RESPIRATORY AND SLEEP HEALTH IN INDIGENOUS AUSTRALIANS .

Report of:
Thoracic Society of Australia and New Zealand and
Australasian Sleep Association
Australian Lung Foundation

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1. Executive Summary

This report was commissioned by Australia's leading national respiratory and sleep health organisations that is the Thoracic Society of Australia and New Zealand, the Australasian Sleep Association and the Australian Lung Foundation. Respiratory illness is a major contributor to differences in life expectancy between indigenous and non-indigenous Australians. The major aims of this report are to review the burden of respiratory and sleep symptoms in indigenous people and to scope relevant health-care outcomes and interventions in order to make recommendations to substantially improve respiratory health in the future.

This report summarises recent surveys of acute and chronic respiratory disease and sleep disorders in indigenous Australians and reports on the status of existing health service resources. The highly significant issues of social determinants and complex public health related topics (housing etc) that affect respiratory health are acknowledged but cannot be adequately addressed in this document.

Findings

1) Prevalence, mortality and morbidity

Acute respiratory illness (ARI) is highly prevalent in young indigenous children and is the most common cause of emergency evacuations and preventable deaths. The mortality rate for indigenous infants with respiratory disease is 11 times higher than for non-Indigenous infants.

Mortality rates for the significant respiratory illnesses (pneumonia, smoking-related lung disease, bronchiectasis, asthma, tuberculosis, respiratory failure) in indigenous people are 2.4 to 24 times higher than in non-indigenous people depending on disease type. For pneumonia, premature deaths tend to occur in childhood. In indigenous adults, most premature deaths occur in the economically productive years prior to age 65.

The limited data available suggest that respiratory-related age standardised mortality rates (ASMR) did not change between the late 1970's and the mid 1990s in indigenous people. There was also no reduction in the disparity between indigenous and non-indigenous respiratory mortality as demonstrated by a persisting ASMR ratio of 5 for indigenous men and 10 for indigenous women. In the Northern Territory (NT), Western Australia (WA) and South Australia (SA), respiratory disease accounts for 15% of the ASMR in indigenous women and 19% in indigenous men. In addition respiratory disease is responsible for 17% of the greater mortality rate in indigenous women and 29% in men.

After renal dialysis, respiratory illness is the second most common cause of hospitalisation for indigenous people nation-wide. Hospitalisation separation data are 4-5 times higher for pneumonia, bronchiectasis and chronic obstructive pulmonary disease (COPD) and 8.5 times higher for acute respiratory failure in indigenous people. Respiratory illness is the most common reason for hospitalisations of infants (rate ratio 3.2) and children aged 1–14 years (rate ratio 1.4).

With a prevalence of 19%, respiratory disease is the most common, long-term health condition reported in indigenous children. Overall 27% of indigenous people report some form of respiratory disease which accounts for 9% of disability adjusted life years.

2) Management and resources

Chronic respiratory illnesses, including COPD, asthma, and bronchiectasis, are responsible for a large burden of disease in indigenous children and adults, both currently and as projected over the next few decades. Care and treatment are seriously under-resourced and illness is non-optimally managed in most remote communities and regional areas.

There is social heterogeneity within indigenous people as reflected in the rural/remote versus urban divide, different tribal groups and attitudes, and the mainland versus the Torres Strait Islander population. Differences in the prevalence and treatment of some diseases are found between these groups.

Management of respiratory illnesses demands a large and disproportionate share of the primary health-care system (20% of primary care reviews) which is overstretched in large population centres and critically so in remote communities in western, central and northern Australia. In these regions, indigenous people are over represented and health-care is more segregated than in the more populous states and the coastal fringe where indigenous health-care is generally integrated with mainstream health services.

Despite the burden of illness conferred, there are comparatively few resources for best practice management of respiratory and sleep diseases. Relative to other subspecialties, there is a substantial dearth of personnel and program resources at a secondary care level. Tertiary level specialised care is especially lacking, particularly in the top end of the NT and in north WA.

Sleep health care is also seriously under-resourced throughout the centre and the far north of Australia and no data on the prevalence of sleep related disorders in these regions are available.

3) Access

In remote regions, there is reliance on transfer to Adelaide, Brisbane, Cairns or Perth for most invasive respiratory investigations and the management of severely ill patients with lung cancer, bronchiectasis, chronic respiratory failure and some paediatric conditions. Thus, there is a need to support the institution of appropriate early chronic disease management and adoption of locally administered individual care plans which are effective in improving health outcomes, minimising disability and maximising quality of life.

Introduction

The profound health disparities experienced by indigenous Australians are well documented. In many respects, they represent the most enduring adverse health indicators within contemporary Australian society. In essence, indigenous people fare worse in virtually all markers of health and social status across the life course and the differences appear to be widening. Premature mortality, largely due to diseases that are preventable, remains the primary driver of inequalities. Death during the years that are normally considered the most productive of someone's life, serve not only to widen differences in life expectancy but also to perpetuate the cycle of disadvantage faced by indigenous communities.

The burden of chronic disease in Aboriginal communities is devastating. As a population, indigenous people have the highest rates of cardiovascular, diabetes and renal mortality in the country. The contribution of these chronic cardio-metabolic conditions to the overall burden of disease is now recognised and, as a result, the independent and synergistic impacts have become a target for significant policy reform.

Despite the enormous burden of respiratory illnesses in indigenous people, as articulated within this publication, this has yet to be recognised as a critical priority in the Australian health reform landscape.

The impact of respiratory illness as a key driver of the elevated burden of disease and as a major contributor to the lower life expectancy in indigenous Australians is almost without peer. This relates not only to the enormity of the problem and the differences between populations but also to the fact that few (if any) clusters of conditions that have such profound impacts across the life-course remain.

From the moment indigenous children are born until the day they die (frequently prematurely), they are exposed to and often experience respiratory illness, acute and chronic, infective and degenerative, at rates unparalleled and rarely documented within any established market economy across the globe. In fact, one could argue that Aboriginal and Torres Strait Islander children are born into a world of risk for the development of acute and chronic respiratory disease. Indigenous children acquire respiratory pathogens within weeks of their birth. Over the first critical years of life, respiratory illness is the most common reason for hospitalisation and is the primary chronic disease and long-term health condition experienced in childhood. As a result, the health trajectories of indigenous children are largely framed within the context of significant risk for the development of recurrent or persistent respiratory conditions.

In adolescence, a time when people are often their most healthy, indigenous people are experience poor respiratory health and are more likely to be hospitalised, diagnosed with, and die from a wide range of respiratory conditions, most of which are either preventable or increasingly uncommon in non-indigenous Australians.

The burden of respiratory illness experienced by indigenous people remains an important reflection of social disadvantage. Internationally, respiratory illness, particularly ARI. is recognised as a barometer of disparity between populations defined by social, ethnic or geographical disadvantage. Whilst ARI is not exclusively borne by the disadvantaged, the size of the gap in burden is a key indicator of disadvantage itself.

These gaps remain, largely as a consequence of the inadequacy of our political and social institutions' to address the fundamental, insidious and unacceptable determinants of respiratory disease within indigenous people. The most notable and frustratingly static of these are the adverse environmental, financial and educational factors that influence many indigenous people across their life-course. Living conditions that are overcrowded, poorly maintained, inadequately constructed and under-resourced and adverse environmental exposures such as inadequate nutritional status, recurrent exposure to smoking and environmental tobacco smoke and impaired (or over-stretched) immune systems are fundamental determinants of lung health in these communities. Political will, underpinned by adequate resourcing to mitigate these factors, remains a dream rather than a reality.

The increasing attention within the political and health system reform process that is being paid to 'closing the gap' in health status between indigenous and non-indigenous Australians will require that respiratory illness is a major priority. To guide this process, we must seriously appraise our performance in preventing and managing respiratory illness in indigenous communities. In this, it is pertinent to ask how we would rate our activities across the health care system?

Have we adequately resourced, developed, trained and educated primary care workers to better identify and manage risk and disease in these communities? How have we contributed, as a health system and within our advocacy roles, to fundamental approaches to primary prevention for these

disadvantaged people? What can we state our approach and contribution to dealing with the underlying determinants of respiratory illness in these communities has been? Have we ensured that every patient has received necessary care defined by their level of need? Have we equipped indigenous communities with the level of health literacy and awareness that is necessary to prevent and manage respiratory risk and disease?

Unfortunately our status to date has not been so positive. Tragically, health system failures are not suffered by those who have failed to act but by people with the least equipment and resources to deal with them. This is in essence, the face of indigenous health disadvantage.

The question thus remains, how can we define and track a course to improve respiratory health for our indigenous people?

Acceptance of the role of key clinicians and professional organisations in developing and progressing a strategic, broad-based approach to indigenous respiratory health is critical and must, as a minimum, include advocacy that engages robust action to improve the determinants of health in these communities. This must include consideration of the poor environmental conditions in which many Aboriginal families live and improvements in the nutritional status and health literacy of communities.

Tobacco control must provide a foundational pillar to optimise the respiratory health of indigenous people. This has significant potential for immediate and future health gain and must be adequately resourced so that the gains that have been delivered to non-indigenous people can be translated to improved health outcomes in indigenous communities.

We must, as a health profession, also consider the structure and performance of the health care system in contributing to health disparities. Alternative approaches to health system and health program development may be required in the pursuit of quality and equity in care for indigenous people. This will require the development of a workforce with the capacity, resources and support for the evidence-based interventions that must be delivered for health gains to be achieved. This may well be achieved, in part at least, by an integration of health programs into the broader chronic disease reform agenda, particularly focused within primary care. This will require adequate resourcing and a commitment to capacity development within this sector, with a particular focus on Aboriginal primary care networks.

This publication is an important collation of critical, and in many respects, disturbing health data for Australia's indigenous people. The epidemiological and clinical data should serve as a constant reminder across political, social and health institutions of the critical need for coordinated, sustainable, and evidence-based programs.

Respiratory illness continues to exert an inordinate burden on indigenous people to a level far in excess of that experienced by non-indigenous Australians. In isolation, the epidemiological realities are cause for concern and are urgent priorities for public health, governmental and societal action. Assessment of the burden of disease in indigenous Australians bears witness to the clash and synergy between infectious and chronic disease epidemics. The determinants of this burden, such as poverty, poor housing, malnutrition, stress, educational disadvantage and governmental inaction must be addressed to improve health outcomes.

While modern Australia continues to accept the large and growing health and social disparities experienced by indigenous people, it continues to fail in its duty to protect and provide for this sector of the community. Will we be judged on our failures, or will they be silenced like so much of the history of Australia's first people?

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Recommendations (further described in Section 11)

To reverse the premature deaths and major morbidity of chronic respiratory disease in indigenous Australians, we urgently recommend that:

1. An overarching strategic framework is developed to improve respiratory and sleep health. This must encompass socio-political strategies, improved housing, and public health measures including immunisation, education, workforce development, community and household food security, chronic disease management and appropriate research.

2. Innovative and tailored, multilayered approaches to tobacco control are undertaken and sustained to help reduce the very high rates of active smoking in adolescents and adults and exposure to environmental tobacco smoke in indigenous children.

3. Existing healthcare policy in Australia is fully integrated with indigenous health care delivery to ensure that the current priorities of self-management, focused on primary care, continuity of care and physical activity, are linked to the timely diagnosis and optimal management of chronic respiratory disease.

4. Innovative and possibly radical ways (such as financial incentives) to alter behaviour are considered in conjunction with promotion of respiratory and sleep health education programs in order to enhance earlier detection of respiratory and sleep disorders in children and adults.

5. Major health initiatives in chronic respiratory disease resources are developed to enable clinicians at all levels to improve the early diagnosis of, as well as optimally manage, respiratory and sleep conditions.

6. Chronic respiratory care is integrated with other dominant chronic diseases (metabolic syndrome, renal disease, cardiovascular disease) in primary care.

7. A workforce that includes indigenous professionals at all levels of health care is developed to sustain effective and optimal primary, secondary and tertiary services.

8. Health systems and support services are coordinated and appropriate to meet the cultural, social and medical requirements for all ages.

9. Reporting and data systems and processes are developed to monitor the prevalence, morbidity and mortality of respiratory and sleep conditions and the adequacy of their management.

10. Research programs in indigenous respiratory and sleep health are prioritised and initiated and a research base that includes studies on the efficacy of public health and clinical interventions for the prevention and management of common yet poorly researched respiratory illnesses is established.

2. Introduction

The Australian government has recognised that the 17 year gap in life expectancy between indigenous and non-indigenous people must be closed.[1] This requires attending to the prevention and management of common causes of mortality and morbidity. Chronic respiratory disease is the second most common reason for hospitalisation in indigenous Australians [1] after routine (3-4 times a week) hospitalisations for renal dialysis. Furthermore chronic respiratory disease is an independent risk factor for other common diseases such as cardiovascular disorders.[2]

This document focuses on the respiratory conditions that affect indigenous Australians. However health is intertwined with all other aspects of life including education, human rights, social justice, the environment, economy, work opportunities etc. This report recognises the undeniable importance of the social determinants of health that cannot be adequately addressed in this document. 'Health equity through action on the social determinants of health' has been recently documented in a WHO document.[3] The socio-economic issues specifically related to indigenous people are available elsewhere {B32}. The report is limited to health-specific data related to respiratory health, with the following aims:

1. To document the current status of respiratory and sleep health in indigenous people
2. To describe health service resources currently available to indigenous people
3. To compare respiratory and sleep symptoms between indigenous and non-indigenous people;
4. To identify areas of greatest need in terms of disease and disability prevention; specifically to identify key gaps in the treatment and prevention of asthma, smoking related lung disease, respiratory infections including tuberculosis, lung cancer and sleep disorders, and paediatric respiratory illness.
5. To identify key principles in public health interventions that directly influence respiratory and sleep health.
6. To outline a framework for improving respiratory and sleep health-care delivery to indigenous people and to make recommendations for particular regional areas and for health issues that require urgent attention and resources.
7. To provide a reference document for discussion with Federal and State health authorities, indigenous groups, local communities and other professional bodies regarding strategies for promoting respiratory and sleep health and improving health service delivery.

In this report, we summarise the prevalence of respiratory and sleep health problems in indigenous people in Section 4. A survey of health resources is presented in Section 5 and specific respiratory disease and sleep disorders issues are described in detail in Section 6 with indicative case studies presented in Section 8. A framework for the delivery of respiratory and sleep health-care is presented in Section 9. A summary of major issues is presented in Section 11. recommendations on how these issues might be addressed are presented in Section 11.

a)

b) Our intended audience includes health professionals and people in government, politics and administration who formulate policy and promote indigenous health. However, we also hope to reach a broader, general readership. We have added text boxes and an executive summary to detail the issues, our findings, our recommendations and the potential solutions in order to assist people with limited time to access detailed information of particular interest.

3. Background

Summary
- In indigenous people, respiratory diseases and sleep disorders comprise a significant part of excess mortality and make a significant contribution to the huge burden of acute and chronic disease
- The links between poor psycho-social determinants and adverse health outcomes have been documented [3] and specific data relating to indigenous children in WA have been reported.(4)
- Although advances in indigenous health will follow improvements in social determinants, improved clinical care remains critical. This will require application of the best evidence on the prevention and management of common respiratory illnesses.
- The Australian Medical Association and Access Economics estimated that the underfunding of indigenous health in 2007 was M$460, an amount equivalent to just one fiftieth of the federal budget surplus in the same year.

Two health facts stand out from the litany of injustice confronting indigenous people recently documented by Linda Burney – the first indigenous person to be elected to the NSW parliament (1)

First, "The life expectancy of indigenous people is 59.4 years for men and 64.8 years for women compared to 76.6 for men and 82.0 for women in the mainstream." There thus remains a major life expectancy gap. Second, the mortality rate in indigenous infants is 3 times that of non-indigenous infants.

In 2008, the prime minister of Australia, Mr Kevin Rudd, and his cabinet committed to "closing the gap" on the 17 year differential in life expectancy between indigenous and non-indigenous people.

Ms Burney also draws attention to the different health demographics between indigenous and non-indigenous populations: "The indigenous birth-rate is almost double the mainstream – 2.3% compared to 1.2%. The median age of indigenous people is 21 years compared to 36 for other Australians and 39% of indigenous people are under the age of 15 years compared to 20% of the mainstream. A massive 57% of the indigenous population are under 25".

This youthful focus in Aboriginal health, which contrasts dramatically with the "ageing population" focus of mainstream health, does not alter the fact that it is the same chronic diseases that affect adults in both populations. After vascular disease and diabetes with renal complications – the so called "metabolic syndrome" cluster, – COPD is the next most common chronic disease in most indigenous communities. This is partly a reflection of the 60-80% of indigenous adults who smoke.

Between 1981 and 2000 and across all age groups in the NT, respiratory conditions and infections accounted for 16-39% of the difference between indigenous and non-indigenous male life expectancy and 16-28% for indigenous female life expectancy (3). In indigenous children, ARI and gastroenteritis are the most prevalent acute illnesses and in central Australia, bronchiectasis. A significant minority of indigenous children live in rural and remote locations which limits access to health-care and plays a role in the development of chronic respiratory disease. It is accepted that recurrent ARI in the setting of "fourth world" living conditions (third world living conditions in a first world country) lead to bronchiectasis and progression to respiratory failure in early adulthood.

Although some of the mechanistic links are not understood, there is increasing recognition that sub-standard living conditions together with a lack of financial resources and political influence, high unemployment, and low educational attainment and home ownership are associated with poor health outcomes. Overcrowding , poor sanitation, maternal smoking and environmental smoke exposure, alcohol misuse and violence, poor maternal and infant nutrition, low birth weight and immune system compromise are all factors that contribute to the poor respiratory health of indigenous people which commences pre-natally and continues throughout life.

There is an emerging body of evidence which documents causal factors for the excess respiratory disease in indigenous adults and children and provides some insights into appropriate strategies for beginning to address it. [Need ref]

A recent study (5) on the state of health hardware in rural and remote indigenous communities documented the deficiencies in housing stock and immediate living environments. The problems related to electrical safety, washing and hygiene and nutrition practices. The survey, conducted in 132 communities between 1999 to 2006 found that only 11% of houses passed a national safety standard assessment of electrical safety; only 50% had the capacity to wash a child in a tub or bath; only 35% had a functioning shower; and only 6% met the criteria for nutritional hardware: ie storage space for food, preparation bench space and a functioning stove and sink. The immediate causes of these problems related largely to lack of routine maintenance (65%) and faulty installation (25%). In contrast with common misconceptions, only 10% of problems were caused by vandalism or misuse. The study concluded that improvements in the living environment of indigenous people will require a sustained commitment to the planning, funding and implementation of maintenance programs in addition to adherence to the design, construction and supervision outlined in the National Indigenous Housing Guide.(6) This study builds upon a body of evidence that links quality of housing to health outcomes.

Remoteness, or distance from urban communities, also influences the prevalence of some respiratory diseases in indigenous people. Living conditions may be different in remote communities and access to health services involves travelling long distances. Self-reported asthma and chronic sinusitis are less frequent in indigenous people living in remote regions. (9) Table 3.1 shows that the lower prevalence of asthma, chronic sinusitis and other respiratory disease with remoteness is consistent across 2001 and 2004/5.

Table 3.2 shows the same pattern across five categories of remoteness from major cities to very remote settings and also between states, with the NT having lower prevalence of respiratory illness than the more populated states. One explanation is that the lower prevalence of asthma in remote settings may result from more intense allergen and microbial exposure inducing immune tolerance (the “hygiene hypothesis”). A low prevalence of respiratory disease in remote areas does not necessarily imply a lower morbidity in the community because other factors such as reduced access to treatment also affect disease severity.

Table 3.1 Self reported data

% of population	**2001**			**2004-05**		
	Remote	**Non-remote**	**Total Indigenous**	**Remote**	**Non-remote**	**Total Indigenous**
Bronchitis	2	5	4	1	4	3
Asthma	11	19	16	9	17	15
Chronic sinusitis	2*	9	7	2	9	7
Other diseases of the respiratory system	9	14	12	8	14	12
Total	21	33	29	17	30	27

Source: ABS 2006 (2004-05 NATSIHS)

Table 3.2

	1995	**2001**			**2004-05**		
	Non-remote	**Remote**	**Non-remote**	**Total**	**Remote**	**Non-remote**	**Total**
Asthma	20	11	19	16	9	17	15

Source: ABS 2006 (2004-05 NATSIHS)

	Major cities	**Inner regional**	**Outer regional**	**Remote**	**Very remote**	**Total**
Asthma	19	18	15	13	8	15

Source: ABS 2006 (2004-05 NATSIHS)

	NSW	**Vic**	**Qld**	**SA**	**WA**	**Tas**	**NT**		**Total**
Asthma	17	20	15	15	14	19	8	18	15

Source: ABS 2006 (2004-05 NATSIHS)

	2001	**2004-05**

	Indigenous	Other Australians	Rate ratio	Indigenous	Other Australians	Rate ratio
Asthma	17	11	1.5	16	10	1.6

Source: ABS 2006 (2004-05 NATSIHS)

The links between smoking and respiratory diseases such as COPD, lung cancer and asthma are well documented at epidemiologic and clinical levels and, increasingly, in the detail of pathologic mechanisms. These links apply not only to cigarette smoking but also to the environmental exposures of wood-fire cooking, mosaic burning of country and ceremonial smoking practices.

The very high prevalence of tobacco smoking in up to 80% of the adolescent and adult population in many remote Indigenous communities and the poor penetration of smoking cessation programs are critical factors in the high prevalence of respiratory disease in indigenous people. Smoking increases the prevalence of lung cancer but cultural factors and access to treatment play further roles in determining disease outcomes. For example, in Queensland, the mean survival following diagnosis of lung cancer is 4.3 months in indigenous people compared with 10.3 months in non-indigenous people. This difference is largely attributable to differences in treatment (10)

Although little is documented, sleep disordered breathing or obstructive sleep apnoea (OSA) appears to be common in indigenous people as is the “overlap syndrome” with COPD. The obesity epidemic is also evident in indigenous adults and contributes to both conditions and to the prevalence of nocturnal hypoventilation syndromes. These disorders remain largely unrecognised and few facilities for investigation and treatment are available.

Poor sleep hygiene is also a major health issue in both urban and remote indigenous people and is thought to contribute to poor sleep architecture, psychosocial dysfunction, lowered mood and impaired cognition and mental health problems. Cognitive impairment from sleep disruption impairs early learning and results in lost productivity, absenteeism and increased rates of motor vehicle accidents and work-related injuries in adults. Ms Burney again, “in the area of mental health, indigenous people are twice as likely to be hospitalised for mental and behavioural disorders. Aboriginal men are 7 times more likely and Aboriginal women are 31 times more likely to be hospitalised for intentional self harm”. .

The Australian Medical Association and Access Economics estimated the underfunding of indigenous health in 2007 at M$460, an amount equivalent to just one fiftieth of the federal budget surplus in the same year. This situation has remained unaddressed as shown in the following table.

Year	Indigenous Health Shortfall	Budget Surplus	Surplus : Shortfall ratio
2002	M$ 250	B$ 7.5	30
2003	M$ 300	B$ 8	26
2004	M$ 500	B$ 13.6	34
2005	M$ 400	B$ 15.8	40
2006	M$ 460	B$ 14	50
2007	M$ 460	B$ 10	28

However, providing resources is not the whole answer and accessibility also involves providing a health service that indigenous people feel they can use. This is important at all levels including primary care clinics and referral to specialist care and tertiary centres. Resource provision is important but considerable resources already exist in some areas and different, more effective health services are needed.

The development of public health interventions which are known to be effective and exploring new culturally specific ways of delivering health messages and health services needs to be broadened, supported and funded.

Some preliminary respiratory research programs exist in asthma, bronchiectasis, community acquired pneumonia and other respiratory infections, COPD and paediatric respiratory health. The

NHMRC recognises the need for and provides special funding for indigenous health research but a more consistent and co-ordinated research effort is needed. The barriers of living in a remote community, multiple service providers and other factors that make respiratory health research difficult need to be broken down and collaborative programs and links between health researchers need to be fostered at a national level.

4. Prevalence, Mortality and Morbidity of Respiratory Disease and Sleep Disorders in Indigenous Australians

Summary points

Indigenous people have a well-documented health disadvantage with a significant proportion attributable to respiratory disease.

Respiratory disease accounts for:

15% of the ASMR in indigenous women and 19% in indigenous men in the NT, WA and SA;

17 and 29% of the greater mortality rate in indigenous women and men respectively

10% of excess Indigenous deaths

9% of disability adjusted life years

20% of primary health-care reviews

Most premature mortality occurs in the economically productive years prior to 65 years of age

Hospitalisation separation data is 4-5 times higher for pneumonia, bronchiectasis and COPD and 8.5 times higher for acute respiratory failure in indigenous Australians.
The mortality rate in iIndigenous people is

24 times higher for mycobacterial disease

6 times higher for bronchiectasis

4 times higher for upper respiratory tract cancer

3 times higher for COPD and asthma

2.4 times higher for pneumonia and

1.6 times higher for all lung cancer

The hospitalisation rate for all causes is 54.1 per 1000 (95% CI 53.1, 55.0) for indigenous and 17.0 (95%CI 16.9, 17.1) for non-indigenous people; a rate ratio of 3.2.
Limited data suggest that no significant change in the respiratory ASMR for indigenous Australians and no reduction in the disparity between indigenous and other Australians' respiratory mortality as shown by a persisting ratio of 5 for indigenous men and 10 for women.

