Deemed Diseases approach – information to support the update of the Comcare Scheme's current deemed diseases legislative instrument

Final report

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BACKGROUND OF THE AUTHOR

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GLOSSARY

AIHW	Australian Institute of Health and Welfare
AWES	Australian Work Exposures Study
DALY	Disability-Adjusted Life Year

EXECUTIVE SUMMARY

Background

The Department of Employment is conducting work to support the updating of the current deemed diseases legislative instrument for the Safety, Rehabilitation and Compensation Act 1988 (SRC Act). This work required epidemiological analysis on the risks and exposure thresholds for the disorders being considered. The required information is presented in this report.

Approach

The project used published material, publically available material, information developed as part of the overall Deemed Diseases project and information developed by the author as part of his work on the Global Burden of Disease study.

Findings

Information is presented separately on relative risks for cancers and other diseases being considered for inclusion in the Comcare Scheme Deemed Diseases list; incidence rates for cancers and other diseases in the population; exposure prevalence; and duration of exposure and latency.

1. INTRODUCTION

The Department of Employment ('the Department') is conducting work to support the updating of the current Deemed Diseases legislative instrument for the Safety, Rehabilitation and Compensation Act 1988 ('SRC Act'). This work required epidemiological analysis to provide information on risk related to occupational exposure, disease incidence rates, exposure prevalence; and duration of exposure and latency. The required information is presented in this report.

The specific requirements were to:

1. A. Provide the risk ratings for the cancers and other diseases being considered for inclusion in the Comcare Scheme Deemed Diseases list; and
   B. Provide incident rates for cancers and other diseases in the population.

2. Apply a study explaining linkage between particular diseases and specific occupations to provide occupational exposure data information on exposure prevalence for various exposures relevant to particular diseases in relevant occupations.

3. Provide advice to the Department on the duration of exposure to causative agents which would be sufficient to cause each of the diseases being considered for inclusion in the Comcare Scheme Deemed Diseases list.

2. APPROACH

The project used published material, publically available material, information developed as part of the overall Deemed Diseases project[1] and information developed by the author as part of his work on the Global Burden of Disease study[2].

3. RELATIVE RISKS FOR CANCERS AND OTHER DISEASES INCLUDED IN THE DEEMED DISEASES LIST

INTRODUCTION

This chapter presents relative risk information for those disorder-exposure pairs which are being considered for inclusion in the Comcare Scheme Deemed Disease list for which such information is available.

CANCERS

Information on the relative risk of particular cancers arising from exposure to specific agents comes from published studies and some un-published meta-analyses. Most of the relative risk estimates come from meta-analyses. Where an appropriate meta-analysis was not available, single studies considered most appropriate are provided. Much of the information provided here is based on work conducted by the author for the Global Burden of Disease study[2].

Information on the relative risk due to ionizing radiation is difficult to obtain for the very low exposures likely in Australia. Therefore, relative risks for cancer arising from exposure to ionizing radiation are not provided. Not including such cancers should not introduce problems because the number of people exposed to ionizing radiation in an occupational setting is small and the risk arising from such exposure is likely to be very small, meaning that the number of potential claims due to such exposure should be very low.

For some cancer-exposure pairs, there are no reliable estimates of relative risk. Few claims would be expected to arise for these because the cancer is uncommon and/or the exposure is uncommon and/or the risk arising from exposure is likely to be low (Table 1).

