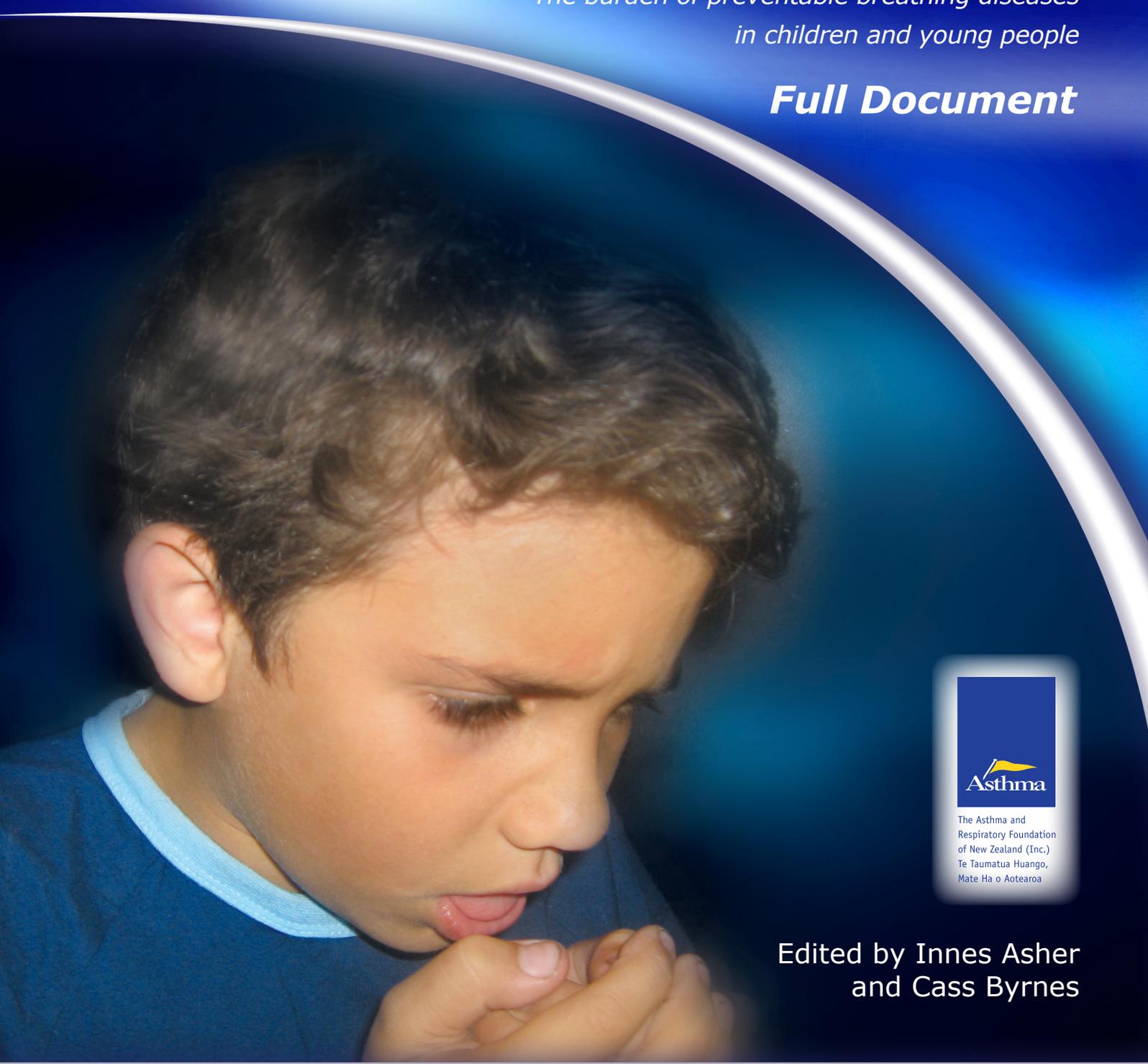


Trying to Catch Our Breath

*The burden of preventable breathing diseases
in children and young people*

Full Document



The Asthma and
Respiratory Foundation
of New Zealand (Inc.)
Te Taumatua Huango,
Mate Ha o Aotearoa

Edited by Innes Asher
and Cass Byrnes

“Trying to Catch Our Breath”

The burden of preventable breathing diseases in children and young people

The Asthma and Respiratory Foundation of New Zealand

Edited by Innes Asher and Cass Byrnes



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Executive Summary

In New Zealand there are far too many children struggling to breathe due to respiratory diseases.

This monograph documents the situation for whooping cough, pneumonia, bronchiolitis, tuberculosis, bronchiectasis, obstructive sleep apnoea, asthma, and smoking related respiratory illness.

In seeking reasons for the high rates of these conditions, the authors have demonstrated relationships with poor housing, poverty, poor nutrition, ethnic disparities, access to primary, secondary and tertiary health care, public awareness, health professional education, smoking and air pollution.

Recommendations address the root influences on these factors, many of which require changes in government policy, and actions from the Ministry of Health and District Health Boards.

It is important to act now, because of the enormous personal, social and economic cost of the current situation, and the need to invest in the future of New Zealand through improving the health of our children.

Key Recommendations

For Government:

1. Introduce a governmental obligation to monitor and report on child poverty.
2. Create strategies and a time line to reduce and eliminate child poverty.
3. Strengthen the New Zealand housing strategy to provide sufficient resources to enable universal access of children to uncrowded, insulated and affordable housing.
4. Resource the provision of easily accessible, free primary health care, 24 hours a day, 7 days a week, and free prescriptions, for children and young people.
5. Continue increases in the tax and real price of tobacco.
6. Seek to eliminate the subtle marketing of tobacco to young people through international films, sports coverage, and sponsorship of educational groups or material.
7. Require tobacco companies to show graphic health warnings on cigarette packets.
8. Introduce government policies to encourage healthier eating, and encourage physical exercise.
9. Legislate for compulsory vehicle exhaust emission testing as part of Warrant of Fitness to reduce air pollution.
10. Develop an inter-sectorial approach to prevention of tuberculosis (TB) (immigration, housing, health, education and justice sectors).

“The primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social. Medicine and politics cannot and should not be kept apart.”

Sir Geoffrey Rose, The Strategy of Preventive Medicine, 1992.

“Our children and young people deserve to grow up in supportive families with adequate incomes; to have a secure home and to have their health and education needs met; to live lives free from violence and crime; and to be able to fulfil their potential as human beings. Children and young people are our future, and we neglect them at our peril.”

Right Honourable Helen Clark, Prime Minister, Opening speech to Parliament, February 2002

For the Ministry of Health:

11. Monitor and report on national indicators of child and youth respiratory health and wellbeing with accurate ethnicity data, and set accountable targets for their improvement.
12. Include respiratory illness as a health priority in the NZ Health Strategy.
13. Develop initiatives which lead to increased capacity of Maori health work force to work with tamariki and their whanau.
14. Increase immunisation levels focusing particularly on early immunisation for pertussis through a broad public communication strategy, improved funding for immunisation service delivery, and completion of the roll out of the National Immunisation Register.
15. Develop more well resourced and accessible programmes to prevent and treat obesity.
16. Implement widespread education of the public and health professionals about the conditions in this document.
17. Implement the Paediatric Society of New Zealand documents:
 - a) 3 best practice evidence-based guidelines, 2005:
 - (i) Management of asthma in children aged 1-15 years;
 - (ii) Wheeze and chest infection in infants under 1 year; and
 - (iii) Assessment of sleep disordered breathing in childhood.
 - b) Through the Eyes of the Child, Respiratory Services 1998 with update, Respiratory Service Guidelines, 2003.
 - c) National Review of Sleep Services for Children and Young People, 2002.

For the Ministry of Transport:

18. Introduce compulsory vehicle emission testing for all vehicles as part of Warrant of Fitness.

For District Health Boards (DHBs):

19. Monitor and report on DHB indicators of child and youth respiratory health and wellbeing with accurate ethnicity data, and set accountable targets for their improvement.
20. District Health Boards which identify high rates of respiratory disease in children should develop local strategies to reduce these levels, and monitor the outcomes.
21. District Health Boards with poorly serviced areas need to develop strategies to address service delivery and health care provision for respiratory diseases.
22. District Health Boards need to have specific strategies for Maori children and young people.
23. District Health Boards need to have specific strategies for Pacific children and young people.
24. Develop the capacity of Maori health work force to work with tamariki and their whanau.

“I visited a family who had almost no furniture in the house. They had taken their child to the doctor one evening in the previous week for an asthma attack. They spent \$80 for the visit and the medications. This was their entire food budget for the following week. They were eating white bread and butter.”

Claire Richards, Asthma Nurse Educator, Porirua Asthma Service.

25. Develop strategies to improve early childhood nutrition, including breast-feeding rates.
26. Implement a Systems approach to identify smoking and smoke exposure in every patient, including exposure of children to tobacco smoke in the home. Identification needs to be patient-friendly but should ensure that all involved health professionals are aware that patients are exposed to this major risk to health.
27. Improve policies, education and programmes to aid smoke addicted people to reduce and give up smoking to reduce the smoke exposure of infants. This would include support of smoking cessation among adults and parents, using a systems approach.
28. Develop more accessible programmes to prevent and treat obesity.
29. Implement widespread education of the public and health professionals about the conditions in this document.
30. Continuing implementation of TB control programmes to detect infectious cases of TB before spread to children occurs and implementation of programmes in the health system, immigration and housing to help reduce spread of disease.
31. Development of community-based education programmes in at risk groups to remove the stigma of TB and bronchiectasis.
32. Increase general public and medical staff awareness of key respiratory symptoms including snoring, and persistent productive or mucousy cough in a child of more than 6-8 weeks duration.
33. Implement the Paediatric Society of New Zealand documents:
 - a) 3 best practice evidence-based guidelines, 2005:
 - (i) Management of asthma in children aged 1-15 years;
 - (ii) Wheeze and chest infection in infants under 1 year; and
 - (iii) Assessment of sleep disordered breathing in childhood.
 - b) Through the Eyes of the Child, Respiratory Services 1998 with update, Respiratory Service Guidelines, 2003.
 - c) National Review of Sleep Services for Children and Young People, 2002.

For universities, other tertiary education institutions and health providers:

34. Develop the capacity of Maori health work force to work with tamariki and their whanau.
35. Develop the capacity of Pacific health work force to work with their children and families.
36. Promote further research into prevention of pneumonia, bronchiectasis and sleep breathing problems in children.

Preface

It is disturbing that many children in New Zealand suffer from breathing difficulty and respiratory diseases, and that our rates for some conditions are higher than comparable countries. What is most disturbing is that much of this burden of disease is preventable.

This document discusses the context of respiratory disease in New Zealand, describes the major diseases and their effects, and recommends what can be done to reduce the burden to individual children, their families, and society, with immediate and long-term benefits. This document and the summary version were written because of serious concern among New Zealand paediatricians that these diseases should be documented and addressed. The authors of the chapters are New Zealand authorities in their field.

Included in this document are smoking related respiratory illness and the major lower respiratory diseases: pertussis, pneumonia, bronchiolitis, tuberculosis, bronchiectasis and asthma. In addition children with obstructive sleep apnoea are discussed. Upper respiratory infections are very common, but are not covered in this document: the common cold, tonsillopharyngitis, otitis media, sinusitis and viral croup. Sudden unexpected death in infancy is also not included.

Is it possible to describe these conditions as preventable? This term implies that some actions could be taken to avoid the illness occurring in the first place, or to prevent the condition worsening or becoming severe or persistent, or to avoid hospital admission. Our Ministry of Health categorises hospitalisations as potentially avoidable or unavoidable. Among the Top 10 causes of potentially avoidable hospital admissions in New Zealanders aged 0-24 years, the majority are respiratory conditions (Figure).

“We cannot waste our precious children. Not another one, not another day. It is long past time for us to act on their behalf.”

*Nelson Mandela and Graça Machel.
From Global Movement for Children, a letter to the people of the world, May 2000.*

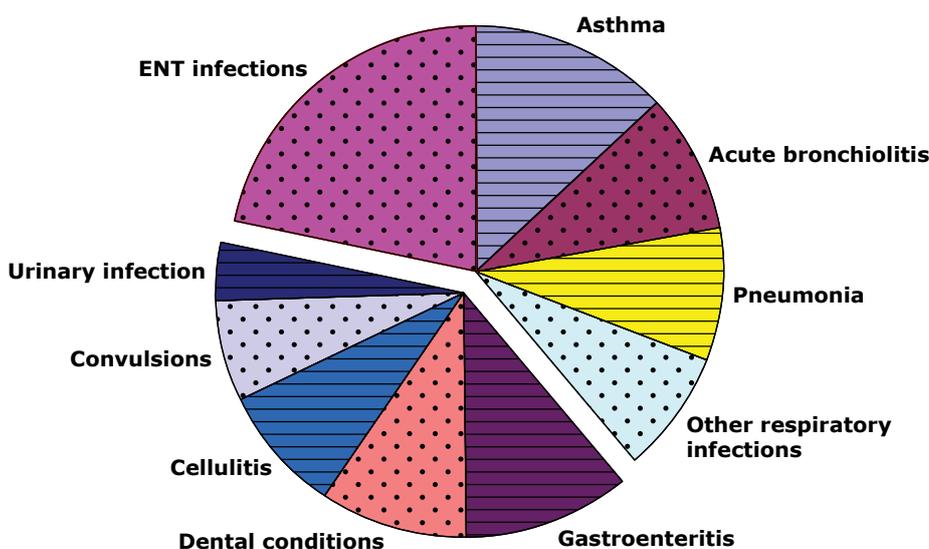
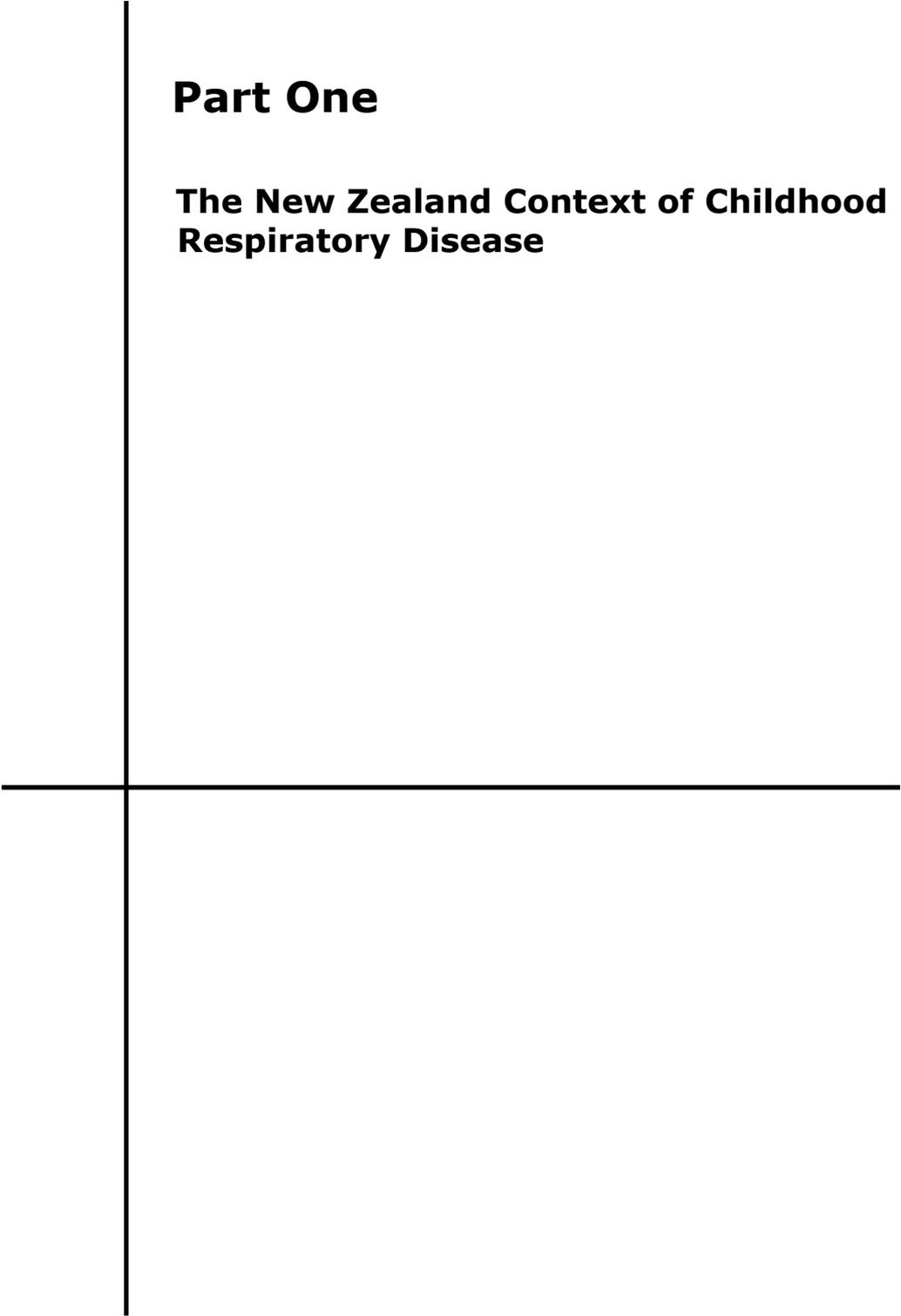


Figure: Top 10 Causes of Potentially Avoidable Admissions, 0-24 Years, 1999¹.

Abundant research has identified many of the issues which need to be addressed to prevent these conditions, but a need for further research has been identified in specific areas. This monograph gives

information about the respiratory health of New Zealand children, and the size of the burden to these children, their families and society, and makes recommendations to improve outcomes. The scope of factors which may help reduce the high rates of these conditions are listed as recommendations the end of each chapter. These indicate that far reaching changes are needed in Government policy and its implementation across all sectors, District Health Board performance, and public and health professional education.

In addition, the Paediatric Society of New Zealand has identified many changes to service delivery which will address these diseases and these recommendations require implementation: *Through the Eyes of the Child, Respiratory Services* (1998) (updated as *Respiratory Service Guidelines* 2003); *National Review of Sleep Services for children and young people in New Zealand: facilities and expertise* (2002); *Management of asthma in children aged 1-15 years* (2005); *Wheeze and chest infection in infants under 1 year* (2005); and *Assessment of sleep disordered breathing in childhood* (2005).



Part One

The New Zealand Context of Childhood Respiratory Disease

Chapter 1: The Socioeconomic Context of Respiratory Disease

“I visited a family who had almost no furniture in the house. They had taken their child to the doctor one evening in the previous week for an asthma attack. They spent \$80 for the visit and the medications. This was their entire food budget for the following week. They were eating white bread and butter.”

Claire Richards, Asthma Nurse Educator, Porirua Asthma Service.



Innes Asher

Since the mid 1980s New Zealanders experienced unprecedented sweeping economic and social reforms. These were arguably greater than any other industrialised country. Despite this there was no monitoring of the impact of the reforms on the daily lives of New Zealanders, and especially no regard for their impact on children and child health². The policy changes were associated with increasing inequality and poverty (Figure 1-1). Those likely to have had the most adverse impact on the health of children are listed in Table 1-1.



Figure 1-1: Percentage change in average household equivalent disposable income by decile 1982-2001 (in equivalent 2001 dollars)^{3,4}. This graph shows the percentage change in average household disposable income according to how well off the family is. Each of these categories – deciles – represents 10% of households. In decile 1 are the poorest families. In decile 10 are the most affluent. Over this 20 year period the rich have got richer (not including capital gain). At the same time families in the lowest deciles have less disposable income now than they did 2 decades ago (before housing costs are counted).

Many of these policy changes directly resulted in a deterioration of the financial situation of many low income households with children. The disadvantage was added to by the increased cost of rental housing^{5,6}. It is not surprising that these changes had major impacts on health because income is widely recognised as the most important health determinant^{7,8}. Income determines the ability to purchase nutritional food; the size, adequacy and location of housing⁶; the ability to afford to heat the home, to buy clothing, bedding, soap and towels; the ability to pay for phone and transport, participate in sport, visit the doctor, and access medicines and education. Many families became unable to afford all these essential items for their children. The proportion of children living in poverty (defined as living in a household with an income below 60% of the median family income net of housing costs) increased from 16% in 1987/88 to a staggering 29% (300,000 children) in

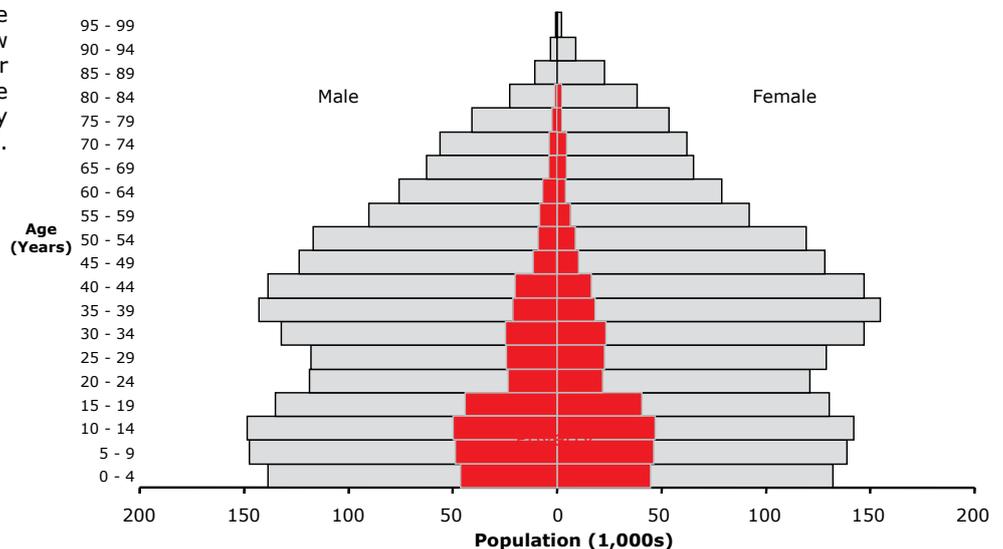
2000/2001⁹ (Figure 1-2). New Zealand has one of the worst rates of child poverty in rich countries¹⁰ (Figure 1-3). It is puzzling that New Zealand's sense of fairness and care for the vulnerable and dependent, exemplified by the non-means tested inflation-adjusted benefits for super-annuitants, has not extended to the most vulnerable members of our population – our children – on whom the future of New Zealand depends¹¹.

Table 1-1: Changes in policy adversely affecting child health.

- 1984 Market-based reforms introduced.
- 1986 GST introduced on all basic consumption including food, clothing and health services.
- 1986-2008 Family income support not indexed.
- 1991 Benefits cut.
- 1991 The universal family benefit abolished.
- 1991 The Employment Contracts Act introduced.
- 1992-1999 11,000 state houses sold off.
- 1993-2000 Market rents for state houses.
- 1996 Child Tax Credit introduced excluding the poorest children.

The deteriorating outcomes for the health and well being of children, and their relationship to inadequate incomes have been documented in numerous governmental^{4,9,12-15} and non-governmental reports^{2,10,16-20} over the last decade. There have been some modest measures introduced since 2001 which have begun to redress the deficits for children. This includes the building of some new state houses (the current waiting list stands at about 11,000), the Healthy Housing Project which has improved the size and quality of some state houses, improved participation in early childhood and tertiary education, more money injected into primary health care, the development of Maori and Pacific health providers, and the 2004 Budget's "Working for Families" package. This latter strategy will eventually improve family incomes where parents are in work, but will not be fully implemented until 2007. However, the poorest 175,000 children (approximately 20%) supported by parents on benefits will largely miss out, and remain on inadequate income to meet essential needs¹⁸ (Figure 1-4).