4.1 Introduction

Estimates of the prevalence of respiratory disease and sleep disorders in indigenous people were provided by the Australian Institute for Health and Welfare (AIHW) and a review of medical records at Austin Health. Hospital admissions were coded into Diagnostic Related Groups under the International Classification of Diseases (ICD-10 AM). The 16 categories and the specific respiratory codes are shown in Table 4.1 (appendix). AIHW provided age-adjusted data for mortality and hospital admissions from death certificate and hospital separations data according to diagnostic groupings for indigenous and non-indigenous people.

There are limitations to estimating the burden of disease in indigenous people from mortality and hospital separation/discharge data and compulsory communicable disease notification systems. Such data are dependent on the collection of information regarding whether affected people were Aboriginal Australians and/or Torres Strait Islanders. Such data have only been reliably collected in the Northern Territory (NT), Western Australia (WA) and South Australia (SA). In 1994, only the mortality data from these regions were considered by the Australian Bureau of Statistics (ABS) to be of sufficient quality to be published. Indeed Queensland, the state with the largest population of indigenous people, did not record indigenous status for deaths prior to 1996. It is much more difficult to assess the burden of disease related to conditions that do not result in hospitalisation or are not attributed as the direct cause of death (eg upper respiratory tract infections and sleep disorders). In addition, people in remote regions may be less likely to attend hospital for treatment

which may lead to an underestimation of the disease burden for conditions such as asthma and respiratory infections.

4.2 Mortality Data

The Australian standardised mortality rates (ASMR) per 100,000 population based on 2002-2004 population data aggregated for the NT, WA, SA and Queensland are shown in table 4.2.1 (appendix). Data are separated by indigenous, status and by gender. Rate ratios (indigenous/non-indigenous people) for mortality and hospital separations are shown in Table 4.3.2. Of key importance; the mortality rate in indigenous people in the selected states is:

- 24 times higher for mycobacterial disease
- 6 times for bronchiectasis
- 4 times for upper respiratory tract cancer
- 3 times for COPD and asthma
- 2.4 times for pneumonia
- 1.6 times for all lung cancer

4.3 Hospital Separation Data

Age-adjusted hospital separation data for each of the 16 respiratory and sleep disease groupings of ICD–10 codes are given in Tables 4.3.1 a and b for each state as the rate per 1,000 population for each gender (appendix). Table 4.3.2 shows rate ratios for indigenous compared to non-indigenous people for these separations.

Some conclusions from these separation data are that:

- Hospitalisations for bronchiectasis and pneumonia are considerably over-represented in indigenous people particularly in WA, Qld and especially in the NT where rates per 1000 population are the highest in the country
- Although hospitalisations for mycobacterial disease are higher in indigenous people, the differential with non-indigenous people is not as high as for mortality from mycobacterial disease suggesting more serious disease and poorer access to treatment in indigenous people
- Although acute and chronic respiratory failure is less frequently made as a final diagnoses, these conditions are also over-represented by 2.5 times in indigenous people
- Hospitalisation with a diagnosis of COPD is 5 times more frequent in indigenous people
- Presentation to hospital with lung or upper respiratory tract cancer is more than 50% higher in indigenous people although this is not as high as the differential in mortality for these conditions.

Table 4.3.3 (in appendix) shows the 1998-2000 total hospital separations for respiratory disease. The hospitalisation rate per 1000 was 54.1 (95% CI 53.1, 55.0) for indigenous people and 17.0 (95%CI 16.9, 17.1) for non-indigenous people; a rate ratio of 3.2.

Table 4.3.2

		Mortality Rate Ratios (Indigenous / non-Indigenous) 4 States (NT, WA, SA and Qld)			Separation Rate Ratios (Indigenous / non-Indigenous) All States		
		Male	**Female**	**Total**	**Male**	**Female**	**Total**
1.	**Mycobacterial**	9.0	27.0	**24.0**	3.3	1.2	**2.1**
2.	**COPD**	2.5	3.2	**2.8**	4.7	5.3	**4.9**
3.	**Bronchiectasis**	15.0	2.4	**6.2**	8.2	3.5	**5.0**
4.	**Asthma**	2.7	3.1	**2.8**	1.5	3.1	**2.1**
5.	**ILD**	1.0	0.8	**0.9**	1.4	1.3	**1.4**
6.	**LRTI**	2.6	2.1	**2.4**	4.0	4.6	**4.3**
7.	**URTI**	2.0	0.3	**1.0**	1.5	2.6	**2.0**
8.	**Pleura**	2.0	*	*****	1.1	1.4	**1.1**
9.	**Aspergillosis**	*	*	*****	9.6	*	*****
10.	**Lung cancer**	1.6	1.7	**1.6**	1.5	1.6	**1.5**
11.	**URT cancer**	3.7	4.2	**3.9**	2.0	2.1	**1.9**
12.	**Mesothelioma**	0.7	1.3	**0.8**	0.8	1.2	**0.8**
13.	**Acute Respiratory Failure**	*	*	*****	2.7	14.3	**8.5**
14.	**Chronic Respiratory Failure**	*	*	*****	2.5	2.5	**2.5**
15.	**Sleep Breathing Disorder**	*	*	*****	0.2	0.3	**0.2**

* too few deaths recorded in these categories to give meaningful estimates

4.4 Limitations and Interpretation of Estimates of Indigenous Australian Respiratory Mortality, Morbidity and Burden of Disease

Where state and territory data are used to identify indigenous status, this appears to be accurate. However the accuracy of recording cause of death depends on the ability of the coding personnel to correctly classify the death and is subject to misclassification. (12) In a study that reviewed the validity of recorded cause of death in adult indigenous people in the NT in 1992, indigenous status was correctly identified but 8% of deaths were erroneously classified at the ICD chapter level. The overall effect was to overestimate circulatory disease deaths by 3.2% and to undercount respiratory disease by 1.3%. If this misclassification error was corrected, we could surmise that respiratory rather than circulatory disease accounted for the highest proportion of indigenous deaths in the NT in 1992.

The accurate enumeration of respiratory mortality, morbidity and burden of disease is further confounded by the fact that indigenous people comprise only a small percentage of the population (2.4% in 2001) and 26%, compared with 2% of other Australians, live in remote or very remote regions.(13) As such, there is a tendency for indigenous people to remain uncounted in mortality and morbidity statistics and this under-ascertainment is likely to lead to an under-estimation of the true burden of respiratory disease in indigenous communities. Findings relating to data from the NT, WA, SA and QLD can only be generalised to Aboriginal and Torres Strait Islanders living outside these areas with caution. The need for the ongoing systems to identify and capture indigenous health outcomes is a clear priority.

Overall Aboriginal and Torres Strait Island people have a much lower life expectancy than non-indigenous people. In 1996-2001, this was 59 years for males and 65 years for females compared to the life expectancy for all Australians of 77 years for men and 82 years for women.(13)

Relying on hospital separation data to assess the incidence and burden of respiratory disease may under-estimate rates in indigenous people. Cultural issues, remoteness and different beliefs about illness may result in illness in some indigenous people being managed in the community, whilst others with the same condition seek treatment in hospital. Self-report data may also lack reliability if there are deficiencies in illness knowledge, literacy or language which will lead to under-estimations of the rates of ambulatory illnesses in indigenous people.

Respiratory disease contributes significantly to premature mortality in indigenous people. Current respiratory mortality for indigenous Australians is comparable with that of non-indigenous people at the beginning of the last century. Florence Nightingale in her pamphlet 'Sanitary Statistics of Native Colonial Schools and Hospitals' noted 150 years ago that *'The hospital returns throw little light on the causes of the disappearance of native races, unless these are found in the great prevalence of tubercular and chest diseases'.* (14) Even in isolated locations with little contact with other Australians, such as the deserts of WA and SA, respiratory disease was an obvious cause of ill health and early mortality. W. Williams reporting in 1880 on British occupation from 1872 in relation to the Yircla Meening people around Eucla on the Nullabor Plain in south-east WA noted that *'Lung disease is their chief complaint and my informant thinks 55 years the greatest age they attain'*(14) The respiratory health of non-indigenous people has improved dramatically since colonisation but this his not been the case for indigenous people.

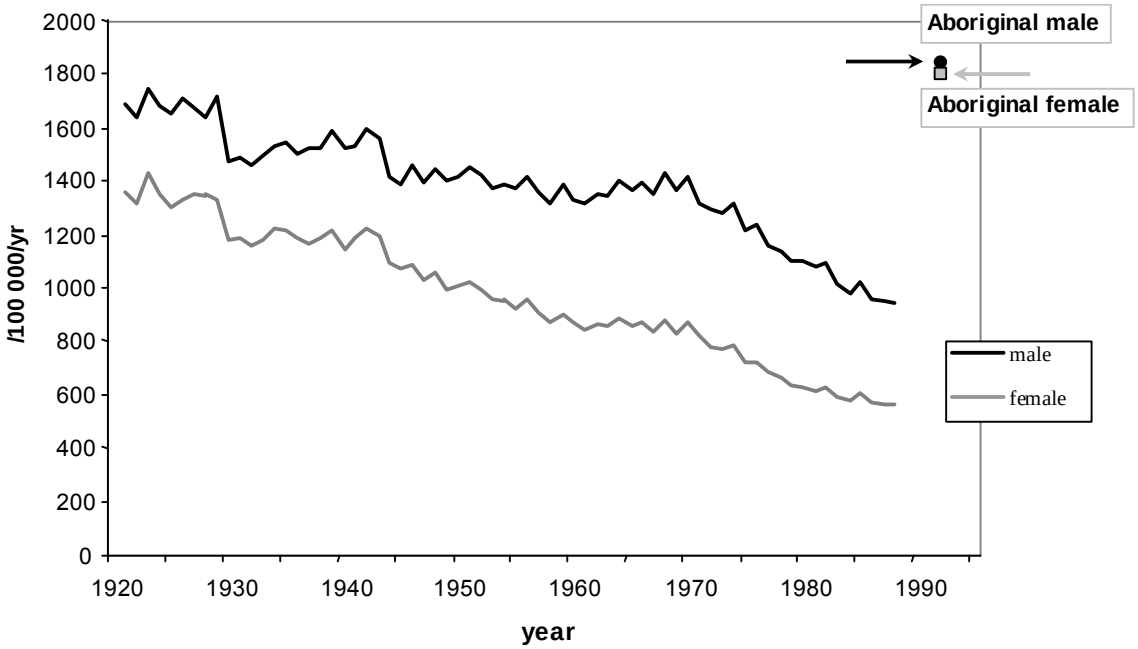

Figure 4.4.1
Australian all-cause death rates (/100 000/yr) standardised to 1996 Australian census data compared with all-cause ASMR for Northern Territory Aboriginal Australians in 1991(15, 16)

A previous assessment of respiratory disease in indigenous people relied on the International Classification of Diseases, (ICD)(17) and used ICD-9 coding for the majority of deaths relating to respiratory disease (excluding neoplasms) that fall under the conditions of pneumonia (480–486), influenza (487), asthma (493), chronic obstructive pulmonary disease (490–492) and allied conditions (494–496) which include bronchiectasis and hypersensitivity pneumonitis.

Using this classification, the ASMR for indigenous people compared with other Australians in the NT from 1979 to 1995 was 5 times greater for men and 10 times greater for women.(18),(15) In the NT, WA and SA respiratory disease accounts for 15% of the ASMR in indigenous women and 19% in indigenous men. In addition respiratory disease is responsible for 17% of the higher mortality in indigenous women and 29% in men (19), (15) and a significant proportion of premature mortality in the economically productive years prior to 65 years of age (20)(see Figure 4.4.2)

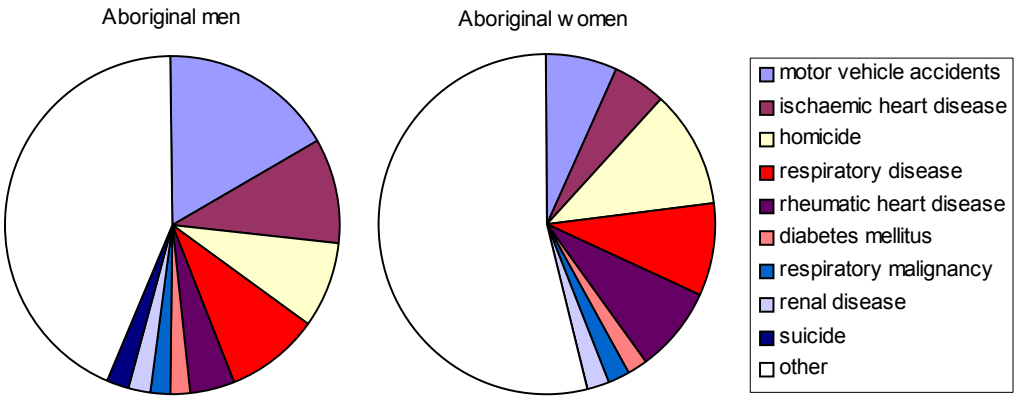

Figure 4.4.2
Contributors to premature mortality ($YPLL_{65}$ - years of potential life lost prior to 65 years) for Aboriginal Australians in the NT (1979-1991) (20)

Whilst clear disparity exists between Indigenous and non-indigenous mortality, the temporal trends in this disparity: *are things getting better or worse?* are conflicting. Mortality from all respiratory causes for indigenous people has unfortunately shown little change. From 1979-1995 there was no significant change in the respiratory ASMR for indigenous people in the NT (18) nor was there any reduction in the disparity in respiratory mortality with a persisting ratio between indigenous and non-indigenous people of 5 for Aboriginal men and 10 for women. An earlier study in the NT supported these findings (15). Respiratory mortality for the larger population of WA, SA and NT combined over the period 1985-1994 again showed no significant change in respiratory ASMR for indigenous people nor any change in the disparity as demonstrated by a constant standardised mortality rate.(19)

For the periods 1991–1996 and 1997–2003 in WA, SA and the NT (Table 4.4.1), there were apparent declines in mortality rates from respiratory diseases in indigenous people, however, these declines did not reach statistical significance. There were no significant changes in the mortality rates from respiratory diseases for non-indigenous people for either period. However the overall mortality rate for respiratory disease remains three times higher for indigenous people.

Table 4.4.1:
Age-standardised mortality rates, rate ratios and rate differences, respiratory diseases, WA, SA and NT, 1991–1996 and 1997–2003

	1991	1992	1993	1994	1995	1996	Annual change[(a)]	1997	1998	1999	2000	2001	2002	2003	Annual change[(a)]
Indigenous rate per 100,000[(b)]	264.5	249.7	217.8	227.1	211.2	234.6	−7.3	162.3	174.3	146.7	176.0	163.9	152.0	154.6	−1.8
Other[(c)] rate per 100,000[(b)]	59.8	67.1	59.6	59.0	53.8	60.0	−1.1	63.6	57.5	54.6	60.1	58.4	62.2	61.6	0.3
Rate ratio[(d)]	4.4	3.7	3.7	3.9	3.9	3.9	−0.1	2.6	3.0	2.7	2.9	2.8	2.4	2.5	0.0
Rate difference[(e)]	204.8	182.5	158.1	168.2	157.4	174.6	−6.2	98.7	116.8	92.0	115.9	105.5	89.8	93.0	−2.1

- Represents results with statistically significant increases or declines at the p<.05 level over the period 1991–1996 and 1997–2003.

(a) Average annual change in rates, rate ratios and rate differences determined using linear regression analysis.
(b) Rates have been directly age standardised using the 2001 Australian standard population.
(c) 'Other' includes deaths of non-Indigenous people and those for whom indigenous status was not stated.
(d) Mortality rate for indigenous Australians divided by the mortality rate for other Australians.
(e) Mortality rate for indigenous Australians minus the mortality rate for other Australians.

Source: AIHW analysis of AIHW National Mortality Database.

Mortality rates for individual respiratory conditions shows that persistent and unchanging excess respiratory mortality in indigenous people is not due to all respiratory conditions or present in all regions. The differences are reviewed for individual diseases in Section 6.

It is clear that indigenous people have a well-documented health disadvantage with a significant proportion of this attributable to respiratory disease. Systems for the ascertainment of indigenous mortality data require ongoing development. However the persisting and unchanging disparity between indigenous and non-indigenous respiratory mortality requires more effective efforts to better optimise respiratory health, prevent the development of respiratory disease and provide accessible, acceptable and sustainable respiratory health-care services to indigenous Australians with established lung disease.

5. Health Resource Provision for Indigenous Australians

Summary points

Provision of pulmonary rehabilitation programs, asthma education, bronchoscopy services, access to respiratory function testing and sleep study facilities are largely non-existent in many remote areas. This necessitates patient transport to the population centres of Adelaide, Darwin, Cairns, Townsville, Brisbane and Perth for many of these services.
Provision of sleep disordered treatment modalities such as CPAP and non-invasive ventilatory support are similarly restricted to large centres and unavailable in almost all remote communities.
For the burden of respiratory disease described in Section 4, there are comparably few respiratory resources for best practice management of respiratory and sleep diseases.

Introduction

In state capitals and the coastal population fringe of Australia, indigenous health-care is largely assimilated into mainstream health services though, in many places, indigenous-specific primary health clinics that are funded through a variety of mechanisms operate in parallel. The large numbers of indigenous people living in remote communities are generally served by local health clinics usually operated by nursing staff and some with visiting, or occasionally, a resident general practitioner (GP).

Emergency services, including the Royal Flying Doctor Service, can be accessed to fly out the critically ill but the high cost of evacuation constitutes a disincentive in this regard. Some communities have outreach specialist services provided at intervals of a few months or longer. Indigenous people living on outstations or who live “in the country” and have returned to traditional homelands usually “walk in” to the main population centres for health care. In the North, the wet season isolates these people for months at a time every year.

Data collected in 2006 to quantify the level of respiratory and sleep health resources in the NT, the Kimberley region and far north and north Queensland are given in tables 5.1, 5.2 and 5.3.

Table 5.1 Respiratory and sleep health resources in the Northern Territory

Northern Territory	Alice Springs	Tennant Creek	Katherine	Darwin	Nhulumbuy	Total NT
Total population	**42,000**	**3,000**	**20,000**	**115,000**	**16,000**	**196,000**
Urban population - total	**27,000**	**3,000**	**10,000**	**100,000**	**4,000**	**144,000**
- indigenous	**3,000**	**2,000**	**3,000**	**18,000**	**1,000**	**27,000**
Remote population - total	**15,000**		**10,000**	**15,000**	**12,000**	**52,000**
- indigenous	**15,000**		**9,000**	**15,000**	**12,000**	**51,000**
Indigenous % total	**42%**	**66%**	**60%**	**29%**	**81%**	**40%**
Primary Care Clinics (GPs)	**3 (15)**	**1 (1)**	**Whirli 1 (4)**	**3 (10)**	**2 (2)**	
Remote Primary Care Clinics	**West 16 East 8**	**Barkley 6**	**E Sunrise 8 (4) West KHS 8 (3)**	**20 (12)**		
Major Hospitals	**ASH**	**TCH**	**KH**	**RDH**	**NH**	**5**
Beds	**150**	**20**	**65**	**350**	**32**	**627**
Hospital medical officers	**55**	**4**	**10-15**		**9**	
Nurses	**200**			**700**		
Indigenous Health Care Workers	**20**			**30**		
Physiotherapy	**y**			**y**		
Gen/Phy (Community Phy)	**5 (1)**	**n**	**visiting**	**14 (1/2)**	**n**	**20**
Respiratory Physiotherapy	**visit 1/12**	**n**	**n**	**visit 1/12**	**n**	**n**
Respiratory Nurse 1	**1**	**n**	**n**	**1**	**n**	**2**
Thoracic Surgeon	**n**	**n**	**n**	**n (vats)**	**n**	**n**
'Paediatric Respiratory Physician'	**1**	**n**	**visiting**	**visiting**	**n**	**1**
Fibreoptic Bronchoscopy	**y/n adult, y paed.**	**n**	**n**	**y**	**n**	**n**
Radiology – CXR	**y**	**y**	**y**	**y**	**y**	**y**
High Resolution CT Scan	**y**	**n**	**n**	**y**	**n**	**y/n**
Spirometry	**y**	**y/n**	**y**	**y**	**y**	**y**
Gas Transfer	**y**	**n**	**n**	**y**	**n**	**y/n**
Arterial Blood Gases	**y**	**n**	**y**	**y**	**y**	**y**
Exercise tests	**6MWD**	**n**	**n**	**6MWD**	**n**	**n**
Pulmonary Rehab.	**y**	**n**	**n**	**y**	**n**	**2**
Asthma Education	**y**	**n**	**n**	**y**	**n**	**2**
Smoking Cessation	**y**	**n**	**n**	**y**	**n**	**1**
Skin Prick tests	**n**	**n**	**n**	**n**	**n**	**n**
Sleep Laboratory (n/yr)	**1 (200)**	**n**	**n**	**1 (400)**	**n**	**2 (600)**
CPAP	**y**	**n**	**n**	**y**	**n**	**2**
MAS	**n**	**n**	**n**	**n**	**n**	**n**

Abbreviations: ASH= Alice Springs Hospital; CPAP= Continuous Positive Airway Pressure; KH= Katherine Hospital; KHS= Katherine Health Service; MAS= **Mandibular Advancement Splints**; MWD= minute walk distance; NH= Nhulumbuy Hospital; RDH= Royal Darwin Hospital; TCH= Tennant Creek Hospital; VATS= Video assisted thorascopic surgery- .

Table 5.2 Respiratory and sleep health resources in the Kimberly Region

Kimberley Region (WA)	Broome	Wyndham	Derby	Fitzroy Crossing	Kununurra	Halls Creek
Total population	**18,507**	**8051 inc KNX**	**9138 inc FX**	**see DBY**	**see WYN**	**3,556**
Indigenous % total	**23%**	**26.26%**	**45.16%**			**76.97%**
Primary Care Clinics (GPs)	**2**	**0**	**0**	**0**	**0**	**0**
Remote Primary Care Clinics	**4**	**2**	**5**	**8**	**3**	**5**
Aboriginal comm-contr health service	**1**	**0**	**1**	**1**	**1**	**1**
Major Hospitals	**1**	**1**	**1**	**1**	**1**	**1**
Beds	**30**	**10**	**40**	**5**	**20**	**8**
HMO's	**7**	**2**	**7**	**3**	**7**	**2**
Nurses						
Indigenous Health Care Workers						
Physiotherapy	**y**	**n**	**y**	**n**	**y**	**n**
Gen Physician (Community Physician)	**2 for region**					
Respiratory Physiotherapy	**n**	**n**	**n**	**n**	**n**	**n**
Respiratory Nurse1	**n**	**n**	**n**	**n**	**n**	**n**
Thoracic Surgeon	**n**	**n**	**n**	**n**	**n**	**n**
Paediatric Resp??	**n**	**n**	**n**	**n**	**n**	**n**
Fibreoptic Bronchoscopy	**n**	**n**	**n**	**n**	**n**	**n**
Radiology - CXR	**y**	**y**	**y**	**y**	**y**	**y**
High Resolution CT Scan	**y**	**n**	**n**	**n**	**n**	**n**
Spirometry	**y**	**y**	**y**	**y**	**y**	**y**
Gas Transfer	**n**	**n**	**n**	**n**	**n**	**n**
Arterial Blood Gases	**lab**	**iSTAT**	**lab**	**iSTAT**	**lab**	**iSTAT**
Exercise tests	**y**	**n**	**y**	**n**	**y**	**n**
Pulmonary Rehabilitation.	**n**	**n**	**n**	**n**	**n**	**n**
Asthma Education	**n**	**n**	**n**	**n**	**n**	**n**
Smoking Cessation	**y**	**y**	**y**	**y**	**y**	**y**
Skin Prick tests	**n**	**n**	**n**	**n**	**n**	**n**
Sleep Laboratory PSG	**n**	**n**	**n**	**n**	**n**	**n**
CPAP some machines distributed from Perth						
Mandibular Advancement Splints						

Abbreviations: see table 5.1

Table 5.3 Respiratory and sleep health resources in Queensland's Northern Region

Queensland: Northern Area Health Service					
Service District		**Far N Qld SD**	**N Qld SD**	**NW Qld SD**	**Mackay SD**
Total population	**608,836**	**231,050**	**196,670**	**30,942**	**150,175**
Indigenous	**58,520**	**33,117**	**12,906**	**7,018**	**5,480**
Non - Indigenous	**506,592**	**180,567**	**173,340**	**20,710**	**131,980**
Not specified	**43,724**	**17,365**	**10,426**	**3,214**	**12,719**
Indigenous, % total	**9.6 – 16.7**	**14.3 - 21.8**	**6.5 - 11.8**	**22.6 - 33.0**	**3.6 - 12.0**

Major Hospital	**Cairns Base**	**Townsville**	**Mt Isa**	**Mackay**
Beds (approx.)	**330**	**350**	**150**	**250**
Small Hospitals	**7** incl Thursday Is.	**8**	**2**	
Primary Care Clinics (GPs)				
Remote Indigenous Community Clinics	**20**	**1**	**2**	**1**
Indigenous Health Care Workers at hospital	**y**	**y**	**y**	**Y**
Physiotherapy Treatment	**y**	**y**	**y**	**Y**
General Physicians (Community Physician)	**10 (2)**	**25**	**2**	**6**
Respiratory Physician	**3**	**3**	**0**	**1**
Respiratory Nurse	**3**	**2**	**0**	**0**
Thoracic Surgeon	**0**	**3**	**0**	**0**
Paediatric Resp??	**visiting**	**visiting**	**0**	**visiting**
Fibreoptic Bronchoscopy	**y**	**y**	**n**	**y**
Radiology - CXR	**y**	**y**	**y**	**y**
High Resolution CT Scan	**y**	**y**	**y**	**y**
Spirometry	**y**	**y**	**y**	**y**
Gas Transfer	**y**	**y**	**n**	**y**
Arterial Blood Gases	**y**	**y**	**y**	**y**
Exercise tests	**y**	**n**	**n**	**n**
Pulmonary Rehabilitation	**y/n**	**y**	**n**	**?**
Asthma Education	**y**	**y**	**n**	**?**
Smoking Cessation	**y**	**n**	**n**	**?**
Skin Prick tests	**y**	**y**	**n**	**?**
Sleep Laboratory PSG (n/yr)	**1 (800)**	**1 (1000)**	**n**	**1 (500)**
CPAP	**y**	**y**	**y**	**y**
MAS	**y**	**n**	**n**	**n**

Abbreviations: See table 5.1

Ideally a direct comparison of disease burden vs available resources for respiratory and sleep health (prevention and treatment) should be presented. However with the lack of data, this comparison was not possible. Some observations on close analysis of the tabulated data suggest the following:

- There is understaffing of many remote indigenous health clinics and primary health services with many unfilled GP positions and a high turnover amongst nursing and allied health staff. In late 2006, there were 22 unfilled GP positions in the NT.
- Existing respiratory clinical services are potentially adequate for large city and urban dwelling indigenous people where access to mainstream and indigenous community controlled primary care clinics and mainstream hospitals is available. However, for many people living in remote communities and homelands, this is not the case.
- At specialist level, “community” general physicians provide chronic disease management care plans in some communities in central Australia and far north Queensland, but secondary and tertiary (respiratory and sleep specialists) levels of medical cover are mostly under-resourced. A full-time adult respiratory physician in the NT was appointed to Darwin Base Hopsital in early 2010, but there are none elsewhere in the NT or the north of WA. The far north Queensland model provides respiratory clinics in remote communities including on the western side of Cape York and in the Torres Strait which are visited 3-6 times annually by respiratory physicians and nursing staff from Cairns Base Hospital. This is seen as an effective way of delivering chronic respiratory disease management. Spirometry and chest radiography are provided and a respiratory care plan is put in place and revised at each outpatient visit. This is accessed and implemented by local clinic nurses who live in the communities and by GPs who visit, usually on a weekly basis.
- Provision of pulmonary rehabilitation programs, asthma education, bronchoscopy services, access to respiratory function testing and sleep study facilities are all largely non-existent in many remote areas. This necessitates patient transport to the population centres of Adelaide, Darwin, Cairns, Townsville, Brisbane and Perth for many of these services.
- Provision of sleep disordered treatment modalities such as CPAP and non-invasive ventilatory support are similarly restricted to large centres and unavailable in almost all remote communities.
- Respiratory health education and promotion and disease prevention presents a major challenge for health-care providers in both mainstream and indigenous populations. Whilst there are some excellent programs in both city/urban and remote locations, there are many areas without these programs, particularly in remote regions.
- There is a need for substantial collaboration and co-ordination between clinicians providing primary and obstetric care, public health professionals, paediatricians and respiratory specialists in delivering comprehensive education and advice about respiratory health.
- There is an urgent need for more research into developing better and more successful strategies for preventing smoking uptake and controlling respiratory infections. It is also important that cross-cultural approaches to health education are developed and that materials are circulated in indigenous languages.

