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TRENDS IN OCCUPATIONAL GROUPS AND INDUSTRIES ASSOCIATED WITH AUSTRALIAN MESOTHELIOMA CASES 1979-1995

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INTRODUCTION

In the mid 1970s concern was raised by a group of occupational health professionals, compensation authorities and government regulators about the rising numbers of mesothelioma cases occurring in the Australian community. Asbestos exposure was known at this time to be a major contributor to the cases and certain industries such as crocidolite mining at Wittenoom, local asbestos cement production, ear-time gas mask construction and the manufacture of crocidolite covered welding rods had contributed to local cohorts. Most states by this stage had specific asbestos regulations designed to prevent health effects principally asbestosis in the mining and manufacturing workforce with compensation authorities conducting regular inspection and health audits.

Despite the introduction of these contemporary control strategies mesothelioma cases have continued to rise in line with the world wide trend (Peto *et al.*, 1995). Although this increase can be attributed to the long latency effects of the historical heavy exposure to asbestos especially amphiboles, there is still considerable concern in the community in regard to the use of bound chrysotile products and to the legacy of asbestos products such as in public and private buildings. This study provides an analysis of the trends that have developed in Australian mesotheliomas as a means of predicting future outcomes.

MATERIALS AND METHODS

Australian cases of mesothelioma have been collected by some state compensation authorities for more than 30 years and by a national registration scheme since 1979.

The Australian Mesothelioma Surveillance Program (1979-1985)

This research project centred in the Commonwealth Department of Health was set up by a diverse group of occupational health professionals to investigate amongst other things the incidence and aetiology of mesothelioma in Australia (Ferguson *et al.*, 1987). Detailed occupational and environmental histories were obtained by direct interview with patients or next of kin and, failing this, work



associates. All histories were independently examined by two occupational hygienists who had considerable experience in investigating exposures in a range of asbestos manufacturing and user industries.

The Australian Mesothelioma Register (1986-1995)

The comprehensive collection and reporting of cases continued post 1985 (Leigh *et al.*, 1991, 1996). Owing to a number of factors the data collected on each case became less substantive with reliance placed on local rather than central diagnosis, case histories were reliant on information provided from clinical records with the consequence of considerable variability of details, quality and interpretation of information. Central register data was reviewed and coded by two experienced occupational hygienists one of which was involved with the coding of the 1979-1985 cases.

The NSW Worker's Compensation (Dust Diseases) Board (1985-1995)

As part of the requirements of the "no fault" compensation scheme for dust diseases operating in the State of New South Wales (NSW), data is collected on asbestos related diseases associated with employment in that State (DDB, 1995). Detailed occupational histories are obtained by direct interview which is followed up by industrial inspectors who conduct field inspection of premises and employer records and prepare a report to the independent medical panel.

RESULTS

In the period 1979-1995, 3538 cases were collected nationwide with an increase of 6-7% p.a. although this varies considerably across different industries and occupations (Tables 1 and 2). Five industries are typical of the differing trends found during the period of study and show the considerable influence of exposure to amphiboles.

The building industry produced the largest number of cases and also the largest increase ($n = 559$, 448%) across a wide range of occupations. Some cases recalled being present when "Limpet" (mainly amosite and crocidolite in Australia) was sprayed by insulation workers. Trades such as electricians and plumbers indicated that they had disturbed a variety of asbestos products whilst carrying out repairs, renovation or installation of new services. Many carpenters and labourers indicated that they had worked with asbestos cement products which were commonly used in domestic and commercial construction in the 1950s, 1960s and 1970s.

Shore based shipbuilding, repair and demolition accounted for the second largest industry group. Case numbers appeared to have remained steady with a variable but slight increase of around one case per year. The majority of these were involved in boiler and engine repairs which involved the disturbance of asbestos lagging. Other trades such as shipwrights, welders, plumbers and electricians indicated working with asbestos however and only a small proportion of cases listed their occupation as ships ladders.

The local asbestos cement production industry ranks third in overall cases with an increase of approximately 5% p.a. although there is some evidence from Fig. 1 that this rate may have plateaued in the last 5 years. Almost all cases have arisen

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Table 1. Industry distribution of mesothelioma cases in three different periods

Industry	Mesothelioma Program 1979-85	Mesothelioma Register 1986-90	Mesothelioma Register 1991-95
<i>Primary asbestos industries</i>			
Wittenoom crocidolite mining/milling	49	66	49
Asbestos cement production	53	55	68
Insulation manufacture/installation	27	16	26
Stevedoring	22	27	34
<i>Primary asbestos user industries</i>			
Ship construction/repair/demolition	88	87	132
Building	65	203	291
Railway loco fabrication/maintenance	45	29	63
Coal fired power station construction and maintenance	29	32	47
<i>Secondary user/product contact</i>			
Engineering fabrication/repair	15	50	88
Metal smelting	10	12	27
Chemical plants	10	18	7
Motor vehicle repair	7	16	24
<i>Other industries</i>	301	341	271
Insufficient information/unknown	137	218	363
Total	658	1170	1510