Figure 1-2: The population of New Zealand in 5 year age bands, with the proportion in poverty estimated in red¹².



It is vital that the income for children’s basic needs is protected regardless of the source of their parents’ income, but the “Working for Families” package fails to do this. The Ministry of Social Development projects that only 30% of children in poverty will be lifted out of poverty by 2007. To attain this figure the Ministry have used a poverty line based on 60% of median family income before housing costs, and that there will be 100% uptake of the package²¹. However based on past experience such a high uptake rate is very unlikely.

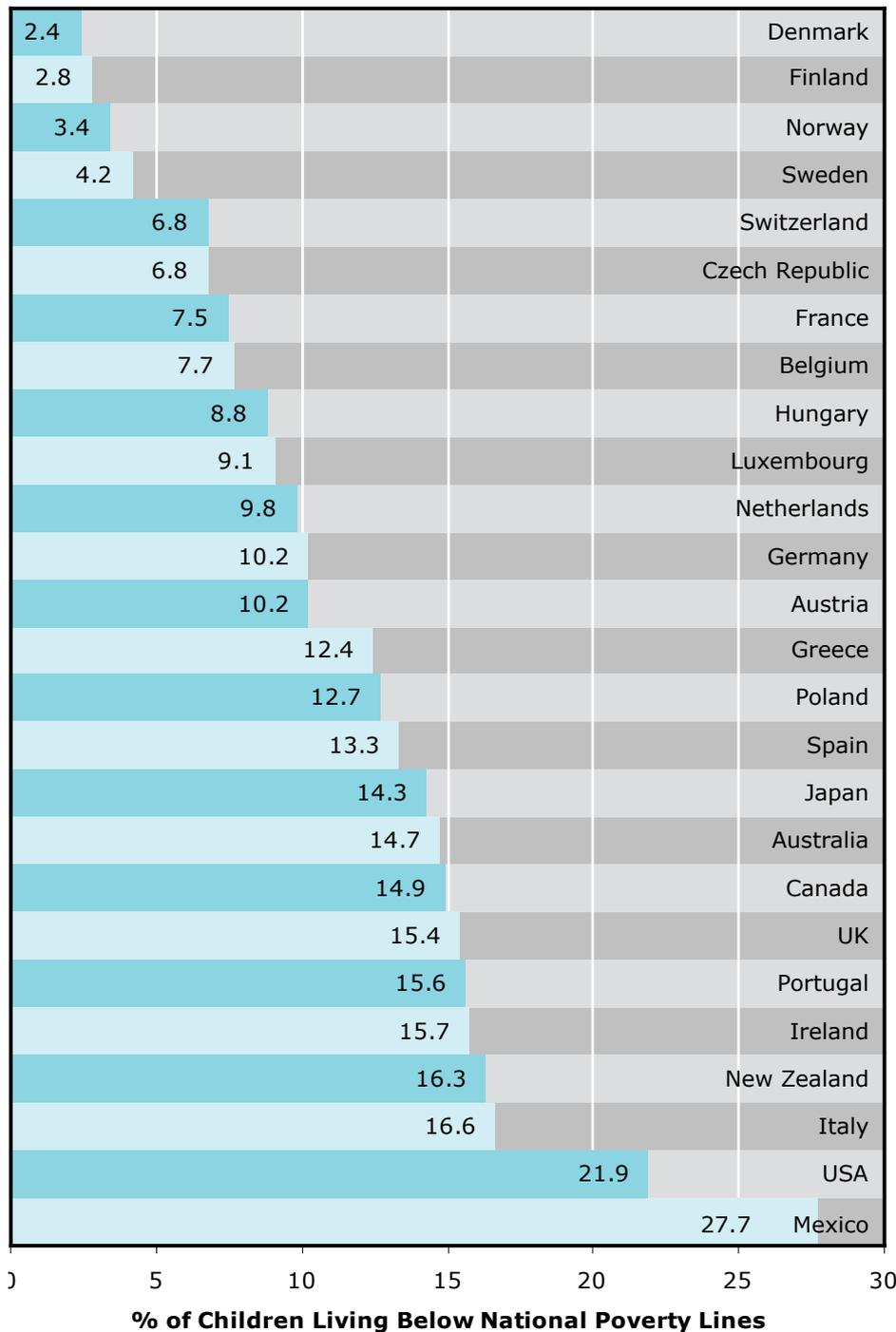
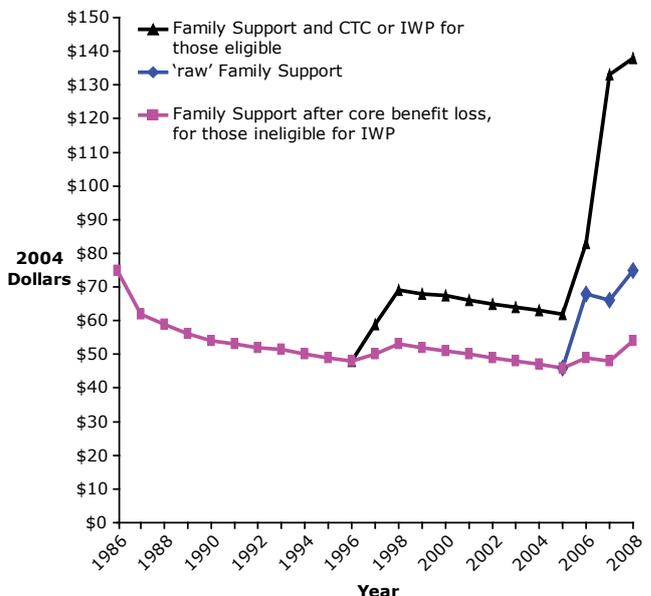


Figure 1-3: The Child Poverty League¹⁰. The bars show the percentage of children living in relative poverty defined as households with income below 50% of the national median income in 2001. While MSD have corrected these figures to a slightly improved 14.6% in 2001, their figure has risen to 15% in 2004, showing deterioration.

The cumulative effects of long term inadequate nutrition, crowded substandard housing and living conditions, and unaffordable or inaccessible primary health care over the last 15-20 years have taken a lasting toll on the health of hundreds of thousands of New Zealand children causing loss of well being, and even permanent disability in some. New Zealand children have very high rates of preventable

Figure 1-4: Maximum per week real family assistance 1986-2008. One child family (in equivalent 2004 dollars)²². From 1986 to 2005 family support fell in real terms. When the "Working for Families" package is fully rolled out in 2007, families entitled to in work payments will have a significant income boost. But about 175,000 poor children will have inadequate inflation adjustments after their parents' core benefit is cut, miss out on in work payments and fall further behind. (CTC = child tax credit, IWP= In work payment).



diseases and injury compared with other similar countries like the UK and Australia, which have more generous economic support for families with children. Until the poor economic situation of New Zealand children remaining in poverty is addressed this alarming situation will continue into the next decades.

**"...Do you know
what it feels like
When you're having
dinner and the
power runs out
The kids are in
the shower and the
water runs out
Three babies are
crying 'cause their
powder run out
Instead of buying
food every week
they're paying bills so
every night they've
got somewhere
to sleep..."**

*From NO ARTIFICIAL
FLAVOURS CD,
released 2003
(Courtesy of EMI).*

Respiratory or "breathing" disorders feature highly among the health burden, but, apart from asthma, they have had little public recognition. Compared with our neighbouring Pacific nations we have higher rates of admission for diseases such as pneumonia and whooping cough. The danger is that we are accustomed to these high rates of disease as the "normal" child health picture in New Zealand, even though the rates are exceedingly high in comparison with other OECD countries, and some developing countries have better preventive health policies, and thus better outcomes.

The New Zealand government has made good progress in introducing policy changes which result in reduction of environmental tobacco exposure. In contrast, our track record on air pollution is poor by international standards. The main source of air pollution in New Zealand is from vehicle exhaust emissions, from which about 400 New Zealand adults die each year²³. There are serious health effects from vehicle exhaust emissions on children too, including increased risk of wheezing under one year²⁴, increased chronic cough, and increased asthma symptoms. New Zealand is the only OECD country which does not have compulsory vehicle exhaust emission testing as part of the warrant of fitness. In 2003 a decision was made to change the Transport Law to include compulsory vehicle exhaust emission testing from mid 2006. However in May 2005 this decision was modified so the check will now look only at the emission of clearly visible, dense smoke and will miss all non-visible pollutants, and thus New Zealand will not meet international emission standards.

1.1 Recommendations

- Require child impact reports for all government policies.
- Monitor and report on child poverty.
- Adopt clear goals for reduction in child poverty, extending policies beyond “Working for families”.
- Ensure an adequate safety net for all children so that basic necessities can be afforded, regardless of the source of income of their parents.
- Ensure an adequate income support for all low income families with children, allowing for inflation and real growth in wages.
- Provide adequate long term funding of the New Zealand Housing Strategy, including increased investment in healthy affordable state housing.
- Monitor and report on indicators of child and youth health and wellbeing, including respiratory health, and set accountable targets for their improvement.
- Enact legislation for compulsory testing of vehicle exhaust emissions.

A couple on the sickness benefit with one child has not had any increase in their family assistance since 1996. From April 1 2005 they got \$7.50 per week after their core benefit reduction and nothing more until 2007 when they will get another \$10 per week.

Income determines the ability to purchase nutritional food; the size, adequacy and location of housing; the ability to afford to heat the home, to buy clothing, bedding, soap and towels; the ability to pay for phone and transport, participate in sport, visit the doctor, and access medicines and education. Many families became unable to afford all these essential items for their children.



Jim Reid

While much has been achieved in the four years since publication of the Primary Health Care Strategy, for some families the cost is still too high for them to afford visits to the doctor.

The concept of free access is far from universal.

The cost of after hours services can be high for many parents.

The prescription charges are unaffordable for some families, even with a community services card.

Chapter 2: Healthcare Delivery

Approximately 95% of all health care delivery in New Zealand is from Primary Health providers – general medical practitioners, nurses, and pharmacists being in the front line. This is recognised in the Primary Health Care Strategy authorised by the Minister of Health, the Honourable Annette King, in February 2001²⁵. This document promises that “Doctors, nurses, community health workers and others in primary health care will work together to reduce health inequalities and to address the causes of poor health status. Services will be readily available at a cost people can afford.” While much has been achieved in the four years since publication, for some families the cost is still too high for them to afford visits to the doctor. Some General Practices are access funded which is at an overall higher level than those which are interim funded. Often these practices are in the same geographic area and consultation charges differ as a result of overall bulk funding. Progress is however being made on universal access funding.

Health delivery in New Zealand has undergone a number of social and economic reforms in the last two decades. It is to be hoped that the changes implemented by the current government will be given time to “bed down” before further change is contemplated. Continual restructuring is confusing to the public, disruptive to the health professionals, confusing to management, and costly. It is often accompanied by increasing and changing bureaucracy for health professionals, whose primary task should be health care delivery. Many general practitioners now estimate that at least one third of their time is engaged in compliance requirements and paper work.

For children and young people to access health care there must be availability, trust in the provider, trust in the appropriateness of the provision of the service including cultural appropriateness, confidentiality, and it must be affordable. The Primary Health Care Strategy does much to advance the affordability, but in most cases payment is still a requirement. For a long time all children in New Zealand under the age of six were treated free, and in many cases this still applies, with the doctor being prepared to accept a much lower fee than the usual. However as this benefit has eroded, the concept of free access is now far from universal.

The cost especially of after hours services can be high for many parents. One can argue that some financial contribution to a medical service may project some value to it, but the quantum of that payment should not be a barrier to seeking medical attention. There is still evidence that in some parts of the country the cost of seeing a doctor (especially for out of hours services) is still a disincentive.

Prescription charges were introduced in the mid-1980s. These extra costs are unaffordable for some families, even with a community service card, who have to make decisions about which, if any, prescription items to pay for. This may result in inadequate treatment

and poor outcomes.

While adequate access to primary health care is paramount, one must not forget the importance of appropriate contact with specialist care. Again this needs to be available within reasonable time, and at reasonable cost. In this country in many cases it is accessed via the public hospital system at no cost to the patient. On many occasions the waiting time in this system is inappropriately long.

2.1 Recommendations

- The provision of easily accessed, affordable primary health care is of paramount importance.
- Payment should not be a barrier to medical care.
- All children should have a general medical practitioner who can provide continuing care.
- There should be appropriate access to specialist care within a reasonable time frame.

There is still evidence that in some parts of the country the cost of seeing a doctor (especially for out of hours services) is still a disincentive.

The public hospital waiting time for specialist review on many occasions is inappropriately long.



Matire Harwood

The burden of paediatric respiratory disease falls heavily on Maori.

Chapter 3: The Context for Maori Tamariki and Taitamariki

3.1 Respiratory Disease and Maori Children

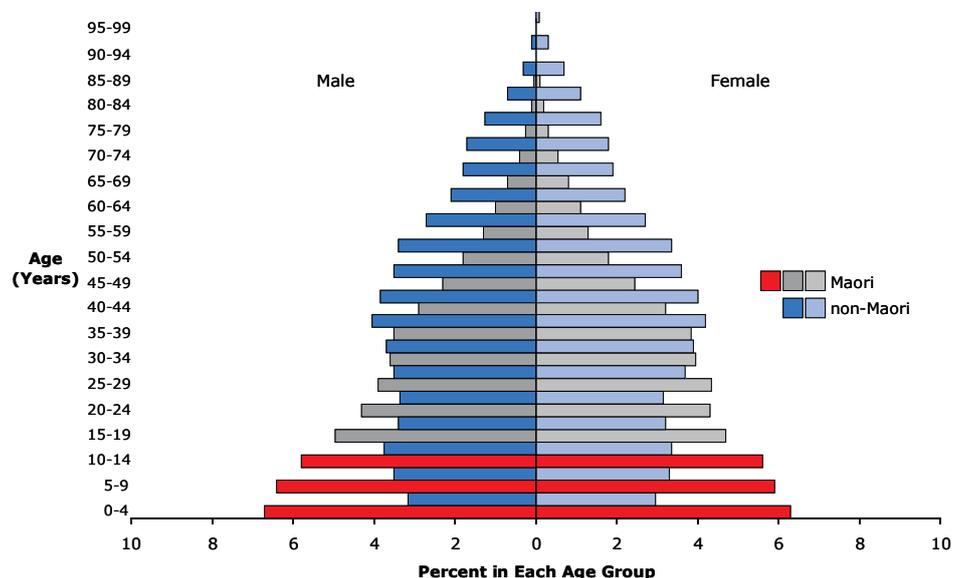
The burden of paediatric respiratory disease falls heavily on Maori. Inequalities in incidence and mortality rates, the quality of care and resultant disability exist for most infectious and non communicable respiratory disease in Maori children compared with non-Maori children. Importantly, asthma and rangatahi health are two of the eight health priorities in He Korowai Oranga, the Maori Health strategy²⁶, highlighting the significant impact respiratory disease has on Whanau ora.

Maori children are a valued part of our community and their rights to wellbeing are guaranteed in both the Treaty of Waitangi and national and international statutes. Maori children currently make up 25% of all children living in New Zealand and more than a third of the Maori population is aged 14 years and younger (compared with 20% of the non-Maori population)²⁷ (Figure 3-1).

Sadly they are also a group who are most at risk of poor health caused by the unequal distribution of and access to sufficient disposable income, adequate housing, educational opportunities and effective, available and acceptable health care²⁸. Woven in with the social and economic determinants of health is the impact of ethnicity. Maori at all educational, occupational and income levels have poorer health status than non-Maori²⁸. Smoking prevalence among Maori women of child-bearing age ranges up to 60%²⁹. Any improvements in socioeconomic status, housing and education will advance the wellbeing of Maori children suffering respiratory disease but the betterment of Maori political status will also contribute to health gain.

Health care services play important roles. The quality of health care provided to Maori children must be monitored to ensure that services are working to reduce health disparities and to attain equitable outcomes. Therefore the collection of accurate ethnicity

Figure 3-1: Population pyramid of the Maori & non-Maori populations, 2000²⁷.



data is necessary so that the standard of care for Maori children with respiratory illness can be measured against best practice. Evidence based guidelines, such as guidelines for the management of paediatric asthma, community acquired pneumonia and tuberculosis, have examples of audit tools for clinicians and consumers to utilise for this purpose. Many District Health Boards (DHBs) have also identified specific targets for Maori, child and respiratory health that may assist providers.

3.2 Some Specific Examples – Asthma, Bronchiectasis, Pneumonia

3.2.1 Asthma and Maori Children

Although the prevalence of paediatric asthma in New Zealand is similar for Maori and non-Maori³⁰, Maori children with asthma:

- Have more severe symptoms when presenting to the health provider for routine or acute care³⁰;
- Require hospitalisation for asthma almost twice as often as non-Maori children³⁰⁻³²; and
- Require more time off school because of asthma³¹.

Despite an increased need for adequate asthma management, Maori children with asthma appear to be further disadvantaged when it comes to acceptable asthma care. They are less likely to receive adequate education, to have an asthma action plan and to be prescribed preventive medication³³⁻³⁵. Other commonly cited barriers for Maori with asthma include cost for consultation, access to transport and telephone and the attitude of the doctor/provider including bias and discrimination^{31,36}.

A number of initiatives have been developed by Maori to facilitate the provision of quality asthma care and include the Tu Kotahi Maori Asthma Society, Maori health services providing customised Action Plans and Maori asthma educators/nurses and Auahi Kore programmes to help parents quit smoking. Marae based asthma programmes that take a partnership approach are also effective³⁷. New or novel approaches to asthma care that incorporate Maori initiatives alongside best practice guidelines must be encouraged if we wish to improve the quality of asthma care delivered to tamariki, taitamariki and their whanau.

3.2.2 Bronchiectasis

Despite its decline in other developed countries, bronchiectasis appears to be a problem in Auckland³⁸ and other centres in New Zealand. Significantly more Maori and Pacific children have a diagnosis of bronchiectasis (by high resolution CT scan of the chest) than non-Maori non Pacific children living in Auckland³⁸. Of note the Maori and Pacific children with bronchiectasis also appeared to experience more socioeconomic deprivation and have lower immunisation rates.

Maori at all educational, occupational and income levels have poorer health status than non-Maori.

The quality of health care provided to Maori children must be monitored to ensure that services are working to reduce health disparities and to attain equitable outcomes.

Researchers highlight the fact that only the more severe cases are identified and therefore children with ‘moderate’ disease and their health care providers may not be aware that they have bronchiectasis. A call for improved methods of detection are sought in order to identify and manage children with bronchiectasis³⁸.

3.2.3 Pneumonia

Evidence points to a long standing history of Maori being at increased risk from the effects of introduced respiratory infections since the colonisation of New Zealand.

Between the 1850’s and 1860’s nearly half of the Maori population was wiped out by measles and the common cold. The 1918 influenza epidemic caused further devastation. Over 8000 people died from the disease in New Zealand and historians have suggested that every family living in NZ at the time was affected by it. The impact on Maori was huge and significant inequalities in mortality rates existed with rates for Maori over seven times higher than rates for NZ Europeans (42.3/1000 versus 5.8/1000).

“When the influenza epidemic hit, it decimated Maori communities across New Zealand. Masters of knowledge were lost. The skills of carvers and weavers were buried with them - and fear stirred. For the traditional arts and crafts were the chronicles of the culture, carving and weaving centuries of history, recording families, language and every facet of every tribe”.

Te Puia web site (<http://www.nzmaori.co.nz/aboutus/history.html>).

Over time improvements in public and primary health care has led to a decline in most of the major respiratory tract infections in New Zealand but Maori and Maori children still continue to carry the greatest burden. Maori children have higher rates of community acquired pneumonia³⁹ and based on comparisons of vital signs and intensity of therapy, are hospitalised with more severe pneumonia than European children in New Zealand⁴⁰.

The incidence of tuberculosis has decreased for adults in NZ over recent years but disturbingly, there has been no such reduction in paediatric rates⁴¹. Significant ethnic disparities in tuberculosis incidence rates exist and Maori children aged less than 15 years account for 15% of all cases of TB compared with 3% of European and 17% of Pacific children⁴².

“There is no great virtue in encouraging healthy lifestyles in poor areas without also attempting to redress the structural inequalities that limit human lives and aspirations...”

In short, health promotion will be of limited value if it is not accompanied by fundamental changes that guarantee human dignity and full inclusion in society and the economy.”

Mason Durie, Maori Ora, 2001.

Maori children with asthma are less likely to receive adequate education, to have an asthma action plan and to be prescribed preventive medication.

New or novel approaches to asthma care that incorporate Maori initiatives alongside best practice guidelines must be encouraged.

Maori children have higher rates of community acquired pneumonia and are hospitalised with more severe pneumonia than European children in New Zealand.

3.3 Summary

Paediatric respiratory disease is a priority for Maori. Maori tamariki and taitamariki are a significant part of the Maori community and contribute to New Zealand's young people - their wellbeing must be protected. Our goal is to remove the inequalities in respiratory illness rates, health care and health outcomes that exist for Maori children.

3.4 Recommendations

- Appropriate public health action that addresses wider contextual and environmental factors that impact on the respiratory health Maori children such as improved housing, removal of socioeconomic barriers, effective tobacco cessation programmes.
- Ensure quality and evidence based health care for all children.
- Collect accurate ethnicity data and monitor appropriate outcomes.
- Develop the capacity of Maori health work force to work with tamariki and their whanau.

3.5 Glossary:

Auahi Kore	Smoke Free
He Korowai Oranga	Maori Health Strategy
Marae	Meeting site for whanau, hapu, iwi (tribal affiliation)
Maori	Indigenous people of New Zealand
Rangatahi	Young people
Tamariki	Children
Taitamariki	Teenagers
Tu Kotahi	Name for the Maori Asthma Society
Whanau	Extended family



Teuila Percival

Compared with most New Zealanders, Pacific children are disadvantaged in health, housing, education and household income.

Chapter 4: The Context for Pacific Children

“If you want sight and insight into my psyche, you will have to speak to the gods which inhabit it. You have to eavesdrop on the dialogue between my ancestors and my soul. You have to address my sense of belonging.

I am not an individual, I am an integral part of the cosmos. I share my divinity with my ancestors, the land, the seas and the skies. I am not an individual because I share a tofi with my family, my village and my nation.

I belong to my family and my family belongs to me. I belong to my village and my village belongs to me. This is the essence of my sense of belonging.

These are the reference points which define who I am, and they are reference points for other Samoans. Any service which seriously wishes to address our health must take these into account.”

Honourable Tuiatua Tupua Tamasese Efi, Former Prime Minister of Western Samoa, Excerpt from address to Pacific Medical Association Conference, Auckland, 2000.

Pacific people in New Zealand are made up of many different ethnic groups with origins in the Pacific Island nations. The largest groups are from Samoa, Tonga, Niue, Cook Islands, Tuvalu and Tokelau. As a collective group Pacific people make up 6.5% of the New Zealand population. Languages and culture and strength of acculturation vary between groups but there are also many commonalities which the different ethnic groups share such as the migration experience, marginalisation, and cultural barriers to accessing health and social services. The Pacific population is relatively youthful group compared with greater New Zealand with 39% of Pacific aged less than 15 years of age compared with just over 20% of total New Zealand being in the same age group⁴³.

“I am not an individual, I am an integral part of the cosmos. I share my divinity with my ancestors, the land, the seas and the skies. I am not an individual because I share a tofi with my family, my village and my nation.

I belong to my family and my family belongs to me. I belong to my village and my village belongs to me. This is the essence of my sense of belonging.

These are the reference points which define who I am, and they are reference points for other Samoans. Any service which seriously wishes to address our health must take these into account.”

Tuiatua Tupua Tamasese Efi.

