

**Mesothelioma in Australia:
Incidence (1982 to 2013) and Mortality (1997 to 2012)**

2015



safe work australia

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ISBN for PDF: xx

ISBN for Word: xx

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Executive summary



Mesothelioma

Mesothelioma is a fatal cancer that typically occurs 20 to 40 years after exposure to asbestos, although exposure does not always result in the disease. Mesothelioma of the pleura (a cancer affecting the protective lining of the lungs and chest cavity) is the most common form of mesothelioma in Australia and has accounted for approximately 93% of cases since 1982. Mesothelioma of the peritoneum (a cancer affecting the abdominal lining) is less common and has accounted for approximately 6% of cases since 1982. The figures in this report include all forms of mesothelioma.


Sources of data

The Australian Institute of Health and Welfare (AIHW) collects data on new mesothelioma cases and deaths due to mesothelioma. The Australian Mesothelioma Registry (AMR) receives notifications of new mesothelioma cases from jurisdictional cancer registries. This report analyses and presents these AIHW and AMR data as illustrated below.

Incidence data

Period of data	1982  2011	2012  2013
Source and type of data	AIHW data: national and jurisdictional number of mesothelioma cases and trends over time; national rates of mesothelioma cases	AMR data: national number of mesothelioma cases

Mortality data

Period of data	1997  2012
Source and type of data	AIHW data: national and jurisdictional number of mesothelioma deaths and trends over time; national rates of mesothelioma deaths

Incidence of mesothelioma

In 2011, 690 new cases of mesothelioma were diagnosed in Australia. The preliminary number of diagnoses for 2013 is 575.

The number of new mesothelioma cases has increased in most years since 1982, when national data first became available, and peaked at 690 in 2011.

The age-standardised incidence rate of mesothelioma increased from 1.1 new cases per 100 000 population in 1983 to a peak of 3.2 in 2010. The rate fell to 2.8 new cases per 100 000 population in 2011.

In 2011, the highest age-specific incidence rate of new mesothelioma cases occurred among males aged 85 years and above (49.9 cases per 100 000 population aged 85 years and above).

Deaths due to mesothelioma

In 2012, 638 deaths were attributed to mesothelioma.

The number of deaths resulting from mesothelioma increased between 1997 and 2012 and reached a peak of 638 in 2012.

In 2012, the age-standardised mortality rate for mesothelioma was 2.5 deaths per 100 000 population. The age-standardised mortality rate remained relatively stable over the 16 years for which data are available and ranged between a minimum of 2.1 deaths per 100 000 population in 1999 and a maximum of 2.7 in 2001.

Introduction

Mesothelioma

Mesothelioma is a fatal cancer that typically occurs 20 to 40 years after exposure to asbestos, although exposure does not always result in the disease. Mesothelioma of the pleura (a cancer affecting the protective lining of the lungs and chest cavity) is the most common form of mesothelioma in Australia and has accounted for approximately 93% of cases since 1982. Mesothelioma of the peritoneum (a cancer affecting the abdominal lining) is less common and has accounted for approximately 6% of cases since 1982. The figures in this report include all forms of mesothelioma.

Due to the long latency between exposure to asbestos and diagnosis of mesothelioma, it was expected that the incidence of mesothelioma would not peak until after 2013. Clements et al. (2007a) predicted that the number of new cases in Australia would peak in 2017. Another study by Clements et al. (2007b) used two different models to project the incidence of mesothelioma in males in New South Wales. Using an age-birth cohort model, they predicted that the number of new cases would peak in 2021. Using a model based on potential exposure to asbestos, age and calendar year, they predicted the peak would occur in 2014.

Asbestos production, use and exposure

In Australia, more chrysotile (white asbestos) than amphibole (blue and brown) asbestos was mined until 1939. New South Wales, the first jurisdiction to mine asbestos, produced the largest amount of chrysotile until 1983, as well as smaller quantities of amphibole until 1949. With the commencement of mining in Wittenoom in Western Australia in 1937, crocidolite (blue asbestos) dominated production until the closure of the mine in 1966. The main sources of raw asbestos imports were from Canada (chrysotile) and South Africa (crocidolite and amosite—brown asbestos). Consumption peaked around 1975 at approximately 70 000 tonnes per year.

In addition to imports of asbestos fibre, Australia also imported many manufactured asbestos products, including asbestos-containing cement articles, yarn, cord and fabric, joint and millboard, friction materials and gaskets. The main sources of supply were the United Kingdom (UK), the United States of America (USA), the Federal Republic of Germany and Japan. With the closure of the crocidolite mine at Wittenoom, Australian asbestos production and exports declined. Imports of chrysotile also started to decline.

Over 60% of all production and 90% of all consumption of asbestos in Australia occurred in the asbestos cement manufacturing industry. From around 1940 to the late 1960s, all three types of asbestos were used in this industry. The use of crocidolite began to be phased out from 1967, while amosite was used until the mid-1980s. Much of the industry output remains today in the form of “fibro” houses and water and sewerage piping. By 1954, Australia was fourth in the Western world in gross consumption of asbestos cement products, after the USA, UK and France, and first on a per capita basis. After World War II to 1954, 70 000 asbestos cement houses were built in New South Wales (52% of all houses built in Australia).

In the past, exposure to asbestos was very high in some industries and occupations. It was as high as 150 fibres per millilitre of air (f/ml) in asbestos pulverisers and disintegrators in the asbestos cement industry and up to 600 f/ml among baggers at Wittenoom.

Regulation and management of asbestos

The use of asbestos products has been regulated since the late 1970s. A series of regulations adopted in the late 1970s and early 1980s by various jurisdictions imposed exposure limits of 0.1 f/ml for crocidolite and amosite and 0.1–1.0 f/ml for chrysotile. In July 2003, a revised national exposure standard for chrysotile asbestos of 0.1 f/ml was declared by the National Occupational Health and Safety Commission.

The prohibition of all forms of asbestos was adopted simultaneously under regulations in each Australian jurisdiction and by Australian Customs on 31 December 2003. The prohibition bans the use of asbestos, but does not require the removal of asbestos products that were in place as at 31 December 2003. Therefore, some asbestos products are still present and need regulation to ensure their management or removal does not result in asbestos exposure.

The model work health and safety laws were adopted by the Australian Capital Territory, the Commonwealth, New South Wales, the Northern Territory and Queensland on 1 January 2012, and South Australia and Tasmania on 1 January 2013 (Safe Work Australia 2013). Victoria and Western Australia have yet to pass the model legislation. The model regulations for asbestos aim to provide a consistent framework for the minimisation of asbestos exposure, the removal of asbestos and the management of remaining asbestos materials in workplaces.