6. Specific Disease Issues

Summary points

COPD and asthma

- COPD is recognised as one of the four most common chronic diseases (after cardiovascular disease, diabetes and renal disease). COPD affects approximately 20% of indigenous people nation-wide but the prevalence is higher in remote communities
- The significantly higher prevalence of COPD and rate of hospital admission (separation rate for indigenous people is 5 times that of other Australians) translates to a higher mortality from this condition (rate ratio 2.8)
- The overall prevalence of asthma in indigenous people is 16.5 (95% CI 14.9–18.1) which is higher than in other Australians at 10.2 (95%CI 9.7–10.7).
- Asthma morbidity is higher in indigenous people, with higher hospital separation and hospitalisation days for all age groups. The hospital separation rate for asthma was 2.1-fold higher in indigenous people
- Indigenous people are 3.2 times more likely to die from asthma (age-specific mortality)

Pneumonia and bronchiectasis

- Indigenous people are 5.5 more likely to be admitted to hospital with pneumonia
- Pneumonia is a significant contributor to indigenous respiratory morbidity and mortality in that it accounts for approximately one of third of respiratory-related deaths in regions where the data are more reliable.
- In central Australia, the bronchiectasis rate is 147 per 10,000 indigenous children (1 in every 68). This is much higher than rates of cystic fibrosis (CF) in Australia of 3.6 per 10,000.
- Long term reduction in bronchiectasis is likely to be primarily driven by a reduction in the burden of ARI which will require a number of public health interventions

Tuberculosis

- The annual incidence of tuberculosis in indigenous people is 8.7 per 100,000 which is much higher than in non-indigenous people at 0.8 per 100,000.
- The mortality rate ratio for indigenous compared to non-indigenous people is 24-28

Sleep health

- The hospital separation rate ratio for chronic respiratory failure in indigenous compared with non-indigenous people is 2.5 and for acute respiratory failure is 8.5
- Despite the above, the only available data on sleep issues in indigenous children reported a snoring prevalence of 14.2% (95%CI 12.5-19.6).

Lung cancer

- Age-standardized incidence rates for lung cancer in 2000-2004 had a 49% higher incidence in indigenous males and a 55% higher incidence in indigenous females
- The mortality rate for lung cancer in indigenous people is higher than the rate in non-indigenous people (4 times in Queensland and 3.6 in the NT)
- The prevalence and death rates related to lung cancer would be much higher if indigenous people had the same life expectancy as the rest of Australia.

Children

- Respiratory illness is the most common reason for hospitalisations for infants and children (rate ratios of 3.2 and 1.4 respectively)
- Respiratory diseases is the most common (19%) long-term health condition in indigenous children aged 0-14 years
- The mortality rate for indigenous infants with respiratory disease is 11 times that of non-indigenous infants.

Specific respiratory diseases and sleep disorders are considered in this section. The data provided are specific to indigenous people and where available, comparative data with other indigenous populations are provided. Information for non-indigenous Australians is available elsewhere in the many standard reports. Primary, secondary and tertiary preventative interventions are common for almost all respiratory diseases and thus these are grouped in section 9 as intervention points. Disease-specific interventions are noted at the end of each subsection.

For diseases related to national priority areas, (asthma and cancer), additional intervention points are generic for the general population. These are available in the National Service Improvement Framework documents.(81) (www.cancerlearning.gov.au/docs/CancerPDFramework.pdf)

6.1 Chronic Obstructive Pulmonary Disease in Indigenous Australians

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COPD is characterised by airway inflammation and airflow obstruction that is not fully reversible.(21) Whilst the definition and diagnosis of COPD relies on spirometry (a breathing test), limited access to this equipment means mortality and morbidity estimates for indigenous people are more often informed by clinical examination.

Airflow obstruction due to COPD is defined as a forced expiratory volume in one second (FEV1): forced vital capacity FVC) ratio of < 70% and an FEV1 < 80% predicted which is not fully reversible with bronchodilators (eg Ventolin®). When this ratio remains below 70% after bronchodilators, fixed airway narrowing is present and in combination with a consistent history, a diagnosis of COPD can be made. This definition is used to classify a severity of disease which is labelled as Stage II or greater (ref Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Global Initiative for Chronic Obstructive Lung Disease, 2006. http://goldcopd.org/ (accessed March 3, 2009). Fixed airflow obstruction also occurs in people with chronic asthma and bronchiectasis. Whilst the exact cause of fixed airflow obstruction can be confusing in a minority of cases, the impact of the airflow obstruction on symptoms, disability, health care utilisation and premature mortality is similar irrespective of the cause. Asthma and bronchiectasis are addressed in more detail in other sections of this report.

Nationally, COPD affects approximately 20% of indigenous adults (table 6.1.1) but the prevalence exceeds this in remote regions. Tobacco smoking is the major contributor to COPD.(22, 23) but other contributors are nutrition and growth during pregnancy and in early childhood (24, 25), lung infections in early life(26) and environment factors, including exposure to air borne pollution (27, 28) and environmental tobacco smoke (ref). All of these factors are more prevalent in indigenous communities.(13)

Burden of disease

In this section, mortality and hospital morbidity/separation data and community-based surveys are reviewed to describe the impact of COPD on indigenous people.

Whilst the overall burden of COPD in indigenous people is difficult to assess, several isolated studies provide initial insight. More detailed knowledge will be provided by the Australian Burden of Obstructive Lung Disease (BOLD) study, which is funded by the National Health and Medical Research Council and commenced in 2008. A summary of previous surveys is shown in Table 6.1.1. All of these studies suffered from varied diagnostic classifications, selection bias and limited generalisability.

Table 6.1.1 Previous surveys of Indigenous Australian respiratory health and estimates of COPD

Site	Population	Case definition	Prevalence	Reference
Northern Queensland	20 years and older	abnormal chest x-ray, a pre-existing diagnosis of chronic lung disease	20%	(29)
Central NT and northern QLD	20 years and older	chronic cough, recent wheeze, abnormal examination or the presence of airway hyperactivity	54%	(30, 31)
Northern WA	18 years and older	MRC criteria (32) for chronic bronchitis (cough productive of sputum for more than three months)	18.4%	(33)
Northern NT	18 years and older	chronic bronchitis and/or recent wheeze and/or respiratory signs with airflow obstruction	16.7%	(34)

Although there are no comparative COPD prevalence data for non-indigenous populations, a survey of Sydney residents aged over 40 years found a prevalence of Stage II or greater COPD of 10.8% (ref Lancet 2007; 370: 741-750). The prevalence of COPD of similar severity in a comparable age cohort in a single NT indigenous community was over three times greater (ref 34).

Another perspective can be gained from hospital admission data (Table 6.1.3 in appendix) and mortality figures (6.1.4 in appendix) provided for 2000-2004 by AIHW which show 5 fold higher rates in indigenous compared with non-indigenous populations in Queensland, WA, SA and the NT. This provides a perspective on more severe illness, is more likely to reflect acute exacerbations of COPD, and may be influenced by misclassification bias. Nevertheless the same disparities are seen.

Hospital admission data in WA from 1983-1991 show age-standardised rates for COPD were 8.8 and higher for indigenous women 4.5 times higher for men (36). Similar over-representation was seen in the NT in 1988 where age-standardised hospital admission rates for COPD were 4.2 times higher for indigenous women and 1.7 times higher for indigenous men (15). This over-representation of respiratory morbidity became more marked over the period 1979-1988.

It is not surprising that the significantly higher prevalence and rate of hospital admission for COPD translates to a greater level of mortality from this condition. As shown in Table 6.1.3 (appendix), the separation rate for indigenous people is 5 times that of non-indigenous people. However despite the severity of the disease, the average hospital bed stay was lower at 5.5 days compared with 7.7 days for non-indigenous people. This raises the possibility of premature discharge without optimisation of respiratory health or continuity of care.

Comparison with international populations

COPD in indigenous people is characterised by a higher prevalence, earlier onset and a greater representation of women compared with populations in medium and high income countries. Table 6.1.2 shows the prevalence of Stage II or greater COPD in a single NT indigenous community with that of a North American cohort. A similar scenario of a higher prevalence of COPD is also illustrated by a comparison with the 12 international sites of the BOLD study (ref). Even in places such as Guangzhou, China where smoking rates are extremely high, Cape Town, South Africa where up to one fifth of participants had a history of tuberculosis, Turkey and the Philippines, the prevalence of airflow obstruction (an essential component of COPD) was only half that of the Australian indigenous population. In the five Latin American countries of the PLATINO study (Lancet 2005; 366: 1875-1881) a similar disparity was seen in the prevalence of airflow obstruction, and thus presumed COPD.

Similar data for indigenous populations living in high average income, ‘developed’ countries, such as the Maori and Pacific Islander populations of New Zealand, the First Nations (Inuit and Métis) peoples of Canada, American Indian/Alaska Native people of the United States and Sámi of northern Europe are unfortunately not available. Nonetheless a recent review of COPD

management at Waikato Hospital in New Zealand indicated a higher burden of COPD and younger age of onset in Maori people (ref Intern Med J. 2007 Dec;37(12):840) and in Alberta Canada, First Nations people were twice as likely to present to emergency departments with asthma and COPD (though half as likely to have a specialist review or spirometry) (ref Chest 2002; 121:1841–1846).

Table 6.1.2 Comparison of the prevalence of moderate obstructive lung disease* in the NHANES# III/US population (37)and a single NT Aboriginal Australian community (ref 34)

	Moderate obstructive lung disease* prevalence		
	NHANES III/US (88–94) %	**NT Aboriginal community (1999)** %	**Ratio** US : NT Aboriginal Australian
Sex			
Male	7.4	20.8	2.8
Female	5.8	29.5	5.1
Age group (yrs)			
25–44	2.3	16.9	7.4
45–54	7.2	41.7	5.8
55–64	14.1	56.3	4.0
65–74	20.7	17.9	0.9
>75	22.9	60.0	2.6
Total	6.6	25.4	3.9

Despite its impact on indigenous health and its contribution to premature mortality and the burden of disease, an accurate assessment of the prevalence of COPD in Aboriginal and Torres Strait Islander populations has not been made. Whilst the current Australian BOLD study will provide this information for indigenous people living in remote and very remote Australia, more accurate measurements of the prevalence of disease in Torres Strait Islanders and the majority of indigenous people living in cities and large regional centres are needed. Such data will allow refinement of the response to preventing and managing COPD in these settings however the available data are sufficient to support early action in improving diagnosis and management.

The key to a diagnosis of COPD is access to high quality spirometry and trained health care staff. Despite the simplicity of diagnosing COPD, many people remain undiagnosed and thus are denied interventions which can delay progression, reduce symptoms and disability and minimise healthcare utilisation. This is even more the case for indigenous people. Improving the diagnosis of COPD requires raising the profile of COPD in indigenous primary health care to ensure the condition is suspected, the provision of affordable spirometers, training and support of primary health care staff to perform spirometry and financial schemes to ensure the cost of diagnosing COPD is commensurate with the funding available.

Key issues and what is needed?

- **Improved diagnosis of COPD**. An essential component of the early detection of COPD is spirometry which is clearly practicable at a primary health care level but is not widely available in rural and remote Australia

A comprehensive strategy is required to raise the profile of COPD (both for patients and primary health care providers) and to improve availability of spirometry and the skill to interpret the results. Community-based profile raising, the provision of subsidises to offset capital costs of spirometers, training opportunities and support for primary health care staff and a remunerative structure to reflect the true cost of spirometry may all be required.

- **Chronic disease management strategies**. Consistency in evidence-based management which is cognisant of the local service and community environment is required. Such management includes accurate diagnosis (spirometry) and assessment of severity (spirometry, blood gas analysis, echocardiography, six minute walk test). The majority of COPD management can occur in the primary health care and community setting if there is access to

appropriate equipment (spirometer and blood gas analyser), procedures/protocols, training and expertise and support (allied health and specialists).

A minimum standard of care for COPD must be defined using existing evidence-based resources (eg COPDX guidelines) and translated to the local service environment (eg local/regional protocols – CARPA, Queensland Chronic Disease Manual, Kimberley chronic disease protocols and standard drug list). Training is required to ensure the ability to diagnose, assess and manage COPD can occur at a primary health care level with access to allied health, specialist support and investigations (eg blood gases, echocardiography).

- **Access to long-term domiciliary oxygen therapy**. Patients with chronic respiratory failure will benefit from long-term domiciliary oxygen therapy. Access to, and support of people requiring, long-term domiciliary oxygen therapy is therefore required and may need to be tailored to meet the needs of indigenous people living in remote and very remote regions.

A comprehensive national system of approval, provision and monitoring of domiciliary oxygen would particularly benefit indigenous patients living in remote and very remote Australia. This would be achieved by access to appropriate facilities for assessment (including portable arterial blood gas analysis and community-based echocardiography) with centralised coordination and specialist support.

- **Access to pulmonary rehabilitation** reduces disability and improves outcomes in COPD. Until 2008, pulmonary rehabilitation was been largely limited to cities and large regional centres.

In-centre, hospital-based pulmonary rehabilitation should be developed in regional centres throughout Australia. Many people living in remote and very remote regions will nonetheless still have difficulty accessing such services. Increasing the availability of pulmonary rehabilitation to people with COPD will require the ongoing development of the primary health care workforce with the support of remote allied health providers (including physiotherapists). The Breathe Easy, Walk Easy program developed by the Australian Lung Foundation in partnership with local health providers, Territory and State Health Departments and Aboriginal community-controlled health services in the Northern Territory and Western Australia provides a model for facilitating high quality primary health care-based COPD care and pulmonary rehabilitation for indigenous people living in remote and very remote regions.

- **Access to the full complement of PBS-subsidised medications for COPD** remains limited due to State Health Department policies (eg *tiotropium (Spiriva)*).

Whilst systems for simplifying medication access are supported, access to the full complement of TGA approved, PBS subsidised medications for COPD should be ensured by local health authorities and State and Territory health departments

- **Smoking cessation programs**. Despite the contribution of tobacco to respiratory and other chronic disease there is variable access to well grounded smoking cessation programs.

Management of COPD requires recognition of ongoing tobacco use, assessment of dependence and readiness to quit, and access to the full complement of proven pharmacologic and non-pharmacologic interventions to facilitate quitting and remaining a non-smoker. This should form a key component of any local COPD strategy and is the minimum standard of care for COPD (see above). Research to evaluate techniques for improving the success of smoking cessation programs for indigenous people in all regions should be supported

- **The capacity of primary health care to manage COPD** is integral in improving diagnosis and treatment for indigenous people. Central to this is the knowledge and skill of primary health care providers including indigenous health workers, nurses, GPs and rural generalists.

Ongoing training and support of primary health care providers is required and should reflect the varying educational needs of all members of the primary health care team. This should include an understanding of the causes and pathophysiology of COPD, targets for primary prevention, diagnosis (including recognition of those at risk and training in the conduct and interpretation of spirometry), assessment of severity and management. Given the parallels with other chronic non-communicable diseases, where possible this should be incorporated into a comprehensive primary healthcare-based chronic disease training strategy.

- **Access to specialist physicians**. Specialists with expertise in managing COPD and other lung diseases (respiratory physicians or specialist in general internal medicine) are needed to provide support to primary health care providers, provide expertise in the development of

policies and protocol, advocate for resources and manage patients with atypical or advanced disease.

COPD management and the development of respiratory services require the input of respiratory or general physicians with respiratory expertise. Community-based outreach programs to remote and very remote regions and to town-based health services with a predominant indigenous clientele should complement the availability of accessible and appropriate specialist respiratory outpatient services. Such outpatient services need to address the cultural, language and transportation needs of indigenous clients.

- **Identifying knowledge gaps and research.** There remains a paucity of data regarding the prevalence of and risk factors for COPD in indigenous people. In addition, the nature and efficacy of different models of service delivery for COPD, including community-based pulmonary rehabilitation and outreach COPD care requires further development and evaluation.

A strategic approach to research regarding COPD in indigenous people should prioritise a accurate assessment of the prevalence of disease and the implementation and evaluation models of comprehensive COPD care including pulmonary rehabilitation.

6.2 Community Acquired Pneumonia in Indigenous Australians

A/Prof Graeme Maguire, James Cook University and Cairns Base Hospital

Pneumonia, and particularly community-acquired pneumonia, is a major contributor to respiratory health-care utilisation, morbidity and mortality for all Australians and even more so for indigenous people. As a condition characterised by infection of the lung, this illness is typically diagnosed using a combination of symptoms and physical signs in the setting of an abnormal chest x-ray. Pneumonia is usually classified by the causative organism (eg pneumococcal, influenza etc) or the setting in which it occurs (ie community-acquired, nosocomial/hospital acquired). Hospitalisation data for pneumonia are determined using ICD-10-AM codes J10–J18(38), a classification that has been shown in predominantly non-indigenous adults to correlate well with agreed clinical definitions of pneumonia.(39).

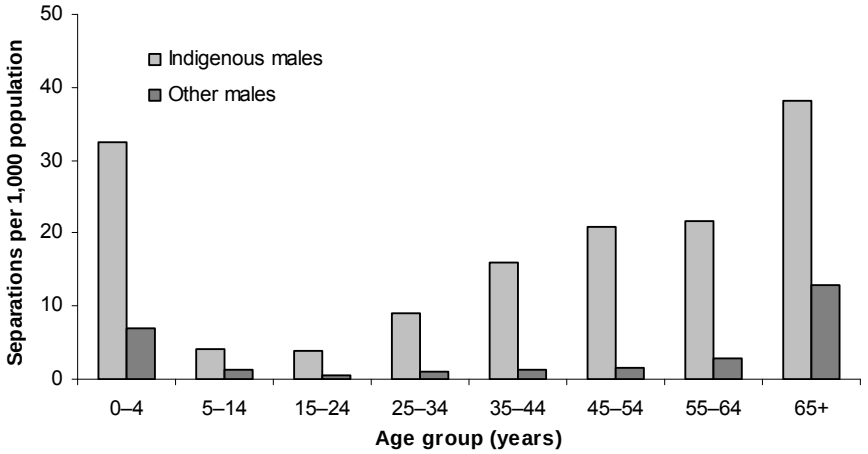
Burden of disease

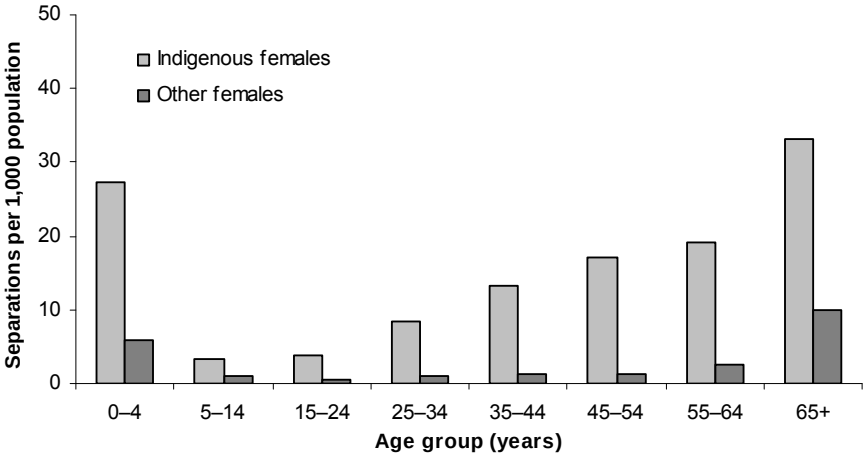
As for most other health-related data, the impact of pneumonia is largely restricted to Queensland, WA, SA and the NT which AIHW regards as having adequate identification of indigenous status (40). As such, these data exclude NSW which has the largest proportion of the total indigenous population (28.7%). Findings relating to tuberculosis as a specific of cause of pneumonia are presented elsewhere.

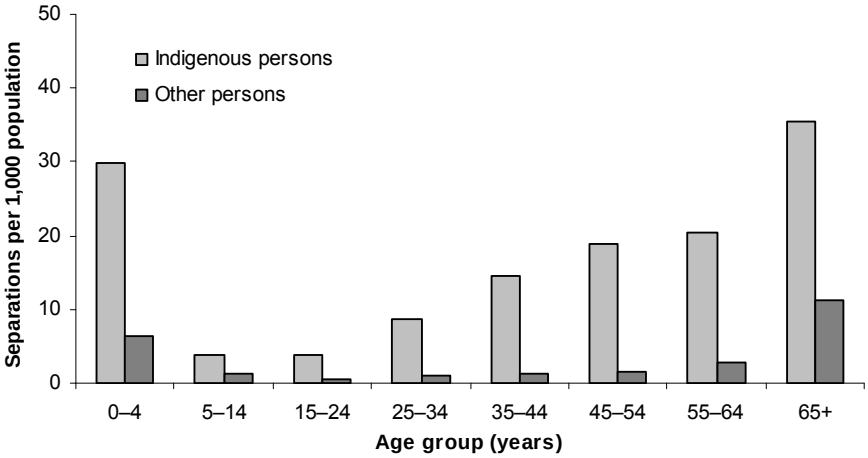
The burden of pneumonia is most accurately assessed by hospitalisations and mortality during or following hospitalisation. It is often only in hospital settings that diagnostic facilities to confirm pneumonia, especially by access to a chest x-ray, are available. As a result, available data are likely to underestimate the true impact of pneumonia especially in remote regions where a lack of access to primary health-care and especially to diagnostic chest x-ray reduce confirmation of diagnosis.

From July 2002-June 2004 indigeous people in Queensland, WA, SA and the NT were 5.5 more likely to be admitted to hospital with pneumonia compared with other Australians (see Figure 6.2.1). More recent enhanced surveillance of community-acquired pneumonia admissions in the Kimberley region of WA and the centre of the NT from July 2005-June 2007 utilising a more stringent definition of pneumonia based on the presence of consistent symptoms and a new abnormality on chest x-ray (B26) showed even greater disparity with indigenous people being 8.1 times more likely to be hospitalised with community-acquired pneumonia compared with non-Indigenous people living in the same region.

