# ASTHMA

## Introduction

Asthma is a chronic inflammatory disorder of the airways of the lower respiratory tract. The inflammation is associated with airflow obstruction and bronchial hyper-responsiveness, which leads to episodes of bronchospasm (where smooth muscle in the airway walls contracts and the airways become narrowed), and symptoms such as wheezing, chest tightness, shortness of breath and coughing [133].

Asthma typically begins in early childhood and a family history of asthma and/or atopy is an important risk factor. The most common triggers of asthma attacks in children are viral infections and aero-allergens such as pollen, mould, house dust mites, animal dander and cigarette smoke. However, asthma may also be triggered by exposure to cold air, exercise or psychological stress [133].

New Zealand is one of the countries with the highest prevalence of asthma in the world [134]. Results from Phase Three of the International Study of Asthma and Allergies in Childhood (ISAAC) conducted in Auckland, the Bay of Plenty, Christchurch, Nelson, and Wellington during 2001-2003 found that 30% of children aged 6-7 years and 32% of adolescents reported having 'ever had' asthma [135]. Phase One of the ISAAC Study also suggested that asthma was more prevalent in Māori > European > Pacific children, but that symptom severity was worst for Pacific > Māori > European children with asthma [136]. Māori children have also been reported as having higher rates of hospital admission for asthma than non-Māori children and this disparity is greatest for children from rural areas [137].

From a public health perspective, addressing issues such as parental smoking, access to primary healthcare and the appropriate use of preventer medication may assist in reducing ethnic disparities in asthma symptoms and hospital admission rates [136]. However, the extent to which population level interventions may be of value in reducing the overall prevalence of asthma among New Zealand's children and young people remains unclear.

The following section explores asthma in children and young people using information from the National Minimum Dataset and the National Mortality Collection. It concludes with a brief overview of evidence-based reviews and guidelines which consider the most effective interventions for preventing or managing asthma in children and young people.

**Data Sources and Methods**

**Indicator**

1. *Acute and Semi Acute Hospital Admissions for Asthma in Children and Young People Aged 0–24 Years*

Numerator: National Minimum Dataset: Hospital admissions for children and young people aged 0–24 years with a primary diagnosis of Asthma (ICD-10-AM J45–46).

Denominator: Statistics NZ Estimated Resident Population (with linear extrapolation being used to calculate denominators between Census years).

*2. Mortality from Asthma in Children and Young People Aged 0–24 Years*

Numerator: National Mortality Collection: Deaths in children and young people aged 0–24 years where the main underlying cause of death was Asthma (ICD-10-AM J45–46).

Denominator: Statistics NZ Estimated Resident Population (with linear extrapolation being used to calculate denominators between Census years).

**Notes on Interpretation**

Note 1: An acute admission is an unplanned admission occurring on the day of presentation, while a semi-acute admission (referred to in the NMDS as an arranged admission) is a non-acute admission with an admission date <7 days after the date the decision was made that the admission was necessary.

Note 2: **Appendix 3** outlines the limitations of the hospital admission data used. The reader is urged to review this Appendix before interpreting any trends based on hospital admission data.

