SWA Deemed Diseases List Recommendations for amendments to 2015 List

Final report

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BACKGROUND OF THE AUTHOR

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GLOSSARY

IARC	International Agency for Research on Cancer
ILO	International Labour Organization
PCR	Polymerase chain reaction
PTSD	Post-traumatic stress disorder

EXECUTIVE SUMMARY

Background

In 2015, the Deemed Diseases in Australia report was released by Safe Work Australia. This report resulted in the recommendation that certain disorder-exposure pairs (the 2015 Deemed Diseases List) should be considered deemed diseases and be included as such in relevant State and Territory and other relevant agency compensation legislation. The report was based on literature published to the end of 2014. Therefore, Safe Work Australia commissioned a project to review literature published since 2014 that would support any modifications to the 2015 Deemed Diseases List.

Approach

Literature published since 2014 was searched and reviewed, relying on review articles almost entirely.

Findings

Recommendations are made to include a number of additional disorder-exposure pairs in the Revised Deemed Diseases List, and to remove one disorder-exposure pair because of inconsistency in the evidence regarding the causal connection between exposure and disease.

1. INTRODUCTION

In 2015, the Deemed Diseases in Australia report was released by Safe Work Australia. This report *"…provides evidence-based information to help anyone involved in the prevention or compensation of occupational disease and can be considered by jurisdictions when reviewing their deemed diseases lists in their workers' compensation legislation."*[1]. As explained in that report, deemed diseases are "*…diseases that are deemed to be work-related. The effect of this is to reverse the onus of proof. A worker with the disease who has been exposed to the relevant exposure in the course of their work is assumed to have developed that disease because of the exposure unless there is strong evidence to the contrary. Diseases that are not included on the List can still be the subject of a workers' compensation claim through the normal approach, where the reverse onus of proof would not apply. The Deemed Diseases approach simplifies relevant claims on the assumption that there is a high likelihood that the disease has arisen as a result of work-related exposures.*" Deemed diseases are sometimes also known as 'proclaimed diseases' or 'scheduled diseases' or 'prescribed diseases'. The relevant legislation is sometimes known as 'presumptive legislation', although in Australia the term presumptive legislation is primarily used in connection to approaches to compensation for certain cancers in designated employment groups. The 2015 report recommended a list of diseases and associated exposures that should be included as deemed diseases in Australian jurisdictions. This list is known here as the Safe Work Australia Deemed Diseases List (the '2015 Deemed Diseases List'). The report, and the resulting list, were based on literature published to the end of 2014. The 2015 Deemed Diseases List appears to have been adopted in whole or to a substantial extent by several jurisdictions and is being considered for adoption by some others.

As part of a two-stage process to update the 2015 Deemed Diseases List, a project was undertaken to evaluate the report in the light of its use by jurisdictions in Australia and peer-reviewed evidence published since the literature review undertaken for the 2015 report. That project recommended a full review be undertaken of the 2015 Deemed Diseases List with the aim of producing a revised list (the 'Revised Deemed Diseases List'). Safe Work Australia subsequently endorsed this recommendation. This report presents the methods and findings of this full review.

This report consists of seven chapters:

- Chapter 1 provides a brief introduction
- Chapter 2 describes the methods used
- Chapter 3 presents a review of published occupational disease information since 2014 and recommends changes to be made to the 2015 Deemed Diseases List.
- Chapter 4 presents a summary and discussion of methodological aspects of the project
- Chapter 5 presents recommendations on changes to be made to the 2015 Deemed Diseases List
- Chapter 6 presents a brief conclusion
- Chapter 7 contains the references cited in the report.

2. METHODS

INTRODUCTION

This section summarizes the methods used in this study to identify the information used in this report on occupational disorders. It also describes the approach used to identify information to support the work in the other chapters of this report, with most of the detail for this work provided in the relevant chapters.

OVERALL APPROACH

The original recommended Deemed Diseases List developed by Safe Work Australia was based on a review of the literature up to the end of 2014. For the current project, a search of the literature from 2015 onwards was conducted in an attempt to identify any additional exposure-disorder pairs that should be added to the 2015 Deemed Diseases List. For a small number of disorders, some literature published prior to 2015 was also considered.

INCLUDED DATABASES

This search focussed on PubMed and Medline (via Ovid), with some searches also considering Scopus. For cancers, the International Agency for Research on Cancer (IARC) Monographs were used. Grey literature was not included.

SEARCH STRATEGY

Relevant key words for each of the disorders and exposures being considered were paired with [‘occupation*’ OR ‘work-related*]. For cancers, the classifications in the IARC Monographs were used, with only exposures classified as Group 1 (definite human carcinogens) included, paired only with cancers for which IARC considered there was sufficient evidence of causation.

The final searches were conducted in June and July 2021.

In addition to the database search, possibly relevant studies mentioned in the identified papers were reviewed to identify any additional papers of relevance.

INCLUSION AND EXCLUSION CRITERIA FOR ARTICLES

The main inclusion criteria were full peer-reviewed publications describing studies that provided information on health disorders in workers and that included topics of interest to the project. Review articles were the primary focus and given priority, but for a small number of disorders individual articles were also included when appropriate review articles were not available. Conference abstracts were excluded.

Excluded at the stage of reviewing the studies identified by the search output were:

- Studies that only provided information on injuries
- Studies published before 2015 (with some exceptions for a small number of specific disorders, as described in the relevant sections)
- Studies that did not focus on humans.

REVIEW PROCESS

Identified studies were included or excluded based on title, abstract and, if necessary, full text versions of the articles. A similar approach was used for possibly relevant studies identified through reading papers. One person (the author) undertook all the searching and made the decisions regarding inclusion and exclusion.

DATA EXTRACTION, CRITICAL APPRAISAL AND SYNTHESIS

Critical appraisal of the relevant literature and consideration of the weight of evidence in regards to a particular disorder was undertaken. The results from the included studies were synthesized qualitatively.

INCLUSION AND EXCLUSION CRITERIA FOR DISORDERS

The same approach to inclusion and exclusion as used for the original Safe Work Australia Deemed Diseases project was used for the current work. For the Safe Work Australia project, decisions on inclusion were not based on single studies. Instead, a systematic review or a number of well-conducted single studies providing similar evidence were required before it was accepted there was sufficient evidence of a causal connection

between exposure and a disorder for a disorder-exposure pair to be considered for inclusion on the List.

In developing the original 2015 Deemed Diseases List, three criteria were used to determine diseases for inclusion. These were:

*"**1. Strong causal link between the disease and occupational exposure***

For this criterion, 'strong evidence' was defined as arising from:

(a) categorisation by the International Agency for Research into Cancer (IARC) as Group 1—human carcinogen (for cancers), or

(b) a systematic review of the evidence or multiple good quality studies showing a causal relationship between the disease and the occupational exposure.

2. Clear diagnostic criteria

It is important that diseases included in a scheduled list have clear diagnostic criteria. This will mean there should be little question as to whether or not the claimant really has the disease that is the subject of the claim.

3. The disease comprises a considerable proportion of the cases of that disease in the overall population or in an identifiable subset of the population

A considerable proportion of the cases of that disease in the overall population or in an identifiable subset of the population are known or likely to be due to the relevant occupational exposure."[1].

3. REVIEW OF PUBLISHED OCCUPATIONAL DISEASE INFORMATION SINCE 2014

INTRODUCTION

This chapter presents the results of the consideration of literature published since 2014 (and a small amount of literature published earlier than this) and recommendations arising from this review regarding additional disorders recommended to be added to the original Safe Work Australia Deemed Diseases List published in 2015, and disorders that were included on this 2015 Deemed Diseases List but which warrant consideration for removal from the List. Disorders included on the 2015 Deemed Diseases List and for which there is no new evidence to suggest review of this decision should be made are not considered explicitly in this chapter.

FINDINGS

INFECTIOUS DISEASE

COVID-19

COVID-19 is a disease resulting from exposure to SARS-CoV-2. This virus and the associated disease were unknown at the time the 2015 Deemed Diseases List was developed. There have been many well-documented instances of workers in particular occupations who appear to be at higher risk than the general community of being diagnosed with COVID-19[2]. Health workers, abattoir workers and workers in 'quarantine hotels' are examples[3-5]. (There is also considerable evidence of other effects on workers of the COVID-19 pandemic, such as 'burn-out syndrome'[6], but that is not included in the current assessment.) COVID-19 is already covered as a prescribed disease in some jurisdictions in Australia (e.g. in New South Wales following the passing of the COVID-19 Legislation Amendment (Emergency Measures – Miscellaneous) Bill 2020)[7*].

