MESOTHELIOMA IN AUSTRALIA 2014

4th annual report

australian
mesothelioma
registry

Acknowledgements

· · · · · · · · · · · · · ·

safe work australia

Australian Government
Comcare

Contents

List of tables

List of figures

Abbreviations and acronyms

ABS — Australian Bureau of Statistics

ACD — Australian Cancer Database

ACM — asbestos-containing material

ACT — Australian Capital Territory

AIHW — Australian Institute of Health and Welfare

AMR — Australian Mesothelioma Registry

ANZSCO — Australian and New Zealand Standard Classification of Occupations

HRF — Hunter Research Foundation

JSM — job-specific module

MonCOEH — Monash Centre for Occupational and Environmental Health

NDI — National Death Index

N.E.C. — not elsewhere classified

NOHSC — National Occupational Health and Safety Commission

n.p. — not published

NSW — New South Wales

NT — Northern Territory

OccIDEAS — Occupational Integrated Database Exposure Assessment System

Qld — Queensland

SA — South Australia

Tas — Tasmania

TWA — time-weighted average

Vic — Victoria

WA — Western Australia

Executive summary

The Australian Mesothelioma Registry (AMR) became operational in 2011 and contains information about people diagnosed with mesothelioma in Australia from 1 July 2010.

The AMR also has a voluntary component that enables the collection of asbestos exposure information directly from people who have mesothelioma.

Number of new cases

As at 31 May 2015, the AMR had received 641 notifications of people newly diagnosed with mesothelioma between 1 January and 31 December 2014. Of these people, 518 were males and 123 were females, and the majority (85.0%) were aged 65 years or over at the time of diagnosis. The annual age-specific incidence rates of mesothelioma peaked at 7.1 per 100,000 in females 80–84 years of age and 41.8 per 100,000 in males 80–84 years of age.

For 2014 diagnoses, the most common subtype of mesothelioma was the epithelioid subtype (50.4%). The most common location was the pleura (93.1%).

An additional 101 people with mesothelioma were notified to the AMR following publication of the AMR's 2013 report. This has increased the previously reported number of diagnoses for 2013 from 575 to 676. An increase is also likely to be seen in the number of patients diagnosed in 2014.

Age-standardised incidence rates

The provisional age-standardised mesothelioma incidence rate in 2014 for males and females combined was 2.5 cases per 100,000 population.

The male age-standardised incidence rate declined between 2011 and 2014, from 5.2 per 100,000 to 4.3 per 100,000, while the female age-standardised incidence rate remained at 0.8–0.9 per 100,000.

Number of deaths

At 31 May 2015, 607 mesothelioma patients on the AMR were recorded as having died in 2014. Where there was a known cause of death, 89.0% were recorded as being due to mesothelioma.

Asbestos exposure

The AMR's data on asbestos exposure are based on the estimated exposure profiles of people with mesothelioma diagnosed since 1 July 2010.

Of the 510 people (408 males and 102 females) with mesothelioma who had completed the asbestos exposure questionnaire at 1 April 2015, 449 (88.0% representing 358 males and 91 females) also completed the telephone interview.

Of the 449 who were interviewed:
- 268 (59.7%) respondents (264 males and four females) provided information indicating 'possible' or 'probable' occupational asbestos exposure
- 377 (84.0%) people (294 males and 83 females) provided information indicating 'possible' or 'probable' asbestos exposure in non-occupational contexts.
- 24 (5.3%) people (17 males and seven females) provided no information indicating asbestos exposure above background levels in either occupational or non-occupational spheres.

The assessments consider only the probability of asbestos exposure and the estimated level of exposure, but do not provide information about the duration, intensity or frequency of exposure, if exposure had occurred. Although a large proportion of interviewed participants reported information indicating non-occupational asbestos exposure, the majority of these exposures are less certain ('possible') and of those classed as 'probable' the level of likely exposure was low in most cases.

1. Introduction

Purpose

This is the fourth report of the Australian Mesothelioma Registry (AMR), a national registry that became operational in 2011. The AMR contains information about people diagnosed with mesothelioma in Australia from 1 July 2010 onwards. This report primarily presents data for the period from 1 January 2014 to 31 December 2014. Selected data for earlier calendar years are also shown to help understand patterns of change in mesothelioma incidence and mortality.

Background

Asbestos is a well-established occupational carcinogen. The term 'asbestos' refers to a group of naturally occurring fibrous silicate minerals that are composed of fibres that do not readily break down within the human body and are resistant to fire and chemical corrosion. Asbestos fibres are so small that they are invisible to the naked eye and can be inhaled into the lungs.

Until the mid-1980s, Australia was a producer of asbestos and one of the world's highest users per capita of asbestos (Leigh et al. 2002). Asbestos-containing materials (ACMs) were used extensively in Australia due to their qualities of durability, and fire and chemical resistance. Examples of ACMs include insulation and flooring materials, wall and roof sheeting, brake linings, paints, rope, gas mask filters, oven insulation, fire proofing, pipes and lagging (Foster 1997).

Until the 1970s, ACMs were used extensively in construction (including residential homes), industrial plants and equipment, ship-building, train locomotives and motor vehicles. General use of asbestos in gaskets and brakes was only discontinued on 31 December 2003, when the use and importation of all forms of asbestos was prohibited in Australia. Some exemptions were granted for specialised use in the Australian armed forces. The legacy is a large amount of asbestos in buildings and other infrastructure, and thousands of different products containing asbestos are still in use today. Many homes built in Australia before the late 1980s contain some ACMs.

Asbestos exposure can cause cancers such as lung cancer (in interaction with tobacco smoking) and is the predominant cause of mesothelioma, an aggressive form of cancer that arises in the mesothelium – the membranous tissue that surrounds the heart, lungs, gastrointestinal and urogenital organs, and lines the chest and abdominal cavities. The mechanism by which asbestos causes cancer is only partly understood. Mesothelioma has been linked to both occupational and non-occupational exposure to asbestos; occupational exposure having been the most important source of exposure up to the present time.

Australia has one of the highest incidence rates of malignant mesothelioma in the world. The incidence of mesothelioma increased in Australia from at least 1982, when data on new cases first became available nationally, to 2003 (Safe Work Australia 2013). Some fluctuation has occurred in the number of new diagnoses since that time, however, a general increase is still apparent (AIHW 2015). There is currently no cure for mesothelioma and the progression of the disease is usually rapid. Average life expectancy from diagnosis to death is nine months, and even with aggressive treatment, few people survive longer than two years.

The AMR

Since 2011, the AMR has collected new cases of mesothelioma diagnosed from 1 July 2010 in Australia. The Registry replaced the Australian Mesothelioma Register managed by the National Occupational Health and Safety Commission (NOHSC). In 1998, the voluntary notification of new cases to the Register by state and territory registries declined when new state and territory privacy legislation was enacted. As a result, the incidence of mesothelioma was dramatically under-reported

and the reporting of asbestos exposure information dropped to less than 50% of new cases reported. Due to incompleteness of data, published reports ceased in 2004 and the Register was suspended in December 2007.

The new AMR collects information about cases of mesothelioma to:

- accurately measure the incidence of mesothelioma in Australia for the purposes of
    - monitoring changes in the incidence of mesothelioma following the ban on all uses of asbestos
    - identifying increases in the incidence of mesothelioma that may result from ongoing or possibly increasing non-workplace exposure to asbestos already in the wider environment (the postulated third wave), or exposure to a new hazard entering the occupational or general environment
    - identifying the groups of workers most at risk of exposure to asbestos so that future exposures can be prevented.
- permit periodic assessment of mesothelioma survival to ascertain whether changes in care for mesothelioma are resulting in measurable improvements in survival
- document the asbestos or other exposure experience of people newly diagnosed with mesothelioma as a form of surveillance for new or increasing sources of exposure to asbestos or other carcinogenic fibres
- provide a resource for research into the causes and control of mesothelioma and to assist the development of policies to best deal with the asbestos still present in our environment.

The AMR collects asbestos exposure information via a postal questionnaire and telephone interview from eligible, consenting patients. The flow chart in Figure 1.1 shows the AMR's process of obtaining mesothelioma notifications and asbestos exposure data.

Figure 1.1: AMR data flow

AMR Data Flow

MESOTHELIOMA NOTIFICATIONS FROM STATES/TERRITORIES
NSW / Vic / Qld / WA / SA
Tas / ACT / NT

Information Flow

CONTACT DOCTOR
Obtain doctor's advice to contact mesothelioma patient

NO → Information Flow → END PROCESS

PATIENT CONSENT
Obtain patient consent for collection of asbestos exposure information

Information Flow

ASBESTOS EXPOSURE INFORMATION COLLECTION → Information Flow → australian mesothelioma registry

Notifications

Notifications refer to the cases of mesothelioma provided to the AMR by the state and territory cancer registries. Cancer registries are notified of all cases of cancer diagnosed in residents living in their jurisdiction. For the AMR, mesothelioma cases are 'fast-tracked' by each state and territory; that is, these records are given priority and are processed and coded as quickly as possible. The state and territory cancer registries submit notifications to the AMR on a regular basis. Notified records include demographic information and details of the diagnosis and death.

Asbestos exposure information

Once a notification of mesothelioma is received, the state or territory cancer registry contacts the patient's clinician to confirm whether their patient meets the eligibility criteria for participation. Eligibility criteria include confirmation of mesothelioma diagnosis on or after 1 July 2010, and that the patient is well enough to be contacted about their exposure to asbestos. Following this, the state and territory cancer registries contact the patient.

Patients are able to self-notify directly to the AMR. In this case, the AMR sends an information pack directly to the patient and the clinician is not contacted. Self-notifying patients are not included in the AMR unless a notification is received from the respective state or territory cancer registry to confirm their mesothelioma diagnosis.

Asbestos exposure information is obtained from consenting mesothelioma patients through a postal questionnaire and telephone interview (Figure 1.2). In the postal questionnaire, patients list their residence, school and occupation histories. Patients are also asked about their family history of mesothelioma. Patients' residence and occupation information is systematically compiled through an online assessment tool called OccIDEAS (Occupational Integrated Database Exposure Assessment System). The Monash Centre for Occupational and Environmental Health (MonCOEH) uses information from the postal questionnaire to assign relevant telephone interview questions for each person.

Following the postal questionnaire, a telephone interview is conducted. Based on the individual's responses to the postal questionnaire, specific questions are asked in the interview to assess their potential for having been exposed to asbestos. This means the telephone interview is tailored to the participant. The Hunter Research Foundation (HRF) conducts the telephone interviews.

The information collected is used by MonCOEH staff to assess and assign values to each patient's lifetime asbestos exposure. Further information about the asbestos exposure assessments can be found in Appendix A.

