Review of respiratory disease among Indigenous peoples

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Introduction

Respiratory disorders are major causes of illness and death in the Indigenous population and contribute to high rates of hospitalisation and mortality. (See Box 1for a description of the different kinds of respiratory disorder.) One-third of Indigenous people reported in the 2001 National Health Survey (NHS) that they had a long-term respiratory condition [1] and respiratory conditions were responsible for more than one-seventh of hospital separations (excluding those for renal dialysis and pregnancy-related conditions) [2][1]. One in 12 of the deaths and one in 10 of the excess deaths of Indigenous people living in Queensland, Western Australia, South Australia, and the Northern Territory in 1997–99 were attributed to respiratory disease [1] [3]. As with many other disorders afflicting Indigenous people, the high morbidity and mortality from respiratory disorders are related to their poor environmental and socioeconomic conditions, exacerbated, in some cases, by less than optimal medical management.

After providing a broad overview of current levels of mortality and hospitalisation from respiratory disease among Indigenous people, this section will briefly review other information about acute respiratory infections and about chronic respiratory diseases, including asthma[2]. Readers should refer also to information on pneumococcal disease and on *Haemophilus influenza*.

The nature of respiratory disease

The term *respiratory disease* refers to a number of conditions that affect the lungs or their components; each of these conditions is characterised by some level of impairment of the lungs in performing the essential function of gas exchange.

Respiratory disorders, which can be caused by a variety of different factors and other medical problems (which may or may not start in the lungs), are generally divided into two basic categories: acute respiratory infections and chronic respiratory disorders.

Acute respiratory infections

Acute respiratory infections (ARIs), usually caused by viral or bacterial organisms, are categorised according to the location of the infection within the respiratory system-namely as upper respiratory tract infections (URTIs) and lower respiratory tract infections (LRTIs)[3]. All people are affected at some time by ARIs, but children tend to contract them more frequently than adults. The differences in ARI infection rates by age are due largely to the fact that children have little or no prior exposure to the infections (and hence little or no immunity), and to nutritional and hygiene factors. It is estimated that globally 3–3.5 million children under 5 years of age die from ARIs every year.

URTIs are more common than LRTIs, and are usually caused by viruses. Common URTIs include acute nasopharyngitis (common cold), acute sinusitis, acute pharyngitis, and acute tonsillitis. URTIs are generally mild and self-limiting in nature, and result in little or no mortality. In some cases, however, especially those caused by bacteria, URTIs can lead to serious complications. For example, *epiglottitis* caused by *Haemophilus influenzae*, if left untreated, can be fatal (see the section on *H. influenzae*); and acute otitis media (middle-ear infection) caused by *S. pneumoniae* or *H. influenzae* can result in hearing loss and subsequent learning and speech impairments. (Because it is such a serious health problem, middle-ear infection, although technically a respiratory infection, is covered separately in the Ear*InfoNet*.)

LRTIs, while less common than URTIs, account for most of the hospitalisation and deaths associated with ARIs. As with URTIs, viruses are responsible for the majority of LRTIs, but the most serious forms are bacterial. LRTIs that can result in hospitalisation and death include pneumonia, bronchopneumonia, acute bronchitis, and bronchiolitis.

Chronic respiratory disorders

The main chronic respiratory conditions are chronic bronchitis, emphysema, asthma, and bronchiectasis. (Asthma is classified as a chronic condition, even though most morbidity is due to acute episodes.)

Chronic bronchitis is diagnosed clinically on the basis of a history of daily coughing with sputum production for at least 3 months of the year for more than 1 year. Obstruction of the airways with mucus may occur (due to inflammation and swelling of airway linings), increasing the likelihood of bacterial lung infections. Emphysema is caused by dilation and destruction of the lung alveoli, which usually leads to shortness of breath. The factors contributing to the development of chronic bronchitis and emphysema are very similar - cigarette smoking is the main factor, but climate and air pollution also contribute.

Asthma is an inflammatory condition of the airways that results in episodes or attacks of breathing problems (such as coughing, wheezing, chest tightness, and shortness of breath). Symptoms arise because inflammation of the airways, which is largely a result of hyper-responsiveness to allergens and irritants (including physical activity and upper respiratory infections), results in airflow obstruction.

Bronchiectasis, generally very uncommon in developed countries like Australia, is permanent dilatation of the bronchi caused by destruction of the elastic and muscular components of the bronchial walls, usually resulting from a previous infectious illness, such as pneumonia. The disease is characterised by recurrent respiratory infections, a disabling cough, breathlessness, and high sputum production.

Chronic obstructive pulmonary disease (COPD), the term applied to chronic disorders for which airway inflammation and airflow limitation are not fully reversible, includes chronic bronchitis, emphysema, bronchiectasis and many cases of asthma.