Whether this disorder, linked to particular occupations, should qualify for inclusion is not immediately clear, because the probability of a particular infection being caused by work, rather than arising from exposure to the virus in a non-occupational circumstance, would be influenced by the prevalence of infection in the general community. For much of the time since early 2020, Australia as a whole, or significant parts of it, have been in the fortunate situation of having extremely low community COVID-19 prevalence. There are several

[*] Note that as of November 2021, the New South Wales Government has noted its intention to repeal its New South Wales COVID-19 presumptive legislation.

published studies that suggest frontline healthcare workers are at increased risk of developing COVID-19 compared to the general public or other group used for comparison[8-10]. Different definitions of healthcare workers were used in the studies but the key aspect appears to have been direct patient contact. There were some other occupational categories for which there is evidence of increased risk, but the evidence is less extensive and/or weaker at this time. One specific occupational group in this regard is residential aged care workers. There are references that provide clear evidence of episodes of increased risk of infection in residents in aged care facilities[11]. There is also a large cohort study conducted in 2020 in the United States of America and the United Kingdom during periods of high community incidence and prevalence of COVID-19 that provides evidence of increased risk in residential aged care workers[10]. However, in many of the residential aged-care facility outbreaks, once these residents are vaccinated, which is increasingly the case in Australia, there will be much lower risk of infection from working with them and it would become more likely that infected workers will have caught the infection in the community rather than becoming infected as a result of their work. This would mean it would not be appropriate for the disorder to be included as a Deemed Disease. (This differs from the situation of health care workers who have direct patient contact, working in an acute setting like a hospital, where patients would regularly be coming from the community for management of COVID-19 or for management of other disorders but who are found to have COVID-19.) Of course, this wouldn't stop a claim being made through the usual workers' compensation mechanism. More information is likely to be become available in the next 12 months or so, but at this point the data only appear strong enough to include healthcare workers with direct patient contact. It should also be noted that most of the relevant evidence published to date is based on exposures before the Delta COVID-19 strain became predominant. COVID-19 in healthcare workers appears to satisfy the three criteria required for inclusion – there is a strong causal link between COVID-19 and work as a frontline healthcare worker; there are clear diagnostic criteria (the polymerase chain reaction or PCR test); and work-related exposures appear to be responsible for a majority of the cases of COVID-19 in frontline healthcare workers. Therefore, COVID-19 in healthcare workers is recommended to be included on the Revised Safe Work List. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

> "*Frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)*".

OTHER VIRAL RESPIRATORY INFECTIONS NOT EXPLICITLY MENTIONED IN THE 2015 DEEMED DISEASES REPORT

An argument can be made for including as a deemed disease other respiratory infections that in certain settings are more common in health care workers. Examples include Severe Acute Respiratory Syndrome, Middle East Respiratory Syndrome, Avian Influenza, Influenza A (H1N1) ("swine flu") and most recently COVID-19 in health care workers[12]. All of these except COVID-19 are likely to be very rare in Australia.

There have not been any cases of Severe Acute Respiratory Syndrome reported worldwide since 2004 and it is not recommended to be included on the Revised Deemed Diseases List.

Middle-East Respiratory Syndrome is likely to be very uncommon in Australia (no cases reported in the most recent year (2015) for which annual data have been published[13]) but it remains a notifiable disease in Australia and health workers appear to be at higher risk of disease than the general community[12, 14]. Therefore, it is recommended that Middle East Respiratory Syndrome in frontline healthcare workers (e.g. nurses and doctors) be included on the Revised Deemed Diseases List. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

> *"Frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)".*

Avian Influenza A rarely occurs in Australia and the strains that have caused severe disease have not been identified in Australia. Workers most at risk appear to be persons working with birds. Increased risk in frontline healthcare workers might also be expected from a consideration of likely exposure scenarios, but the real-world evidence for this is not strong[15, 16]. Since Avian Influenza A is an uncommon condition in the general community and there are well-described occupational groups very likely to be at considerably increased risk, it is recommended that Avian Influenza A in workers exposed to birds be included on the Revised Deemed Diseases List. Frontline healthcare workers are recommended to be included also, notwithstanding the fact that objective evidence for their increased risk is not strong. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

"*Relevant occupation involving work with birds (such as poultry slaughterer, poultry farm worker, pet shop worker, veterinarian, veterinary nurse) or frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)*".

A systematic review of the occupational risk of influenza A (H1N1) published in 2016 found an increased risk (approximately double) of infection in healthcare workers (compared to "controls/comparisons")[17]. The peak number of cases in Australia was in July 2009 and there had been 37,000 documented cases by the end of that year. There do not appear to have been cases of influenza A (H1N1) in Australia after 2010[18]. On that basis it could be argued that the disorder does not need to be included on the Deemed Diseases List. However, since influenza A (H1N1) could return and healthcare workers do appear to be at higher risk than the general community, it is recommended that influenza A (H1N1) in frontline healthcare workers be included on the Revised Deemed Diseases List. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

"*Frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)*".

PSITTACOSIS

Psittacosis (also known as ornithosis) was not explicitly addressed in the Safe Work Australia 2015 report. Psittacosis is a zoonotic disease characterized by an infection of the lung caused by a bacterium (Chlamydia psittaci) that can be transmitted to humans, usually from contact with infected birds, and is usually seen in people with prolonged contact with birds, not uncommonly in an occupational context.[19-22]. Psittacosis was relatively common in past decades[23]. It appears not to be a common condition now, including in Australia[21], although it is probably under-reported[21, 24] (there were 16 reported cases of psittacosis in Australia in 2015[13]). There are recent case reports of outbreaks in two chicken-slaughtering facilities in the United States in 2018[25], and one in a poultry farm in France in 2013[26], but the only recent Australian reports of occupationally-related cases are from a veterinary hospital that appeared to involve exposure from horses[27] and from an outbreak on a poultry farm in 2003[28]. The most likely occupational groups at risk are people working with birds (e.g. workers in poultry slaughter facilities or poultry farms, pet shops and veterinary hospitals[24-26]). Since psittacosis is an uncommon condition in the general community and there are well-described occupational groups very likely to be at considerably increased risk, it is

recommended that psittacosis in high-risk workers (e.g. workers in poultry slaughter facilities or poultry farms, pet shops and veterinary hospitals) be included on the Revised Deemed Diseases List. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

> "*Relevant occupations involving work with birds (such as poultry slaughterer, poultry farm worker, pet shop worker, veterinarian, veterinary nurse)*".

TETANUS

Tetanus was not explicitly addressed in the Safe Work Australia 2015 report. Tetanus is a life-threatening infection due to a bacterium (Clostridium tetani), the spores of which are found in material such as soil, dust and animal faeces. If the spores enter a deep wound, the bacteria can produce a toxin that can cause paralysis[29]. Tetanus is now a rare condition in Australia because a high proportion of the community is vaccinated against the disorder[13]. It is clear that having an open wound that comes into contact with soil or faeces would increase the risk of developing tetanus. However, there is little published information regarding the risk of tetanus related to particular occupational circumstances, just a few case reports and a 'preliminary' study of seroprevalence of tetanus antibodies in farmers in the United States which suggested a high proportion of farmers were immune to tetanus (presumably because they had appropriate immunization)[30]. One study (published in 1992) of tetanus cases linked to occupation in Finland found a predominance of the occupational cases (but a minority of the total cases) in farmers but an incidence of only one in 100,000 'occupational accidents', showing how rare the condition is in most developed countries[31]. In addition, it should be noted that tetanus is a very rare disease in Australia due to the high immunization rates (there were only two reported cases of tetanus in Australia in 2015[13]), which means it would be very unusual for a person to develop tetanus as a result of a work-related exposure. Therefore, there does not seem to be enough evidence in the literature to support considering tetanus linked to any specific occupation as a deemed disease and it is recommended that tetanus not be included on the Revised Deemed Diseases List.

TOXOPLASMOSIS

Toxoplasmosis is not explicitly addressed in the Safe Work Australia 2015 report. Toxoplasmosis is a common parasitic disease affecting humans, who most commonly become infected through ingesting under-cooked meat or through contact with cat faeces.

