NATIONAL OCCUPATIONAL HEALTH AND SAFETY COMMISSION

THE INCIDENCE OF

MESOTHELIOMA IN AUSTRALIA 1997 to 1999

AUSTRALIAN MESOTHELIOMA REGISTER REPORT 2002

May 2002

Australian Mesothelioma Register

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EXECUTIVE SUMMARY

This publication is the fourteenth report of the Australian Mesothelioma Register (the Register), produced by the Epidemiology Unit of the National Occupational Health and Safety Commission (NOHSC). Mesothelioma is a fatal form of cancer usually with a very long period between exposure and diagnosis.

Long-term data from the Register indicates that:

(a) the incidence rates of malignant mesothelioma have been increasing in Australia since 1965. It is believed that these high rates of mesothelioma are related to the extensive use and production of asbestos in Australia in previous decades;
(b) mesothelioma incidence rates are higher in males than females, possibly because of a higher exposure in male-dominated industries that produced or used asbestos (e.g. construction and manufacturing);
(c) the 50-64, 65-79 and 80 plus age groups have the highest age-specific incidences of mesothelioma;
(d) year-to-year fluctuations in age-specific mesothelioma incidence rates are lower in persons younger than 64 years than in older persons; and
(e) most Australian mesothelioma cases are cancerous lesions of the pleura. Mesothelioma cases affecting the peritoneum and other sites are fewer.

Based on the malignant mesothelioma cases recorded in 1997-99:

(a) there is no indication of when the incidence rates of mesothelioma will start to decline in Australia;
(b) incidence rates of malignant mesothelioma continue to be the highest in males, especially in SA and WA. The NT, the ACT and TAS have incidence rates below the national average while NSW, QLD and VIC have incidence rates approximating to the national average of 60 cases per million males; and
(c) incidence rates of mesothelioma in SA are now higher than what they were previously, especially in males aged 75 years and above. SA now has the highest incidence rate for malignant mesothelioma cases for (92-118 per million males) in Australia, which is higher than the national average (60 cases per million males). It is not clear however, whether this indicates a genuine divergence from other jurisdictions or changes in the consistency of reporting in different jurisdictions.

Since 1986 the Register has received 5,546 notifications of mesothelioma. About 88% of these cases were linked to a previous exposure to asbestos. Cases of mesothelioma reported to the Register in 1997-1999 were used to study occupational exposure to asbestos, given industry and occupation, with the view to improve efficiency in monitoring mesothelioma. The Australian and New Zealand Standard Industrial Classification (ANZSIC) (ABS 1993) and the Australian Standard Classification of Occupations (ASCO) (ABS 1997) coding systems were used to code for industry and occupation, respectively. About 50 cases from VIC were excluded from the study because of a lack of information on industry, occupation and other information necessary to determine work-relatedness and asbestos exposure. The study found that:

(a) About 50% of the cases were uncodeable for industry and occupation;
(b) Close to 45-49% of the cases were uncodeable for occupational asbestos exposure and work-relatedness;
(c) A third of the persons that were exposed to asbestos worked in the *Construction* industry and a quarter worked in the *Manufacturing* industry;
(d) Of the mesothelioma cases with a past asbestos exposure, close to 90% were work-related, about 2% were not work-related and the rest (9%) could not be classified;
(e) Of the persons with work-related mesothelioma, one in three had worked in the *Construction* industry and one in five had worked in the *Manufacturing* industry. Workers in the *Cultural and Recreational Services* industry had the fewest cases of occupational mesothelioma; and
(f) Most occupational asbestos exposures occurred among *Tradespersons/Related workers, Labourers/Related workers* or *Intermediate Production/Transport workers*. In general, Service workers (e.g. *Advanced Clerical/Service workers* and *Elementary Clerical workers*) had the fewest cases of occupational asbestos exposures.

INTRODUCTION

This document is the fourteenth report of the Australian Mesothelioma Register, produced by the Epidemiology Unit of NOHSC.

Malignant mesothelioma is a cancer of the outer covering of the lung (the pleura) or the abdominal cavity (the peritoneum). Formerly rare, it is increasing in incidence throughout the industrial world and is very frequently associated with past exposure to asbestos. It is usually fatal and has no direct relation to smoking. Australia has the world's highest incidence rate (Takahashi et al, 1999, Tossavainen and Takahashi, 2000).

ASBESTOS PRODUCTION AND USE IN AUSTRALIA

In Australia, more chrysotile than amphibole asbestos was mined until 1939. With the commencement of mining at Wittenoom, Western Australia in 1937, crocidolite dominated production, until final closure in 1966. New South Wales, the first State to mine asbestos, also produced the largest tonnages of chrysotile (until 1983) as well as smaller quantities of amphibole (until 1949). With the closing of the crocidolite mine at Wittenoom, Australian asbestos production and exports declined. Imports of chrysotile also started to decline. The main sources of raw asbestos imports were from Canada (chrysotile) and South Africa (crocidolite and amosite). Consumption peaked in about 1975 at 70,000 tonnes/year.

In addition to imports of asbestos fibre, Australia also imported many manufactured asbestos products, including asbestos cement articles, asbestos yarn, cord and fabric, asbestos joint and millboard, asbestos friction materials and gaskets. The main sources of supply were the United Kingdom, USA, Federal Republic of Germany and Japan. In Australia, over 60% of all production and 90% of all consumption of asbestos fibre was used by the asbestos cement manufacturing industry. From about 1940 to the late 1960s all three types of asbestos were used in this industry. The use of crocidolite began being phased out from 1967. Amosite was used until the mid 1980s. Much of this industry output remains in service today in the form of "fibro" houses and water and sewerage piping. By 1954 Australia was number four in the Western world in gross consumption of asbestos cement products, after the USA, UK and France, and clearly first on a per capita basis. After World War II to 1954, 70,000 asbestos cement houses were built in the State of New South Wales alone (52% of all houses built). In Australia as a whole, until the 1960s, 25% of all new housing was clad in asbestos cement.

Exposures in the past were very high in some industries and jobs - (eg, 25 million particles per cubic foot (150 fibres/ml) in asbestos pulverisors and disintegrators in the asbestos cement industry; up to 600 fibres/ml in baggers at Wittenoom). Australia still imports about 1,500 tonnes a year of chrysotile fibre and some asbestos products a year, mainly friction material and gaskets. Handling of asbestos in place and removal operations are subject to a National Code of Practice. A series of regulations adopted in the late 1970s and early 1980s by the various States now impose exposure limits of 0.1 fibre/ml for crocidolite, amosite and mixtures and 0.1-1.0 fibre/ml for chrysotile (TWA 8 hr membrane filter method light microscopy, WHO fibres). On 17 October 2001, NOHSC declared a prohibition on the use of chrysotile asbestos in Australia. The prohibition will take effect simultaneously under regulations in each Australian OHS jurisdiction by no later than 31 December 2003.

The first reported case of mesothelioma, from Wittenoom, was in 1962 (McNulty, 1962). Retrospective search identified 658 cases (535 male, 123 female) occurring in Australia from 1945-1979 (Musk et al, 1989).

THE AUSTRALIAN MESOTHELIOMA PROGRAM AND REGISTER

The Australian Mesothelioma Surveillance Program (Ferguson et al, 1987) began on 1 January 1980. Formal voluntary notification of cases was actively sought from a network of respiratory physicians, pathologists, general and thoracic surgeons, medical superintendents, medical records administrators, State and Territory departments of occupational health, cancer registries, compensation authorities or any other source. A full occupational and environmental history was obtained for each case, either from the patient or next-of-kin. The history taking was non directive but included specific questions on asbestos exposure at the end. Occupational and environmental exposure was based on the opinions of two experienced hygienists, who were not independent or blinded as to disease status. The diagnosing pathologist was requested to provide slides and/or tissue specimens. These were circulated among a pathology expert panel for confirmation of diagnosis. Post-mortem examination was actively sought in every case in order to confirm diagnosis and to obtain lung tissue free of tumour for lung fibre content analysis.

From 1 January 1986, a less detailed notification system has operated, with a short questionnaire history, which is followed up by mail. In the case of all WA and most of the NSW notifications (comprising 60% of the total Australian notifications), detailed occupational and environmental exposure histories from interview are available from the WA Mesothelioma Register and the NSW Dust Diseases Board. Only histologically confirmed cases are accepted but there is no pathology panel diagnosis confirmation. This is now known as the Australian Mesothelioma Register but is a continuation of the Program. Cross checks with State cancer registries are regularly carried out. Annual incidence reports are published (NIOHS (AGPS) 1989 - 2001). Recent reviews are available (Leigh, 1994, Leigh et al 1998, 2001).

This report includes data on cases notified to the register and diagnosed in 1997, 1998 and 1999. Reconciliation with all State cancer registries has been carried out, but some initial under-reporting for 1999, 2000 and 2001 might be expected because of the relocation of the Register from Sydney to Canberra 2001 and recent changes in privacy legislation.

Full analysis of incidence in 2000, 2001 and 2002 awaits reconciliation checks with State cancer registries. However, notifications for 2000, 2001 and 2002 (to 31 March 2002) were respectively 490, 685 and 82.

NOHSC acknowledges the continued cooperation of the notification network.