Compared with most New Zealanders, Pacific children are disadvantaged in health, housing, education and household income^{2,43}. Pacific families have lower household median annual income than that of all other ethnic groups and unemployment rates continue

to be higher than fellow New Zealanders². Forty-two percent of Pacific people live in the most deprived neighbourhoods (NZDep01 Decile 10) compared with 10% of total New Zealanders⁴⁴. Pacific families are also more likely to live in overcrowded and poor housing compared with other New Zealanders^{2,45}. As many as 1 in 3 Pacific children in Auckland live in overcrowded homes⁴⁶. In the PIFT (Pacific Islands First Two Years of Life & Transition to School) longitudinal study of South Auckland Pacific children, over a third of mothers reported that their homes were damp and over half reported problems with cold housing⁴⁷. Pacific children are more likely to live in larger families. Over one third live in families with four or more dependent children compared with 16% in the national population. Whereas 29% live in extended families, Pacific children are also increasingly living in single parent led families⁴³.

Pacific children continue to experience poorer health status than other New Zealand children. Pacific infant mortality rates are higher than other New Zealanders⁴⁸ (Figure 4-1). Pacific children have hospitalisation rates for preventable diseases higher than Maori, European and other ethnic groups⁴⁹. Respiratory disease is a particular concern for Pacific children. Their hospitalisation rates are almost three times that of other children for lower respiratory tract infections^{48,50}. Compared with NZ European children they also have more severe disease when hospitalised with pneumonia⁵⁰. Pacific children have disproportionately high rates of (non-cystic fibrosis) bronchiectasis thought to be mainly due to socioeconomic deprivation and low immunisation³⁸.

Pacific children also have a 50% higher hospitalisation rate for asthma than the New Zealand average⁴⁹. Prevalence rates for other diseases such as rheumatic fever, tuberculosis and meningococcal disease are similarly higher than that of all other New Zealand children⁴⁸.

Pacific families face economic, cultural and language barriers in their interactions with health and social services. Limited access to care and less quality or effectiveness of care is supported by the very high rates of hospitalisation for conditions such as asthma which

Pacific children have hospitalisation rates for preventable diseases higher than Maori, European and other ethnic groups.

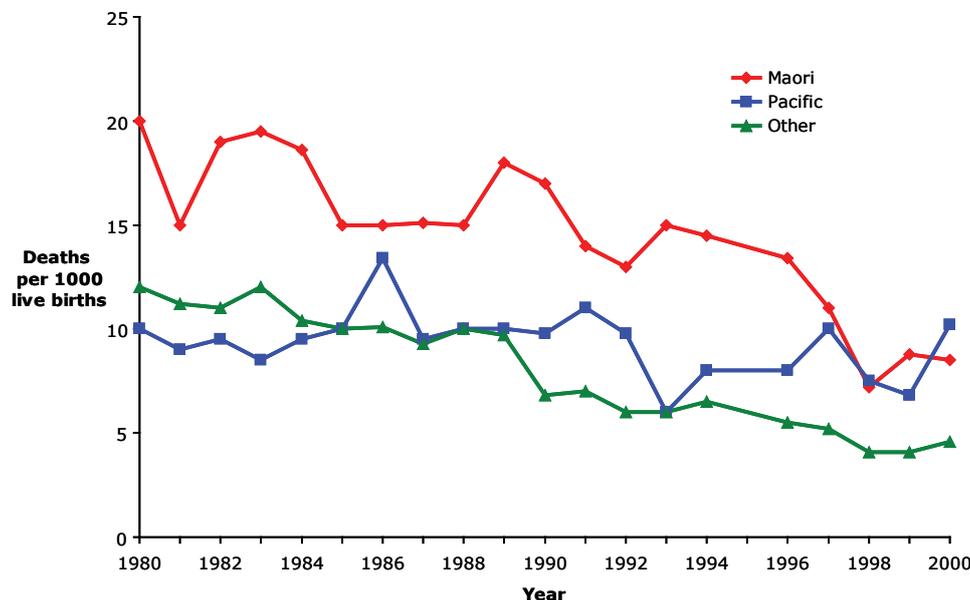
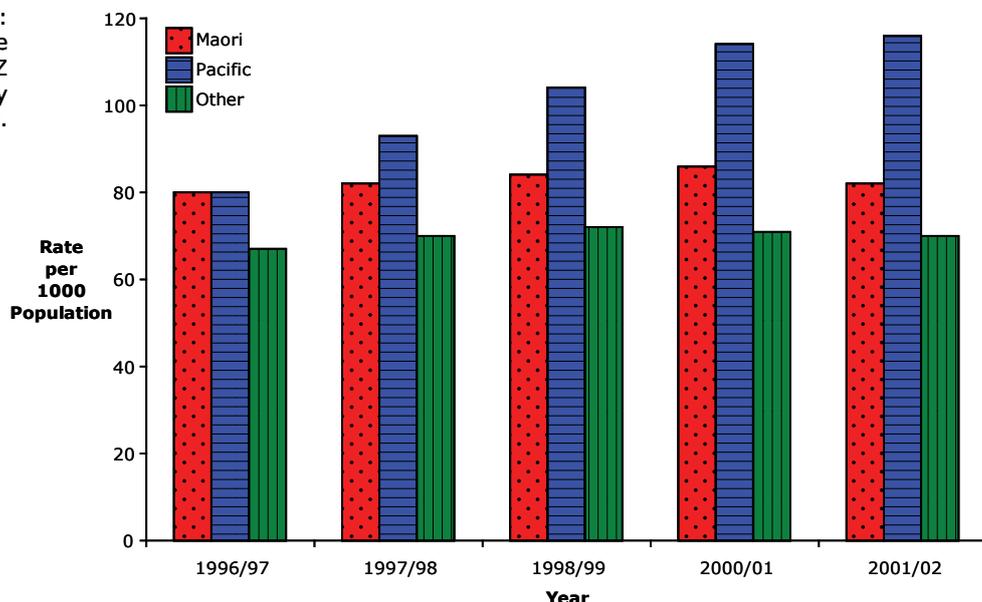


Figure 4-1: New Zealand infant mortality by ethnic group⁵¹.

Figure 4-2:
Ambulatory sensitive
hospitalisations for NZ
under 5 year olds, by
ethnicity, 1996-2002⁴⁹.

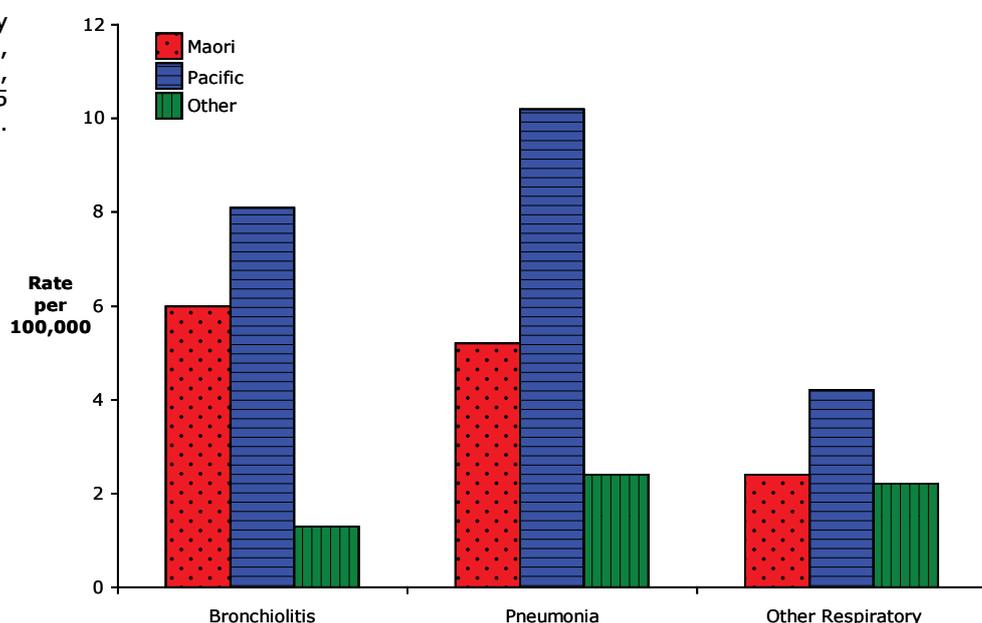


**Pacific children
have a 50% higher
hospitalisation rate
for asthma than the
New Zealand average.**

are preventable through good community based health care. The picture of health service usage by Pacific people is notable in that they are more likely to forego visiting a GP than other New Zealanders even though they recognise there is a need^{48,52}. The most common reason given is cost. Similarly the commonest reason given for not picking up a prescription is cost. Pacific people are also less likely to be seen as secondary care outpatients and less likely to attend primary care for screening or health promotion. Other factors impacting on Pacific children's health are environmental tobacco smoke exposure with almost one third of Pacific adults still smoking^{48,49}. Less than half of Pacific babies are still fully breast-fed at three months⁴⁸ of age with a further rapid decline in rates in the six to twelve months age group.

As a group, Pacific children are excessively burdened with poor health and socioeconomic disadvantage. The poor health seen represents both increased prevalence and severity of disease. Respiratory disease is the leading cause of morbidity or ill health for Pacific children. Much of this respiratory morbidity is preventable. Ethnic diversity and differing languages, culture and degree of

Figure 4-3: Respiratory
infection admissions,
Counties Manukau,
children under 15
years, 1999¹.



acculturation affect the ability of Pacific children and their families to access effective health care and social services.

Socioeconomic disadvantage continues to impact negatively on Pacific children's health. The poverty and poor housing conditions experienced by Pacific children, as well as the access to effective first line primary health services need to be addressed.

The way forward for Pacific children and their families requires a commitment to health promotion and addressing the underlying determinants of our children's health such as education, housing and household income. Investing in our Pacific children's educational success is particularly important in addressing the ongoing health and economic disparities in the long term⁵². Improving access to health services as well as their effectiveness for Pacific children and families is also needed. This requires a more in depth understanding of our changing communities and the issues they face by health care providers and their funders.

Improving the health and well-being of Pacific children requires medium and long term strategies for positive change.

"A society that enjoys high levels of participation, connection and cohesion will have a more productive and successful economy..."

The objective of an inclusive economy is to improve the well-being of New Zealanders...

Policy should address its primary effort to improve the outcomes for Maori and Pacific who do worse than the median...

Improving literacy and numeracy skills of Maori and Pacific primary school students is the priority for further development."

Towards an Inclusive Economy, Treasury, NZ Government, 2001.

6.1 Recommendations

- A commitment to focus on and reduce disparities between Pacific and other NZ children.
- Focus on health promotion and prevention.
- Improving access to and effectiveness of health services.
- Improving the educational success of Pacific children.

Pacific people are more likely to forego visiting a GP than other New Zealanders. The most common reason given is cost. Similarly the commonest reason given for not picking up a prescription is cost.

Respiratory disease is the leading causes of morbidity or ill health for Pacific children. Much is preventable.

The poverty and poor housing conditions experienced by Pacific children, as well as the access to effective first line primary health services need to be addressed.



Nikki Turner

Children continue to suffer unnecessarily from high rates of vaccine-preventable diseases in NZ despite the availability of high quality safe and effective vaccines.

Chapter 5: Immunisation Delivery

Immunisation is well recognised as one of the most important public health achievements of the 20th century⁵³.

The gains are enormous – smallpox disease has been eradicated, poliomyelitis is close to eradication, and rates of diseases such as measles, pertussis, haemophilus influenza and hepatitis B in our children are considerably lessened. Furthermore there is an international explosion in vaccine technology and new important vaccines are entering the world market giving potential to tackle other significant childhood diseases such as pneumococcal, meningococcal, rotavirus diseases, and pertussis for adolescents⁵⁴. However while there is enormous potential to gain much better control of these diseases the ability to deliver has not matched the ability of the technology. Children continue to suffer unnecessarily from high rates of vaccine-preventable diseases in NZ despite the availability of high quality safe and effective vaccines.

5.1 Low Coverage

New Zealand has a poor record with immunisation coverage with immunisation rates well below the targets set in national strategies. There is no currently available national coverage data, however rates are unlikely to have improved much over the 1992 national coverage survey⁵⁵ which showed less than 60% of children fully immunised by two years of age, and more alarmingly only 42% of Maori and 45% of Pacific children fully immunised by two years.

The effect of low coverage translates into high disease rates, as evidenced by pertussis: currently NZ is suffering a pertussis epidemic, on target to be worse than the last epidemic in 1999-2001 when there were nearly 7,000 cases notified⁵⁶ (see Chapter 7).

New Zealand is in the process of developing a national immunisation register. Currently this is up and running for the epidemic meningococcal B vaccine delivery programme, and is planned to be

Table 5-1: Immunisation coverage estimates for pertussis antigen (from World Health Organisation data).

Country	% Immunised	Year of Estimate
Niue	100	1997
Tokelau	100	1994
Sweden	99	1997
Samoa	99	1997
France	97	1997
UK	95	1997
Tonga	95	1997
USA	94	1995
Canada	93	1994
Cook Islands	91	1997
Australia	86	1997
New Zealand	84	1994
New Zealand	81	1998*

* data obtained from the NZ Ministry of Health Immunisation Coverage Surveillance report

introduced progressively around the country from later in 2005, enrolling all children from birth. This will be vital tool for being able to track lost children and to monitor progress with immunisation coverage. Until this is present we have no accurate coverage data, and no easy way of finding children who have missed out on immunisation services.

5.2 Improving Coverage

International literature has clear themes on how to gain and maintain high immunisation coverage. These include enhancing access and provider-based interventions and strategies to increase community demand⁵⁷. Key aspects of delivery include financing the system effectively, focusing on provider practice, appropriate integrated information systems and community support⁵⁷.

Despite the disappointing national picture, local initiatives have shown it is possible to achieve and maintain higher coverage rates⁵⁸. These all take local flavour, but show the key characteristics of committed teams and integrated processes at the primary health care level.

NZ research in 2002⁵⁹ highlighted one of the most significant barriers to raising coverage identified by general practitioners was lack of funding to providers. This is strongly backed by international literature that shows clear relationships between improving coverage with financial and quality support to health professionals. The inadequacy of the immunisation benefit subsidy, particularly to cover the costs of the harder to access children, has been frequently highlighted⁶⁰.

The most consistent message coming through from parental and health professional research is that one of the biggest barriers to achieving immunisation in New Zealand is parental concerns⁶¹⁻⁶³. This is also reflected by parents in the Maori community⁶⁴. For our most vulnerable children, parents frequently have considerable logistic, financial and at times cultural barriers to overcome to complete an immunisation event. It does not take much to seed a degree of doubt or fear in a struggling parent to make the likelihood of achieving a full and timely course of immunisation even more remote.

The current NZ approach to immunisation service delivery is clearly inadequate. If we are to have a genuine commitment to improving immunisation rates for our children, there need to be more resources provided both at the service delivery end, and at the community support and awareness end. Furthermore a real commitment to health gains for our children must include consideration of the important new vaccines, and new vaccine strategies that are being taken up by many more progressive child-focused Western countries. Until such time our children will continue to suffer unnecessarily.

The effect of low coverage translates into high disease rates.

We have no accurate coverage data, and no easy way of finding children who have missed out on immunisation services.

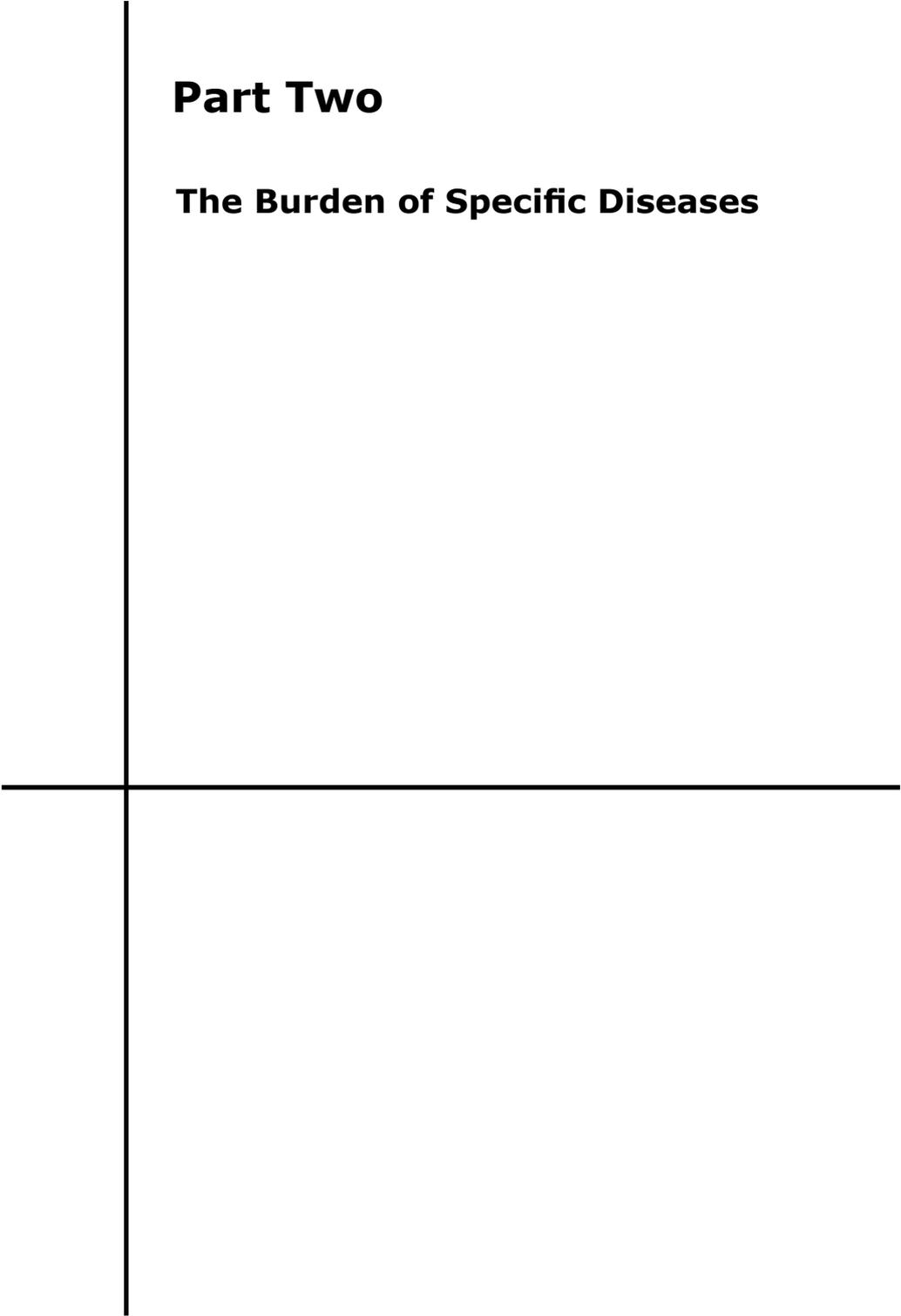
Local initiatives have shown it is possible to achieve and maintain higher coverage rates.

One of the most significant barriers to raising coverage identified by general practitioners was lack of funding to providers.

Parents frequently have considerable logistic, financial and at times cultural barriers to overcome to complete an immunisation event.

5.3 Recommendations

- Improve funding at the primary health care level for immunisation service delivery.
- Complete the roll out of the National Immunisation Register.
- Resource local service delivery to utilise the NIR data to follow up children identified as incompletely and un-immunised.
- Increase resources for immunisation health promotion and communication strategies, particularly targeting Maori and Pacific children.
- Focus on the potential gains with new vaccines – particularly conjugate meningococcal, pneumococcal and varicella.



Part Two

The Burden of Specific Diseases

Chapter 6: The Burden of Smoking-related Respiratory Illness in Children and Young People

Cigarette smoke contains many chemicals including cell poisons, carcinogens, and substances active on blood vessels such as nicotine itself, which is also highly addictive when inhaled. It is not surprising that exposure to significant amounts of cigarette smoke has detrimental effects on the embryo and foetus (exposed via tobacco constituents in mother's blood that cross the placenta) and on children (exposed via side stream and exhaled smoke and volatile smoke constituents on clothing).

In a country with good nutrition, sanitation and immunisation systems, cigarette smoke is the leading preventable cause of disease and death in children.



Philip Pattemore

6.1 Smoking Prevalence in New Zealand (Figure 6-1)

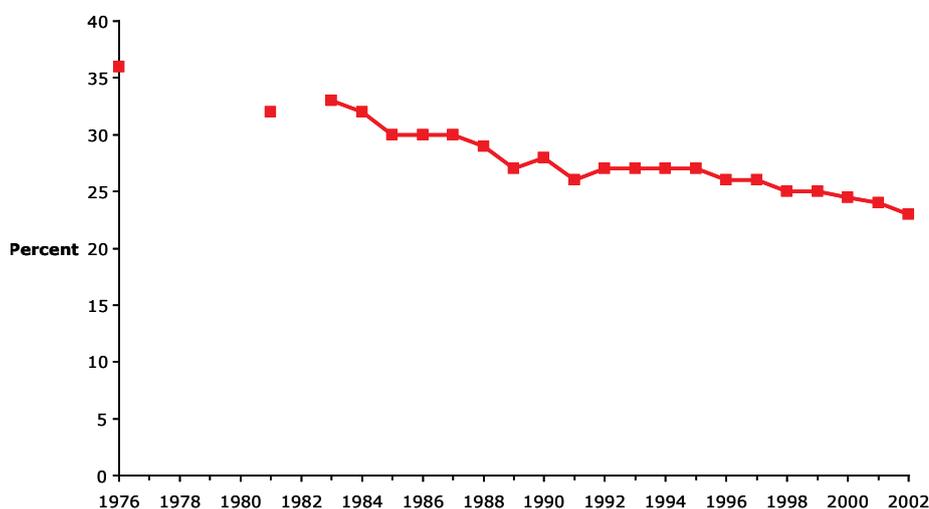


Figure 6-1: Prevalence of cigarette smoking (%) (15+ years), 1976–2002⁶⁵ (Source: 1976 and 1981 Censuses of Population and Dwellings, Department of Statistics 1983–2000. ACNielsen (NZ) Ltd.).

Regional smoking prevalence ranges considerably. In 2002, Lakes DHB region prevalence was the highest at 38% and Northland, West Coast, Whanganui, Bay of Plenty, Hutt Valley and Tairāwhiti all had prevalences greater or equal to 30%. Capital & Coast, and MidCentral had the lowest smoking rates at 21% and South Canterbury, Waitemata, Canterbury, Taranaki and Wairarapa all had prevalences less or equal to 24%⁶⁵.

“Maori smoking prevalence rates are double those of non-Maori. About half of all Maori adults over 15 years of age smoke. Smoking prevalence among Maori women of child bearing age ranges up to 60% and estimates of smoking among pregnant Maori women range from 40%-80%.”

Dr Marewa Glover, June 2004, Social & Community Health, School of Population Health, University of Auckland²⁹.

A crude estimate of exposure is 14,000-19,000 NZ babies exposed in utero per year.

Cigarette smoke contains many chemicals including cell poisons, carcinogens, and substances active on blood vessels.

6.2 Exposure of children to cigarette smoke (Table 6-1)

6.2.1 In Utero

Table 6-1: Prevalence of smoking in NZ pregnant mothers 1990-91⁶⁹.

Category	Smoking Prevalence (%)
Overall	33.0
Maternal age: <20 years	63.7
Maternal education: <11 years	60.0
Marital status: married	21.1
Marital status: <i>de facto</i>	58.0
Marital status: single	64.8
Employment status: unemployed	57.6
Ethnicity: European	23.0
Ethnicity: Maori	68.4
Ethnicity: Pacific Island	23.6

In a country with good nutrition, sanitation and immunisation systems, cigarette smoke is the leading preventable cause of disease and death in children.