Figure 1.2: AMR asbestos exposure information collection
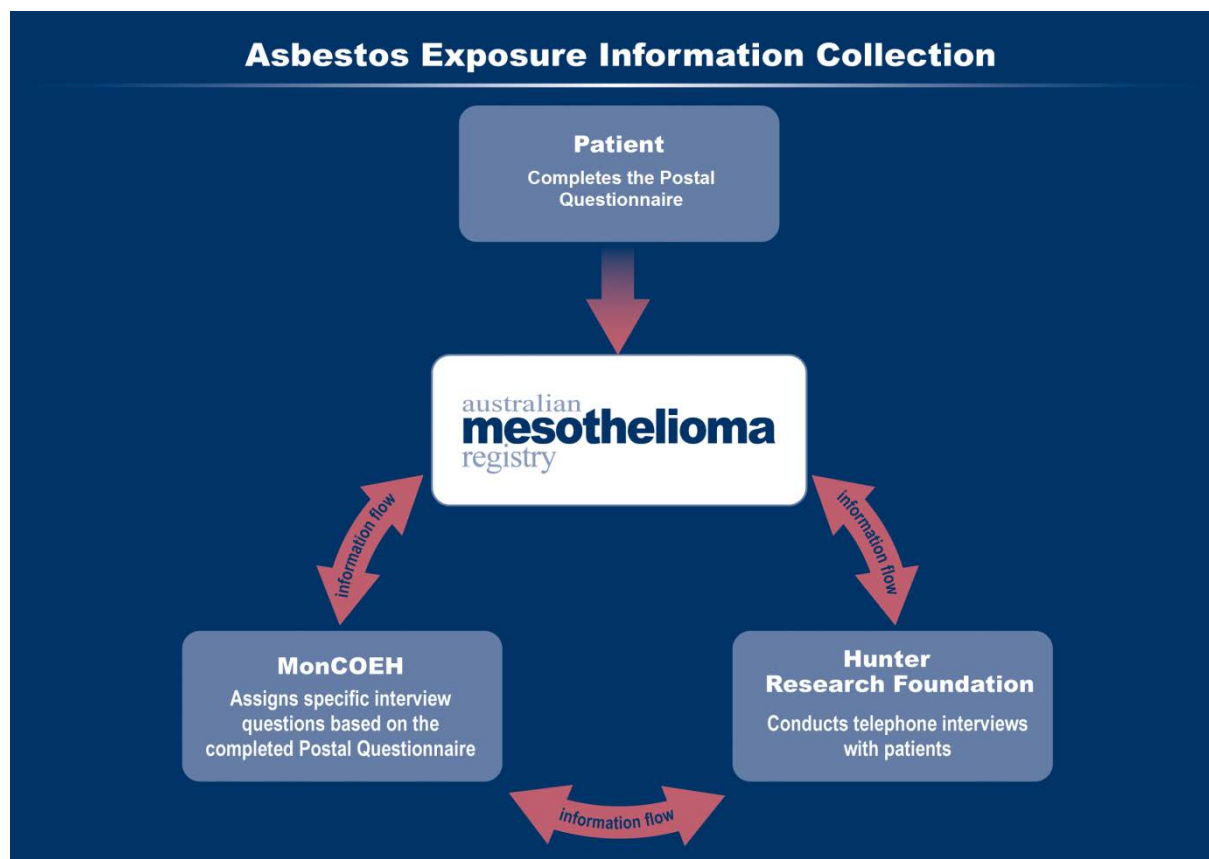
This report

This is the fourth report presenting data collected through the AMR, including mesothelioma notifications and asbestos exposure information. This report primarily presents data for patients diagnosed during the calendar year 1 January 2014–31 December 2014.

Since the AMR's 2011 data were first published (AMR 2012), an additional 80 people diagnosed with mesothelioma in 2011 have been notified to the AMR. Since the 2012 report (AMR 2013), 94 new cases have been notified for that year, and since the 2013 report (AMR 2014), 101 new cases have been notified for that year. Possible reasons for the extended time between diagnosis and notification include delays in:

- confirmation of diagnosis
- notification by pathology laboratories to cancer registries
- the cancer registry process (e.g. periodic shortage of experienced staff, time taken to code complex cases).

The reported incidence and mortality figures are based on the data recorded at the time of extraction from the AMR. Extraction dates and methods used may differ across AMR publications. Table A1 shows the differences in AMR reports published between 2012 and 2015.

The report includes the following additional sections:

2. Incidence

3. Mortality

4. Asbestos exposure.

Appendix A details methods used for collating and reporting the data. Appendix B contains additional data, including tables underlying the figures. Appendix C lists the publications and key presentations on the AMR since 2010.

2. Incidence

Number of cases

In total, 641 people diagnosed with mesothelioma from 1 January 2014 to 31 December 2014 had been notified to the AMR at 31 May 2015 (Table 2.1). This compares with 575 cases reported for 2013 at 31 May 2014.

Table 2.1: People in Australia newly diagnosed with mesothelioma by year and sex, 2011 to 2014

Year of diagnosis	Males	Females	Persons
2011	587	105	692
2012	591	122	713
2013	547	129	676
2014	518	123	641

Since the previous publication (AMR 2014), there have been additional notifications of people diagnosed with mesothelioma reported to the AMR for all previous years: 29 for 2011 (4.4% increase), 61 for 2012 (9.4% increase), and 101 for 2013 (17.6% increase). A similar increase is anticipated in the reported number of patients diagnosed in 2014.

Table 2.2 shows the number of males and females newly diagnosed with mesothelioma by state and territory for the year 2014. The incidence rate for males and females combined was 2.5 per 100,000 population overall and ranged from 1.4 in Tasmania to 3.6 in Western Australia. The rate for males was higher than for females in all jurisdictions and overall (4.3 and 0.9, respectively).

The incidence rate age-standardised to the World Standard Population (Segi 1960) was 1.4 per 100,000 (Table A4). This is the figure that should be used when comparing incidence rates in Australia to those in other countries.

The overall 2014 age-standardised mesothelioma incidence rates differed minimally from those in previous years of AMR data (Table A5).

Table 2.2: New cases of mesothelioma and age-standardised incidence rates by sex and state and territory, 2014

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
Number									
Males	147	110	136	77	35	<5	6	<5	518
Females	38	30	21	17	10	n.p.	<5	—	123
Persons	**185**	**140**	**157**	**94**	**45**	**10**	**n.p.**	**<5**	**641**
Rate per 100,000 population[a]									
Males	3.6	3.6	5.8	7.6	3.0	n.p.	n.p.	n.p.	4.3
Females	0.8	0.8	0.8	1.3	0.8	n.p.	n.p.	0.0	0.9
Persons	**2.1**	**2.1**	**3.1**	**3.6**	**2.0**	**1.4**	**n.p.**	**n.p.**	**2.5**

(a) Directly age-standardised using the 2001 Australian standard population.

n.p. Not published to protect confidentiality of small numbers.

Age at diagnosis for patients diagnosed in 2014 ranged from 25 to 99 years. The largest proportions were in the age groups ranging from 70 to 79 years (Table A6).

Figure 2.1 shows the distribution by age and sex of new cases of mesothelioma diagnosed in 2014. There were 518 males diagnosed with mesothelioma (see Table 2.1) with the largest numbers in the 70–74 year age group (119 patients) (Table A7). The 123 females diagnosed with mesothelioma were more evenly spread across age groups.

Figure 2.1: New cases of mesothelioma by age group and sex, 2014
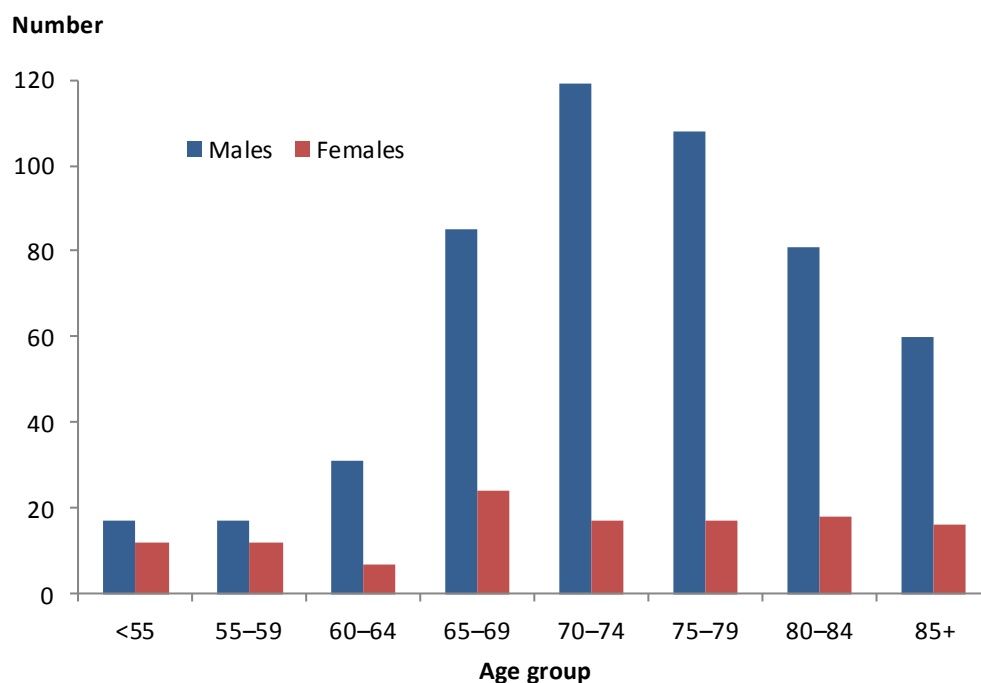
Source: Table A7.

Age-specific incidence rates of mesothelioma (Figure 2.2) generally increased with age. The rates were highest at 41.8 per 100,000 among males aged 80–84 years, and 7.1 per 100,000 females aged 80–84 years (Table A7).

Figure 2.2: Age-specific incidence rates of mesothelioma by sex, 2014
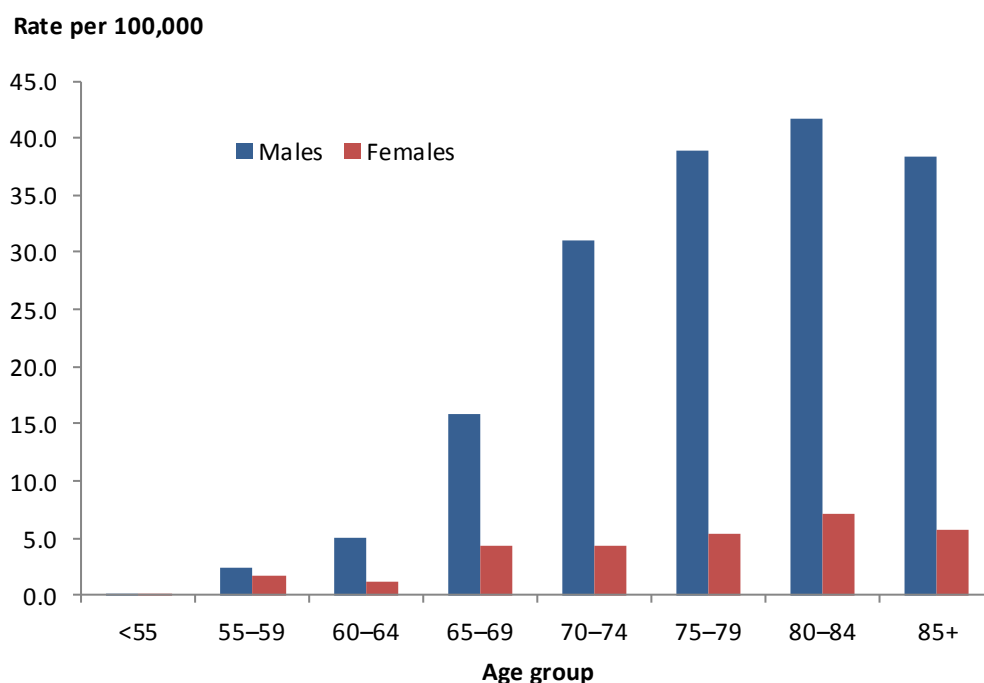
Source: Table A7.