STATISTICS

Incidence in a calendar year is defined as the number of new cases of mesothelioma first occurring* in an Australian State or Territory in that year. Age specific incidence rates are computed from population tables published by the Australian Bureau of Statistics for the estimated resident mid year populations for 1997, 1998 and 1999 (estimates based on Census 30 June, 1996). Standardised incidence rates (SI) were calculated using the "World Standard Population" 20 years of age or greater[1].

The cumulative incidence rate (CR) is obtained by summing the annual incidence rates (assumed constant in each 5 year group). It can be shown, for rare diseases like mesothelioma, that the cumulative incidence rate approximates the cumulative risk, or probability, of developing the disease in a lifetime[2]. This can be expressed as a percentage. Thus the figure 0.36 in table 3 for NSW (males) under CR indicates a 0.36% or 0.0036 lifetime (20-75) risk of developing mesothelioma. Therefore, the chance of developing mesothelioma between the ages 20-75 is approximately 1 in 275.

* "First occurrence" is the earliest known date of diagnosis (presumptive or confirmed). Cases where a presumptive diagnosis had been rejected before the date of this report (27 March 2002) have been excluded.

1. Waterhouse, J., Muir, C., Shanmugaratnam, K., & Powell, J., eds, *Cancer Incidence in Five Continents Volume IV*, Lyon (IARC Scientific Publications No 42, 1982) pp 671- 674.

2. Breslow, N. & Day, N., *Statistical Methods in Cancer Research Volume I*, Lyon (IARC Scientific Publications No 32, 1980) pp 51-52.

Figure 1

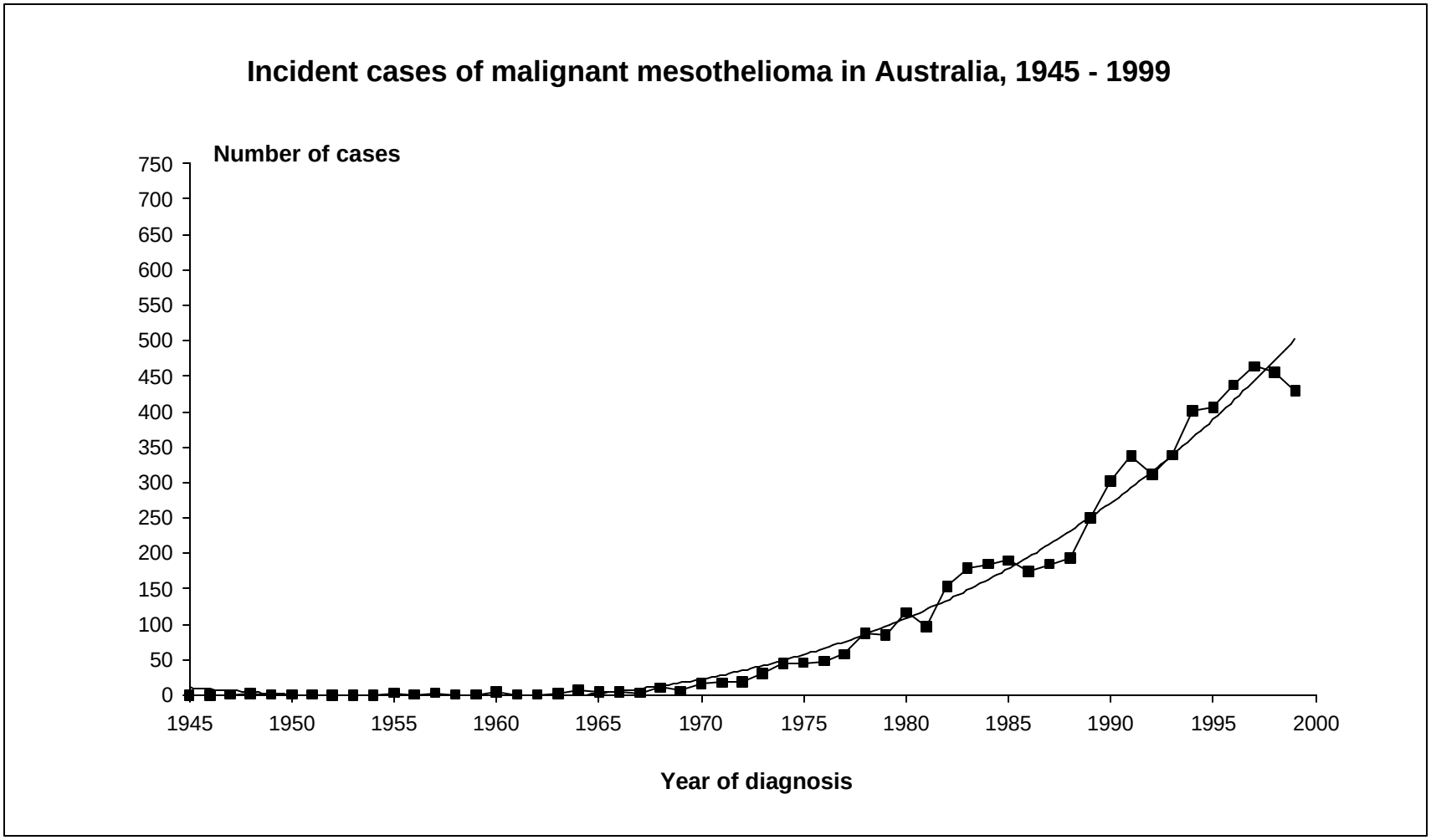
Incident cases of malignant mesothelioma in Australia, 1945 - 1999
Number of cases
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
Year of diagnosis

Figure 2

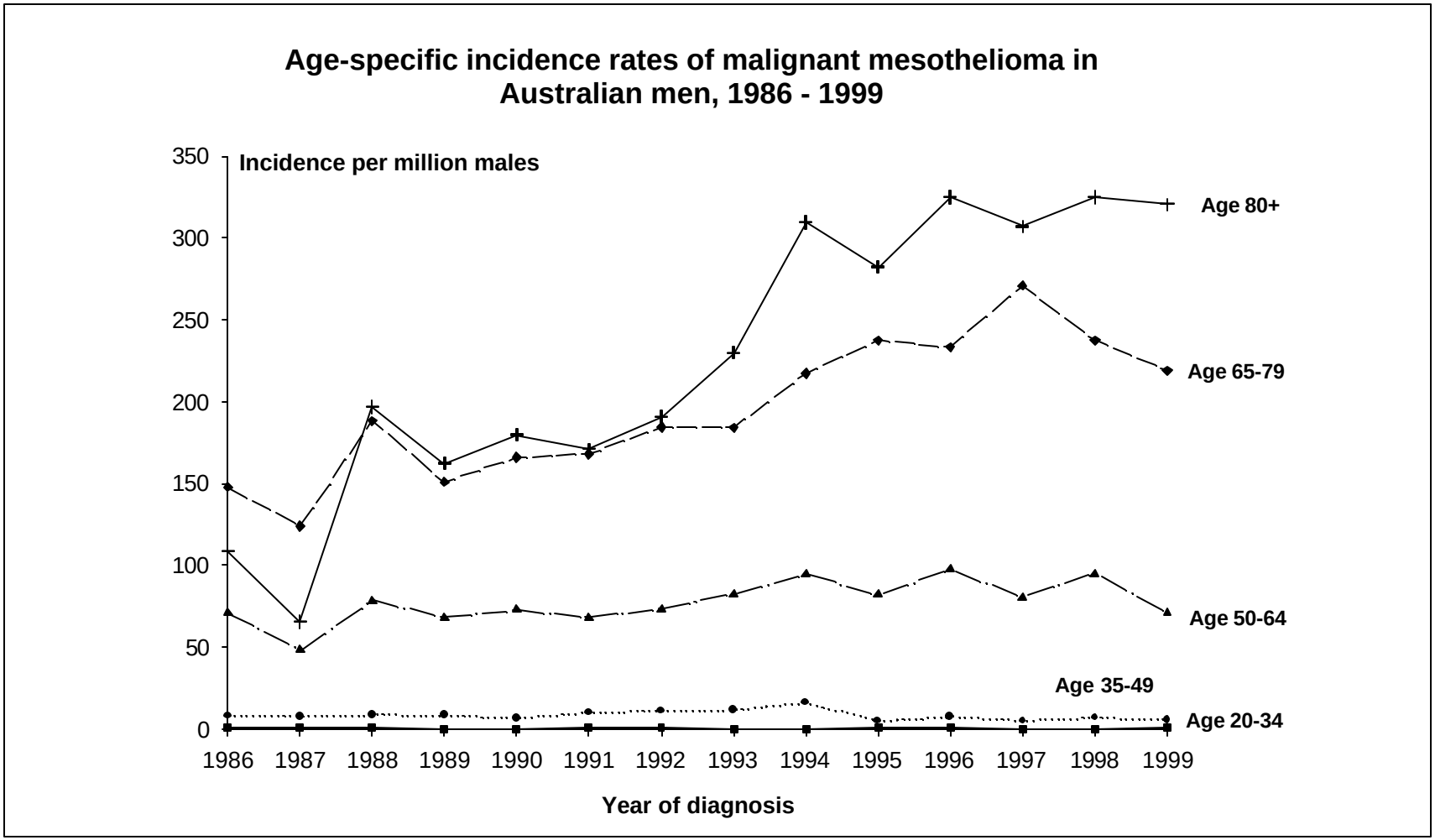
Age-specific incidence rates of malignant mesothelioma in Australian men, 1986 - 1999
Incidence per million males
350
300
250
200
150
100
50
0
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Year of diagnosis
Age 80+
Age 65-79
Age 50-64
Age 35-49
Age 20-34