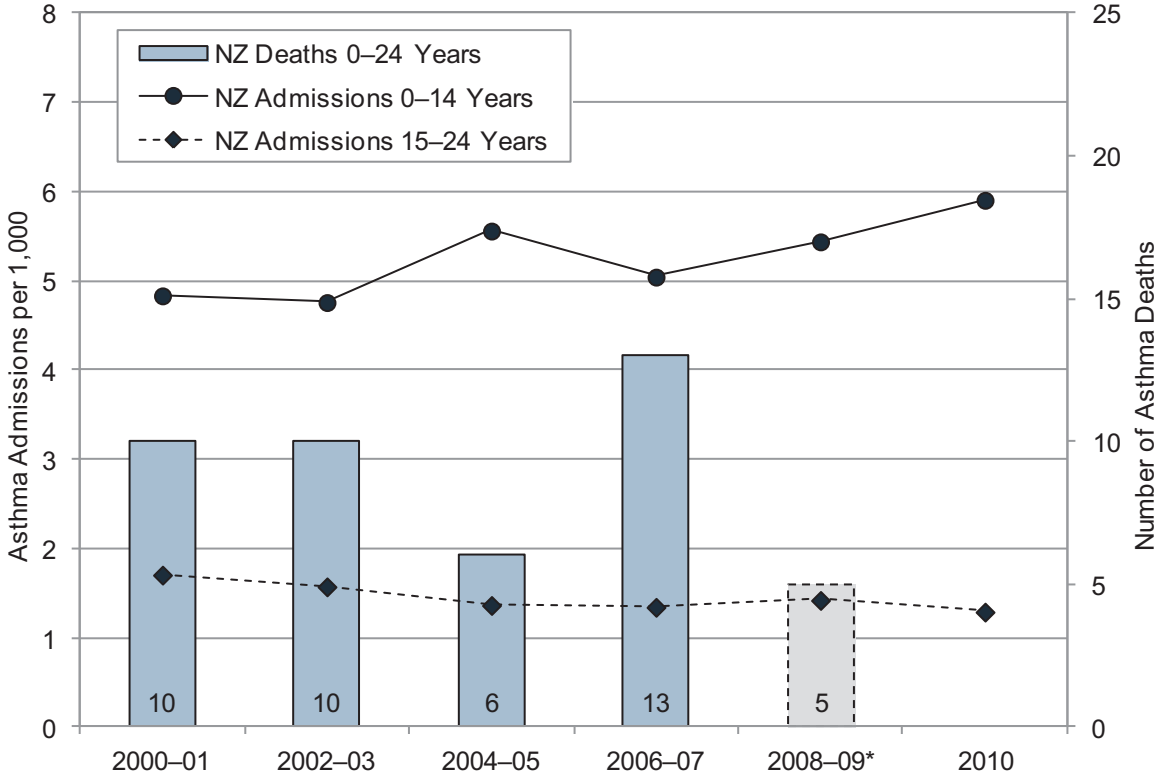
Note 3: 95% confidence intervals have been provided for the rate ratios in this section and where appropriate, the terms *significant* or not *significant* have been used to communicate the significance of the observed associations. Tests of statistical significance have not been applied to other data in this section, and thus (unless the terms *significant* or non-*significant* are specifically used) the associations described do not imply statistical significance or non-significance (see **Appendix 2** for further discussion of this issue).

# New Zealand Distribution and Trends

## New Zealand Trends

In New Zealand during 2000–2010, asthma admissions in children gradually increased, while admissions in young people were more static after 2004–2005. On average during 2000–2008, five New Zealand children or young people each year, died as the result of asthma (**Figure 62**).

Figure 62. Acute and Semi-Acute Hospital Admissions (2000−2010) and Deaths (2000−2008) from Asthma in New Zealand Children and Young People Aged 0−24 Years