It is caused by the protozoa toxoplasma gondii and estimated to have a sero-prevalence of 20 to 40% in Australia[32]. The occupational groups most commonly considered to be at possible increased risk are those working with meat and those working with animals (e.g. abattoir workers, meat-processing workers, dairy workers, veterinarians) and also cooks and some laboratory workers[33-35]. There are single case reports that strongly suggest a causal connection in individual cases. However, the overall evidence of a consistent causal connection in particular occupations is not strong and several studies have not found evidence of a higher infection rate (compared to the general community) in those at-risk occupations[36, 37]. There is no relevant published evidence in Australia. Since the evidence of a strong and consistent causal connection with particular occupations is lacking and lifetime prevalence of toxoplasmosis in the general Australian community is not low, toxoplasmosis does not appear to satisfy the first and the third criteria for inclusion. Therefore, toxoplasmosis does not seem appropriate to include as a deemed disease and it is recommended that toxoplasmosis not be included on the Revised Deemed Diseases List.

HYDATID DISEASE

Hydatid disease (caused by echinococcus) is not explicitly addressed in the Safe Work Australia 2015 report. Hydatid disease (formally known as echinococcosis) is a common parasitic disease affecting humans, who most commonly become infected through the faecal-oral route. It is caused by the tapeworm Echinococcus granulosus, with dogs the main source of infection (usually due to eating offal from herbivores containing hydatid cysts) and mainly in a rural setting[38, 39]. The prevalence and incidence of hydatid disease in Australia is not known, but a 1996 study estimated an 'annual prevalence' of 2.6 cases per 100 000 population in rural New South Wales in the 1990s, and at least about 20 per 100,000 in some areas, with these estimates described as likely to be considerable underestimates[40].

Two recent review articles studied what the authors described as 'potential risk factors', noting that the complex life-cycle of the echinococcus, with several different stages commonly lasting over decades, the lack of overt disease in most infected humans, and difficulty controlling for all important potential confounding factors, made identifying causal connections difficult. Potential risk factors apparently related to work and identified as indicating higher than background risk were working as a 'farmer', work in forests ('went to forests for vocational reasons'), hunting ('handling foxes'), 'slaughtering at slaughterhouses'

and 'herding'[38, 39]. There is no relevant published evidence regarding occupational echinococcosis in Australia.

Since the evidence of a strong and consistent causal connection with particular occupations is lacking and lifetime prevalence of hydatid infection in Australia is not well described, hydatid disease does not appear to be satisfy the first and the third criteria for inclusion. Therefore, hydatid disease does not seem appropriate to include as a deemed disease and it is recommended that hydatid disease not be included on the Revised Deemed Diseases List.

No new information on other infectious diseases was identified that suggests other infectious diseases should be included on the Revised Deemed Diseases List.

CANCER

The decisions regarding inclusion of cancers and their associated exposures on the original Safe Work Australia List were based on the classifications by the International Agency for Research on Cancer (IARC). Only exposures classified as IARC Group 1 (carcinogenic to humans), paired with the cancer types for which IARC determined there was 'sufficient' epidemiological evidence, were deemed eligible for inclusion on the 2015 Deemed Diseases List. The same approach has been adopted for the current consideration of the evidence.

Since the beginning of 2015, IARC has classified six additional exposures with potential occupational relevance in Australia as Group 1 (carcinogenic to human). These are:

- 1,2-Dichloropropane (resulting in cholangiocarcinoma)[41]
- Acheson process (resulting in lung cancer)[42]
- lindane (resulting in non-Hodgkin's lymphoma)[43]
- pentachlorophenol (resulting in non-Hodgkin's lymphoma)[44]
- ultraviolet light from welding (resulting in ocular melanoma)[45]
- welding fumes (resulting in lung cancer), having previously been classified as Group 2B (possibly carcinogenic to humans)[45].

All of these cancer-exposure pairs appear appropriate to include on the Revised Deemed Diseases List, with the exception of the Acheson process (the Acheson process is used to

make silicon carbide). This process does not have a clearly identified single causative exposure, unlike all the other cancers on the 2015 Deemed Diseases List.

There was one other finding of relevance. The causal connection between benzene exposure and the occurrence of acute myeloid leukaemia was reinforced by a recent IARC Working Group[46]. Acute myeloid leukaemia is not explicitly mentioned on the 2015 Deemed Diseases List. Instead, leukaemia, excluding chronic lymphatic leukaemia, is mentioned. It is not proposed to make the List more restrictive. Therefore, the current use of the term "leukaemia" is considered reasonable and no change is proposed for the leukaemia-benzene entry on the List.

The recent classification of fluoroedenite as a Group 1 carcinogen causing mesothelioma[42] is not considered relevant as exposure to fluoroedenite does not appear to occur in Australia, either in an occupational or non-occupational context. It is not recommended to be included on the Revised Deemed Diseases List.

Occupational exposure as a fire-fighter is currently classified by IARC as a Group 2B carcinogen (possibly carcinogenic to humans)[47]. It therefore does not meet the requirements to be included as an exposure linked to a cancer within the Deemed Disease framework.

MENTAL OR NEUROPSYCHIATRIC DISEASES

Post-traumatic stress disorder

Post-traumatic stress disorder (PTSD) is a psychological condition arising after exposure to one or more highly stressful situations and is characterized by one or more of a range of persistent debilitating psychological symptoms. The connection between post-traumatic stress disorder (PTSD) and various occupational exposures has been the subject of considerable work since 2014. Several important systematic reviews have been published[48-60].

Post-traumatic stress disorder has been identified as occurring at rates higher than in the general community in a wide range of occupations[60]. For many of these the evidence has been inconsistent, probably due primarily to differences in the definitions of PTSD used and

the reliance of many studies on self-report measures. Consistent evidence is available for emergency response workers – ambulance officers including paramedics, police officers and fire fighters, in particular[51, 52, 54-58, 60-62]. These workers do appear at higher risk of developing PTSD resulting from their work compared to members of the general public[55, 61, 62]. For areas of nursing and medicine there is reasonably strong evidence, particularly in mental health nurses, but this evidence is less consistent than for emergency responders[50, 59, 63]. Personal factors are clearly important in terms of who develops the condition and who does not, despite apparently similar psychologically traumatic exposures[64, 65]. This makes the causal connection to work difficult to establish in many situations. In addition, the diagnosis is made largely on self-report of symptoms and much of the exposure measurement in relevant studies has been based on self-report. This leaves considerable room for measurement bias, making it difficult to be confident in the findings of many of the studies. In addition, there is often difficulty characterising the causative exposures, and the influence of personal psychological factors can make the work-related component, contribution or cause difficult to establish with confidence[62, 64-67].

The diagnosis of PTSD can be difficult but there are clear diagnostic criteria provided by the Fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5)[68] and in the International Classification of Diseases[69].

The lifetime prevalence of PTSD in the general Australian community appears to be about 12%, higher in women than men[70]. In comparison, the most recent available review reported that lifetime prevalence of PTSD in first responders across various countries ranged from 6% to 32% (6% to 32% in law enforcement officers; 9% to 22% in paramedics; 17% to 32% in fire fighters), with the lower range estimates suggested to be at least partly due to under-reporting[55]. Another recent review found a “current prevalence” (presumably a point prevalence) of 10% in “rescue workers” (essentially emergency responders)[61].

On balance, the evidence appears strong enough and consistent enough, and the prevalence relative to the general public high enough, to include PTSD in emergency responders on the Revised Deemed Diseases List and it is recommended this be done. PTSD is already covered as a deemed disease for certain workers in Tasmania (for public servants)[71], the Northern

Territory[72] and Queensland[†]; and there is legislation before parliament in South Australia[‡]. Post-traumatic stress disorder (or post-traumatic stress injury) in emergency service personnel has also been included in the equivalent of deemed diseases schemes in other countries (e.g., in Canada and the United States of America[73, 74]). For other occupational groups, given the uncertainty in the risk associated with specific exposures that appear related to the risk of PTSD, issues with establishing the diagnosis, and uncertainty about the prevalence of the disorder in apparently at-risk populations, PTSD does not seem appropriate to include on the List with the current state of knowledge, and is not recommended for inclusion on the Revised Deemed Diseases List. The available information does not provide insight as to whether volunteer emergency service workers, such as rural fire-fighters and State Emergency Service Workers, have higher rates of PTSD than the general community. Therefore, they are also not recommended for inclusion at this point in time. This decision could reasonably be reviewed when the List is next reviewed, when hopefully more relevant information will be available. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

> "*Occupations involved as first responders (such as police officers, ambulance officers including paramedics, fire fighters)*".