Whilst indigenous people had higher hospitalisation rates for pneumonia across all age groups, this was particularly marked in the 35–44 and 45–54 year age groups with rates of hospitalisation for pneumonia 12–14 times higher than the rate of other Australians. The highest rates of hospitalisation were nonetheless in 0–4 year old children and in adults over 65 year age groups for both Indigenous and non-indigenous people.(13)







Source: AIHW analysis of AIHW National Hospital Morbidity Database.

Figure 6.2.1: Age-specific hospitalisation rates for a principal diagnosis of pneumonia by indigenous status and sex in Queensland, WA, SA and the NT betweeen July 2002–June 2004 {B1}

Table 6.2.1 (appendix) presents hospitalisations for a principal diagnosis of pneumonia for July 2002-June 2004 for Queensland, WA, SA and the NT. The data indicate very high rates of pneumonia. In the NT, indigenous people were nine times more likely and in WA, were eight times more likely to be hospitalised for pneumonia. In SA and Queensland, indigenous people were hospitalised for pneumonia at five and three times the rate of other Australians respectively

Whilst trends over time for pneumonia hospitalisations vary, rates for indigenous people tended to fall between 1998–99 and 2003–04 in Queensland, WA, SA and the NT whilst those for non-indigenous people remained stable. This change was, however, only statistically significant for indigenous males. Overall the changes nonetheless translated to a small but significant reduction in the disparity between indigenous and non-indigenous hospitalisations for pneumonia with an average yearly fall in the difference in hospitalisation rates of 0.4/1 000/year.

Table 6.2.2: Age-standardised hospitalisation rates, rate ratios and rate differences from pneumonia, Qld, WA, SA and NT, 1998–99 to 2003–04

	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04	Annual change[(a)]
Indigenous rate per 1,000							
Males	20.0	18.6	17.0	17.2	17.0	17.0	−0.6*
Females	15.6	14.7	14.3	12.5	14.6	14.5	−0.2
Persons	17.6	16.5	15.6	14.7	15.7	15.7	−0.4
Other Australian[(b)] rate per 1,000							
Males	3.5	3.3	3.1	3.3	3.3	3.2	—
Females	2.5	2.4	2.3	2.6	2.5	2.6	—
Persons	2.9	2.8	2.7	2.9	2.9	2.9	—
Rate ratio[(c)]							
Males	5.7	5.7	5.5	5.2	5.2	5.3	−0.1*
Females	5.3	5.3	5.3	4.3	5.1	5.0	−0.1
Persons	6.0	6.0	5.8	5.1	5.5	5.5	−0.1*
Rate difference[(d)]							
Males	16.5	15.4	13.9	13.9	13.7	13.8	−0.5*
Females	12.7	11.9	11.6	9.7	11.7	11.6	−0.2
Persons	14.7	13.7	12.9	11.8	12.8	12.8	−0.4*

* Represents results with statistically significant increases or declines at the p<.05 level over the period 1998–99 to 2003–04.
(a) Average annual change in rates, rate ratios and rate differences determined using linear regression analysis.
(b) 'Other' includes hospitalisations of other people and those for whom Indigenous status was not stated.
(c) Hospitalisation rates for Indigenous Australians divided by the hospitalisation rates for other Australians.
(d) Hospitalisation rates for Indigenous Australians minus the hospitalisation rates for other Australians.
Note: Rates have been directly age standardised using the 2001 Australian standard population.
Source: AIHW analysis of AIHW National Hospital Morbidity Database.

The trend for reduced pneumonia hospitalisation was more encouraging in 0-4 year old indigenous children (Table 6.2.3) in whom the average yearly decline was 2.1/1000/year. Whilst this correlated with a falling gap in pneumonia hospitalisation between indigenous and non-indigenous children of 2.3/1 000/year, the most recent data demonstrate a persisting disparity with a 4.6 times greater rate of hospitalisation in 2003-4.

Table 6.2.3: Children aged 0–4 years, hospitalisation rates, rate ratios and rate differences from pneumonia, Qld, WA, SA and NT, 1998–99 to 2003–04

	1998–99	1999–00	2000–01	2001–02	2002–03	2003–04	Annual change[a]
Indigenous rate per 1,000							
Persons	40.1	36.5	34.8	31.8	30.3	29.6	−2.1*
Other Australian[b] rate per 1,000							
Persons	5.5	5.8	6.2	6.3	6.3	6.4	0.2*
Rate ratio[c]							
Persons	7.2	6.3	5.6	5.1	4.8	4.6	−0.5*
Rate difference[d]							
Persons	34.5	30.8	28.6	25.5	24.0	23.2	−2.3*

* Represents results with statistically significant increases or declines at the p<.05 level over the period 1998–99 to 2003–04.
(a) Average annual change in rates, rate ratios and rate differences determined using linear regression analysis.
(b) 'Other' includes hospitalisations of other people and those for whom Indigenous status was not stated.
(c) Hospitalisation rates for Indigenous Australians divided by the hospitalisation rates for other Australians.
Hospitalisation rates for Indigenous Australians minus the hospitalisation rates for other Australians.
Source: AIHW analysis of AIHW National Hospital Morbidity Database.

Mortality data for Queensland, WA, SA and the NT for 2000–2004 showed 214 deaths from pneumonia and influenza, a rate 2.5 times higher than for non-indigenous people. This difference in mortality tended to be greater in indigenous men (2.8 times) than in women (2.0 times). Overall this accounted for approximately one third of respiratory-related deaths over the period that is 32.6%, (95% CI 29.0 - 36.6) and 2.9% (95% CI 2.5 –5 3.3) of all deaths.

Thus,, there is evidence that pneumonia is a significant contributor to indigenous respiratory morbidity and mortality and accounts for approximately one of third of respiratory-related deaths in regions where the data are more reliable. Hospitalisation data also show a high disparity. Whilst recent decreases in pneumonia hospitalisations for indigenous people are encouraging, the ongoing disparities indicate a need for continued action.

Comparison with international populations

It is clear that indigenous Australians have a high burden of pneumonia, particularly community-acquired pneumonia. Data of the incidence of pneumonia in the New Zealand Maori, American Indian and Alaskan Native peoples indicate that this scenario is not restricted to indigenous Australians. A review of adult pneumonia admissions to Christchurch and Waikato Hospitals in New Zealand from 1999-2000 show a burden of disease in the local Maori population which was 3.03 times that of non-Maori {B27}. A similar but larger review of pneumonia admissions and outpatient reviews in American children under 6 years from 1999–2001 showed that the rate of pneumonia admissions for American Indian and Alaskan Native children was twice the rate of all American children {B28}. American Indian and Alaskan native infants under one year of age were also four times more likely to have an outpatient/primary health care presentation compared with the overall American rate.

Assessment and Surveillance

Key issues pertaining to pneumonia assessment and surveillance include accuracy of diagnosis, aetiology and broader capture of health care utilisation data especially that related to primary health care.

The diagnosis of pneumonia is difficult without access to facilities to undertake a chest x-ray because lower respiratory symptoms may also be related to bronchiloitis, asthma, tuberculosis, bronchiectasis and COPD. The clinical management of suspected pneumonia in remote primary care settings may nonetheless preclude a chest x-ray. It is important that patient transport systems and access to regional radiology services are available to ensure a chest x-ray can be obtained in patients with atypical, frequent or recurrent presentations or persisting symptoms despite empiric treatment.

The absence of a chest x-ray when a patient is hospitalised with pneumonia or attributing a hospital admission to pneumonia when the chest x-ray is normal provides further targets for

enhancing pneumonia assessment and the accuracy of surveillance data. Whilst patients diagnosed with pneumonia in a large Australian capital city hospital are likely to have a chest x-ray (97%) nearly 1/3 of these (29%) show no evidence of pneumonia {B29}. In remote Australian hospitals with radiology services the uptake of chest x-rays was similar (86%) but as in large urban centres, 1/3 (33.3%) of patients with a diagnosis of pneumonia had no chest x-ray performed or the chest x-ray showed no evidence of pneumonia (ref Remond M, Watts J, Maguire G. Improving inpatient management of community-acquired pneumonia in remote northern Australia. Aust. J. Rural Health (2008) 16, 383–384).

Improving the availability of radiology services for people in remote and very remote regions and encouraging a more stringent diagnosis of pneumonia based on the presence of an abnormal chest x-ray will facilitate a greater capture of pneumonia presentations in primary care and improve the specificity of pneumonia diagnosis for indigenous people who are admitted to hospital.

Another key aspect of pneumonia surveillance is a detailed understanding of aetiology. The initial management of pneumonia including the choice of antibiotics is guided by the likely aetiologic organisms. For indigenous people, this is typically informed by data from large Australian city-based studies or by opportunistic surveys of pneumonia aetiology {B25,26}. To date, no comprehensive and consistent data of the causative organisms for pneumonia in indigenous people, particularly in remote and very remote regions, have been collected. The nature of indigenous social and health disadvantage, the associated epidemic of chronic non-communicable disease and the high prevalence of associated chronic lung disease (particularly COPD and bronchiectasis) all increase the likelihood that the aetiology of pneumonia will differ compared with predominantly non-Indigenous, city-based populations. Without detailed data regarding aetiology of pneumonia in remote regions, it remains difficult to develop accurate evidence-based protocols for pneumonia management.

The final issue relates to assessing the true impact that pneumonia has on the health, disability and premature mortality of indigenous people. The importance of making an accurate diagnosis of pneumonia in hospitalised patients has already been made but a significant proportion of the burden of pneumonia, particularly in remote regions, occurs in primary health care. The diagnostic uncertainty associated with managing pneumonia in a setting with limited access to chest x-ray facilities has already been highlighted. However, with an agreed case definition for lower respiratory tract infection and the support to collect comprehensive primary health care utilisation data, it should be possible to develop a greater appreciation of the impact of pneumonia at a community level.

Key issues and what is needed?

- Greater consistency is required in the management of pneumonia including prompt and accurate diagnosis, initial antibiotic choice and follow-up after treatment

Existing protocols for community-based and hospital management should be supported and where possible developed and disseminated in partnership between jurisdictions which share similar environments and pneumonia aetiology

- A greater understanding of the aetiology and assessment of severity of pneumonia particularly in rural, remote and very remote regions is required to inform the ongoing development of management protocols

Refinement of pneumonia treatment protocols requires a greater understand of its microbiologic aetiology. A prospective system of routine comprehensive investigation to ascertain a microbiologic cause of pneumonia presentations to hospital should be supported at selected surveillance sites. Existing prognostic scoring systems utilised in existing pneumonia management protocols are not validated for indigenous people, particularly those living in remote and very remote northern Australia. In addition they do not reflect the realities of local service delivery and availability of pathology and radiology services and do not reliably inform decisions which are largely unique to the remote health care setting (eg requirement for evacuation, etc). Initiatives to evaluate the utility of existing or new prognostic scoring systems should be supported to inform the ongoing development of treatment protocols.

- The accurate assessment of the impact of pneumonia for indigenous people requires a greater appreciation of the impact of this condition at a primary care level.

A consistent methodology for collecting primary health care utilisation data that reflects the nature of urban, rural and remote health care should be supported particularly as it relates to respiratory presentations

- A nationally agreed and implemented case definition for pneumonia which recognises the realities of health care delivery in remote regions needs to be developed for both hospitalised patients and primary health care.

Improved management and outcomes for pneumonia will rely on a valid and clinically relevant case definition for pneumonia. This may need to reflect the limited access to chest x-ray facilities in remote primary health care.

6.3 Bronchiectasis in Indigenous Children and Adults

Assoc Professor. Paul Torzillo

Bronchiectasis and chronic suppurative lung disease typically manifest a spectrum of respiratory symptoms including chronic moist cough, sputum production, haemoptysis, reactive airway symptoms, dyspnoea, recurrent infection and growth failure. Bronchiectasis is usually defined as irreversible bronchial dilatation and is often progressive.

In adults with a typical spectrum of symptoms and x-ray findings, a strong clinical diagnosis can be established. However, high resolution CT (HRCT) scan remains the basis of definitive diagnosis (46, 47). In children with typical symptoms, a diagnosis of “chronic suppurative lung disease” is used when a high resolution CT scan cannot be obtained or has been performed without definitive radiological criteria being met. High resolution CT chest scans should be performed when radiological changes of pneumonia fail to resolve or when symptoms and/or signs suggest bronchiectasis. High resolution CT scanning in children should only be conducted in centres with experience both in performing and interpreting scans as well as administering appropriate anaesthesia. In an ideal situation, bronchiectasis is diagnosed by CT scan abnormalities that persist over time, but this has to be balanced with the potential problems of repeat CT scans in children.(48) For children in remote areas, access to high resolution CT scans is always problematic with numerous logistic and cost issues.

In remote regions with high rates of bronchiectasis, there are marked differences in the ‘phenotype’ of disease. Some patients in their second or third decade have severe disease and often die with pulmonary hypertension and hypoxia. However, there are also patients with a diagnosis established in childhood but who have relatively mild symptoms and minimal exercise limitation into their fifth decade.(9)

Burden of Disease

It is likely that the prevalence of bronchiectasis is generally higher in indigenous people. Data from central Australia suggest very high prevalence rates similar to those in indigenous populations in Alaska (41) and New Zealand(42). The only published data on prevalence is from central Australian Aboriginal children under 15 years of age in which HRCT proven bronchiectasis has a rate of 147 per 10,000 population.(43) This compares with the rates of cystic fibrosis (CF) in Australia of 3.6 per 10,000 population. In addition, recent estimates of the prevalence of bronchiectasis in patients with COPD suggests a likely further pool of indigenous adults with high smoking rates who are likely to also have bronchiectasis.(44, 45)

Aetiology, even within the broad bronchiectasis literature, is controversial and publications often report high levels of underlying specific abnormality although the true contribution of these to bronchiectasis is not certain.(49) In particular, the presence of minor immunological defects is of interest but is not well established as a clear aetiology for bronchiectasis because of a lack of quality controlled studies. In a central Australian study, 12.2% of indigenous children had at least one specific underlying abnormality that included mechanical factors such as aspiration as well as immunological defects.(43)

Historically, bronchiectasis rates are high in populations with high rates of ARI such as in indigenous children in remote regions.(50) However, while early childhood adenoviral infection predisposes to the development of bronchiectasis, there are no quality data about either the microbiological nature of infection, the timing of onset or recurrence and subsequent risk of developing bronchiectasis. In one study in central Australia, an episode of severe pneumonia was a clear risk factor for subsequent development of bronchiectasis.(51)

Long term reduction in the prevalence rate of bronchiectasis is likely to be primarily driven by reduction in the burden of ARI that will require a number of public health interventions around the living environment, reduction in low birth weight, increased breast feeding, reduction in population smoking rates and comprehensive immunisation coverage.

Indigenous children and adults with bronchiectasis are rarely transferred for tertiary level care in contrast to non-indigenous people with bronchiectasis related to CF. At all levels of health care, substantially fewer resources are available to people with non-CF related bronchiectasis compared to patients with CF.

Comparison with international populations

Alaskan Native children have been documented as having high rates of non-CF bronchiectasis since the 1950s. There have been substantial decreases in bronchiectasis in the USA, including in Alaska, but the prevalence of bronchiectasis in the Yukon delta remains high, estimated at 12-20/1,000 births.(Singleton-personal communication) The reported prevalence of bronchiectasis is similar to that of Australian indigenous children in the NT.[4] The age of diagnosis in the Alaskan children is also similar to that in Australian indigenous children (median age about 4.5 years). In New Zealand, the prevalence of bronchiectasis is also high in Maori and Pacific Islanders at 1/1875 for Pacific peoples, 1/4244 for Maori and 1/24,900 for European groups.[5]

Assessment and Surveillance

Investigations are necessary for diagnosis, assessment of disease severity and monitoring. The microbiology of respiratory secretions is important for selection of appropriate antibiotic therapy and also has implications for disease progression. In children, *Haemophilus influenzae, Streptococcus pneumoniae* and *Moraxella catarrhalis* are the most common bacteria isolated. *Pseudomonas* colonisation is more common in adults and this mandates particular approaches to antibiotic therapy.

Since tuberculosis is much more common in indigenous communities, there needs to be a high index of suspicion for this diagnosis in patients with chronic respiratory symptoms. Non-tuberculous mycobacteria are also isolated in patients with bronchiectasis although their pathogenicity is often uncertain.

Immunological competence should be assessed and in this, immunoglobulin levels and IgG sub-class deficiency are probably the most important parameters. In adults assessment for hypoxaemia, pulmonary hypertension and nocturnal respiratory failure is necessary as disease progresses.

Key Issues and what is needed

- Improved management. The mainstay of acute bronchiectasis management is the administration of antibiotics, physiotherapy and nutritional support. Oral antibiotic outpatient therapy is usually administered for mild exacerbations but hospitalisation with intravenous antibiotics is necessary with increasing disease severity. The key maintenance treatment is regular physiotherapy. There may be benefit in long term macrolide antibiotics for which there are encouraging early data of effectiveness.(56)
- Research into evidence based management. There are few quality data to support treatments that are commonly used including bronchodilators and inhaled steroids (52, 53). Respiratory immunisation is generally recommended but, again, without evidence of effectiveness.(54, 55)
- Optimised therapies for indigenous people which include appropriate primary, secondary and tertiary care require ready access to:
    - Standard therapies for suppurative lung disease such as chest physiotherapy
    - Hospital care
    - Microbiology laboratory resources
    - Respiratory function and arterial blood gas assessment
    - Fibreoptic bronchoscopy
    - Echocardiography
    - Centres with the capacity to assess nocturnal respiratory failure.
- Competent and comprehensive primary health-care systems need to be accessible to all indigenous people. While there is a lack of high level evidence of the benefits of particular treatments for bronchiectasis, the gains in life expectancy for patients with CF achieved with active management paradigms provide a model of care. This seems particularly appropriate in the treatment of indigenous children with chronic suppurative lung disease or established bronchiectasis.(57) Early treatment of ARI is likely to be important in reducing the proportion of

children who subsequently develop bronchiectasis although, again, there are no quality studies that establish the efficacy of this intervention. But for this to occur, competent and comprehensive primary health-care systems need to be accessible to all indigenous people.

- Training of health-care professionals. Assessment and treatment of ARI, in childhood in particular, needs to be a focus of the training of health-care professionals who service indigenous populations.

6.4 Asthma

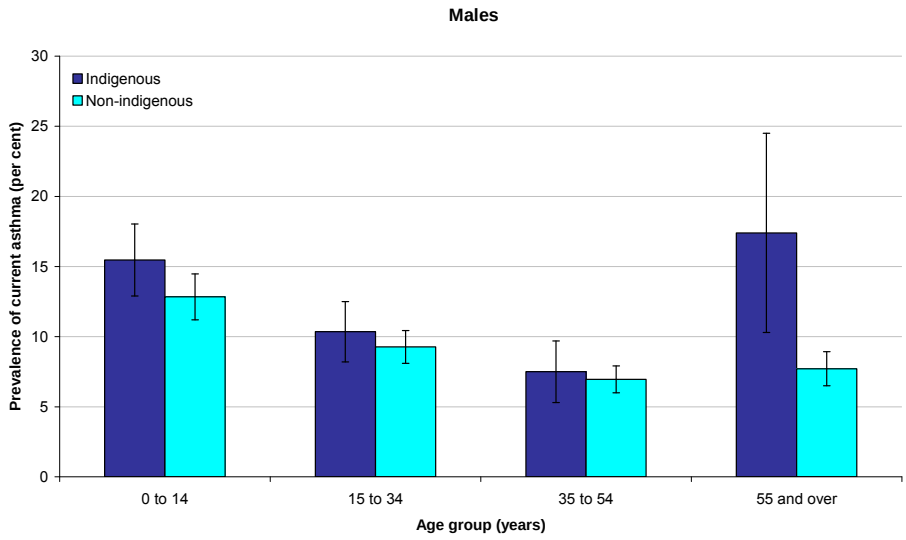
Prof. Anne Chang, Menzies School of Public Health Research, Darwin; Queensland Children's Respiratory Centre and Queensland Children's Medical Research Institute, Royal Children's Hospital, Brisbane

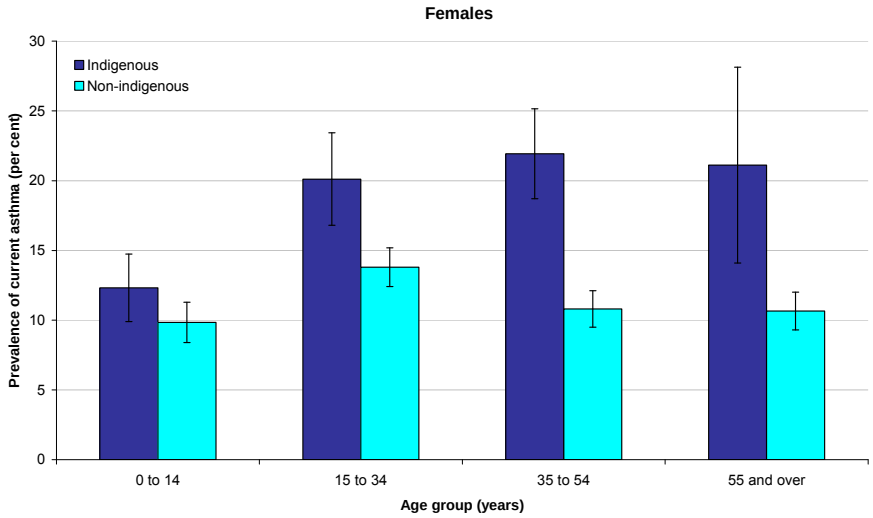
Case definitions for asthma fall into 2 categories; (a) that for asthma itself, and (b) that for asthma severity (mild, moderate severe, intermittent, persistent). Definitions for research purposes are not always useful in clinic settings, especially in rural and remote regions with limited access to specialised respiratory services. A clinically useful definition of asthma was provided in the 2005 ACAM report; "Asthma is a chronic disease causing episodes of wheezing, chest tightness and shortness of breath due to widespread narrowing of the airways within the lungs and obstruction to airflow. The underlying problem is usually inflammation of the air passages, which tend to over-react by narrowing too often and too much in response to a wide range of triggers".[6] However, even this definition of asthma is not completely satisfactory because other diseases such as wheeze with viruses and COPD share some of these features especially in the very young (0-3 years) and the elderly.[6] In clinical settings, when these features co-exist with an underlying disorder such as bronchiectasis, the condition is termed 'asthma-like' as opposed to asthma.

Burden of Disease

According to ABS data, asthma has consistently remained the second most common self reported long-term illness (after eye-sight problems) in indigenous people with a prevalence of 15%(59, 60), a rate 1.6 times of that of other Australians.(59) The updated ACAM data show that the overall asthma prevalence was higher in indigenous people in all age groups.[7]

Figure 6.4.1: Prevalence of current asthma, by age, sex and Indigenous status, 2004–05[7]





Note: **Age-standardised to the Australian population as at June 2001.**
Source: Australian Centre for Asthma Monitoring (ACAM)[7]

The overall prevalence of asthma in indigenous people was 16.5 (95% CI 14.9–18.1) (non-indigenous people 10.2 (9.7–10.7).[7] However the difference was highest in infants aged 0-1 years and therefore the accuracy of diagnosis is questioned. In contrast to data from the ABS and AIHW, (59, 60) prevalence data based on epidemiological research studies has been inconsistent with a prevalence of 0%-28% (62-64) as is reflected in local publications.(64-66) Thus, there is considerable mismatch between the prevalence of self-reported asthma in national health surveys and the published epidemiological data. Up to the last decade, asthma was thought to be very low in indigneous people and a report from the National Asthma Council stated “While ‘city kids’ wheeze in ever-increasing numbers, the incidence of asthma in many remote Aboriginal communities is almost non existent” (67).

Nevertheless, asthma morbidity is higher in indigenous people with higher hospital separation rates and hospitalisation days for all age groups.(62) In 2006–07, the rate of hospital separations for asthma was 2.1-fold higher in indigenous (384.4 per 100,000 population; 95% CI 362.6–406.9) than in non-indigenous people (179.3 per 100,000 population; 95% CI 177.4–181.2).[7] However, hospital separation rates for asthma are highest in the 0-1 year age group in which a misdiagnosis of asthma is most likely. Hospital days for asthma per 100,000 population are also higher in indigenous people in every age group with rates almost 3 times that for other Australians in the ≥55 age group and the smallest difference in the 15-34 age group.(62)

Reported asthma rates in non-remote areas (17%) are almost twice those in remote areas (9%), and higher in people aged >45 years (19%) compared with younger age groups (12-16%). (59) Hospitalisation separation rates for asthma are also higher for indigenous adults living in remote locations and in socio-economically disadvantaged areas.(68, 69) In WA, “ever having asthma” was reported by 24.4% (95% CI, 21.4%–17.6%) of indigenous adolescents, of whom 12.9% (95% CI, 10.8%–15.3%) used asthma medication, and these rates were inversely related to geographic isolation. This compared with 17.3% in non-indigenous 12–16 year olds of whom 8.7% used asthma medication with no association with area of residence.(70) In far north Queensland, a study found a high level (55-88%) of suboptimal asthma therapy and a higher level (30%) of persistent symptoms in indigenous children (5-7%). (71)

The ACAM data also reported that the mortality due to asthma is higher in indigenous Australians than other Australians. Over the five-year period between 2002 and 2006, there were 3.15 (95% CI 2.09–4.56) times more deaths due to asthma in Indigenous Australians than expected based on age-specific mortality rates in other Australians.[7]

In summary, the prevalence data shows that the age-adjusted prevalence of current asthma is higher and more severe (including higher rates of asthma-related hospitalisations and mortality) in

indigenous people. However accuracy of data is uncertain and it is likely that a significant proportion of people have another primary or co-existent chronic respiratory disease such as chronic suppurative disease or COPD. Nevertheless current data suggest that the prevalence of asthma is similar in indigenous and non-indigenous people but the burden of illness reflected by hospitalisations is significantly greater in the indigenous population.