A national model code of practice, *How to Manage and Control Asbestos in the Workplace*, is available on the Safe Work Australia website. The code of practice provides businesses with practical guidance on how to manage risks associated with asbestos and asbestos-containing material in the workplace (Safe Work Australia 2011).

The Commonwealth Government established the Asbestos Safety and Eradication Agency (ASEA) to focus on asbestos-related issues at a national level. Along with developing a national strategic plan aimed at preventing asbestos exposure and eradicating asbestos-related diseases in Australia, the ASEA also undertakes research and awareness activities, including an examination of current disposal infrastructure and a study of community awareness and attitudes to asbestos (ASEA 2013).

The Australian Mesothelioma Registry

Safe Work Australia initiated and funded the Australian Mesothelioma Registry (AMR) in 2010. The AMR is currently co-funded by Safe Work Australia and Comcare and administered by the Cancer Institute of New South Wales in association with the Monash Centre for Occupational and Environmental Health. In addition to receiving notifications of new mesothelioma cases from all Australian cancer registries, the AMR surveys patients to gain a better understanding of the link between asbestos exposure and mesothelioma. The AMR's management committee includes leading experts in asbestos-related diseases in Australia.

The aims of the AMR are to:

- better understand the exact relationship between asbestos exposure and mesothelioma
- better understand the nature and levels of asbestos exposure that can result in mesothelioma
- identify the groups of workers exposed to potentially dangerous levels of asbestos and to prevent that exposure
- assist in the development of policies to best deal with the asbestos still present in our environment (mainly our built environment)
- provide information to assist researchers in undertaking investigations with the aim of preventing mesothelioma in the future, and
- identify other potential exposures that may cause mesothelioma.

The AMR's third annual report was released in 2014 and is available on its website. The report provides information on mesothelioma diagnoses and deaths for 2011, 2012 and 2013.

Sources of data

All new cases of mesothelioma are notified to jurisdictional cancer registries because mesothelioma is a notifiable disease (i.e. a disease that must be reported to an appropriate authority). National data on the number of new mesothelioma cases are collected from jurisdictional cancer registries by the Australian Institute of Health and Welfare's (AIHW) National Cancer Statistics Clearing House. Information on mesothelioma deaths is also collected by the AIHW as part of its National Mortality Database. The AIHW publishes these data on its website.

This report outlines the incidence of mesothelioma from 1982 to 2011 and deaths due to mesothelioma from 1997 to 2012 using national data from the AIHW website and jurisdictional data that were provided to Safe Work Australia by the AIHW. In addition, the number of new cases notified to the AMR by jurisdictional cancer registries are provided for 2012 and 2013.

Incidence of mesothelioma

This chapter reports on the incidence of mesothelioma using AMR and AIHW data. The focus of the analysis is on AIHW data due to the detailed nature of these data. The year of incidence is the year in which the mesothelioma diagnosis was made by a medical practitioner.

Cases notified to the Australian Mesothelioma Registry

Table 1 shows that the AMR was notified of 652 new cases of mesothelioma in 2012. The preliminary number of diagnoses for 2013 is 575. Males accounted for over 80% of cases in both years.

Table 1: Number of new mesothelioma cases notified to the AMR by sex, 2012 and 2013

Year	Male	Female	Total
2012	540	112	652
2013	465	110	575

The figure for 2013 is preliminary and likely to increase due to delays in receiving notifications.

Source: AMR 2014.

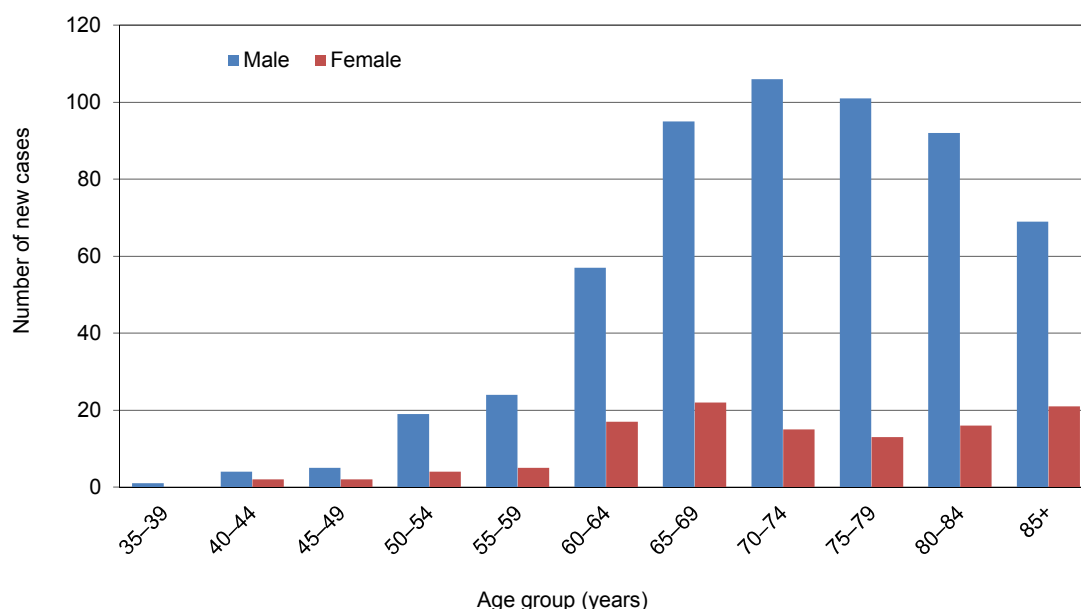
Cases compiled by the Australian Institute of Health and Welfare

Cases in 2011

The most recent year covered by AIHW data is 2011. Figure 1 shows a sex and age group breakdown of the 690 people who were diagnosed with mesothelioma in 2011, the majority (83%) of whom were males. Of the 573 males who were diagnosed with mesothelioma, 91% were aged 60 years and above. The youngest male was diagnosed with mesothelioma in his late thirties.

There were 117 females who were diagnosed with mesothelioma in 2011. Like males, most female mesothelioma patients were of older age (88% were aged 60 years and above). The youngest female was diagnosed with mesothelioma in her early forties.