Figure 3

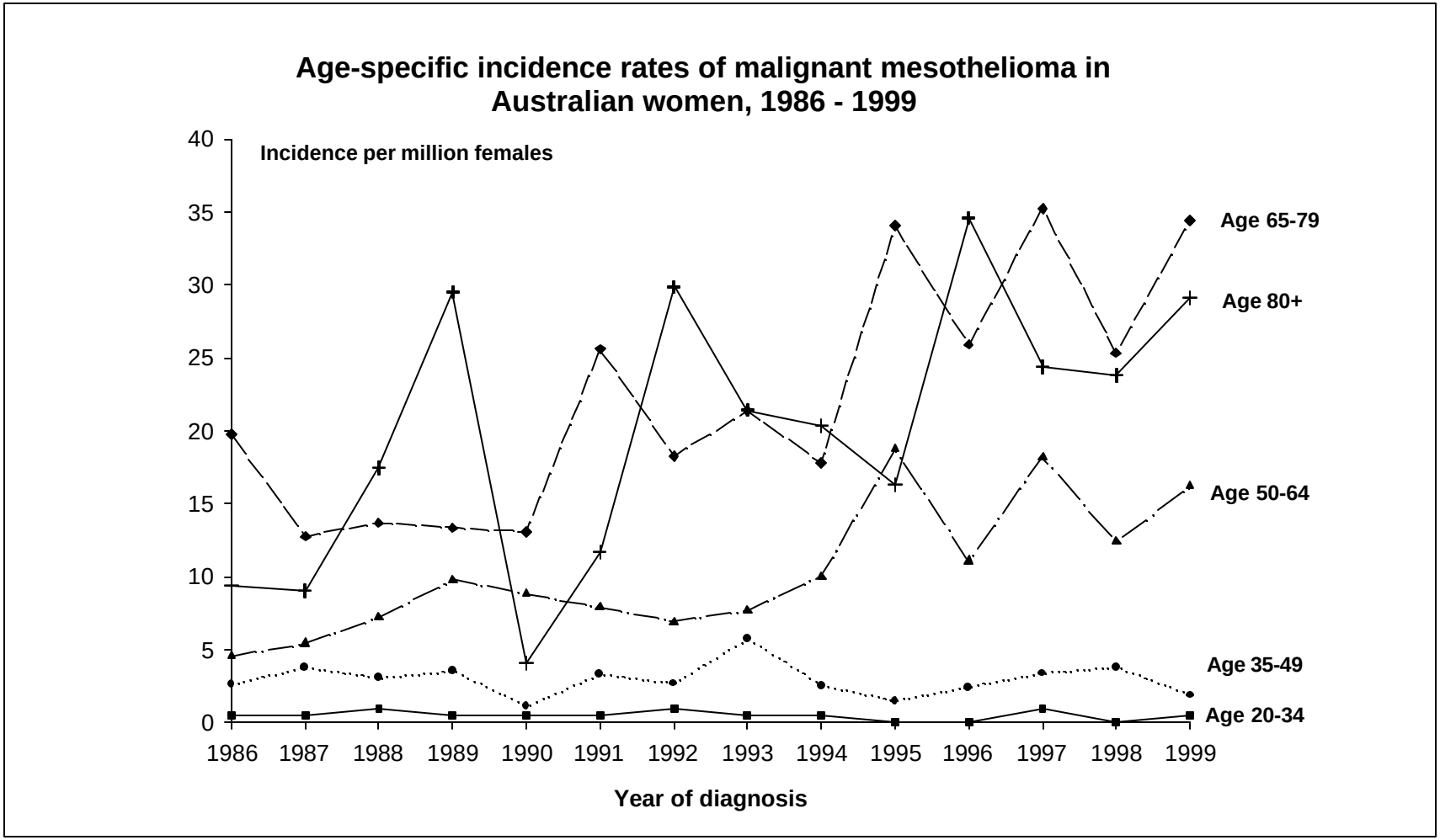
Age-specific incidence rates of malignant mesothelioma in Australian women, 1986 - 1999
Incidence per million females
40
35
30
25
20
15
10
5
0
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
Year of diagnosis
Age 65-79
Age 80+
Age 50-64
Age 35-49
Age 20-34

Table 1

MALE CASES OF MESOTHELIOMA IN AUSTRALIA, 1997, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0	0	0
35-39	1	0	0	0	1	0	0	0	2
40-44	1	1	0	0	1	0	0	0	3
45-49	4	0	1	0	1	0	0	0	6
50-54	7	4	11	1	1	1	0	0	25
55-59	8	5	9	3	5	0	0	0	30
60-64	13	15	13	2	10	0	0	0	53
65-69	16	16	12	6	11	0	0	0	61
70-74	37	22	12	10	9	1	0	0	91
75-79	23	12	10	7	15	0	0	0	67
80-84	11	12	4	5	4	0	0	0	36
85+	5	4	1	1	2	3	0	0	16
All ages	126	91	73	35	60	5	0	0	390

Table 2

FEMALE CASES OF MESOTHELIOMA IN AUSTRALIA, 1997, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0	0	0	0	0	0	0	0	0
25-29	0	0	0	1	0	0	0	0	1
30-34	0	1	0	0	0	0	0	0	1
35-39	0	0	0	0	0	0	0	0	0
40-44	0	0	0	0	0	0	0	0	0
45-49	1	3	3	0	0	0	0	0	7
50-54	0	2	2	3	0	0	0	0	7
55-59	3	4	1	0	1	0	0	0	9
60-64	4	0	0	2	2	0	0	0	8
65-69	1	2	0	1	0	0	0	1	5
70-74	7	6	1	1	1	0	0	1	17
75-79	6	1	2	1	1	0	0	0	11
80-84	1	1	0	0	1	0	0	0	3
85+	0	2	1	1	0	0	0	1	5
All ages	23	22	10	10	6	0	0	3	74

Table 3

AGE-SPECIFIC INCIDENCE RATES FOR MESOTHELIOMA PER MILLION MALES IN AUSTRALIA, 1997, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39	4.0	0.0	0.0	0.0	13.7	0.0	0.0	0.0	2.7
40-44	4.3	5.9	0.0	0.0	14.3	0.0	0.0	0.0	4.4
45-49	18.4	0.0	8.2	0.0	15.2	0.0	0.0	0.0	9.2
50-54	37.0	29.4	105.6	22.3	18.5	70.4	0.0	0.0	44.9
55-59	54.1	46.3	113.1	86.3	121.5	0.0	0.0	0.0	69.3
60-64	103.5	164.0	203.5	65.5	306.5	0.0	0.0	0.0	147.1
65-69	134.9	186.1	205.4	201.7	372.8	0.0	0.0	0.0	181.3
70-74	372.4	307.3	246.6	379.9	378.9	131.8	0.0	0.0	323.7
75-79	339.3	251.3	297.8	390.9	979.5	0.0	0.0	0.0	352.9
80-84	288.9	431.4	211.6	479.3	444.0	0.0	0.0	0.0	331.8
85+	230.7	236.4	88.8	166.6	348.2	1743.2	0.0	0.0	250.0
All ages	56.7	55.9	61.1	66.2	94.6	30.7	0.0	0.0	59.6
SI	45.4	46.4	56.7	46.6	88.6	24.8	0.0	0.0	50.4
CR	0.36	0.37	0.44	0.38	0.62	0.10	0.00	0.00	0.39
Lifetime risk 1 in:	275	271	227	265	161	989	-	-	256

Table 4

AGE-SPECIFIC INCIDENCE RATES FOR MESOTHELIOMA PER MILLION FEMALES IN AUSTRALIA, 1997, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-29	0.0	0.0	0.0	18.6	0.0	0.0	0.0	0.0	1.4
30-34	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	1.4
35-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	4.7	18.8	25.6	0.0	0.0	0.0	0.0	0.0	10.9
50-54	0.0	15.0	20.3	67.2	0.0	0.0	0.0	0.0	13.1
55-59	20.8	37.6	13.4	0.0	25.6	0.0	0.0	0.0	21.4
60-64	31.5	0.0	0.0	63.7	61.6	0.0	0.0	0.0	22.0
65-69	8.0	22.0	0.0	31.8	0.0	0.0	0.0	253.0	14.2
70-74	59.6	69.9	18.4	32.2	37.8	0.0	0.0	276.5	51.8
75-79	65.5	15.2	46.4	40.7	48.9	0.0	0.0	0.0	43.0
80-84	15.7	21.5	0.0	0.0	67.5	0.0	0.0	0.0	16.8
85+	0.0	50.3	41.4	68.8	0.0	0.0	0.0	800.0	33.5
All ages	10.0	12.8	8.2	18.0	9.4	0.0	0.0	27.2	10.9
SI	7.6	10.5	6.9	16.2	8.5	0.0	0.0	28.5	9.0
CR	0.06	0.08	0.04	0.11	0.06	0.00	0.00	0.26	0.07
Lifetime risk 1 in:	1605	1185	2579	936	1600	-	-	378	1468