No new information on other mental or neuropsychiatric disease was identified that suggests other mental or neuropsychiatric diseases should be included on the Revised Deemed Diseases List

NEUROLOGICAL DISEASES

CHRONIC SOLVENT-INDUCED TOXIC ENCEPHALOPATHY

Two narrative reviews considering chronic solvent-induced toxic encephalopathy have been published since 2014[75, 76]. These did not contain any information that would change the original decision that chronic solvent-induced toxic encephalopathy is not appropriate to be classified as a deemed disease and it is recommended that it not be included on the Revised Deemed Diseases List.

[†] https://www.worksafe.qld.gov.au/news-and-events/news/2021/new-streamlined-claim-pathway-for-first-responders-and-eligible-employees-diagnosed-with-ptsd

[‡] https://www.legislation.sa.gov.au/LZ/B/CURRENT/RETURN%20TO%20WORK%20(POST%20TRAUMATIC%20STRESS%20DISORDER)%20AMENDMENT%20BILL%202020_HON%20FRANK%20PANGALLO%20MLC/B_AS%20INTRODUCED%20IN%20LC/RETURN%20DISORDER%20AMENDMENT%20BILL%202020.UN.PDF

DEMENTIA

Several narrative reviews considering the possible role of occupational exposures in causing dementia have been published since 2014[77-79]. These did not contain any information that would change the original decision that dementia is not appropriate to be classified as a deemed disease and it is recommended that it not be included on the Revised Deemed Diseases List.

PARKINSON'S DISEASE

Several review articles considering the relationship between occupational exposure to metals and other hazards such as pesticides and the risk of developing Parkinson's Disease have been published since 2014[80-85]. The evidence for a causal connection is strongest for manganese, but there is some inconsistency even for the manganese evidence. Parkinson's Disease associated with manganese exposure was included as a deemed disease in the 2015 Deemed Diseases List. Based on all the available evidence, it could be argued that the strength and consistency of evidence connecting occupational manganese exposure and the occurrence of Parkinson's Disease is insufficient for it to remain a deemed disease. The evidence regarding a causal connection between occupational exposure to other metals and the occurrence of Parkinson's Disease is definitely insufficient for Parkinson's Disease linked to other metals to be included as a deemed disease. It is recommended that Parkinson's Disease is not included on the Revised Deemed Diseases List.

NYSTAGMUS

Nystagmus associated with working in low light, particularly mining, and commonly known as "coal miner's nystagmus" or "miner's nystagmus" is a deemed disease under Tasmanian Government legislation, being defined as "[nystagmus associated with] *occupations involving working in or about an active mining area"*[86]. However, this disorder appears to be primarily of historical interest only, and there is debate as to the cause and even the existence of the condition[87, 88]. If it is a real entity, it appears to be vanishingly rare. Miners' nystagmus does not satisfy any of the criteria to be included as a deemed disease and therefore it is recommended that it is not included on the Revised Deemed Diseases List.

No new information on other neurological diseases was identified that suggests other neurological diseases should be included on the Revised Deemed Diseases List.

CARDIOVASCULAR DISEASE

Many studies review articles considering the relationship between occupational exposures and the risk of developing one or more forms of cardiovascular disease, have been published since 2014[89-104]. The evidence for a causal connection for some exposures, particularly long working hours (causing ischaemic heart disease) and noise (causing hypertension) is stronger than when the 2015 Deemed Diseases List was produced. However, the evidence regarding cardiovascular disease, and risk factors such as hypertension, is still not strong enough to warrant inclusion of any cardiovascular disease as a deemed disease, given the limitations in the strength of evidence and particularly given how common cardiovascular disease (arising from non-occupational risk factors) is in the general community. Therefore, it is recommended that no cardiovascular disease is included on the Revised Deemed Diseases List.

RESPIRATORY DISEASES

Chronic obstructive pulmonary disease

As is the case for cardiovascular disease, many review articles have been published since 2014 considering the relationship between occupational exposures and the risk of developing chronic obstructive pulmonary disease[105-120]. Several large individual studies have also been conducted in that period[121-129]. However, this new information does not change the decision made when developing the 2015 Deemed Diseases List that chronic obstructive pulmonary disease does not meet the criteria necessary to be included on the list. This is because the definitive evidence required in terms of identifying the relevant exposures is still lacking, smoking is responsible for a large proportion of COPD in the community, and COPD caused by non-occupational exposures (particularly smoking) is common in the general public. Therefore, it is recommended that COPD is not included on the Revised Deemed Diseases List.

Obliterative bronchiolitis

Bronchiolitis is a condition characterised by inflammation of the small airways (those less than two millimetres). Obliterative bronchiolitis (also known as bronchiolitis obliterans) is a constrictive form of bronchiolitis, presenting clinically with shortness of breath on exertion and cough and pathologically with "*bronchiolar inflammation and peribronchiolar fibrosis that encroaches on the bronchiolar lumen*."[130] Obliterative bronchiolitis in an occupational context was first recognized in food-flavouring workers and for this reason was initially

commonly known as 'popcorn lung' and more recently as 'Flavorings-Related Lung Disease'[131]. It has been considered in a number of recent reviews[112, 130-137]. The exposures for which the strongest causal evidence exists are diacetyl and 2,3-pentanedione. However, it appears the disorder can result from exposure to a range of substances involved in food production (such as coffee and chocolate) and more recently has been associated with other exposure circumstances such as with fiberglass workers and military personnel [136].

The diagnosis of bronchiolitis obliterans is made on the basis of a combination of symptoms and signs, imaging, lung function testing and, if possible, lung biopsy. Making the diagnosis can be challenging because tissue biopsies are often not obtained (due to the associated risks and discomfort) and the respiratory function tests (which show fixed obstructive lung disease) are not diagnostic.

Obliterative bronchiolitis is a rare condition in the community and the workplace.

Since the condition is rare in the community, and the connection is strong to circumstances involving occupational exposure to food flavourings, it is reasonable to accept that a worker exposed to food flavourings as part of their work and who develops obliterative bronchiolitis did so because of their work exposures. Therefore, it is recommended that obliterative bronchiolitis in high-risk workers (workers exposed to food flavourings, typically in the manufacturing industry) be included on the Revised Deemed Diseases List. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

> "*Relevant occupations involving exposure to food flavourings associated with obliterative bronchiolitis (such as some manufacturing workers involved in food production)*".

HEPATIC DISEASES

Non-infectious hepatitis (linked with various occupational agents known to cause hepatitis), chronic active hepatitis (in persons with known HBV or HCV related to occupation) and hepatic cirrhosis (in persons with known HBV or HCV related to occupation) were included on the 2015 Deemed Diseases List and have not been further considered. No new

information on other hepatic diseases was identified that suggests other hepatic diseases should be included on the Revised Deemed Diseases List.

SKIN DISEASES

Contact dermatitis (linked with various occupational agents) and occupational vitiligo (linked to para-tertiary-butylphenol; para-tertiary-butylcatechol; para-amylphenol; hydroquinone or the monobenzyl and monobutyl ether of hydroquinone) were included on the 2015 Deemed Diseases List and have not been further considered. No new information on other skin diseases was identified that suggests other skin diseases should be included on the Revised Deemed Diseases List.

MUSCULOSKELETAL DISEASES

ROTATOR CUFF SYNDROME

Several review articles that have considered occupational causes of rotator cuff syndrome have been published since 2014[138-141]. These have reinforced the consideration made for the 2015 Deemed Diseases List – there is moderate evidence that certain occupational exposures (particularly prolonged overhead working, repeated shoulder abduction, heavy lifting and some psychological workplace factors) increase the risk of rotator cuff syndrome and certain occupations have higher rates of rotator cuff syndrome. However, like several other musculoskeletal disorders possibly related to work, the specific exposures are difficult to characterize and measure accurately and consistently, most relevant studies have important methodological limitations and non-occupational causes for the condition are common in the community. The difficulty accurately quantifying the exposures of concern in specific occupations, and the high prevalence of the condition in the community, means the original conclusion that rotator cuff syndrome is not appropriate to be classified as a deemed disease is unchanged and it is recommended that rotator cuff syndrome not be included on the Revised Deemed Diseases List.