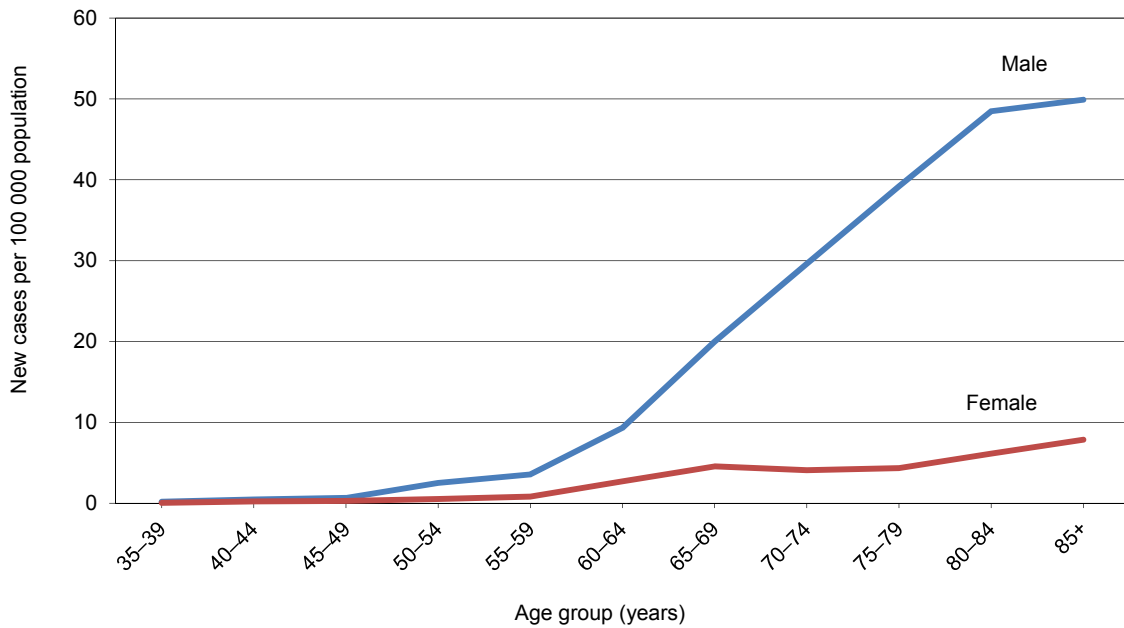
Figure 1: Number of new mesothelioma cases by sex and age group, 2011



Source: AIHW 2015.

Figure 2 shows the age-specific incidence rates for 2011. Among males, incidence rates increased consistently with age and reached a maximum of 49.9 new cases per 100 000 males aged 85 years and above. Among females, the rate also increased with age and reached a maximum of 7.9 new cases per 100 000 females aged 85 years and above.

Figure 2: Age-specific incidence rates of mesothelioma by sex, 2011



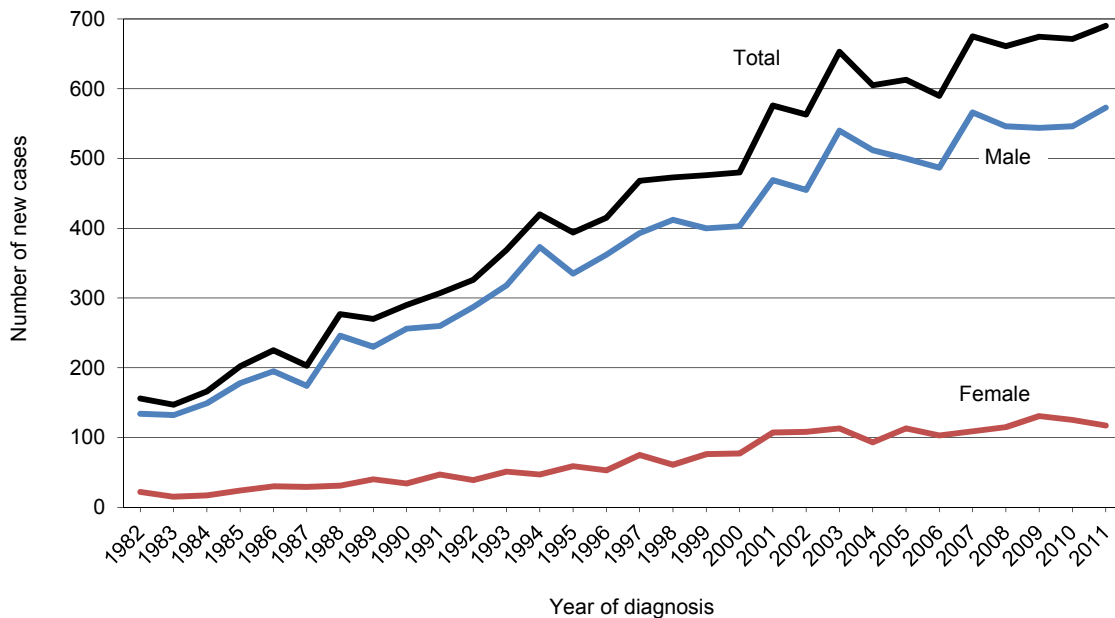
Source: AIHW 2015.

National trends over time

Figure 3 and Table 2 show that the total number of new mesothelioma cases has increased in most years since 1982, when national data first became available, and reached 653 new cases in 2003. After 2003, the number of new cases decreased to 590 in 2006, which initially suggested a decreasing trend. However, the number of new cases increased after 2006 and peaked at 690 in 2011.

Figure 3 shows that the majority of new cases in each year involved males. However, the proportion of female diagnoses increased from 12% of all new cases in 1982–1986 to 18% in 2007–2011.