Mortality

Disease of the respiratory system was the fourth most common cause of death for Indigenous males living in Queensland, WA, SA, and the NT combined for the period 1997-1999, and was responsible for 8.2% of deaths [4]. It was responsible for 8.5% of deaths of Indigenous females, making it the fifth most common cause of death. Importantly, it was responsible for almost one-tenth of excess deaths experienced by Indigenous people. The more detailed breakdown of deaths for Indigenous people living in WA, SA and the NT for 1999-2001 reveals that the number of Indigenous deaths from respiratory deaths was five times the number expected from rates for the non-Indigenous population (Table 1). The leading specific respiratory cause of death for both Indigenous males and females for this period was chronic lower respiratory disease (J40-J47), for which cause there were around five times more deaths than expected. Pneumonia and influenza (J10-J18) were responsible for only small numbers of deaths, but these numbers were 12-15 times more than expected from rates for the corresponding non-Indigenous populations.

Table 1: Respiratory disease: numbers of Indigenous deaths and standardised mortality ratios (SMRs), by sex, WA, SA and the NT, 1999-2001

Category of resiratory disease	Males		Females		Persons	
	Number	SMR	Number	SMR	Number	SMR

Source: Derived from data provided by the AIHW National Mortality Database and ABS low series population projections

Notes:

1. Standardised mortality ratio (SMR) is the ratio of the actual number of deaths identified as Indigenous and the number expected from the age-specific rates of the same-sex non-Indigenous population
2. The numbers and SMRs in this table have not been adjusted for the likely under-identification of Indigenous people in deaths registrations. Based on the estimated completeness of identification for WA, SA and the NT, the numbers and SMRs shown here could be up to 30% higher

Table 1: Respiratory disease: numbers of Indigenous deaths and standardised mortality ratios (SMRs), by sex, WA, SA and the NT, 1999-2001

Category of resiratory disease	Males		Females		Persons	
	Number	SMR	Number	SMR	Number	SMR
All respiratory disease (J00-J06)	134	5.2	92	4.5	226	5.0
Pneumonia and influenza (J10-J18)	10	12.5	6	15.0	16	13.3
Chronic lower respiratory diseases (J40-J47)	66	4.7	15.1	5.0	117	4.8
Other respiratory disease	58	5.3	35	3.5	93	4.4

Age-specific death rates

As well as much higher death rates among infants and very young children, the striking difference between Indigenous and non-Indigenous people in respiratory disease mortality is the very much greater impact among young and middle aged Indigenous people. For all respiratory disease, the death rates for Indigenous people were 9 to 22 times higher than those for non-Indigenous people in the 25-54 years age groups (Table 2).

Table 2: Respiratory disease: age-specific death rates, by Indigenous status and sex, and rate ratios, WA, SA and the NT, 1999-2001

Age group (years)	Indigenous		Non-Indigenous		Rate ratios	
	Males	Females	Males	Females	Males	Females

Source: Derived from data provided by the AIHW National Mortality Database and ABS low series population projections

Notes:

1. Rates are per 100,000 population Rate ratios are the Indigenous rates divided by the same-sex non- Indigenous rates
2. The numbers and SMRs in this table have not been adjusted for the likely under-identification of Indigenous people in deaths registrations. Based on the estimated completeness of identification for WA, SA and the NT, the numbers and SMRs shown here could be up to 30% higher

0-4	15	31	2	1	7.0	24.6
5-14	0	0	1	0	0	0
15-24	5	5	0	1	17.9	4.8
25-34	20	19	2	1	8.7	14.4
35-44	70	38	3	2	21.9	20.3
45-54	121	51	6	6	18.8	8.4
55-64	329	211	38	29	8.8	7.2
65-74	1,150	319	192	102	6.0	3.1
75+	76	55	97	87	0.8	0.6

Hospitalisation

Respiratory disease was responsible for 15.2% of the 51,880 hospital separations of Indigenous males in Australia in 1999-2000 (excluding those for renal dialysis), and for 14.4% of the 53,351 separations of Indigenous females (excluding those for renal dialysis and pregnancy-related conditions) [5]. Separation rates for respiratory disease were much higher for Indigenous people than for non-Indigenous people - 2.6 times higher for males and 3.2 times higher for females. Indigenous rates were particularly high in infancy and early childhood.

ARIs were responsible for around one-tenth of separations of Indigenous males and for more than one-twelfth of those of Indigenous females (excluding those for renal dialysis and pregnancy-related conditions) (Table 3). The most common specific conditions requiring hospitalisation were those included in the ICD group 'influenza and pneumonia' (J10-J19), with rates for Indigenous males and females 4.6 and 4.9 times respectively those for non-Indigenous males and females. Other acute lower respiratory tract infections (J20-J22) were also much more common causes of hospitalisation for Indigenous people - the rate for Indigenous males was 4.7 times that of non-Indigenous males, and the rate for Indigenous females 5.7 times that of non-Indigenous females. Chronic lower respiratory diseases (J40-J47) were responsible for 3.6% of Indigenous male separations and for 4.4% of Indigenous female separations, with rates 3.0 and 4.1 times respectively those of non-Indigenous males and females.