There are no data on asthma expenditure specific to indigenous people and thus the effects of asthma in social and economic terms are also unknown.

In 2004, the National Aboriginal Community Controlled Health Organisation (NACCHO) examined barriers experienced by Aboriginal community controlled health services (ACCHSs) as part of a national evaluation of the Asthma 3+ Visit Plan.(58) The quantitative survey found that "significant barriers exist for ACCHSs to access the Asthma 3+ Plan funding initiative that limits Aboriginal people's capacity to benefit. Around a third of services were immediately 'locked out' of the program on the basis of 'Practice Incentive Program' ineligibility. Moreover, 50% of eligible services reported not using this initiative, and a further 25% were unsure".(58) In addition, 80% of services indicated a problem in patient access to spacer devices and 48% in patient access to asthma medications.(58)

The best model of service delivery for indigenous people with asthma has not been fully evaluated. One paper described a model of specialist services to remote indigenous communities through a community controlled indigenous health service.(71) Based on data on other indigenous groups living in affluent countries,(72) it seems likely that specifically designed programs are required to best provide asthma treatment in indigenous communities.

Assessment and Surveillance

The collection of data on asthma, a designated national health priority area, is relatively well resourced compared with other respiratory illnesses such as bronchiectasis that are also common in indigenous communities.(43) Data on asthma is specifically captured by ACAM (40, 58) and additional national data on asthma prevalence and its burden are available in reports by the ABS (59, 60) and the AIHW.(61)[7] As asthma is a national priority, a national strategic framework exists. Also the National Service Improvement Framework (NSIF) for asthma in Australia which is "intended to drive improvements in health services for people with national health priority area conditions" addresses critical intervention points for the prevention and management of asthma.(81) Specific references to indigenous populations are made throughout the document. Known and universally accepted risk factors for the development of asthma (such as exposure to in-utero and environmental tobacco smoke) are common to most chronic respiratory diseases.

Primary preventative factors include cessation of in-utero smoke exposure, passive and active smoking, low birth weight, and avoidance of poor diet and obesity. The evidence for these factors has been addressed in the NSIF document. Indigenous communities have an increased prevalence of all these risk factors.(81) Factors associated with an increased severity of asthma (secondary risk factors) are: low socio-economic status, under-treatment, poor psychosocial well-being, passive and active smoking and these risk factors are also higher in indigenous communities.(81, 82) For example indigenous people aged ≥15 years are more likely (61%) to be classified as overweight or obese.(59) Also, 51% of indigenous people aged over 15 years smoke compared with 19% of non-indigenous people.(40, 82) In one study, 48% of indigenous children with asthma were exposed to environmental tobacco smoke.(71)

Treatment aimed at assessment of severity and achieving good control is important in the management of asthma. Regular review is required. Primary health-care services that allow for the use of registers, recall and reminder systems and longer consultation times using culturally aware and trained staff, enhance the regular review of indigenous people. Possession of asthma action plans is low (24.9%) in indigenous communities but similar to other Australians (22.5%).[7] The problems of smoking and poor access to quality care are well documented for indigenous people and similar to minority groups in many other affluent countries.[8]

Assessment of co-morbidity in indigenous people with asthma is also important given the high rate of co-morbid conditions. After adjusting for age, 56.1% of indigenous people hospitalised with a principal diagnosis of asthma had at least one co-morbidity in the period 2003–04 to 2005–06.[7] In people aged 15 years and over hospitalised with asthma, the likelihood of having diabetes listed as an additional diagnosis was 2.4 times higher in indigenous people.[7] Indigenous adults hospitalised with asthma also experienced more heart, stroke and vascular disease (rate ratios of 1.5, 95%CI 1.2-2.0).[7]

Comparison with international populations

The prevalence of asthma in rural Alaska natives is low (2%) and stable.(73) In the Canadian province of Saskatchewan, the prevalence of asthma in native Indians was also stable from 1991 to 1998. (74) The prevalence was higher in native Indians than non-native Indians in two age groups (0-4 and 35-64 years) but not at 5-14 and 15-34 years. In the 0-4 years age group, the prevalence of asthma in 1998 was 11% in native Indians, 8% in urban areas and 6% in rural regions; in the 35-64 years age group, the figures were 4% in native Indians, 2% in urban areas and 2% in rural regions.(74) In New Zealand, Maori children aged 6-7 years have a higher prevalence of asthma (32%) than European children (26%) but with similar rates in children aged 13-14 years (25%).(75) Globally, people in minority groups with asthma usually have increased asthma severity, deficient care, are less likely to see a specialist and are more likely to receive poorer case management compared with people from non-minority groups.(76-79) While there are few data for Australia, the scenario is likely to be similar given that institutional racism has been described. (80)

Key Issues and what is needed

- **Interventions that address known contributing factors** to the higher prevalence and severity of asthma in indigenous Australians are required. These include access to and delivery of appropriate services, medications, devices and asthma and tobacco control programs, as well as management of co-morbidities.
- **Improvement in diagnosis.** Discrepancy of data in children and adults suggest that a significant proportion of indigenous people with asthma have an alternative primary diagnosis such as chronic suppurative lung disease. Correct diagnosis is important because this drives therapeutic approaches
- **Appropriate resources**. Recognition of the need to resource specific and supplementary asthma programs in communities with a high asthma prevalence, regular asthma focused clinics and initiatives such as the ‘Asthma 3+ Visit Plan’ and ‘Cycle of Care’ need to be tailored to the primary health-care environment to ensure accessibility.
- **Optimal service provision** requirements have been summarised in the NSIF document. (81) These require delivery of comprehensive primary health-care that includes:

    - Culturally secure and supportive primary health-care environments
    - Specialist services that are integrated with primary health-care and coordination of care that is within the local primary health-care framework
    - Availability of a full range of educational material for asthma as well as a communication strategy that can be tailored to local needs and priorities; these should be developed in consultation with indigenous representative bodies, indigenous people and other major stakeholders
    - Strategies that support and enable access to asthma medications and delivery systems through the PBS
    - More intense and resource appropriate interventions for smoking cessation and prevention of uptake of tobacco use

- **Important research areas** specific for asthma in indigenous people include:
    - Evidence for best approach of optimal diagnosis of asthma and asthma-like symptoms in children and adults
    - More accurate data of prevalence and burden of disease rates
    - Best health service delivery model for people in urban and rural/remote communities
    - Defining what constitutes culturally appropriate asthma information strategies.

6.5 Tuberculosis in Indigenous Australians

Dr. Graham Simpson, Cairns Base Hospital

Burden of Disease

Australia overall has a very low annual incidence of tuberculosis which has declined from around 50 per 100,000 population in the late 1940s to 5-6 per 100,000 over the 1990s. This rate now seems to be stable. This overall satisfactory state of affairs, however, conceals some problems. National figures suggest that some groups of the population have much higher rates of tuberculosis. The two groups most at risk are people born overseas with a reported incidence in 2003 of 19.9 cases per 100,000, and indigenous people with 8.7 cases per 100,000. The incidence of tuberculosis in non-indigenous Australians is 0.9 cases per 100,000.(83)

Even these figures may be misleading with evidence of considerable variation in the incidence of tuberculosis in indigenous people living in different localities. For example, although the overall figures for Queensland are similar to the national figures for indigenous people with a rate of 18.6 per 100,000 reported in 1995, the incidence at the same time was double this at 35.9 per 100,000 in indigenous people living in far north Queensland(84).

Mortality data are scarce. In the NT, it has been suggested that indigenous people are 8-10 times more likely to die or be hospitalised from tuberculosis (85) whereas in far north Queensland, indigenous people have a 20 fold higher risk of death.(84) It is highly probable that both the incidence and mortality from tuberculosis may be under-estimated because autopsy rates in indigenous communities are low and tuberculosis may be a contributor to death in patients with other disease such as chronic renal disease or diabetes. Overall, the mortality from tuberculosis is rare in non-indigenous people at 0.12 per 100,000 (table 4.2.1 in appendix) in contrast with indigenous people at 2.43 per 100,000.

Studies in far north Queensland show a dramatic increase in cases of tuberculosis in the Torres Strait, mainly attributable to increased contact between Torres Strait Islanders and the population of the Western Province of Papua New Guinea, the apparent arrival of both multi-drug resistant (MDR) tuberculosis in the Western Province, and increased HIV per tuberculosis co-infection.(84)

Assessment and Surveillance

Currently the control of tuberculosis in indigenous people relies heavily on case finding and immediate contact tracing. The great mobility of many indigenous people requires an extensive network of health-care services. Management of tuberculosis is challenging because many cases occur in remote communities without resident medical staff. Supervision of treatment relies on extensive medical out-reach services working together with locally employed nurses and Aboriginal health-care workers.

Outcomes in the indigenous population can be improved by rigorous application of the Direct Observation of Treatment Strategy (DOTS).(86) A basic part of DOTS is a stable and continuing supply of first line anti-tuberculosis drugs and Australia is not performing well with the program unavailable in many remote communities. Currently pyrazinamide is only available through the Special Access Scheme and some strengths of ethambutol are not available at all. Of equal concern is the continued failure to allow combination tablets to be supplied in Australia. The availability of combination chemotherapy simplifies treatment considerably and removes many of the worries concerning the development of drug resistance. These preparations, which are available almost everywhere in the world, are still not approved here. Drug resistant tuberculosis has not thus far been a significant problem in Australia or in the indigenous population but there are worrying indicators that this may be changing, particularly with the influx of MDR tuberculosis from Papua New Guinea to the Torres Strait and parts of Northern Australia.(86)

There are several possible explanations for the high rates of tuberculosis in indigenous people. The disease was almost certainly introduced with the white settlement of Australia. The introduction of tuberculosis into a naïve population produces a rapid rise in incidence of active tuberculosis which then declines naturally over succeeding generations. The indigenous population

may still be in this relatively active stage of disease in population terms. However, other risk factors are also important. These include overcrowding, poverty, co-morbidities, high smoking rates, alcohol abuse and poor nutrition. Alcohol use leads to relatively poor success and completion rates for chemo-prophylaxis for latent tuberculosis.(84) Comorbidities such as diabetes and renal disease, both of which are prevalent in indigenous people, also increase the risk of developing tuberculosis as well as increasing severityand likelihood of persistence.[9]

Key Issues and what is needed

- Information on local patterns of tuberculosis. Further information is required so that areas of high disease prevalence can be identified and targeted for more aggressive surveillance and intervention. It is likely that such variations are currently obscured in data gathered on a state or national basis.
- Better linkage of services. More detailed information about specialist out-reach services visiting remote communities would be of interest to identify short-comings in provision of services.
- Increased community awareness of tuberculosis and its consequences.
- Training of GPs and clinic and practice nurses to perform and interpret tuberculin tests.
- Adequately resourced DOTS programs.
- Improved screening procedures to reduce tuberculosis exposure in indigenous people.

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6.6 Lung Cancer in Indigenous Australians

Dr. Ral Antic and Dr. Phan Nguyen, Royal Adelaide Hospital and
Dr. David Roder, Cancer Council of South Australia

Introduction

Lung cancer is a serious and increasing global public health problem with a large impact on Australians. The ill-health and premature death caused by lung cancer is mostly avoidable because of its link to cigarette smoking. Other risk factors are also mainly environmental and therefore controllable. There is evidence that where smoking rates fall, lung cancer rates fall – and where they rise, so does the incidence of lung cancer. However global epidemiological data show large national and regional variations in lung cancer rates, only partly explained by variations in smoking rates.

Burden of disease

Available data show a higher incidence of lung cancer in indigenous people in Queensland and the NT for 1996-2000. In WA, the incidence was similar.(89) In SA from 1977-2001, lung cancer accounted for 13.4% of all cancers in indigenous people compared with 10.5% in non-indigenous people.{DHS Epidemiology, #102} In NSW from 2000-2004, 17.6% of all new cases of cancer (31 per year) were lung cancer in the indigenous population compared to 9.1% in other populations.{Population Health Division, #103}

There are few age-specific data on lung cancer for indigenous populations. NT data from 1991-2001 shows that indigenous people aged 0-64 years had an incidence rate ratio for lung cancer of 3.1 compared with non-indigenous people. The incidence ratio was similar in people aged 65 years or older.(92)

In NSW, data from 2000-2004 show that lung cancer constitutes 22.3% of all new cases in indigenous males, and 13.0% in indigenous females compared with 10.7% and 7.1% respectively in the non Indigenous population. In Queensland from 1982-1996, the standardised incidence ratio of lung cancer was 213 in indigenous males, and 267 in indigenous females.(93)

There is also little national data on whether indigenous people have a worse stage of disease at the time of diagnosis. A retrospective cohort study in the NT reported that indigenous people had a higher proportion of localised lung cancer at the time of diagnosis compared with other people.(94) This was thought to be due to the high prevalence of chronic respiratory diseases and tuberculosis leading to more frequent chest x-rays and other investigations. The age and stage adjusted relative risk of death was 1.4 (95% CI 1.1-1.8).

However, the mortality rate for lung cancer in indigenous people is high. In Queensland, the mortality rate is four times the state average.(94) Data from 1982-1996 from the Queensland Cancer Registry showed that the standardised mortality ratio in indigenous males is 238 (95% CI 170-324) and in females is 262 (95% CI 136-458). NT data shows a mortality ratio of 3.6 in people aged 0-64 years, and 1.4 in people aged 65 years and over.(95) Five year survival rates are 5.2% in indigenous people compared to 11.5% in non-indigenous people. A retrospective cohort study in the NT found that the relative risk of death from lung cancer in indigenous people, adjusted for age and stage, is 1.4 (95% CI 1.1-1.8).(94)

Also the ASDR is higher for all cancers in indigenous people.(95) The AIHW reported that in 2000-2004, 15.4% of all cancers diagnosed in indigenous people were of the lung, bronchus and trachea and that these were the most common cancers reported. Other common sites included female breast (12.7%), large bowel (9.2%), unknown primary (6.4%) and prostate (4.7%). A comparison of age-standardized incidence rates for lung cancer showed a 49% higher incidence in indigenous males and a 55% higher incidence in indigenous females.

During 2000-2005, the most common causes of cancer death in indigenous people, based on relatively complete data for the NT, SA, WA and Queensland, were cancers of the lung and respiratory organs, accounting for about 30% of all indigenous cancer deaths. A Queensland

matched cohort study (96) reported that possible reasons for the higher mortality rate included the presence of more co-morbidities such as diabetes, hypertension, ischaemic heart disease and chronic renal disease. Also indigenous people were less likely to undergo surgery and when surgery did proceed, it occurred later than in non-indigenous patients. Furthermore, they were less likely to undergo all forms of treatment.

In summary, the prevalence and death rates from lung cancer are higher in indigenous people and would be much higher if this population had the same overall length of life as non-indigenous Australians.

Comparison with international indigenous populations

Alaska natives have an odds ratio of 1.4 (95% CI 1.2-1.6) of death from lung cancer compared with white Americans.(97) This is similar to the findings from the retrospective NT cohort study. The American Indian population has also been exposed to radon from uranium mining, which is linked to an increased risk of cancer, including lung cancer. One study has shown that two thirds of lung cancers in uranium miners are of the small cell or undifferentiated variety.(97) There are no available published data on the incidence of lung cancer attributable to radiation exposure in the Australian indigenous population.

Key Issues and what is needed

The Cancer Council of Australia convened a National Discussion forum in August 2004 to reduce the impact of cancer in indigenous communities.(101) with an aim of addressing the imbalance in incidence, mortality and morbidity in the indigenous population. The SA Statewide Cancer Control Plan also outlined recommended measures for cancer control as a whole which could be applied to the indigenous population.(102)

As cancer is a national priority area, a national strategy for cancer exists. However the implementation of this strategy needs to be carefully developed for the indigenous population to:

- Ensure availability and access to effective smoking cessation programs and resources tailored to the needs of indigenous Australians
- Prioritise actions based on likely success of prevention and identify the role of stake holders involved in prevention and management (see section 9).
- Ensure that appropriate health service delivery is available to offer the best opportunity for cure, the limited opportunity for prolongation of life and importantly symptom control.
- Examine whether there are special environmental or genetic risk factors in this group and especially the impact of remoteness.
- Enhance quality of service. The limited data on the quality of service delivery for lung cancer in indigenous populations suggests different attitudes and approaches in providers and consumers which may, at least in part, explain differences in service delivery and survival rates.
- Improve early detection of cancer diagnosis and referral (102). This requires an expansion of education programs to indigenous communities in order to change health behaviours.
- Accessibility and timeliness of cancer care.(102)
- Culturally appropriate psycho-social and palliative care.(102)
- Education regarding palliation in the indigenous community.(101)
- Improve access to appropriate treatments for indigenous patients with lung cancer; eg chemotherapy services to rural and remote communities need to be improved.(102)
- Accessible, appropriate and expedient management of the respiratory complications present in lung cancer.

6.7 Sleep Health in Indigenous Australians

Prof. Rob Pierce, Institute for Breathing and Sleep, Austin Health

Sleep disordered breathing includes the three conditions of sleep apnoea, the "overlap syndrome" which includes obstructive sleep apnoea (OSA) with COPD, and nocturnal hypoventilation. The epidemic increase in obesity in the general population in recent decades has also occurred in indigenous people together with a high prevalence of diabetes mellitus, hypertension and hyperlipidaemia which, with obesity, constitute the "metabolic syndrome". This cluster is a known cause of vascular and renal disease and is also associated with sleep disordered breathing. It is expected that sleep disordered breathing is both highly prevalent and increasing in the indigenous population.

The commonest form of sleep apnoea is OSA. The diagnosis of this condition is made clinically on the basis of symptoms of snoring, witnessed apnoeas and excessive daytime sleepiness and confirmed by overnight sleep studies (polysomnography) to record respiratory and sleep variables. Traditionally, sleep studies have been performed in a hospital sleep laboratory setting but "ambulatory" studies in the patient's home or in a clinic setting even in remote communities are now feasible given appropriate monitoring equipment and sleep/respiratory scientist availability for recording and analysis. Sleep laboratories also exist in most major public and many private hospitals and the number of studies performed in locations such as Darwin, Alice Springs, Cairns and Townsville hospitals are given in tables 5.1 and 5.3.

Burden of Disease

Clinically significant OSA is present in 4-5% of Australia men and 2% of women.(103) However no systematic studies have been undertaken to measure rates in indigenous populations. Indeed there are virtually no data on sleep quality or on the major diseases affecting sleep, that is sleep disordered breathing, insomnia, narcolepsy or periodic limb movement disorder, in indigenous populations.

The prevalence of sleep disordered breathing is not reflected in hospital separation or mortality data because hospital sleep studies are often performed without inpatient admission. Further, although sleep disordered breathing might contribute to mortality via its links with cardiovascular or neuropsychological dysfunction, it would rarely be noted as the cause of death on certification.

Management of OSA consists of weight reduction, wearing a pressurised nose mask to support the airway with continuous positive airways pressure (CPAP) or an oral appliance which holds the lower jaw forward (a mandibular advancement splint. Nasal CPAP is also used in various types of sleep breathing disorders.

The prevalence of sleep disordered breathing is expected to be higher in the Torres Strait Island population given the heavier build of these people. Although an ssociation with increased body weight is well documented in other populations e.g. Maori in New Zealand and in Samoa, this has not been documented in Torres Strait Islanders. Using existing prevalence figures in mainstream communities (103), we would anticipate a prevalence of sleep apnoea of at least 5% of the adult indigenous population.

Along with the high prevalence of both COPD and obesity in indigenous people, a high prevalence of the overlap syndrome and nocturnal hypoventilation is expected but, again, little research has been conducted in these areas.

In children, OSA and the "Upper Airway Resistance" syndrome can result in neuro-psychologic morbidity including reduced attention, concentration, mood and learning ability, reduced growth rate and failure to thrive. With the high prevalence of chronic upper respiratory tract infections in indigenous children, a commensurately high prevalence of sleep disordered breathing is expected. In a study of 1650 indigenous children living in the Torres region in far north Queensland, the prevalence of snoring was 14.2% (95% CI 12.5-15.9), of snorting was 3.6% (95% CI 2.7-4.6) and of restless sleep was 6% (95% CI 4.9-7.2). The prevalence of snoring was significantly higher in

males (17.1%) compared to females (10.8%), P=0.005. Children were five times more likely to have experienced snoring and snorting if they reported wheezing in the last 12 months.

Tonsillectomy and adenoidectomy are very effective treatments for OSA in children but access to these is problematic with long hospital waiting lists in remote areas. There are similarly no data on sleep quality or the prevalence of OSA in indigenous children and facilities for the investigation, diagnosis and management of this condition are completely lacking outside major capital cities.

Sleep disruption is very common in remote communities given the high prevalence of domestic violence and cultural practices which result in music and noise extending late into the night. However, the impact of these factors on daytime performance, school learning, depression and motor vehicle and domestic accidents has not been measured.

Key Issues and what is needed

- Improved access to **investigational resources**. Resources are scarce particularly in the far north. Sleep apnoea due to tonsillar hypertrophy in indigenous children and due to upper airway instability in infants is inadequately recognised and investigated. With only 1000 sleep studies per year performed in Darwin and 200 per year in Alice Springs, the capacity of these facilities to serve both the urban population and also remote regions is grossly inadequate in relation to the large population of patients with sleep disordered breathing. Also, there is a major disincentive to investigate patients with sleep disorders in remote areas because of the transport required to access investigation facilities in major centres.
- Improved education for recognition. There is general under recognition of the clinical impact of snoring, witnessed apnoeas, daytime sleepiness and the symptoms of sleep disordered breathing.
- Improved access to treatment. There is serious lack of access to treatment modalities such as continuous positive airways pressure (CPAP) and mandibular advancement devices for OSA and non-invasive ventilatory support for nocturnal hypoventilation.
- Improved access to management. Patient education, follow-up and infrastructure support required to maintain compliance with therapy is simply missing in remote communities, again mitigating against effective delivery of treatment for sleep disorders in the indigenous population.

6.8 Respiratory Problems in Indigenous Children

Dr. Rob Roseby, Alice Springs Hospital

The disparity for all-cause mortality, lower life expectancy and higher morbidity compared to the general population(104) begins antenatally in indigenous children. For example, indigenous children are more likely to have a lower birth weight and be born into environments where risk factors for disease and death are more prevalent. Indigenous infants have two to four times the national rate of mortality and greater all-cause morbidity in childhood. A major contributor to this is respiratory illness. The major contributors to respiratory illnesses in adults and children are discussed in section 9. Indigenous women tend to have smaller and more premature babies and this is of particular significance with respect to ARI because both conditions are risk factors for subsequent respiratory morbidity (125, 126). However, while there is little doubt that low birth weight and pre-existing small lungs are detrimental for future lung function, there is increasing evidence that other early events in life are equally, if not more important, determinants of adult pulmonary dysfunction.[10,11,12]. Furthermore, the severity (oxygen requirement and length of hospital stay) of ARI episodes in hospitalised children is an independent risk factor for later development of bronchiectasis.[13]

Burden of Disease

In the NT, ARI is the most common cause of hospitalisation (329 per 1000), retrievals from remote communities, and preventable deaths in indigenous infants.[14] The rate of admission to hospital of indigenous children with respiratory disease was over 33 for every 100 live births.(112) Respiratory illness is the most common reason for hospitalisation for infants outside the perinatal period, with a rate ratio of 3.2 in indigenous infants.[15] In 2005–2006, indigenous children aged 1-14 were hospitalised at a rate 1.3 times that of other children of the same age. In indigenous children, diseases of the respiratory system were the leading cause of hospitalisations, followed by injury and poisoning and infectious and parasitic diseases.[15]

Within the category of ARIs, bronchiolitis (with or without pneumonia) is the most common cause of hospitalisation in children aged under 12 months. In central Australia, the prevalence of respiratory syncitial virus (RSV) is approximately 190 per 1000 children.[16] Another study in central Australia showed that, in 2001-2003, hospitalisation for RSV disease was three times more common in indigenous children (113). In Townsville, the rate was 46/1000 for indigenous infants compared with 14/1000 for non-indigenous infants.[17] The prevalence of all causes of bronchiolitis (as opposed to RSV only) would clearly be higher.

Studies of the epidemiology of pneumonia in WA children show that indigenous infants born in 1986 had a three-fold risk of hospitalisation for pneumonia in the first two years of life (109). Between 1988 and 1993, the rate of pneumonia was 10-20 times higher in indigenous children aged up to 14 years (110). For a cohort of over 270,000 singleton children born between 1990 and 2000, the risk of admission to hospital with pneumonia in the first two years of life was 13.5 fold for indigenous infants who were also three times more likely to have multiple admissions with this diagnosis (111). In 1990-2000, indigenous children aged less than 2 years had a 7.5 times increased risk of hospitalisation for ARI (112).