In 2002, cotinine-validated rates of smoking in pregnancy in Christchurch were estimated at 28%⁶⁶, an improvement from 33% in 1996⁶⁷. A study in 2003 from the Wellington-Kapiti area documented 22.2% women and 54.6% Maori women reported smoking at conception⁶⁸. Yet the Christchurch and Wellington-Kapiti areas have among the lowest prevalences of smoking among New Zealand regions.

A crude estimate of exposure is 14,000-19,000 NZ babies exposed in utero per year, based on a possible range of overall pregnancy smoking rates of 25-33% and 55,000-57,000 live births annually (birth rate from Statistics New Zealand).

6.2.2 In the Home (Table 6-2)

Table 6-2: Prevalence of tobacco smoking, 1996⁷¹.

Category	Ethnicity/Location	Smoking Prevalence (%)
New Zealand homes with a smoker who smokes inside	Overall	28
	European	24
	Maori	48
	Pacific Island	34
Where New Zealanders smoke	Inside the home	25
	Outside and inside	57
	Outside	30
	Don't smoke at home	2
Where New Zealanders smoke in households with children aged under 5 years	Inside the home	22
	Outside and inside	36
	Outside	40
	Don't smoke at home	2

“National survey data indicate that at least 18% of all New Zealanders and 30% of Maori are exposed to second hand smoke in the home. Surveys of high school students indicate home second hand smoke exposure levels of 30% or more. The exposure appears to have decreased during 1996–2003 for Maori and the general population ($p < 0.001$ for trend for both), with low-income households more likely to be exposed than others. There is an absence of exposure data for many specific population groups including pregnant women and infants.”⁷⁰

Statistics New Zealand estimates that the number of children under 15 in New Zealand in 2005 is 880,790. If 30% of these are exposed to smoking in the home as suggested by the figures for high school students in Table 6-2, this equates to approximately 250,000 children exposed. If the lower overall figure of 18% of all New Zealanders exposed to smoke in the home is used, 160,000 children would be exposed. Recent data about the proportion of smokers with children smoking inside are lacking, but the 1996 data suggested over 50% of children under five who lived with a smoker were exposed to smoking inside the home⁷¹.

ETS exposure of infants was 5–8 times higher in households of smokers trying to protect their children by smoking outdoors than in households of non-smokers.

In a quasi-experimental study of smoking indoors versus outdoors, ETS exposure of infants was 5–8 times higher in households of smokers trying to protect their children by smoking outdoors than in households of non-smokers. ETS exposure of infants was 2-6 times higher in households of smokers who smoked indoors than in households of smokers who smoked outdoors⁷².

“During 1999–2003, over 90% of both Maori and the general population disagreed with the statement that it was ‘OK to smoke around children.’”⁷³

6.2.3 Active Smoking (Table 6-3)

Category	Year	Girls (%)	Boys (%)
Daily smokers	1999	17	14
	2001	15	12
	2003	14	10
Smoking daily, weekly or monthly	1999	32	25
	2001	28	21
	2003	25	17

Table 6-3: Action on Smoking and Health (ASH) studies of prevalence of tobacco smoking in Year 10 (15 yr olds) (figures rounded to nearest 1%)⁷⁴.

“Over one-third of the students who smoked had purchased tobacco products from commercial sources in the month before the survey; most frequently from dairies and service stations. For more than one-third of smokers (35.7%), being younger than 18 years was not a barrier to purchasing tobacco products. During 2002, the retail value of tobacco sales to those 14–16 years, alone, was estimated to be in excess of \$18 million, with around \$12.5 million of this going to the Government as taxes.”⁷⁵

Major independent risk factors and population attributable risks for smoking among NZ fourth form children identified by Ford et al

The estimated annual burden of childhood illness due to smoking in New Zealand is: 50 deaths, 500 admissions to hospital, 27,000 general practitioner consultations for respiratory illness and asthma, 1,500 glue ear operations and 15,000 episodes of asthma.

were: parental smoking (22.9%), poor knowledge of adverse health effects (7.3%) and watching televised sports (13.4%). These three factors accounted for 36.1% of the total smoking prevalence⁷⁶.

“The effect of both parents smoking on the risk of daily smoking by students varied significantly ($p < 0.0001$) between ethnic groups, being strongest for Asian students (adjusted relative risk (RR) = 6.64 compared with students of non-smoking parents), intermediate for European (RR = 3.11) and Pacific (RR = 3.05) students, and weakest for Maori (RR = 1.74). Adolescent smoking was also positively associated with pocket money amount and living in a home where people smoked. Two thirds of daily smoking could be explained by the combined exposure to one or more of the following factors: parental smoking, pocket money >\$5 per week, and smoking in the house.”⁷⁷

6.3 Health Risks and Burden (Table 6-4)

Table 6-4: Estimated respiratory health risks and burden of health effects in New Zealand children. Estimates in the right hand column are based on reference 78 and are independent of the risks quoted from the literature in the centre column.

Conditions	Increase in Risk	Estimated Annual Burden of Childhood Illness Due to Smoking ⁷⁸
Sudden infant death syndrome (SIDS) (50% of cases attributable) ⁷⁹⁻⁸¹	2-5 fold	50 deaths
Infant lung function ⁸²⁻⁸⁴	Decreased	
Infant wheezing ^{83,84}	Increased	
Infant admission to hospital, any cause (14% of admissions attributable) ⁸⁵	1.5 fold	500 admissions
Respiratory illnesses including: Otitis media ⁸⁶⁻⁸⁸ Pharyngotonsillitis ⁸⁹ Rhinitis & sinusitis ⁹⁰⁻⁹² Bronchitis, bronchiolitis & pneumonia ⁹³⁻⁹⁸	1.5-4 fold	27,000 general practitioner consultations for respiratory illness and asthma 1,500 glue ear operations
Severity of asthma and other chronic respiratory disorders	Increased	15,000 episodes of asthma
Physical fitness and lung function	Decreased	
Likelihood of smoking uptake ⁷⁷	1.7-6.6 fold	

The figure given in Table 6-4 for hospital admissions may be an underestimate, and would imply a much lower attributable risk than 14%.

Non-respiratory risks to children before and after birth include a 2 fold increased risk of miscarriage or stillbirth⁹⁹⁻¹⁰¹, a 1.5 fold risk of meningococcal disease (or 50 cases annually)^{102,103}, and an increased risk of burns or death from house fires¹⁰⁴.

In summary, exposure to cigarette smoke causes a wide spectrum of significant health effects in children, both before and after birth,

and increases the risk of children becoming smokers themselves. The prevalence of smoking in adults and in teenagers is showing a very slow decline but, disappointingly, as many as a third of pregnant mothers and parents of small children continue to expose their children to cigarette smoke. A large number of illnesses, hospitalisations, operations, and even deaths in children are the result.

6.4 Prevention of Adolescent Uptake

The strategies that best prevent adolescent uptake of smoking are debated and many see this as an area which has no proven strategy as yet. We know already some of the important risk factors for teen smoking. These include being exposed to smoking by significant others, especially parents and peers, availability and affordability of cigarettes, and the effect of smoking teenage role models on television or in films. Subtle marketing strategies such as tobacco sponsorship and advertising in televised international sporting events may play a part. Education level is also inversely associated with the risk of taking up smoking, but there is little evidence to suggest that education in the school about smoking is effective in preventing teenage smoking, although it increases knowledge about the effects of smoking. Based on these risks the most logical strategies would appear to be in decreasing order of priority:

- i. Decrease the rate of parental smoking and smoking by adults in the community
- ii. Increase pricing via excise, and decrease visibility and accessibility of cigarettes to minors.
- iii. Recommend R-rating of movies showing smoking. Alternatively develop pre-movie counter-tobacco advertising (this has been trialed successfully in Auckland).
- iv. Prohibit tobacco company sponsorship of educational packages (such as I've got the Power) or initiatives (such as Life Education).
- v. Continue education of young schoolchildren about the effects of tobacco smoking as part of health education. This at least gives children a background knowledge about some of the risks.

6.5 Recommendations

- Support of smoking cessation among adults and parents is likely to have the largest and most immediate effect on the health of children.
- Pregnancy and parenthood are key times to intervene in the vicious cycle of smoking and its effects for the following reasons:
 - Smoking cessation will have immediate health benefits for the child.
 - Parents and prospective parents are often in contact with health professionals so that many opportunities exist to discuss the health issues.
 - Many or most parents are prepared to forgo some of their own pleasures for the sake of a child's health, and a child's health is a potential motivator.

As many as a third of pregnant mothers and parents of small children continue to expose their children to cigarette smoke.

"...the He Papa Pounamu - Building Bridges programme, which targets at-risk rangatahi/ youth, is now being supported by British American Tobacco (BAT). However as noted by former ASH UK Director Clive Bates: "It's like the Mafia godfather going to church on Sunday and putting a thousand dollars on the collection plate - it's what they do during the week that matters."

*Leigh Sturgiss,
Tobacco Control Update.*

“Mrs Turia said that Europeans bought land 160 years ago in exchange for goods - including tobacco. “The effects of that transformation have been significant. Our people are dying of cancer and suffering strokes and heart attacks at a rate we can ill-afford.” “Twink out the Goldie pipe.”

*Gisborne Herald,
22 April 2005*

- A systems approach in primary and hospital care is recommended to identify and counsel parents and pregnant women with the aim of helping them (in descending order of priority) to quit, to reduce their smoking, to eliminate smoking in indoor areas including motor vehicles, and to wear discardable smoking jackets in outside smoking areas.
- Continued increase in the tax and real price of cigarettes is likely to be the most effective tool for reducing the prevalence of smoking in the population, particularly among the young and the disadvantaged. Pressure has been brought to bear on the government to use such tax to invest back in tobacco control policy and smoking cessation, but this is unlikely to succeed.
- Continued education of the public, parents, and children regarding the effects of tobacco smoking. This is unlikely to succeed on its own, but is a necessary part of a tobacco control strategy. School education strategies have yet to prove themselves. Colour graphic warnings on cigarette packets have had some success in other countries.
- Reducing the profile of smoking and counter strategies. Reducing the subtle yet effective marketing of cigarettes to youth via brand sponsorship and placement in films and coverage of international sporting events (such as the Grand Prix) is a difficult task, but could be tackled through censorship of such films, and counter-advertising before such films.

Chapter 7: New Zealand's Excessive Pertussis Disease Burden

7.1 Clinical Pertussis

Pertussis (whooping cough) is an illness characterised by prolonged coughing. It is most severe and sometimes fatal in babies. Typically there are four phases to the illness caused by infection with *Bordetella pertussis*. The incubation phase lasts 7 to 10 days and no more than 14 days. It is followed by a catarrhal phase (like the common cold) lasting 7 to 10 days, a paroxysmal coughing phase lasting from 1 to 4 weeks and a convalescent phase lasting 2 weeks to several months^{105,106}.

The initial clinical illness during the catarrhal phase resembles a mild upper respiratory tract infection with rhinorrhoea, mild conjunctival injection, tearing, occasional sneezing, and a mild cough. Fever is minor or absent. The paroxysmal phase is characterised by bouts of persistent, severe, hacking cough which increases in severity and frequency for two to three weeks and then slowly improves over the subsequent weeks to months of convalescence¹⁰⁵.

Pertussis is a disease with a wide clinical spectrum with only a proportion of those with an infection following this clinical pattern. Atypical disease occurs in infants, who can present with apnoea and cyanosis prior to the onset of paroxysmal cough. Prior immunisation reduces the severity of clinical pertussis.

7.2 Pertussis Mortality

7.2.1 Pertussis in the Pre-immunisation Era

Pertussis was a major cause of death in developed countries during the 19th century and the first half of the 20th century. In the United States during the 1930s pertussis resulted in more infant deaths than measles, diphtheria, poliomyelitis and scarlet fever combined, and from 1940 to 1948 of all infections only pneumonia, diarrhoea and dysentery caused more childhood deaths than pertussis^{107,108}.

7.2.2 Effect of Mass Immunisation

Consistent with other developed countries the number of deaths and the mortality rate from pertussis in New Zealand decreased during the later part of the 19th century and the first half of the 20th century. The mortality rate started to decline prior to mass immunisation. As shown in Figure 7-1 the rate of decline increased when immunisation was introduced. The pertussis mortality rate in the 1990s (0.004 per 100,000) is comparable with contemporary estimates from other developed countries^{109,110}.

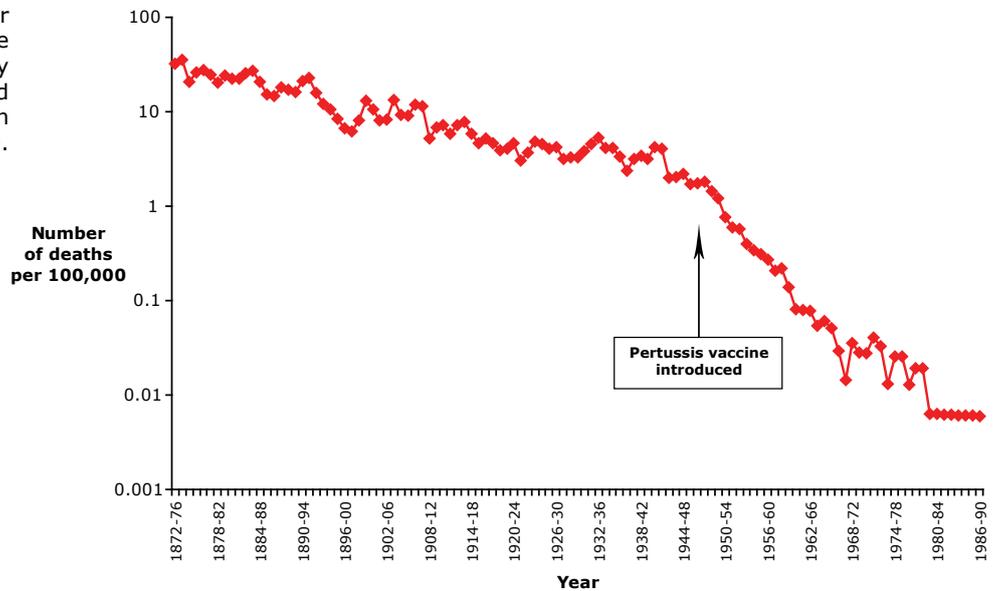
Although mortality rates have declined dramatically pertussis continues to kill infants in New Zealand. One infant has died of pertussis in Starship Children's Hospital each year from 2000 to 2005. Consistent with the experience of other developed countries



Cameron Grant

Pertussis is most severe and sometimes fatal in babies.

Figure 7-1: Five year moving average pertussis mortality rate in New Zealand per 100,000 person years 1872 to 1990¹¹¹.



infants die despite intensive care¹¹²⁻¹¹⁵. Data from the United States indicates that the number of infants dying from pertussis increased in the 1990s compared with the 1980s¹¹⁴.

7.2.3 Pertussis Mortality is Underestimated

The number of deaths from pertussis is underestimated. The potential for deaths caused by pertussis to be underestimated is greater than for many of the other infectious diseases. As the prolonged coughing attacks and associated vomiting can lead to malnutrition, pertussis predisposes children to death from other illnesses such as gastroenteritis and measles. Based upon data from the United States in the 1980s and 1990s and the United Kingdom in 1990s it is estimated that only approximately one third of all pertussis deaths are identified as being due to pertussis¹¹⁶⁻¹¹⁹.

7.3 Pertussis Morbidity

Pertussis continues to kill infants in New Zealand.

7.3.1 Underestimation of Disease Incidence

Pertussis morbidity is underestimated to an even greater extent than pertussis mortality. Estimates of the proportion of pertussis cases that are notified have varied between 6% and 25%, i.e. there are 4 to 16 times more people with pertussis than are notified¹²⁰. The proportion notified is higher in epidemic compared with non-epidemic time intervals and decreases with increasing age¹¹⁶.

7.3.2 Historical Trends

Although a reduction in pertussis mortality rates began well before immunisation, a reduction in pertussis incidence rates did not occur until mass immunisation was introduced. In fact reported pertussis incidence increased in the United States from 1910 to 1930-1935¹⁰⁸.

Following the introduction of mass immunisation pertussis incidence fell dramatically in European and North American countries. The annual pertussis incidence rate per 100,000 in Canada decreased from 160 during 1934-43 to 14 during 1964-73; in England and

Wales from 230 in 1940-49 to 51 in 1974-75; and in the United States from 157 during 1932-41 to 0.5 to 1.5 during 1973-85^{105,109,121,122}.

7.3.3 Global Pertussis Incidence

Figure 7-2 shows the number of reported cases of measles, pertussis, diphtheria, polio and tetanus in the world, reported to the WHO annually from 1980 to 1999. As can be seen, pertussis is the second most frequent of the childhood vaccine preventable diseases. The number of cases of each of these diseases has decreased substantially over this 20 year period. In 1999 the number of reported cases of pertussis was 18 times higher than the number of reported cases of diphtheria, 13 times higher than the number of reported cases of polio, four times higher than the number of reported cases of tetanus and one sixth the number of reported cases of measles¹²³.

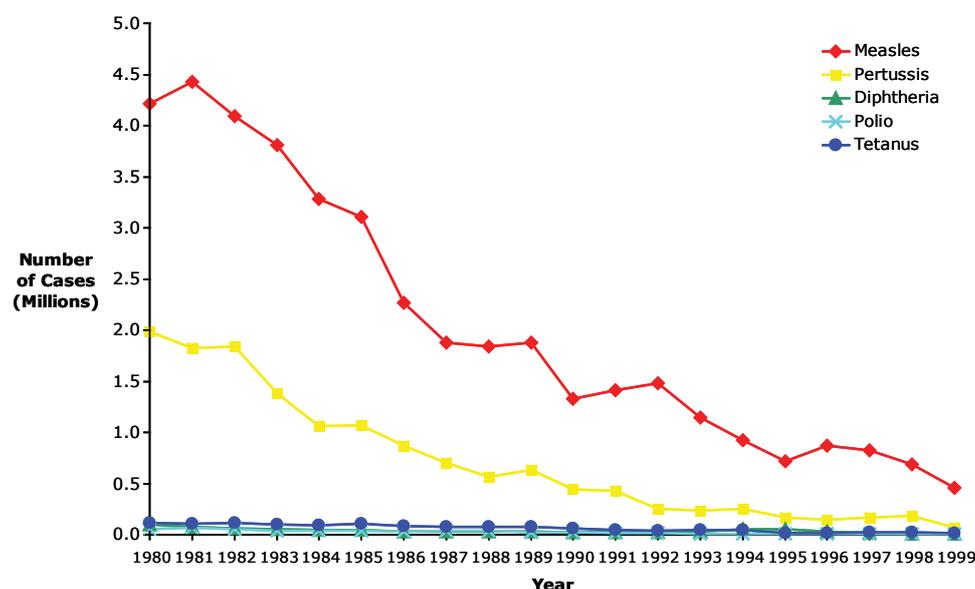


Figure 7-2: Global annual reported incidence of childhood vaccine preventable diseases, 1980-99¹²³.

7.3.4 Determinants of International Incidence Variability

Countries with consistently low pertussis incidence rates since the introduction of mass immunisation have in common high immunisation coverage that has been sustained over several decades. Examples of such countries include Hungary, the former East Germany, Poland, Samoa and Tonga¹²³⁻¹²⁵.

A reduction in coverage results in a prompt increase in disease incidence. England and Japan experienced increases in pertussis incidence following a reduction in vaccine coverage and withdrawal of vaccine respectively¹²⁶⁻¹³⁰.

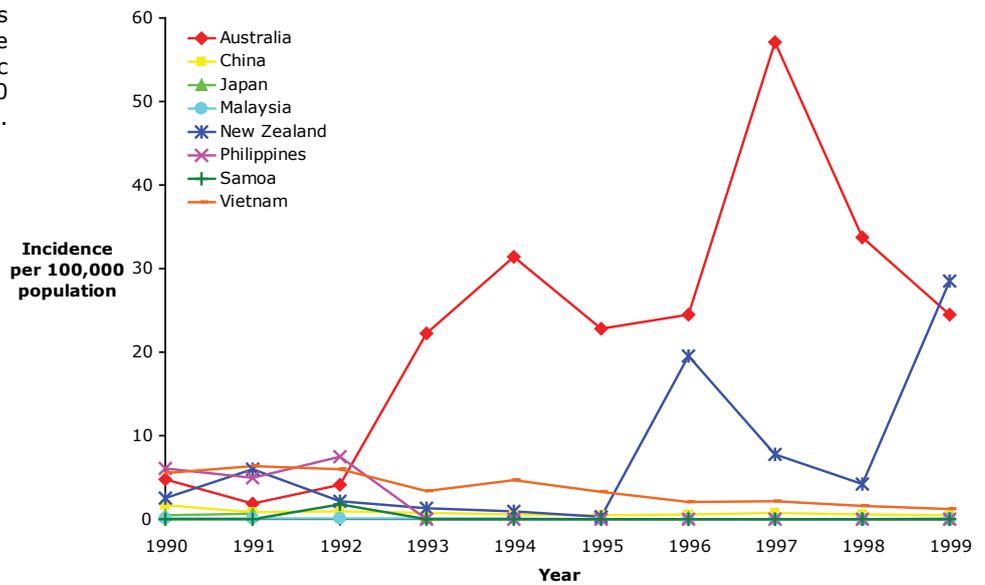
Variability in vaccine efficacy as has occurred in Canada and The Netherlands also affects disease incidence¹³¹⁻¹³³.

7.3.5 New Zealand in Comparison With its Pacific Neighbours

The reported incidence of pertussis is not directly related to the economic wealth of a country. For example, in the Pacific region the two countries with the highest incidence rates during the 1990s, Australia and New Zealand, are both developed countries. The Cook

Islands and Tonga, two other Pacific nations with lower pertussis incidence rates than New Zealand, are also classified by the WHO as developing countries (Figure 7-3)¹²³.

Figure 7-3: Pertussis incidence in the Western Pacific region per 100,000 population 1990-99¹²³.



As pertussis only became a notifiable disease in New Zealand in 1996, the under estimation of disease incidence is likely to have been greater during the first half of this decade¹³⁴. Compared with a notification system that includes a clinical case definition, the laboratory case definition used prior to 1996 resulted in a five fold underestimation of the incidence of pertussis in New Zealand. Although the data presented in Figure 7-3 suggests that pertussis incidence in New Zealand was similar to the other western Pacific countries, it is more probable that pertussis incidence rates in New Zealand were elevated throughout whole decade.

7.3.6 Pertussis Disease Burden in New Zealand Compared With Other Developed Countries

7.3.6.1 Notification Rates

The pertussis notification rate in New Zealand in 1996, an epidemic year, was 19.8 per 100,000¹³⁵. This incidence rate was more than seven times greater than that for the United States in 1993¹³⁶. Of note, the number of notifications during the 1993 epidemic in the United States was more than in any of the preceding 25 years¹³⁶.

7.3.6.2 Laboratory Isolate Data

Comparisons of pertussis incidence in New Zealand with that in the United Kingdom and the United States have been made using laboratory isolate data¹³⁷. The average monthly positive isolate rates per 100,000 in New Zealand during three epidemic years; 1982, 1986 and 1991 were compared with those from the United Kingdom for the same three epidemic years. The comparison is shown in Table 7-1. In 1982 the isolate rate in New Zealand was 1.3 times less than in the United Kingdom, but in 1991 the rate in New Zealand was more than six times greater. The change in relative frequency occurred because the isolate rate decreased six fold in the United

Cook Islands and Tonga have lower pertussis incidence rates than New Zealand.

Kingdom from 1982 to 1991 whereas it remained relatively constant in New Zealand.

Over this 10 year time period the immunisation rate in the United Kingdom increased from 30% to 90%^{126,128}. In contrast, the immunisation rate in New Zealand remained between 70 and 85%¹³⁸⁻¹⁴⁰.