Figure 4

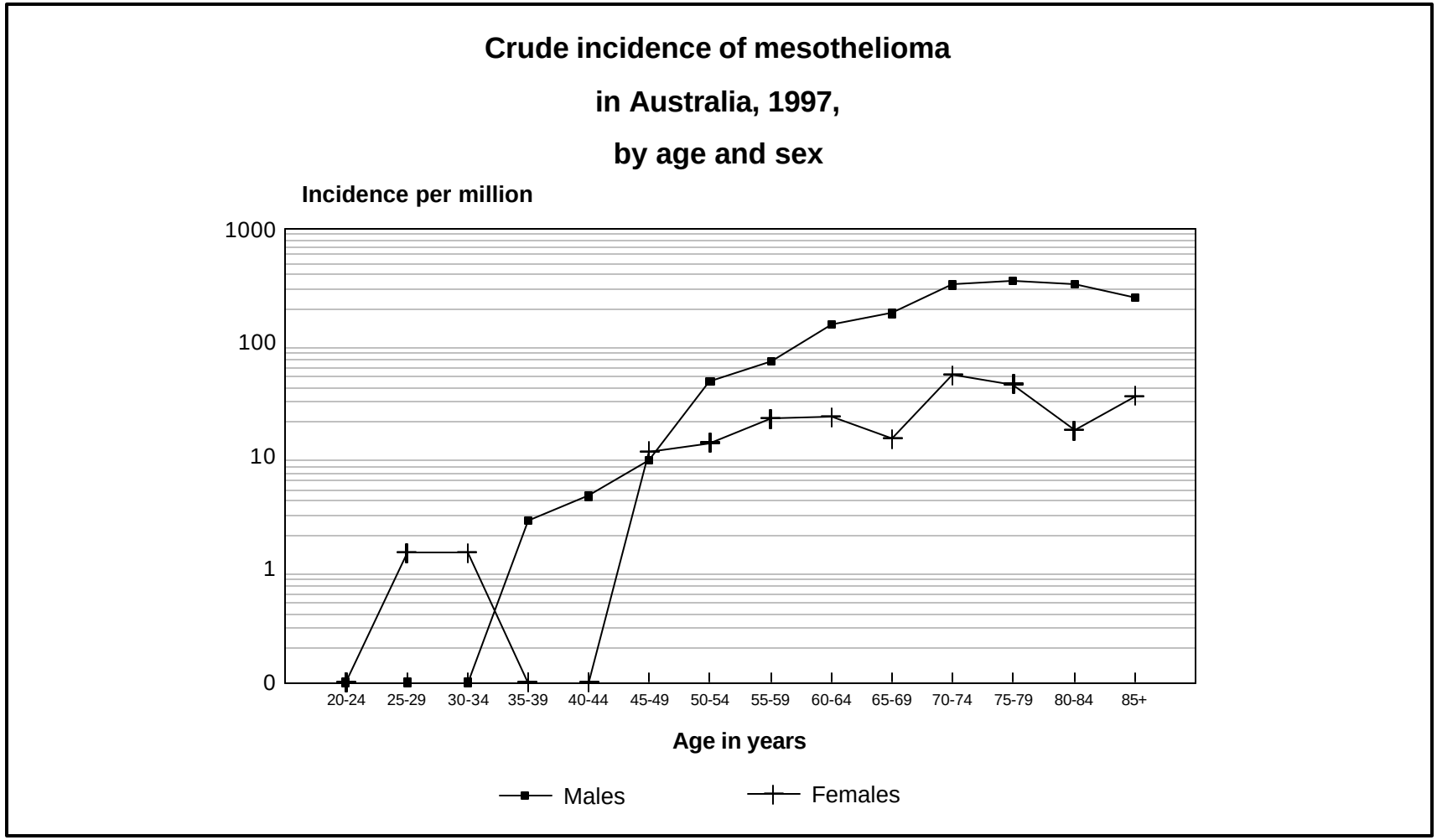
Crude incidence of mesothelioma
in Australia, 1997,
by age and sex
Incidence per million
1000
100
10
1
0
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
Age in years
Males
Females

Table 5

MALE CASES OF MESOTHELIOMA IN AUSTRALIA, 1998, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0	0	0
35-39	1	0	1	0	1	0	0	0	3
40-44	2	1	0	1	0	0	0	0	4
45-49	2	5	1	0	0	0	0	0	8
50-54	8	16	2	3	2	0	0	0	31
55-59	15	6	10	5	7	0	0	0	43
60-64	9	7	15	14	12	1	0	0	58
65-69	29	15	9	2	13	2	0	1	71
70-74	19	21	7	6	10	2	0	0	65
75-79	19	14	13	7	6	0	0	0	59
80-84	14	10	6	3	4	0	0	0	37
85+	6	4	1	8	2	0	0	0	21
All ages	124	99	65	49	57	5	0	1	400

Table 6

FEMALE CASES OF MESOTHELIOMA IN AUSTRALIA, 1998, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	0	0	0	0
40-44	1	0	0	0	0	0	0	0	1
45-49	1	3	0	2	1	0	0	0	7
50-54	1	0	0	2	0	1	0	0	4
55-59	2	1	0	0	0	0	0	0	3
60-64	4	1	2	0	1	1	0	0	9
65-69	2	4	0	1	2	0	0	0	9
70-74	1	2	1	1	1	0	0	0	6
75-79	5	1	1	1	1	0	0	0	9
80-84	2	1	1	0	2	0	0	0	6
85+	1	1	0	0	0	0	0	0	2
All ages	20	14	5	7	8	2	0	0	56

Table 7

AGE-SPECIFIC INCIDENCE RATES FOR MESOTHELIOMA PER MILLION MALES IN AUSTRALIA, 1998, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39	3.9	0.0	7.4	0.0	13.4	0.0	0.0	0.0	4.0
40-44	8.5	5.8	0.0	18.1	0.0	0.0	0.0	0.0	5.7
45-49	9.1	31.5	8.1	0.0	0.0	0.0	0.0	0.0	12.2
50-54	39.9	111.4	18.0	63.8	34.5	0.0	0.0	0.0	52.4
55-59	98.8	54.2	121.0	139.1	164.1	0.0	0.0	0.0	96.4
60-64	71.6	76.5	234.8	458.5	367.8	104.3	0.0	0.0	161.0
65-69	246.9	175.9	154.0	68.4	439.7	222.8	0.0	263.8	212.4
70-74	188.7	287.3	141.0	225.0	412.2	259.6	0.0	0.0	227.3
75-79	266.0	277.0	368.6	371.3	363.7	0.0	0.0	0.0	294.2
80-84	360.6	358.2	307.5	284.7	447.4	0.0	0.0	0.0	336.1
85+	260.6	221.0	82.3	1237.4	333.1	0.0	0.0	0.0	307.5
All ages	55.2	60.0	53.5	92.1	88.1	30.7	0.0	9.4	60.4
SI	45.1	49.5	48.6	76.8	88.0	26.7	0.0	13.2	52.2
CR	0.33	0.37	0.34	0.49	0.72	0.29	0.00	0.13	0.39
Lifetime risk 1 in:	300	269	292	206	140	341	-	758	259

Table 8

AGE-SPECIFIC INCIDENCE RATES FOR MESOTHELIOMA PER MILLION FEMALES IN AUSTRALIA, 1998, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40-44	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
45-49	4.6	18.6	0.0	37.7	15.5	0.0	0.0	0.0	10.8
50-54	5.2	0.0	0.0	42.3	0.0	68.6	0.0	0.0	7.0
55-59	13.5	9.2	0.0	0.0	0.0	0.0	0.0	0.0	7.0
60-64	31.0	10.5	31.3	0.0	29.9	100.2	0.0	0.0	24.3
65-69	16.2	44.4	0.0	32.4	66.4	0.0	0.0	0.0	25.8
70-74	8.5	23.2	18.1	32.5	37.2	0.0	0.0	0.0	18.2
75-79	52.4	14.4	22.2	38.9	46.3	0.0	0.0	0.0	33.6
80-84	31.1	21.6	33.1	0.0	136.4	0.0	0.0	0.0	33.3
85+	18.3	24.1	0.0	0.0	0.0	0.0	0.0	0.0	12.8
All ages	8.6	8.1	4.0	12.5	12.3	11.6	0.0	0.0	8.2
SI	6.7	6.8	3.3	10.6	10.0	12.4	0.0	0.0	6.7
CR	0.04	0.05	0.02	0.07	0.07	0.08	0.00	0.00	0.05
Lifetime risk 1 in:	2402	1889	4045	1380	1343	1185	-	-	2117