The 2004–05 NATSIHS and 2004–05 NHS data on the prevalence of long-term health conditions in children 0–14 years of age [15] showed that the most common long-term health conditions for indigenous children were respiratory diseases (19%), diseases of the ear (10%) and diseases of the eye (8%).[15]

In the NT, ARIs also top the list for preventable deaths in indigenous infants (5 times higher than non-indigenous infants).[14] ABS data indicate that mortality rates for respiratory diseases in indigenous infants is 11 times that of non-indigenous infants.

Data relating to asthma and suppurative lung disease are described in sections 6.3 and 6.4. Other significant respiratory issues in children include chronic neonatal lung disease and airway disorders. Other relevant respiratory related issues include the high prevalence of ear disease. Acute otitis media develops early in indigenous children, often in the first months of life, is severe

and often persists(106). This disease appears to correlate with high rates of bacterial carriage and nasal inflammation(107) with indigenous children having a higher carriage of nasal bacterial pathogens than other children (105).

Key Issues and what is needed

- Better access to specialist health-services. This is poor or non-existent in remote communities and is largely dependent on the quality of health care professionals serving the communities.
- Improved management and follow-up care of ARI particularly after discharge from hospital.
- Recognition by the public and health professionals that chronic cough is not normal.
- Sleep services are almost non-existent in rural and remote areas. Although important, this area of health may not be the highest current priority.
- Intervention studies are required more than descriptions of child respiratory problems.
- Vaccines against respiratory pathogens are useful for reducing morbidity and mortality in the short to medium term.
- Continued research to determine the major preventable risk factors for pneumonia in indigenous infants and children.
- Improved health education for indigenous communities to reduce risk exposure (eg to indoor tobacco smoke), and acquisition and transmission of respiratory infections
- Strategies to implement effective interventions to minimise the morbidity and mortality from pneumonia.

7. Personal reflections by an urban-based team conducting respiratory research in remote Indigenous populations

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Introduction

Numerous studies of respiratory health have been undertaken in remote indigenous communities. We conducted three surveys from 1991-1999 in the same community at the northern tip of WA, in the tropics during the dry season, and another in the dry central desert within WA and near the NT border (33, 129-131). Other health surveys involving respiratory assessments have been conducted in the Pilbara and Warburton areas of WA (132, 133), central Australia including SA (30, 31) and the NT (30, 133), and in Cape York in Queensland (29, 30). Recently, a state-wide survey of the health of Aboriginal children, The Western Australian Aboriginal Child Health Survey (WAACHS), was undertaken using a random sampling approach and included urban, rural and remote communities(134). The authors of this survey developed a new measure of "remoteness" – the level of relative isolation (LORI) – to reflect the extreme remoteness, as distinct from regional or rural living, of some Aboriginal communities. A number of distinctive issues arose in the conduct of these surveys, some in relation to the culture of indigenous people, their communities and their health-care administration; and others in relation to the logistics of conducting surveys in remote regions of Australia.

Access and Preparation

Access is the most important and difficult hurdle to overcome and we spent some two years negotiating with representatives before our first community survey commenced. Initial interest was stimulated by a conversation between Bill Musk and a representative of the Health Department with strong professional and personal links to the northern WA community. This led to an introduction to the community elders and Council who officially invited our team to survey the respiratory health of the community, with the following aims:

1. To estimate the prevalence of respiratory symptoms and illness and their risk factors;
2. To measure lung function in all community members to establish normal values;
3. To characterise the types of respiratory illnesses that were present;
4. To train community members in the assessment of respiratory health, and;
5. To provide feedback to the community on the findings.

After discussions with community health nurses and the Community Council, an invitation from the Council and a study plan were sent to the Ethics Committees of our Institution and of Aboriginal Health (based in Perth). The former was accepted without revision but the latter required further revision and negotiation before being accepted, probably reflecting our relative inexperience with this group.

Discussions involved a number of groups, including community elders (who move on and off the Council), the local community Council, the Council-appointed administrator, the community health nurses, the area health authority, the Royal Flying Doctor service and the Aboriginal section of the Health department and its Aboriginal Ethics Committee. Each of these groups expresses a responsibility to the community, although not necessarily with the same perspective. Finally, permits to travel into Aboriginal lands were required.

The more extensive and very comprehensive WAACHS was 8 years in the preparation, planning and consultation and two years in the execution. Pages 6-8 of the published Volume I(134) are recommended reading for the discussion of survey development, Aboriginal involvement, community consultation and approval, ethical approval and indigenous identification.

Research Staff

There is no shortage of willing volunteers to join expeditions into the outback to study people in remote communities. However, it is important to limit numbers to staff who have the skills to contribute to the overall aims of the study. We required skilled personnel including a study co-ordinator, liaison assistants, trained respiratory technologists, phlebotomists and laboratory technicians. Multi-skilling was the most valuable asset of a worker as was the ability to

communicate with the members of the community. Younger people from the community found it easier to relate to young researchers, females to female researchers etc. A resource co-ordinator, conversant with details of the study, was invaluable back at the home laboratory.

The inclusion of local community liaison personnel and researchers is important for community contact, introduction to participants and community elders, and understanding cultural and local sensitivities. This also represented an opportunity to employ Aboriginal people from the community in the survey, to provide training to community members and to provide a source of communication of the study findings. The community health nursing staff were the pivotal link between the external sources of health-care (area health authority, Flying Doctor), local health-care, access to health records (after permission obtained from participants) and community individuals. Their support was essential because they knew the community members and were trusted by them, and they knew how things were done in the community and what was going on. Unexpected events such as funerals, football competitions and cultural activities can often result in a significant proportion of the population being suddenly absent during surveys. These events are not posted on a website!

In central Australia, we had an Aboriginal liaison person who, although not from the same language group, was able to suggest culturally important approaches and responses as they arose. Because she was the mother of a famous WA league footballer, she inspired confidence in the project by her mere presence!

Laboratory Space

The community nursing posts were too busy and crowded to afford space for a busy research survey, which immediately and continuously provided a focal point for locals to gather, especially children. Therefore testing (questionnaires, height and weights, lung function measurements, skin tests, venesection) was undertaken elsewhere: on the veranda of the nursing post, in people's houses, and in the front yards of houses. The fact that one of our subjects had successfully conducted peritoneal dialysis in his front yard with few complications over a number of years gave encouragement to us and the community.

We set up a laboratory for plating sputum samples and separating and aliquoting blood samples in makeshift accommodation where there was water and electricity and away from the children.

Language and Culture

Not all community members spoke fluent English and, for many, English was not the language of first choice. Our knowledge of the local language was poor and it took some time before we realised that people were responding to specific questions with a clear yes ("yuwa") or no ("wiya"). The patience of many participants in the face of our repeated questions had to be admired. Responses are not necessarily offered directly with eye contact so that initially we did not appreciate the considerable co-operation that we were receiving. The education level of community members was highly variable due to individual and cohort effects over the years and we were obliged to introduce some local idiom (as little as possible) into our questionnaire to make it comprehensible. We had a rudimentary introduction to the culture, language and history of the specific communities that we were to visit. With hind-sight, this was time well spent and should have been considerably increased.

In small communities, there are family and individual rivalries, tensions and political issues that we were occasionally aware of. We remained at a distance from such issues but it is useful to be aware of their existence, particularly with regard to interviewing and examining people in circumstances which often lack privacy. Certainly, it is essential to have an even-handed and professional approach to all community members.

Logistics

Getting people and equipment to and from remote regions and ferrying supplies in and out, particularly frozen specimens, can be challenging and/or expensive. Even in remote Australia we found communications excellent and it was possible to fine-tune arrangements to meet changing circumstances at relatively short notice. We arranged with the Royal Flying Doctor and commercial

air services such as Alligator Air to take out partly prepared blood samples for further processing and storage on a daily basis.

Conducting the Survey

Information about non-responders is useful for testing the representativeness of the sample. WAACHS was able to obtain some demographic details from their sample database. In remote communities with shifting populations and little opportunity to re-visit, such information is impossible to obtain. Many indigenous people belong to more than one community so that the precise denominator population cannot be defined. However, nursing post health records (after individual informed consent) contain a complete list of community members including demographic data and some family links.

Each participant completed a standard questionnaire, had their height and weight measured, had prick skin tests to common allergens, performed spirometry, had a methacholine challenge and had a blood sample taken. Even young children were surprisingly stoic about blood sampling. In the third north WA survey, the level of suspicion about genetic information was at an all-time high thanks to the lay press. Therefore, blood sampling which would have jeopardised participation in any part of the survey was not undertaken.

Contact of participants within the community was by word of mouth and by going from door-to-door, which is practicable in small communities. Most people were seen at a centralised study centre and a make-shift laboratory was set up to take advantage of available space. The equipment was also taken to some houses using a purpose-built mobile laboratory (see Figure) as a gesture of our commitment to the project and this seemed more than acceptable.

Appointments were soon abandoned and we recruited around the community until we had seen everyone who was likely to take part. No coercion was involved but after a few people, especially community elders, had been examined the level of reserve/suspicion fell and those who had initially declined came forward when approached again.

Results

The results of the various surveys have been published (33, 130) but a few points related to remoteness are worth noting. Firstly, remoteness is associated with different respiratory illness patterns in indigenous people. This was most commonly manifest as a lower prevalence of asthma, seen in a number of the cross-sectional studies (30,33,130,133) and elsewhere.(135) There was also a lower prevalence of atopy as assessed by prick skin tests but very high total IgE levels as a result of parasitic infection in some communities but not others. Similarly, airway hyper-responsiveness was low in some communities(30) but not others(130). The WAACHS (134) showed that remoteness was associated with less smoking, asthma and wheezing in the last 12 months and more allergy (hay fever) and recurrent chest infections.

Secondly, lung function was related to symptoms but not to levels of smoking (33). One explanation might be that the effects of smoking are overshadowed by other risk factors such as exposure to wood-fire smoke, or by respiratory illness such as infection.

All lung function results (with clinical interpretation) were offered to the participants or their parents but almost always were sent to the health centre for filing with health records. The results of blood tests were immediately returned to the health centre with comments on any action that needed to be taken. Occasionally results were found to require urgent treatment and this was commenced (e.g. a haemoglobin level of 4 gm/L in a young female with hookworm infestation).

The results of our studies were published with a copy to the relative ethics committees and to the communities. In addition, a senior member of the research team travelled back to the community after each survey to directly discuss the results with community members in groups and individually.

Discussion

Validation of results from community surveys is difficult but there were some factors that were helpful. The fact that respiratory symptoms were related to lung function adds some external validity to questionnaire responses. In addition, we found a relationship between Aboriginality and lung function with mixed-race parentage associated with levels of lung function intermediate between people with both parents either Aboriginal or non-Aboriginal.

In one community, questionnaire responses were compared with the health records at the nursing station(130). In children, there was only 1 discordant result of the 20 positive responses to “has anyone ever told you that you have asthma?” and none for the negative responses. In adults, there were 7 false positive replies out of 55 responses ie there was no record of asthma in the health records although in each instance the participant reported respiratory symptoms in the survey. As in the children, no false negative responses were observed in adults. These results suggest remarkably reliable recall.

It is difficult to provide indigenous people with evidence that understanding their physiology and their diseases will improve their medical care or health. Surveys are extremely demanding and costly and follow-up is required but difficult to provide comprehensively, given the transient nature of the community members and their local health providers. As a result, community members may readily develop a mindset that they are “guinea-pigs” and be likely to resent the whole process. Therefore, feedback of both individual and overall community results to participants and to the community is important and should be part of the original planning, perhaps with the input of the Community Health authority.

8. Case Studies

Case studies reflect the reality of respiratory health scenarios faced by many indigenous people. The following case studies of a 60 year old Indigenous woman with COPD and a 5 year old boy with respiratory tract infection**s** are drawn from real case records. The names and locations have been changed and reflect the usual health-care status and prospects for indigenous people in similar locations and social circumstances.

8.1 A lady with COPD

The scenario below illustrates the differences in the health care for a lady with COPD (Eunice) living in 3 different settings.

Eunice is a 60 year old married woman with three adult children. She has smoked 25 cigarettes/day for 42 years and has a chronic productive cough with a small amount of yellowish mucoid sputum and mild exertional breathlessness. For two days she has had a slight fever, increased greenish sputum and is more breathless.

Melbourne's inner West: Eunice's husband phones their local primary health clinic and leaves a message on the answering machine. The weekend locum service receives the call and a doctor she has not seen before comes to the house the next afternoon to examine her chest. He decides that she is not acutely ill enough to be sent to emergency at the public hospital so he gives her an injection, prescribes ongoing Amoxycillin and 3 days later her GP practice nurse phones to see if she has settled. She suggests Eunice visit the surgery 2 weeks later where her GP takes a history and performs spirometry which shows moderate airflow obstruction. He diagnoses COPD and discusses the COPD-X plan. He prescribes Spiriva and Symbicort, enquires whether she is ready to consider stopping smoking, lists her for annual Fluvax and refers her to the respiratory clinic at the local hospital where she sees a respiratory specialist. She has arterial blood gases sampled which suggest that she might benefit from long-term domiciliary oxygen and is enrolled in the pulmonary rehabilitation program. Eunice stops smoking with the help of nicotine replacement therapy (NRT) patches and a smoking cessation support group, her exercise tolerance improves with the rehabilitation and she attends regular respiratory follow-up. She dies of a stroke 15 years later.

Hopevale, Queensland: Eunice's friend walks with her to the clinic next morning. The doctor is in today and he prescribes Amoxycillin from the clinic formulary and asks about her usual effort tolerance. He suspects COPD, warns her about smoking but does not have a spirometer or the capacity to measure blood gas tensions, so he lists her for the next available community physician specialist appointment in 3 months' time. That doctor does spirometry to confirm COPD and implements a chronic disease management COPDX plan for the clinic nurse to follow up on. Eunice has difficulty stopping smoking despite Zyban from the clinic because there are 3 other smokers in the house. She cannot afford Spiriva or NRT patches and continues to smoke. There is no pulmonary rehabilitation program in Hopevale. The GP gives her Fluvax each year. She continues to experience slowly progressive airflow obstruction and exertional breathlessness which impairs her quality of life. She develops chronic respiratory failure and dies of a heart attack 6 years later.

Kowanyama, Queensland: Eunice walks to clinic the next morning but there is no doctor this week. The clinic nurse dispenses Amoxycillin from the formulary and tells Eunice to report back next week if she is not better. Eunice feels better in a few days and has a lot on her plate with her abusive husband's alcoholism and her daughter's diabetes. She thinks no more of her chest problems and continues to smoke as this has long been one way in which she deals with the stresses in her life. She tolerates her exertional breathlessness until she gets another acute exacerbation of chest infection when, again, antibiotics provide a quick fix. In the meantime, chronic inflammation gradually reduces her lung function, eventually resulting in a fairly abrupt worsening of exertional breathlessness and the onset of chronic respiratory failure. Eunice dies from an acute episode of pneumonia 2 years later.

8.2 A Child with a Cough: the Development of Childhood Bronchiectasis - going on to End-stage Chronic Respiratory Failure in Early Adult Life

The below illustrates the differences in the health care for a child with a respiratory infection living in 2 different settings.

Billy is 5 years old. For the last two days he and his sister Sally have had a “cold”. Billy has a fever, runny nose, cough and a sore ear.

Darwin: Billy had had colds like this before. They started soon after he began child care. His mother took him to the local doctor who thought he did not need antibiotics, just careful watching. His mother took a few days off from her work at the local supermarket to look after him. Billy recovered from this cold. He had a few more colds during the next two years but eventually grew out of them. He had good health as a teenager, played football and subsequently worked in the tourism industry.

A small outstation community 1½ hrs by road from Hermannsberg, NT (2¾ hrs from Alice Springs): Billy had had colds like this before. In fact he had been troubled by recurrent upper respiratory tract problems since early childhood. He had a low birth weight and his mother had been undernourished and smoked during the pregnancy. When he got really sick his mother took him to Hermannsberg for antibiotics and he usually settled down after a while. He developed chronic nasal discharge and a wet cough but many other children in the community had similar problems as did the child of one of the other families sharing the house, and Billy seemed happy enough most of the time. One such respiratory infection was accompanied by severe pain in the left ear. This settled after two bad nights but was followed by a chronic ear discharge. His mother took Billy to see the doctor in Hermannsberg and then back again to see an ear specialist. He suggested an operation to fix Billy’s hearing but the waiting list was more than a year and it would have meant the family going to Alice Springs for a week so they didn’t go back to the doctor. Over the next few years Billy seemed OK but he did get breathless on running and avoided sports.

In his teens, Billy started smoking like most of his peers. In his early twenties, he had several emergency admissions to Alice Springs Hospital with pneumonia and on several occasions needed ventilatory assistance in intensive care. After one such episode, he had a chest CT scan and was told that he had bronchiectasis. In his thirties, Billy developed severe hypercapneic respiratory failure. He had stopped smoking and was on regular bronchodilators and inhaled steroids but could not have oxygen at home because of difficulties with supply and other smokers in the house. Billy saw a visiting respiratory physician in Alice Springs on several occasions and lung transplantation was considered but his remoteness from acute hospital care and the difficulty of family relocation to a transplant centre interstate to wait for a suitable donor made this impracticable. Billy died in his 30’s. Billy’s death from acute and chronic respiratory failure at an age when other Australians are apparently healthy and unaffected by chronic disease is not unusual in indigenous people in central Australia.

9. A Strategic Framework for Respiratory and Sleep Health-Care and How Existing Resources Measure Up.

9.1 A Framework for Disease Prevention and Management

A comprehensive approach that combines public health measures to prevent disease with a comprehensive clinical service to manage established disease is required to address respiratory health issues. The model of chronic disease prevention and control developed by the National Public Health Partnership 2001 and outlined in Table 9.1 is as applicable to respiratory health as it is to that of other body systems.

Table 9.1[This Table should be rewritten with the same font as the rest of the document if possible]

A comprehensive model of chronic disease prevention and control

Stage of disease continuum	Well Population	At Risk	Established disease	Controlled chronic disease
Level of prevention	*Primary Prevention*	*Secondary Prevention/ Early Detection*	*Tertiary Prevention and Disease Management*	
Nature of intervention	• Promotion of healthy behaviours and environments across the life course • Universal and targeted approaches	Assessment • Screening • Case finding • Periodic health examinations • Control risk factors - lifestyle	Assessment • Treatment and Acute Care • Complications management	Assessment • Continuing Care • Maintenance • Rehabilitation • Self Management
Responsible sectors	• Public health • Primary health care • Other sectors	• Primary health care • Public health	• Specialist Services • Hospital care • Primary health care	• Primary health care • Community care
Represents promotion of health and well being and health related quality of life across continuum of care	Health Promotion	Health Promotion	Health Promotion	Health Promotion
Intervention objective	Prevent movement to the 'at risk' group	Prevent progression to established disease and hospitalisation	Prevent/delay progression to complications and prevent readmissions	

Each stage requires critical assessment of:
Workforce requirements, resource allocation, data requirements, evidence base for intervention (incl. cost effectiveness), quality measures, guidelines and standards, monitoring and evaluation, roles and responsibilities (Commonwealth/State, public/private), equity impact, consumer involvement etc

National Public Health Partnership 2001, Preventing Chronic Disease: a strategic framework background paper

For respiratory disease prevention and control, the approach begins with a series of public health promotion and disease prevention measures at primary, secondary and tertiary levels - as summarised in Table 9.2. As mentioned in section 2, important issues of social determinants of health such as overcrowding are recognised.

9.2 Respiratory Disease Prevention Measures

Table 9.2. Summary of Respiratory Disease Prevention Measures

Primary **Normal lung development and removal of risk factors**	**Secondary** **Early detection of disease**	**Tertiary** **Reduce mortality and complications of disease**
Avoidance of in-utero tobacco smoke exposure	Equivalent standard primary care	Equitable access to secondary and tertiary care
Antenatal care (preventing low birth weight)*	Adequate follow up of all respiratory episodes	Equitable access to treatment and procedures
Breast feeding	Minimisation of further lung injury- address tobacco exposure (active and passive) and substance abuse	Appropriate treatment (eg of infections, use of preventer therapies for asthma)
Avoidance of ETS, biomass combustion, petrol sniffing	Access to diagnostic facilities of equivalent quality especially spirometry, CXR, oximetry	Model of service delivery
Prevention of severe respiratory tract infections	Community and health professional education for symptoms and signs of respiratory and sleep disorders	
Prevention of tobacco uptake	Early education and assessment of respiratory health, access to tailored smoking cessation strategies for young people	Access to smoking cessation modalities and multidisciplinary approaches to achieving and sustaining tobacco-free status
Environmental health (access to running water, sanitation, pollution)		Minimisation of further lung injury Address tobacco exposure (active and passive) and substance abuse
Nutrition (avoid growth faltering and later obesity)		Minimisation of co-morbidities Nutrition/obesity Diabetes
Socio-economic factors (poverty alleviation, sufficient housing, etc), education, employment)		Appropriate case management
Immunisation		
Mental health issues (parenting, spiritual and cultural issues to minimise risk taking behaviours)		

9.2.1 Primary Prevention

Primary respiratory disease prevention measures are aimed at (1) promoting normal lung development and (2) removing risk factors for development of respiratory disease.

9.2.1a Promoting normal lung development

Lung development begins in-utero and continues into early childhood particularly in the first two years but possibly up to 8 years, and is a complex, regulated process.[18][19] When this process is interrupted, lung growth is not optimised and the risk of lung dysfunction increases. Although lung health at birth was previously thought to be the most important determinant of healthy adult lung function, early childhood factors are now thought to be equally if not more

important.[18][20][21][22][11] Thus optimisation of factors that influence lung growth in-utero as well as in early childhood are key factors in the prevention of lung disease. These factors include:

- Avoidance of in-utero tobacco smoke exposure.
  - Promotion of smoking prevention programs specifically targeting pregnant women and their families. The ACAM report[7] indicated that "In-utero smoke exposure is higher in indigenous Australians both in urban and remote areas". In WA, 46% of indigenous children were exposed to in-utero smoke (134). National Perinatal data from NSW, WA, SA, the ACT and the NT for 2001–2004 show that half (51%) of indigenous women reported smoking during pregnancy. Indigenous mothers were around three times more likely to smoke during pregnancy
- Avoidance of environmental tobacco smoke.
  - The National Health Survey found that 56% of indigenous males and 46% of females smoked compared with 27% of non-indigenous males and 20% of females.(98) These findings were consistent with the National Aboriginal and Torres Strait Islander survey.(99) Thus, indigenous children are exposed to a high level of environmental tobacco smoke. In far north Queensland, 28% of indigenous children with asthma were exposed to environmental tobacco smoke.[23]
  - In-utero exposure to tobacco smoke also increases the risk of developing asthma and respiratory tract infections.[18]
- Prevention of low birth weight infants.
  - Low birthweight babies are at greater risk of poor health and premature death. The ABS reported that from 1991-2004 there was a significant increase in the rate of low birthweight in singleton births to indigenous mothers from 11.1 to 12.1 per 100 live births.{15B}ref in comment box} Contributors to low birth weight include socioeconomic disadvantage, size of parents, age of the mother, number of babies previously born, mother's nutritional status, smoking and alcohol intake, and illness during pregnancy.{15B}
- Promotion of breast feeding
  - In 2004–2005, 85% of indigenous children aged 0–3 years in remote areas and 79% in non-remote areas were currently breastfeeding or had previously been breastfed. The proportion of indigenous infants aged less than 12 months who were breastfeeding in 2004–05 was particularly high in remote areas (85% of infants aged less than six months and 82% of infants aged 6–12 months.{15B}
- Prevention and appropriate treatment of severe respiratory infections
  - Prevention of respiratory infections includes attention to environmental issues like overcrowding and house hardware {15B} The ABS 2008 report indicated that 14% of indigenous households were overcrowded in 2006.{15B} House hardware issues were discussed in section 3.
  - Appropriate treatment of respiratory infections includes adequate follow-up of respiratory infections and further management if symptoms persist.{} For example, a child with a chronic cough should receive ongoing medical care.
- Avoidance of biomass combustion and other air pollution.
- Promotion of nutrition, post-natal growth and healthy eating
  - Anaemia and/or growth failure are the most common afflictions (26%) in indigenous children especially in remote regions. These conditions usually occur in children under 2 years when nutrition is crucial for later cognitive development,[24] optimisation of lung and kidney growth [11] and prevention of disease.

<u>9.2.1b Removing risk factors for early respiratory disease</u>

Once optimal lung growth occurs, primary preventative factors include:

- *Avoidance of tobacco smoke*
  - Cigarette smoking has long been identified as the most important risk factor for many respiratory problems including lung cancer and COPD. This is particularly important in indigenous people in which the incidence of smoking is much higher than in non-indigenous populations.
- *Tobacco control recommendations*
  - The National Health survey identified culturally appropriate anti-smoking strategies as important in an attempt to reduce the smoking rate.