Table 3: Numbers and proportions of Indigenous separations for respiratory conditions and Indigenous:non-Indigenous rate ratios, by sex and condition, Australia, 1999-2000

	Males			Females		
Principle diagnosis	**Number of separations**	**Proportion of separations**	**Rate ratio**	**Number of separations**	**Proportion of separations**	**Rate ratio**
Acute URTI	1,047	2.0	1.7	956	1.8	2.5
Influenza and pneumonia	2,417	4.7	4.6	2,114	4.0	4.9
Other acute LRTI	1,802	3.5	4.7	1,613	3.0	5.7
All ARI	5,266	10.2	n/a	4,683	8.8	n/a
Other URT conditions	338	0.7	0.4	383	0.7	304

Source: Lehoczky et al., 2002

Notes:

1. Separations for dialysis and pregnancy-related conditions have been excluded in the calculation of the proportions to provide a better indication of the proportional impact of respiratory conditions within the overall Indigenous burden of disease
2. Rate ratio is the Indigenous rate divided by the non-Indigenous rate

Table 3: Numbers and proportions of Indigenous separations for respiratory conditions and Indigenous:non-Indigenous rate ratios, by sex and condition, Australia, 1999-2000

Principle diagnosis	Males			Females		
	Number of separations	Proportion of separations	Rate ratio	Number of separations	Proportion of separations	Rate ratio
Chronic LR diseases	1,879	3.6	3.0	2,322	4.4	4.1
Other respiratory diseases	397	0.8	1.9	281	0.5	2.6
All respiratory diseases	7,880	15.2	2.6	7,669	14.4	3.2
All separations excl dialysis and pregnancy-related separations	51,880	100.0		53,351	100.0	

Acute respiratory infections

Incidence and prevalence

Information on the incidence of ARI among Indigenous children is scarce, but longitudinal data on 66 Aboriginal children living in remote areas of the NT found that there was an average of five episodes of respiratory illness necessitating clinic attendance during the first year of life [6].

Prevalence figures may be less sensitive than incidence in measuring the true level of disease in a community, but they do provide an indication of the disease load carried by the population at a given point of time. Unfortunately, prevalence data on ARI among Indigenous children are scarce also - and dated - but they point to the widespread prevalence of serious ARI in some Indigenous communities. In one study in 1979 of seven Aboriginal communities in the Pilbara region of Western Australia, 29% of the population had signs of LRTI, with a quarter of children under 5 years of age affected [7]. From about the same time, a retrospective survey of all infants born during the period 1979-1981 in the Bourke district of New South Wales revealed a 25% prevalence of lobar pneumonia in Indigenous children under the age of 3 years, compared with a 3% prevalence in non-Indigenous children [8]. Further, in one remote Aboriginal community in the north-west Kimberley region of Western Australia, over one-fifth (21%) of children had evidence of lower respiratory infection [9].

Hospitalisation for ARI

As noted above, ARIs are responsible for a large proportion of the hospitalisation of Indigenous people, but the Australia-wide figures do not reveal the true extent of the differences between Indigenous and non-Indigenous people in hospitalisation rates.

The estimates for Indigenous people living in WA in 1988-1993 are likely to provide a much better indication of the differences between Indigenous and non-Indigenous people. Indigenous infants were hospitalised for acute bronchitis and bronchiolitis at a combined rate of 15,025 admissions per 100,000 person-years, 6.3 times the rate for non-Indigenous infants (Table 4) [10] [11]. For pneumonia, the rate of 6,189 per 100,000 person-years for Indigenous infants was almost 28 times higher than the non-Indigenous rate. Pneumonia was the main respiratory cause of admissions in the age groups 15-24, 25-39 and 40-54 years, and the second leading cause in adults aged 55 years or older. In general, rates of admission for pneumonia were higher in non-metropolitan than metropolitan areas. The hospitalisation rates vary with age, but the Indigenous:non-Indigenous rate ratios are high across all age groups, particularly for pneumonia.