Diagnosis information

In 2014, epithelioid mesothelioma was the most common subtype (50.4%) of mesothelioma notified to the cancer registries. Sarcomatoid mesothelioma, which includes desmoplastic mesothelioma, accounted for 13.4%. Biphasic mesothelioma, where a combination of epithelioid and sarcomatoid cells are present, represented 10.0%, while unspecified types of malignant mesothelioma accounted for 26.2% of cases (Table 2.3). The tumour location was the pleura for 93.1% of patients (Table 2.4).

Table 2.3: New cases of mesothelioma by histological type, 2014

Type of mesothelioma	Number	Per cent
Epithelioid	323	50.4
Sarcomatoid[a]	86	13.4
Biphasic	64	10.0
Malignant – not otherwise specified	168	26.2
Total	**641**	**100.0**

(a) Includes desmoplastic mesothelioma.

Table 2.4: New cases of mesothelioma by location of tumour, 2014

Tumour location	Number	Per cent
Pleura[a]	597	93.1
Peritoneum[b]	38	5.9
Other	6	0.9
Total	**641**	**100.0**

(a) Includes pericardium, pleura and mediastinum.
(b) Includes peritoneum and specified parts of peritoneum.

Table 2.5 presents laterality information, excluding 22 cases for non-paired organs where this was not applicable and 203 cases where laterality was not stated. None of the reported tumours were bilateral.

Table 2.5: New cases of mesothelioma by laterality (where applicable), 2014

Laterality	Number	Per cent
Right	255	61.3
Left	161	38.7
Bilateral	—	0.0
Total	**416**	**100.0**

Note: Excludes cases where laterality was not known.

The most common basis for diagnosis was histology (89.2%). There were only two cases for this period where diagnosis was based on the death certificate only (Table 2.6). National death data for 2014 have not yet been received by all cancer registries; therefore, the total number of mesothelioma deaths reported here is likely to be an underestimate. It is expected that at least 3–4% of all incident mesothelioma cases will ultimately be 'diagnosed' by death certificate only.

Table 2.6: New cases of mesothelioma by best basis of diagnosis, 2014

Best basis	Number	Per cent
Death certificate only	2	0.3
Clinical, no investigation[a]	7	1.1
Clinical investigation[b]	13	2.0
Specific tumour markers	—	—
Cytology	44	6.9
Histology[c]	572	89.2
Not stated	3	0.5
Total	**641**	**100.0**

(a) Diagnosis made before death, but without any of the remaining types of information listed.
(b) All diagnostic techniques, including x-ray, endoscopy, imaging, ultrasound, exploratory surgery and autopsy, without a tissue diagnosis.
(c) Includes histology of metastasis, primary tumour or not otherwise specified.

Trends over time

There are limitations with reporting mesothelioma trends due to the lack of time series data in the AMR at this stage. However, Figures 2.3 and 2.4 present trends in mesothelioma incidence using available data from two sources: the Australian Cancer Database (ACD) (AIHW 2015) for 1982–2010, and the AMR for 2011–2014. To date, the highest overall number of new cases has been reported for 2012 (713). It is important to note that the apparent decline seen in recent years may be due to delays in notifications of mesothelioma cases to the AMR, rather than a real decline in incidence.

Figure 2.3: New cases of mesothelioma by year and sex, 1982 to 2014
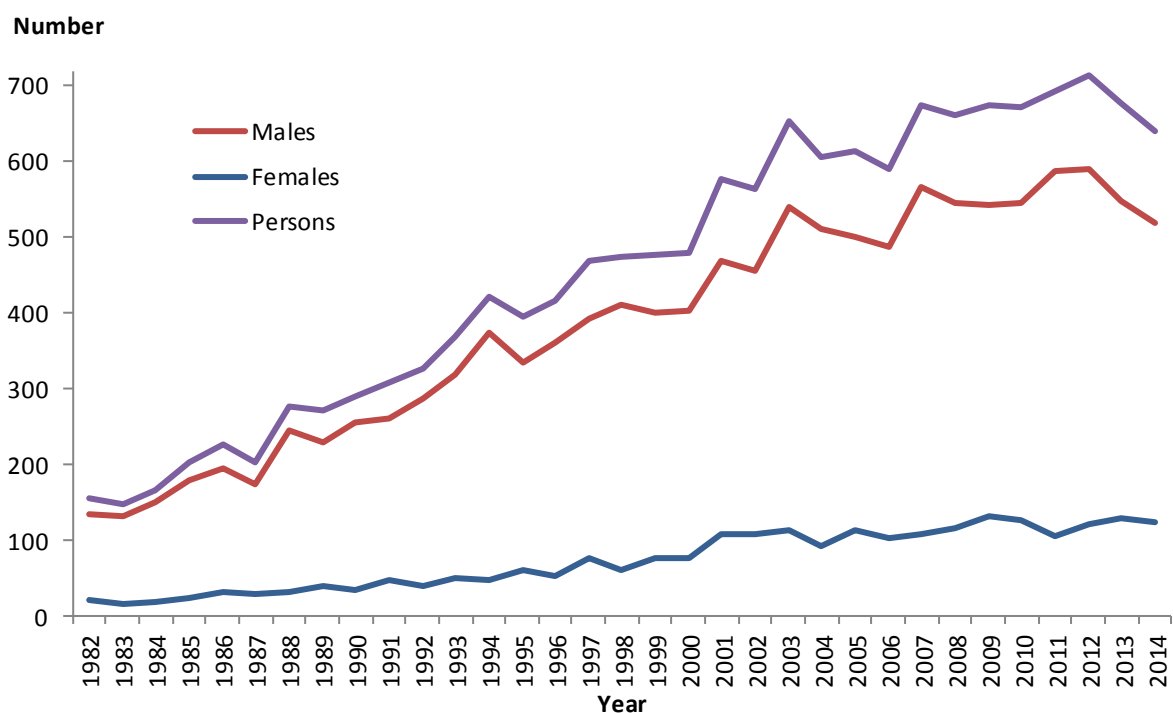
Source: Table A8.

Using the same sources, age-standardised incidence rates show some fluctuation, although a general increase occurred to 2003, when the overall rate was 3.2 per 100,000 and the rate for males 5.9 per 100,000. The overall rate was 3.1 per 100,000 in 2007. This rate remained between 2.8 and 2.9 per 100,000 from 2008 to 2012 (Figure 2.4).

Figure 2.4: Age-standardised incidence rates of mesothelioma by year and sex, 1982 to 2014

Rate per 100,000
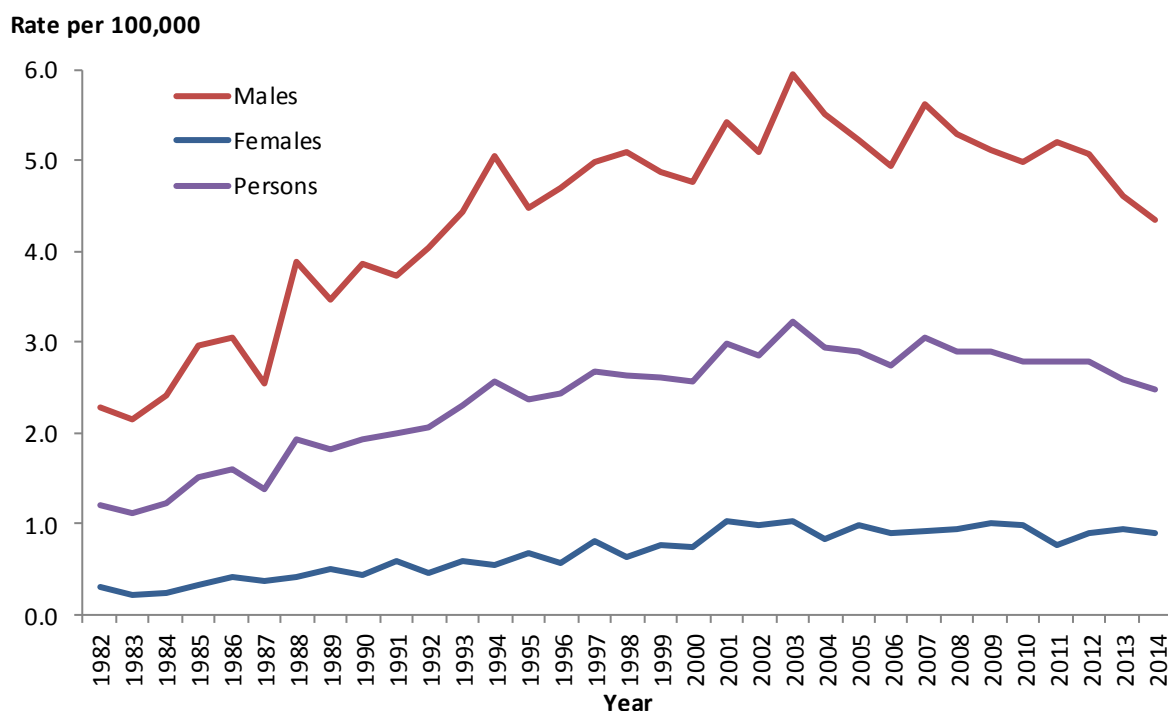
Source: Table A8.

3. Mortality

Mortality figures are obtained using data linkage of AMR cases to the National Death Index (NDI). Where NDI data are not available, date and cause of death information from state and territory cancer registry data are reported (see Appendix A).

Number of deaths

At 31 May 2015, 607 deaths of people with mesothelioma in 2014 had been notified to the AMR (Table 3.1). The total number of deaths in the AMR for 2011 and 2012 is lower than expected because the AMR only includes people diagnosed since 1 July 2010.

Table 3.1: Deaths of people with mesothelioma by year and sex, 2011 to 2014

Year of death	Males	Females	Persons
2011	323	57	380
2012	481	92	573
2013	533	95	628
2014	499	108	607

The age-standardised mortality rate for 2014 was 2.3 per 100,000 (Table 3.2). The number of deaths for previous years by state and territory are presented in Table A9. The 2014 death figures are expected to increase in subsequent editions of this report as death information becomes available for more cases.