Year	Positive Isolate Rate per 100,000	
	New Zealand	United Kingdom
1982	0.77	1.03
1986	0.46	0.34
1991	1.08	0.17

Table 7-1: Average monthly *B. pertussis* isolate rates per 100,000¹³⁸.

The *B. pertussis* isolate rate in New Zealand from 1980 to 1989 was compared with that over the same period from the United States. Over this decade the number of positive isolates per year per 100,000 population was 3.75 for New Zealand and 0.37 for the United States¹³⁷.

7.3.6.3 Hospitalisation Rates

In Figure 7-4 the average annual pertussis hospital discharge rates in New Zealand during the 1980s and 1990s are compared with those reported from other developed countries during the same time periods^{110,118,141-143}. The pertussis hospital discharge rates in New Zealand have been five to 10 times higher than those reported from England and Wales and the United States. Only the pertussis hospitalisation rate reported from Sweden in the early 1980s was higher than that in New Zealand, with the former rate reported following the discontinuation of pertussis immunisation in 1979¹⁴¹. The average length of hospital stay for pertussis in New Zealand is similar to that reported from the United States^{110,116}.

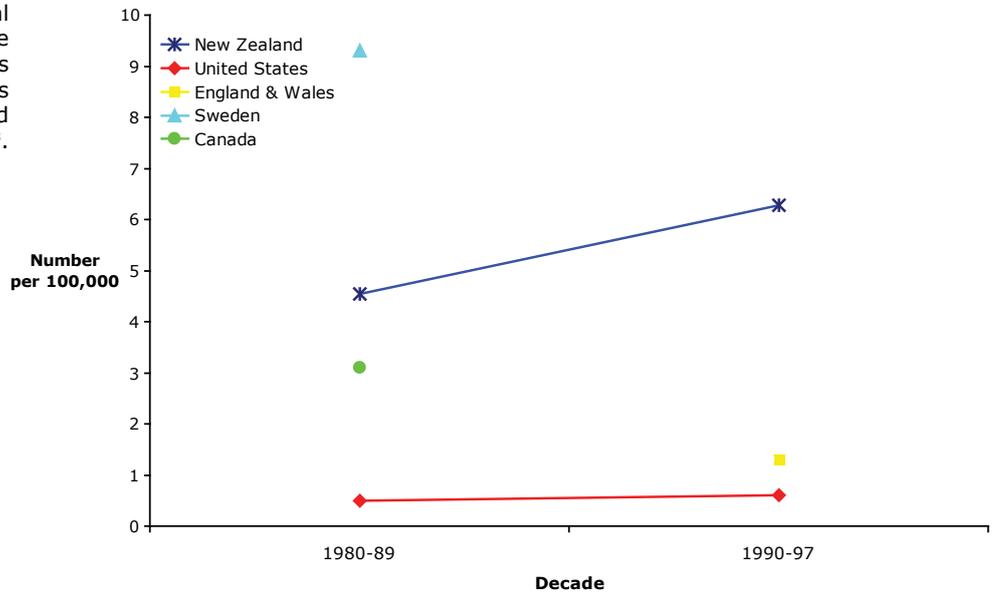
The pertussis hospital discharge rates in New Zealand have been five to 10 times higher than those reported from England and Wales and the United States.

7.4 Why Does New Zealand Have So Much Pertussis?

New Zealand has an excessive disease burden from pertussis primarily because of low immunisation coverage and even lower on-time immunisation coverage. New Zealand has never had and still does not have a primary care system capable of delivering immunisations on time to all of its children^{144,145}. Until the 1980s, New Zealand's immunisation schedule was influenced more by decisions aimed at reducing adverse vaccine reactions rather than maximising population protection^{138,146}. Pertussis vaccines used in New Zealand have been shown to be efficacious in other countries¹⁴⁷⁻¹⁵⁰. The vaccine efficacy estimates performed in New Zealand have been consistent with the international efficacy data^{138,151}.

There has only been a small increase in immunisation coverage over the past 25 years. Currently between 80% and 90% of children receive the primary series with only 50% to 60% of children receiving these immunisations on time^{138-140,152-158}. New Zealand has lower immunisation rates than most of its Pacific neighbours¹⁵⁹.

Figure 7-4: International comparison of average annual pertussis hospital discharge rates during the 1980s and 1990s^{110,118,141-143}.



New Zealand has an excessive disease burden from pertussis primarily because of low immunisation coverage and even lower on-time immunisation coverage. New Zealand has never had and still does not have a primary care system capable of delivering immunisations on time to all of its children.

Only 50% to 60% of children receive the primary series of immunisations on time.

In New Zealand delayed receipt of any of the three infant doses of pertussis vaccine is associated with a five fold increased risk of hospital admission with pertussis¹⁶⁰.

Consistent with other countries, delay in receipt of the first immunisation dose predicts subsequent incomplete immunisation¹⁶¹. Poverty related factors are important barriers to immunisation^{153,155}. There is widespread public support for immunisation in New Zealand but poor understanding of the immunisation schedule and the true contraindications to immunisation^{140,161}. Compared with the emphasis this area has received internationally, research to date on health system barriers to immunisation in New Zealand has been relatively sparse^{60,162}.

Clear and comprehensive recommendations have repeatedly been made for improving immunisation in New Zealand^{163,164}. A lack of accountability in the health care system and frequent changes to health policy have prevented these recommendations from being introduced¹⁶⁵.

7.5 Summary

7.5.1 Pertussis Mortality

Because of its propensity to strike very early in life pertussis was one of the biggest killers of children in the pre-immunisation era. The decline in pertussis mortality rates, which commenced prior to immunisation, was accelerated by mass immunisation.

Pertussis continues to kill infants and, in the developed world, intensive care cannot always prevent death. The number of deaths from pertussis is underestimated by a factor of three. Pertussis is known to kill at least one infant each year in New Zealand. Information from the United States indicates that the number of pertussis deaths in infants may be increasing.

7.5.2 Pertussis Morbidity

Pertussis incidence rates are underestimated 4 to 16 fold. The degree of underestimation increases with increasing age and decreasing disease severity.

Prior to immunisation pertussis incidence was not decreasing. The introduction of mass immunisation was associated with a profound reduction in the incidence of pertussis. Between 1930 and 1980 there were 5 to 100 fold reductions in pertussis incidence in Canada, England and Wales and the United States.

Countries with consistently low pertussis incidence rates since the introduction of mass immunisation have in common high immunisation coverage rates sustained over several decades. Higher pertussis incidence rates in some countries now, and in others in the recent past, have been due to lower immunisation coverage, and to a lesser extent, lower vaccine efficacy.

The pertussis incidence rate in New Zealand is also higher than that in most other Pacific nations. Based upon comparisons of national passive surveillance data, laboratory isolate data and hospital discharge rates the pertussis incidence in New Zealand is between 5 and 10 times greater than in the United Kingdom or the United States.

7.5.3 Why Does New Zealand Have So Much Pertussis?

New Zealand has an excessive disease burden from pertussis primarily because of low immunisation coverage and even lower “on-time” immunisation coverage. Immunisation coverage has increased minimally in New Zealand over the past 25 years. New Zealand continues to struggle to overcome the poverty related barriers that currently prevent a significant proportion of our children from being protected against vaccine preventable diseases.

7.6 Recommendations

- Pertussis continues to kill infants and infants die despite paediatric intensive care. Therefore young infants in whom there is any clinical suspicion of pertussis need to be closely monitored.
- The principal reason for starting the immunisation schedule at as young an age as possible is to protect infants from pertussis. The timely delivery of the immunisation schedule prevents infants dying from pertussis.
- There is compelling evidence from many countries which shows that if New Zealand were to increase its immunisation coverage to 95% the pertussis disease incidence would decrease 10 fold.



Cameron Grant



Richard Milne

Pneumonia is fundamentally different in children compared with adults.

Paediatric pneumonia is more common in New Zealand than in other developed countries.

Chapter 8: What Does Pneumonia Cost New Zealand?

8.1 Clinical Pneumonia

Most children with pneumonia present with cough or difficulty breathing, but only the minority of children with these symptoms have pneumonia¹⁶⁶. Among children with pneumonia in New Zealand, many are managed in primary care settings, but those with more severe symptoms are admitted to hospital.

In preschool aged children who have cough or difficulty breathing the World Health Organization (WHO) have defined three key clinical signs that should be used when deciding whether or not a child has pneumonia. These clinical signs are tachypnoea, chest indrawing and absence of wheezing¹⁶⁷. A child has pneumonia if s/he has tachypnoea or indrawing and no wheeze.

Tachypnoea is defined by the WHO as a respiratory rate greater than 60 breaths per minute if the child is less than 2 months of age, a respiratory rate greater than 50 breaths per minute for children aged two to 12 months and a respiratory rate greater than 40 breaths per minute for children aged 12 months to five years¹⁶⁷. Chest indrawing is defined as retraction of the lower chest wall on inspiration¹⁶⁶. A chest radiograph is helpful for identifying complications of pneumonia such as a pleural effusion. Inter-observer agreement between radiologists has been shown to be poor when categorising children's chest radiographs as normal, equivocal or indicative of pneumonia or when differentiating children who have a proven viral or bacterial aetiology for their pneumonia^{168,169}.

8.2 How Common is Pneumonia?

Pneumonia remains a common and serious health problem in both developed and developing countries. It is fundamentally different in children compared with adults. The annual incidence of pneumonia in children younger than five years of age is 34 to 40 cases per 1,000 in Europe and North America, higher than at any other time of life, except perhaps for adults 75 years of age or older¹⁷⁰.

Compared with the developed world, pneumonia in the developing world is more common and more severe. It is the most frequent killer of children in the developing world. In 2000, of the 10.8 million estimated children less than five years of age who died, between 14 and 24% of these deaths were from pneumonia¹⁷¹.

Paediatric pneumonia is more common in New Zealand than in other developed countries. Based upon all New Zealand hospital ICD-9 discharge diagnoses for pneumonia in 1998/1999, the national pneumonia hospital admission rate for children aged 0 to 14 years was 4.0 per 1,000¹⁷². Contemporary statistics from the United States demonstrated a hospital admission rate in the same age group of 0.5 to 1.0 per 1,000, i.e. about five to 10 times lower

than in Auckland¹⁷³.

Pneumonia hospital admission rates are highest for the youngest children. Based upon the national 1998/1999 statistics, the hospital admission rate for pneumonia per 100,000 children was 1,534 for children aged less than 2 years, 562 for children aged 2 to 4 years, 170 for children aged 5 to 9 years and 73 for children aged 10 to 14 years¹⁷². This amounts to 3,261 children hospitalised with pneumonia each year in New Zealand; 1,673 children less than two years of age, 909 children aged two to four years, 466 children aged five to nine years and 212 children aged 10 to 14 years.

In New Zealand pneumonia hospital admission rates vary with ethnicity. Based upon data from Starship Children’s Hospital in Auckland, the pneumonia admission rate for Pacific children 0 to 14 years of age is 14.0 per 1000, for Maori children 6.7 per 1000 and for European/other children 2.7 per 1,000¹⁷⁴. It should be noted that even for non-Maori, non-Pacific (‘European/other’) children the pneumonia hospitalisation rate is three to five time greater than contemporary rates from the United States¹⁷³. The difference in hospitalisation rates is most significant for the youngest children. As shown in Figure 8-1, between four and five percent of Pacific children, between two and three percent of Maori children and almost one percent of European/other children less than two years of age from west Auckland, central Auckland and the north shore are hospitalised with pneumonia each year.

Over 3,000 children are hospitalised with pneumonia each year in New Zealand.

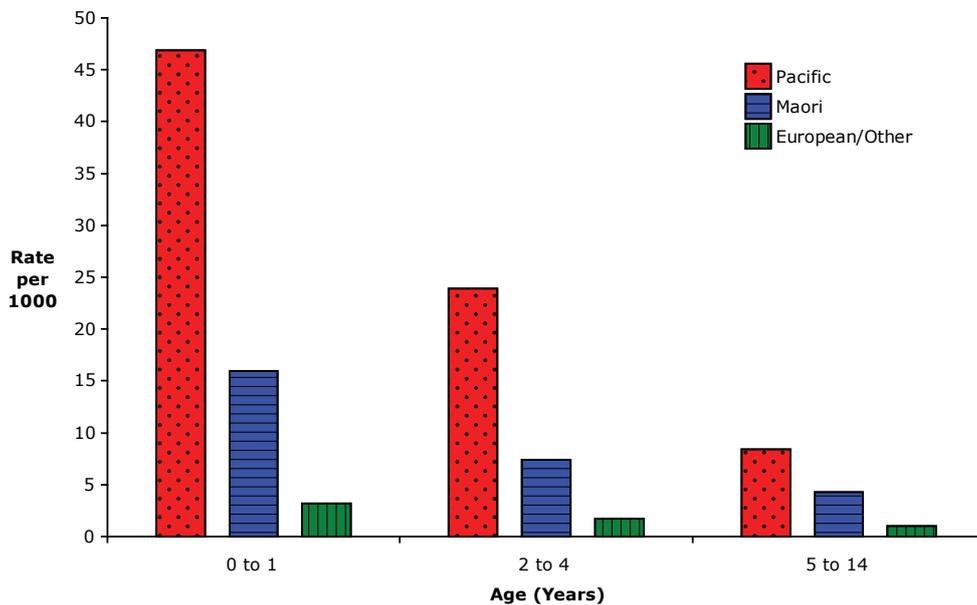


Figure 8-1: Paediatric pneumonia hospitalisation rates by age and ethnic group in Auckland, 1993 to 1996¹⁷⁴.

It is important to remember that only a proportion of children with pneumonia are hospitalised. For example, only approximately half of the children who are diagnosed with pneumonia at Starship Children’s Hospital are admitted to hospital. Particularly for school aged children, a significant proportion of those with pneumonia are managed in emergency departments or in the community without admission to hospital.

For ‘European/other’ children, the pneumonia hospitalisation rate is three to five time greater than contemporary rates from the United States.

8.3 Are Pneumonia Hospitalisations Avoidable?

Children in New Zealand are being hospitalised at an increasing rate. From 1988 to 1995 there was an average annual increase of five percent in the hospitalisation rate for children 0 to 14 years of age¹⁷⁵. Paediatric hospital admission rates are also increasing in other developed countries¹⁷⁶⁻¹⁷⁸.

One in three hospital admissions were potentially avoidable. In two thirds of these, the intervention necessary to avoid the hospital admission was more effective primary health care services.

Over the same time period that hospital admission rates have been increasing there has been an increase in the proportion of hospitalisations that are avoidable. An avoidable hospitalisation is one that could be prevented by good quality primary or outpatient care. Avoidable hospitalisations include those for conditions that are almost always avoidable, for example, vaccine preventable diseases; and those for conditions for which most hospitalisations are avoidable, for example pneumonia and asthma¹⁷⁹⁻¹⁸¹.

An analysis of national hospital discharge data from 1989 to 1998 demonstrated that by 1998 one in three hospital admissions were potentially avoidable. In two thirds of these, the intervention necessary to avoid the hospital admission was more effective primary health care services¹⁸¹. Age standardised rates of avoidable hospitalisations in Maori and Pacific people in 1997-98 were 60% and 70% higher than in European/other New Zealanders. Respiratory infections are the largest contributor to both the ethnic and socioeconomic excesses in avoidable hospitalisations¹⁸².

Respiratory infections are the largest contributor to both the ethnic and socioeconomic excesses in avoidable hospitalisations

8.4 Measurement of the Cost of Treating Children With Acute Pneumonia

Cost estimates depend upon the perspective, for example the cost to the individual, the family, the health care system, or society. The true cost of any disease that causes premature death is extremely difficult to measure. For example, how do you quantify the cost to a family of the loss of a child's life?

The direct medical cost of pneumonia in New Zealand children aged 0 to 14 years has been estimated based upon hospital admissions, emergency department visits and general practitioner visits¹⁷². These costs exclude any of the non-medical costs or indirect costs such as transport to the General Practitioner, days of parental work lost, days of school absence by children, and all the intangible costs such as stress in families caused by acute illness in children.

Each year New Zealand spends over five million dollars on inpatient hospital costs and more than one million dollars on emergency department costs for paediatric pneumonia.

Table 8-1 shows the estimated costs of hospital admissions and emergency department visits for children less than 15 years of age. Each year New Zealand spends over five million dollars on inpatient hospital costs and more than one million dollars on emergency department costs for paediatric pneumonia.

The costs of primary care for children with pneumonia can be estimated from a study conducted by the Dunedin research unit of the Royal New Zealand College of General Practitioners¹⁸³. All consultation and prescribing records from 29 New Zealand practices

for the time period 1 January 2000 to 31 December 2000 formed the study database. The total population of the database was 136,629, of whom 7,019 patients (5.1%) were aged less than two years. General practice consultations by children with pneumonia were identified from this data base. The per-patient costs of these visits for general medical services, prescribed antibiotics and chest radiographs were estimated. An estimate was also made of the number of children that would have been seen by all general practitioners in New Zealand and, from this, the total primary care costs for pneumonia were estimated. Based upon these estimates New Zealand spends almost \$400,000 on primary care for pneumonia each year for children aged zero to 14 years, including both Government costs and patient co-payments for pharmaceuticals (Table 8-1).

	Age Group (Years)				Total
	0 to 1	2 to 4	5 to 9	10 to 14	
Hospital admissions					
Number of children admitted to hospital with pneumonia	1702	948	490	193	3,333
Costs per admission*	\$1,560	\$1,263	\$1,709	\$1,486	
Emergency department cost for each admission	\$191	\$191	\$191	\$191	
Costs per year	\$2,980,202	\$1,378,392	\$931,000	\$323,661	\$5,613,255
Emergency department consultations without admission to hospital					
Number of children†	2049	1906	845	922	5,722
Emergency department cost per visit	\$191	\$191	\$191	\$191	
Annual costs for emergency department visits‡	\$391,359	\$364,046	\$161,395	\$176,102	\$1,092,902
General practitioner consultations§					
National cost estimate¶	\$125,550	\$122,570	\$109,324	\$32,356	\$389,800
Total	\$3,497,111	\$1,865,008	\$1,202,719	\$532,119	\$7,095,957

Table 8-1: Estimated annual costs of pneumonia in New Zealand based upon hospital admissions, emergency department visits and General Practitioner consultations.

* Based on Starship Children's Hospital ward plus general paediatrics charges.
† Estimates based on the proportion of children that present to Starship Children's Hospital Emergency Department who are diagnosed with and treated for pneumonia but are not admitted to hospital.
‡ Cost based upon Starship Children's Hospital Emergency Department.
§ Includes General Medical Services benefit, and charges for antibiotics and chest radiographs.
¶ Extrapolated from Royal New Zealand College of General Practitioners database¹⁸³.

Therefore in summary, based upon the direct medical costs only, pneumonia in children under 15 years of age costs New Zealand at least seven million dollars per year.

8.5 Childhood Pneumonia Leading to Health Problems for Adults

It is difficult to emphasise how much the above calculations underestimate the true cost of pneumonia. As described, only the direct medical costs have been measured. It must also be noted that these have only been estimated for the acute episode of pneumonia. No estimate has been made of the subsequent health care costs that occur. Longitudinal studies that have followed populations of children though into adult life have demonstrated that having pneumonia as a young child is associated with poorer lung function in adult life¹⁸⁴.

Longitudinal studies that have followed populations of children though into adult life have demonstrated that having pneumonia as a young child is associated with poorer lung function in adult life.

Some children with pneumonia have a severe illness, which leaves them with damaged lungs. This damage can be permanent and can lead to chronic lung disease, for example bronchiectasis (see Chapter 9), and eventually respiratory failure in adult life. Based upon data from the United States, chronic lung disease is the fourth leading cause of death in adults¹⁸⁵.

8.6 Summary and Conclusions

Pneumonia occurs in too many of our children. Large numbers of young children are hospitalised each year with pneumonia and for some this signals the beginning of a chronic illness that leads to premature death. At least seven million dollars is required each year to meet the direct medical costs of community, emergency and inpatient health care for New Zealand children with pneumonia.

8.7 Recommendations

For New Zealand to be less embarrassed by its pneumonia problem will require focused sustained effort that includes:

- Improved access to higher quality primary health care for all children.
- More effective early childhood policy relating to immunisation and nutrition.
- A fundamental improvement in the indoor environment in which our children are nurtured.

Chapter 9: The Burden of Bronchiolitis in New Zealand

Acute lower respiratory tract infections are an important cause of mortality among children less than 5 years of age and remain the leading cause of disability-adjusted life years lost worldwide. This is disproportionately borne by children in developing regions where it is estimated that 4.3 million children aged less than 5 years die annually of lower respiratory tract infections (LRTI)¹⁸⁶. However there is also substantial childhood morbidity and mortality from lower respiratory tract infections in developed countries, including New Zealand.

Bronchiolitis affects children less than 2 years of age with peak incidence occurring at 3-6 months. It is a virally induced lower respiratory tract infection (LRTI) that results in increased mucus production and narrowed airways. After a 4-5 day prodrome, the children present with a raised breathing rate, wheeze, increased work of breathing, fever and can have difficulty feeding. The children become unwell over the first 3 days, then usually recover in 2-4 days with no specific treatment. Between 0.5%-2% of previously healthy children require hospitalisation for supportive treatment with feeding, fluids, oxygen and more rarely ventilatory support^{187,188}. The mortality of those admitted is less than 1%. However 20% have a protracted course, 20% have apnoea, and 7% require ventilation although in previously healthy infants only 1.8% are transferred to intensive care units. In a New Zealand study 8% of these infants had apnoea prior to admission and 3.1% required ventilation¹⁸⁹.

While a number of viruses can cause this illness, the major cause is Respiratory Syncytial Virus (RSV). RSV is recognised as a common serious infection worldwide since the 1960s and it remains the number one cause of viral bronchiolitis and pneumonia in infants. Annual seasonal outbreaks of RSV infection occur. Spread requires close contact with infected individuals or surfaces contaminated by secretions, usually by exhaled droplets but, for example, it can remain viable on the cot rail for 6 hours¹⁹⁰.

9.1 Rates of Infection

RSV infection is virtually universal. In the 1980s a follow up of 125 children less than 12 months of age showed that 68% had an RSV infection by the end of the first winter, 97% by the second year and 100% had been infected by the end of the third year¹⁹¹. In a study from Hong Kong over a 4 year period 86% of those with bronchiolitis who had viruses recovered had RSV¹⁹². Most children will therefore have 2-4 RSV infections in the first 7 years of life. Although the symptoms can be mild or restricted to the upper airway, it can result in serious infection in both normal and high risk individuals in either first or subsequent illnesses. *It is this severe disease that we seek to prevent.*



Cass Byrnes

Acute lower respiratory tract infections remain the leading cause of disability-adjusted life years lost world-wide.

Bronchiolitis affects children less than 2 years of age with peak incidence occurring between 3 and 6 months.

9.2 Hospitalisation for Bronchiolitis in New Zealand

Currently more than 3000 infants per year are admitted for bronchiolitis in New Zealand. Rates of admission for bronchiolitis were 26.6/1000 children under 1 year in 1988 increasing to 58.1/1000 in 1998, an increase of 118%¹⁸⁹. The Top Ten report¹ is the first significant overview of the key indicators of child and youth health in the Auckland and Waikato regions. It covers 556,000 young people aged between 0-24 years from 1995-1999. The report analyses the top ten causes of potentially avoidable hospitalisations – infectious diseases dominate the picture in all areas and all ethnic groups. Within the top ten; asthma, bronchiolitis, pneumonia and ‘other’ respiratory infection are all listed separately indicating the importance of respiratory disease. The percentage of potentially avoidable hospital admissions has risen throughout New Zealand from 1995 to 2000 from 32% to 34% but this reached 38.8% in South Auckland and 37.7% in rural Waikato.