Figure 5

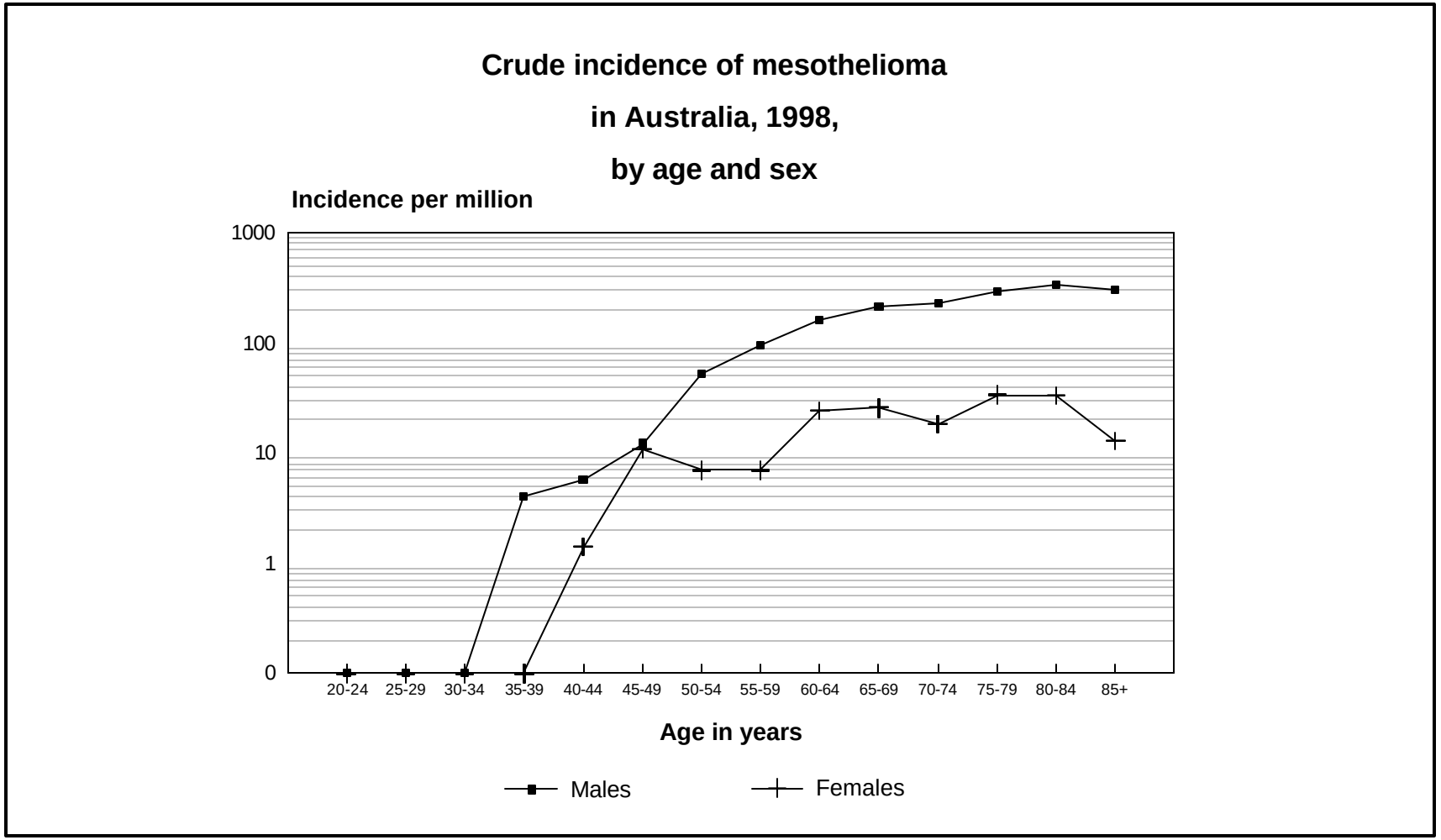
Crude incidence of mesothelioma
in Australia, 1998,
by age and sex
Incidence per million
1000
100
10
1
0
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
Age in years
Males
Females

Table 9

MALE CASES OF MESOTHELIOMA IN AUSTRALIA, 1999, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0	1	0	0	0	0	0	0	1
25-29	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	1	0	0	0	1
35-39	1	1	0	0	0	0	0	0	2
40-44	0	1	1	1	2	0	0	0	5
45-49	2	1	2	0	0	0	0	0	5
50-54	4	8	3	2	7	0	0	3	27
55-59	5	6	9	6	2	1	0	0	29
60-64	9	11	10	11	6	0	0	0	47
65-69	20	11	10	11	10	0	0	2	64
70-74	19	13	5	10	9	1	0	2	59
75-79	22	9	8	12	8	0	0	1	60
80-84	12	6	4	6	9	1	0	0	38
85+	6	2	7	4	2	0	0	0	21
All ages	100	70	59	63	56	3	0	8	359

Table 10

FEMALE CASES OF MESOTHELIOMA IN AUSTRALIA, 1999, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0
30-34	1	0	0	0	0	0	0	0	1
35-39	0	1	0	0	0	0	0	0	1
40-44	0	0	0	0	0	0	0	0	0
45-49	2	1	0	0	0	0	0	0	3
50-54	0	2	2	2	0	0	0	0	6
55-59	3	3	0	3	1	0	0	0	10
60-64	1	3	1	2	0	0	0	0	7
65-69	1	0	0	1	0	0	0	0	2
70-74	5	5	1	1	3	0	0	0	15
75-79	5	5	3	0	3	0	0	0	16
80-84	1	1	3	2	0	0	0	0	7
85+	1	1	1	0	0	0	0	0	3
All ages	20	22	11	11	7	0	0	0	71

Table 11

AGE-SPECIFIC INCIDENCE RATES FOR MESOTHELIOMA PER MILLION MALES IN AUSTRALIA, 1999, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	1.4
25-29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-34	0.0	0.0	0.0	0.0	14.1	0.0	0.0	0.0	1.4
35-39	3.9	5.4	0.0	0.0	0.0	0.0	0.0	0.0	2.7
40-44	0.0	5.7	7.7	18.0	27.8	0.0	0.0	0.0	7.1
45-49	9.0	6.2	16.1	0.0	0.0	0.0	0.0	0.0	7.5
50-54	19.4	53.9	25.9	41.0	115.5	0.0	0.0	282.1	44.1
55-59	31.5	52.3	103.0	161.4	44.6	82.7	0.0	0.0	62.2
60-64	68.9	116.0	144.8	352.0	169.7	0.0	0.0	0.0	124.1
65-69	172.0	129.3	170.8	381.4	337.4	0.0	0.0	514.9	192.4
70-74	186.5	175.7	98.5	372.8	363.7	128.5	0.0	644.3	203.4
75-79	292.3	166.9	215.1	601.4	452.4	0.0	0.0	442.5	282.4
80-84	304.3	214.7	201.6	568.2	1010.3	323.4	0.0	0.0	342.1
85+	244.4	103.2	543.6	577.6	312.4	0.0	0.0	0.0	288.1
All ages	43.9	41.7	47.6	117.6	84.7	18.4	0.0	73.9	53.3
SI	33.9	36.0	42.7	90.5	75.7	12.5	0.0	78.1	44.5
CR	0.25	0.28	0.28	0.66	0.54	0.11	0.00	0.72	0.32
Lifetime risk 1 in:	407	363	353	151	186	947	-	139	309

Table 12

AGE-SPECIFIC INCIDENCE RATES FOR MESOTHELIOMA PER MILLION FEMALES IN AUSTRALIA, 1999, BY AGE AND STATE

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	AUST
20-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25-29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30-34	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
35-39	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	1.3
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	9.1	6.1	0.0	0.0	0.0	0.0	0.0	0.0	4.5
50-54	0.0	13.5	18.1	40.8	0.0	0.0	0.0	0.0	10.1
55-59	19.5	26.5	0.0	80.7	23.8	0.0	0.0	0.0	22.2
60-64	7.6	31.0	15.0	61.6	0.0	0.0	0.0	0.0	18.5
65-69	8.2	0.0	0.0	32.7	0.0	0.0	0.0	0.0	5.8
70-74	42.7	58.3	17.9	32.7	110.4	0.0	0.0	0.0	45.5
75-79	49.8	68.1	63.9	0.0	131.4	0.0	0.0	0.0	56.8
80-84	15.6	21.9	98.6	117.3	0.0	0.0	0.0	0.0	39.2
85+	17.3	23.0	36.7	0.0	0.0	0.0	0.0	0.0	18.2
All ages	8.5	12.5	8.7	19.6	10.6	0.0	0.0	0.0	10.2
SI	6.1	9.6	5.3	16.6	7.5	0.0	0.0	0.0	7.5
CR	0.05	0.07	0.03	0.12	0.07	0.00	0.00	0.00	0.05
Lifetime risk 1 in:	2191	1421	3919	805	1490	-	-	-	1829