Table 3.2: Deaths of people with mesothelioma by state and territory, 2014

Deaths	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
Number	153	125	156	93	66	11	<5	<5	607
Rate per 100,000 population[(a)]	1.7	1.8	3.1	3.6	3.0	1.5	n.p.	n.p.	2.3

Note: Includes death information from the NDI where available, otherwise from state/territory cancer registries.

(a)   Directly age-standardised using the 2001 Australian standard population.

n.p. Not published due to small numbers.

Cause of death

No cause of death information was available from the NDI for deaths in 2014. Cause of death information from state and territory cancer registries was available for 396 of the 607 (65.2%) deaths recorded in this period. Where cause of death was known, mesothelioma was the reported cause in 95.7% of cases (in 17 cases, mesothelioma was not recorded as the underlying cause of death) (Table 3.3).

Table 3.3: Cause of death for people with mesothelioma, 2014

Cause of death	Number	Per cent
Mesothelioma	379	95.7
Not mesothelioma	17	4.3
Total	**396**	**100.0**

Notes:

1. Excludes cases where cause of death was not known.

2. Death information from state/territory cancer registries.

Cause of death from either the NDI or state and territory cancer registries was available for 372 of the 380 (97.9%) deaths recorded for 2011, for 531 of the 573 (92.7%) deaths recorded for 2012, and for 398 of the 628 (63.4%) deaths recorded in 2013 (Table A10). Cause of death information is not yet available for a large number of deaths of people diagnosed in 2014, as cases are yet to be coded.

Trends over time

There are as yet insufficient data from the AMR to report trends in mortality and survival or to provide future projections of mortality. However, Figure 3.1 presents trends in mesothelioma mortality using available data from the Australian Cancer Database (ACD) (AIHW 2015) for 1997–2012, and the AMR for 2013–2014. To date, the highest overall number of deaths has been reported for 2012 (638). It is important to note that the apparent decline seen in recent years may be due to delays in notifications of mesothelioma deaths to the AMR, or their lack of inclusion in the NDI linkage, rather than a real decline.

Figure 3.1: Deaths of people with mesothelioma by year of death and sex, 1997 to 2014
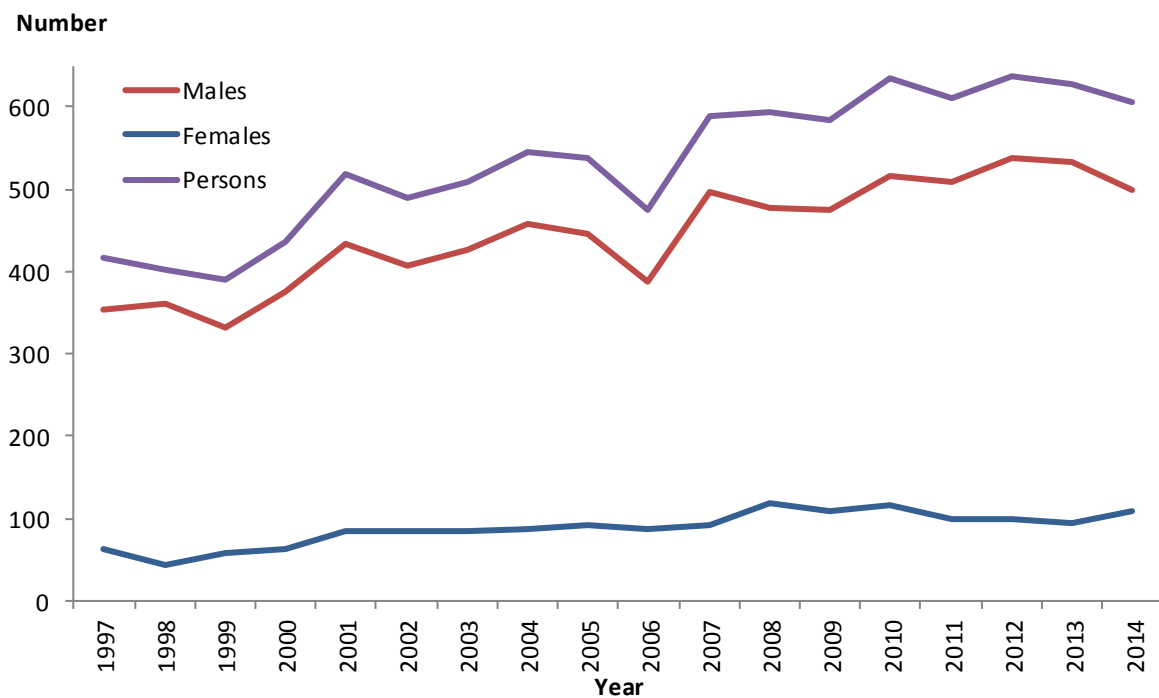
Source: Table A11.

Using the same sources, age-standardised mortality rates show some fluctuation, although rates were generally stable over the period. The overall rate has remained between 2.3 and 2.6 per 100,000 since 2007 (Figure 3.2).

Figure 3.2: Age-standardised mortality rates of mesothelioma by year of death and sex, 1997 to 2014
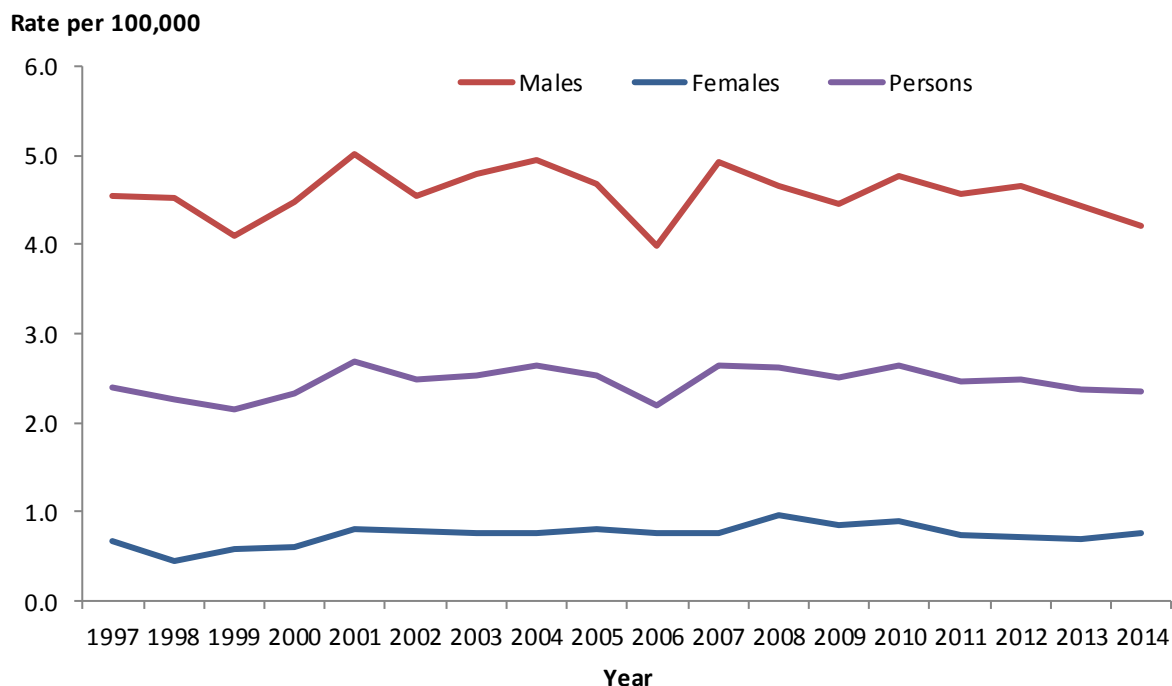
Source: Table A11.

4. Asbestos exposure

This section describes the results of exposure assessment for participants diagnosed from 1 July 2010 onwards. Table 4.1 presents the numbers of people who completed the recruitment process or were in the process of being recruited at 1 April 2015. This table should be interpreted in the context of Table A3 (Appendix A), which outlines the patient recruitment models used by the state and territory cancer registries.

The overall number of people diagnosed since 1 July 2010 who consented to participate in the asbestos exposure assessment was 510 at 1 April 2015. Of these, 449 people (88.0%) completed both the questionnaire and telephone interview components of the assessment (Table 4.1).

Table 4.1: Recruitment for asbestos exposure data collection by year and state and territory, at 1 April 2015

Year of diagnosis	NSW/ACT[a]	Vic	Qld	WA	SA	Tas	NT	Total
Consenting patients/Postal questionnaires completed								
2010–2011	38	41	16	12	13	6	1	127
2012	55	32	20	29	5	5	—	146
2013	38	28	17	23	13	3	1	123
2014	42	22	19	14	11	1	1	110
2015	3	—	—	—	1	—	—	4
Total	**176**	**123**	**72**	**78**	**43**	**15**	**3**	**510**
Interviews conducted								
2010–2011	33	36	15	12	10	5	1	112
2012	52	28	18	27	5	5	—	135
2013	33	26	15	21	10	3	1	109
2014	32	19	17	12	9	1	1	91
2015	1	—	—	—	1	—	—	2
Total	**151**	**109**	**65**	**72**	**35**	**14**	**3**	**449**

(a) Includes six ACT participants.

Of the 510 participants who completed the postal questionnaire, 27 (5.3%) reported a family member who also had mesothelioma. However, 63 (12.4%) respondents did not answer this question.

The remainder of this section includes information on the individuals who had consented to participate at 1 April 2015 and who completed both a questionnaire and a telephone interview.

Asbestos exposure assessment: overview

The asbestos exposure assessment for each participant was, in the first instance, based on an assessment of each job held by the participant using job-specific modules (JSMs) (see Appendix A for detailed methodology). The occupational and non-occupational asbestos exposures of participants were assessed and classified according to the likelihood the person was exposed to asbestos above background levels.

It is important to note that the assessment scheme used in this report is based on probability of exposure to asbestos and does not take into account intensity, duration or frequency of exposure. The classification used is a three-level scheme: asbestos exposure 'probable', 'possible' or 'unlikely' (Table 4.2). For jobs assessed as 'probable', exposure was further classified by level of exposure (eight-hour time-weighted average (TWA)) (Table 4.2).

For the purpose of this report, where a participant received the same JSM multiple times (i.e. for different jobs in the same field), with different jobs assessed as having different probabilities of exposure, then the highest probability of exposure derived from that JSM for that individual has been reported.

Table 4.2: Classification of assessments of exposure probability and estimated level of exposure – not taking into account frequency/duration of exposure

Level	Description
Unlikely	No information from JSM interview to indicate exposure, or jobs not allocated JSMs because there was considered to be a low likelihood of exposure.
Possible	Information, usually from JSM interview, indicated that exposure may have occurred.
Probable	Convincing information from JSM interview data that exposure was more likely than not. Probable exposures are further classified by estimated maximum level of exposure, as follows:
	Probable high — Maximum exposure greater than 2 fibres/ml (8-hour TWA)
	Probable medium — Maximum exposure 0.1–2.0 fibres/ml (8-hour TWA)
	Probable low — Maximum exposure less than 0.1 fibres/ml (8-hour TWA)

Note: The same categories of exposure probability have also been used in the assessment of non-occupational exposure.