- The National Aboriginal and Torres Strait Islander Tobacco Control Project, funded under the National Tobacco Strategy, had the following key recommendations(100):
  - National coordination for ATSI tobacco control with the requirement of dedicated funding. There is an immediate need to increase the priority of tobacco control.
  - Tobacco control programs should maximise community control, and understand and respect the social context in which indigenous people live.
  - Tobacco control programs should be holistic in nature and consider the social determinants of health.

  The above recommendations are supported by NACCHO – The National Aboriginal Community Controlled Health Organisation.

❖ Treatment of respiratory infections (see above)

❖ Immunisations
  - Data based on the Australian Childhood Immunisation Register (ACIR) described that indigenous children had lower coverage for all vaccines at 12 months of age (82% compared with 91%), while at two years of age the difference in vaccination coverage between Indigenous and non-indigenous children was not as large (90% and 92% respectively).{15B}
  - Systems and resources to ensure that timely immunisations occur should be enhanced.

9.3 Secondary prevention

Secondary disease prevention measures include the early detection of respiratory disease through:

❖ Access to comprehensive and high quality primary health care equivalent to that offered to urban populations. This requires adequate and appropriately skilled primary care staff including indigenous health workers, doctors, nurses, allied health professionals, and interpreters and well supported physical facilities within easy reach of all indigenous communities.

❖ Access to spirometry for early detection of COPD in adults and of chronic airflow obstruction in children.

❖ Adequate follow-up of all respiratory disease episodes including respiratory and ear infections; chronic care plans for asthma and COPD; follow-up and evaluation of smoking cessation interventions.

❖ Tobacco control and environmental control as outlined above(101, 102).

❖ A process of ongoing evaluation of the quality and effectiveness of primary, allied and specialist healthcare for indigenous people no matter where they live

❖ Indigenous patients often require more consultation time than other patients. It is important that service and funding models allow for this to encourage specialists to see more indigenous children and for indigenous children to receive the best care.

❖ Addressing the underlying causes of morbidity which arise from social disparity is a long-term goal to achieve better health outcomes in indigenous people. Health professionals should support this process wherever possible in professional and personal capacities, and support public health and social interventions that are likely to make a difference.

❖ Promotion of knowledge about the importance of sleep hygiene and about the common sleep disorders and how they impact on neurobehavioral and cardiovascular function. This should lead to increased ability of lay and professional staff to detect sleep disorders earlier.

❖ The dietary and physical characteristics of indigenous people have increased the prevalence and severity of chronic disease such as type II diabetes, ischaemic heart disease and chronic renal failure. In a cohort study(96) these medical factors, which can partially be addressed by lifestyle changes, contributed to poorer mortality outcomes in people with lung cancer. Health behaviours leading to a lower probability of seeking treatment(96) require further culturally relevant education

❖ Addressing the socioeconomic imbalance between indigenous and other populations is beyond the scope of this article. However, access to health-care and culturally relevant education and health literacy about all respiratory illnesses are two key areas that need further activity.

9.4 Tertiary prevention

Tertiary disease prevention measures aim to reduce mortality and complications of established respiratory disease. Irrespective of where indigenous people live, they should have:

- Equitable access to hospital care for those with serious respiratory conditions and acute episodes / exacerbations of pre-existing respiratory disease. Previously mentioned evidence of delayed diagnoses, cultural differences, language barriers and poor access to health-care all contribute to poor respiratory health outcomes in the indigenous population.(101)
- Provision of chronic respiratory disease management care plans for people with chronic` respiratory disease initiated and supervised by primary health care staff with the involvement and support of specialist physicians, paediatricians and allied health care providers
- Medication security including accessible and affordable medication supply with associated safe prescribing and dispensing through a process of ongoing quality use of medicine program support
- Access to pulmonary rehabilitation either in centre or community-based
- Vaccination provision and high coverage for vaccine preventable respiratory infections in children and adults
- Affordable and secure access to assessment, provision and coordination of domiciliary oxygen therapy for appropriately selected patients
- Equitable access to transplantation and thoracic surgical services
- Access to comprehensive palliative and respite care services
- Minimisation of further lung injury by prevention of smoke exposure (active and passive) and early treatment and follow-up for infective episodes.
- Minimisation of co-morbidities e.g. obesity, diabetes and of de-conditioning.
- Equitable access to sleep disorder investigational resources and treatment modalities.
- Management of co-morbidities, especially chronic diseases that accelerate deterioration of function in lung cancer.
- Multi-disciplinary management: a need for allied health agencies to form collaborative partnerships with indigenous organisations.(101) Teleconferencing could improve and facilitate multi-disciplinary care in the rural setting.(102)
- Ensuring that chronic respiratory illness including cancer care is people centred and meets the needs of indigenous people with chronic respiratory illness, their carers and families.(102)
    - The cultural and language needs of indigenous populations are of importance here.
    - A boost in the indigenous health workforce.(101)
    - Health profession-led self-management programs, especially in the palliative care setting which also address end-of-life issues in a culturally acceptable manner.
- Monitoring of safety, effectiveness, efficiency, satisfaction, accessibility and equity outcomes.
    - Data collection for all respiratory and sleep conditions including cancer in indigenous people is suboptimal at present and needs to be improved.(102)
    - A boost in research; in particular national data collection with the assistance of liaison officers (101). Databases such as a national lung cancer database(102).
    - Indigenous support groups.
- Recognising and responding to the needs of indigenous respiratory health by disease-specific non-Government organisation and professional health provider groups through a combination of advocacy, policy development and direct support of primary, secondary and tertiary prevention of lung disease in this setting.

9.5 Roles of health services

Clinical services have roles which are relevant to this spectrum of primary, secondary and tertiary disease prevention approaches, in addition to their more obvious roles in disease management and control. Thus, primary care clinics should be active in primary and secondary disease prevention strategies, and hospitals and specialist outreach services have tertiary disease prevention responsibilities as well as those of managing established illness and its complications. *Public education programs* in respiratory and sleep health can be delivered through primary care and community outreach facilities and by the hospital sector. Interventions should impart knowledge about the structure and function of the respiratory system, common disease processes

and how they disrupt function to cause symptoms, morbidity and disability and how treatment strategies prevent this. They should also target risk factors for respiratory disease such as:

- smoke exposure (active and passive) from cigarettes
- biomass combustion and atmospheric pollution
- antenatal, maternal and early childhood nutrition
- the importance of early recognition, management and follow-up of respiratory infections, asthma and COPD.

Interventions should also promote knowledge about sleep health, sleep hygiene measures, the common sleep disorders and their management.

Community programs can be administered through primary care clinics for:

- immunisations
- respiratory health promotion
- spirometric screening for at-risk individuals or groups
- improved housing with reduced overcrowding and provision of running water
- improved employment programs

Primary health-care provision for respiratory disease and sleep problems:

- early detection, treatment and follow-up for upper respiratory tract (including ear) infections
- early recognition of asthma and provision of appropriate care plans
- early recognition of COPD and bronchiectasis with implementation of pharmacologic therapy, smoking cessation, immunisation and pulmonary rehabilitation
- early recognition of sleep disorders with improved access to sleep studies (polysomnography)

Hospital and outreach community-based programs for chronic respiratory disease management:

Care plan implementation by primary health care teams working in partnership with specialist physician, paediatricians and allied health care providers.

10. Summary of Major Issues

In assessing the lack of health services for indigenous people, we need to be mindful of the health delivery service principles defined by the National Health Priority Action Council (NHPAC) as follows:- "All health services need to provide effective and appropriate services to Aboriginal and Torres Strait Islander people using the Australian Health Ministers' Advisory Council's Aboriginal and Torres Strait Islander Cultural Respect Framework as a guide. Particular attention needs to be given to physical, economic, cultural or other barriers which may limit equitable access. The needs of Aboriginal and Torres Strait Islander people must be addressed at all levels of health policy development and implementation. Health service providers should consider the development of effective data systems that enable monitoring and improvement of both accessibility and effectiveness of health-care provided to Aboriginal and Torres Strait Islander Australians".(81)

In this light we have evaluated the existing respiratory health service resources against the model of disease prevention and chronic disease management outlined in the previous chapter and bring attention to the following major issues in relation to the respiratory and sleep health of indigenous Australians:-

10.1 General Issues

1. Respiratory conditions contribute a major share of the total burden of disease in indigenous people.
2. A systematic public health approach to respiratory disease prevention is needed across primary, secondary and tertiary levels. Fundament requirements are major and sustained efforts to improve the known socio-economic and emotional determinants of chronic disease: poverty, overcrowding, poor sanitation, smoking, alcohol and other substance abuse, unemployment, lack of self-esteem and connection to country. The critical links between socio-economic determinants and disease are now acquiring the evidence base needed to drive the necessary processes of improvement. At present, there are many gaps in health knowledge about indigenous respiratory structure and function, risk factors, common disease processes and their presentation, outcomes and management
3. Primary, secondary and tertiary clinical service provision to indigenous people is variable and usually under-resourced. At primary care level there is a major shortage GPs (22 unfilled positions in the Northern Territory in late 2006) with a high turnover in nursing staff and major under-resourcing of health worker and allied health positions. At secondary care level, community physicians specialising in general internal medicine are highly successful in some remote areas but non-existent in others. At tertiary care level, respiratory specialists and specialist nurses and allied health positions are also under-resourced and not available in many remote regions.
4. Along with metabolic syndrome (diabetes, hypertension, vascular and renal disease) respiratory conditions constitute the commonest form of chronic disease in indigenous people. In children, ARI dominates acute health-care and under-diagnosis and under-treatment are common. This results in a substantial burden of paediatric respiratory disease and ultimately, via complications, to chronic disease of respiratory, cardiac and renal systems in young indigenous adults.
5. Investigational modalities including radiology, respiratory function assessment and polysomnography are under-resourced and unavailable in many regions.
6. Respiratory allied health programs – pulmonary rehabilitation, asthma education, smoking cessation, and domiciliary oxygen provision – are greatly under-resourced. Smoking cessation programs and research to improve their efficacy are critically needed to reduce the very high prevalence of tobacco smoking in indigenous communities.
7. There is a critical need for systematic and widespread implementation of chronic disease management care plans for indigenous patients with respiratory disease, which can be initiated by community and respiratory physicians and implemented in primary health-care by GPs, remote clinic nurses and indigenous health workers.

8. Indigenous health literacy in sleep disorders is in much need of attention. Current educational resources are only patchily available and utilised. More are needed and in some regions, cultural and language specific versions need to be developed. Their systematic development and dissemination through primary health-care clinics is a critical goal.
9. Research into respiratory disease in indigenous people is currently under-resourced and fragmented. Public health research into new culturally-specific methods of delivering health messages and services to indigenous people is urgent given the high and rising prevalence of chronic disease risk factors and the variable uptake of mainstream medical services by indigenous people.

10.2 Specific Issues.

Specific problems of respiratory and sleep health of particular importance in indigenous people are:

1. The high prevalence of acute community acquired pneumonia admissions to hospital with substantial regional variation
2. Bronchiectasis is increasingly being recognised in children and adults. Childhood bronchiectasis resulting in respiratory failure is currently more prevalent in the indigenous population, particularly in central Australia.
3. Childhood chronic airflow limitation is very prevalent and appears to be non-asthmatic in aetiology in many cases.
4. Up to 80 % of indigenous people smoke cigarettes contributing to a very high prevalence of COPD. Success rates for smoking cessation programs are poor. Substantial research effort is needed to develop culturally appropriate smoking prevention in indigenous communities. More focus on primary prevention strategies in primary school education is urgently needed.
5. Tuberculosis remains more prevalent in indigenous people. Drug resistant tuberculosis is an emerging and serious problem in the Torres Strait Islands in far north Queensland and relates to the high prevalence rates in neighbouring Papua New Guinea provinces.
6. Sleep-related breathing disorders are under-recognised, under-diagnosed and under-treated. Clinical identification of likely patients at primary care level and tertiary referral for investigation and management support are needed.
7. Access to respiratory function testing, blood gas analysis and respiratory sleep monitoring (polysomnography) is seriously deficient in central and northern Australia. Promotion of the use of spirometry in primary healthcare to identify adults and children with chronic respiratory disease needs to be vigorously pursued and supported with local training courses for primary healthcare teams including indigenous health workers, nurses, doctors, allied health staff.
8. Access to the entire range of respiratory and sleep treatment programs is problematic in remote regions. This applies particularly to the availability of lung transplantation for young indigenous adults with end stage respiratory failure and in need of pulmonary rehabilitation.
9. Asthma remains a common respiratory problem with problematic access to culture specific treatment programs (Cycle of Care, 3 plus program and asthma education programs)i. Wider asthma prevalence data are also required.

11. Recommendations

To reverse the premature deaths and major morbidity of chronic respiratory disease in indigenous Australians, we urgently recommend that:

1. An overarching strategic framework is developed to improve respiratory and sleep health. This should encompass socio-political strategies, improved housing, public health measures including immunisation, workforce development, community and household food security, chronic disease management and appropriate research.
    - This requires a whole of government approach to develop and sustain a comprehensive respiratory health program that includes primary, secondary and tertiary prevention intervention points (described in section 9).

2. Innovative and tailored, multilayered approaches to tobacco control are undertaken and sustained to help reduce the very high smoking rates in adolescents and adults and passive smoke exposure.

3. Existing dominant themes in healthcare policy in Australia are fully integrated with indigenous health care delivery to ensure that the current priorities of self-management, focus on primary care, continuity of care and physical activity are linked to the timely diagnosis and optimal management of chronic respiratory disease.

4. Innovative and possibly radical ways (such as financial incentives) that can alter behaviour be considered, in conjunction with promotion of respiratory and sleep health education programs, to prevent and enhance the earlier detection of respiratory and sleep disorders in children and adults.
    - Promotion of respiratory and sleep health education programs to:
        a. Recognise that chronic cough is not normal
        b. Enhance the understanding of the concept of chronic respiratory disease and respiratory failure
        c. Enhance the understanding of the concepts of chronic disease management and care plans
        d. Recognise that snoring is not normal and that snoring and sleep disordered breathing have cardiovascular and neuro-psychological consequences
        e. Understand the basic principles of sleep
    - Innovative and possibly radical ways that can alter behaviour that enhances preventative measures for respiratory and sleep health as well as self-care.

5. Major health initiatives in chronic respiratory disease resources are developed to enable clinicians at all levels to improve the early diagnosis of, as well as optimally manage, respiratory and sleep conditions.
    - Coordinated planning and development of respiratory and sleep heath resources especially in northern and central Australia is required to meet the substantial limited resources (described in section 5) compared to the burden of disease (sections 4 and 6).
    - Improved access to: lung function testing, asthma education, chronic disease management care plans for COPD and bronchiectasis, pulmonary rehabilitation programs, thoracic surgery, lung transplantation programs, and diagnostic and therapeutic sleep services.

6. Chronic respiratory care is integrated with other dominant chronic diseases (metabolic syndrome, renal disease, cardiovascular disease) in primary care.
    - Chronic respiratory disease is commonly found with other common illnesses. It also impacts on the morbidity and mortality of these common illnesses leading to sub-optimal treatment and poorer outcomes (sections 6.1, 6.4, 6.6). Thus evaluation for, and management of, respiratory disease is best integrated with other dominant chronic diseases in primary, allied and specialist health care provision.

7. A workforce that includes indigenous professionals at all levels of health care is developed to sustain effective and optimal primary, secondary and tertiary services.
    - Respiratory-specific and respiratory-aware medical, allied health, nursing and health worker workforce (some documented in section 5) in primary, secondary and tertiary services to provide appropriate respiratory and sleep care.
    - Increase indigenous participation in all health professions.

8. Health systems and support services are coordinated and appropriate to meet the cultural, social and medical requirements for all ages.
    - Improved diagnosis and management of acute and chronic respiratory requires health systems that are coordinated, supportive and responsive.
    - People discharged from hospital care should be reviewed by health professionals within the time frame of best practice medical care (e.g. for asthma, exacerbation of COPD and bronchiectasis).
    - Recall systems that will improve follow-up and monitoring of individuals
    - Health-care providers and systems that recognise the cultural and social needs of indigenous people.

9. Reporting and data systems and processes are developed to monitor the prevalence, morbidity and mortality, as well as risk factors for and adequacy of management of respiratory and sleep conditions.
    - Data and systems that enables monitoring of
        a. Quality measures (e.g. follow-up of pneumonia, care plans, lung cancer treatment indices such as timeliness of cancer care)
        b. Morbidity (e.g. quality of life, severity and progression of disease states, etc) and mortality
        c. Data that are accurately collected in all states. Currently, accurate indigenous data are largely restricted to the NT, WA, Queensland and SA
    - Databases that enhance understanding and management of specific respiratory diseases (cancer, bronchiectasis, chronic respiratory failure)

10. Research programs in indigenous respiratory and sleep health are prioritised and initiated. A research base that includes studies on the efficacy of public health and clinical interventions for the prevention and management of common yet poorly researched respiratory illnesses.
    - Priority areas developed conjointly with Indigenous health stake-holders
    - Evidence-based interventions are promoted and ‘collect data and run’ research projects are deterred
    - Common respiratory illnesses that require further study include respiratory infections, COPD, lung cancer, asthma, suppurative lung disease and illnesses affecting very young children when the lungs are still developing
    - Investigate method and delivery of programs that are most effective for chronic illnesses and self-care

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Table 4.1. ICD-10 AM CODE LIST FOR RESP PATIENTS

CODE DESCIPTION	**ICD-10-AM 5TH EDITION CODE**	
Respiratory Tuberculosis Confirmed	A 15	1. Group as Mycobacterial infection
Respiratory Tuberculosis Not Confirmed	A 16	
Miliary Tuberculosis	A 19	
PULMONARY MAC	A31.0	
Simple, mucopurulent Bronchitis	J41	2. Group as COPD
COPD, UNSPECIFIED	J44.9	
COPD, ACUTE EXACERBATION	J44.1	
COPD, INFECTIVE EXACERB'N	J44.0	
CH. OBSTRUCTIVE ASTHMA	J44.8	
CH. BR. EMPHYSEMATOUS	J44.8	
COPD WITH EMPHYSEMA	J44.8	
CHRONIC OBST. BRONCHITIS	J44.8	
EMPHYSEMA	J43	
CHRONIC BRONCHITIS	J42	
BRONCHIECTASIS	J47	3. Group Bronchiectasis
STATUS ASTHMATICUS	J46	4. Group Asthma
ASTHMA, ALLERGIC	J45	
ASBESTOSIS	J61	5. Group ILD
Pneumoconiosis	J62-70	
INTERSTITIAL LUNG DISEASE	J84	
PLEURAL PLAQUE	J92	
PNEUMONIA/Bronchitis	J12.- TO J22**	6. Group LRTI
Suppurative lower respiratory tract infection	J85-6	
BRONCHITIS (UNSPECIFIED ACUTE OR CHRONIC)	J40	
Sinusitis/pharyngitis influenza	J1-11	7. Group URTI
Pleural effusions/disease	J90-92, J94	8. Group other dis. of pleura
Pneumothorax	J93	
PULMONARY ASPERGILLOSIS incl. invasive, unspec.	B44.0 –44.2	9. Group aspergillosis
MALIGNANT NEOPLASM Trachea ,LUNG	C33,C34	10. Group lung cancer
Cancer mouth, lip, sinus, larynx	C00-C14, C30-C32	11. Group URT cancer
MESOTHELIOMA LUNG, PLEURA etc	C45	12. Group mesothelioma
RESPIRATORY FAILURE - ACUTE	J96.0	13. Group acute respiratory failure
RESPIRATORY FAILURE – CHRONIC / UNSPECIFIED	J96.1, J96.9	14Group chronic respiratory failure
DIAPHRAGMATIC PARALYSIS	J98.6	
OSA	G47.3	15. Group Sleep related breathing disorders
Narcolepsy	G47.4	
OBESITY HYPOVENTILATION SYNDROME	E66.2	
Other specified extrapyramidal and movements disorders	G25.8	16. Group RLS

** J12.- means there are multiple possible 4th characters for this code (eg. J12.0. J12.1, etc)
J12.- to J18.9 indicates that all the codes in the J12 J13 J14 etc are pneumonia codes
(eg J13 = pneumonia due to strep pneumoniae, J15.1 = pseudomonal pneumonia, etc)

Table 4.2.1 Mortality Rates per 100,000 population for Respiratory Disease

			Indigenous	other	Total
1.	**Mycobacterial**	Males	1.8	0.2	0.2
		Females	2.7	0.1	0.1
		Persons	**2.43**	**0.12**	**0.15**
2.	**COPD**	Males	87.5	35.7	36.2
		Females	57.7	17.8	18.3
		Persons	**70.36**	**25.39**	**25.91**
3.	**Bronchiectasis**	Males	12.0	0.8	1.0
		Females	3.6	1.5	1.5
		Persons	**7.35**	**1.20**	**1.33**
4.	**Asthma**	Males	3.5	1.3	1.4
		Females	4.9	1.6	1.7
		Persons	**4.21**	**1.49**	**1.55**
5.	**ILD**	Males	10.4	10.1	10.1
		Females	3.8	4.9	4.9
		Persons	**6.55**	**7.12**	**7.14**
6.	**LRTI**	Males	52.6	20.2	20.7
		Females	37.9	17.9	18.3
		Persons	**44.41**	**18.94**	**19.43**
7.	**URTI**	Males	0.6	0.3	0.3
		Females	0.1	0.3	0.3
		Persons	**0.34**	**0.32**	**0.34**
8.	**Pleura**	Males	0.8	0.4	0.4
		Females	0.0	0.3	0.3
		Persons	**0.00**	**0.30**	**0.30**
9.	**Aspergillosis**	Males	0.0	0.0	0.0
		Females	0.0	0.0	0.0
		Persons	**0.00**	**0.03**	**0.03**
10.	**Lung cancer**	Males	81.2	52.0	52.4
		Females	39.3	22.9	23.2
		Persons	**57.32**	**35.98**	**36.35**
11.	**URT cancer**	Males	27.9	7.4	7.6
		Females	8.9	1.9	2.0
		Persons	**17.43**	**4.49**	**4.68**
12.	**Mesothelioma**	Males	4.1	5.5	5.5
		Females	1.0	0.8	0.8
		Persons	**2.33**	**2.93**	**2.93**
13.	**Acute Respiratory Failure**	Males	0.0	0.0	0.0
		Females	0.0	0.0	0.0
		Persons	**0.00**	**0.00**	**0.00**
14.	**Chronic Respiratory Failure**	Males	0.0	0.1	0.1
		Females	0.0	0.2	0.2
		Persons	**0.00**	**0.15**	**0.15**
15.	**Sleep Breathing Disorder**	Males	0.0	0.1	0.1
		Females	0.0	0.0	0.0
		Persons	**0.00**	**0.07**	**0.07**

Data based on 2002-2004 NT,WA,SA and Qld deaths (underlying cause of death only)

Table 4.3.1a: Number of separations (hospital admissions) and separation rate per 1,000 population for males with selected respiratory and sleeping disorders, by Indigenous status[(a)] and state or territory of usual residence, 2004–05.