Table 1. Exposure-outcome pairs, relative risks (95% CI), source and study type

Cancer site/type	Exposure	RR	95% CI^	Source of evidence	Study type+
Nasopharynx	Formaldehyde	2.1	1.05-4.21	Hauptmann et al, 2004[3a]	KS
Nasopharynx#	Wood dust				
Liver#	Vinyl chloride monomer				
Nasal cavity and para-nasal sinuses#	Leather dust				
Nasal cavity and para-nasal sinuses#	Nickel				
Nasal cavity and para-nasal sinuses#	Wood dust				
Larynx	Asbestos	1.38	1.17-1.60	IOM, 2006[4b]	M-A
Larynx	Strong inorganic-acid mists	4.28	2.13-8.58	Soskolne et al, 1992[5c]	KS
Lung	Asbestos (males)	2.27	1.67-2.85	Lenters et al, 2011[6d]	M-A
Lung	Asbestos (females)	1.86	1.56-21.5	Lenters et al, 2011[6d]	M-A
Mesothelioma	Asbestos			Rake et al, 2009[7e]	
Ovary	Asbestos	1.77	1.37-2.28	Camargo et al, 2011[8]	M-A
Kidney	Trichloroethylene	1.24	1.06-1.45	Kelsh et al, 2010[9]	M-A
Bladder#	2-naphthylamine				
Bladder#	Benzidine				
Bladder#	Cyclophosphamide				
Bladder#	Ortho-toluidine				
Bladder#	Polycyclic aromatic hydrocarbons				
Leukaemia	Benzene	2.62	1.57-4.39	Khalade et al, 2010[10]	M-A
Leukaemia	Formaldehyde	1.47	1.19-1.83	Collins and Lineker, 2004[11]	M-A
Leukaemia#	Butadiene				
Leukaemia#	Cyclophosphamide				

+: M-A = meta-analysis; KS = key study.

^: 95% confidence interval.

#: These exposure-outcome pairs are likely to be responsible for very few cases because the exposure circumstances are now absent or very rare, the cancer type is rare, or both.

Notes:

a: Cited as the key defining evidence by IARC[12].

b: The estimates come from a meta-analysis based on review by IOM, 2006[4], using inverse weighted average from relevant occupational cohorts included in that report.

c: This is the key study because the other only other potentially relevant studies (Steenland[13] and Soskolne et al, 1984[5]) were of acid mists experienced by chemical workers involved in metal processing and the exposures were thus relatively high. The lower limit of the RR for Low exposure was 0.97, which was rounded to 1.0 for the analysis.

d: Final relative risks used are based on the meta-analysis using the five best studies and estimated exposure of 2.0 times the U.S. PEL for males and 1.0 times the U.S. PEL for females.

e: The estimates of population attributable fraction were obtained directly from the literature. It is recommended to assume a population attributable fraction of 80% (the Australian Burden of Disease study released in 2016, and covering 2011, estimated an occupational attributable fraction of 81% for mesothelioma[14]).

ASTHMA

There is no information available on the relative risk of asthma arising from exposure to each of the hundreds of agents that are known to result in occupational asthma. Instead, relative risk information is based on occupation, which is used as a proxy measure for such exposure. There is only one comprehensive study that provides the necessary information for incident cases of asthma. This was conducted by Karjalainen and co-workers[15, 16]. This is a Finnish study but the results are likely to be generally applicable to the Australian workforce. The relative risk for agricultural occupations was based on a different study[17]. This information was used because the results were thought to be more generalizable to agriculture outside of Finland (Table 2).

Table 2. Relative risk of asthma from occupational exposure to asthmagens - by occupation and sex[+].

	Males		Females	
	RR	**95%CI[^]**	**RR**	**95% CI**
Background	1		1	
Administrative	1		1	
Technical	1.05	0.98-1.12	1.06	1.03-1.10
Sales	1.14	1.05-1.23	1.13	1.08-1.18
Agriculture	1.5	1.11-2.03	1.5	1.11-2.03
Mining	1.95	1.58-2.40	1.95	1.58-2.40
Transport	1.31	1.22-1.40	1.22	1.13-1.31
Manufacturing	1.56	1.47-1.65	1.33	1.27-1.39
Services	1.53	1.42-1.66	1.41	1.35-1.46

+: Based on Karjalainen et al, 2001, 2002[15, 16] and Kogevinas et al, 1999[17].

^: 95% confidence interval.

4. INCIDENCE RATES FOR CANCERS AND OTHER DISEASES IN THE POPULATION

INTRODUCTION

Accurate incidence rates for diseases in Australia are really only available for cancers. Other information included in this section comes from a range of sources, as described in the relevant section.

CANCER

The information on cancer incidence comes from the Australian Institute of Health and Welfare's Australian Cancer Incidence and Mortality (ACIM) books[1]. Information is available on incidence and mortality (both frequency and population-based rates) for most individual cancers and for all cancers combined. Information is available separately by age and sex, and for all years from 1982 to 2012, inclusive[18].