There were 449 participants who had participated fully in the exposure component at 1 April 2015. In summary, a total of 268 (59.7%) participants were assessed as having possible or probable occupational asbestos exposure, and of these, 172 also had indications of non-occupational exposure. There were 157 participants with indications of non-occupational exposure but not occupational exposure. No information was found to indicate asbestos exposure in either occupational or non-occupational spheres for 24 participants (5.3%) (Table 4.3).

Table 4.3: Summary of occupational and non-occupational exposure assessment, by sex

	Exposure indicated				
	Occupational exposure only	Non-occupational exposure only	Both occupational and non-occupational exposure	Neither occupational or non-occupational exposure	Total
Males	48	78	216	17	359
Females	—	79	4	7	90
Persons	**48**	**157**	**220**	**24**	**449**

Figure 4.1 provides a summary of participants in relation to their occupational exposure assessment. Further details about occupational and non-occupational exposure findings are provided below. It is important to note that the data presented represent the exposure profiles of mesothelioma cases only. Because comparable exposure data from the general population are not available at this time, estimates of the risk of mesothelioma associated with particular exposure circumstances ascertained cannot be made.

Figure 4.1: Occupational exposure assessment summary

Total consenting participants n=449	Occupational exposure indicated by JSM data n=268
	Occupational exposure not indicated n=181
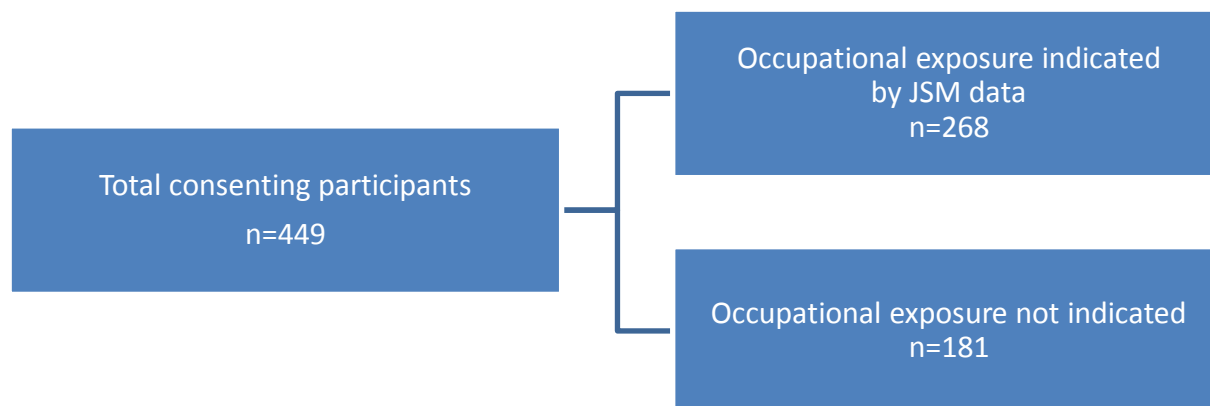
Note: JSM = job-specific module

Occupational asbestos exposure assessed by job-specific modules (JSMs)

JSMs were allocated to particular jobs that the participant held during their working career for which more information was needed by the exposure assessment team. Jobs with very low probability of exposure were not allocated JSMs, and where a participant had many similar jobs, JSMs were allocated to a representative selection.

Table 4.4 shows how many participants received each of the most commonly used JSMs at least once. A single participant could receive a particular JSM more than once for different jobs, and a single participant could receive JSMs of different types for different jobs. Each single job could only receive one JSM; therefore, the totals in Table 4.4 do not add up to the total number of participants.

The most frequently administered JSM was the Trades module, which was intended to capture asbestos exposures in a wide range of trades and related jobs. In total, 101 participants were given this module to evaluate construction-related jobs, 36 participants received the Trades JSM for electrician-related jobs, 22 for plumbing-related jobs, 21 for boilermaker and/or welder-related jobs and 67 for other metal/mechanical-related jobs. JSMs for land and water transport-related jobs were given to 73 and 53 participants respectively. The Land Transport module was most frequently used for jobs involving driving or operating other mobile plant and jobs associated with maintenance of land vehicles (including heavy and light road vehicles as well as railway trains or other mobile plant). The Water Transport JSM was most frequently given for shipbuilding and/or maintenance jobs. The 'Asbestos Users N.E.C.' module was intended to capture asbestos exposure in a range of miscellaneous jobs and it was administered to 20 participants. The largest single group given this module were given it for laundry-related jobs.

Twenty-seven participants were given other JSMs. The Asbestos Mine/Mill JSM was administered to only two participants who reported jobs in the asbestos mining/milling industry (and exposure was assessed as probable and high for these jobs in both cases). One participant reported an asbestos removal job for which the Asbestos Removal JSM was used (assessed as probable/medium).

Table 4.4: Job-specific modules (JSMs) assigned to participants by types of jobs

JSM name	Types of jobs covered by this JSM	No. participants allocated this JSM at least once[a]
Trades	Construction (carpenter, joiner, builder, bricklayer etc.)	101
	Electrician	36
	Plumber	22
	Boilermaker, welder	21
	Other metal & mechanical trades (including fitters, turners, machinists)	67
	Engineer	10
	Telecommunications technician	9
	Other	52
	Total participants given Trades JSM	**258**
Land Transport	Driver	23
	Mechanic/fitter/panel beater	41
	Other	12
	Total participants given Land Transport JSM	**73**
Water Transport	Marine engineer/mechanic	11
	Other seagoing jobs (including military navy)	10
	Shipwright/boat builder	24
	Waterside worker/stevedore	7
	Other	4
	Total participants given Water Transport JSM	**53**
Asbestos Users N.E.C.	Laundry worker	6
	Other	15
	Total participants given Asbestos Users N.E.C. JSM	**20**
Other JSMs[b]	**Total participants given other JSMs**	**27**

(a) Individuals can be allocated more than one JSM and therefore the totals in this table do not equal the total number of participants. An individual can receive the same JSM several times for different jobs, or can receive different JSMs for different jobs, as appropriate to the individual's job history.

(b) Other JSMs: furnace industry, insulator, asbestos mine/mill, asbestos removalist, automotive component manufacture, cement factory, tip worker and textile manufacture.

Table 4.5 shows how many participants received each of the most commonly reported JSMs and the highest probability/level of exposure estimated for these participants based on the module in question. Given that participants can receive more than one type of JSM, the numbers in this table do not equal the number of participants.

Of those participants who received the Trades JSM, 209 (81.0%) were classified as probably exposed on the basis of the information they provided in response to that module. The majority of these were classified as having probable and high exposure. It is important to note that this exposure assessment method ('highest ever') tends to classify individuals as 'high' exposure level so the many 'high' exposure levels in this and subsequent tables should be interpreted with caution. It is also important to note that these findings are for mesothelioma cases, among whom higher levels of exposure are not unexpected. For 32 (12.4%) of the recipients of the Trades JSM, asbestos exposure was considered unlikely based on this JSM. For the majority (68.5%) of those who received the Land

Transport JSM, exposure was considered unlikely based on that JSM and for the majority (71.7%) of those who received the Water Transport JSM, evidence suggested exposure was probable(Table 4.5).

Table 4.5: Job-specific module (JSM) exposure assessment results (probability and estimated level of exposure only) by JSM type (for JSMs used sufficiently often for meaningful interpretation)

JSM name	No. participants allocated JSM at least once	Assessed probability of exposure (no. participants)					
		Unlikely	Possible	Probable[b]			
				Unknown	Low	Medium	High
Trades	258	32	17	—	1	3	205
Land Transport	73	50	1	—	—	—	22
Water Transport	53	7	8	—	6	8	24
Asbestos Users N.E.C.	20	10	2	2	—	—	6
All other JSMs[a]	27	9	3	1	—	6	8

(a) Other JSMs: furnace industry, insulator, asbestos mine/mill, asbestos removalist, automotive component manufacture, cement factory, tip worker and textile manufacture.
(b) These categories refer to the estimated level of asbestos exposure.

Table 4.6 shows the assessed exposure probability and level for the 258 participants who received the Trades JSM, by the most common job types reported by these participants. The majority of individuals given the Trades JSM for construction, electrical, plumbing, metal trades or other trade-related jobs were classified as having had probable asbestos exposure.

Table 4.6: Trades JSM exposure assessment results (probability and estimated level of exposure only) for largest categories of job titles

Job title	No. participants allocated this JSM at least once	Assessed probability of exposure (no. participants for whom asbestos exposure was assessed)				
		Unlikely	Possible	Probable[a]		
				Low	Medium	High
Construction (carpenter, joiner, builder, bricklayer etc)	101	10	3	—	—	88
Electrician	36	7	4	—	—	25
Plumber	22	2	1	1	—	18
Boilermaker, welder	21	—	—	—	—	21
Other metal & mechanical trades (including fitters, turners, machinists)	67	11	6	—	2	48
Engineer	10	3	2	—	—	5
Telecommunications technician	9	5	2	—	—	2
Other	52	20	4	—	1	27
Total participants given Trades JSM	**258**					

(a) These categories refer to the estimated level of asbestos exposure.

Non-occupational exposure

All participants received a common questionnaire module to assess their non-occupational exposure regardless of occupational history and irrespective of whether JSMs were also administered to that individual. Information from the non-occupational module was used to assess exposure probability and level of exposure for each participant in the same way as occupational exposure was assessed (probability 'probable', 'possible' or 'unlikely' and level 'high' 'medium' and 'low').

For 449 participants, 377 were assessed as having had possible or probable exposure in non-occupational contexts based on data collected from the non-occupational questionnaire module. For 72 participants the non-occupational exposure assessment did not identify possible or probable asbestos exposure above background levels (Figure 4.2).