In a New Zealand study of the infants admitted to hospital for bronchiolitis – 8% had apnoea and 3.1% required ventilation.

Infants and young children have substantially higher rates of hospitalisations for treatment of LRTIs than the other age groups. For the whole of New Zealand, the admission rate for children less than 1 year of age for LRTI (predominantly bronchiolitis and pneumonia) was 102.6/1000 but up to 176.5/1000 in certain regions.

Bronchiolitis is responsible for an average of 2.8/1000 avoidable admissions across the country but is higher in some of these regions such as 4.6/1000 in South Auckland. It is listed as the third cause of preventable admission in both Maori and Pacific Island communities. Again there are higher levels in certain regions such as 6.9/1000 in Urban Waikato Maori and 8.4/1000 in South Auckland Pacific Island communities (Table 9-1).

Table 9-1: Numbers of potentially avoidable hospitalisations for bronchiolitis per thousand children. Modified from Causes of Potentially Avoidable Hospitalisation Age standardised rates for 0-24 years of age per 1,000 population 1999 – The Top Ten report with permission¹.

	New Zealand	South Auckland	Urban Waikato
Overall	2.8	4.6	3.5
Maori	4.2	6.0	6.9
Pacific Island	6.3	8.4	5.0

In New Zealand in 1998, 409 infants were admitted into 5 major hospitals. Of these 8% were ex-premature (<32 weeks gestation), and 53% were aged less than 6 months¹⁸⁹. While there was some variation between the hospitals in terms of management, overall:

- 59% required oxygen;
- 21% required nasogastric fluids;
- 22% intravenous fluids;
- 34% had antibiotics;
- 42% had bronchodilators; and
- 60% had a chest x-ray.

Respiratory secretions collected for viral studies showed 59% were positive for RSV. The overall proportion of infants requiring supportive treatment was 65% which was higher than a previous

study in Christchurch in 1986-1988¹⁹³ where only 25% required a similar intervention. Risk factors for requiring oxygen were; a high risk infant, younger age group and higher respiratory rate on admission. The mean length of stay was 3.4 days and did not differ significantly between centres. The five hospitals studied admitted 1900 infants out of the total of 3210 that year. Compared to the previous study the increased admission rate was not due to admitting infants who were less severely ill. In fact thresholds for admission appear to have risen over the last 10 years.

9.3 Risk Factors for Admission

Residence in an area of social and material deprivation increases the risk of admission for bronchiolitis. This was increased by 1.5 times in a Sheffield study (England) even when smoking exposure was taken into account¹⁹⁴. In 10 centres in the United Kingdom the rate of admissions was higher for both RSV and non RSV infections in industrial rather than suburban or rural areas but disease severity was similar. The incidence of hospital admissions in Newcastle due to RSV was analysed by social class and was lowest in class 1 (least deprived) where the incidence was 6 per 100,000 compared with 38 per 100,000 for the five more deprived classes¹⁹⁵.

In Malmo, Sweden (1998/9), infants living in the area with the highest social burden were hospitalised twice as often as those from the rest of the city, although again the severity of disease was similar. The admission rate correlated significantly with low per capita income and the percentage of immigrants in the area¹⁹⁶. In Houston, infants born to low income families showed a hospitalisation rate higher than infants born to middle income families¹⁹⁷. In New York State, rates of hospitalisation for LRTI in children living in inner city areas was documented at 22.5/1000 children, far higher than those from a suburban area at 7.5/1000 children¹⁹⁸. A case-control study in rural Alaska showed that risk factors for RSV hospitalisation included household crowding while breast-feeding was protective¹⁹⁹.

9.4 Mortality

Underlying conditions may increase the risk for both hospitalisation and mortality including prematurity, chronic lung disease, congenital heart disease, immune compromise and infants less than 3 months of age. However studies in Canada, USA, Australia and Europe and noted that 58-80% of hospitalisation for bronchiolitis occurred in otherwise healthy children²⁰⁰⁻²⁰².

From 1996 to 1998 in the United States, the annual infant mortality rate was 2.0 per 100,000 live births. The median age of death was 3 months and the majority of the deaths (55%) occurred between 1 to 3 months of age. The most significant risk factor for death was low birth weight. A birth weight of less than 1500 grams gave a 25 times greater risk, and a birth weight of less than 2500 grams gave a 5 times greater risk of dying compared with normal birth weight babies. Other infant characteristics associated with an increased mortality risk included a shorter gestational age, a low 5-minute

The major cause of bronchiolitis is Respiratory Syncytial Virus (RSV) infection.

It is the severe disease associated with low socioeconomic status, overcrowding, smoking and reduced breast-feeding that we seek to prevent.

apgar score, multiple birth, and a high live birth order (or a greater number of siblings). Maternal characteristics were being unmarried, of young age (less than 25 years), smoking during pregnancy, and a lower education level¹⁹⁰. Many of the identified risk factors can be associated with lower socioeconomic status.

Within the TOP TEN causes of potentially avoidable hospitalisations in children – asthma, bronchiolitis, pneumonia and ‘other’ respiratory infection are all listed separately. This indicates the significant morbidity of respiratory disease in New Zealand.

Many of the infant and maternal characteristics that are associated with morbidity mortality of this disease in otherwise healthy children can be attributed to low socioeconomic status and poor education.

Despite increasing admissions to hospitals – there is a suggestion that the threshold for admission has risen over the last 10 years.

Although deaths overall from respiratory diseases decreased in the USA from 1979–1997, the proportion of bronchiolitis associated deaths did not vary²⁰³. “This makes reducing bronchiolitis mortality and morbidity among infants an important goal for public intervention”¹⁹⁰.

9.5 Financial Costs

In the USA, parameters of hospitalisation, hospital length of stay, general practitioner consultations, and days of lost work raise the cost to US\$2,913 per child hospitalised for an RSV infection²⁰⁴. One of the contributions to the cost of the children admitted is the investigations and treatment that they receive. A new guideline was developed in New Zealand in 2005 – “Wheeze and Chest Infection in the less than 1 year old”²⁰⁵. This is an evidence based guideline commissioned by the Ministry of Health through the Paediatric Society of New Zealand. It has been endorsed by the New Zealand Guideline Group, the New Zealand Paediatric Society and the College of General Practitioners as well as a number of other influential groups. Based on evidence that has been carefully scored – the conclusion for bronchiolitis is that investigations (blood tests, blood cultures, nasopharyngeal aspirates, x-rays) are of no benefit in diagnosis (in particular differentiating bronchiolitis from pneumonia) or in the management of the typical infant bronchiolitis illness.

In this age group it is difficult to accurately diagnose the very few in whom this illness is the commencement of asthma, as most will have an episode of wheezy illness or illnesses that will decrease in frequency through early childhood. Even those that will go on to become responsive to asthma treatment, may well not respond at this time. *Despite continued research, there is no available specific treatment for this disease at the current time.* One recent study suggests that reduced days of wheeze occurred in children given one anti-inflammatory drug (montelukast)²⁰⁶, but this is only available as purchased chewable tablets which seem inappropriate in this group, and more research is needed to confirm these findings, particularly in the infants aged less than one year.

The problem does not just stop with bronchiolitis alone. Severe RSV is associated with increase in wheezing, lower respiratory tract infections and asthma diagnosis up to 6 years of age⁸³. There is increased risk of respiratory symptoms and chronic productive cough continuing at age 5-8 years in figures taken from a case control study²⁰⁷. A review of 6 studies of children less than 12 months of age hospitalised with proven RSV infection and comparing them to controls showed that 40% affected versus 11% controls reported

wheezing up to 5 years and 22% versus 10% reported wheezing at 5-10 years after the initial illness²⁰⁸. While most children with wheeze will not go on to have asthma; at 3 years of age, 11 of 47 children with RSV had asthma compared to 1 of 93 in the control group suggesting a risk factor for asthma development²⁰⁹. At a median of 19 years of age, physician diagnosed asthma was reported in 30% with a bronchiolitis history, 41% with a pneumonia history but in only 15% in controls²⁰⁷.

9.6 Prevention

There is no specific treatment for RSV bronchiolitis, however there is the possibility of prevention. A number of high quality studies in a variety of settings involving large numbers of infants have confirmed the risks of smoke exposure for generating increased lower respiratory tract infections in infants^{210,211}. In utero exposure results in the development of smaller airways and therefore a higher risk of developing wheeze in infancy. However, some studies have also shown increased episodes of wheeze in infants from a household where the father is a smoker and the mother is not, indicating that the effect is not only caused by in utero exposure.

Breast-feeding strongly protects against lower respiratory tract infection. A substantial body of evidence with large numbers of infants both in developing and developed countries confirms the protective effect of *any* breast-feeding. An analysis of several studies showed a more than tripling of hospitalisations for severe respiratory tract infections for infants not breast-fed compared to those breast-fed for 4 months²¹².

There is no current vaccination available. However there is the possibility of giving passive protection by giving immunoglobulin therapy, which acts by giving the infant antibodies that will act against the RSV antigen when the infant is exposed. The first available in New Zealand was Palivizumab, a humanised monoclonal antibody. A large multi-centre randomised controlled trial²¹³ enrolled 1502 children in whom 1002 received Palivizumab and 500 placebo given as monthly intramuscular doses for a 5 month period. The drug reduced RSV hospitalisation by 55%, hospital days by 42% and time receiving oxygen by 40% compared with placebo. In the study 17 children required treatment to prevent one RSV admission. Palivizumab was licensed in the USA in 1998, and in New Zealand 1999. A very small number of infants receive prophylaxis in New Zealand each winter, usually funded by individual hospital boards on a case by case basis. This is due to high cost of the medication – approximately NZ\$6560 for 5 doses for an infant averaging 5 kilograms. The American Academy of Pediatrics²¹⁴ recommended its use in premature infants less than 28 weeks gestation for 2 winters, less than 32 weeks gestation for 1 winter and in children with chronic lung disease on oxygen for 2 winters following discharge from the neonatal unit. The estimated RSV readmission rate before 1 year corrected age in infants less than 32 weeks gestation discharged on home oxygen was 42%²¹⁵. In New Zealand a cost analysis within

Although deaths overall from respiratory disease decreased in the USA between 1979 and 1997, the proportion of bronchiolitis associated deaths did not vary. This makes reducing bronchiolitis mortality and morbidity among infants an important goal for public intervention.

Wheeze and Chest Infection in the less than 1 year old' is a new evidence based guideline developed with NZ Paediatric Society and Ministry of Health support and is available on both these websites (www.paediatrics.org.nz and www.moh.govt.nz).

The problem does not stop with RSV infection in infancy alone – there is increased wheezing, lower respiratory tract infections and asthma in those children up to 6 years of age.

these parameters was undertaken²¹⁶ and found that the cost per case averted averaged \$NZ60,000 (range \$28,000-\$166,700 in the differing groups). These high costs may be reduced with:

- a reduced cost of the drug;
- use of longer intervals between injections (e.g. 6 weekly) if adequate protection is conferred;
- coverage of a shorter period (e.g. 3-4 winter months) instead of 5 months if sufficient; and
- use of smaller vials (previously not available in New Zealand) to avoid significant wastage of the medication.

Prevention of severe disease is possible with: reduced environmental tobacco smoke exposure and promotion of breast-feeding.

With these changes and in the face of increasing RSV admissions the cost analysis now (5 years later) may be different. Also in the context of children who are ex-premature infants, it was noted that the health care costs for these children are in the realms of \$NZ150,000 and \$6560 is a relatively small additional small cost²¹⁶.

9.7 Summary

New Zealand has a high rate of hospitalisation for bronchiolitis and this contributes to the numbers of preventable hospitalisations particularly in certain groups such as rural Waikato, South Auckland, Maori and Pacific Island communities. Mortality and hospitalisation is increased in high risk groups (prematurity, chronic lung disease, congenital heart disease, immune compromise and infants less than 3 months of age) although most disease still occurs in otherwise normal infants. Improvement of the socioeconomic standing of our poorest communities, reducing domestic crowding, reducing cigarette smoke exposure and promotion of breast-feeding may be cost effective measures to reduce disease rates and, in particular, the severity of disease. Awareness of, and adherence to, the new best practice evidence based guideline for “Wheeze and Chest Infection in the less than 1 year old”²¹⁷ may contribute to cost reduction by reducing unnecessary investigations and drug treatment where only supportive treatment is appropriate. Prevention by use of prophylactic immunoglobulin may become cost effective in high risk infants and revisiting the cost analysis should be considered.

Cigarette smoke exposure increases hospital admissions for lower respiratory tract infection.

Breast-feeding strongly protects against lower respiratory tract infections and sustained breast-feeding longer than 4 months of age provides greater protection.

9.8 Recommendations

- Policies, education and programmes to aid smoke addicted people to reduce and give up smoking to reduce the smoke exposure of infants.
- Policies and education to improve breast-feeding rates.
- Improve socioeconomic conditions particularly to reduce domestic crowding.
- Awareness and implementation of the best practice evidence based guideline “Wheeze and Chest Infection in the less than 1 year old” which suggests that in the infant with a straight-forward bronchiolitic illness, investigations and drug treatment are unnecessary.
- Re-examine the cost analysis for the use of prophylaxis in high risk infants.

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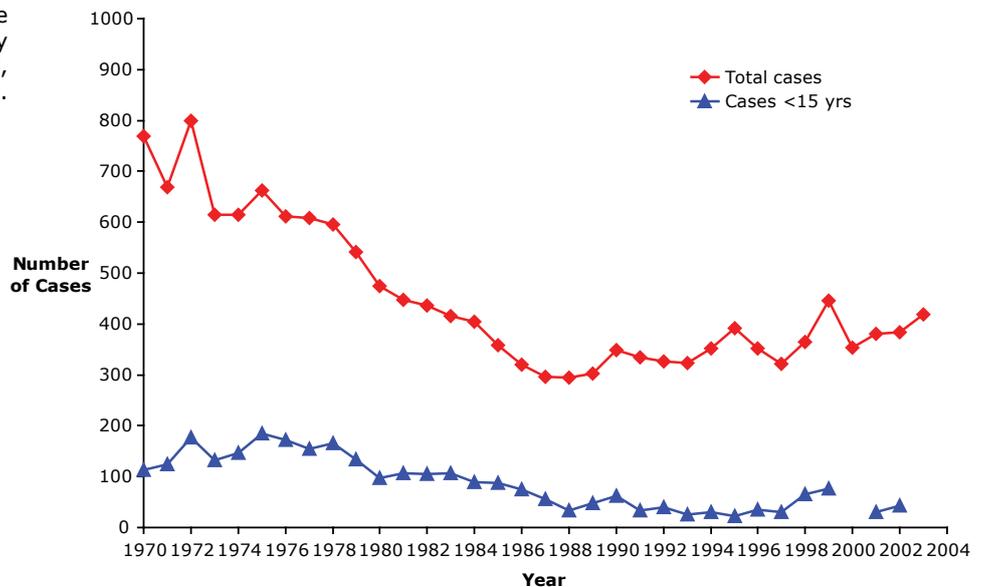
Lesley Voss

Chapter 10: Tuberculosis in Children

Tuberculosis (TB), also historically known as “consumption”, “phthisis” and “wasting disease”, was thought to be conquerable in the 1940s and 50s when streptomycin and isoniazid first became available. This resulted in a steady decline in numbers of reported cases in the developed world for many years. Then, in the 1980s, a worldwide resurgence in TB was reported. By the 1990s it was estimated that a third of the world’s population was infected with TB, leading to the World Health Organisation declaring a global crisis in 1993²¹⁸. In New Zealand (NZ) there were significant decreases in the rate of TB from the 1960s but since the early 1990s this decline has reached a plateau and the rate has remained around 10-11 per 100,000 population per year²¹⁹ (Figure 10-1).

Children account for approximately 5% of all reported clinical cases of TB. Young children infected with *Mycobacterium tuberculosis* (TB infection = a positive tuberculin test without clinical or x-ray abnormalities of TB) are at high risk of developing active disease (TB disease = clinical, x-ray or laboratory evidence of pulmonary or extrapulmonary TB) and have a higher risk of disseminated disease

Figure 10-1: Incidence of Tuberculosis by Year New Zealand, 1970-2003²¹⁹.



TB infection = positive tuberculin test without clinical or x-ray abnormalities of TB.
TB disease = clinical, x-ray or laboratory evidence of pulmonary (lung) or extrapulmonary TB.

or meningitis. TB in children occurs in most cases by contact with an infectious adult. As a result, the rate of TB disease in children tends to reflect a similar pattern to that happening in the adult population. Over a 10 year period from 1992 to 2001, 401 children under 16 years were notified with TB disease in NZ. A total of 269 cases were evaluated in depth as part of a retrospective study²²⁰. Disproportionately high rates were found in the under 5 year olds with an overall rate of 6.2 per 100,000. Ethnic disparities were also seen with a rate in Pacific children under 16 years of 15.2 per 100,000 and in African children under 16 years of 575 per 100,000. The rates in the African group are not unexpected as most of these children are recent arrivals in NZ and reflect the TB incidence in the country of birth. The rate in Pacific Island children under 16 years is significantly higher than that in Maori (6.4 per 100,000) and European (0.6 per 100,000).

Changes in the incidence within the NZ population has been influenced less by the HIV pandemic and more by immigration, with 60-70% of total cases notified in recent years being born in a foreign country and with 60% of disease occurring within 1 year of arrival²¹⁹. Twenty-eight percent of children in this study were non-NZ born, 91% of whom developed disease within the first 5 years of arrival and 64% within 1 year of arrival in NZ. The lower number of children being non-NZ born reflects many children, particularly Pacific children, being born in NZ but living with parents and family who are born overseas. They remain at higher risk of TB from exposure to household contacts who continue to have rates similar to their country of origin²²¹. This has resulted in the current NZ BCG programme which recommends children who live with household members from high risk countries should receive BCG²²² (Table 10-1). Although there are controversies over the BCG vaccine it is most effective in preventing severe forms of disease and death in young children.

In the 1940s and 1950s TB was thought to be conquerable – this has not proven to be the case with a resurgence in the 1980s and 1990s.

In the 1990s it was estimated that a third of the world's population was infected with TB.

Neonatal BCG should be offered to infants at increased risk of TB, defined as those who:

- Will be living in a house or family/whanau with a person with either current TB or a past history of TB;
- Have one or both parent who identify as being Pacific people;
- Have parents or household members who within the last 5 years have lived for a period of six months or longer** in countries where there is a high incidence of TB*; or
- During their first five years will be living for three months or longer in a high-incidence country.

* All countries except Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Holland, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, New Zealand, Norway, Slovakia, Switzerland, the UK, and USA.

** This indication is not absolute.

Table 10-1: Neonatal BCG Eligibility Criteria 2002²²².

Transmission of TB is generally from an infectious adult to a child. TB in young children is rarely infectious. So every case of TB in a child represents a sentinel event indicating transmission of *Mycobacterium tuberculosis*²²³. Over the last ten years in Auckland there have been at least three outbreaks of TB involving fifty-five children^{224,225}. The first outbreak was in a school and local community²²⁴. Although the majority of cases were among high school students, three younger children were infected from close household exposure from a teenager. As a result, widespread contact tracing had to be undertaken in the school setting, with over 500 pupils and teachers needing to be screened for TB. An outbreak in 1999 in a Pacific Island church community resulted in disease in three adults and twenty-four children with over 160 people, mainly children being investigated²²⁵. A more recent outbreak which was linked to one infectious adult, who moved home frequently, resulted in twenty-four further cases of TB in young children, with an average age of 5.7 years²²⁶. These outbreaks reflect the burden of disease in children resulting from ongoing disease transmission in the adult population.

The World Health Organisation declared TB to be a global crisis in 1993.

TB has frequently been associated with poverty – overcrowding and poor living conditions have been found to be risk factors.

In New Zealand, disproportionately high rates of TB were found in children aged less than 5 years at 6.2/100,000.

Young children, when exposed to TB, are more likely to progress from infection to disease, and are more likely to develop severe disease.

Ethnic disparities for TB disease were seen in Pacific Island and African children less than 16 years of age.

The BCG vaccination programme in New Zealand recommends that children who live with household members from high risk countries should receive the BCG. It is most effective in preventing severe forms of disease and death in young children.

Young children, when exposed to TB, are more likely to progress from latent infection to disease and are more likely to develop severe disease²²³. In the 269 children studied, although the majority had respiratory disease, there were fifty-three cases where sites other than the lungs were affected and of these, twenty-three cases had severe forms of disseminated disease or meningitis²²⁰. All the children (269) required treatment with a minimum of three drugs for six months, with those with severe disease requiring up to twelve months and often four drugs in the early stages. This is a huge burden of medication for the young child to tolerate and requires intensive community nursing and support. Those with severe disease often required prolonged hospital stays and tend to bear the majority of long-term morbidity, particularly neurological complications. Children with severe pulmonary disease can progress to long-term chronic lung problems with the development of bronchiectasis (lung scarring – Chapter 11). Two children, both under 5 years old, died as a direct result of TB during this study period, both from disseminated disease, one case diagnosed only at post-mortem.

TB has frequently been associated with poverty. In this group of children TB was associated with socioeconomic deprivation with a median New Zealand Deprivation index (NZDep96) score of 9 (10 being lowest, 1 highest)²²⁷ (Figure 10-2). The NZDep96 score used pooled census data from 1996 from 8 domains of material and social status, including household crowding, to measure socioeconomic status at the neighbourhood level. Although social factors were not looked at in association with TB in this study, overcrowding and poor living conditions have previously been found to be important risk factors for TB. Other infectious diseases, most recently meningococcal disease have also been found to be associated with household crowding²²⁸. However, with the high numbers of recent immigrant families within this affected population, who tend to be concentrated in poorer suburbs for economic reasons, it is difficult to disentangle poverty from ethnicity and immigration status^{229,230}.

Although we can record numbers, we have little information on the indirect costs to the family and the community of a case of TB. There is the direct family burden of getting children to take daily medication for six months (frequently with more than one child in a household being treated) and the economic pressures that occur with hospitalisation and regular visits to health care services. The societal implications of this disease are immeasurable, with stigma, isolation and fear of exposure being a very real concern for a family living with TB. Stigma around TB is related to basic health beliefs and culture - lack of knowledge as well as associations with past negative memories, such as death, spitting, uncleanliness, poverty - all contributing toward difficulties in accessing health services, delay in diagnosis and difficulties for health services in providing effective management and contact tracing^{224,231}.

While TB continues in our adult population, children will continue to suffer, particularly the very young who are at most risk of severe

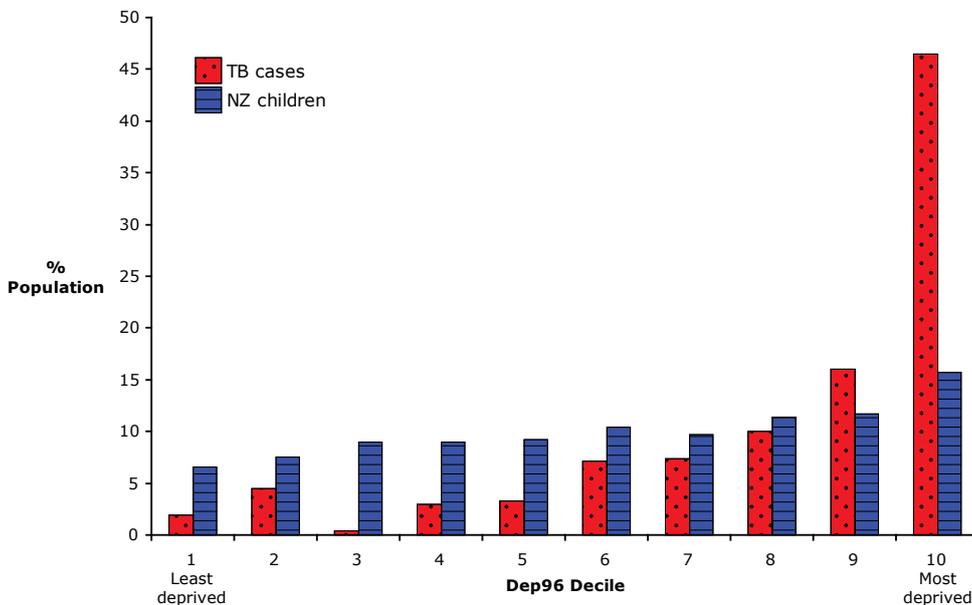


Figure 10-2: Deprivation in childhood TB cases versus all NZ children²²⁷.

disease, and those living in deprived environments. The NZ Ministry of Health 2001 publication “An integrated approach to infectious disease: Priorities for action” places TB in the highest priority with targets to reduce the TB burden in the Pacific to half the current levels by 2010, specifically through a 50% reduction in current TB rates for Maori and Pacific peoples by 2010²³². A number of strategies were put forward to help work toward these goals, with a number of these having been achieved, but an ongoing commitment from the government, along with a partnership between workers within the field and affected communities, is crucial to achieve these goals and reduce the burden of disease in children.