LATERAL AND MEDIAL EPICONDYLITIS

Two review articles focusing on occupational causes of epicondylitis have been published since 2014. These produced contrasting results, with one finding a consistent positive association between work-related biomechanical factors and the occurrence of lateral epicondylitis[142] and other finding limited or no evidence of such an association with either medial or lateral epicondylitis[143]. These have reinforced the consideration made for the

2015 Deemed Diseases List – the frequency, exact nature and forcefulness of the required exposures are not able to characterised well enough, and are not consistent enough in specific occupations, for either lateral or medial epicondylitis to be considered appropriate for inclusion as a deemed disease and it is recommended that epicondylitis not be included on the Revised Deemed Diseases List.

RADIAL NERVE ENTRAPMENT AND ULNAR NERVE ENTRAPMENT

One narrative review[144] and one systematic review[138] which mention radial and ulna nerve entrapment have been published since 2014. These did not contain any information that would change the original decision that radial nerve entrapment and ulnar nerve entrapment are still not appropriate to be classified as deemed diseases and it is recommended that they not be included on the Revised Deemed Diseases List.

DE QUERVAIN'S DISEASE

No new relevant reviews have been published since 2014 but one study (a prospective case-control study[145]) has been published since the last major review. It didn't find any clear connection between heavy manual labour or injury and the risk of being diagnosed with De Quervain's tenosynovitis. However, the methodological limitations of the study mean little weight should be given to the findings. Therefore, no change is recommended to the original decision, which was not to include De Quervain's Disease as a deemed disease.

CARPAL TUNNEL SYNDROME

Several review articles and an umbrella review that have considered occupational causes of carpal tunnel syndrome have been published since 2014[144, 146-150]. These have reinforced the consideration made for the 2015 Deemed Diseases List – there is good evidence that certain occupational exposures (particularly repetition and forceful exertion of the hand) increase the risk of carpal tunnel syndrome and certain occupations have higher rates of carpal tunnel syndrome, but the specific exposures are difficult to characterize and measure accurately and consistently, most relevant studies have important methodological limitations and non-occupational causes for the condition are common in the community. The difficulty accurately quantifying the exposures of concerns in specific occupations, and the high prevalence of the condition in the community, means the original conclusion that carpal tunnel syndrome is not appropriate to be classified as a deemed disease is unchanged

and it is recommended that carpal tunnel syndrome not be included on the Revised Deemed Diseases List.

OCCUPATIONAL OVERUSE SYNDROME

No reviews relevant to occupational overuse syndrome have been published since 2014 and the approach taken in the 2015 Deemed Diseases List remains valid. Therefore, it is recommended that occupational overuse syndrome not be included on the Revised Deemed Diseases List.

BURSITIS

No new relevant reviews or single studies on bursitis have been published since 2014. Therefore, no change is recommended to the original decision, which was to include olecranon bursitis, pre-patellar bursitis and infra-patellar bursitis (linked to the relevant causative exposures for which there is strong evidence) on the 2015 Deemed Diseases List but not to include other types of bursitis due to their rarity and the lack of strong evidence linking them to specific occupational exposures.

LOW BACK PAIN

Many review articles that have considered aspects of occupational causes of low back pain have been published since 2014 (or weren't included in the 2015 Deemed Diseases report)[138, 151-168]. These have reinforced the consideration made for the 2015 Deemed Diseases List – the connection between low back pain symptoms, disability and demonstrable pathology is often not clear; there is significant debate regarding the validity of much of the evidence regarding connection to specific occupations, work tasks, workplace factors and psychological factors; and low back pain from non-occupational causes is very common in the community. For these reasons, low back pain is still not considered suitable to be classified as a deemed disease and it is recommended that low back pain not be included on the Revised Deemed Diseases List

OSTEOARTHRITIS

Several systematic and narrative reviews and an umbrella review have been published since 2014 (or weren't included in the 2015 Deemed Diseases report) that consider the relationship between occupational exposures and osteoarthritis, usually focusing on one or both of osteoarthritis of the knee or osteoarthritis of the hip[89, 169-175]. The most recent

systematic review of evidence addressing the relationship between ergonomic risk factors and osteoarthritis of the knee and the hip found an increased risk for both but judged the evidence to be of low quality and concluded there was "limited evidence of harmfulness"[175]. An earlier review concluded there was strong evidence of an increased risk of osteoarthritis of the hip arising from heavy manual labour, and noted that osteoarthritis of the hip is "*…a prescribed occupational disease in the UK for long-term employees in agriculture*"[172]. Heavy physical workload (several anatomical sites) and kneeling, bending and squatting (knee) are the occupational activities with the strongest evidence for increasing the risk of arthritis. Many studies of the area are subject to important methodological limitations and inconsistency between studies in terms of definitions used for exposures and outcomes makes it difficult to validly combine the results. Overall, the evidence for increased risk from specific activities appears moderate at best and the connection to particular occupations does not appear consistent. For these reasons, osteoarthritis of the knee, hip and other anatomical locations are still not considered suitable to be classified as deemed diseases and it is recommended that they not be included on the Revised Deemed Diseases List.

SCLERODERMA

Several relevant review articles have been published since 2014 (or weren't included in the 2015 Deemed Diseases report) which consider the relationship between various occupational exposures and the risk of scleroderma (also known as systemic sclerosis) [176-182]. Silica is the primary occupational exposure linked with scleroderma, although there is weaker evidence for some other exposures.

In 2018, the United Kingdom Industrial Advisory Council reviewed the published literature with a view to deciding whether the connection between occupational exposure to silica and the occurrence of connective tissue diseases should be prescribed for compensation purposes (equivalent to declaring this a deemed disease). The Council decided against prescription at that time. They concluded "*Collectively this provides reasonable evidence pointing to an occupational hazard, the evidence generally being deeper for systemic sclerosis/scleroderma than for the other two conditions [systemic lupus erythematosus and rheumatoid arthritis]. Prescription is hampered, however, by the difficulty of defining the qualifying levels of occupational exposure.*" The Council also considered requiring the presence of silicosis to determine eligibility for prescription (and thus compensation), but

concluded "*…unresolved methodological concerns about the few available reports of this kind have proved to be a stumbling block.*"[183].

The most recent comprehensive relevant systematic review and meta-analysis in regard to the relationship between occupational silica exposure and the occurrence of scleroderma found a raised risk estimate[180]. This, along with an earlier review[184], provide moderate evidence that occupational silica exposure does increase the risk of developing scleroderma. However, the methodological limitations of the original studies and the inability to examine for evidence of a dose-response relationship means that bias, confounding and chance can't be excluded with confidence. For these reasons, scleroderma is considered not appropriate to be included as a deemed disease and it is recommended that it not be included on the Revised Deemed Diseases List.

OSTEONECROSIS

Osteonecrosis (death of bone tissue) associated with working in conditions of significantly increased or decreased air pressure is a deemed disease under Tasmanian Government legislation, being defined as "*compressed air illness including avascular necrosis*" associated with "*exposure to increased or reduced atmospheric pressure (including, but not limited to, working underground or underwater and working at high altitude)*" [86]. It does not appear to have been considered for inclusion in the in the 2015 Deemed Diseases List. There is clear evidence of a connection between work in significantly increased or decreased air pressure and an increased risk of osteonecrosis. Osteonecrosis is easily diagnosed. It is not a common condition in the community and if it occurs in a worker exposed to increased or decreased air pressure at work it is likely that the disorder would have arisen from that work-related exposure[185-188]. Osteonecrosis therefore meets the criteria for inclusion as a deemed disease. It is recommended that osteonecrosis in workers working in atmospheres where the pressure is much higher or much lower than normal (e.g. professional divers, caisson divers, hyperbaric exposure chamber attendants) be included on the Revised Deemed Diseases List. The recommended text for the exposure groups, consistent with that used in the 2015 Deemed Diseases List, is:

> "*Relevant occupations involving working at significantly increased or decreased air pressure (such as professional divers, caisson divers, hyperbaric exposure chamber attendants)*".

VIBRATION DISEASES

Many review articles that have considered aspects of disorders associated with occupationally-related vibration, either local vibration (such as from use of powered tools) or whole body vibration (such as from operating certain vehicles or equipment), have been published since 2014[140, 146, 148, 149, 170, 189-195]. Raynaud's disease associated with vibration is already on the 2015 Deemed Disease List but other disorders were not included. None of the new articles provide additional information that would change the current approach, because of difficulties with consistent diagnosis and the common association of relevant disorders with non-occupational exposures. Therefore, it is recommended that vibration-related disorders (apart from Raynaud's disease) are not included on the Revised Deemed Diseases List.

