

TABLE 43.6. Individual lifetime risk of mesothelioma (MM) in Australia by occupational groupings

Occupational group	Lifetime risk of MM (%) [*]
Wittenoom miner/miller	16.5
Power station worker	12
Railways laborer	6.5
Navy/merchant navy	5
Carpenter/joiner	2
Waterside worker/docker	2
Plasterer	2
Boilermaker/welder	2
Bricklayer	2
Plumber	1.5
Painter/decorator	1
Electrical fitter/mechanic/electrician	0.5
Vehicle/automobile mechanic	0.5
All Australian men	0.4
All Australian women	0.05

^{*}To the nearest 0.5%, except for all Australian men and women.

Source: Modified from Leigh et al.⁴⁵

the building industry have been poorly regulated.^{42,159,195,196} In Australia, crocidolite miners/millers, power station workers, railway laborers, and naval, merchant naval, and shipyard personnel (in descending order of risk) have the highest estimated individual lifetime risks of MM (Table 43.6).³⁶ Even so, the number of personnel employed in each of those occupations is smaller than in the building and construction industry, so that carpenters/joiners, for example, contribute greater absolute numbers to the national MM toll, although their individual risk is less.^{193*}

Statistical data for the U.K. published by the Health and Safety Executive (HSE)⁴⁴ also recorded significant numbers of mesotheliomas as a consequence of insulation materials in buildings (and elsewhere), the highest risks being the consequence of exposures related to shipbuilding, railway carriage and locomotive building, and the installation or maintenance of insulation materials in buildings or factories.

Substantial numbers of MMs—about 10% of the total, according to data from the HSE in the U.K.⁴⁹—are now seen as a consequence of nonoccupational exposures, including occasional and transient “handyman”-type

^{*}Data for Australia are discussed at various points in this chapter because the Australian Mesothelioma Register collated all cases of pathologically verified mesothelioma across the entire Australian population (~20 million), but following the introduction of privacy legislation, follow-up of the reported cases became more difficult and notifications to the register were suspended in 2006. However, it seems that mortality statistics and some other data will continue to be reported, from anonymous data sent from State Cancer Registries. The peak incidence of mesothelioma in Australia seems likely to occur in about 2020.

exposures related to home renovation, repairs and maintenance, and domestic exposure¹⁹⁷ (e.g., from shaking and laundering asbestos-contaminated work clothes¹⁹⁸) and other types of occasional or nonoccupational exposures.^{42,117,163,193} It is worth emphasizing, however, that not all such nonoccupational exposures necessarily represent low-dose exposures; for example, the shaking of asbestos-contaminated work clothes before laundering them can generate high peak concentrations of airborne asbestos fibers,^{199,200} resulting in cumulative exposures that can approach or amount to some occupational exposures^{162,201,202} (such as those recorded for electricians¹⁶²), and some such cases have shown clinical or histologic evidence of asbestosis.^{203,204} Roggli et al.¹⁶¹ recorded asbestosis in three of 38 cases of mesothelioma that followed household contact exposure to asbestos (8%), and more than half had pleural plaques (Table 43.7).

Apart from some specific industries, such as former crocidolite miners/millers at the Wittenoom blue asbestos industry in Western Australia^{205–207} (Figs. 43.5 to 43.8), those who assembled gas masks that contained crocidolite fibers during World War II,²⁰⁸ and amosite factory workers, most asbestos exposures in the past (until about the early 1980s) involved mixtures of commercial amphibole and chrysotile fibers (e.g., in asbestos insulation and high-density asbestos-cement products), so that most mesotheliomas following end-use asbestos exposures are a consequence of mixed-fiber exposures.⁴² There is also evidence that manipulations carried out on such materials resulted in preferential release of amphibole fibers as opposed to chrysotile, presumably because of differences in their physical properties. Accordingly, the proportional concentrations of the airborne fibers in the breathing zones of those exposed were not the same as the proportions in the products as manufactured; for example, in one report in Australia, the ratio of crocidolite/chrysotile fibers in the airborne dust produced by machining of asbestos-cement products was about 28:100 in comparison to 11:100 for the asbestos-cement as manufactured (about 2.5 times greater).²⁰⁹