Table 2. Occupational distribution of mesothelioma cases in three different periods

Occupation	Mesothelioma Program 1979-85	Mesothelioma Register 1986-90	Mesothelioma Register 1991-95
<i>Building trades</i>			
Carpenters	63	107	158
Electricians	25	30	59
Plumbers	13	29	39
Builders labourers	0	34	35
Painters	6	25	24
Plasterers	3	4	11
Bricklayer (insulation/furnace)	3	5	1
Bricklayer (non-insulation)	0	5	7
<i>Metal and engineering trades</i>			
Boiler makers & assistants	20	76	69
Welders	15	7	15
Car mechanics	7	16	24
<i>Shipping</i>			
Ablescamen	2	6	17
Stokers	7	3	7
Marine engineers	1	10	13
Wharf labourers	21	19	33

from employees who commenced in the era when dust levels were relatively high and crocidolite was used (Boyle and Rogers, 1993). This industry had been operational from 1916 to 1987 and used at its peak over 90% of all asbestos fibre mainly in the form of roofing and cladding. By 1954 this accounted for 25% of new housing and a world ranking of four in per capita consumption. Imported

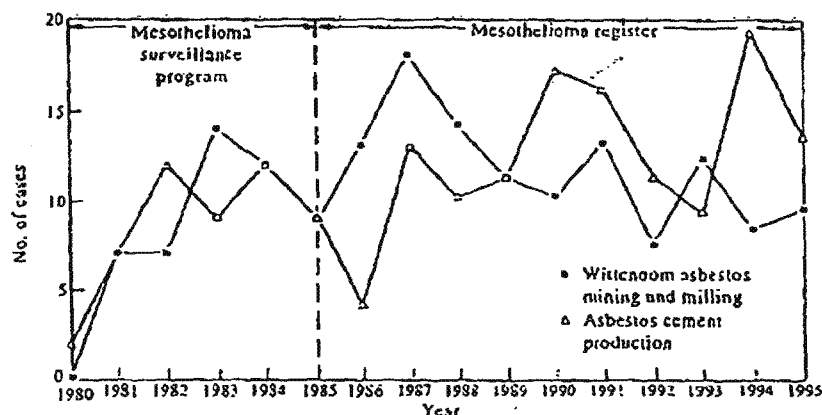


Fig. 1.

crocidolite, amosite and chrysotile and local sources of crocidolite and chrysotile were used in various combinations throughout the history of the industry.

Crocidolite mining, milling and associated activities at Wittenoom which ran in a number of phases from 1937 to 1966 ranked fourth and there is clear evidence that the numbers have been gradually decreasing over the last 7 years. Most of the cases were as a direct exposure at the various mines and mills whilst others were involved in transportation or the use of tailings for local road and concrete construction. Environmental cases from non mine employees such as women, children and town visitors are not included in this study having been reported elsewhere (Rogers and Nevill, 1995). Although the infamy of the Wittenoom mine gives the impression that Australia was a major producer of asbestos, more than 95% was imported from Canada and South Africa (Boyle and Rogers, 1993). The stevedoring industry which was responsible for unloading both imported and locally produced crocidolite and chrysotile shows a steady increase of approximately 3-4% in cases.

A group of primary asbestos user industries such as railway loco construction and repair, various engineering and metal fabrication groups and coal fired electric power stations have combined contributed 11% of cases and the number of cases from each industry has increased more than 50% since 1980. All of these industries involved the large scale use of both bulk crocidolite and bulk amosite along with chrysotile products such as rope, cloth and board. A steady rate of approximately 60 cases per year arose from a wide variety of both large and small industries. These involved jobs where the potential contact with amphibole or chrysotile asbestos ranged from negligible to highly likely.

DISCUSSION

Although a steady increase in mesothelioma over all industries and occupations cases is observed, there appear to be at least two separate groups. Cases arising from primary asbestos industries appear to have plateaued and for Wittenoom they are on the decline. This is in line with predictions made using proportional latency

calculation particularly and Nevill, and post the numbers for compound.

The above primary asbestos products which were product manufacturing of NSW units usually insured products were difficult to reference asbestos companies indicate that 4 or 5:1 since the ratio of caution in asbestos exposure intermittent tools which are in the workplace immigration. In examining mesothelioma al hygiene practices control of dust.