The most recent information from the Global Burden of Disease study provides estimates of population attributable fraction for occupational exposures for some relevant cancers. These are shown in Table 4 and are based on deaths and Disability-Adjusted Life Years (DALYs)[19, 20]. Comparable population attributable fraction results are available from the Australian Burden of Disease study released this year, and covering 2011, although these are based only on DALYs[14].

Table 4 Population-attributable fraction for cancers due to occupational exposures – deaths and DALYs; GBD[+] and AIHW[^]

Cancer type	GBD PAF (deaths)	GBD PAF (DALYs)	AIHW PAF (DALYs)
Larynx cancer	5.3	4.8	5.3
Lung cancer	16.4	14.5	6.1
Nasopharynx cancer	0.7	0.8	0.1
Ovary cancer	0.8	0.6	0.3
Kidney cancer	0.0	0.0	-
Mesothelioma[2]	74.7	67.2	80.7
Leukaemia	1.2	1.1	5.3
Total	**3.7**	**2.9**	**-**

+: Global Burden of Disease study, based on IHME, 2015[20].
^: AIHW, based on AIHW, 2016[14].

[1] Available at http://www.aihw.gov.au/acim-books/.

INFECTIOUS DISEASE

The Australian National Notifiable Disease Surveillance System reported that in terms of new (incident) cases in 2014 there were 17 cases of brucellosis, 231 cases of Hepatitis A, 176 cases of Hepatitis B, 433 cases of Hepatitis C, 88 cases of leptospirosis, 469 cases of Q-fever, 1,339 cases of tuberculosis and zero cases of anthrax[21].

DISEASES OF THE NERVOUS SYSTEM

PARKINSON'S DISEASE

A 2015 report estimated that there about 11,500 new cases of Parkinson's disease in Australia each year[22].

PERIPHERAL NEUROPATHY

There is no accurate Australian information on the incidence of peripheral neuropathy related to external agents.

DISEASES OF THE RESPIRATORY SYSTEM

ASTHMA

There is no information on the incidence of adult asthma in Australia. The National Health Survey has provided information on the prevalence of current asthma, with results suggesting about 10% of adults in Australia currently have asthma[23]. The most recent information from the Global Burden of Disease study suggests occupational exposures are responsible for approximately 12.5% of asthma in adults worldwide[19, 20], but the Australian Burden of Disease study estimated an occupational attributable fraction of 9.5% based on DALYs[14].

PNEUMOCONIOSES

There are probably still in the order of 20 to 50 deaths from pneumoconiosis each year in Australia[24], but there are very few new cases diagnosed. Exposures in Australian workplaces should be well enough controlled to prevent any new cases due to recent exposure, although the recent identification of a small number of new cases of coal workers' pneumoconiosis in Australia indicate that exposure control is not always sufficient.

BYSSINOSIS AND EXTRINSIC ALLERGIC ALVEOLITIS

There is no information in Australia regarding the incidence of byssinosis and extrinsic allergic alveolitis, but the incidence of both conditions is likely to be very low.

HEPATIC DISEASES

NON-INFECTIOUS HEPATITIS

There is no accurate Australian information on the incidence of non-infectious hepatitis related to external agents.

CHRONIC ACTIVE HEPATITIS

There is no accurate Australian information on the incidence of chronic active hepatitis, but there are probably several hundred new cases per year[25].

SKIN DISEASES

IRRITANT AND ALLERGIC CONTACT DERMATITIS

There is no accurate Australian information on the incidence of irritant and allergic contact dermatitis.

VITILIGO

There is no accurate Australian information on the incidence of vitiligo.

MUSCULOSKELETAL DISEASES

RAYNAUD'S DISEASE

There is no accurate Australian information on the incidence of Raynaud's disease

BURSITIS (AT THE ELBOW OR KNEE)

There is no accurate Australian information on the incidence of bursitis at the elbow or knee.

ACUTE POISONING AND TOXICITY

There is no accurate Australian information on the incidence of acute poisoning and toxicity from occupational causes.