Table 4: Indigenous hospital separation rates for acute bronchitis and bronchiolitis and pneumonia, and Indigenous:non-Indigenous rate ratios, by age group, WA, 1988-1993

Age group (years)	Acute bronchitis and bronchiolitis		Pneumonia	
	Separation rate	Rate ratio	Separation rate	Rate ratio
0	15,025	6.3	6,189	27.7
1-4	1,740	6.0	3,812	20.7
5-14	458	6.0	667	12.8
15-24	204	3.0	781	21.7
25-39	179	5.6	1,393	26.8
40-54	209	15.2	2,350	38.5
55+	407	6.9	3,922	9.5

Source: Adapted from (Health Department of Western Australia Office of Aboriginal Health, 1997)
Notes:

1. In the infant age group (0 years), the majority of ARI were acute bronchiolitis, followed by acute bronchitis. In the 1 to 4 years group, they were mainly acute bronchitis, followed by acute bronchiolitis and acute tonsillitis. In the 5 to 14 years group, ARI were mainly acute tonsillitis followed by acute bronchitis
2. In the age groups 0, 1-4 and 5-14 years, pneumonia includes ICD codes 485 and 486. In the other age groups, pneumonia includes ICD codes 481, 485 and 486. 3 Rate ratio is the Indigenous rate divided by the non-Indigenous rate

A slightly different insight into hospitalisation information is provided by an innovative Western Australian study using linked antenatal, birth, death and hospital discharge records for all children born in the State from 1980 onwards [12]. For children born in

1986 with birth weights of at least 500 grams, 17% of Indigenous children were hospitalised once and 11% repeatedly for lower respiratory tract illnesses in their first two years of life, compared with 5% and 1% of non-Indigenous children. Pneumonia was the most common reason for respiratory admissions of Indigenous children, and perinatal conditions (such as respiratory distress syndrome and broncho-pulmonary dysplasia) were the most common reasons for admission of non-Indigenous children.

A longitudinal study of 2,254 Indigenous children born during the ten-year period 1976-1985 in the NT also revealed high rates of admission for respiratory tract infections. Of a total of 3,657 hospital admissions, 17% were due to respiratory tract infections [13]. On average, there were six hospital admissions for respiratory tract infections annually for every 100 Indigenous children under five years of age. Since many Indigenous children are diagnosed and treated for ARI at the community level by primary health care services, these hospitalisation rates markedly underestimate the overall incidence of ARI in Indigenous children [14]. An earlier report on hospitalisation for radiologically proven pneumonia in Alice Springs Hospital in 1983 found that admissions of Indigenous children admissions exceeded those of non-Indigenous children by a ratio of more than 60:1 [15]. Figures from Queensland are suggestive also of the high rates of admission for respiratory tract infections in the Indigenous population (even though Indigenous people were not identified separately in hospitalisation data). The separation rate for ARIs (excluding pneumonia) for people living in five Statistical Local Areas (SLAs) for which the Indigenous proportion of the population exceeded 73% was 852 per 100,000 person-years in 1994-1995, compared with 315 per 100,000 for Queensland as a whole [16]. For pneumonia, the admission rate for people living in the five SLAs was 1,354 per 100,000 person-years, a rate 4.6 times higher than for Queensland as a whole.

Deaths

Indigenous mortality from ARI has fallen significantly over the last few decades, but it still remains an important cause of death at a rate several times higher than that of the non-Indigenous population. As noted above, conditions included in the ICD group 'pneumonia and influenza' were responsible for only small numbers of deaths in WA, SA and the NT in 1999-2001, but the numbers of deaths were much higher than expected.

Mortality from ARI in Indigenous children is low compared with levels in developing countries, but it is still an important cause of Indigenous infant mortality. The published ABS figures do not include an age breakdown of deaths from pneumonia, but mortality from respiratory disease was very high in the infant age group [17]. The death rate for Indigenous male infants was 234 per 100,000, 15.6 times the rate for the total Australian population, and that for Indigenous female infants 247 per 100,000, 19 times higher than the corresponding all Australian rate.

An analysis of the 1991-1996 mortality database for WA, SA and the NT found that there were 22 deaths from acute respiratory infections (including pneumonia and influenza) among children aged 0-9 years [18]. Of these, 9 deaths (41%) were of Indigenous children. The relatively low mortality from ARI in Indigenous children, compared with the situation in developing countries, has been achieved at the cost of an extraordinarily high rate of hospitalisation [14].

Factors contributing to ARI

Studies of the aetiology of childhood pneumonia in developing countries (using both invasive procedures, such as lung aspiration, and less invasive procedures, such as blood cultures and serology) have consistently shown Streptococcus pneumoniae (pneumococcus) and Haemophilus influenzae (type b) to be the leading bacterial causes, and respiratory syncytial virus the leading viral cause [19].

In the first study of its kind to describe the aetiology of acute lower respiratory tract infections in Indigenous children, 322 cases in 280 children admitted to the Alice Springs Hospital in 1990-1992 were analysed prospectively [20]. At least one bacterial, viral or chlamydial agent was found in blood, urine and nasopharyngeal aspirate samples in over two-thirds of the cases (68%). A significant aspect was the high proportion of co-infections - in the 92 cases with serological evidence of pneumococcal infection, there was also evidence of concomitant viral infection in 26 cases, Hib infection in two and chlamydia in two.