GENITOURINARY SYSTEM DISEASES

Many review articles that have considered aspects of occupational causes of renal disease have been published since 2014[196-205]. These have focused particularly on chronic renal failure in agricultural workers, particularly in Mezo-America. The 2015 Deemed Diseases Report noted the strong evidence connecting occupational exposure to some metals and an increased risk of renal failure but that even in people with these exposures, non-occupational factors were more likely to be responsible for the vast majority of cases. The new information doesn't change this situation and it is still considered that renal failure does not meet Criterion 3. For this reason, renal failure and other genitourinary diseases are still not considered suitable to be classified as deemed diseases and it is recommended they not be included on the Revised Deemed Diseases List.

REPRODUCTIVE RISKS

Many review articles that have considered aspects of the relationship between occupational exposures and the risk of reproductive disorders (infertility and congenital disorders) have been published since 2014[206-218]. The situation in terms of appropriateness for consideration of one or more of these disorders as a deemed disease hasn't changed since the 2015 assessment of information – the evidence of a causal association is not consistent, diagnostic criteria are not clear and the disorders are common in the general community. Therefore, reproductive disorders are still not considered suitable to be classified as deemed diseases and it is recommended they not be included on the Revised Deemed Diseases List.

ACUTE CHEMICAL POISONING / TOXICITY

The Safe Work Australia List includes an entry for "A*cute poisoning/toxicity*" and pairs this with a considerable number of specific exposures, plus a catch-all statement and footnote to cover other exposures. Xylene is not explicitly included but would be covered by the catch-all statement and footnote. However, xylene is a reasonably common exposure known to cause acute chemical poisoning. Therefore, it would be reasonable to include it with the exposures explicitly specified on the Revised Deemed Diseases List.

No new information on other acute chemical poisoning or toxicity was identified that suggests other acute chemical poisoning or toxicity should be included on the Revised Deemed Diseases List.

MULTIPLE CHEMICAL SENSITIVITY

Multiple chemical sensitivity was not included on the 2015 Deemed Diseases List because of a lack of consistent evidence connecting one or more exposures to the disorder, difficulties with establishing the diagnosis and uncertainty about the incidence and prevalence of the disorder in the genera community and in particular occupational groups. No new information on multiple chemical sensitivity was identified which would suggest it is suitable to be considered a deemed disease and it is recommended multiple chemical sensitivity not be included on the Revised Deemed Diseases List.

DISORDERS ASSOCIATED WITH ENVIRONMENTAL FACTORS SUCH AS AIR POLLUTION FROM BUSHFIRES

A specific request was made by Safe Work Australia to consider whether "*environmental factors such as air pollution from bushfires*" when combined with one or more disorders should be included in the Revised Deemed Diseases List. There has been considerable interest in the potential effects of bushfire smoke on health in Australia in recent years but there is only weak evidence of an increased risk of specific disorders[219-222]. Disorders linked with exposure to bushfire smoke are likely to include acute problems related to airway irritation from smoke or toxic effects of substances within the smoke, and acute and long-term disorders associated with exposure to particulate matter less than 10 microns in diameter (PM_{10}) and less than 2.5 microns in diameter ($PM_{2.5}$). The main disorders linked with PM_{10} and $PM_{2.5}$ are respiratory and cardiovascular disorders, with the evidence about health effects resulting from exposure to $PM_{2.5}$ being stronger and more consistent than the

evidence for PM_{10}[223-225]. All these disorders are common in the community as a result of non-occupational causes. Since the evidence of a causal connection between exposure to bushfire smoke and the occurrence of these respiratory and cardiovascular disorders is not strong, and the disorders are common in the general community, these disorders linked to bushfire smoke are not suitable for inclusion as deemed diseases. It is recommended that respiratory and cardiovascular disorders linked with exposure to bushfire smoke are not included on the Revised Deemed Diseases List.

GUIDANCE MATERIAL FOR NEW DISORDER-EXPOSURE PAIRS RECOMMENDED FOR INCLUSION

For all disorders included on the 2015 Deemed Diseases List brief guidance material on each disease was developed. As documented in the 2015 report, "*This information could sit separately to the List and be used by potential claimants and claims officers when deciding whether or not a claim might be appropriate given the current knowledge about the disease and its relationship to relevant exposures.*

The Technical Advisory Group requested that the guidance material include:

- *a short description of the disease, and relevant information on*
    - *relevant occupation or industry*
    - *latency period*
    - *minimum exposure*
    - *any non-occupational causes.*".

The recommended guidance material for the disorders recommended for inclusion on the Revised Deemed Diseases List is provided here. For some disorders (non-Hodgkins lymphoma; carcinoma of the lung; acute poisoning/toxicity), there is already guidance material available in relation to other relevant exposures. For those disorders the recommended entire new guidance material is provided here.

COVID-19	
Description	Viral illness most commonly producing respiratory symptoms but other symptoms can occur.
Exposure	SARS-CoV-2.
High risk occupation or industry	Frontline healthcare occupations with direct patient contact (such as nurse, doctor, physiotherapist).
Latency period	Typically five days but ranges from one to 14 days.
Main external non-occupational risk factors	Common in the general community when the virus is circulating in the community.

Middle East Respiratory Syndrome	
Description	Viral illness most commonly producing respiratory symptoms but other symptoms can occur.
Exposure	MERS-CoV.
High risk occupation or industry	Frontline healthcare occupations with direct patient contact (such as nurse, doctor, physiotherapist).
Latency period	Typically five days but ranges from two to 14 days.
Main external non-occupational risk factors	Uncommon in the general community but would be more common if the virus is circulating in the community.

Avian Influenza A	
Description	Viral illness most commonly producing respiratory symptoms but other symptoms can occur.
Exposure	Avian Influenza A.
High risk occupation or industry	Relevant occupations involving work with birds (such as poultry slaughterer, poultry farm worker, pet shop worker, veterinarian, veterinary nurse) or frontline healthcare occupations with direct patient contact (such as nurse, doctor, physiotherapist).
Latency period	One to ten days.
Main external non-occupational risk factors	Uncommon in the general community but would be more common if the virus is circulating in the community.

Influenza A (H1N1)	
Description	Viral illness most commonly producing respiratory symptoms but other symptoms can occur.
Exposure	Influenza A (H1N1).
High risk occupation or industry	Frontline healthcare occupations with direct patient contact (such as nurse, doctor, physiotherapist).
Latency period	Typically two days but ranges from one to seven days.
Main external non-occupational risk factors	Uncommon in the general community but would be more common if the virus is circulating in the community.

Psittacosis	
Description	Bacterial illness characterized by an infection of the lung which results in respiratory symptoms.
Exposure	Chlamydia psittaci.
High risk occupation or industry	Relevant occupations involving work with birds (such as poultry slaughterer, poultry farm worker, pet shop worker, veterinarian, veterinary nurse).
Latency period	Typically five to 14 days.
Main external non-occupational risk factors	Uncommon condition in the general community.

Cholangiocarcinoma	
Description	Malignant disease of the gall bladder and biliary tree.
Exposure	1,2-Dichloropropane.
High risk occupation or industry	Occupations involved in printing.
Latency period	Minimum five years; commonly at least 15 to 20 years.
Main external non-occupational risk factors	All not common; primary hepatobiliary disease such as primary sclerosing cholangitis is the most common of these.

Non-Hodgkins Lymphoma	
Description	Malignant disease of a subset of white blood cells.
Exposure	Ionizing radiation, lindane, pentachlorophenol.
High risk occupation or industry	Ionizing radiation: exposure would be expected to be very well controlled in Australia but is relevant for anyone whose occupation potentially exposes them to x-rays on a regular basis, which can occur in a range of settings—health (radiographers, radiologists, radiotherapists, dentists), manufacturing and industry (various specific jobs), security (customs officers), nuclear industry (work with isotopes). Lindane: Exposure should no longer occur in Australia but it may still be relevant for some pesticide workers. Pentachlorophenol: Exposure should be uncommon in Australia but may occur through contact with treated timber (e.g. sawmill workers, timber products manufacturing worker).
Latency period	Minimum one year; commonly at least 10 to 15 years.
Main external non-occupational risk factors	Smoking.