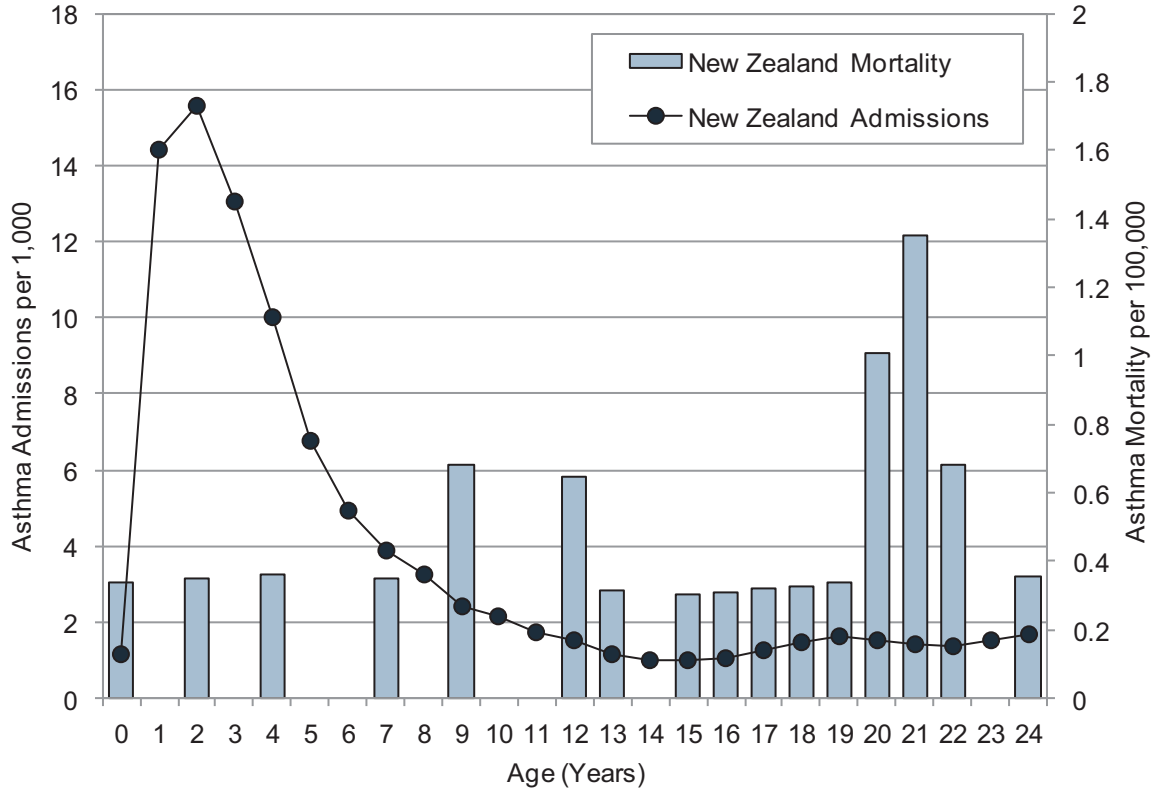



Source: Numerators: National Minimum Dataset (Acute and semi-acute admissions only) and National Mortality Collection; Denominator: Statistics NZ Estimated Resident Population. *Note: Number of Deaths is per 2 year period, with the exception of 2008–09, which is for a single year (2008) only.

## New Zealand Distribution by Age

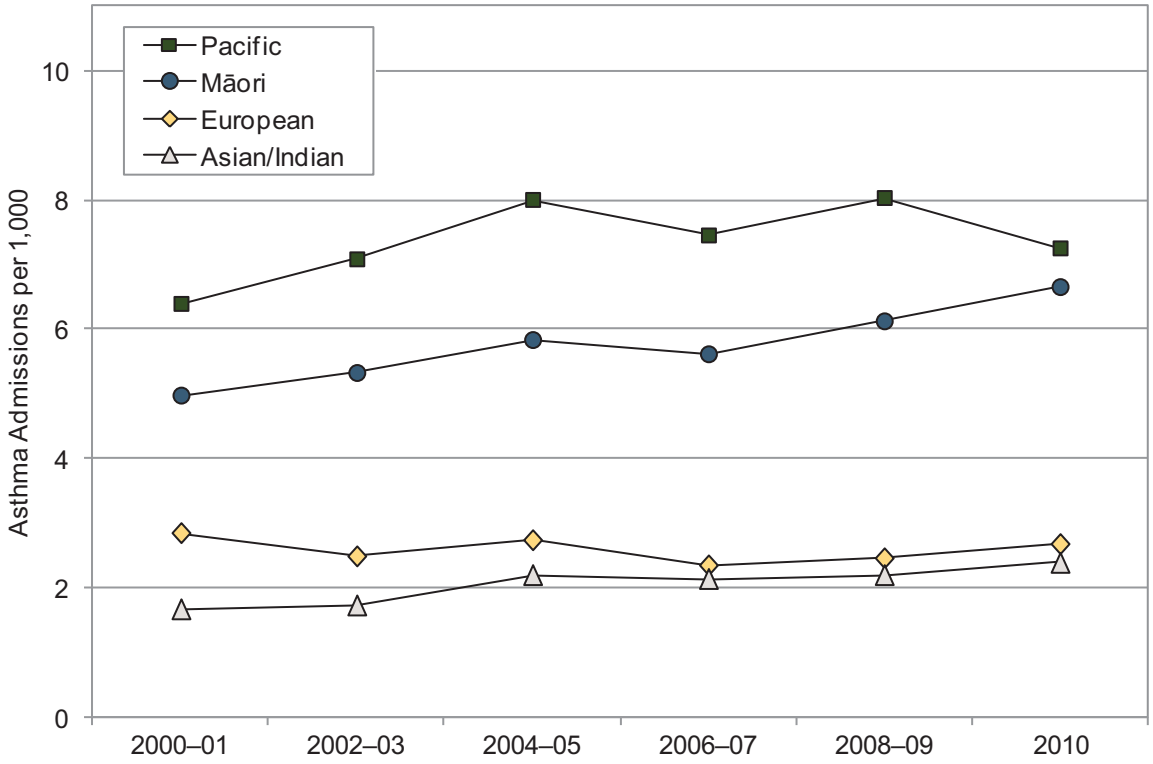
In New Zealand during 2006–2010, hospital admissions for asthma were relatively infrequent during infancy but increased rapidly thereafter to reach a peak at 2 years of age. Admissions then declined during early-middle childhood with the lowest rates being seen amongst those in their teens and early twenties. In contrast, asthma deaths were most frequent amongst those in their teens and early twenties (**Figure 63**).

