2	0.8	0.0	0.4	1.2	70.2	0.3	29.8	99.7
85+	0.8	0.5	-0.3	0.3	1.0	61.7	-35.1	38.3	135.1

Sources: AIHW analysis of ABS 1998 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished tables of 2012 Survey of Disability, Ageing and Carers; ABS unpublished abridged Australian life tables 1996-1998 and 2010-2012.

**Table A7: Age- and sex-specific prevalence rates of disability and severe or profound core activity limitation, 1998 and 2012 (per cent)**

Age	1998		2012		1998		2012	
	Males	Females	Males	Females	Males	Females	Males	Females
	<b>Total with disability</b>				<b>Severe or profound core activity limitation</b>			
0–4	4.6	2.7	3.7	3.5	3.1	1.2	2.5	2.4
5–9	11.5	7.5	10.5	6.0	6.5	3.9	6.8	3.1
10–14	12.7	6.0	11.8	6.3	4.9	2.3	6.0	3.1
15–19	9.2	7.1	8.9	7.6	2.6	2.1	3.4	2.2
20–24	9.9	8.2	6.8	8.3	1.7	1.4	1.4	1.9
25–29	10.2	9.1	8.6	8.6	2.0	2.2	1.7	2.5
30–34	12.7	10.8	8.2	9.2	3.0	2.7	1.7	2.2
35–39	14.5	12.6	10.2	10.3	2.5	4.0	2.3	2.5
40–44	17.0	16.6	12.1	13.1	3.6	4.0	3.0	3.5
45–49	18.3	20.3	16.9	16.7	5.0	6.7	3.8	4.1
50–54	26.4	25.9	18.2	20.4	6.0	6.7	3.4	6.3
55–59	31.9	32.2	26.4	25.6	8.9	8.0	5.5	6.6
60–64	42.4	35.5	32.5	33.0	8.3	9.4	8.0	9.5
65–69	43.3	37.4	39.9	39.2	7.9	9.0	9.7	9.1
70–74	50.9	47.2	43.5	44.7	11.8	15.0	12.0	12.8
75–79	60.7	56.7	56.2	55.2	18.7	24.9	15.2	21.1
80–84	63.4	66.6	66.7	66.5	24.4	35.5	26.6	32.2
85+	84.5	84.1	80.2	81.8	56.1	68.9	44.6	58.0
Total	19.6	19.1	18.0	19.0	5.4	6.7	5.4	6.7
Total 0–64	15.5	13.6	12.9	12.7	4.1	3.9	3.7	3.7
Total 65+	54.0	53.8	51.3	53.9	16.3	24.9	17.1	23.1

*Note:* Data for 2012 were calculated based on rounded numbers of ABS unpublished data tables, so rates may be slightly lower than the ABS published numbers.

*Sources:* AIHW analysis of ABS 1998 Survey of Disability, Ageing and Carers confidentialised unit record files; ABS unpublished tables of 2012 Survey of Disability, Ageing and Carers.

**Table A8: Age-standardised rates of disability and severe or profound core activity limitation, 1998, 2003, 2009 and 2012 (per cent)**