Figure 6

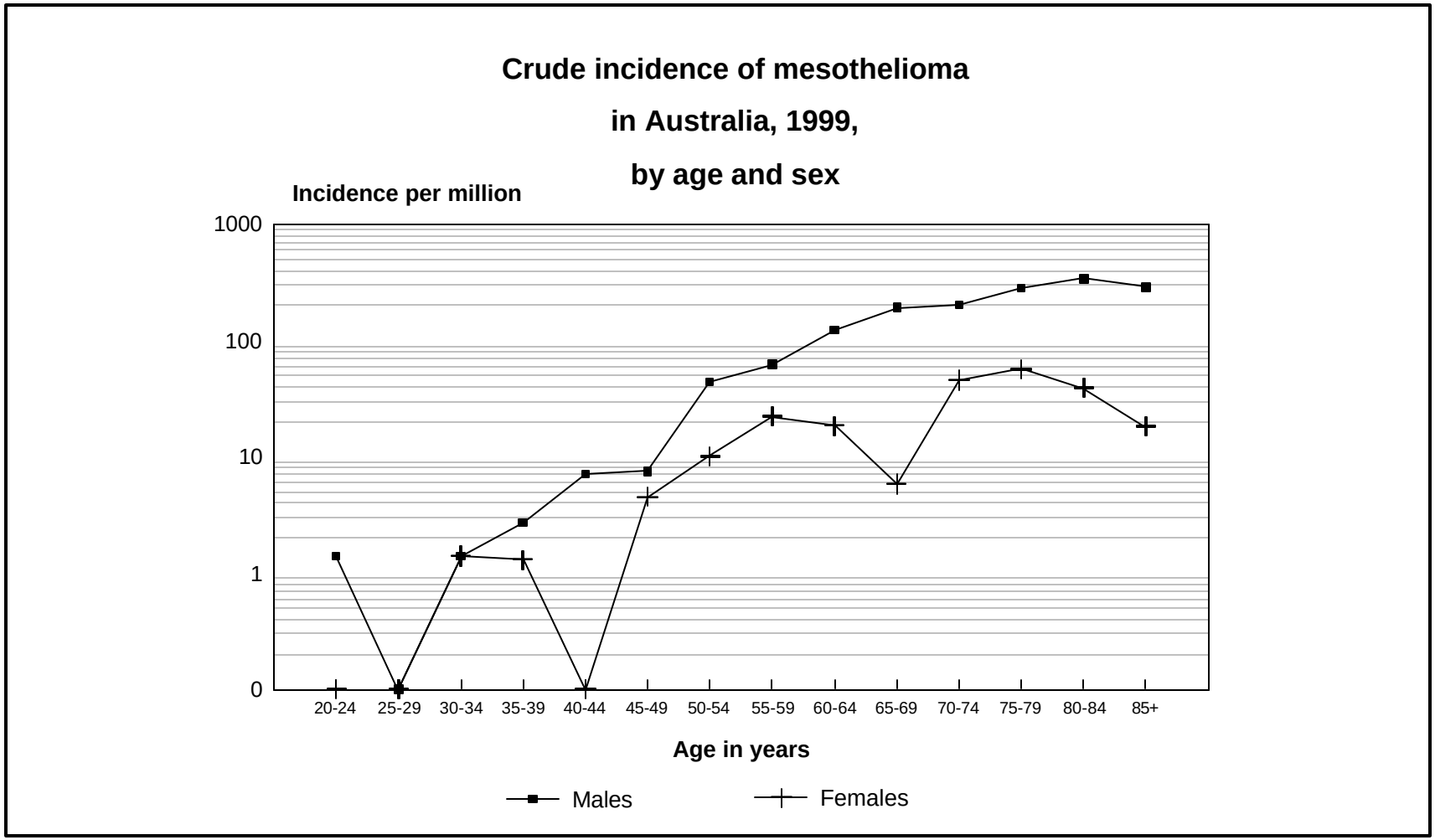
Crude incidence of mesothelioma
in Australia, 1999,
by age and sex
Incidence per million
1000
100
10
1
0
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80-84
85+
Age in years
Males
Females

Figure 7

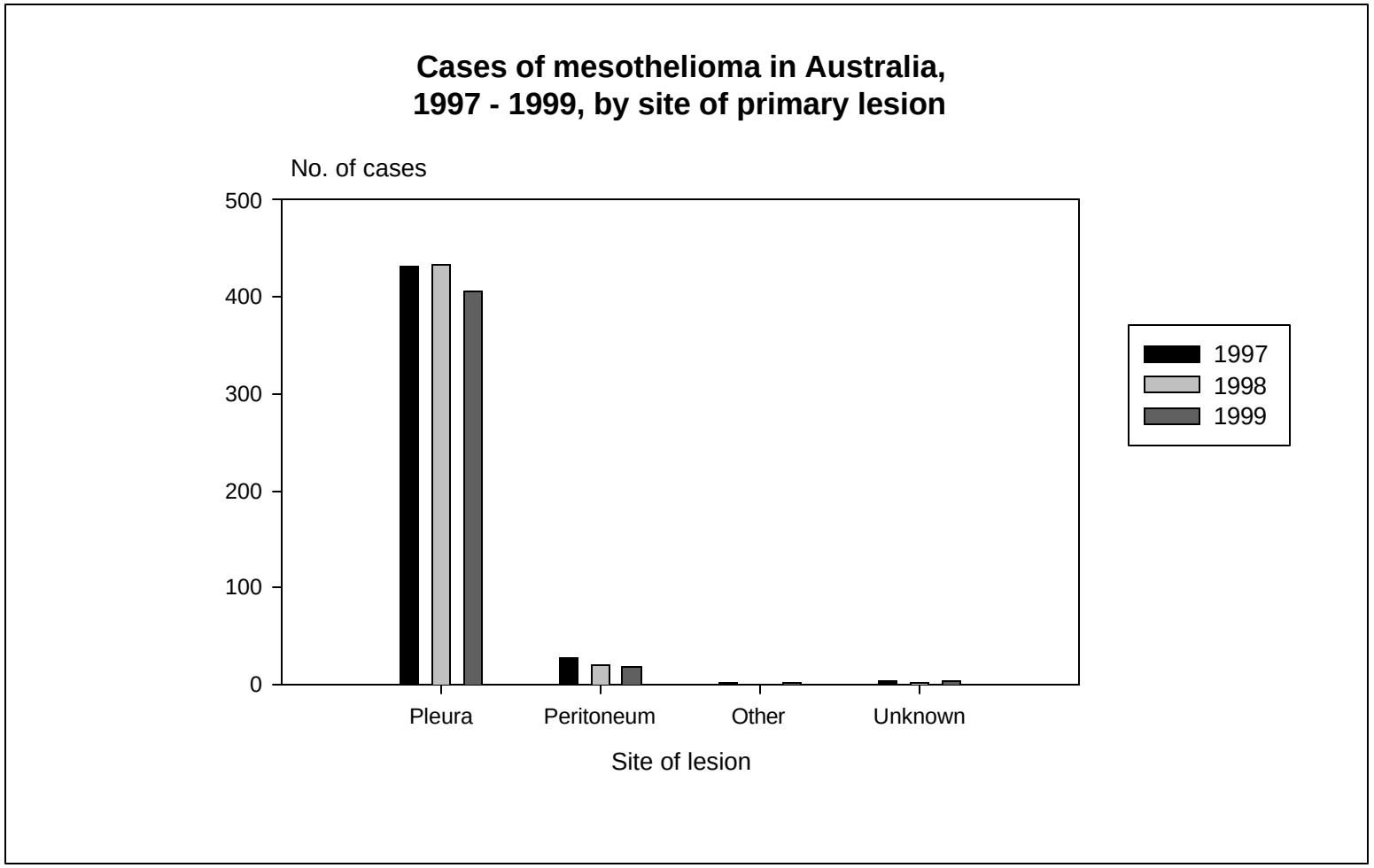
Cases of mesothelioma in Australia,
1997 - 1999, by site of primary lesion
No. of cases
500
400
300
200
100
0
Pleura
Peritoneum
Other
Unknown
Site of lesion
1997
1998
1999

Figure 8

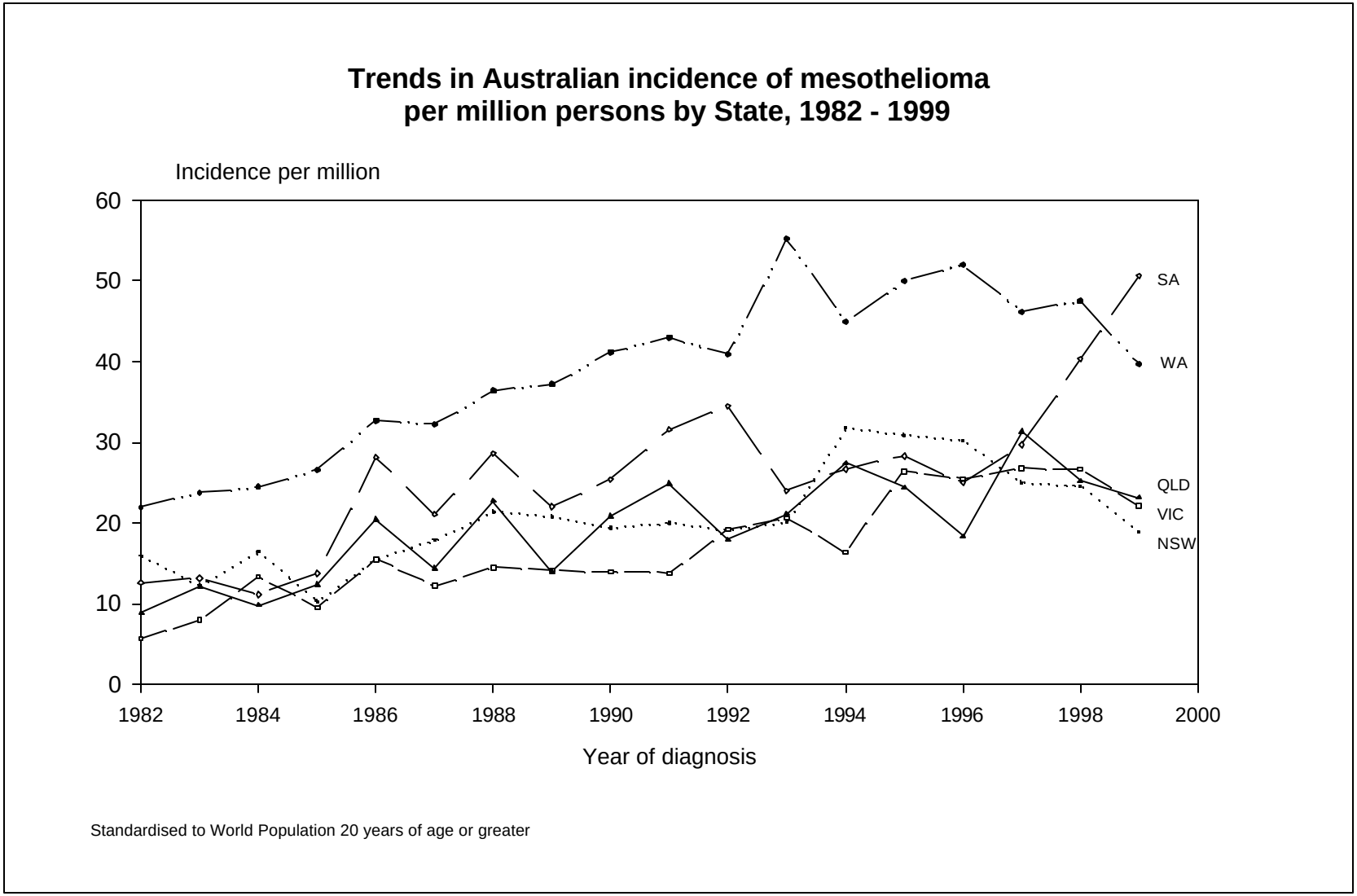
Trends in Australian incidence of mesothelioma
per million persons by State, 1982 - 1999
Incidence per million
60
50
40
30
20
10
0
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
Year of diagnosis
SA
WA
QLD
VIC
NSW
Standardised to World Population 20 years of age or greater