A large proportion of the LRTI cases were due to Streptococcus pneumoniae, with at least a third of the cases showing evidence of infection. The identification of pneumococci was mainly determined by the presence of pneumolysin immune complex and antibody assays, as there were only six blood cultures positive for Streptococcus pneumoniae. Of the 20 blood cultures positive for bacteria, 11 were due to Haemophilus influenzae (all except one were type b). The low bacterial isolation rate, particularly for H. influenzae, could well have been due to the fact that a high proportion of cases had a history of antibiotic administration prior to admission. Further, Hib vaccination had started in the area during the latter phase of the study. Evidence of viral infection was present in 155 of the 322 cases (48%). Respiratory syncytial virus was the most common, accounting for one-third of all viral isolates. Other viruses commonly isolated were adenovirus, rhinovirus and parainfluenzae 3.

Chlamydia was detected infrequently, with only two definite and seven possible cases of Chlamydia trachomatis and three cases of Chlamydia pneumoniae. Interestingly, cases of Chlamydia trachomatis LRTI usually had C. trachomatis conjunctivitis as well. This raised the possibility that contamination of nasal secretions from ocular infection via the naso-lacrimal duct may be widespread in this population of Indigenous children in whom trachoma was endemic. If this is the case, horizontal transmission between children with profuse nasal secretions colonised by C. trachomatis is a possibility.

In an analysis of the records of 189 consecutive admissions to Cairns Hospital in 1992-1993 for community-acquired pneumonia (90 of which were Indigenous), S. pneumoniae and H. influenzae were the most common pathogens identified [21]. Indigenous patients also had staphylococcal and melioidosis pneumonia, two types not found in the non-Indigenous patients with pneumonia.

Age is another important factor in LRTI, with almost one-half (47%) of the cases in the Alice Springs study (range: 2 months to 12 years) being under 1 year of age, and 94% under 5 years [20]. The weight-for-height of 10% of the cases was below the third percentile, indicating nutritional wasting. Among Indigenous adults, common

risk factors for pneumonia are heavy alcohol use, chronic lung disease and diabetes mellitus [22].

Pneumonia due to melioidosis

Melioidosis, or infection with the organism Burkholderia pseudomallei, is being recognised with increasing frequency in northern Australia as a cause of serious morbidity and mortality [23]. The organism is widely distributed in the water and soil of the tropics, and during the rainy season and spreads through direct contact, cutaneous inoculation, inhalation or ingestion [24]. Diabetes and renal failure predispose to clinical disease.

In the period 1990-1998, melioidosis was the second most common cause of admission for, and the most common cause for death from, community-acquired bacteraemic pneumonia at the Royal Darwin Hospital [25]. Pneumonia was the most common form of presentation of the 240 cases of melioidosis recorded in the Top End of the Northern Territory in that period. The severe septicaemic form of pneumonia had a case-fatality rate of over 50%. Information about the breakdown of the cases by Indigenous status is not available, but a detailed analysis of 33 cases early in this nine-year period found that the incidence among Indigenous people was around nine times that among non-Indigenous people [26]. Such a difference is consistent with the believed mode of infection - with most cases believed to be acquired through percutaneous inoculation - and the known risk factors - diabetes, excessive alcohol consumption, chronic renal disease, chronic lung disease and excessive kava consumption [27].

Based on an analysis of records from the Thursday Island Hospital, all of the 23 cases of melioidosis diagnosed in the Torres Strait in the six-year period 1995-2000 were Torres Strait Islanders [28]. The average annual incidence of 43 cases per 100,000 is the highest documented to date in the Torres Strait area, and considerably higher than the overall incidence of 17 per 100,000 in the Top End of the NT [23]. Most people presented with community-acquired pneumonia or a deep-seated abscess, and five died. More than three-quarters of the people diagnosed with melioidosis were diabetics [28].

Control measures for ARIs

Broad-ranging environmental changes can bring about a reduction in ARI (as well as other infectious diseases) among Indigenous populations. These changes include improvements in housing, waste disposal, and water and power supply [14]. As well, there needs to be an emphasis on strategies promoting optimal growth and protecting infants from ARI. Strategies include antenatal care, breast-feeding, improved weaning practices, frequent washing of hands and faces, childhood immunisation and cessation of parental smoking (view HealthInfoNet tobacco use page).

Improved case management by primary health care providers would contribute also to reducing the high hospitalisation rates from ARI [14]. This would involve allocation of resources, development of appropriate curriculum and standard treatment

protocols, training, supervision and evaluation. Immunisation with the pneumococcal vaccine provides the most immediate and effective means of preventing serious morbidity and mortality from pneumococcal disease among Indigenous people. Prevention of melioidosis is possible through health education aimed at high risk groups avoiding contact with wet-season soils or muddy water by using footwear and gloves [29]. Treatment with the appropriate antibiotics is effective, especially if the disease is diagnosed early. Prevention of much of the morbidity and mortality from ARI is achievable, given existing knowledge and technology. But, as with many other areas of Indigenous health, this will require greater political and administrative commitment than shown to date.