Figure 3: Number of new mesothelioma cases by sex, 1982 to 2011



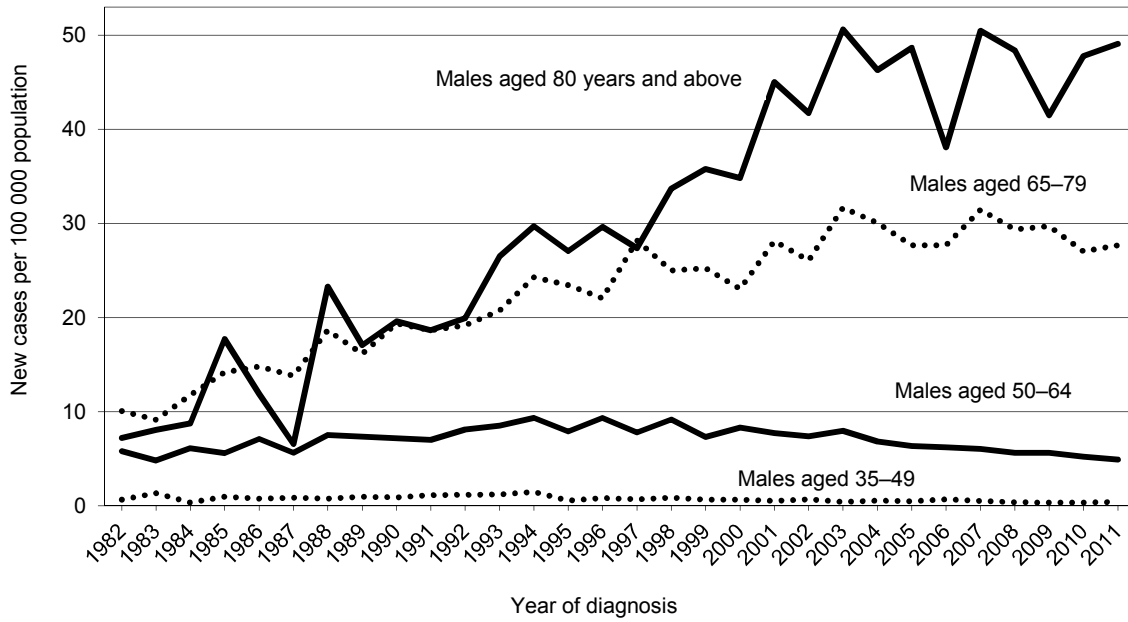
Source: AIHW 2015.

Table 2: Number of new mesothelioma cases by sex, 1982 to 2011

Year	Male	Female	Total
1982	134	22	156
1983	132	15	147
1984	149	17	166
1985	178	24	202
1986	195	30	225
1987	174	29	203
1988	246	31	277
1989	230	40	270
1990	256	34	290
1991	260	47	307
1992	287	39	326
1993	318	51	369
1994	373	47	420
1995	335	59	394
1996	362	53	415
1997	393	75	468
1998	412	61	473
1999	400	76	476
2000	403	77	480
2001	469	107	576
2002	455	108	563
2003	540	113	653
2004	512	93	605
2005	500	113	613
2006	487	103	590
2007	566	109	675
2008	546	115	661
2009	544	131	675
2010	546	125	671
2011	573	117	690

Source: AIHW 2015.

Figure 4: Age-specific incidence rates of mesothelioma for males, 1982 to 2011



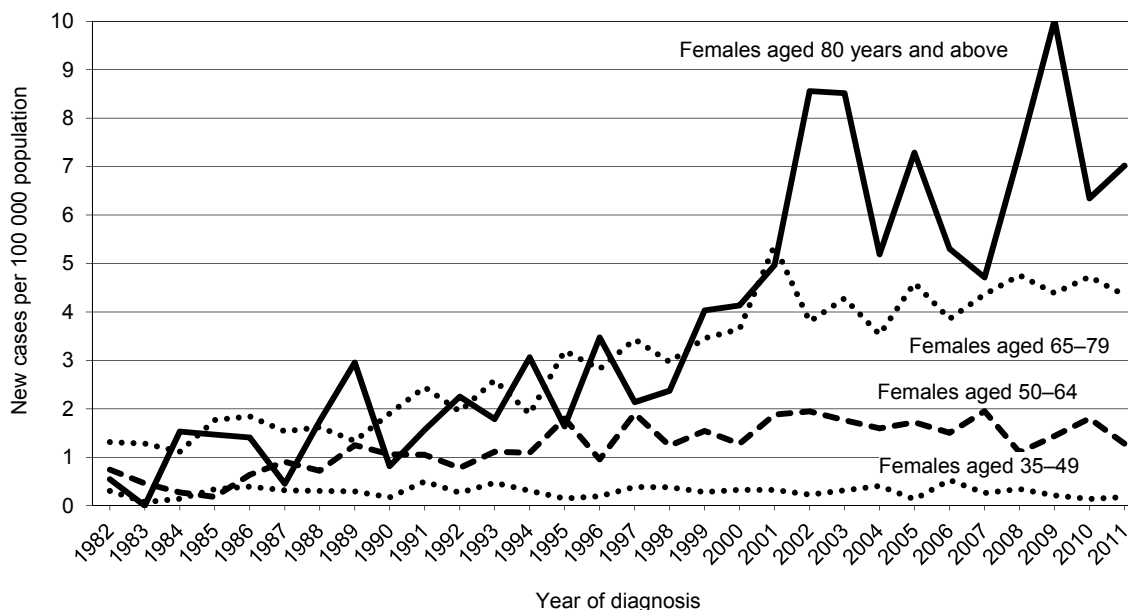
Source: AIHW 2015.

Figures 4 and 5 show age-specific incidence rates for selected age groups of males and females respectively. The graphs show that incidence rates in the two highest age groups generally increased over the period for both males and females.

The highest male incidence rates in more recent years occurred among males aged 80 years and above. Their rates increased through the late 1990s and early 2000s and reached a peak of 50.6 new cases per 100 000 population in 2003. In 2011, the rate was 49.1 new cases per 100 000 population. Males in this age group would most likely have worked through the post-war boom in the 1950s and 1960s, a period in which the production, import and use of asbestos was also booming. The fluctuations in the rates reflect annual fluctuations in the number of new cases among males aged 80 years and above.

Incidence rates among females aged 80 years and above increased from 4.7 new cases per 100 000 population in 2007 to 10.0 in 2009. The rate fell to 7.0 new cases per 100 000 population in 2011. The trends in Figure 5 should be interpreted with caution due to the relatively low number of mesothelioma cases among females.

Figure 5: Age-specific incidence rates of mesothelioma for females, 1982 to 2011



Source: AIHW 2015.