5. EXPOSURE PREVALENCE

CARCINOGENS

Information on the prevalence of exposure of Australian workers is available from the Australian Work Exposures Study (AWES), a study led by Lin Fritschi and conducted from about 2012. The study was a cross-sectional telephone survey which looked at the prevalence of current occupational exposure to 38 known or probable priority carcinogens among Australian workers. The study found that about 2.7 million men (58%) and 880,000 women (21%) appeared to be exposed to at least one of the priority carcinogens[26]. Note that carcinogens have a prolonged latency period and that people exposed to a carcinogen remain at risk of developing a resultant cancer for many years, usually decades, afterwards. Therefore, the proportion of people currently exposed is likely to be considerably less than the proportion of people who are at risk at any one time. The relevant proportion at risk will vary by cancer and age, but a rough estimate would be of the order of two and half to four times the current prevalence of exposure.

The prevalence for the main carcinogens is shown in Tables 5 and 6, which were Table 3 and Table 4, respectively, in the overview paper that presented the AWES study results[26].

ASTHMAGENS

Information on the prevalence of asthmagens in Australian workers first became available only in 2016. The relevant study estimated that approximately 2.8 million men and 1.7 million women (47% of men and 40% of women) are exposed to at least one asthmagen in the course of their work. This study, also led by Lin Fritschi, provides a list of occupational asthmagens relevant to the Australian workforce[27] and estimates of the prevalence of exposure for key agents (277 asthmagens, assembled into 27 groups)[28]. Some asthmagens relevant to Australia may not be included, but it is unlikely many agents with significant exposure prevalence were omitted. Regardless, these results are not helpful for conducting burden estimates along the lines required for the Department's analysis because individual relative risks for each of the agents are not available. The relative risk estimates presented earlier in this report are based on occupation. So, standard occupation data sources can provide the information on prevalence of employment in each of the relevant occupation groups for which the relative risks are available.

Other agents

There is no useable exposure information for the other agents listed in the Deemed Diseases List.

Table 5 Proportion of final sample and Australian working population estimated to be occupationally exposed by carcinogenic agent, men[+]

Carcinogen[1]	Most common occupational groups	Sample n (%)	Population n (%)	Population 95% CI[2]
Solar UVR	Farmer, animal/horticultural, painter	963 (34.8)	1 737 500 (37.0)	35.2 to 38.8
Diesel engine exhaust	Farmer, heavy vehicle driver, miner	796 (28.8)	1 344 500 (28.6)	26.9 to 30.3
ETS	Painter, plumber, hospitality	589 (21.3)	1 164 000 (24.6)	23.2 to 26.4
Benzene	Farmer, animal/horticultural, automobile driver	370 (13.4)	636 440 (13.5)	12.3 to 14.8
Lead	Painter, vehicle worker, plumber	295 (10.7)	502 100 (10.7)	9.6 to 11.9
Silica	Miner, construction, engineer	289 (10.5)	543 390 (11.6)	10.5 to 12.9
Wood dust	Carpenter, painter, handyperson	271 (9.8)	449 470 (9.6)	8.6 to 10.8
Artificial UVR	Farmer, vehicle worker, metal worker	247 (8.9)	391 770 (8.4)	7.4 to 9.4
PAHs	Farmer, emergency worker, food service	239 (8.6)	454 160 (9.7)	8.6 to 10.9
Shiftwork[3]	Nurse, miner, passenger transport	203 (7.3)	396 120 (8.4)	7.4 to 9.5
Chromium VI	Painter, metal worker, carpenter	168 (6.1)	291 930 (6.2)	5.3 to 7.1
Asbestos	Vehicle worker, emergency worker, miner	138 (5.0)	251 960 (5.4)	4.6 to 6.3
Formaldehyde	Carpenter, painter, emergency worker	118 (4.3)	200 150 (4.3)	3.6 to 5.1
Nickel	Metal worker, plumber, vehicle worker	98 (3.5)	170 840 (3.6)	3.0 to 4.4
Ionising radiation	Health professional, miner, scientist	74 (2.7)	127 800 (2.7)	2.2 to 3.4
Trichloroethylene	Farmer, metal worker, plumber	44 (1.6)	73 570 (1.6)	1.2 to 2.1
Arsenic	Carpenter, office worker, heavy vehicle driver	33 (1.2)	49 750 (1.1)	0.8 to 1.5
Vinyl chloride	Emergency worker, machine operator	19 (0.7)	40 780 (0.9)	0.6 to 1.3
Ethylene Oxide	Emergency worker, food factory, scientist	22 (0.8)	46 240 (1.0)	0.7 to 1.5
1,3-butadiene	Emergency workers	21 (0.8)	44 650 (1.0)	0.7 to 1.5
Cadmium	Metal worker, vehicle worker, electrical worker	13 (0.5)	20 840 (0.4)	0.2 to 0.7
Nitrosamines	Metal worker, scientist	8 (0.3)	14 710 (0.3)	0.1 to 0.6
Acid mists	Machine operator, metal worker, engineer	5 (0.2)	11 060 (0.2)	0.1 to 0.5 [4]