Figure 9

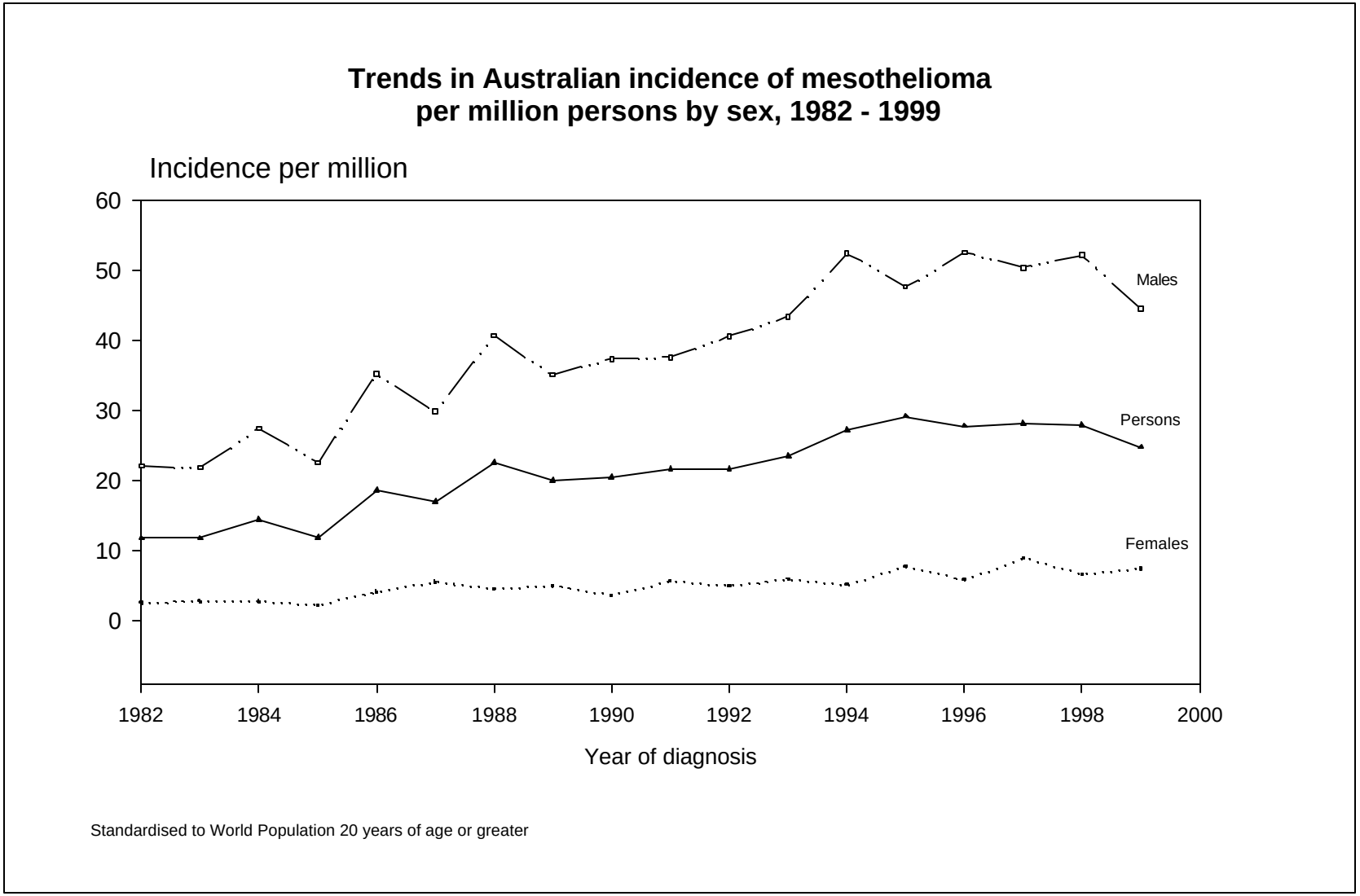
Trends in Australian incidence of mesothelioma
per million persons by sex, 1982 - 1999
Incidence per million
60
50
40
30
20
10
0
Males
Persons
Females
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
Year of diagnosis
Standardised to World Population 20 years of age or greater

Table 13

NUMBER OF MESOTHELIOMA CASES ASSOCIATED WITH A PAST ASBESTOS EXPOSURE AND INDUSTRY IN AUSTRALIA, 1997-1999

Industry	Asbestos exposure				
	Yes	Possibly	No	Unknown	Total
Uncodeable	73	43	11	547	673
Construction	161	12	7	15	195
Manufacturing	141	13	5	5	164
Government Administration / Defence	52	4	4	6	66
Communication / Finance / Insurance	26	11	7	9	53
Transport / Storage	38	5	1	1	45
Mining	22	2	2	1	27
Retail Trade	17	3	3	2	25
Electricity / Gas / Water	18	0	0	0	18
Agriculture / Forestry / Fishing	11	3	2	0	16
Cultural / Recreational Services	8	1	0	0	9
Total	567	97	42	586	1292

Table 14

NUMBER OF WORK-RELATED, MESOTHELIOMA CASES AND INDUSTRY IN AUSTRALIA, 1997-1999

Industry	Work-related			
	Yes	No	Unknown	Total
Uncodeable	20	24	630	673
Construction	194	0	1	195
Manufacturing	164	0	0	164
Government Administration / Defence	64	1	1	66
Communication / Finance / Insurance	53	0	0	53
Transport / Storage	45	0	0	45
Mining	27	0	0	27
Retail Trade	25	0	0	25
Electricity / Gas / Water	18	0	0	18
Agriculture / Forestry / Fishing	16	0	0	16
Cultural / Recreational Services	8	0	1	9
Total	634	25	633	1292

Table 15

NUMBER OF MESOTHELIOMA CASES CLASSIFIED BY OCCUPATION AND INDUSTRY IN AUSTRALIA, 1997-1999

Industry	Occupation										
	Uncodeable	Managers/ Administrators	Professionals	Associate Professionals	Trades-persons / Related workers	Advanced Clerical/ Service workers	Intermediate Clerical/ Sales/ Service workers	Intermediate Production/ Transport workers	Elementary Clerical/ Sales/ Service workers	Labourers/ Related workers	Total
Uncodeable	655	1	5	1	4	0	0	2	0	6	673
Construction	1	21	4	2	142	0	1	8	3	13	195
Manufacturing	3	4	10	0	86	1	3	18	0	39	164
Government Administration / Defence	4	3	14	17	18	0	5	3	0	2	66
Communication / Finance / Insurance	0	5	10	6	5	4	12	1	6	4	53
Transport / Storage	0	0	2	0	5	1	0	12	1	24	45
Mining	0	0	1	0	0	0	1	19	0	6	27
Retail Trade	0	0	0	6	12	0	2	2	2	1	25
Electricity / Gas / Water	1	0	2	0	12	0	0	2	0	1	18
Agriculture / Forestry / Fishing	1	8	0	0	0	0	0	1	0	6	16
Cultural / Recreational Services	0	0	1	1	2	0	1	1	2	1	9
Total	665	42	49	33	286	6	25	69	14	103	1292

Table 16

NUMBER OF MESOTHELIOMA CASES ASSOCIATED WITH A PAST ASBESTOS EXPOSURE AND OCCUPATION IN AUSTRALIA, 1997-1999

Occupation	Asbestos exposure				
	Yes	Possibly	No	Unknown	Total
Uncodeable	71	40	11	543	665
Tradespersons/Related workers	241	21	8	16	286
Labourers/Related workers	88	10	3	2	103
Intermediate Production/Transport workers	61	4	2	2	69
Professionals	35	5	4	5	49
Managers/Administrators	25	6	3	8	42
Associate Professionals	25	3	1	4	33
Intermediate Clerical/Sales/Service workers	12	5	5	3	25
Elementary Clerical/Sales/Service workers	7	3	2	2	14
Advanced Clerical/Service workers	2	0	3	1	6
Total	567	97	42	586	1292