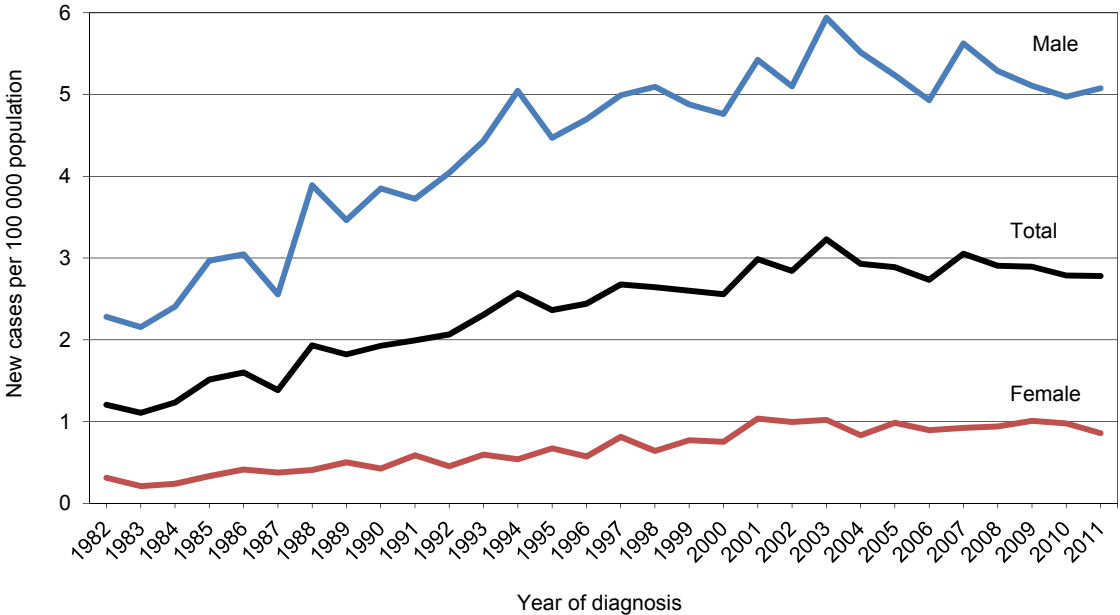
Age-standardised rates are calculated by applying age-specific incidence rates to a standard population. This eliminates differences in population age structures and allows rates from different populations or rates for a population from different points in time to be compared.

Figure 6 shows age-standardised incidence rates of new mesothelioma cases from 1982 to 2011. The age-standardised incidence rates increased from a low of 1.1 new cases per 100 000 population in 1983 to a peak of 3.2 in 2003. After 2003, the age-standardised incidence rate declined to 2.8 new cases per 100 000 population in 2011.

The age-standardised incidence rate of new mesothelioma cases was considerably higher for males than for females in every year between 1982 and 2011. The age-standardised incidence rate for males ranged from a minimum of 2.2 new cases per 100 000 males in 1983 to a maximum of 5.9 in 2003. In 2011, the age-standardised incidence rate for males was 5.1 new cases per 100 000 males.

Between 1982 and 2011, the age-standardised incidence rate for females ranged between 0.2 and 1.0 new cases per 100 000 females. In 2011, the age-standardised incidence rate for females was 0.9 new cases per 100 000 females.

Figure 6: Age-standardised incidence rates of mesothelioma by sex, 1982 to 2011



Source: AIHW 2015.

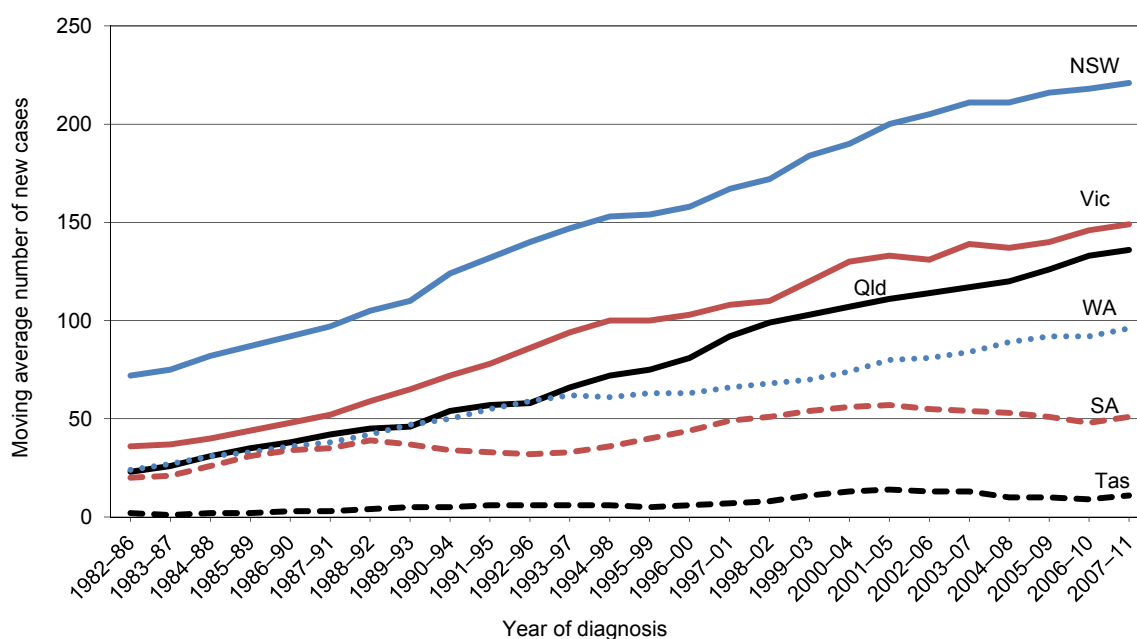
Because asbestos exposure in the workplace and the general environment has now been greatly reduced, the incidence of new mesothelioma cases in the population is expected to decline. However, because of the long latency period between asbestos exposure and diagnosis of mesothelioma (20 to 40 years), it is expected that the incidence of mesothelioma will not peak until sometime between 2014 and 2021, depending on the projection methodology used to estimate the peak (Clements et al. 2007b).

Jurisdictional trends over time

Figure 7 shows the five-year moving average number of new mesothelioma cases occurring in each jurisdiction from 1982–1986 to 2007–2011. Five-year moving averages are used to smooth out annual fluctuations in the number of new cases and to preserve confidentiality of data from smaller jurisdictions. Detailed jurisdiction-specific data by sex can be found in Table 2 on page 13.

The jurisdictional distribution of new mesothelioma cases generally reflects the size of each jurisdiction's population. The most populous jurisdictions, New South Wales, Victoria and Queensland, had the highest number of new cases, respectively averaging 221, 149 and 136 cases a year in 2007–2011. The three jurisdictions also experienced relatively consistent and similar rates of increase in the average number of new cases over the period between 1982–1986 and 2007–2011. The average number of new cases in Western Australia increased at a similar rate until the mid-1990s and then decreased. Since the early 1990s, the rate of increase in the average number of new cases in South Australia and Tasmania has been lower than other jurisdictions.

Figure 7: Five-year moving average number of new mesothelioma cases by jurisdiction, 1982–1986 to 2007–2011



The number of mesothelioma cases in the ACT and NT are relatively low and cannot be plotted clearly at this scale. These numbers can be found in Table 3 on page 13.

Legend: NSW—New South Wales; Vic—Victoria; Qld—Queensland; WA—Western Australia; SA—South Australia; Tas—Tasmania; ACT—Australian Capital Territory; NT—Northern Territory.

Source: data supplied to Safe Work Australia from the AIHW's 2011 Australian Cancer Database.