1 Includes only those priority carcinogens with five or more workers exposed.

2 95% CI of the proportion

3 Exposed to any one or more of seven shiftwork agents (light at night, phase shift, sleep disturbance, diet and chronodisruption, alcohol and chronodisruption, lack of physical activity and vitamin D insufficiency).

ETS, environmental tobacco smoke; PAHs, polycyclic aromatic hydrocarbons; UVR, ultraviolet radiation.

[+] reproduced from *Carey et al. 2014*[26]

Table 6 Proportion of final sample and Australian working population estimated to be occupationally exposed by carcinogenic agent, women[+]

Carcinogen[5]	Most common occupational groups	Sample n (%)	Population n (%)	Population 95% CI[6]
Solar UVR	Farmer, handyperson, automobile driver	137 (6.2)	334 870 (7.9)	6.9 to 9.1
Diesel engine exhaust	Metal worker, heavy vehicle driver, miner	127 (5.7)	255 200 (6.0)	5.1 to 7.1
Shiftwork[7]	Passenger transport, emergency worker, nurse	104 (4.7)	192 730 (4.5)	3.7 to 5.4
Benzene	Farmer, automobile driver, animal/horticultural	101 (4.5)	217 200 (5.1)	4.3 to 6.1
ETS	Construction, miner, heavy vehicle driver	86 (3.9)	247 360 (5.8)	4.9 to 6.8
Ionising radiation	Health professional, scientist, nurse	60 (2.7)	99 940 (2.3)	1.8 to 3.0
PAHs	Farmer, emergency worker, food service	58 (2.6)	104 720 (2.5)	1.9 to 3.3
Silica	Construction, miner, farmer	27 (1.2)	43 510 (1.0)	0.7 to 1.5
Wood dust	Carpenter, farmer, printer	20 (0.9)	28 850 (0.7)	0.4 to 1.2
Formaldehyde	Animal/horticultural, health professional, health support	16 (0.7)	29 390 (0.7)	0.4 to 1.2
Lead	Miner, vehicle worker, emergency worker	12 (0.5)	31 040 (0.7)	0.4 to 1.2
Artificial UVR	Metal worker, farmer, scientist	9 (0.4)	12 670 (0.3)	0.2 to 0.6
Ethylene oxide	Electrical worker, health professional, health support	7 (0.3)	12 970 (0.3)	0.2 to 0.6
Trichloroethylene	Farmer, nurse, office worker	6 (0.3)	8550 (0.2)	0.1 to 0.5 [8]

[5] Includes only those priority carcinogens with five or more workers exposed

[6] 95% CI of the proportion.

[7] Exposed to any one or more of seven shiftwork agents (light at night, phase shift, sleep disturbance, diet and chronodisruption, alcohol and chronodisruption, lack of physical activity, and vitamin D insufficiency).

ETS, environmental tobacco smoke; PAHs, polycyclic aromatic hydrocarbons; UVR, ultraviolent radiation.

[+] reproduced from *Carey et al 2014*[26]

6. DURATION OF EXPOSURE AND LATENCY

INTRODUCTION

For most conditions included on the Deemed Diseases list, there is a period of time (the latency) measured in months or years between first exposure and clinical occurrence of the resulting disorder. There is also likely to be a minimum exposure ('sufficient exposure') below which the disorder would not occur or is very unlikely to occur. The relevant measure of this exposure is usually the total exposure (cumulative exposure) rather than just a length of exposure or a level (concentration or intensity) of exposure. That is, a higher exposure (in terms of the concentration in air or liquid, or the force required for movement) for a shorter time is assumed to have a similar risk to a lower exposure for a longer time.