Figure 4.2: Non-occupational exposure assessment summary

Note: In previous reports, only participants without occupational exposure were assessed for non-occupational exposure. The current report, however, reports non-occupational module results for all participants.
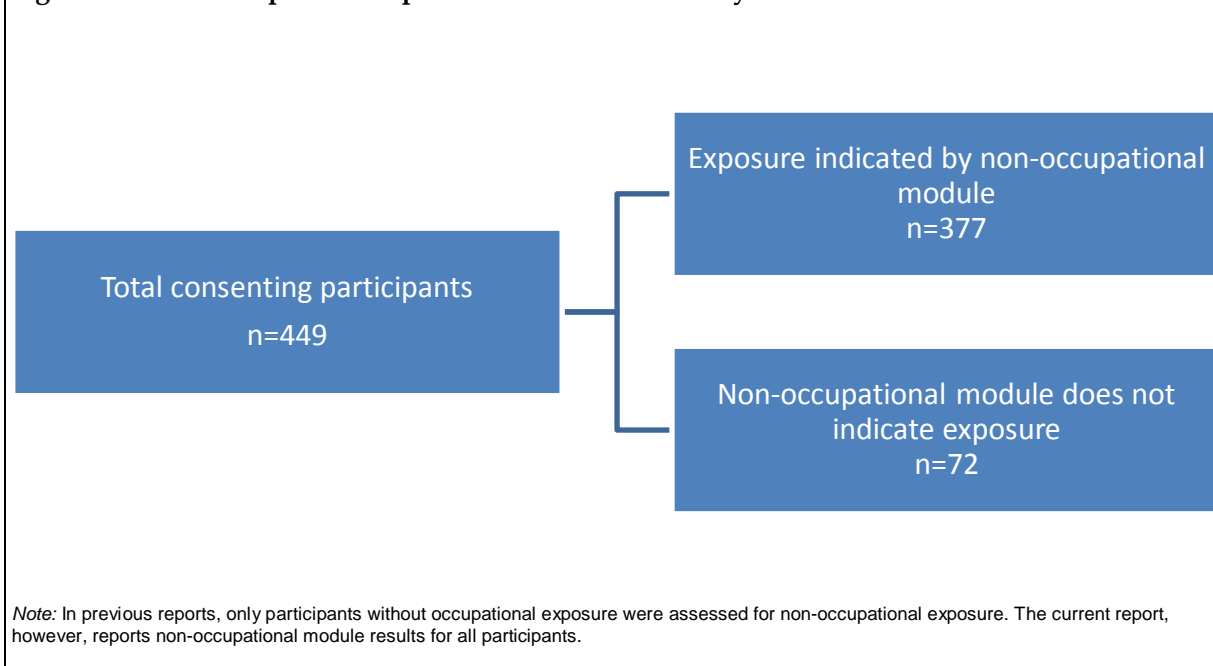
Table 4.7 shows the contexts of non-occupational asbestos exposure that were reported by the 449 participants who completed the non-occupational module.

Table 4.7: Sources of non-occupational asbestos exposure

Non-occupational module section	Assessed probability of exposure (no. participants)						
	Total	Unlikely	Possible	Probable			
				Unknown	Low	Medium	High
Ever lived in a house made mainly of fibro (built 1947–1987)	449	394	—	—	55	—	—
Ever lived near asbestos mine or asbestos products factory	449	435	—	—	14	—	—
Ever did major home renovations which involved asbestos products (excluding paid work)	449	195	218	21	—	15	—
Ever lived in a house during major renovations (where house was built and the work undertaken during relevant periods)	449	257	192	—	—	—	—
Ever serviced car brakes/clutch (excluding paid work)	449	321	—	—	128	—	—
Ever lived in same home as someone with asbestos-exposed job who came home dusty	449	358	66	—	—	25	—
Ever visited Wittenoom in Western Australia (excluding paid work)	449	410	39	—	—	—	—
Ever visited another Australian asbestos mining town (excluding paid work)	449	440	—	9	—	—	—
Other self reported non occupational exposure	449	384	65	—	—	—	—

Fifty-five respondents reported ever living in a house made mainly of fibro and which was built between 1947 and 1987. Fourteen participants reported living near an asbestos mine or factory.

It should be noted that a number of respondents answered the question about living in a house during renovations and undertaking major home renovations apparently in relation to the same renovation event: of the 254 home renovators, 192 also answered 'yes' to living in a house during renovations. Of the 254 who reported having done home renovations, 91 were women.

Of the 449 participants in Table 4.7, 39 answered 'yes' to having visited Wittenoom.

Sixty six respondents reported a household member with a dusty job, however, most of these respondents either did not launder the worker's clothing and/or the worker's job details provided indicated that their asbestos exposure was less than probable. Twenty five respondents were classified as having had probable exposure because they laundered the work clothes of a family member who had occupational asbestos exposure.

It is important to note there is overlap between categories of exposure in Table 4.7. Among the 449 participants reported in the table, it was common to have indications of exposure in more than one non-occupational context. Therefore, a number of participants are counted in more than one category and the column totals do not add up to 449.

Although a large proportion of respondents reported information indicating the possibility of non-occupational exposure, the majority of these exposures are less certain ('possible'). Of those classed as 'probable', the level of likely exposure was 'low' in most cases.

Exposure not indicated

For a total of 24 (5.3%) participants, no information was found to indicate asbestos exposure above background levels in either occupational or non-occupational spheres. Of these, 17 were males and seven were females. These participants are classified as 'exposure unlikely'. It should be noted that although it has not been possible to identify asbestos exposure among these participants using the AMR exposure assessment, this does not mean that they have never been exposed to asbestos. It means that no evidence of above background exposure was obtained by the ascertainment methods used.

Appendix A: Methods

This report focuses on data for people diagnosed with mesothelioma during the period 1 January 2014–31 December 2014 and notified to the AMR. The data presented in the report represent those that had been received by the Australian Mesothelioma Registry at 1 April 2015 for exposure data and 31 May 2015 for incidence data. Mortality data from the NDI are reported at 30 March 2015 and from state and territory cancer registries at 31 May 2015 (Table A1).

Table A1: Differences in AMR reports over time

AMR report	Year of publication	Date of recorded incidence	Population used for age-specific rates	Population used for age standardisation	Date of recorded mortality	Death data type and source
Mesothelioma in Australia 2011	2012	31 August 2012	Australian estimated resident population at 30 June 2011	Australian estimated resident population at 30 June 2011	12 April 2012	Number of deaths & cause of death – National Death Index
					31 August 2012	Number of deaths & cause of death – state/territory cancer registries
Mesothelioma in Australia 2012	2013	30 June 2013	Australian estimated resident population at 30 June 2012	Australian 2001 standard population	10 April 2013	Number of deaths – National Death Index
				World Standard Population (Segi 1960)	30 June 2013	Cause of death – state/territory cancer registries
Mesothelioma in Australia 2013	2014	31 May 2014	Australian estimated resident population at 30 June 2013	Australian 2001 standard population	10 March 2014	Number of deaths & cause of death – National Death Index
				World Standard Population (Segi 1960)	31 May 2014	Number of deaths & cause of death – state/territory cancer registries
Mesothelioma in Australia 2014	2015	31 May 2015	Australian estimated resident population at 30 June 2014	Australian 2001 standard population	30 March 2015	Number of deaths & cause of death – National Death Index
				World Standard Population (Segi 1960)	31 May 2015	Number of deaths & cause of death – state/territory cancer registries

Statistical methods

Age groups: The basis for most statistics is a summation of cases by five-year age groups. Age groups are expressed as whole years.

Age-specific rates are calculated by dividing the number of cases by the Australian estimated resident population of the same sex, age group and state/territory at 30 June of the year presented.

Age-standardised rates are calculated by the direct method and represent a summation of weighted age-specific rates. The **2001 Australian standard population** or the **World Standard Population** (Segi 1960) is used for age-standardised rate calculations in tables, as indicated.

Rates in this report are calculated separately for males and females and are expressed as diagnoses per 100,000 population, with most data reported as the rate per 100,000.

Completeness

Notification data were complete for many data items for 2014 diagnoses. However, the percentage of missing mandatory fields ranged from 0.0% to 34.2%.

For 2014 deaths, there were 607 cases with a date of death recorded. Of these, the cause of death was not reported or unknown for 29.8% of the cases.

For South Australia (SA), the following data items were not provided unless the patient consented to participate: Indigenous status, country of birth, full date of birth (month and year are provided), full date of diagnosis (month and year are provided), address and all names. In Table A2, 34 of the missing cases for these fields are from SA. In addition, cause of death is provided by SA for all cases if it is sourced from linkage with the NDI; otherwise it is provided for consenting patients only, from other sources.

Table A2: AMR notification fields and per cent of missing records, 2014

Field	Mandatory field	No. of records	No. missing/ not stated	Per cent missing
Cancer registry ID/unique identifier	Yes	641	—	—
Record status	Yes	641	—	—
State/territory	Yes	641	—	—
Title	No	641	388	60.5
Last name	Yes	641	34	5.3
First name	Yes	641	34	5.3
Other names	No	641	256	39.9
Case address	Yes	641	34	5.3
Date of birth[(a)]	Yes	641	34	5.3
Sex	Yes	641	—	—
Indigenous status	Yes	641	219	34.2
Country of birth	No	641	204	31.8
Diagnosis date[(b)]	Yes	641	—	—
Best basis of diagnosis	Yes	641	3	0.5
Topography	Yes	641	—	—
Morphology	Yes	641	—	—
Laterality	No	619	203	32.8
Date of death[(c)]	No	607	—	—
Cause of death[(c)]	No	607	181	29.8

(a) The 34 missing cases are for SA where only MM/YYYY has been provided, although full dates are recorded by SA.

(b) Diagnosis date is only available as MM/YYYY for NSW/ACT. SA also only provides MM/YYYY, although full dates are recorded by SA. These have not been included in missing figures as month and year of diagnosis is adequate.

(c) Based on 2014 year of death, not year of diagnosis.

New South Wales (NSW) reported receiving mesothelioma notifications without pathological confirmation. At 31 May 2015, there were 62 reported cases of mesothelioma yet to be confirmed for NSW, across several diagnosis years. For these cases, there is some evidence to suggest mesothelioma, but not enough to satisfy the criteria of the state's internal coding policy. This may

also be the case for other state and territory cancer registries. These additional diagnoses have not been included in figures for this report.

Cases may be notified to the AMR and then removed due to identification as a duplicate, or a change in diagnosis, date of diagnosis or other details. The records that have been removed are retained in the AMR system and recorded as inactive records. Inactive records are not included in this report.

Data linkage with the National Death Index

All records in the AMR at 30 March 2015 were sent to the Australian Institute of Health and Welfare (AIHW) for linkage with the NDI. The purpose of the linkage was to obtain death data, including date of death and cause of death, for all relevant records on the AMR.

Cases notified to the AMR after 30 March 2015 were not included in the data linkage; therefore, death figures may be an underestimate. However, data from state and territory cancer registries were used where NDI data were unavailable. Due to the 2014 AMR data being relatively recent, cause of death information from the NDI was not yet available for any 2014 records. Subsequently, provisional data from states and territories were used for cause of death information for 2014, and for earlier years where NDI data were unavailable. Death data obtained from the NDI will be updated to allow reporting of death information for previous years in subsequent AMR reports.

The AMR data are linked with the NDI on an annual basis and the linkage provides updates to previously linked cases and those not successfully linked. The NDI data on deaths are based on collected data from state and territory Registrars of Births, Deaths and Marriages and coded cause of death from the Australian Bureau of Statistics (ABS). These data may differ to those reported by state and territory cancer registries, which may use a combination of sources including but not limited to pathology reports, other notifications and death certificates, to ascertain deaths for mesothelioma cases.

Small cells

Small cells of less than five cases have been presented in some tables in this report. Exceptions are state and territory tables disaggregated by more than one demographic factor, such as sex and age group, and where rates are based on cells of less than 10 cases. 'n.p.' has been used instead of these rates and for cells where numbers are greater than four but the number is suppressed to protect the confidentiality of small cells in the same row or column.

The data in the asbestos exposure section are based on exposure judgements made by MonCOEH and not solely on demographic characteristics, so they do not directly represent information provided by interview participants. Therefore, cells of less than five cases have been presented in this section.