Table 3: Five-year moving average number of new mesothelioma cases by jurisdiction and sex, 1990–1994 to 2007–2011

	1990–94	1991–95	1992–96	1993–97	1994–98	1995–99	1996–00	1997–01	1998–02	1999–03	2000–04	2001–05	2002–06	2003–07	2004–08	2005–09	2006–10	2007–11
M	110	116	123	128	132	131	134	139	141	150	156	163	167	175	176	178	179	182
F	14	16	17	19	21	23	24	28	31	34	34	37	38	36	35	39	39	39
T	124	132	140	147	153	154	158	167	172	184	190	200	205	211	211	216	218	221
M	61	64	73	77	83	82	85	89	90	98	106	109	106	115	113	114	118	120
F	11	13	14	17	17	18	19	18	20	23	23	24	24	24	25	26	28	30
T	72	78	86	94	100	100	103	108	110	120	130	133	131	139	137	140	146	149
M	46	49	50	58	64	66	71	79	83	86	89	91	94	98	100	103	109	112
F	8	8	8	8	8	10	10	14	17	17	18	20	20	18	20	23	24	24
T	54	57	58	66	72	75	81	92	99	103	107	111	114	117	120	126	133	136
M	44	49	52	55	55	57	56	57	59	60	62	68	69	70	75	78	79	82
F	6	6	7	7	6	7	7	9	9	10	12	13	12	14	14	14	14	14
T	50	55	59	62	61	63	63	66	68	70	74	80	81	84	89	92	92	96
M	30	29	28	28	31	34	37	41	43	45	46	47	46	44	44	41	38	40
F	4	4	4	5	5	6	7	8	8	9	9	10	9	10	10	10	10	11
T	34	33	32	33	36	40	44	49	51	54	56	57	55	54	53	51	48	51
M	5	5	5	5	5	4	5	5	7	9	11	12	11	11	9	9	9	10
F	0	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1	1
T	5	6	6	6	6	5	6	7	8	11	13	14	13	13	10	10	9	11
M	2	2	2	2	2	3	4	4	4	5	5	4	4	5	4	5	5	6
F	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1
T	2	2	3	3	3	4	5	5	4	6	5	5	5	6	6	6	7	7
M	1	1	2	2	3	2	2	1	1	1	2	2	2	2	2	2	1	2
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	1	1	2	2	3	3	2	2	1	1	2	2	2	2	2	2	1	3
M	299	315	335	356	375	380	394	415	428	453	476	495	499	521	522	529	538	555
F	44	49	50	57	59	65	68	79	86	96	100	107	106	106	107	114	117	119
T	342	363	385	413	434	445	462	495	514	550	575	602	605	627	629	643	654	674

The figures above are averages that have been rounded to the nearest whole number. Therefore, the sum of male and female figures may not equal the total figures. 2010 and 2011 figures are estimated for NSW and ACT.

Legend: M—Male; F—Female; T—Total; NSW—New South Wales; Vic—Victoria; Qld—Queensland; WA—Western Australia; SA—South Australia; Tas—Tasmania; ACT—Australian Capital Territory; NT—Northern Territory.

Source: data supplied to Safe Work Australia from the AIHW's 2011 Australian Cancer Database.

Deaths due to mesothelioma

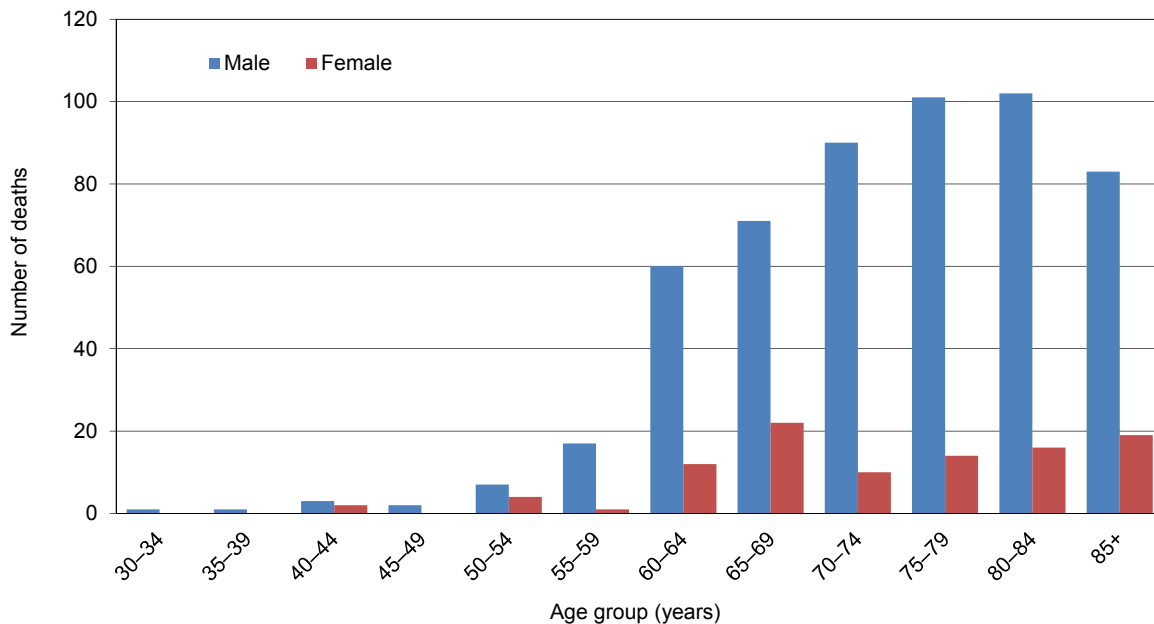
The cause of every death in Australia is certified by a medical practitioner and recorded on a death certificate. The death certificates are required by jurisdictional registrars of births, deaths and marriages under jurisdiction-specific legislation. On behalf of the registrars, these data are assembled, coded to the underlying cause of death and published by the Australian Bureau of Statistics (ABS). The AIHW uses these ABS data to compile national data on deaths caused by mesothelioma. The AIHW publishes these data on its website. This chapter reports on deaths due to mesothelioma using national data from the AIHW website and jurisdictional data that were provided to Safe Work Australia by the AIHW.

Data on deaths due to mesothelioma are available from 1997—the year in which a code for mesothelioma was added to the 10th revision of the International Classification of Diseases. Data for 2012 are based on the year of registration rather than the year of death. The year of death and the year of registration usually coincide, although deaths at the end of a calendar year may be held over until the following year, as may deaths that require further examination by a coroner. In recent years, less than 5% of deaths due to all causes were held over from one year to the next. This method of reporting mortality data allows the most recent year to be used.