Unfortunately, for most exposure-disorder pairs, the latency and minimum exposure are not well characterized. In addition, the level (concentration) of exposure is unlikely to be known with any accuracy for an individual worker. Therefore, any judgments on this can really only be based on a qualitative assessment. For some limited exposure-disorder pairs there is some information in the literature, but assessing this comprehensively for all conditions on the List would be a lengthy process and beyond the scope of the current project. In addition, it is unlikely to provide definitive recommendations on sufficient exposure or latency that are precise enough to make a meaningful difference to the current assessment being undertaken for the Department.

In the absence of definitive information on required cumulative exposure and the likely absence of useful workplace exposure data to establish the cumulative exposure of an individual worker, the appropriate approach appears to be to recommend a minimum exposure time. This assumes that typical workers with exposure to a particular hazardous substance have similar levels of exposure, which means that if they are exposed for a similar length of time they will have a similar cumulative exposure and thus a similar risk of developing the disease related to the exposure. This is the rationale for proposing a minimum exposure period rather than proposing a minimum cumulative exposure. Therefore, with the above provisos, recommendations on sufficient exposure are made for relevant conditions, based on a qualitative and semi-quantitative assessment of the available information. This does not mean that a shorter, intense, exposure could not result in the development of the condition, but there would be enough uncertainty about this to mean such a claim might be better pursued through the usual compensation pathway rather than the Deemed Diseases pathway.

Recommendations on latency for most conditions were provided in the official Deemed Diseases report. Some of this information is not suitable for the Comcare Scheme's Deemed Diseases approach, as explained in the next section, and so alternative latencies are provided that are more consistent with the Comcare Scheme's Deemed Diseases approach.

CANCER

ALL CANCERS

The minimum latencies and exposures to adopt for the Comcare Scheme's Deemed Diseases approach depend on the degree of sensitivity (i.e. including all claims that do arise from occupational exposures and therefore that should be compensated) and specificity (excluding all claims that do not arise from occupational exposures and therefore that should not be compensated). Inevitably, the approach adopted must be a balance between the two, keeping in mind that individual cases which are deemed not to fall under the Deemed Diseases approach can still be the subject of a claim using the usual compensation methods.

There is only a small amount of published information available on minimum latency periods for cancer. This issue has been considered in detail for the World Trade Centre Health Program, which required estimates of minimum latency in regards to providing appropriate health cover to people exposed to any of a variety of hazards following the World Trade Centre attack in 2001. The Administrator of the Program adopted minimum latencies of 11 years for mesothelioma, four years for most other solid cancers, 2.5 years for cancer of the thyroid and 0.4 years for lymphoproliferative and hematopoietic cancers[29]. These were deliberately very generous assessments, with the minimum period identified by any relevant publication adopted, and are too sensitive for the purposes of the Comcare Scheme's Deemed Diseases approach. Median latencies for most of the cancers would be much longer than the periods used for the World Trade Centre Health Program, in the order of 20 to 30 years for mesothelioma, 15 to 20 years for other solid cancers, and at least one to two years for lymphoproliferative and hematopoietic cancers. However, using median latency is considered too conservative an approach to the identification of an appropriate minimum latency in keeping with the Comcare Scheme's proposed Deemed Diseases approach.

The World Trade Centre Health Program did not suggest or adopt minimum exposure periods because the relevant exposures were very short term, occurring over a matter of hours, days or, sometimes, weeks.

The recommendations below have been developed with an assumption that the Deemed Diseases approach to be adopted for the Comcare Scheme should not be based on minimum required latency or exposure, but on latencies and exposures developed so there should be little question that the disease of interest could have developed as a result of the occupational exposures in question. Different recommendations would be made if minimum latency (and minimum exposure periods) were to be adopted, as has been done for the World Trade Centre Health Program. However, the adoption of such minimum latencies is less consistent with the Deemed Diseases approach of including disorders very likely to be due to work-related exposures while excluding disorders where the relationship to work is less clear.