Transmission of TB is generally from an infectious adult to a child, while TB infection in young children is rarely infective.

10.1 Recommendations

- Continuing commitment to TB treatment and surveillance programmes.
- Continuing cooperation with other agencies (e.g. immigration, housing) to improve screening and help reduce spread of disease.
- Development of community-based education programmes in at risk groups.

Over the last 10 years in Auckland there have been at least 3 outbreaks of TB requiring widespread contact tracing.



Cass Byrnes

On behalf of the Bronchiectasis team at Starship Children's Health (Dr Elizabeth Edwards, Dr Jacob Twiss, Lorraine Stevens/Pauline Lolohea, Sarah Butler).

"When I get sick, it feels like I'm going to fall over and pass out."

Pirimona Heemi, East Coast Bays Courier, May 2005

Bronchiectasis is a type of lung scarring that results in recurrent chest infections and is usually life limiting.

Chapter 11: The Burden of Bronchiectasis in New Zealand Children

11.1 Bronchiectasis

Bronchiectasis (Bx) is a type of lung scarring where the airways become dilated and cystic, resulting in mucus pooling and recurrent infection in these damaged areas. While it can be caused by any airway obstruction (TB, inhalation of food, fluids or foreign body), it is usually the result of either severe or recurrent lower respiratory tract infection. In turn Bx then leads to recurrent pneumonia which results in increasing morbidity and disability, progression of disease, and ultimately respiratory failure and death.

Most of the children suffering from the disease were previously healthy and only 10% have underlying immune dysfunction. The discussion here excludes children and adults who have Bx as a result of cystic fibrosis. Positive diagnosis is made by a chest CT scan done at a time of stability (not when acutely unwell).

11.2 Rates of Disease

In most developed countries the incidence of Bx has fallen in the 20th century due to improved living conditions, improved vaccination programmes and antibiotic treatment of chest infections. But not in New Zealand.

High prevalence has been reported in certain communities and this includes Alaskan native children²³³, the Australian aboriginal community²³⁴, children from Turkish communities²³⁵ and New Zealand children³⁸. Here 80% of the children affected are of Maori and/or Pacific Island descent. A recent study aimed to prospectively estimate the national incidence of Bx diagnoses over a 2 year period in the 0.85 million NZ children²³⁶. Paediatricians from around the country participated reporting all new cases in 2001 and 2002. The incidence from this study was found to be 3.7 per 100,000 per year, which is 7 times greater than the only other comparable national study in Finnish children²³⁷ and equates to 1 in 1,700 births being diagnosed with Bx before the age of 15 years. If the incidence rate was to remain static and all these children survive to age 15, then the figure equates to a prevalence of *1 in 3,000 children overall* but, *1 in 625 Pacific children*. The incidence was found to be 3 times higher in Maori children and 12 times higher in Pacific Island children compared with those of European ethnicity but with no differences in severity or aetiology.

High rates of Bx particularly in Maori peoples were reported as long ago as 1958²³⁸. In a mass survey of Western Samoa in 1980 it was estimated at 1 in 170 adults²³⁹. It is concerning is that the high rates of disease are not disappearing.

Not only is this disease too common in New Zealand, but it is severe in those affected. In the Auckland³⁸ and in the National²³⁶ studies 83-93% had disease affecting both sides of the chest and 61-64% had 3

or more of the 6 lobes of the lung involved. This is significant and widespread scarring. The degree of severity that is currently being seen also implies that we are only diagnosing the worst cases thus the rate of disease given is likely to be a serious underestimate.

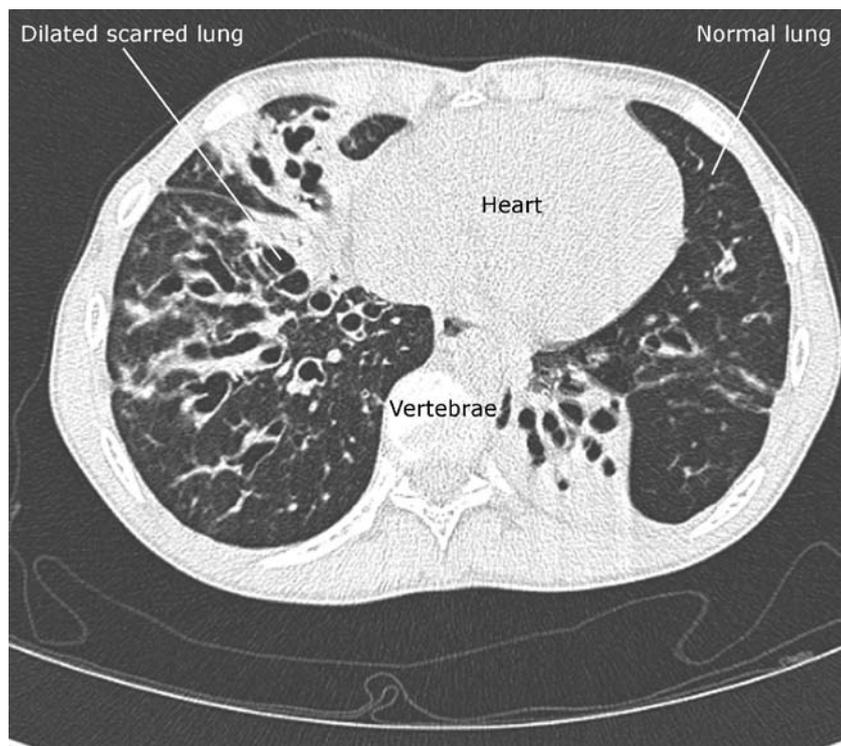


Figure 11-1: CT scan of bronchiectasis illustrating typical features of airway dilatation with sputum plugging.

The diagnosis is made by a CT scan of the chest during a time of disease stability.

Another area of concern is the very young age at which this diagnosis is being made. The Auckland study showed a median age of 8 years at diagnosis but 2 years later the National study showed a median age of only 5.2 years. Thirty percent of the children in the Bx clinic in Auckland are less than 5 years of age; consistent with the other published paediatric series. A causative insult at this young age may result in quite significant damage in a developing versus mature lung with a developing versus mature immune system. The delay in making the diagnosis remains a significant concern. The children in whom a diagnosis was made at an average age of 5.2 years, the age of onset of cough was a median of 2.3 years and the age at first respiratory hospitalisation was a median of 1 year. This meant that

In most developed countries the incidence of Bx is falling. This is not so in New Zealand.

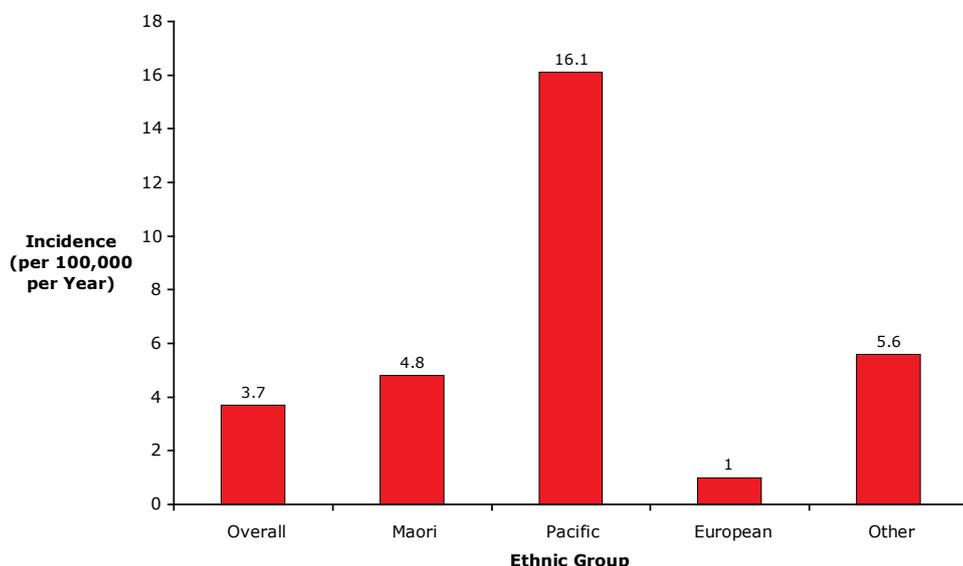
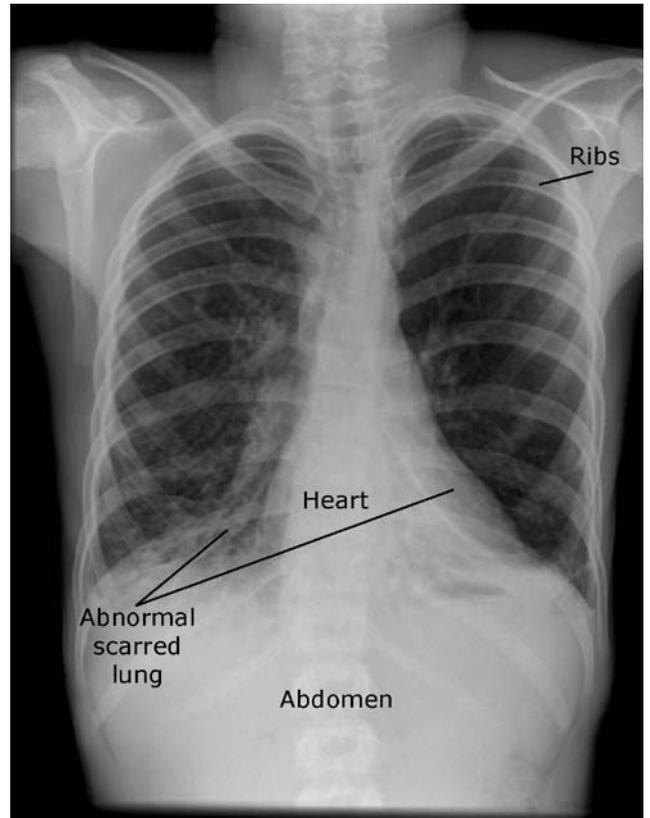


Figure 11-2: New Zealand bronchiectasis study²³. Note: Incidence in Pacific children is 4 times greater than the National incidence and 16 times greater than the European incidence. There is a trend for more severe disease in Maori and Pacific children.

Figure 11-3: X-ray illustrating bronchiectasis.



High prevalence has been described in certain groups – Alaskan native children, Aboriginal children, Turkish children and New Zealand children (predominantly Pacific Island and Maori).

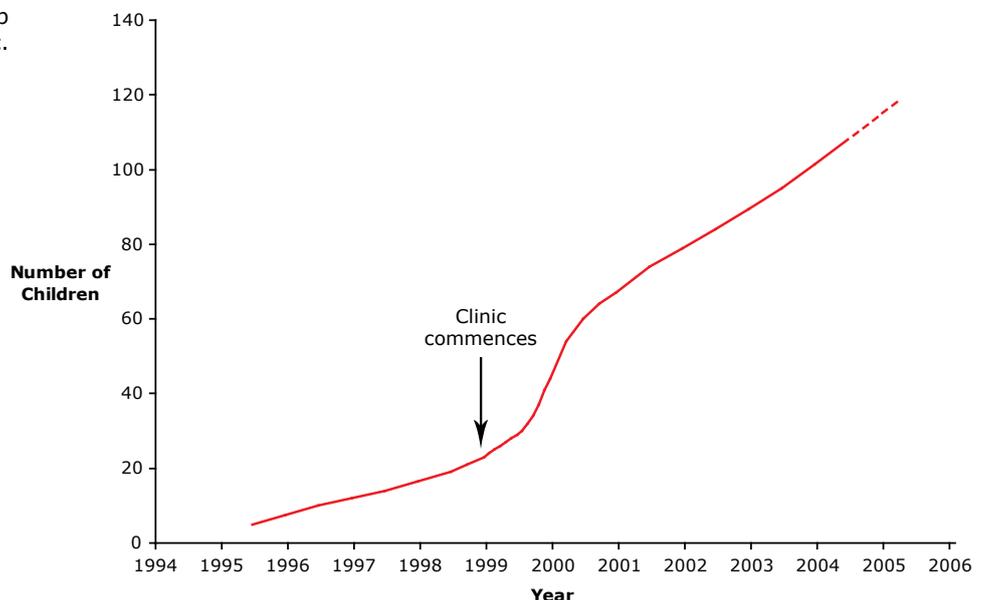
A recent national study in New Zealand found an incidence that equates to 1 in 1,700 births being diagnosed with Bx before 15 years of age.

the 1st hospitalisation was 4 years, and commencement of persistent cough was more than 2 years before the diagnosis was made. The degree of disease progression possible in that time frame is completely unknown.

11.3 Aetiology

Studies world-wide show that despite extensive investigation, the specific reason for the development of Bx remains unknown in up to 50% of cases^{38,233-236,240}. In the main these are assumed to be secondary to early, severe or recurrent lower respiratory tract infections. An additional 20-25% is due to severe pneumonia with an organism detected such as adenovirus, pertussis, staphylococcal aureus or tuberculosis. In New Zealand, the development of chronic lung disease was described in 60% of 43 paediatric patients up to

Figure 11-4: Starship bronchiectasis clinic.



13 years after being admitted to hospital with an adenovirus '21' bronchiolitis²⁴¹. The remaining causes of Bx include other insults such as immunodeficiency or immune suppression, aspiration of saliva, gastric contents or foreign body, and elsewhere primary ciliary dyskinesia for which we cannot do widespread testing in New Zealand.

11.4 Socioeconomic Considerations

Deprivation is long known to be a risk factor for this condition. An assessment of socioeconomic status of these children with Bx in the Starship Hospital clinic in 2001³⁸ gave a median deprivation score of '9' with 70% classified in areas '7-10'. Forty percent of the children were classified as '10' – meaning that their area of residence is in the most deprived 10% in New Zealand. Only 70% of these children were appropriately immunised and in 58% of the families one or more members of the household smoked on a daily basis.

While the basic management strategies needed for most of the children (physiotherapy, oral antibiotics) are cheap, the burden of this disease is financially expensive²⁴². Firstly, in terms of days at work lost by adult sufferers and parents of affected children, school days lost and loss of working years in adults who die in the 20-50 year decades, with the years prior to their final respiratory failure spent becoming increasingly disabled. The wider cost of this disease taking into account these considerations has not been studied in New Zealand. Patients attend out-patient clinics 2-4 times per year and in a recent adult series²⁴³ 30% required at least one hospital admission per year. In 2004, of the 104 children managed in one clinic²⁴², 57 required at least one hospital admission and 8 had 3-4 admissions. The current cost of a 14-day paediatric hospital stay is approximately NZ\$8270 and this does not include extra costs of insertion a long-line for antibiotics, the antibiotics themselves, or the physiotherapy. Thus bed stay alone from this clinic of children in 2004 was in the realms of NZ\$736,030.

More hard data with regard to expenditure comes from the United States where the prevalence has been estimated in adults at 52 per 100,000 overall and results in an additional 1.1 billion US dollars of health care expenditure per annum²⁴⁴.

11.5 Mortality

Significant mortality from Bx doesn't begin until adulthood in NZ, however it would appear that in many cases the disease begins in childhood²⁴⁵. Deaths from Bx are reported at 50 per 100,000 in Maori and Pacific People^{246,247}. Compared to asthma; Bx causes a tenth the hospital admissions and half the number of deaths overall^{248,249}. In some age groups (early adulthood) more adults die of Bx than of asthma. It results in 75% more admissions and nearly five times as many deaths as cystic fibrosis^{248,249}.

The prevalence is 1 in 3,000 children but 1 in 625 Pacific Island children.

The disease seen in New Zealand children is severe – suggesting we are only diagnosing the most severely affected and missing children with more mild disease.

The majority are thought to be caused by severe pneumonia in young children.

There is a delay in diagnosis. The onset of chronic cough occurred an average of 2 years and the first hospital admission for respiratory disease an average of 4 years before the diagnosis was made.

Deprivation is a risk factor for Bx – 40% of children affected lived in the 10% most deprived areas of New Zealand.

The mainstay of treatment is chest physiotherapy every day and antibiotics with infection.

Compared to asthma, Bx causes a tenth as many admissions and half the number of deaths. (New Zealand Health Information Service 2004).

11.6 Future

While the aim is to increase awareness, diagnosis and treatment to improve the current statistics and the individuals' quality of life, *prevention is the key*. The number of children who suffer from this chronic debilitating respiratory disease will only reduce when their quality of life and socioeconomic status improves.

A decade ago, a NZ Public Health Commission report on the health of NZ Pacific Peoples identified bronchiectasis as a major cause of hospitalisation and the 8th highest cause of death in Pacific women²⁵⁰. The Ministry of Health concluded the report provided a baseline for future monitoring and policy development²⁵¹. In the same year the NZ government established child and Maori health as “priority gain areas”. The figures given above suggest the situation has not improved from that time.

11.7 Recommendations

- Prevention of the disease requires improved socioeconomic status of the most deprived areas in New Zealand; a reduction in domestic overcrowding, reduced smoking rates and improved vaccination coverage.
- Increase general public and medical staff awareness of this disease.
- Encourage early diagnosis with investigation of children with persistent productive or mucousy cough that has lasted for more than 6-8 weeks, and possibly follow-up of children that have had more than one hospitalisation with pneumonia that have specific characteristics such as being secondary to adenoviral infection.
- Improved management options based on research into treatment.
- A research focus on early natural history to look for specific times or events which mark opportunities to intervene to prevent disease development and progression.
-

Chapter 12: Obstructive Sleep Apnoea in Children

Obstructive sleep apnoea (OSA) was first described in children in 1976²⁵², and a case series published in 1982 described severe complications of this condition such as failure to thrive, heart failure, permanent neurologic injury and death²⁵³. Since that time, knowledge about the condition has increased substantially, and it is now recognised as being more common in children than epilepsy, diabetes or cystic fibrosis. Recognition of this condition is growing rapidly, but to date there is no specific information about the prevalence or impact of this condition on New Zealand children.

12.1 Definitions

Symptoms suggestive of OSA in snoring children include frequent daytime mouth breathing, snoring most nights, observed cyanosis or apnoea during sleep, difficulty breathing during sleep and parental concern about the child's breathing²⁵⁴⁻²⁵⁶. Unlike the condition in adults, daytime sleepiness may not be a feature of with OSA in children, and females are as likely to have the condition as males²⁵⁷.

OSA is a condition in which breathing during sleep is compromised by obstruction of the upper airway²⁵⁸. The upper airway may be intermittently completely obstructed (apnoea) or may be partially obstructed (hypopnoea), often for prolonged periods. Episodes of airway obstruction can lead to intermittent hypoxia, hypercapnia, and frequent brief arousals from sleep. These arousals lead to surges in heart rate and blood pressure which may have long term cardiovascular implications^{259,260}. Arousals and consequent sleep disturbance may also be the mechanism by which OSA affects learning and behaviour during the day²⁵⁸.

Snoring is very common in the adult New Zealand population, affecting 20-60% depending on age^{261,262}. International estimates for children are that 6-12% of children have habitual snoring, also depending on age²⁶³⁻²⁶⁶. Probably due to the fact that snoring is so common in the community, this symptom is frequently ignored in children, leading to lack of recognition of OSA and potential delays in diagnosis and treatment.

12.2 Prevalence

OSA is one of the most common respiratory disorders of childhood, affecting an estimated 1-2% of normal children²⁶³⁻²⁶⁶. It occurs in children of all ages, from neonates to adolescents. It is most common in preschool children, when the tonsils and adenoids are at their largest size in relation to the size of the upper airway. However, there is increasing evidence that OSA is very common in children with obesity^{267,268}, and thus the prevalence in older children is likely to rise in coming years. Some studies have shown a higher prevalence in certain racial groups such as African Americans²⁵⁷. OSA has been demonstrated to be higher amongst Maori than non-Maori adults²⁶⁹, but to date no studies have examined the prevalence of the condition in New Zealand children.

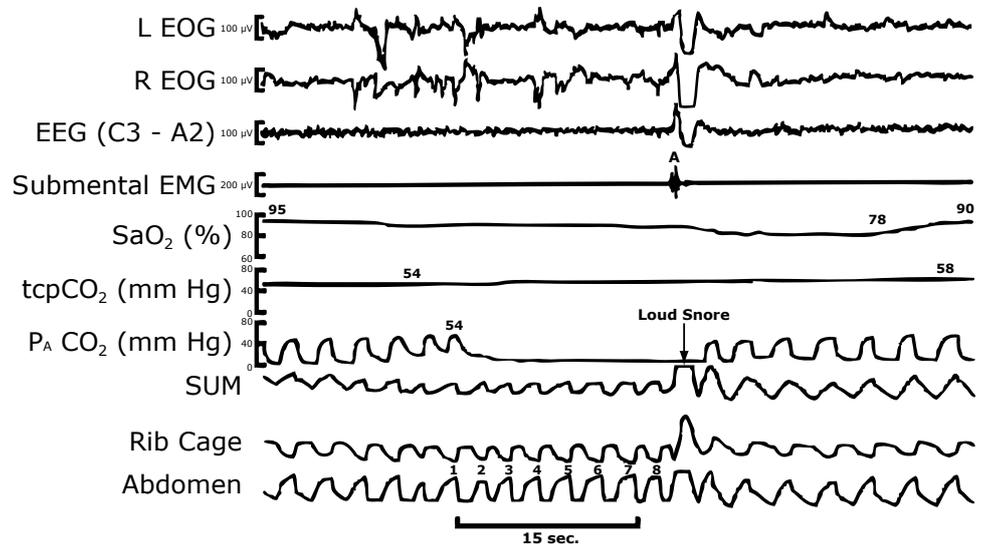


Gillian Nixon

Obstructive sleep apnoea is now recognised as being more common in children than epilepsy, diabetes or cystic fibrosis.

Symptoms suggestive of OSA in snoring children include frequent daytime mouth breathing, snoring most nights, observed cyanosis or apnoea during sleep, difficulty breathing during sleep and parental concern about the child's breathing.

Figure 12-1: Sixty seconds of a recording during sleep, showing an obstructive event lasting 15 seconds. During the event, the airflow (as recorded on the SUM and PA CO₂ channels) is markedly reduced or absent, the ribcage and abdomen move paradoxically. Following the event, there is a fall in oxygen saturation to 78%, a rise in carbon dioxide, and a brief arousal from sleep (A). These types of events are seen repeatedly during sleep in children with obstructive sleep apnoea. (EOG = electro-oculogram, EEG = electroencephalogram, EMG = electromyogram, SaO₂ = arterial oxygen saturation, tcpCO₂ = transcutaneous pressure of carbon dioxide, PA CO₂ = alveolar pressure of carbon dioxide).