Pleural/Peritoneal Mesothelioma Ratios

On theoretical grounds, one would expect the pleural/peritoneal ratio for true spontaneous MMs uninfluenced by any exogenous causal factor(s) to be about 1:1 or <1:1, taking into account the mesothelial surface areas for the pleural cavities combined versus the peritoneum. Although peritoneal mesotheliomas outnumber pleural MMs in some series—for example, in 86 deaths among Swedish insulation workers during the period 1970–1994, there were seven peritoneal mesotheliomas but no pleural MMs²¹⁰—in most series and in national data, about 90% of MMs or more affect the pleura, about 9% the peritoneum, and about 1% or less the pericardium or tunica

TABLE 43.7. Malignant mesothelioma (MM) pleura-to-peritoneum ratio, parietal pleural plaques and asbestosis, according to industry and occupational versus non-occupational exposures for 1445 cases of MM, in the United States

Industry/occupation	Pleura-to-peritoneum ratio	Parietal pleural plaques (%)	Asbestosis (%)
<i>Industry</i>			
Shipbuilding	52:1	81	26
U.S. Navy	54:1	21	11
Construction	8.6:1	34	17
Insulation	2.1:1	85	58
Oil/chemical	82:1	78	17
Power plant	17:1	85	19
Automotive	8:1	67	0
Railways	38:1	83	12
Steel/metal	9.3:1	93	27
Asbestos products mfg.	2.2:1	87	65
Paper mill	6:1	83	20
Ceramics/glass	6:0	50	0
<i>Occupation</i>			
Pipefitter	50:1	87	24
Boilermaker	30:1	81	24
Maintenance	26:1	80	20
Machinist	22:1	78	14
Electrician	74:1	83	27
Sheet metal	20:1	82	14
Other asbestos	5:1	33	0
<i>Nonoccupational</i>			
Domestic	4.3:1	57	7.9
Building occupants	1.8:1	43	0
Environmental	4:10	0	0
Other	8.5:1	46	9.5

Source: Modified from Roggli et al.¹⁶²

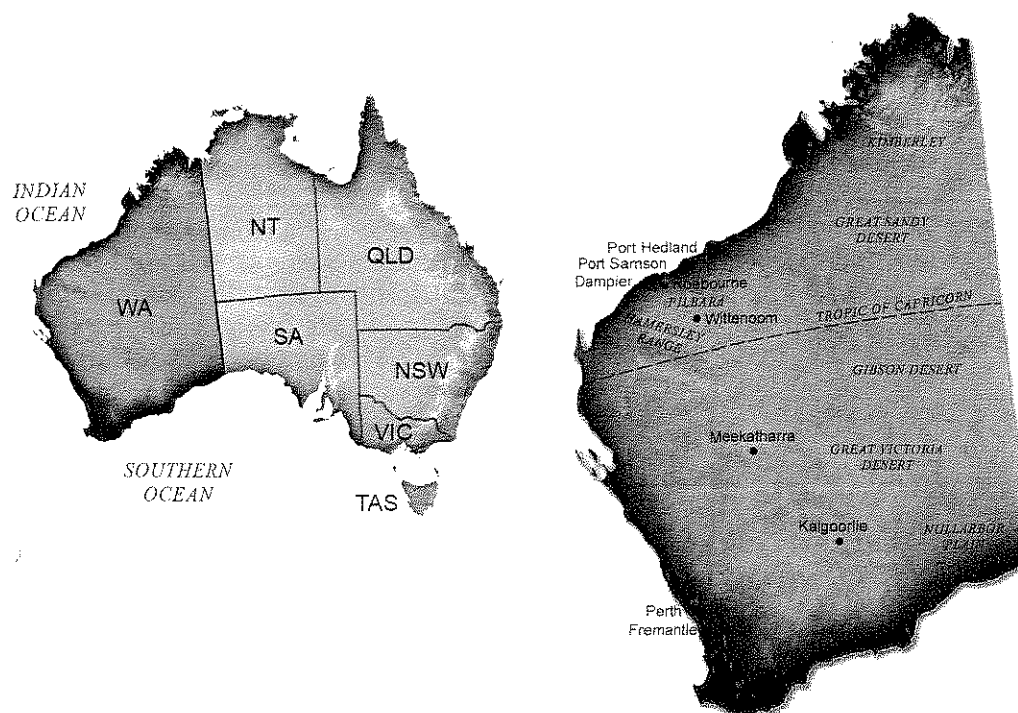


FIGURE 43.5. Schematic map of Western Australia showing Wittenoom in relation to the Tropic of Capricorn, in the Pilbara-Hamersley region, together with other regional centers and

Perth. WA, Western Australia; NT, Northern Territory; SA, South Australia; NSW, New South Wales; QLD, Queensland; VIC, Victoria; TAS, Tasmania.