Specific recommendations are made for mesothelioma and lung cancer For all other cancers, a single recommendation is made for solid cancers and a single recommendation for haematological malignancies, as there is insufficient published information available to provide reliable separate estimates.

MALIGNANT MESOTHELIOMA

For the Comcare Scheme's Deemed Diseases approach, the minimum exposure period for asbestos work for malignant mesothelioma is recommended to be one year, and the minimum latency is recommended to be twenty years from first exposure.

The recommended minimum latency for mesothelioma arising from asbestos exposure is based on a review study of mesothelioma cases thought to be due to occupational exposure to asbestos which found that 99% of cases had a latency of at least 15 years and 96% had a latency of at least 20 years[30]. There is no published information to provide strong guidance on a minimum exposure period to asbestos, but it is clear that brief periods (days to weeks) of significant exposure can meaningfully increase the risk of developing mesothelioma. Therefore, a minimum period of one year, shorter than that recommended for most solid cancers, is recommended for asbestos and malignant mesothelioma for the purposes of the Comcare Scheme's Deemed Diseases legislation.

LUNG CANCER

For the Comcare Scheme's Deemed Diseases approach, the minimum latency for lung cancer caused by asbestos exposure is recommended to be 15 years from first exposure, and the minimum exposure period for lung cancer from asbestos exposure is recommended to be five years.

These recommendations are based on some limited useful information available about latency for lung cancer – 27% of cases exposed to asbestos had a latency of less than 20 years[31], 14% of cases exposed to chromium had a latency of less than 20 years[32], and the use of a latency of 15 years showed a good fit to the data in several studies of silica

and lung cancer[33]. Therefore, it is recommended that a latency of 15 years be used for lung cancer. There is no consistent evidence that provides strong guidance regarding required exposure. Therefore, it is recommended that a minimum exposure of five years be used, consistent with that recommended for most other solid cancers (described below).

ALL OTHER CANCERS

The latency for all solid cancer types not addressed earlier in this section is recommended to be a minimum of fifteen years in terms of claims under the Comcare Scheme's approach to Deemed Diseases legislation. This recommendation is based on the limited available information on the latency for lung cancer, mentioned earlier, and on vinyl chloride monomer and angiosarcoma of the liver[34]. The minimum exposure period for all solid cancers is recommended to be five years for all cancer types, other than those already mentioned above, in terms of claims under the Comcare Scheme's approach to Deemed Diseases legislation.

The latency for all haematological malignancies is recommended to be three years, based on evidence of minimum latencies of two years for formaldehyde and lymphoproliferative and hematopoietic malignancies[35]; and 1.5 years for benzene exposure and acute non-lymphocytic leukemia[36]. Without strong evidence of a required minimum exposure period, it is recommended that two years be used, taking into account what evidence is available and the five year recommendation for solid cancers.

INFECTION

There is no minimum exposure period in terms of infectious agents and a resulting disorder. Any confirmed or likely contact with the relevant infectious agent would be deemed sufficient exposure.

The relevant latency periods (usually called 'incubation periods') for infectious diseases typically range from one to two weeks up to several months, depending on the specific infectious disease. Recommended latency periods are provided in the Deemed Diseases report.

DISEASES OF THE NERVOUS SYSTEM

PARKINSON'S DISEASE

There is little direct information available on which to base a minimum exposure period or latency. However, one study of manganism in welders identified a minimum exposure period of one year in a welder (with a mean exposure period of 13.5 years)[37]. Based on this information and a likely relevant pathophysiological processes, the minimum exposure period, and the minimum latency period, are both recommended to be one year.

PERIPHERAL NEUROPATHY

There is no clear minimum exposure period in terms of agents that may result in peripheral neuropathy. It is possible a single, high level contact with one of the relevant agents could eventually result in peripheral nerve damage, but the amount of exposure could vary considerably between agents. To take into account the likely variation in necessary exposure time, and for consistency with the approach to Parkinson's disease, the minimum exposure period is recommended to be one year. The relevant latency period can probably vary between weeks to years. A minimum latency of one year is recommended.