12.3 Morbidity

Untreated OSA can result in significant morbidity. Early reports of more severe cases documented failure to thrive, right heart failure, mental retardation and death in some cases^{252,253}. In recent times, these severe sequelae are less often seen, but several studies have demonstrated accelerated growth after treatment of OSA, suggesting a degree of growth impairment before treatment²⁷⁰. Many studies have shown problems with learning, attention and behaviour in children with OSA^{257,271-273}, with one large study in the USA demonstrating OSA in 18% of 6-year-old children performing in the lowest 10% of the class²⁷⁴. Up to 25% of parents of children with OSA describe hyperactivity and behaviour problems^{272,275}. Hypertension and ventricular dysfunction have also been reported, proportional to the severity of the condition^{260,276}.

12.4 Diagnosis

A sleep history including questions regarding snoring should be part of all routine health assessment of children²⁵⁸. The presence of some other symptoms increases the likelihood of significant OSA in children who snore: witnessed obstructive apnoea, frequent daytime mouth breathing, parent afraid/wakes child because of breathing, difficulty breathing while asleep, frequent waking from sleep in a child who has previously slept through, secondary enuresis, daytime behavioural problems, and failure to thrive or slowing of weight gain^{254,255,257,277}. Enlarged tonsils and nasal obstruction are associated with OSA, but a linear relationship between tonsillar size and severity of OSA has not been demonstrated^{256,277}.

International standards recommend formal confirmation of the diagnosis by multi-channel physiologic recordings during sleep (polysomnography)²⁷⁸. Currently we do not have the resources in New Zealand to provide polysomnography to confirm the diagnosis of OSA in the large group of children who snore and thus national guidelines have recommended an alternative approach to assessment and treatment in the New Zealand environment.

OSA is one of the most common respiratory disorders of childhood, affecting an estimated 1-2% of normal children.

12.5 Treatment

Adenotonsillectomy is the first line treatment in children with OSA and enlarged tonsils and adenoids. This surgery leads to resolution of OSA in the vast majority of cases^{271,279}. Significant improvements in growth, cognitive functioning and daytime behaviour have also been demonstrated in children who have had adenotonsillectomy for OSA^{270,271,275,279,280}.

In those for whom adenotonsillectomy is not indicated or is not fully effective, continuous positive airway pressure by mask (nasal CPAP) may be indicated^{281,282}. This treatment can be used in children of all ages²⁸³, but requires specialist care to initiate and adjust to the unique requirements of each child. Close follow-up is needed, as treatment requirements may vary over time, particularly with increasing age or changes in the underlying condition²⁵⁸.

12.6 Economic Burden

Children with undiagnosed OSA are high users of health care services. Published data from Israel has demonstrated that children with OSA cost the health system more than twice that of controls over one year²⁸⁴. Children with OSA had more days in hospital, more visits to the emergency department, and received more prescriptions for more drugs. These costs do not include the costs of parental absence from work, direct financial costs to the family of affected children or costs of educational under-achievement secondary to OSA.

After adenotonsillectomy for treatment of OSA, the Israeli data showed a reduction in total annual health care costs by one third²⁸⁵. Adenotonsillectomy was associated with a 60% reduction in the number of new admissions, 39% reduction in emergency department visits, 47% reduction in the number of consultations, and 22% reduction in costs for prescribed drugs.

This data suggests that early recognition of OSA in children will not only reduce morbidity for the child, but will also lead to a significant reduction in costs to public health care. The Paediatric Society of New Zealand has produced a new best practice evidence based guideline “Assessment of Sleep-Disordered Breathing in Childhood” which needs publicity and implementation²⁸⁶.

12.7 Summary and Recommendations

Obstructive sleep apnoea is a common condition of childhood and can result in severe complications if left untreated. The following are recommended to improve recognition of this condition in childhood, thereby ensuring early treatment and minimisation of morbidity and economic burden to New Zealand:

- Public awareness of the importance of good sleep for children
 - Parents should be informed about normal sleep in childhood.
 - Children should not snore, and those that do should be assessed

More severe cases documented failure to thrive, right heart failure, mental retardation and death in some cases.

Many studies have shown problems with learning, attention and behaviour in children with OSA.

**Adenotonsillectomy
is the first line
treatment in
children with OSA.**

**Children with
undiagnosed OSA are
high users of health
care services.**

by a health professional for the possible presence of obstructive sleep apnoea.

- Widespread education of health professionals and well child providers - Many children presenting with OSA have had symptoms for some time. Early recognition of OSA in childhood and provision of appropriate treatment may not only treat or prevent medium term complications such as learning difficulties, but may potentially prevent serious long-term cardiovascular complications.
- Specialist paediatric sleep medicine services - A subset of symptomatic children require investigation with polysomnography. Some will require treatment with continuous positive airway pressure by mask at home and appropriate follow-up. Providers of these services should be appropriately trained and accredited for the provision of such services to children.
- Programmes to prevent and treat obesity - The enormous increase in prevalence of obesity worldwide is expected to have flow-on effects for the diagnosis of obesity-related conditions in children, such as diabetes and obstructive sleep apnoea. Well resourced and accessible programmes for children and families are vital in reducing this problem.
- Further research - Research is required in New Zealand to investigate the extent of obstructive sleep apnoea in New Zealand children and the morbidity of this condition in our population. Such information would inform the development of sleep medicine services for children.
- Awareness and implementation of the best practice evidence based guideline “Assessment of Sleep-Disordered Breathing in Childhood”.

Chapter 13: Asthma

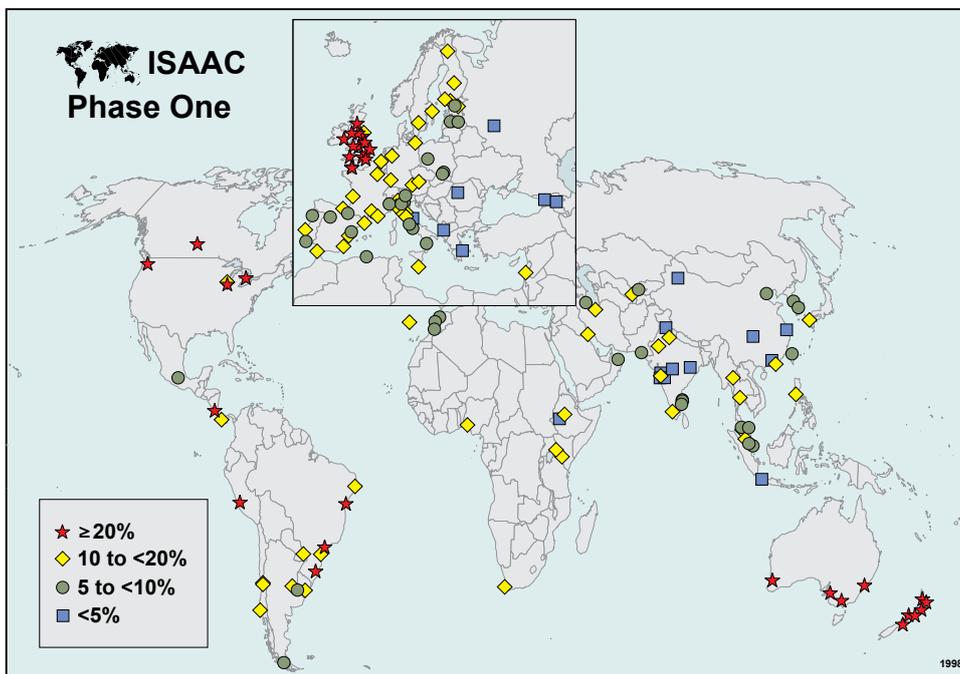
New Zealand has one of the highest recorded asthma prevalence rates in the world. Rates of hospital admissions due to asthma are highest in children, being about double that of adults, with the majority occurring in those less than 5 years.

13.1 Prevalence

ISAAC (The International Study of Asthma and Allergies in Childhood) is the largest study of the prevalence of asthma in children in the world. This standardised international study included 37,000 children from 6 centres in New Zealand. The 12 month prevalence in the 6–7 year age group for those reporting asthma was 26.5%²⁸⁷. The current population under 15 is around 900,000 which suggests over 200,000 children are affected^{288,289}.



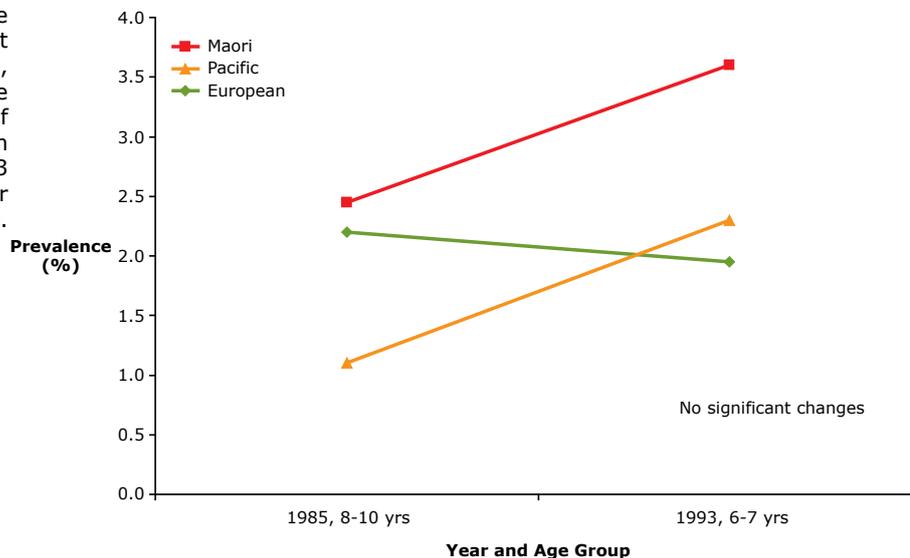
Ian Shaw



There are important ethnic differences. Studies have suggested prevalence of asthma is similar in Maori and non-Maori children²⁹⁰. Latest evidence from the ISAAC study has found significant differences²⁸⁹. In 6–7 year olds the prevalence of asthma for Europeans was 25.9%, Maori 31.7% and Pacific children 21.25%. The prevalence of wheeze in the last 12 months was European 24.2%, Maori 27.6%, Pacific 22%. In the older age group of 13–14 year olds the prevalence of asthma was European 25.2%, Maori 24.7% and Pacific 19.2%. Of wheeze in the last 12 months European 31.7%, Maori 30.8% and Pacific 21.1%. These findings were consistent with an earlier study on asthma prevalence in Auckland children²⁹¹.

New Zealand has one of the highest recorded asthma prevalence rates in the world.

Figure 13-2: Change in prevalence of recent wheeze, asthma, and frequent wheeze between 1985 study of 8-10 yr old children in Auckland²⁹¹ and 1993 ISAAC study of 6-7 yr old children in Auckland.



Rates of hospital admissions due to asthma are highest in children, being about double that of adults, with the majority occurring in those less than 5 years.

The greatest difference between ethnic groups is the presence of more severe symptoms among Maori and Pacific children compared with European.

13.2 Morbidity

13.2.1 Prevalence of Severe Asthma

Case fatality rates for severe asthma in children are very low. Prevalence of severe asthma symptoms and assessment of asthma severity in studies using questionnaires is difficult to quantify. Frequency of attacks is one aspect of severity, but the prevalence of chronic interval symptoms better reflects asthma management. Frequency of wheeze disturbing sleep was assessed in the ISAAC study as 3.5% for the 6–7 years olds and 3.2% for the 13–14 year olds²⁸⁹.

A figure of case morbidity for night waking can be calculated by the ratio of numbers waking with wheeze to the number reporting “asthma”. This was worked out as reflecting 10% in European 6–7 year old children compared to 18% in Maori and 27% in Pacific children. For the older age group 13–14 year olds the figures were European 11%, Maori and Pacific young people 19%. This suggests that the greatest difference between ethnic groups is the presence of more severe symptoms among Maori and Pacific children compared with European.

13.2.2 Hospital Admission Rates

Asthma remains the commonest cause for hospital admissions for children. Whilst admissions remain high, numbers internationally and nationally fell in the 1990s²⁴⁹.

There were 3210 non-Maori children aged less than 15 years admitted with a diagnosis of asthma in 2001 and 1486 Maori children aged less than 15 (representing 68% and 32% of asthma admissions respectively). The figure of 32% of all children admitted with asthma being Maori contrasts with the estimated childhood Maori population at the time of 15%. The burden of asthma admissions is highest for the younger children, over half aged less than 5 years²⁹².

The hospitalisation rate from July 1999 – June 2004 was reasonably constant*. However while rates have gradually decreased in NZ Europeans, rates for Maori and Pacific people have risen. In children aged less than 5 hospitalisation rates per 1000 for NZ Europeans were 7.8 whilst Maori were 20.5 and Pacific children 24.6.

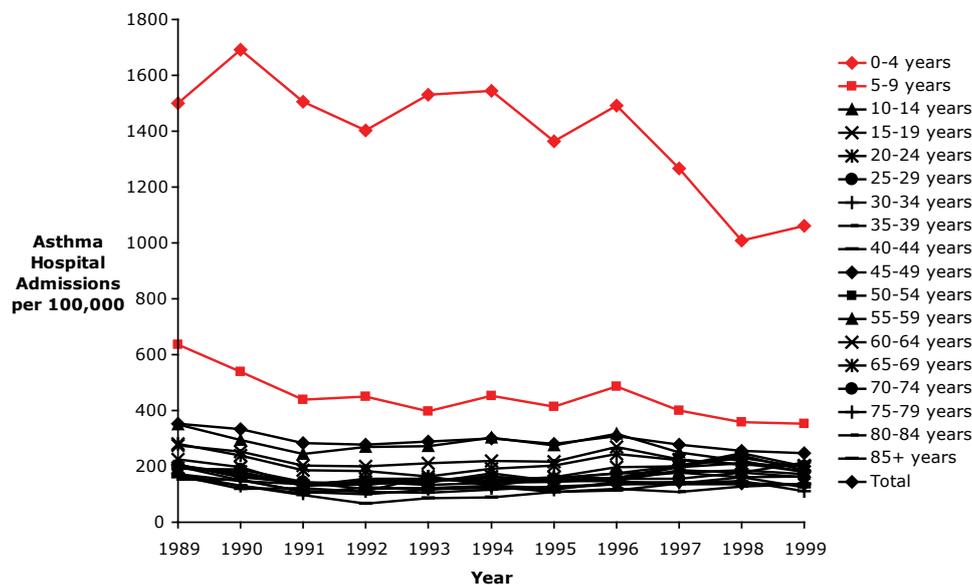


Figure 13-3: Asthma Hospital Admissions in New Zealand, 1989–99. (New Zealand Health Information Service)

This gives a relative risk for Maori to NZ Europeans of 2.6 and for Pacific to NZ Europeans of 3.2. For those aged 5 – 14 the rates per 1000 (2003 – 2004 year) were NZ European 1.9, Maori 4.3 and Pacific 5.3. The relative risk for Maori to European is 2.3 and Pacific to European is 2.8²⁹².

Admissions for Maori and non-Maori are not evenly distributed geographically. Asthma hospitalisations in Maori and non-Maori between 1994 and 2000 indicated that there were significant variations with some districts reporting high hospitalisation rates for Maori compared to non-Maori. Rural hospitalisation rates were higher than urban areas³⁰.

13.2.3 Asthma Control

Further assessment of asthma control was undertaken in the Patient Outcomes Management Survey (POMS)²⁹³. Children in this study ranged in age from 7 – 15. Definition of asthma control and under treatment was based on the globally standardised criteria for asthma control in the Global Initiative for Asthma (GINA) Guidelines. The majority of children did not have good control of asthma symptoms, 44% having asthma that was not well controlled, and 1/20th of children falling in the category “markedly out of control”. In the previous 3 months a third of children had had unscheduled appointments or contact with doctors after hours because of asthma and 14% had been to the emergency department or admitted to hospital.

The burden of asthma admissions is highest for the younger children, over half aged less than 5 years.

There was a marked mismatch between the patient’s perception of asthma control and the actual level of control as defined for

* Due to some differences in short stay admission reporting by District Health Boards, these figures are in fact under-estimates.

this study. Over $\frac{3}{4}$ thought their asthma was well controlled and 85% reported satisfaction with their level of asthma control. Of the children whose asthma was not well controlled 71% were under treated and for those markedly out of control, 75% were under treated.

Another way of measuring asthma management and control is use of medication. There are 3 main medications used, short acting beta agonists (SABA), long acting beta agonists (LABA) and inhaled corticosteroids (ICS). SABA use is highest in young children similarly there is higher use in younger patients for ICSs but LABAs have higher use in the older age group (50+).

In the younger age groups LABA use is much higher in New Zealand Europeans than other ethnic groups. SABA use was highest in Maori and lowest in Pacific patients which contrasts with the very high hospitalisation rate for Pacific patients. The ratio of SABA: ICS dispensing is regarded as a potential measure of poor asthma control and this ratio is highest in young children. The SABA: ICS ratio (suggesting poorer control) is also higher in Maori and especially Pacific patients. The lower ICS:hospitalisation and LABA: hospitalisation ratios for Maori and Pacific patients suggests unmet need²⁹².

Low asthma pharmaceutical use and high asthma hospitalisation rates identify greater morbidity in Maori and Pacific patients.

Association of low asthma pharmaceutical use and high asthma hospitalisation rates are consistent with previous studies identifying greater morbidity in Maori and Pacific patients.

In addition there has been an overall reduction in the average daily dose for inhaled corticosteroids of over 8% for all age groups. The average daily dose (ADD) of beclomethasone equivalents for children aged 0 – 5 years is 504 mcg and for children 6 – 16 years 705 mcg. It is important to note that whilst ICS use is decreasing SABA use has remained constant which increases the SABA to ICS ratio often used as an indicator of diminished quality of asthma treatment²⁹².

The Australian ICS ADD continues to be around 50% higher than New Zealand and is still increasing compared with New Zealand's decreasing rate. Australia also has higher rates of SABA use than New Zealand.

Although access to LABAs has improved significantly for children in recent years there appears to be very low uptake amongst children for LABA prescriptions despite the average daily dose of inhaled corticosteroids being over 500 mcg and the reported poor control and frequent night time waking^{30,292}.

13.3 Socioeconomic and Ethnic Factors

There have been many studies attempting to relate prevalence of asthma to socioeconomic status (SES). Atopy is more common in higher SES groups. The evidence for asthma has been conflicting. The Dunedin Multidisciplinary Health and Development Study has

been a longitudinal investigation of health and behaviour²⁹⁴. It has found the socioeconomic status in childhood has no impact on the prevalence of asthma. This report does not assess in detail morbidity, only prevalence and there are many studies that suggest that socioeconomic disadvantage adversely affects asthma management and results in increased hospital admissions. The cost of GP visits has been identified as one significant barrier. Location of health services is another factor identified as a significant barrier²⁸⁹. SES did not independently explain ethnic differences in any category of asthma symptoms in a 1985 Auckland study²⁹¹.

It is important to note that in all measures of prevalence and severity as measured by morbidity admission rates and pharmaceutical use, Maori are significantly over represented. There is a disproportionate burden on Maori and Pacific people and there is a lower use of bronchodilators and preventer agents in children especially in lower socioeconomic groups despite higher prevalence of reported asthma symptoms. This is consistent with studies noting high levels of sub optimal asthma control. While smoking incidence and poor housing are evident factors SES does not completely explain these differences nor the geographic differences identified between DHBs with some reporting much higher rates of admissions than others^{30,291}. Local geographic differences would support regional services being an issue for Maori.

13.3.1 Economic Cost

Economic cost will include the cost of pharmaceuticals, hospitalisation costs as well as access to emergency after hours care without admission. The Pharmaceutical Management Agency of New Zealand (PHARMAC) identified asthma as the most heavily under treated disease group in their gap analysis of 2002 with “patient-year equivalents for pharmaceuticals dispensed for asthma being perhaps one third of that expected epidemiologically”. PHARMAC reports that the pharmaceutical budget for asthma medication was 60 million dollars for 2002-03. Separate data for costs of treating children was not available.

For the year 2000-2001 there were 4390 children aged less than 15 years admitted with a diagnosis of asthma. The reported average length of stay was 2.4 days resulting in approximately 10,000 days in hospital²⁴⁹.

Emergency department (ED) visits by children may be extrapolated from studies that found that 27-39% of people with asthma attending emergency departments were admitted to hospital. This would suggest around 12,000 children attend ED per annum at a cost of around \$250 per visit (i.e. a total cost of \$3 million)²⁸⁹.

Indirect costs for children primarily relate to days off school. This does have a significant impact on loss of work days for care givers. A French study of children aged 6-16 years with persistent asthma found that nearly 30% of care givers lost work days because of their children’s asthma. More than 13% lost more than 5 days and

There are many studies that suggest that socioeconomic disadvantage adversely affects asthma management and results in increased hospital admissions.

PHARMAC has identified asthma as the most heavily under treated disease group in their gap analysis of 2002.

care giver absenteeism was significantly correlated with elements of asthma control. A significant finding was an 8 fold risk of losing more than 5 work days per annum for care givers of children whose asthma was poorly controlled²⁹⁵. Given the high level of poor control identified by the POMS study it is likely that there is a substantial cost to the work force in addition to days lost from school.

The Paediatric Society of New Zealand has the best practice evidence based guideline “Management of Asthma in Children Aged 1-15 Years”²⁹⁶. Implementation of this guideline will lead to improved asthma outcomes.

13.4 Summary

New Zealand has amongst the highest recorded asthma rates in the world with rates of hospital admissions due to asthma highest in children being about double that of adults with the majority occurring in those less than 5 years.

It is important to reduce the burden of asthma. The key barriers identified in New Zealand are socioeconomic deprivation with implications for access to health care services and pharmaceuticals. Closely linked with this is poor education and issues with infrastructure noting that a significant barrier for many Maori included location of health services. Specific strategies to target the high needs identified in Maori and Pacific children need to be developed. Whilst this will include strategies to address cost there needs to be specific approaches to addressing issues of location, transport, communication and education.

For such a strategy to succeed there would need to be major participation from within the communities themselves. It is noted that PHARMAC has a Maori responsiveness strategy for both children and respiratory disease but there is no similar responsiveness strategy for Pacific people and this should be addressed.

Environmental factors including air pollution, smoking and poor housing all need separate strategies including further promotion and implementation of anti tobacco public health policies and addressing standards of housing.

District Health Boards identified as having high hospitalisation rates and those with significant rural populations should develop local strategies to reduce the burden of asthma and reduce hospitalisation rates for Maori in their district. Similar strategies will need to be developed for Pacific children.

13.5 Recommendations

Improvements in child asthma health care will require:

- Reduction in financial barriers to accessing health care. These may include free nurse based asthma clinics and facilitating a reduction in GP fees for children.

“In the UK if you are a child with persistent asthma the GP visits and prescriptions are free, no matter what time of day you need them.”

Claire Richards, Asthma Nurse Educator who emigrated from the UK in 2002.

- Reduction in geographic barriers to accessing health care. This may mean providing mobile health clinics delivering services to remote or poorly serviced areas.
- Improved access to asthma education within the community.
- Reduction in financial barriers to accessing pharmaceuticals. It is noted that PHARMAC has a Maori responsiveness strategy for both children and respiratory disease but there is no similar responsiveness strategy for Pacific people.
- Address poor housing to reduce respiratory illness in children.
- Continued improvements in smoking cessation with emphasis on families with young children.
- Continue to address clean air policies to reduce air pollution.
- District Health Boards identified as having high hospitalisation rates to develop local strategies to reduce the burden of asthma and reduce hospitalisations for Maori in their district. Similar strategies will need to be developed for Pacific children.
- District Health Boards with significant rural populations will need strategies to address service delivery and health care provision to remote populations with limited access.
- Implementation of the best practice evidence based guideline “Management of Asthma in Children Aged 1-15 Years”.

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