Ocular melanoma	
Description	Malignant disease of the eye.
Exposure	Ultraviolet light from welding.
High risk occupation or industry	Occupations involved in welding.
Latency period	Minimum five years; commonly at least 15 to 20 years.
Main external non-occupational risk factors	History of dysplastic nevus syndrome; a family history of melanoma; the presence of fair skin and light-coloured eyes.

Carcinoma of the lung	
Description	Malignant disease of the respiratory tree and gas exchange areas of the lung.
Exposure	Arsenic, asbestos, beryllium, bis(chloromethyl) ether, cadmium, chromium VI, diesel engine exhaust, ETS, Ionizing radiation, nickel, PAHs, Radon-222 and its decay products, silica dust (crystalline), soot (chimney sweeping), welding fume.
High risk occupation or industry	Arsenic: workers exposed through mining, manufacturing (treated timbers, non-ferrous metal production and processing, iron and steel milling), or use of products containing arsenic (carpenters, oil and gas extraction, water and sewage). Asbestos: Asbestos exposure can occur through mining (no longer in Australia), transport (truck drivers, dock workers—no longer in Australia except for transport of material contaminated with asbestos), manufacturing (no longer in Australia), contact with asbestos products through construction, maintenance or demolition (carpenters, boilermakers, plumbers, demolition workers). Beryllium: Uncommon exposure. Workers most at risk of exposure are construction trades workers, welders, electricians, and dental technologists. Bis(chloromethyl)ether: Exposure is uncommon but can occur during chemical manufacturing. Cadmium: Exposure can occur to welders, automotive service technicians and saw-filers. Chromium VI: Exposure can occur to welders, machinists, automotive service technicians and workers in saw mills treating timbers. Diesel engine exhaust: Exposure can occur to workers operating equipment with diesel engines or working near where diesel equipment operates—truck and bus drivers, heavy equipment operators, forklift operators, non-metal miners, car mechanics. ETS: Hospitality workers, outdoor workers. Ionizing radiation: Ionizing radiation would be expected to be very well controlled in Australia but is relevant for anyone whose occupation potentially exposes them to x-rays on a regular basis, which can occur in a range of settings— health (radiographers,

	radiologists, radiotherapists, dentists), manufacturing and industry (various specific jobs), security (customs officers), nuclear industry (work with isotopes). Nickel: Workers involved with commercial and industrial machinery and equipment repair and maintenance, motor vehicle parts manufacturing, and architectural and structural metals manufacturing. PAHs: There are a wide range of potential exposure circumstances. Exposures mainly occur through cooking (chefs and cooks); use of fuels (mechanics); and in heavy industry (coal tar production and distillation, coal gasification, coke production); and in a range of other work circumstances (paving and roofing using coal tar, creosote wood preservation, aluminium production, carbon electrode manufacture, mining, metal working, calcium carbide production, petroleum industries, chemical production and transportation, electrical industries and chimney sweeping). Radon-222 and its decay products: Rare in Australia. Exposure can occur to workers involved in underground mining or other underground work. Silica dust (crystalline): Exposure can occur to workers involved in construction, especially excavators; mining; brick, concrete or stone cutting; abrasive blasting; foundry casting. Soot (chimney sweeping): Chimney sweeps. Welding fume: Exposure occurs when welding (or when in close proximity to welding).
Latency period	Minimum five years; commonly at least 15 to 20 years.
Main external non-occupational risk factors	Smoking.

Post-traumatic stress disorder	
Description	Psychological distress following exposure to highly stressful circumstances. Clear diagnostic criteria are provided by the Fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5)[68] and in the International Classification of Diseases[69].
Exposure	Highly stressful circumstances during emergency response work.
High risk occupation or industry	Occupations involved in emergency response (such as police officers, ambulance officers including paramedics, fire fighters).
Latency period	Weeks to months.
Main external non-occupational risk factors	Various non-occupational highly stressful exposures.

Obliterative bronchiolitis	
Description	Respiratory disorder causing shortness of breath on exertion and cough.
Exposure	Food flavourings associated with obliterative bronchiolitis.
High risk occupation or industry	Relevant occupations involving exposure to food flavourings associated with obliterative bronchiolitis (such as some manufacturing workers involved in food production).
Latency period	Weeks to months.
Main external non-occupational risk factors	Rare in the general community.

Osteonecrosis	
Description	Death of bone, usually resulting in pain.
Exposure	Work in significantly increased or decreased air pressure.
High risk occupation or industry	Relevant occupations involving working at significantly increased or decreased air pressure (such as professional divers, caisson divers, hyperbaric exposure chamber attendants).
Latency period	Months to years.
Main external non-occupational risk factors	Various

Acute poisoning/toxicity	
Description	Poisoning causing damage to one or more of the heart, lungs, liver, kidney, nervous system and blood).
Exposure	Acrylonitrile; alcohol, glycols or ketones; antimony; arsenic; benzene; beryllium; cadmium; carbon disulphide; chemical asphyxiants (carbon monoxide, hydrogen cyanide, hydrogen sulphide, methylene chloride); chromium; copper; fluorine; herbicides and related compounds; hexane; irritants (benzoquinone and other corneal irritants); lead; manganese; mercury; mineral acids; nitroglycerine (or other nitric acid esters); osmium; oxides of nitrogen; ozone; pesticides (organophosphate and organochlorine compounds); pharmaceutical agents; phosgene; phosphorus; selenium; styrene; thallium; tin; toluene; vanadium; xylene; zinc; toxic halogen derivatives of other aliphatic or aromatic hydrocarbons; toxic nitro and amino-derivatives of benzene; other less common, specific substances not included here.
High risk occupation or industry	A wide range of occupations, particularly in manufacturing.
Latency period	Minutes to hours (typically).
Main external non-occupational risk factors	Instances due to non-occupational exposure are uncommon.

OTHER SUGGESTED CHANGES TO THE 2015 DEEMED DISEASES LIST AND REPORT

In Table 6.1 of the 2015 Safe Work Australia Deemed Diseases report, several of the diseases have a list of relevant exposures which is not exhaustive, as made clear by a superscript that refers to a footnote under the table. For the entry for acute poisoning/toxicity there is a superscript '2' at the end of the list of exposures. This is a mistake. It should have had the superscript '*', which referred to the first footnote of the table ("*The large number of occupational agents that have been shown to cause these diseases means that it is impractical to list every relevant agent.*"). This reinforces the fact that the exposures specified in the category were not meant to comprise an exhaustive list of all exposures to be included in the category.

4 SUMMARY AND DISCUSSION

INTRODUCTION

This chapter provides a summary of the main findings of this detailed review and considers the main strengths and limitations of the approach used. Recommendations regarding changes to be incorporated into the Revised Deemed Diseases List are presented in the following chapter.

RELEVANT CONSIDERATIONS TO THE DEVELOPMENT OF THE SAFE WORK LIST

Deemed diseases are "*…diseases that are deemed to be work-related. The effect of this is to reverse the onus of proof. A worker with the disease who has been exposed to the relevant exposure in the course of their work is assumed to have developed that disease because of the exposure unless there is strong evidence to the contrary. Diseases that are not included on the List can still be the subject of a workers' compensation claim through the normal approach, where the reverse onus of proof would not apply. The Deemed Diseases approach simplifies relevant claims on the assumption that there is a high likelihood that the disease has arisen as a result of work-related exposures.*"[1]. Deemed diseases are sometimes also known as 'proclaimed diseases' or 'scheduled diseases' or 'prescribed diseases'. The relevant legislation is sometimes known as 'presumptive legislation', although in Australia the term presumptive legislation is primarily used in connection to approaches to compensation for certain cancers in designated employment groups.

Prior to the 2105 Deemed Diseases report, deemed diseases lists in Australia were heavily based on The International Labour Organization's (ILO's) List of Occupational Diseases (the ILO List) as documented in ILO Convention 42 (Workmen's Compensation (Occupational Diseases) Convention (Revised), 1934) and more recent updates of this, including Recommendation 194[226]. The ILO List is based on a very different approach to that used to develop the Safe Work Australia List and most entries are not consistent with the approach recommended by Safe Work Australia. The ILO List of Diseases in Convention 42 are a mixture of specific and non-specific diseases. This contrasts with the approach used in the Safe Work Australia List, which links a specific disease to a specific exposure(s).