Table 17

NUMBER OF WORK-RELATED, MESOTHELIOMA CASES AND OCCUPATION IN AUSTRALIA, 1997-1999

Occupation	Work-related			
	Yes	No	Unknown	Total
Uncodeable	8	25	632	665
Tradespersons/Related workers	286	0	0	286
Labourers/Related workers	103	0	0	103
Intermediate Production/Transport workers	69	0	0	69
Professionals	49	0	0	49
Managers/Administrators	42	0	0	42
Associate Professionals	33	0	0	33
Intermediate Clerical/Sales/Service workers	25	0	0	25
Elementary Clerical/Sales/Service workers	13	0	1	14
Advanced Clerical/Service workers	6	0	0	6
Total	634	25	633	1292

Table 18

NUMBER OF WORK-RELATED, MESOTHELIOMA CASES ASSOCIATED WITH A PAST EXPOSURE TO ASBESTOS IN AUSTRALIA, 1997-1999

Asbestos exposure	Work-related			
	Unknown	Yes	No	Total
Unknown	536	43	7	586
Yes	52	503	12	567
Possibly	37	57	3	97
No	8	31	3	42
Total	633	634	25	1292

APPENDIX A

ASBESTOS EXPOSURES AS DOCUMENTED IN THE AUSTRALIAN MESOTHELIOMA REGISTER

FROM 1 JANUARY 1986 TO 31 DECEMBER 2001

Circumstances of exposure	Single exposure	With other exposure	Total exposures
Acoustic engineer	1	0	1
Air-conditioning	13	14	27
Aircraft	11	5	16
Armed forces / wartime	29	19	48
Armed forces / peacetime	7	3	10
Asbestos bagging (not Wittenoom)	8	4	12
Asbestos bags – handled which had contained asbestos	8	0	8
Asbestos clothing worn	9	4	13
Asbestos covers for cooking	3	0	3
Asbestos dwelling/fence – built/renovated	71	14	85
Asbestos dwelling – lived in	29	9	38
Asbestos products factory – lived near	11	2	13
Asbestos products factory – worked near	11	0	11
Asbestos mine – worked / lived near - (not Wittenoom)	13	7	20
Asbestos product handled in the workplace	45	9	54
Asbestos product manufacturer - worked	107	39	146
Asbestos product part of workplace or surrounds	50	13	63
Asbestos tailings – played on as a child	10	4	14
Asbestos / or products worker – lived with/washed clothes	47	6	53
Bakery (ovens)	3	0	3
Boilermaker / cleaner / attendant / installer / welder	86	62	148
Brake linings – made/ repaired	59	19	78
Brewery	1	0	1
Bricklayer	15	5	20
Brickworks	8	3	11
Builder / builder's labourer	197	43	240
Carpenter / joiner	234	49	283
Cement factory worker	20	2	22

APPENDIX A continued

Circumstances of exposure	Single exposure	With other exposure	Total exposures
Chemical engineer	1	0	1
Civil engineer	7	0	7
Coal miner	1	0	1
Concreting	7	3	10
Construction worker	15	2	17
Demolition	5	2	7
Design engineer	2	1	3
Diesel engineer	0	1	1
Dockyard worker	41	23	64
Electrical engineer	7	8	15
Electrical fitter	15	4	19
Electrical mechanic	3	0	3
Electrician	59	17	76
Electroplater	0	1	1
Engineer	30	1	31
Fireproofing	5	0	5
Fire doors	5	0	5
Fire fighter	6	3	9
Fitter / turner	56	23	79
Flour miller	1	0	1
Foundry	6	2	8
Furnace	6	0	6
Glassworks / glaziers	6	0	6
Industrial chemist	5	0	5
Industrial engineer	2	0	2
Instrument technician	1	0	1
Insulation	19	4	23
Jeweller	7	2	9
Knitting mill worker	1	0	1
Laboratory technician	8	3	11
Labourer	33	17	50
Lagger	31	16	47
Lagging in workplace	24	5	29
Laundry / drycleaners	14	5	19
Linesman	9	4	13
Locksmith	1	0	1

APPENDIX A continued

Circumstances of exposure	Single exposure	With other exposure	Total exposures
Machine fitter	3	1	4
Machine inspector	2	0	2
Machine operator	1	5	6
Machinist	4	0	4
Maintenance carpenter	3	1	4
Maintenance electrician	2	1	3
Maintenance engineer	4	1	5
Maintenance fitter	13	5	18
Maintenance mechanic	3	2	5
Maintenance worker	12	3	15
Marine engineer	11	8	19
Mechanical engineer	7	0	7
Mechanical fitter	8	5	13
Metal fabrication	3	0	3
Metal trades	3	1	4
Metallurgy	1	0	1
Moulder	4	1	5
Navy	162	66	228
Oil refinery	7	3	10
Painter / decorator	40	8	48
Panel beater	9	2	11
Paper mill	3	2	5
Patternmaker	6	3	9
Pipes – handled / cut / stored / drilled	25	6	31
Plasterer	18	7	25
Plumbing	60	28	88
Power station worker	88	52	140
Pressure pack manufacturer	1	0	1
Printing	10	3	13
Radiographer	2	0	2
Railways	102	50	152
Renovations / maintenance / lagging in workplace	21	5	26
Roofing	17	4	21
Rubber manufacturing	0	1	1

APPENDIX A continued

Circumstances of exposure	Single exposure	With other exposure	Total exposures
Sheet metal	14	12	26
Ships – building / repairing / on	76	59	135
Shop fitter	2	0	2
Site visits / inspections	8	7	15
Smelting	1	0	1
Steelworks	13	8	21
Storeman	18	0	18
Stoves	2	0	2
Sugar mill	6	4	10
Tannery	2	0	2
Telephone technician	6	3	9
Tiler	13	1	14
Toolmaker	4	2	6
Trades assistant	17	3	20
Transporting asbestos	14	6	20
Transporting asbestos product	17	3	20
Truck driver - general	1	0	1
Tyre factory	10	4	14
Waterside worker	96	13	109
Weighing trucks	1	0	1
Welder	23	9	32
Whitewash – Greece / Cyprus	4	1	5
Wine making (filters)	1	0	1
Wittenoom	194	60	254
Wood machinist	4	0	4
Wood chipper	1	0	1

SUMMARY OF ASBESTOS EXPOSURES

Asbestos exposure	
single	2,800
multiple	400
possible	281
No apparent asbestos exposure	475
No response to questionnaire	1,590
Total cases from 1/1/86 – 31/12/2001	5,546
Respondents with asbestos exposure	3,481
Total respondents	5,546
Percentage respondents with asbestos exposure	88%

APPENDIX B

NATIONAL OCCUPATIONAL HEALTH AND SAFETY COMMISSION

AUSTRALIAN MESOTHELIOMA REGISTER NOTIFICATION

Please direct all correspondence to:

The Registrar
Australian Mesothelioma Register, National Occupational Health and Safety Commission, GPO Box 1577 Canberra ACT 2600 Telephone: (02) 6279 1005

Patient details - please supply ALL available information

SURNAME: ..... FIRST NAMES: .....

ADDRESS:.....

STATE: ……POSTCODE: ……GENDER: M / F DATE OF BIRTH: / /

IF DECEASED, DATE OF DEATH: / / PLACE OF DEATH: .....…….

DATE OF INITIAL DIAGNOSIS: Month ..... Year: .....

HISTOLOGICAL: YES / NO

HOSPITAL DIAGNOSED: ..... PRIMARY SITE: .....

CLINICIAN'S NAME: .....NAME OF LOCAL GP: ……

ADDRESS: ..... ADDRESS: ……

Please describe briefly main occupation(s) of patient's worklife.

OCCUPATION	INDUSTRY	YEAR
1.	1.	19 - 19
2.	2.	19 - 19
3.	3.	19 - 19

KNOWN ASBESTOS EXPOSURE: YES / NO

If "YES" please indicate circumstances and duration:
.....

Details of person completing this form.

NAME: …… SIGNATURE: ……

ADDRESS: …… DATE: .....

Please circle the appropriate category: CLINICIAN PATHOLOGIST CANCER REGISTRY MEDICAL RECORDS ADMIN
DUST DISEASES BOARD OTHER:

Office Use Only
Date Received: REGISTRATION NO:

LIST OF PUBLICATIONS FROM THE MESOTHELIOMA PROGRAM AND REGISTER

Armstrong B.K., Musk A.W., Baker J.E., Hunt J.M., Newall C.C., Henzell H.R., Blunsdon B.S., Clarke-Hundley M.D. (1984). *Epidemiology of malignant mesothelioma in Western Australia*. Med. J. Aust. 141:86-88.

Baker G., Driscoll T., Daniel S., Thompson R., Lee J., Constance T., Ferguson D., Leigh J. (1991). *Clinical features of mesothelioma associated with tumor cell histology*. Proceedings of the Thoracic Society of Australia and New Zealand, p 33.

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