Patient recruitment for asbestos exposure component

Patient recruitment for the AMR includes two main phases: contacting the patient's doctor to obtain advice on eligibility of the patient to participate in the postal questionnaire and telephone interview, and, if consent is received, contacting the patient to see if they are interested in participating.

The patient recruitment processes vary across the states and territories in line with a state's or territory's ethics approval or patient recruitment protocols. In Queensland, South Australia and Northern Territory, doctors need to return a completed consent form to the relevant cancer registry to indicate consent. All other jurisdictions (NSW/Australian Capital Territory, Victoria, Western Australia and Tasmania) are operating on a 'passive consent' (opt out) model. A passive consent model is one where consent is assumed and the patient is contacted if doctors do not respond within three to four weeks. Table A3 presents some characteristics of the different processes.

For Victoria, Queensland and South Australia, consent forms are returned to the relevant cancer registry. Only those where the patient gives consent to participate are forwarded on to the AMR, along with the completed postal questionnaire.

Table A3: Characteristics of patient recruitment process, by state and territory

	NSW/ACT	Vic	Qld	WA	SA	Tas	NT
Doctor stage							
'Opt out' for clinicians	Yes	Yes	No	Yes	No	Yes	No
Timeframe for 'opt out'	4 wks	4 wks	—	3–4 wks	—	3 wks	—
Patient stage							
Return of consents/questionnaire directly to AMR	Yes	No	No	Yes	No	Yes	Yes

Coding of occupations

All occupations reported by patients via the AMR postal questionnaire are coded according to the Australian and New Zealand Standard Classification of Occupations (ANZSCO) (ABS 2013). These data are not presented in this report. However, all data have been coded down to the Unit Group level (six-digit classification) where possible.

Assessment of asbestos exposure

Occupation and residence histories provided via the postal questionnaire are entered into OccIDEAS, and MonCOEH staff review the job history to assign JSMs for the telephone interviewers to administer. JSMs are allocated to particular jobs that the participant has reported, based on judgement by MonCOEH of possible asbestos exposure. The purpose of a JSM is to ask a systematic series of questions about a possible asbestos-exposed job, in a standardised way, to elicit task and exposure information that can then be used to estimate the individual's occupational asbestos exposure. Participants may receive several JSMs for different jobs, or none depending on how many jobs they had for which the exposure assessor judges as requiring further investigation. Where the participant has a large number of jobs of interest, it is not feasible to administer JSMs for all jobs. A judgement is made taking into consideration the number of relevant jobs and the module lengths, with the aim to keep the telephone interview to 30 minutes or less. Exposure in some jobs may be assessed by extrapolation of exposure probability in similar jobs held by the same participant. JSMs are not allocated to jobs with very low probability of exposure (MacFarlane et al. 2012).

Since non-occupational asbestos exposure is relevant for a proportion of participants, a non-occupational module has been constructed in OccIDEAS. This module is similar to a conventional OccIDEAS JSM except that it asks about non-occupational exposures across the patient's lifespan, such as home renovations and whether the patient had ever visited an asbestos mining town. All interview participants receive the non-occupational module, irrespective of their occupational history and whether or not that participant also received any JSMs.

For the purposes of this report, exposure to asbestos has been assessed as the probability of any exposure and the estimated level of exposure. The classification of exposure probability uses a three-level scheme: 'probable', 'possible' and 'unlikely'. Jobs, where there is information to indicate that exposure above background levels was likely, were assessed as 'probably exposed'. 'Possibly exposed' indicates that the available information suggests that exposure may have occurred but was

judged not to be probable. Jobs where no information was found to indicate asbestos exposure above background levels were classified as 'exposure unlikely'. The non-occupational module was assessed and classified in the same way.

The estimated level of occupational exposure is classified as 'probable high', 'probable medium' and 'probable low'. For jobs assessed as 'probable', exposure was further classified by level of exposure (eight-hour time-weighted average) (Table 4.2). The classification of likely level of exposure in participants' jobs was informed by published exposure data supplemented by expert judgement (Fritschi et al. 2003). Estimated levels of non-occupational exposure have also been calculated.

Appendix B: Additional tables

Table A4: Age-standardised incidence rates (World Standard Population) by sex and state and territory, 2014

Sex	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
			Rate per 100,000 population[a]						
Males	2.0	1.9	3.1	4.4	1.6	n.p.	n.p.	n.p.	2.3
Females	0.5	0.6	0.4	0.8	0.5	n.p.	n.p.	0.0	0.5
Persons	**1.2**	**1.2**	**1.7**	**2.1**	**1.2**	**0.8**	**n.p.**	**n.p.**	**1.4**

(a)   Directly age-standardised using the World Standard Population (Segi 1960).
n.p. Not published due to small numbers.

Table A5: New cases of mesothelioma and age-standardised incidence rates by sex and state and territory, 2011 to 2013

Year/Sex	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
2011			**Number**						
Males	189	105	121	91	52	n.p.	11	n.p.	587
Females	29	30	21	12	11	<5	—	<5	105
Persons	**218**	**135**	**142**	**103**	**63**	**14**	**11**	**6**	**692**
			Rate per 100,000 population[a]						
Males	5.0	3.7	5.6	9.8	4.9	n.p.	7.4	n.p.	5.2
Females	0.6	0.9	0.8	1.0	0.8	n.p.	0.0	n.p.	0.8
Persons	**2.6**	**2.1**	**3.0**	**4.4**	**3.0**	**2.1**	**3.4**	**n.p.**	**2.8**
2012			**Number**						
Males	178	127	137	87	40	n.p.	n.p.	—	591
Females	39	22	33	21	5	<5	<5	—	122
Persons	**217**	**149**	**170**	**108**	**45**	**15**	**9**	**—**	**713**
			Rate per 100,000 population[a]						
Males	4.6	4.4	6.1	8.9	3.6	n.p.	n.p.	0.0	5.1
Females	0.8	0.6	1.3	2.1	n.p.	n.p.	n.p.	0.0	0.9
Persons	**2.5**	**2.3**	**3.5**	**4.5**	**2.1**	**2.1**	**n.p.**	**0.0**	**2.8**
2013			**Number**						
Males	174	98	107	80	67	n.p.	<5	<5	547
Females	39	35	25	14	12	<5	<5	—	129
Persons	**213**	**133**	**132**	**94**	**79**	**15**	**n.p.**	**<5**	**676**
			Rate per 100,000 population[a]						
Males	4.3	3.3	4.8	8.3	5.9	n.p.	n.p.	n.p.	4.6
Females	0.9	0.9	1.0	1.3	0.9	n.p.	n.p.	0.0	0.9
Persons	**2.4**	**2.0**	**2.7**	**3.8**	**3.6**	**2.2**	**n.p.**	**n.p.**	**2.6**

(a)   Directly age-standardised using the 2001 Australian standard population.

n.p. Not published to protect confidentiality of small numbers.

Table A6: New cases of mesothelioma by age group, 2014

Age group	Number	Per cent
Less than 40	4	0.6
40–44	2	0.3
45–49	9	1.4
50–54	14	2.2
55–59	29	4.5
60–64	38	5.9
65–69	109	17.0
70–74	136	21.2
75–79	125	19.5
80–84	99	15.4
85–89	50	7.8
90 and over	26	4.1
Total	**641**	**100.0**

Table A7: New cases of mesothelioma and age-specific incidence rates by sex and age group, 2014

Sex	<55	55–59	60–64	65–69	70–74	75–79	80–84	85+	Total
Number									
Males	17	17	31	85	119	108	81	60	518
Females	12	12	7	24	17	17	18	16	123
Persons	**29**	**29**	**38**	**109**	**136**	**125**	**99**	**76**	**641**
Rate per 100,000 population[a]									
Males	0.2	2.5	5.0	15.8	31.0	39.0	41.8	38.3	4.5
Females	0.1	1.7	n.p.	4.4	4.3	5.4	7.1	5.7	1.1
Persons	**0.2**	**2.1**	**3.1**	**10.1**	**17.4**	**21.2**	**22.2**	**17.3**	**2.8**

(a) Age-specific rates using the Australian estimated resident population at 30 June 2013.

n.p. Not published due to small numbers.

Table A8: New cases of mesothelioma and age-standardised incidence rates by year and sex, 1982 to 2014

Year	Males	Females	Persons	Males	Females	Persons
	Number			**Rate per 100,000 population[a]**		
1982	134	22	156	2.3	0.3	1.2
1983	132	15	147	2.2	0.2	1.1
1984	149	17	166	2.4	0.2	1.2
1985	178	24	202	3.0	0.3	1.5
1986	195	30	225	3.0	0.4	1.6
1987	174	29	203	2.6	0.4	1.4
1988	246	31	277	3.9	0.4	1.9
1989	230	40	270	3.5	0.5	1.8
1990	256	34	290	3.9	0.4	1.9
1991	260	47	307	3.7	0.6	2.0
1992	287	39	326	4.0	0.5	2.1
1993	318	51	369	4.4	0.6	2.3
1994	373	47	420	5.0	0.5	2.6
1995	335	59	394	4.5	0.7	2.4
1996	362	53	415	4.7	0.6	2.4
1997	393	75	468	5.0	0.8	2.7
1998	412	61	473	5.1	0.6	2.6
1999	400	76	476	4.9	0.8	2.6
2000	403	77	480	4.8	0.8	2.6
2001	469	107	576	5.4	1.0	3.0
2002	455	108	563	5.1	1.0	2.8
2003	540	113	653	5.9	1.0	3.2
2004	512	93	605	5.5	0.8	2.9
2005	500	113	613	5.2	1.0	2.9
2006	487	103	590	4.9	0.9	2.7
2007	566	109	675	5.6	0.9	3.1
2008	546	115	661	5.3	0.9	2.9
2009	544	131	675	5.1	1.0	2.9
2010[b]	546	125	671	5.0	1.0	2.8
2011	587	105	692	5.2	0.8	2.8
2012	591	122	713	5.1	0.9	2.8
2013	547	129	676	4.6	0.9	2.6
2014	518	123	641	4.3	0.9	2.5

(a) Directly age-standardised using the 2001 Australian standard population.

(b) AMR data are available from 1 July 2010 only. For the 6-month period 1 July–31 December 2010, 350 cases have been reported to the AMR: 285 males and 65 females.

Source: 1982 to 2010: (AIHW 2015). 2011 to 2014: AMR.

Table A9: Deaths of people with mesothelioma by year and state and territory, 2011 to 2013

Year of death	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
2011	132	70	85	54	23	8	n.p.	<5	380
2012	187	116	134	60	48	13	n.p.	<5	573
2013	185	137	118	111	53	12	5	7	628

Note: Death information from the NDI where available, otherwise from state/territory cancer registries.
n.p. Not published to protect confidentiality of small numbers.

Table A10: Cause of death for people with mesothelioma by year, 2011 to 2013

Cause of death	2011		2012		2013	
	No.	Per cent	No.	Per cent	No.	Per cent
Mesothelioma	345	92.7	486	91.5	388	97.5
Not mesothelioma	27	7.3	45	8.5	10	2.5
Total	**372**	**100.0**	**531**	**100.0**	**398**	**100.0**

Notes:
1. Excludes cases where cause of death was not known.
2. Includes cause of death information from the NDI where available, otherwise from state/territory cancer registries.