Examples of a specific disease are “Mesothelioma diagnosed as caused by asbestos” and “Lung cancer diagnosed as caused by chromium VI”. It is usually straightforward to diagnose a person as having mesothelioma, and asbestos is virtually the only known cause of mesothelioma. It is also usually straightforward to diagnose a person as having lung cancer, although it is not possible to unequivocally establish whether or not an individual case of lung cancer arose as a result of chromium VI exposure (or any other exposure).

Most of the other diseases listed in the ILO List are non-specific. For example, “Diseases of a type generally accepted by the medical profession as caused by chrome or its toxic compounds.”. Chromium and related compounds are associated with lung cancer, dermatitis, skin ulcers, perforation of the nasal septum, respiratory tract irritation, and chronic renal failure[227]. All of these diseases can be caused by exposures other than chromium. It may not be appropriate for a deemed diseases list to include, for example, all cases of dermatitis. Instead, the focus should be on dermatitis caused by exposure to chromium or its compounds. Therefore, the List is best structured primarily around the disease and with a direct link to a specific exposure, rather than being structured around the exposure. This format reflects the purpose of the deemed diseases approach, the List being designed to be used by persons with a particular disease, rather than by persons with a particular exposure. Therefore, an entry such as “Diseases of a type generally accepted by the medical profession as caused by chrome or its toxic compounds.”, as appears in the ILO List, would be better along the lines of “Dermatitis associated with occupational exposure to chromium”, “Lung cancer associated with occupational exposure to chromium”, and so on. This is the main reason that the Safe Work List is considered more appropriate to use for deemed diseases purposes than is the ILO List and deemed diseases lists based on it.

It seems sensible that the approach to deemed diseases in Australia be consistent across jurisdictions. Such consistency would minimise anomalies for workers where the same condition with similar exposure circumstances would be covered by deemed diseases legislation in one jurisdiction but not another. Consistency across jurisdictions should also help streamline administration by providing opportunities for jurisdictions to work together on various aspects of arrangements regarding the recognition and consideration of deemed diseases, including mutual recognition. It is unlikely that there would be sufficient differences in disease prevalence or working conditions between different parts of the

country that would warrant including a disorder-exposure pair in a deemed disease list for one jurisdiction but not another. Isolated instances of this might be occur but these would warrant only small differences between the lists used in different jurisdictions. To date, several of the jurisdictions have adopted the Safe Work List in whole or in part, and several others appear to be considering adopting it. It is therefore appropriate that Safe Work Australia encourages all jurisdictions to use the Safe Work List, and any revised Safe Work List, as the basis for their specific deemed diseases list in order to drive national consistency.

Finally, deemed diseases lists should be reviewed based on newly published evidence and (based on the review findings) updated regularly. There is no clear guidance as to how often such a review should take place. Given the issues associated with COVID-19, and the on-going work of IARC, a review in approximately two years may well be appropriate, and in general a review not more than every five years seems a reasonable approach (given how often literature on relevant areas tends to be published).

SUMMARY OF FINDINGS

On the basis of information published since 2014, there are a number of disorder-exposure pairs that were not included in the 2015 Deemed Diseases List but which are now considered suitable for inclusion in the Revised Deemed Diseases List. These are disorder-exposure pairs which were not considered previously, or disorder-exposure pairs which were considered previously but which at that time did not appear to meet all three criteria for inclusion as a deemed disease, and which on the basis of new information now do appear to meet all three criteria. For one disorder-exposure pair, Parkinson's Disease and manganese exposure, new information has provided more evidence of inconsistency in the published findings about a causal connection between exposure and disease, resulting in the recommendation that Parkinson's Disease no longer be included as a deemed disease.

STRENGTHS AND LIMITATIONS OF THE APPROACH USED FOR THE REVIEW

This report provides a detailed consideration of peer-reviewed information published since 2014 that is relevant to whether a disorder-exposure pair meets the three criteria necessary to be classified as a deemed disease. The search was thorough for each topic and relied almost entirely on reviews, usually systematic reviews. Basing a decision in terms of appropriateness to be classified as a deemed disease on a single study would usually not be

considered appropriate because of the uncertainty about the strength of evidence. Conclusions based on multiple studies is much less prone to influence by unrecognised bias. This is the reason decisions were made wherever possible for the 2015 Deemed Diseases List, and for this current report, on the basis of review articles.

The primary literature searches for this report were conducted in Medline, with additional searches in Scopus for some disorders. It is possible that some relevant publications might not have been identified using this approach, but the vast majority are likely to have been and it is considered very unlikely that the inclusion of any papers not identified would have resulted in a different recommendation for any disorder.

Both narrative and systematic reviews were included in the current report, with much greater weighting given to systematic reviews. Narrative reviews are more subject to bias (i.e. methodological error) than systematic reviews, and such bias may be difficult to identify. Narrative reviews were included because it was felt they provided helpful insight into the breadth and consistency of published information on certain topics. To the extent a narrative review was biased, it would not properly reflect the state of current understanding on a particular topic. This could result in unreasonable weight being given to certain findings, which in turn could influence a decision on whether or not the disorder, or disorder-exposure pair, was appropriate to be considered a deemed disease. Care was taken to be alert for such biases and to give appropriate weight to the findings of narrative reviews. Also, as mentioned, much greater weight was given to the findings of systematic reviews.

As was the case for the 2015 Deemed Diseases List, this project was conducted by a single author, acting with the guidance of an advisory group. Using only one person to undertake the literature review increases the possibility of mistakes being made in the searches or in the interpretation of the information provided by the identified papers. However, the work was undertaken by an experienced occupational health researcher who used a standard approach. Therefore, it is considered unlikely that any important publications were missed.

Similarly, the recommendations arising from the report were based on the opinion of the single author. This raises the possibility of the recommendations being unreasonably subject

to the personal opinions of the author as there is necessarily some subjectivity to the final recommendations on inclusion or exclusion. Balancing that, the work was conducted under the guidance of an advisory group, explicit criteria were used to guide the recommendations, and the arguments supporting the recommendations were presented in appropriate detail in this report.

On balance, the findings are considered to present a thorough, balanced and reasonable summary of the relevant literature, and the recommendations to arise directly from that literature, bearing in mind the three criteria to be met for the disorder to be considered a deemed disease.

It would be appropriate for this report to be peer-reviewed.

5. RECOMMENDATIONS

It is recommended that additions be made to the Revised Deemed Diseases List to include additional outcome-exposure pairs. The recommended additions are:

Infectious disease

- COVID-19 associated with frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)
- Middle East Respiratory Syndrome associated with frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)
- Avian Influenza associated with relevant occupation involving work with birds (such as poultry slaughterer, poultry farm worker, pet shop worker, veterinarian, veterinary nurse) or frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)
- Influenza A (H1N1) associated with frontline healthcare occupation with direct patient contact (such as nurse, doctor, physiotherapist)
- psittacosis associated with relevant occupations involving work with birds (such as poultry slaughterer, poultry farm worker, pet shop worker, veterinarian, veterinary nurse).

Cancer

- cholangiocarcinoma associated with exposure to 1,2-Dichloropropane
- non-Hodgkin's lymphoma associated with exposure to lindane
- non-Hodgkin's lymphoma associated with exposure to pentachlorophenol
- ocular melanoma associated with exposure to ultraviolet light from welding
- lung cancer associated with exposure to welding fumes

Mental or neuropsychiatric diseases

- Post-traumatic stress disorder associated with occupations involved as first responders (such as police officers, ambulance officers including paramedics, fire fighters)

Respiratory diseases

- obliterative bronchiolitis associated with relevant occupations involving exposure to food flavourings associated with obliterative bronchiolitis (such as some manufacturing workers involved in food production).

Musculoskeletal diseases

- Osteonecrosis associated with relevant occupations involving working at significantly increased or decreased air pressure (such as professional divers, caisson divers, hyperbaric exposure chamber attendants).

Acute poisoning/toxicity

- non-infectious hepatitis associated with exposure to xylene

It is also recommended that one disorder-exposure pair be removed from the Revised Deemed Diseases List. The recommended deletion is Parkinson's Disease in workers exposed to manganese.

6. CONCLUSIONS

This report provides recommendations on changes to be considered to the 2015 Deemed Diseases List to produce a Revised Deemed Diseases List. The recommendations are based on a detailed review of literature published since 2014, relying on review articles almost entirely. Recommendations are made to include a number of additional disorder-exposure pairs in the Revised Deemed Diseases List, and to remove one disorder-exposure pair because of inconsistency in the evidence regarding the causal connection between exposure and disease.

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