Chronic respiratory diseases

After adjusting for differences in the age structures of the two populations, 33% of Indigenous people reported to the 2001 National Health Survey that they had a long-term respiratory condition, compared with 30% of non-Indigenous people (Table 5) [30]. Asthma was the specific respiratory condition most commonly reported by both Indigenous people (17%) and non-Indigenous people (12%). Asthma was reported more frequently by Indigenous people than by non-Indigenous people for every age group. Indigenous people living in remote areas reported having asthma slightly less frequently (15%) than did those living in urban and rural areas (18%).

Table 5: Proportions (%) of respondents reporting respiratory conditions in the 2001 National Health Survey, by Indigenous status and age group, Australia, 2001

	Indigenous				Non-Indigenous			
Age group (years)	**Asthma**	**Bronchitis**	**Other respiratory conditions**	**Any respiratory condition**	**Asthma**	**Bronchitis**	**Other respiratory conditions**	**Any respiratory condition**
0-4	11	3	3	16	8	2	4	13
5-14	18	3	9	26	16	2	11	26
15-24	18	4	15	31	16	2	19	33
25-34	16	2	15	31	13	3	23	35
35-44	15	5	19	35	9	3	19	33
45-54	17	8	15	35	10	3	19	33
55+	21	12	19	44	9	5	16	31
All ages	17	6	15	33	12	3	17	30

Source: Australian Bureau of Statistics, 2002
Notes:

1. The proportions for 'any respiratory condition' may be greater than the sums of the other conditions, as people may have reported more than one condition
2. The figures for 'all ages' are age-standardised proportions

Chronic bronchitis and emphysema

There is virtually no detailed information on the prevalence or extent of chronic bronchitis and emphysema in the Indigenous population, but it is likely to be very high because of the high prevalence of smoking in the population (view HealthInfoNet tobacco use page). As noted above, the numbers of deaths from chronic lower respiratory diseases for Indigenous people living in WA, SA and the NT in 1999-2001 were around five times the numbers expected from the age-specific rates of the non-Indigenous populations of those jurisdictions. In the five Statistical Location Areas (SLAs) in north Queensland where Indigenous people make up 74% of the population, mortality rates for chronic obstructive pulmonary disease (COPD) (excluding asthma) were 5 times higher than the overall Queensland rates [16]. Australia-wide in 1999-2000, separation rates for these diseases among Indigenous people were 3-4 times those of other Australians [2]. A detailed analysis of hospitalisation in WA in 1988-1993 attributed the much higher separation rates of Indigenous people than of non-Indigenous people for bronchitis (ICD9 490-491), chronic airways obstruction (ICD9 496) and bronchiectasis (ICD9 494) to the cumulative effect over time of exposure to cigarette smoking (Table 6) [11].

Table 6: Hospital separation rates for Indigenous and non-Indigenous people and Indigenous:non-Indigenous rate ratios, bronchitis, chronic airways obstruction and bronchiectasis, Western Australia, 1988-1993

	Separation rates						Rate ratios		
	Indigenous			Non-Indigenous					
Age group (years)	**Bronchitis**	**CAO**	**Bronchiectasis**	**Bronchitis**	**CAO**	**Bronchiectasis**	**Bronchitis**	**CAO**	**Bronchiectasis**
15-24	95	-	34	11	-	6	8.6	-	5.6
25-39	192	-	37	12	-	6	15.4	-	6.2
40-54	430	194	105	19	18	12	22.8	10.6	9.1
55+	1,164	2,046	119	138	515	31	8.4	4.0	3.9

Source: Adapted from (Williams, et al., 1997)
Notes:

1. Admission rates are per 100,000 person-years
2. Rate ratio is the Aboriginal rate divided by the non-Aboriginal rate
3. Bronchitis: ICD490-491; chronic airways obstruction (CAO): ICD496; bronchiectasis: ICD494

Bronchiectasis

Bronchiectasis among central Australian Aboriginal children was the subject of considerable interest in the late 1960s and early 1970s, when the disease was identified from clinical records in 83 out of around 1,000 children [31]. Diagnosis was

by bronchography in 75% of cases, by bronchoscopy in 10%, and by x-ray and zonal tomography in the remainder. Around two-fifths of the patients underwent lung surgery for their condition. The condition was attributed to bronchiolitis in 47% of cases, pneumonia in 37%, and recurrent unspecified chest infection in the remainder. Cystic fibrosis, the most common cause of bronchiectasis in children in developed countries, was absent as a cause of the disease. Over one-half of the cases had concurrent diarrhoea with dehydration requiring intravenous hydration. Malnutrition was common with two-thirds (67%) being less than the tenth percentile for weight and 57% for height.