Deaths in 2012

In 2012, there were 638 deaths in which the underlying cause of death was mesothelioma. Of these deaths, 538 (84%) were of males and 100 (16%) were of females. Figure 8 shows the age and sex distribution of the 638 decedents. The graph shows that deaths due to mesothelioma were markedly skewed towards older age groups—94% of male decedents were aged 60 years and above and 93% of female decedents were aged 60 years and above.

Figure 8: Number of mesothelioma deaths by sex and age group, 2012

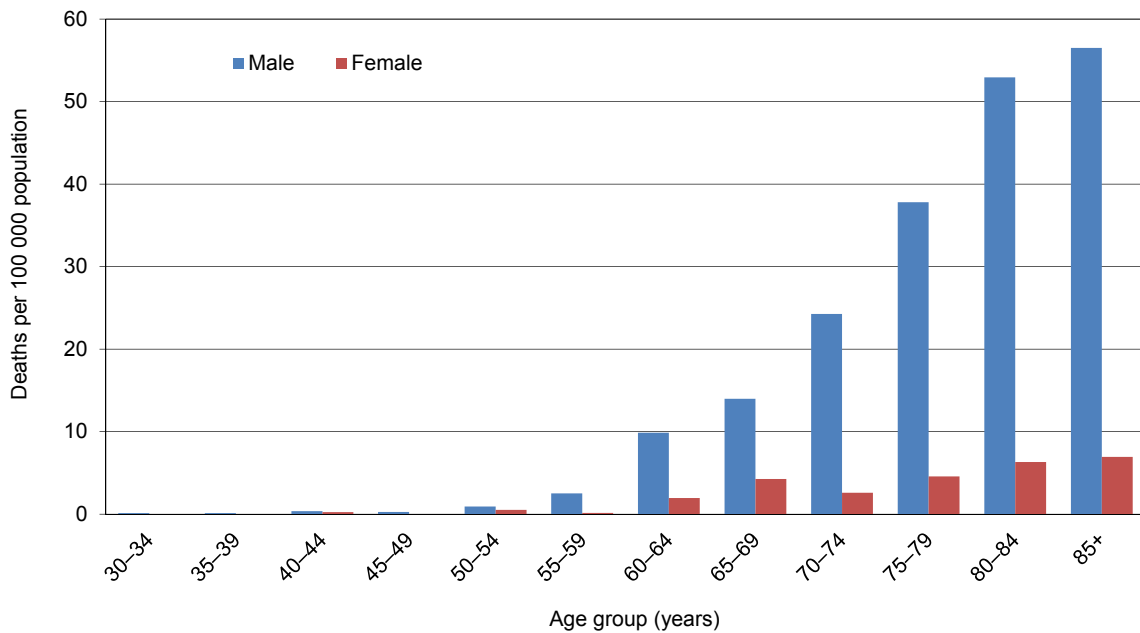


The data in this graph are based on the year of registration rather than the year of death and are subject to revision by the ABS. Source: AIHW 2015.

Figure 9 shows age-specific mortality rates for mesothelioma deaths registered in 2012. Because of the relatively short survival period from the onset of the disease, the age-related pattern of mortality is very similar to the pattern for diagnosis.

The mortality rates for males increased with age and reached a maximum of 56.5 deaths per 100 000 population among males aged 85 years and above. For females, the rates were considerably lower and reached a maximum of 6.9 deaths per 100 000 population among females aged 85 years and above.

Figure 9: Age-specific mortality rates for mesothelioma by sex and age group, 2012

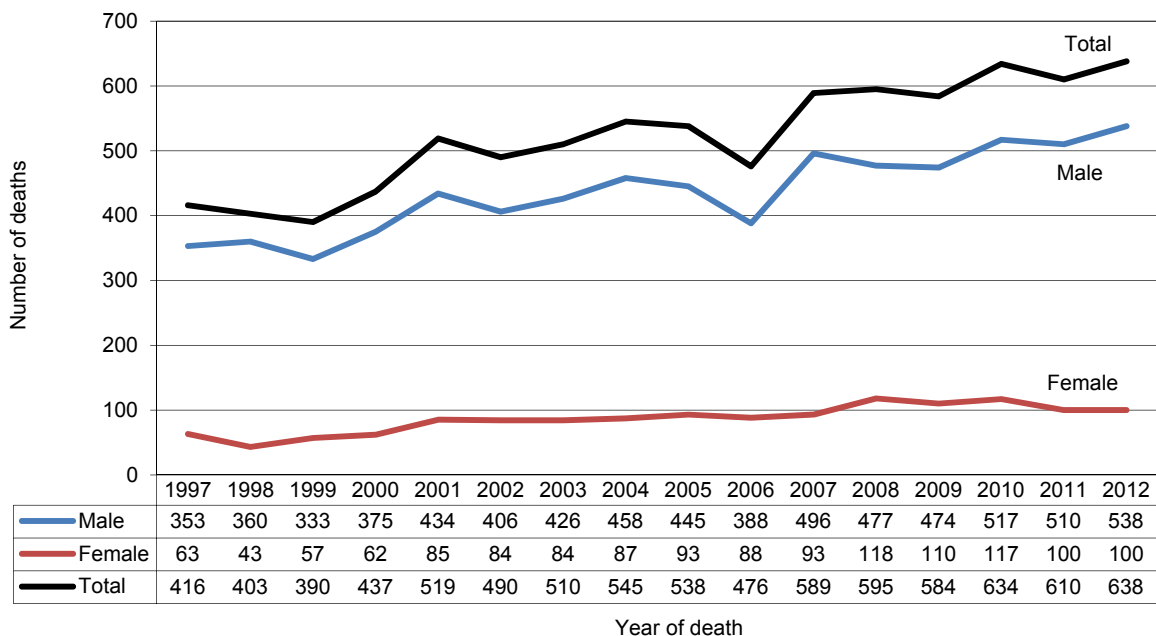


The data in this graph are based on the year of registration rather than the year of death and are subject to revision by the ABS. Source: AIHW 2015.

National trends over time

Figure 10 shows the number of deaths resulting from mesothelioma over the 16-year period from 1997 to 2012. The number of deaths reached a peak of 638 in 2012. Males accounted for the majority of mesothelioma deaths (83%) over the 16-year period.