Table A11: Deaths of people with mesothelioma and age-standardised mortality rates by year of death and sex, 1997 to 2014

Year	Males	Females	Persons	Males	Females	Persons
	Number			**Rate per 100,000 population[a]**		
1997	393	75	468	5.0	0.8	2.7
1998	412	61	473	5.1	0.6	2.6
1999	400	76	476	4.9	0.8	2.6
2000	403	77	480	4.8	0.8	2.6
2001	467	107	574	5.4	1.0	3.0
2002	455	108	563	5.1	1.0	2.8
2003	540	112	652	5.9	1.0	3.2
2004	511	93	604	5.5	0.8	2.9
2005	500	113	613	5.2	1.0	2.9
2006	486	103	589	4.9	0.9	2.7
2007	565	109	674	5.6	0.9	3.0
2008	548	116	664	5.3	0.9	2.9
2009	543	130	673	5.1	1.0	2.9
2010	543	124	667	4.9	1.0	2.8
2011	510	100	610	4.6	0.7	2.5
2012	538	100	638	4.6	0.7	2.5
2013	533	95	628	4.4	0.7	2.4
2014	499	108	607	4.2	0.8	2.3

(a) Directly age-standardised using the 2001 Australian standard population.
Source: 1997 to 2012: (AIHW 2015). 2013 to 2014: AMR.

Appendix C: AMR publications

2014

Publications

AMR (Australian Mesothelioma Registry) 2014. Australian Mesothelioma Registry 3rd annual report: Mesothelioma in Australia 2013. Canberra: Safe Work Australia. Available at: http://www.mesothelioma-australia.com/publications-and-data/publications

Champion de Crespigny FE, MacFarlane E, Laws P, Sim MR 2014. Mesothelioma in Australia: monitoring disease incidence and past asbestos exposure with the Australian Mesothelioma Registry. Asian-Pacific Newsletter on Occupational Health and Safety 21(2): 28–32.

Conference papers

Brims F, Laws P, MacFarlane E, van Zandwijk N, Driscoll T, Benke G, Sim MR 2014. Mesothelioma in Australia 2013: Recent data from the Australian Mesothelioma Registry. Oral presentation at Australian Lung Cancer Conference, Brisbane, October 2014.

Sim M, MacFarlane E, Laws P, Benke GP, Huang L, de Crespigny F, Anderson A, van Zandwijk N, Musk W, Dalton V, Scott C, Ratchford A, Armstrong B 2014. Patterns of workplace and non-occupational asbestos exposure among mesothelioma cases in Australia: Data from the Australian Mesothelioma Registry. Oral presentation at International Conference on Monitoring and Surveillance of Asbestos-Related Diseases, Helsinki, February 2014.

van Zandwijk N, Laws P, MacFarlane E, Brims F, Driscoll T, Benke G, Sim MR 2014. Mesothelioma in Australia: Data from the Australian Mesothelioma Registry. Oral presentation at International Mesothelioma Interest Group meeting, Cape Town, October 2014.

van Zandwijk N, Laws P, MacFarlane E, Benke G, Brims F, Driscoll T, Soeberg M, Sim MR 2014. Mesothelioma in Australia. Oral presentation at Asian Conference on Occupational Health, Fukuoka, September 2014.

Presentations

van Zandwijk N 2014. Asbestos-related cancer research and prevention. Oral presentation at 1st International Conference on Asbestos Awareness and Management, Melbourne, November 2014.

2013

Publications

AMR (Australian Mesothelioma Registry) 2013. Australian Mesothelioma Registry 2nd annual report: Mesothelioma in Australia 2012. Canberra: Safe Work Australia. Available at: http://www.mesothelioma-australia.com/publications.aspx

Conference papers

Huang L, Armstrong B, MacFarlane E, Sim MR, De Crespigny F, Anderson A, Van Zandwijk N, Musk AW, Dalton V, Scott C, Ratchford A & Laws P 2013. Mesothelioma in Australia 2012: Data from the new Australian Mesothelioma Registry. Poster presentation at World Conference on Lung Cancer, Sydney, October 2013.

Laws P, MacFarlane E, Sim MR, De Crespigny F, Van Zandwijk N, Musk AW, Armstrong B, Anderson A, Dalton V, Kwaan G & Forrest A 2013. Mesothelioma in Australia 2011: Data from the new Australian

Mesothelioma Registry. Oral presentation at Thoracic Society of Australia and New Zealand Annual Scientific Meeting, Darwin, March 2013.

Presentations

Van Zandwijk N 2013. Australian Mesothelioma Registry. Better Living with Mesothelioma workshop, Sydney, May 2013.

2012

Publications

AMR (Australian Mesothelioma Registry) 2012. Australian Mesothelioma Registry 1st annual report: Mesothelioma in Australia 2011. Canberra: Safe Work Australia. Available at: http://www.mesothelioma-australia.com/publications.aspx

MacFarlane E, Benke G, Sim M & Fritschi L 2012. OccIDEAS: An innovative tool to assess past asbestos exposure in the Australian Mesothelioma Registry. Safety and Health at Work 3(1): 71–6.

Conference papers

Laws P, Huang L, Raftery A, Sim MR, Musk AW, Anderson A, Hill J, Armstrong B, van Zandwijk N 2012. Australian Mesothelioma Registry. Poster with oral presentation at Thoracic Society of Australia and New Zealand Annual Scientific Meeting, Canberra, April 2012.

van Zandwijk N, Sim MR, Armstrong B, Musk AW, Hill J, Anderson A, Raftery A, Laws P 2012. Australian Mesothelioma Registry. Oral presentation at Australian Lung Cancer Conference, Adelaide, August 2012.

Kwaan G, Laws P, Huang L, Ratchford A, Raftery A, Sim MR, MacFarlane E, Musk AW, Anderson A, Hill J, De Crespigny F, Armstrong B, van Zandwijk N, Dalton V 2012. Australian Mesothelioma Registry. Poster with oral presentation at Clinical Oncology Society of Australia (COSA) - International Psycho-Oncology Society (IPOS) Joint Scientific Meeting, Brisbane, November 2012.

2010

Conference papers

Birch M-R, Huang L, Burnham A, Grayson N, Sim MR, Musk AW, Anderson A, Hill J, Armstrong B, van Zandwijk N 2010. Australian Mesothelioma Registry. Poster presentation at Australian Lung Cancer Conference, Melbourne, October 2010.

Burnham A, Grayson N, Huang L, Sim MR, Musk AW, Anderson A, Hill J, Armstrong B, van Zandwijk N 2010. Australian Mesothelioma Registry. Poster presentation at Clinical Oncology Society of Australia Annual Scientific Meeting, Melbourne, November 2010.

Glossary

Best basis of diagnosis: The most valid basis of diagnosis in a person with cancer.

Cytology: Examination of cells from a primary or secondary site, including fluids aspirated by endoscopy or needle; also includes the microscopic examination of peripheral blood and bone marrow aspirates.

Histology: Microscopic examination of cells and tissues.

Job-specific module (JSM): Telephone questionnaire modules that are specific to certain kinds of jobs and industries. The MonCOEH team allocate JSMs to be administered to each patient in their telephone interview, based on the job history provided by the patient in the postal questionnaire. The purpose of a JSM is to ask a systematic sequence of questions about the job in question in order to elicit specific information needed to estimate that individual's asbestos exposure in that job. A non-occupational module is administered to all patients who consent to a telephone interview.

Laterality: The side of a paired organ that is the origin of the primary cancer in a person with cancer.

Mesothelioma: An aggressive form of cancer that arises in the mesothelium, membranous tissue that surrounds some body organs and cavities.

Morphology: The histological classification of the cancer tissue (histopathological type) in a person with cancer, and a description of the course of development that a tumour is likely to take: benign or malignant (behaviour).

National Death Index (NDI): A database which contains records of all deaths occurring in Australia since 1980.

Notification: A case of mesothelioma provided to the AMR from the state and territory cancer registries. Each notification contains demographic information, diagnosis information and, if relevant, death information. All notifications of cancer are first notified to the state and territory cancer registries from pathology laboratories, radiotherapy and medical oncology departments, and hospitals.

OccIDEAS (Occupational Integrated Database Exposure Assessment System): A secure, web-based survey tool used in research projects where accurate, subject-specific exposure assessment is needed. It is a computerised interview tool for collecting exposure data from individual subjects. OccIDEAS also manages and organises the exposure information and is programmed to calculate exposure assessments automatically by algorithm and/or utilising case-by-case expert judgement. OccIDEAS is based on a modular structure which enables each interview to be customised to the particular subject based on their work history and other information collected in the postal questionnaire (MacFarlane et al. 2012).

Self-notifier: A person diagnosed with mesothelioma who notifies the AMR of their diagnosis.

Topography: The site in which the tumour originated in a person with cancer.

References

ABS (Australian Bureau of Statistics) 2013. ANZSCO: Australian and New Zealand Standard Classification of Occupations. Version 1.2. ABS cat. no. 1220.0. Canberra: ABS and Statistics New Zealand.

AIHW (Australian Institute of Health and Welfare) 2014. Australian Cancer Incidence and Mortality (ACIM) books. Available at: http://www.aihw.gov.au/acim-books/ (accessed 21 May 2015). Canberra: AIHW.

AMR (Australian Mesothelioma Registry) 2012. Australian Mesothelioma Registry 1st annual report: Mesothelioma in Australia 2011. Canberra: Safe Work Australia.

AMR (Australian Mesothelioma Registry) 2013. Australian Mesothelioma Registry 2nd annual report: Mesothelioma in Australia 2012. Canberra: Safe Work Australia.

AMR (Australian Mesothelioma Registry) 2014. Australian Mesothelioma Registry 3rd annual report: Mesothelioma in Australia 2013. Canberra: Safe Work Australia.

Foster K 1997. Communicating the asbestos hazard to the community: An Australian view. In Peters GA & Peters BJ (eds). Sourcebook on Asbestos Disease, Vol 15. Charlottesville, VA: LexisNexis.

Fritschi L, Nadon L, Benke G, Lakhani R, Latreille B, Parent M-E & Siemiatycki J 2003. Validation of expert assessment of occupational exposures. American Journal of Industrial Medicine 43(5): 519–22.

Leigh J, Davidson P, Hendrie L & Berry D 2002. Malignant mesothelioma in Australia 1945–2000. American Journal of Industrial Medicine 41(3): 188–201.

MacFarlane E, Benke G, Sim M & Fritschi L 2012. OccIDEAS: An innovative tool to assess past asbestos exposure in the Australian Mesothelioma Registry. Safety and Health at Work 3(1): 71–6.

Safe Work Australia 2013. Mesothelioma in Australia: Incidence 1982 to 2009, Mortality 1997 to 2011. Canberra: Safe Work Australia.

Segi M 1960. Cancer mortality for selected sites in 24 countries (1950–1957). Sendai: Tohoku University Press.