A recent study has confirmed that bronchiectasis and clinical chronic suppurative lung disease (CSLD) are still major problems for Indigenous children in the region, with a prevalence of 1.5% among children aged 15 years or younger [32]. Using HRCT (high resolution computed tomography), the current 'gold standard' for confirming bronchiectasis, the study identified 59 children with the disease, only 21 of whom were known cases, and a further six with CSLD (cases in which the strict criteria for diagnosing bronchiectasis were not confirmed by HRCT).

The median age at diagnosis for children with bronchiectasis was 4.8 years and 6.2 years for those with CSLD [32]. Almost 95% of the children with bronchiectasis and 83% of those with CSLD had had at least one previous admission for pneumonia, with a median age of 6 months for the first admission. Slightly less than one-half of the children with bronchiectasis and 17% of those with CSLD had had at least one previous admission for bronchiolitis, with a median age of 5 months for the first admission. Almost three-quarters of all the children had a history of chronic suppurative otitis media (CSOM). In view of the association of CSOM with bacterial colonisation at young ages, the authors suggest that early bacterial pneumonia with incomplete eradication of bacteria and persistent airway inflammation may promote the development of bronchiectasis and CSLD.

The confirmation of persisting high levels of bronchiectasis and CSLD among Indigenous children in central Australia promoted the development by the Working Group on Indigenous Paediatric Respiratory Health of consensus recommendations for their early detection and effective management [33]. The recommendations emphasised the importance of early diagnosis of bronchiectasis and CSLD, and aggressive medical management to reduce morbidity and preserve lung function. The Working Group emphasised also the need to reduce exposure of affected children to wood and tobacco smoke, and for 'a culture-and expertise-appropriate healthcare delivery model'.

Hospital statistics from WA during the period 1988-1993 do not mention bronchiectasis as a significant diagnostic category in children aged under 14 years, but it is a cause of considerable numbers of admissions in older age groups [11]. Admission rates for Indigenous people in the 15-24 years, 25-39 years, 40-54 years and the 55 years and older age groups were respectively 5.6, 6.2, 9.1 and 3.9 times higher than the corresponding non-Indigenous rates.

Asthma

As noted above, 15% of Indigenous people living in remote areas and 18% of those living in rural and remote areas reported to the 2001 NHS having asthma as long-term health condition [30]. Despite the similarity of these estimates of the proportions of Indigenous people having asthma as a long-term health condition, there is some evidence that the difference in prevalence between remote and other areas may be greater than that reported to the 2001 NHS.

Bearing in mind that its findings having been questioned on methodological grounds [34] [35], a study in the early 1990s of 1,252 residents aged 5 to 84 years from two rural Aboriginal communities in Cape York, Queensland and two in central Australia found no self-reported recent wheeze among children 5-7 years of age, and a prevalence of 0.5% in children aged 8-12 years [36]. The prevalence among adults aged 20-84 years was 3.3%.

These estimates differ markedly from those of a more recent study of five communities in the Torres Strait and neighbouring areas of Cape York [34]. In this study, undertaken in 1999, 21% of 1,650 children aged 0-17 years reported ever wheezing, 12% of having wheezed in the previous 12 months, and 16% as having asthma.

Much lower levels of asthma, but high levels of current wheezing, were reported from a small 1993 study in a remote Indigenous community in the far north of WA [37]. Only 5.4% of males and 8.9% of females aged 5 to 18 years reported ever having asthma. On the other hand, 14% of males and 24% of females reported current wheezing. For participants aged 18 years or older, a history of ever being diagnosed with asthma was found for 8.5% of males and 15% of females. Current wheezing was reported by 22% of males and 27% of females.

Somewhat higher levels of asthma were found among children aged 5 to 18 years in a 1999 study in a remote Indigenous community in the far north of WA: 17% among males and 12% among females [38]. In a parallel assessment of a very small number of children living in a community in the central desert area of WA, none of the 10 females studied reported a history of asthma and only 7% among the 14 males did so.

These levels contrast markedly with those documented in a study of 158 Indigenous and 1,341 non-Indigenous children attending primary schools in rural NSW in 1997 [39]. The proportions of Indigenous and non-Indigenous children who had been diagnosed with asthma were the same at 39%. Almost one-third of Indigenous children and 27% of non-Indigenous children reported having wheezed in the previous 12 months.

The relatively low levels for Indigenous children living in remote areas are reflected in hospitalisation figures for the NT. A retrospective review of admissions to the Royal Darwin Hospital for the period 1991-1997 found that the hospitalisation rate for asthma for children aged 1-9 years was 2.6 per 1,000 population for Indigenous children from rural areas, 4.7 for Indigenous children from urban areas, and 5.5 for

non-Indigenous children [40]. The contribution of asthma to the overall burden of disease was far less among Indigenous than non-Indigenous children: 6.5% of Indigenous admissions were due to asthma compared with 12.7% of non-Indigenous admissions.