Figure 10: Number of mesothelioma deaths by sex, 1997 to 2012

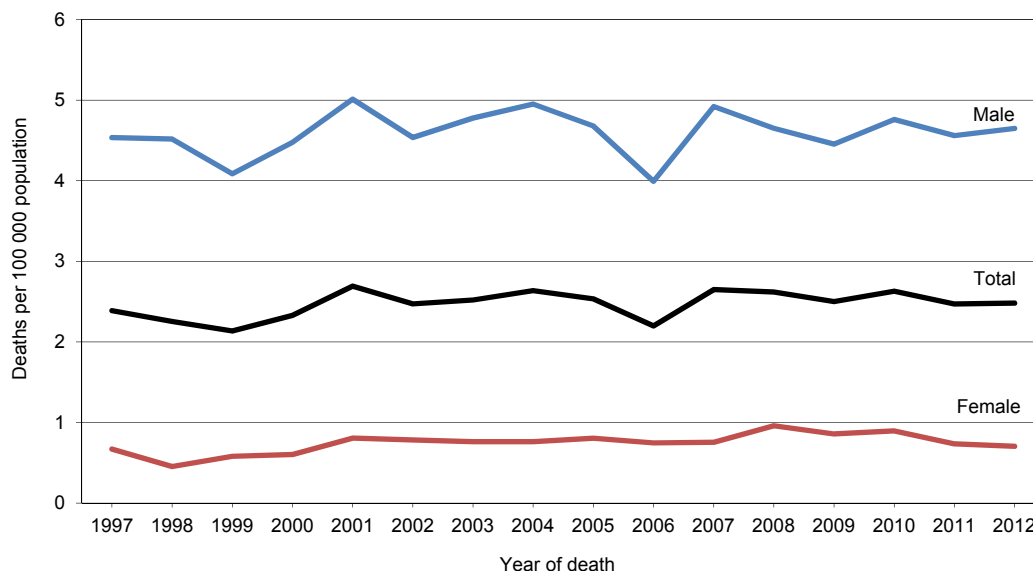


Data for 2012 are based on the year of registration rather than the year of death. Data for 2011 and 2012 are subject to revision by the ABS.

Source: AIHW 2015.

Figure 11 shows that the age-standardised mortality rate of deaths due to mesothelioma has remained relatively stable over the 16 years for which data are available. Over the period, the overall age-standardised mortality rate ranged between 2.1 deaths per 100 000 population in 1999 and 2.7 in 2001. The age-standardised mortality rate in 2012 was 2.5 deaths per 100 000 population.

Figure 11: Age-standardised mortality rates for mesothelioma by sex, 1997 to 2012



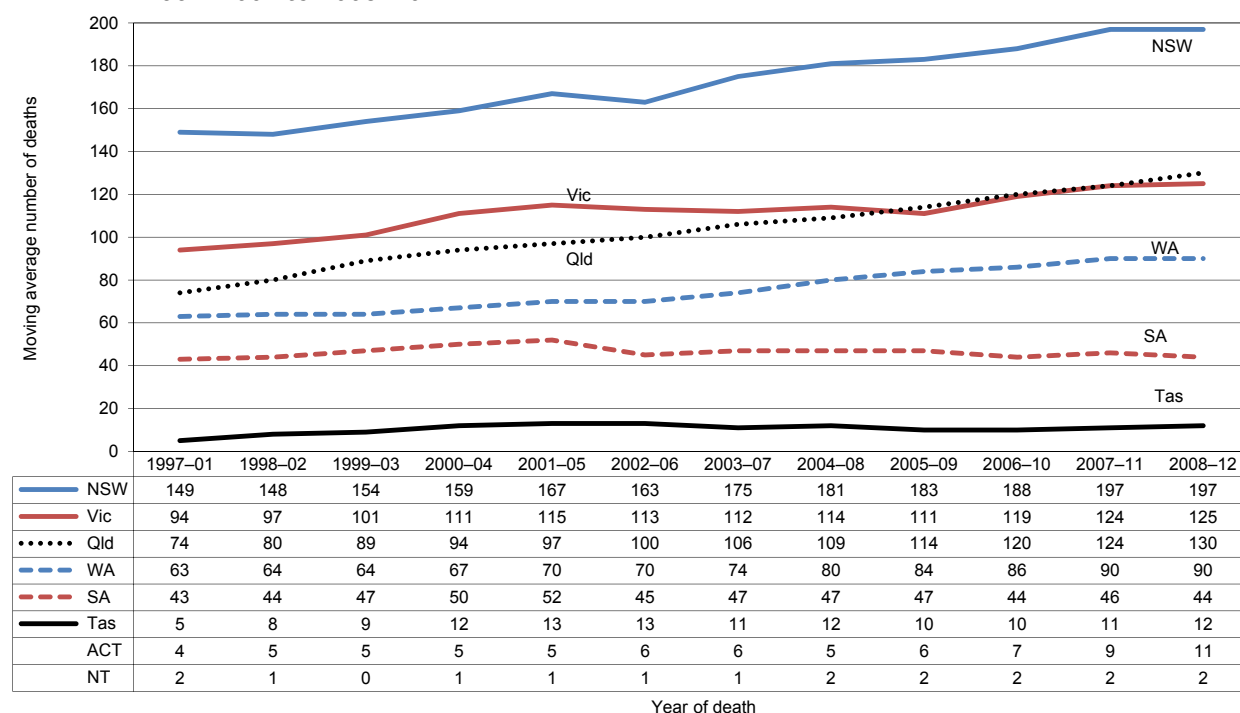
Data for 2012 are based on the year of registration rather than the year of death. Data for 2011 and 2012 are subject to revision by the ABS.

Source: AIHW 2015.

Jurisdictional trends over time

Figure 12 shows five-year moving average number of mesothelioma deaths by jurisdiction. The pattern of mortality is similar to the pattern of new cases because the deaths result from developing mesothelioma. The jurisdictional distribution of mesothelioma deaths generally reflects the size of each jurisdiction's population. The jurisdictional classification of death is based on the jurisdiction of usual residence rather than the jurisdiction in which the death was registered.

Figure 12: Five-year moving average number of mesothelioma deaths by jurisdiction, 1997–2001 to 2008–2012



Data for 2012 are based on the year of registration rather than the year of death. Data for 2011 and 2012 are subject to revision by the ABS. The number of mesothelioma deaths in the ACT and NT are relatively low and cannot be plotted clearly at this scale.

Legend: NSW—New South Wales; Vic—Victoria; Qld—Queensland; WA—Western Australia; SA—South Australia; Tas—Tasmania; ACT—Australian Capital Territory; NT—Northern Territory.

Source: data supplied to Safe Work Australia from the AIHW's National Mortality Database.

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