Sex/age	1998	2003	2009	2012	Difference 1998–2012
	<b>Total with disability</b>				<b>(Percentage points)</b>
<b>Males</b>					
Total 0–64	15.9	15.3	12.8	12.5	–3.4
Total 65+	56.2	56.1	54.3	52.3	–3.9
<b>Total</b>	<b>21.0</b>	<b>20.4</b>	<b>18.1</b>	<b>17.5</b>	<b>–3.4</b>
<b>Females</b>					
Total 0–64	14.0	14.0	12.4	12.1	–1.9
Total 65+	53.1	54.5	51.6	52.4	–0.7
<b>Total</b>	<b>18.9</b>	<b>19.1</b>	<b>17.3</b>	<b>17.1</b>	<b>–1.8</b>
<b>Persons</b>					
Total 0–64	15.0	14.7	12.6	12.3	–2.7
Total 65+	54.6	55.3	52.8	52.4	–2.2
<b>Total</b>	<b>19.9</b>	<b>19.8</b>	<b>17.7</b>	<b>17.3</b>	<b>–2.6</b>
	<b>Severe or profound core activity limitation</b>				
<b>Males</b>					
Total 0–64	4.2	3.9	3.6	3.6	–0.6
Total 65+	18.7	18.1	17.3	17.6	–1.2
<b>Total</b>	<b>6.0</b>	<b>5.7</b>	<b>5.3</b>	<b>5.4</b>	<b>–0.7</b>
<b>Females</b>					
Total 0–64	4.0	3.9	3.4	3.6	–0.4
Total 65+	24.1	24.6	21.2	21.1	–3.0
<b>Total</b>	<b>6.5</b>	<b>6.5</b>	<b>5.7</b>	<b>5.8</b>	<b>–0.7</b>
<b>Persons</b>					
Total 0–64	4.1	3.9	3.5	3.6	–0.5
Total 65+	22.0	22.0	19.6	19.6	–2.4
<b>Total</b>	<b>6.3</b>	<b>6.2</b>	<b>5.5</b>	<b>5.6</b>	<b>–0.7</b>

*Notes:*

1. Rates have been age-standardised to the Australian population at 30 June 2001.
2. Data for 2012 were calculated based on rounded numbers of ABS unpublished data tables so that rates may be slightly lower than the ABS published numbers.

*Sources:* AIHW analysis of ABS 1998 and 2003 Survey of Disability, Ageing and Carers confidentialised unit record files, and ABS unpublished data of 2009 and 2012 Survey of Disability, Ageing and Carers.



## Appendix B: ABS survey definitions of disability

Not all literature on health expectancy uses standard definitions of disability following the International Classification of Functioning, Disability and Health (ICF). A wide range of concepts and measures of disability has been used in the studies on health expectancies. The terms ‘disease’, ‘morbidity’ and ‘disability’ have been sometimes used interchangeably.

The ABS Survey of Disability, Ageing and Carers generally follows the conceptual framework and major concepts of the ICF (ABS 2013).

### Disability

For ABS survey purposes, a person has disability if they have at least 1 of 17 limitations, restrictions or impairments that has lasted or is likely to last for at least 6 months and that restricts everyday activities. People with disability, so defined, are asked further questions about core activity limitations and schooling and employment restrictions. Those reporting a core activity limitation or a schooling or employment restriction are the population with disability and a specific limitation or restriction. The remainder is the population with disability and no specific limitations.

### Core activity

People who were identified as having disability were asked about their need for assistance with the core activities of self-care, mobility and communication.

Core activities comprise the following tasks:

- self-care—bathing or showering, dressing, eating, using the toilet, and bladder or bowel control
- mobility—getting into or out of a bed or chair, moving around at home and going to, or getting around, a place away from home
- communication—understanding and being understood by others: strangers, family and friends.

### Core activity limitation

Four levels of core activity limitation were determined, based on whether a person needs personal assistance with, has difficulty with, or uses aids or equipment for, any of the core activities. A person’s overall level of core activity limitation was determined by the highest level of limitation experienced in any of the core activity areas. The four levels of core activity limitation are:

- profound—always needs assistance from another person to perform a core activity
- severe—sometimes needs assistance from another person to perform a core activity; or has difficulty understanding or being understood by family or friends; or can communicate more easily using sign language or other non-spoken forms of communication
- moderate—does not need assistance, but has difficulty performing a core activity
- mild—has no difficulty performing a core activity but uses aids or equipment because of disability; or cannot easily walk 200 metres, walk up and down stairs without a handrail, easily bend to pick up an object from the floor, or use public transport; or has difficulty or needs help using public transport.

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## Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
DFLE	expected years without disability
DLE	expected years of life lived with disability
ICF	International Classifications of Functioning, Disability and Health
LE	life expectancy
SDAC	Survey of Disability, Ageing and Carers
SPFLE	expected years of life lived without a severe or profound core activity limitation
SPLE	expected years of life lived with a severe or profound core activity limitation
WHO	World Health Organization

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