DISEASES OF THE RESPIRATORY SYSTEM

ASTHMA

Occupational asthma can occasionally result from a single high exposure to a very irritant gaseous agent, but more commonly it occurs as a result of sensitisation to an agent to which there is recurrent contact in the workplace. This contact might only be for a short time before the sensitisation develops. So, it would be reasonable to accept a minimum exposure period and latency of weeks. It is recommended that the minimum exposure period is one month and the minimum latency period is one month.

PNEUMOCONIOSES

Development of pneumoconiosis can arise from, and soon after, a brief period (a few weeks to a few months) of exposure. However, such exposures should no longer occur in Australia and typically the relevant exposure period would be much longer. Therefore, it would be reasonable to accept a minimum exposure period of five years and a latency period of five years.

BYSSINOSIS AND EXTRINSIC ALLERGIC ALVEOLITIS

Byssinosis and extrinsic allergic alveolitis, like much occupational asthma, are immune-mediated disorders that arise due to sensitization to one or more organic agents in the workplace (byssinosis arises due to sensitization to cotton dust). This contact might only

be for a short time before the sensitisation develops. So, it would be reasonable to accept a minimum exposure period and latency of weeks. As with asthma, it is recommended that the minimum exposure period is one month and the minimum latency period is one month.

HEPATIC DISEASES

NON-INFECTIOUS HEPATITIS

There is no clear minimum exposure period in terms of agents that may result in non-infectious hepatitis. A single, high level contact with one of the relevant agents could result in acute liver damage, but the amount of exposure could vary considerably between agents. The relevant latency period can probably vary between days and months. As with peripheral neuropathy, a minimum exposure period of one year and a minimum latency of one year is recommended.

CHRONIC ACTIVE HEPATITIS

There is no minimum exposure period in terms of exposure to the Hepatitis B or C viruses and the development of hepatitis and subsequent chronic active hepatitis. Any confirmed or likely contact with the relevant infectious agent would be deemed sufficient exposure. The relevant latency period for the initial infection is a few weeks, but the period between this and the development of chronic active hepatitis is by definition a minimum of at least six months. Therefore, six months is the recommended minimum latency.

SKIN DISEASES

IRRITANT AND ALLERGIC CONTACT DERMATITIS

Irritant contact dermatitis can result from a single intense exposure or more commonly from recurrent exposure to an agent that causes skin irritation. It would be reasonable to accept a minimum exposure period and latency of weeks. It is recommended the minimum exposure period and latency be four weeks.

Allergic contact dermatitis is similar to occupational asthma in that it occurs as a result of sensitisation to an agent to which there is recurrent contact in the workplace. This contact might only be for a short time before the sensitisation develops. So, it would be reasonable to accept a minimum exposure period and latency of weeks. As with asthma, it is recommended that the minimum exposure period is one month and the minimum latency period is one month.

VITILIGO

Vitiligo results from skin contact with a limited number of chemical agents. The required minimum exposure is not clear but it appears vitiligo can result from a single intense

exposure or from recurrent exposure to an agent that causes skin irritation. It would be reasonable to accept a minimum exposure period and latency of weeks. It is recommended the minimum exposure period and latency be four weeks.

MUSCULOSKELETAL DISEASES

RAYNAUD'S DISEASE

Raynaud's disease usually requires prolonged exposure to vibration from high-powered tools or equipment. It would be reasonable to accept a minimum exposure period and latency of weeks. It is recommended the minimum exposure period and latency be three months.

BURSITIS (AT THE ELBOW OR KNEE)

Bursitis usually requires prolonged exposure to repetitive movements or pressure causing irritation of the pre-patellar (knee) or olecranon (elbow) bursa. This typically takes several weeks to several years of such movements. It would be reasonable to accept a minimum exposure period and latency of several months. It is recommended the minimum exposure period and latency be six months.

ACUTE POISONING AND TOXICITY

There is no clear minimum exposure period in terms of agents that may result in acute poisoning and toxicity. A single, high level contact with one of the relevant agents could result in acute poisoning, but the amount of exposure could vary considerably between agents. The relevant latency period can probably vary between zero days and months. It is recommended there be no minimum exposure period or latency.

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