	NSW			Vic			Qld			WA			SA			Tas			NT			Total (c)		
Respiratory disorder group	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot	Ind	Non-Ind	Tot
Mycobacterial infection																								
Separations	n.p.	n.p.	120	n.p.	n.p.	162	11	83	94	n.p.	n.p.	23	0	30	30	0	n.p.	n.p.	0	10	10	16	426	442
Separations per 1000[(b)]	n.p.	0.0345	0.0347	n.p.	0.0627	0.0628	0.3550	0.0414	0.0460	n.p.	0.0218	0.0233	0.0000	0.0352	0.0349	0.0000	0.0114	0.0111	0.0000	0.1379	0.1130	0.1370	0.0421	0.0430
COPD																								
Separations	225	10160	10385	48	7118	7166	299	5946	6245	131	2350	2481	70	2480	2550	11	650	661	164	258	422	948	28962	29910
Separations per 1000[(b)]	9.2344	2.7269	2.7757	10.8836	2.6145	2.6291	17.9333	2.9733	3.0984	11.6832	2.4170	2.5263	11.7146	2.6910	2.7680	3.1929	2.3111	2.3337	14.5617	5.5916	6.9586	12.6201	2.7123	2.7881
Bronchiectasis																								
Separations	5	232	237	n.p.	n.p.	266	18	260	278	16	124	140	n.p.	n.p.	71	0	25	25	103	n.p.	n.p.	147	974	1121
Separations per 1000[(b)]	0.1225	0.0640	0.0649	n.p.	0.1026	0.1027	0.4805	0.1315	0.1379	0.5369	0.1253	0.1397	n.p.	0.0757	0.0806	0.0000	0.0919	0.0906	3.6762	n.p.	0.8983	0.7595	0.0937	0.1077
Asthma																								
Separations	273	6422	6695	46	4172	4218	250	2979	3229	141	1469	1610	70	1775	1845	n.p.	n.p.	220	n.p.	n.p.	122	815	17124	17939
Separations per 1000[(b)]	2.7210	2.0540	2.0643	1.9851	1.7838	1.7869	3.2924	1.6207	1.6611	3.4232	1.6146	1.6685	4.2534	2.6331	2.6541	n.p.	0.9829	0.9376	0.9059	1.1606	1.0060	2.7105	1.8645	1.8754
ILD																								
Separations	19	1802	1821	n.p.	n.p.	1245	17	859	876	20	431	451	n.p.	n.p.	456	0	79	79	16	14	30	79	4879	4958
Separations per 1000[(b)]	0.7031	0.4873	0.4892	n.p.	0.4612	0.4606	0.5649	0.4317	0.4348	1.1510	0.4415	0.4548	0.6768	0.5010	0.5049	0.0000	0.2910	0.2879	0.7093	0.2718	0.3736	0.6641	0.4617	0.4655
LRTI																								
Separations	676	16752	17428	98	12892	12990	821	9241	10062	946	4210	5156	205	4420	4625	17	950	967	1055	260	1315	3818	48725	52543
Separations per 1000[(b)]	11.0423	4.8702	4.9789	7.6538	4.9752	4.9950	17.7772	4.8083	5.0852	32.0319	4.4637	5.2929	17.5314	5.5291	5.7186	2.5330	3.7837	3.7413	40.0116	4.2604	12.8827	19.3917	4.8618	5.1548
URTI																								
Separations	251	5718	5969	31	3606	3637	287	3319	3606	221	1578	1799	46	1529	1575	9	269	278	100	157	257	945	16176	17121
Separations per 1000[(b)]	2.2252	1.8183	1.8324	1.6541	1.5312	1.5304	3.0728	1.8121	1.8624	4.3869	1.7383	1.8720	2.3753	2.2785	2.2750	0.5371	1.2413	1.2034	2.2319	2.0610	2.0931	2.6826	1.7568	1.7875
Pleural disease																								
Separations	27	1640	1667	n.p.	n.p.	1443	20	1044	1064	9	525	534	8	432	440	n.p.	n.p.	113	7	30	37	74	5224	5298
Separations per 1000[(b)]	0.7259	0.4632	0.4653	n.p.	0.5503	0.5491	0.5241	0.5300	0.5296	0.5467	0.5341	0.5317	0.7748	0.5169	0.5213	n.p.	0.4587	0.4515	0.3269	0.4317	0.4104	0.5433	0.5085	0.5085
Aspergillosis																								
Separations	0	25	25	n.p.	n.p.	34	0	36	36	25	41	66	0	13	13	0	n.p.	n.p.	n.p.	n.p.	n.p.	27	151	178
Separations per 1000[(b)]	0.0000	0.0072	0.0071	n.p.	0.0123	0.0127	0.0000	0.0185	0.0181	0.8434	0.0418	0.0663	0.0000	0.0153	0.0152	0.0000	n.p.	n.p.	n.p.	n.p.	0.0238	0.1420	0.0148	0.0175
Lung cancer																								
Separations	21	3331	3352	n.p.	n.p.	2813	72	2467	2539	20	1059	1079	7	1258	1265	n.p.	n.p.	306	8	61	69	136	11287	11423
Separations per 1000[(b)]	0.7543	0.9113	0.9119	n.p.	1.0499	1.0488	2.9039	1.2239	1.2478	2.1200	1.0763	1.0865	1.1569	1.3980	1.3999	1.9871	1.0564	1.0691	0.6042	1.2250	1.1419	1.5622	1.0682	1.0742
Mesothelioma																								
Separations	5	445	450	0	335	335	n.p.	n.p.	344	n.p.	n.p.	229	0	155	155	0	37	37	0	12	12	9	1553	1562
Separations per 1000[(b)]	0.2350	0.1206	0.1213	0.0000	0.1260	0.1258	n.p.	0.1670	0.1660	n.p.	0.2283	0.2289	0.0000	0.1689	0.1683	0.0000	0.1363	0.1347	0.0000	0.1860	0.1587	0.1140	0.1461	0.1460
Acute respiratory failure																								
Separations	n.p.	n.p.	248	n.p.	n.p.	140	5	106	111	n.p.	n.p.	61	n.p.	n.p.	139	n.p.	n.p.	5	n.p.	n.p.	6	18	692	710
Separations per 1000[(b)]	n.p.	0.0667	0.0668	0.3553	0.0519	0.0525	0.2974	0.0537	0.0554	n.p.	0.0581	0.0603	n.p.	0.1538	0.1542	n.p.	n.p.	0.0170	n.p.	n.p.	0.0577	0.1758	0.0656	0.0668
Chronic respiratory failure																								
Separations	n.p.	n.p.	253	n.p.	n.p.	126	n.p.	n.p.	92	n.p.	n.p.	36	0	53	53	0	10	10	n.p.	n.p.	5	15	560	575
Separations per 1000[(b)]	n.p.	0.0679	0.0683	0.2965	0.0470	0.0476	n.p.	0.0438	0.0453	n.p.	0.0337	0.0363	0.0000	0.0592	0.0588	0.0000	0.0355	0.0352	n.p.	n.p.	0.0570	0.1305	0.0531	0.0542
Sleep breathing disorders																								
Separations	27	8366	8393	12	9316	9328	42	5732	5774	17	909	926	15	2868	2883	n.p.	613	n.p.	n.p.	n.p.	130	125	27931	28056
Separations per 1000[(b)]	0.4779	2.4585	2.4270	1.7030	3.6812	3.6712	0.6891	2.9062	2.8579	0.4354	0.9345	0.9190	1.7629	3.6103	3.5847	0.9702	2.4603	2.4342	n.p.	1.6628	1.3568	0.6359	2.7863	2.7511
RLS																								
Separations	0	17	17	0	41	41	0	16	16	0	8	8	0	n.p.	n.p.	0	n.p.	n.p.	0	0	0	0	93	93
Separations per 1000[(b)]	0.0000	0.0051	0.0050	0.0000	0.0161	0.0161	0.0000	0.0082	0.0079	0.0000	0.0080	0.0079	0.0000	0.0097	0.0096	0.0000	n.p.	n.p.	0.0000	0.0000	0.0000	0.0000	0.0093	0.0091
URT cancer																								
Separations	23	1666	1689	5	1447	1452	49	1455	1504	15	449	464	19	485	504	0	138	138	21	39	60	132	5679	5811
Separations per 1000[(b)]	0.5066	0.4665	0.4690	0.9233	0.5528	0.5532	1.3333	0.7178	0.7331	0.9822	0.4420	0.4505	3.7479	0.5604	0.5800	0.0000	0.5270	0.5154	1.2889	0.5528	0.6812	1.0966	0.5449	0.5527

(a) Identification of Indigenous patients is not considered to be complete and completeness varies among the jurisdictions. The quality of Indigenous identification is considered acceptable for the purposes of analysis only for Queensland, Western Australia, South Australia and the Northern Territory (public hospitals only). Caution should be used in the interpretation of these data because of jurisdictional differences in data quality.

(b) The rates were directly age-standardised using the estimated resident populations as at 30 June 2004 for the observed rates, and the Australian population for 30 June 2001 was used to calculate the expected rates. Separation rate for Other persons includes those records for which Indigenous status was Not reported.

(c) Excludes separations in the Australian Capital Territory.

n.p. Cell not published to suppress figures less than 5. For cells containing a number of separation less than five the separation rate per 1,000 has also been suppressed. Where a cell has been suppressed due to small figures, an adjoining cell in the same disease category by state/territory is also suppressed, but the separation rate is not suppressed. Where possible, the total persons for the disease category have been maintained. In some cases, the data for another state/territory in the same disease category may have been suppressed to prevent calculation of the suppressed data (for the state with small cells). In this case, the separations for state with the next smallest counts for that disease have also been suppressed.

Table 4.3.1b: Number of separations (hospital admissions) and separation rate per 1,000 population for females with selected respiratory and sleeping disorders, by Indigenous status[(a)] and state or territory of usual residence, 2004–05.

	NSW			Vic			Qld			WA			SA			Tas			NT			Total (c)		
Respiratory disorder group	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**	**Ind**	**Non-Ind**	**Tot**
Mycobacterial infection																								
Separations	n.p.	n.p.	107	0	120	120	n.p.	n.p.	76	0	29	29	0	17	17	0	6	6	n.p.	n.p.	5	7	353	360
Separations per 1000[(b)]	n.p.	0.0305	0.0305	0	0.0462	0.0460	n.p.	0.0391	0.0389	0	0.0285	0.0278	0.0000	0.0203	0.0200	0.0000	0.0233	0.0226	0.1442	0.0075	0.0354	0.0431	0.0347	0.0348
COPD																								
Separations	325	7725	8050	22	5622	5644	208	3994	4202	176	1771	1947	101	1922	2023	17	638	655	192	86	278	1041	21758	22799
Separations per 1000[(b)]	12.0209	2.0901	2.1662	3.9609	2.0626	2.0674	8.3647	2.0737	2.1535	12.5711	1.8475	1.9988	17.2129	2.0566	2.1590	8.2265	2.2566	2.2959	13.4674	2.2931	4.2695	10.9306	2.0582	2.1415
Bronchiectasis																								
Separations	8	548	556	n.p.	n.p.	455	14	504	518	15	296	311	5	232	237	n.p.	n.p.	56	n.p.	n.p.	85	125	2093	2218
Separations per 1000[(b)]	0.2272	0.1501	0.1512	n.p.	0.1687	0.1686	0.4599	0.2565	0.2600	0.6995	0.2977	0.3076	0.37975	0.2669	0.2714	n.p.	0.1969	0.1976	2.8525	0.09028	0.6859	0.7005	0.1985	0.2090
Asthma																								
Separations	313	6105	6418	49	4924	4973	312	3295	3607	341	1616	1957	68	1715	1783	6	249	255	93	95	188	1182	17999	19181
Separations per 1000[(b)]	4.5883	1.8194	1.8614	3.1335	1.9658	1.9716	4.7698	1.6755	1.7620	12.5863	1.6268	1.8877	5.0504	2.2659	2.3039	0.58139	1.0468	1.0294	4.0103	1.0511	1.6320	5.5583	1.8122	1.8754
ILD																								
Separations	10	1194	1204	n.p.	n.p.	810	11	539	550	19	237	256	6	304	310	0	67	67	n.p.	n.p.	8	52	3153	3205
Separations per 1000[(b)]	0.2649	0.3237	0.3242	n.p.	0.2971	0.2973	0.3415	0.2822	0.2839	0.9687	0.2483	0.2637	0.7768	0.3344	0.3390	0.0000	0.2413	0.2377	n.p.	n.p.	0.1198	0.3903	0.2997	0.3020
LRTI																								
Separations	623	14666	15289	116	11498	11614	743	8222	8965	917	3575	4492	211	3932	4143	21	873	894	999	186	1185	3630	42952	46582
Separations per 1000[(b)]	10.3580	4.1622	4.2709	11.5005	4.3421	4.3710	16.3021	4.2595	4.5125	31.1275	3.7216	4.5144	18.4295	4.7053	4.9093	2.2904	3.3357	3.3278	41.6829	3.0959	11.0149	19.1819	4.1917	4.4716
URTI																								
Separations	259	4950	5209	35	3232	3267	292	3071	3363	209	1365	1574	51	1274	1325	11	257	268	105	111	216	962	14260	15222
Separations per 1000[(b)]	2.8029	1.4926	1.5239	1.7302	1.3137	1.3170	4.4346	1.5710	1.6396	6.2502	1.3995	1.5375	3.9947	1.7536	1.7740	1.1447	1.1027	1.0903	2.9185	1.0782	1.4866	3.7282	1.4567	1.5026
Pleural disease																								
Separations	16	908	924	8	731	739	11	583	594	8	261	269	14	250	264	0	59	59	7	11	18	64	2803	2867
Separations per 1000[(b)]	0.2471	0.2532	0.2553	1.06935	0.2740	0.2763	0.3385	0.2987	0.2985	0.2759	0.2647	0.2673	1.1959	0.2812	0.2973	0	0.2289	0.2249	0.2502	0.1948	0.2098	0.3667	0.2699	0.2727
Aspergillosis																								
Separations	0	34	34	0	24	24	0	22	22	0	9	9	0	8	8	0	n.p.	n.p.	0	n.p.	n.p.	0	100	100
Separations per 1000[(b)]	0.0000	0.0097	0.0096	0	0.0092	0.0091	0.0000	0.0112	0.0110	0.0000	0.0087	0.0086	0.0000	0.0093	0.0092	0.0000	n.p.	n.p.	0	0.03171	0.0259	0.0000	0.0096	0.0094
Lung cancer																								
Separations	28	1865	1893	n.p.	n.p.	1639	37	1300	1337	13	614	627	n.p.	n.p.	661	n.p.	n.p.	139	12	16	28	97	6227	6324
Separations per 1000[(b)]	0.9615	0.5080	0.5119	n.p.	0.6021	0.6019	1.4680	0.6589	0.6694	0.6482	0.6304	0.6350	n.p.	0.7088	0.7082	n.p.	0.4899	0.4877	0.8241	0.3030	0.3810	0.9271	0.5875	0.5917
Mesothelioma																								
Separations	0	70	70	0	79	79	0	108	108	7	42	49	0	42	42	0	n.p.	n.p.	0	n.p.	n.p.	7	355	362
Separations per 1000[(b)]	0.0000	0.0191	0.0190	0.0000	0.0296	0.0296	0	0.0542	0.0535	0.28486	0.0420	0.0478	0.0000	0.0446	0.0444	0.0000	0.0360	0.0354	0.0000	0.0402	0.0320	0.0411	0.0335	0.0338
Acute respiratory failure																								
Separations	28	244	272	n.p.	n.p.	153	37	120	157	13	42	55	n.p.	n.p.	120	n.p.	n.p.	10	12	0	12	97	682	779
Separations per 1000[(b)]	0.9615	0.0662	0.0732	n.p.	0.0556	0.0565	1.4680	0.0619	0.0792	0.64822	0.0423	0.0538	n.p.	0.1274	0.1298	n.p.	0.03254	0.0350	0.82413	0	0.1332	0.9271	0.0647	0.0730
Chronic respiratory failure																								
Separations	n.p.	n.p.	215	n.p.	n.p.	97	n.p.	n.p.	99	n.p.	n.p.	43	0	59	59	0	11	11	n.p.	0	n.p.	11	514	525
Separations per 1000[(b)]	n.p.	0.0573	0.0579	n.p.	0.0352	0.0355	n.p.	0.0500	0.0504	n.p.	0.0408	0.0432	0.0000	0.0633	0.0629	0.0000	0.0387	0.0382	n.p.	0	0.0174	0.1232	0.0485	0.0491
Sleep breathing disorders																								
Separations	30	3496	3526	12	3590	3602	18	2289	2307	13	392	405	10	976	986	n.p.	n.p.	205	n.p.	n.p.	53	85	10999	11084
Separations per 1000[(b)]	0.4334	1.0000	0.9912	0.7653	1.3731	1.3719	0.2670	1.1358	1.1135	0.2568	0.3917	0.3877	0.8548	1.1941	1.1894	n.p.	0.7853	0.7670	n.p.	0.6487	0.5342	0.3412	1.0668	1.0545
RLS																								
Separations	n.p.	n.p.	33	0	115	115	n.p.	n.p.	18	n.p.	n.p.	9	n.p.	n.p.	13	0	5	5	0	13	13	n.p.	n.p.	206
Separations per 1000[(b)]	n.p.	0.0090	0.0092	0.0000	0.0444	0.0442	n.p.	0.0086	0.0090	n.p.	0.0081	0.0088	n.p.	0.0143	0.0154	0.0000	0.01877	0.01829	0.0000	0.1308	0.1041	n.p.	0.0196	0.0197
URT cancer																								
Separations	n.p.	n.p.	556	0	487	487	23	384	407	n.p.	n.p.	115	13	131	144	0	46	46	10	7	17	53	1719	1772
Separations per 1000[(b)]	n.p.	0.1531	0.1524	0.0000	0.1819	0.1814	0.5372	0.1936	0.2020	n.p.	0.1110	0.1130	0.9044	0.1455	0.1622	0.0000	0.1608	0.1590	0.5555	0.0866	0.1781	0.3394	0.1637	0.1672

(a) Identification of Indigenous patients is not considered to be complete and completeness varies among the jurisdictions. The quality of Indigenous identification is considered acceptable for the purposes of analysis only for Queensland, Western Australia, South Australia and the Northern Territory (public hospitals only). Caution should be used in the interpretation of these data because of jurisdictional differences in data quality.

(b) The rates were directly age-standardised using the estimated resident populations as at 30 June 2004 for the observed rates, and the Australian population for 30 June 2001 was used to calculate the expected rates. Separation rate for Other persons includes those records for which Indigenous status was Not reported.

(c) Excludes separations in the Australian Capital Territory.

n.p. Cell not published to suppress figures less than 5. For cells containing a number of separation less than five the separation rate per 1,000 has also been suppressed. Where a cell has been suppressed due to small figures, an adjoining cell in the same disease category by state/territory is also suppressed, but the separation rate is not suppressed. Where possible, the total persons for the disease category have been maintained. In some cases, the data for another state/territory in the same disease category may have been suppressed to prevent calculation of the suppressed data (for the state with small cells). In this case, the separations for state with the next smallest counts for that disease have

also been suppressed.

Table 4.3.3: Hospitalisations, by principal diagnosis and Indigenous status, Qld, WA, SA and NT, July 1998–June 2000[(a)(b)(c)(d)]

	Number		Percent		Indigenous			Other[(e)]			
Principal diagnosis	**Indigenous**	**Other[(e)]**	**Indigenous**	**Other[(e)]**	**Rate per 1,000[(f)]**	**95% UCL[(g)]**	**95% UCL[(h)]**	**Rate per 1,000[(f)]**	**95% UCL[(g)]**	**95% UCL[(h)]**	**Ratio[(i)]**
Diseases of the respiratory system	23,177	233,612	8.4	5.3	54.1	53.1	55.0	17.0	16.9	17.1	3.2*

* Represents results with statistically significant differences in the Indigenous/other comparisons at the p<.05 level.

(a) Data are from public and most private hospitals. Data exclude private hospitals in the Northern Territory.

(b) Categories are based on the ICD-10-AM (National Centre for Classification in Health 2004).

(c) Financial year reporting.

(d) Data are reported by state of usual residence of the patient hospitalised and are for Western Australia, South Australia, the Northern Territory and Queensland only. These four jurisdictions are considered to have adequate levels of Indigenous identification, although the level of accuracy varies by jurisdiction and hospital. Data for these four jurisdictions over-represent Indigenous populations in less urbanised and more remote locations. Hospitalisation data for four jurisdictions should not be assumed to represent the hospitalisation experience in the other jurisdictions.

(e) Other includes hospitalisations of other persons and those for whom Indigenous status was 'not stated'.

(f) Directly age standardised using the Australian 2001 Standard population.

(g) LCL = lower confidence limit.

(h) UCL = upper confidence limit.

(i) Rate ratio Indigenous: other.

(j) Rates and rate ratios are for females only.

Source: AIHW analysis of AIHW National Hospital Morbidity Database

Table 6.1.3

Top 10 ambulatory care sensitive hospital admissions, by Indigenous status, Qld, WA, SA and NT, July 2002 to June 2004[(a)(b)(c)(d)]

	Separations						Average bed days		Total bed days	
	Number Indigenous	Indigenous rate per 1,000[(e)]	LCL 95%[(f)]	UCL 95%[(g)]	Other rate per 1,000[(e)]	Ratio[(h)]	Indigenous	Other[(i)]	Indigenous	Other[(i)]
COPD	2,910	13.6	13.0	14.2	2.7	5.0*	5.5	7.7	15,916	306,156

* Represents results with statistically significant differences in the Indigenous/other comparisons at the p<.05 level.

(a) Data are from public and most private hospitals. Data exclude private hospitals in the Northern Territory.

(b) Categories are based on the ICD-10-AM (National Centre for Classification in Health 2004).

(c) Financial year reporting.

(d) Data are reported by state/territory of usual residence of the patient hospitalised and are for Queensland, Western Australia, South Australia, and the Northern Territory only. These four jurisdictions are considered to have adequate levels of Indigenous identification, although the level of accuracy varies by jurisdiction and hospital. Data for these four jurisdictions over-represent Indigenous populations in less urbanised and more remote locations. Hospitalisation data for four jurisdictions should not be assumed to represent the hospitalisation experience in the other jurisdictions.

(e) Directly age standardised using the Australian 2001 Standard population.

(f) LCL = lower confidence limit.

(g) UCL = upper confidence limit.

(h) Ratio - Indigenous: Other.

(i) Other includes hospitalisations of other people and those for whom Indigenous status was 'not stated'.

(j) Note that the sum of the number of hospitalisations for each condition exceeds the total as more than one ambulatory care sensitive condition can be diagnosed for each hospital separation.

Source: AIHW analysis of AIHW National Hospital Morbidity Database.

Table 6.1.4

Avoidable mortality, by cause of death and Indigenous status, persons aged 0–74 years, Qld, WA, SA and NT, 2000–2004[(a)(b)(c)(d)(e)]

	Number[(f)]			Per cent			Indigenous			Other			
Cause of death	Indig.	Non-Indig.	Not stated	Indig.	Non-Indig.	Not stated	Rate per 100,000[(g)]	LCL 95%[(h)]	UCL 95%[(i)]	Rate per 100,000[(g)]	LCL 95%[(h)]	UCL 95%[(i)]	Ratio[(j)]
Chronic obstructive pulmonary disease	205	3,027	58	4.2	5.0	5.1	45.0	42.9	47.0	9.1	9.1	9.1	5.0*

* Represents results with statistically significant differences in the Indigenous/other comparisons at the p<.05 level.

(a) Data are reported for Queensland, Western Australia, South Australia and the Northern Territory only. These four jurisdictions are considered to have adequate levels of Indigenous identification in mortality data. They do not represent a quasi-Australian figure.

(b) Data are presented in five year groupings due to small numbers each year.

(c) Rates exclude 950 deaths where the Indigenous status was not stated.

(d) While most deaths of Indigenous Australians are registered, it is likely that some are not accurately identified as Indigenous. Therefore, these statistics are likely to underestimate the Indigenous all causes mortality rate. It is also difficult to exactly identify the difference between the Indigenous and other mortality rates due to these data quality issues.

(e) Deaths are by year of occurrence except the latest year which is based on year of registration.

(f) It should be noted that different causes of death may have different levels of completeness of identification of Indigenous deaths that differ from the 'all cause' under-identification (coverage) estimates.

(g) Directly age standardised using the Australian 2001 standard population.

(h) LCL = lower confidence limit.

(i) UCL = upper confidence limit.

(j) Rate ratio indigenous: other.

Source: AIHW analysis of AIHW National Mortality Database.

Table 6.2.1: Hospitalisations for principal diagnosis of pneumonia, by Indigenous status and sex, Qld, WA, SA and NT, July 2002–June 2004[(a)(b)(c)(d)]

	Indigenous				Other[(e)]				
	Number	Rate per 1,000[(f)]	LCL 95%[(g)]	UCL 95%[(h)]	Number	Rate per 1,000[(f)]	LCL 95%[(g)]	UCL 95%[(h)]	Ratio[(i)]
Qld									
Males	954	11.1	10.1	12.2	11,106	3.3	3.2	3.3	3.4*
Females	837	8.9	8.1	9.7	10,256	2.7	2.6	2.7	3.3*
Persons	1,791	9.9	9.2	10.5	21,362	2.9	2.9	3.0	3.3*
WA									
Males	1,040	20.7	19.0	22.5	4,675	2.8	2.7	2.9	7.4*
Females	963	18.0	16.6	19.5	4,242	2.2	2.1	2.3	8.2*
Persons	2,003	19.3	18.2	20.4	8,917	2.5	2.4	2.5	7.8*
SA									
Males	273	14.0	11.6	16.4	5,463	3.6	3.5	3.7	3.9*
Females	282	14.4	12.2	16.5	4,748	2.7	2.6	2.8	5.4*
Persons	555	14.2	12.6	15.8	10,211	3.1	3.0	3.1	4.6*
NT									
Males	1,302	27.0	24.9	29.2	332	3.1	2.7	3.5	8.8*
Females	1,151	23.1	21.4	24.8	246	2.7	2.3	3.1	8.5*
Persons	2,453	24.9	23.6	26.2	578	2.9	2.6	3.2	8.6*
Qld, WA, SA and NT[(d)]									
Males	3,569	17.0	16.2	17.8	21,576	3.2	3.2	3.3	5.3*
Females	3,233	14.5	13.9	15.2	19,492	2.6	2.5	2.6	5.7*
Persons	6,802	15.7	15.2	16.2	41,068	2.9	2.8	2.9	5.5*

* Represents results with statistically significant differences in the Indigenous/other comparisons at the p<.05 level.

(a) Data are from public and most private hospitals. Data exclude private hospitals from the Northern Territory.

(b) Categories are based on the ICD10-AM (National Centre for Classification in Health 2004); ICD-10-AM codes J12–J18.

(c) Financial year reporting.

(d) Data are reported by state/territory of usual residence of the patient hospitalised and are for Western Australia, South Australia, the Northern Territory and Queensland only. These four jurisdictions are considered to have adequate levels of Indigenous identification, although the level of accuracy varies by jurisdiction and hospital. Data for these four jurisdictions over-represent Indigenous populations in less urbanised and more remote locations. Hospitalisation data for four jurisdictions should not be assumed to represent the hospitalisation experience in the other jurisdictions.

(e) Other includes hospitalisations of non-Indigenous people and those for whom Indigenous status was 'not stated'.

(f) Directly age standardised using the Australian 2001 Standard population.

(g) LCL = lower confidence limit.

(h) UCL = upper confidence limit.

(i) Rate ratio Indigenous: other.

Source: AIHW analysis of AIHW National Hospital Morbidity Database