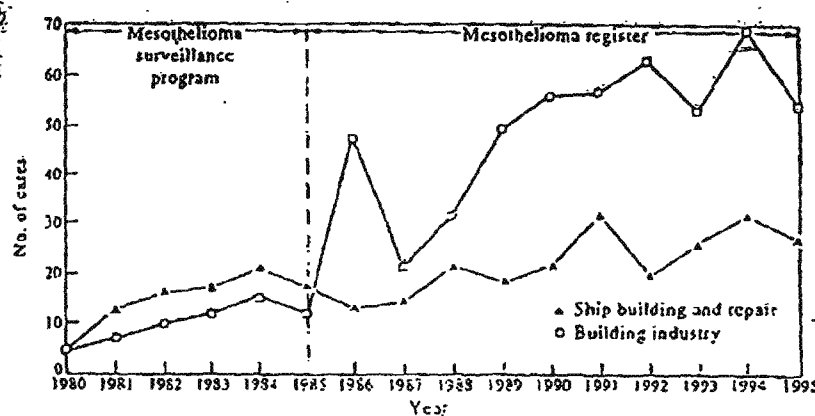


Fig. 2.

calculations made for these industries which ceased contact with amphiboles, particularly crocidolite, some 20-30 years ago (Boyle and Rogers, 1993; Rogers and Nevill, 1995). Data from the census of U.K. asbestos workers employed pre and post the 1969 Asbestos Regulations, also indicates a decline in mesothelioma numbers for those manufacturing industries such as asbestos cement and asbestos compounding that traditionally used amphibole asbestos (Hutchings *et al.*, 1995).

The above group is in sharp contrast to those industries who were users of the primary asbestos products and in trades where contact was made with *in situ* asbestos products. These industries were not included in early asbestos regulations which were usually specifically designed to prevent disease in asbestos mining and product manufacturing. Of particular concern are the trades associated with the building industry which were not covered by specific legislation in the largest State of NSW until 1983. For post 1983 cases collected in the national Register, there was usually insufficient information in the occupational history to determine if asbestos products were used and if so to what extent exposure occurred. To overcome this difficulty reference was made to the NSW DDB cases where considerable details on asbestos contact had been gathered. Building industry cases shown in Figs 2 and 3 indicate that the ratio of national to NSW cases has risen from approximately 2:1 to 4 or 5:1 since the change in programme to register information. This is higher than the ratio of 3:1 across all industries (Leigh *et al.*, 1996). The differences urge caution in assigning of all cases from the building trade being associated with asbestos exposure in that industry although it had the potential for continued intermittent contact during renovation and repair, introduced the use of power tools which created higher potential for dust exposure and had considerable growth in the workforce particularly during the post war industrial expansion and later immigration programs.

In examining the industry trends against the overall increasing numbers of mesothelioma it is possible to observe how the implementation of good occupational hygiene practice such as the technical prohibition on the use of amphiboles, the control of dust emissions, adequate legislation and enforcement and removal of

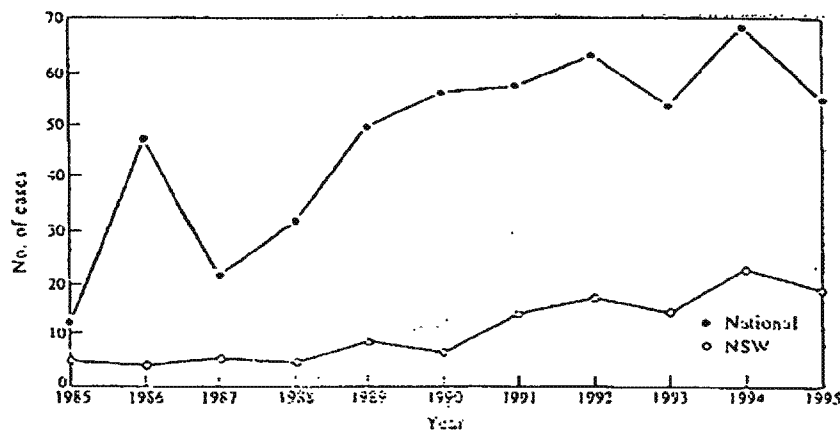


Fig. 3.

asbestos from buildings and ships has led to a reduced mesothelioma risk in the workforce albeit due to latency effects it has taken some 30–40 years for the results to show. Controls introduced later in the asbestos user industries will not show up in reduced mesothelioma numbers till around 2010.

In addition to data presented in this study, the reporting of cases not associated with significant occupational exposure has increased and this has resulted in conflicting reports as to the significance of intensity of exposure, trace environmental, low level occupational and chrysotile exposure or non-asbestos background mesotheliomas as contributing factors to mesothelioma in Australia.

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