Admission rates for asthma in WA in 1988-1993 were much higher than those for the NT, with those for Indigenous children being particularly high (Table 7) [11]. The age-standardised separation rate for asthma was 3.1 times higher for Indigenous than non-Indigenous people. Separation rates were consistently higher for Indigenous people living in non-metropolitan areas than in the metropolitan area, but the extent to which this reflects differing admission practices is not clear.

Table 7: Hospital separation rates for Indigenous people and Indigenous:non-Indigenous rate ratios, asthma, Western Australia, 1988-1993

Age group (years)	Separation rate		Rate ratio
	Indigenous	Non-Indigenous	
0	33.5	6.4	5.3
1-4	41.8	19.8	2.1
5-14	10.9	7.7	1.4
15-24	4.1	2.5	1.6
25-39	8.8	1.3	6.7
40-45	18.4	1.6	11.5
55+	22.3	3.6	6.2

Source: Adapted from (Williams, et al., 1997)
Notes:

1. Separation rates are per 100,000 person-years
2. Rate ratio is the Indigenous rate divided by the non-Indigenous rate

Factors contributing to the prevalence of asthma

The variations in the prevalence of asthma among different Indigenous communities and population sub-groups could be due, at least partly, to environmental factors. Allergic stimulants are two main factors involved in the aetiology of asthma, through the development of atopy (involving the production of antibodies in response to an allergic challenge) and airway hyper-responsiveness (AHR) [41] [36].

The prevalence of atopy was low to a range of allergens tested among the Indigenous children living in two Cape York and two central Australian communities, for which very low levels of asthma were reported (see above). The prevalence of adult atopy was similar to that found in non-Indigenous people [36].

Interestingly, the environmental levels of a common asthma allergen, house dust mite, was high in the two Cape York communities and low in the two central Australian communities, but the prevalence of atopy was similar across all communities [36]. The investigators suggest that this could be due to cross-antigenicity between house dust mite allergens and Sarcoptes scabiei (the scabies mite) which is endemic in many Indigenous communities.

Several hypotheses have been put forward to explain the slow acquisition of atopy and the low prevalence of asthma in these Indigenous children. First, the high prevalence of chronic and profuse nasal discharge may prevent or attenuate the presentation of air allergens to the respiratory mucosal surface and thus retard sensitisation to allergens [36]. Second, the high antigen load from recurrent infections may saturate cell-mediated immune response mechanisms and prevent or delay the sensitisation process [40]. Third, given that immune responses to helminthic parasites and to air allergens are virtually identical, the chronic and high levels of intestinal parasites in some Indigenous children may result in a diversion of immune system responses away from interactions with air allergens that are likely to cause asthma [42].

Understanding the difference in asthma prevalence

There is no doubt that asthma has become a major problem for many Indigenous people, but much is still unknown about actual levels and, more importantly, about those aspects that could be addressed in reducing its prevalence and in the management of established cases. For further research to be informative, it has been suggested that measurable factors need to be assessed if the differences between remote, rural and urban communities are to examined properly . As well, the recording of parent-reported levels of asthma and symptoms needs to be accompanied by detailed study of microbial burdens. These aspects could be best combined in prospective cohort studies, which, by providing reliable data about Indigenous children, could benefit their management at the same time as well as contributing to a better understanding of the origins of asthma.

Control of chronic respiratory disorders

The factors contributing to chronic respiratory disease that are most amenable to interventions for Indigenous people are smoking (view HealthInfoNet tobacco use page), sub-standard/overcrowded housing (view HealthInfoNet environmental health page)and poor nutrition (view HealthInfoNet nutrition page). It is, of course, vital that established respiratory conditions among Indigenous people are diagnosed and managed to the same high standards as experienced by other Australians. This applies to chronic bronchitis, emphysema and bronchiectasis - conditions that have been long recognised as causing considerable morbidity and mortality among Indigenous people - and also to asthma, which appears to be a cause of increasing morbidity.

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Endnotes

1. (a) Excluding separations for dialysis and pregnancy-related conditions provides a better indication of the proportional impact of respiratory disease among Indigenous people, for two reasons. First, many of the separations for dialysis involve repeat admissions of the same person, in some cases on an almost daily basis. Thus, their inclusion greatly distorts the denominator in estimating the proportional contributions of other diseases, such as respiratory disease. Second, separations for normal care in pregnancy and/or delivery should not be included as a part of the Indigenous burden of disease. (b) In view of the incompleteness of Indigenous identification in hospital statistics (see Chapter 2), some of the Indigenous:non-Indigenous rate ratios presented in this chapter are likely to be substantial underestimates.
2. Some sources provide information about respiratory disorders according to location of residence—urban, rural, or remote—but unfortunately most do not. Hence, it is not possible to present a detailed analysis of the influence of different housing/living conditions.
3. ARI conditions are largely covered by the ICD groups ‘Acute upper respiratory tract’ (J00–J06), ‘Influenza and pneumonia’ (J10–J18) and ‘Other acute lower respiratory infections’ (J20–J22).