Figure 63. Acute and Semi-Acute Hospital Admissions (2006−2010) and Deaths (2004−2008) from Asthma in New Zealand Children and Young People by Age




Source: Numerators: National Minimum Dataset (Acute and semi-acute admissions only) and National Mortality Collection; Denominator: Statistics NZ Estimated Resident Population

Figure 64. Acute and Semi-Acute Hospital Admissions for Asthma in Children and Young People Aged 0−24 Years by Ethnicity, New Zealand 2000−2010




Source: Numerator: National Minimum Dataset (Acute and semi-acute admissions only); Denominator: Statistics NZ Estimated Resident Population. Note: Ethnicity is Level 1 Prioritised.

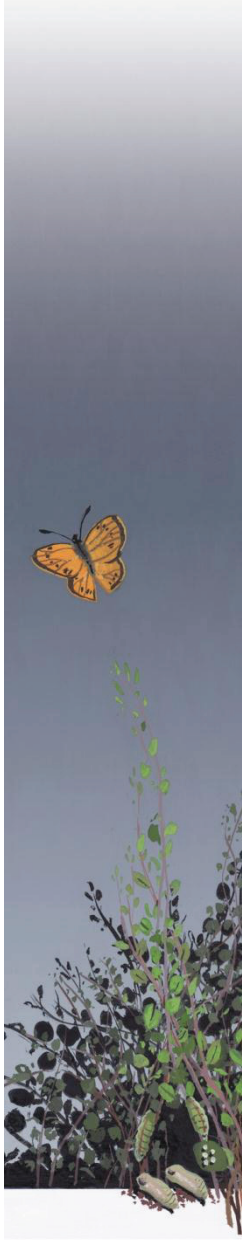
## New Zealand Distribution by Ethnicity, NZDep Index Decile and Gender

In New Zealand during 2006–2010, hospital admissions for asthma in children were *significantly* higher for males, Pacific > Māori > Asian/Indian > European children and those living in average-to-more deprived (NZDep decile 3–10) areas. In contrast, asthma admissions in young people were *significantly* higher for females, Pacific and Māori > European > Asian/Indian young people and those living in average-to-more deprived (NZDep decile 4–10) areas (**Table 74**). When both age groups were combined, asthma admissions during 2000–2010 were higher for Pacific > Māori > European > Asian/Indian children and young people. The differences seen between Pacific and Māori children and young people narrowed during this period as did the differences between European and Asian/Indian children and young people (**Figure 64**).

Table 74. Acute and Semi-Acute Hospital Admissions for Asthma in Children and Young People Aged 0−24 Years by Ethnicity, NZ Deprivation Index Decile and Gender, New Zealand 2006−2010

| Variable | Rate | Rate Ratio | 95% CI | Variable | Rate | Rate Ratio | 95% CI |
|---|---|---|---|---|---|---|---|
| Asthma | | | | | | | |
| Children 0–14 Years | | | | | | | |
| NZ Deprivation Index Decile | | | | NZ Deprivation Index Quintile | | | |
| Decile 1 | 2.92 | 1.00 | | Decile 1–2 | 2.87 | 1.00 | |
| Decile 2 | 2.82 | 0.96 | 0.89–1.04 | Decile 3–4 | 3.61 | 1.26 | 1.19–1.33 |
| Decile 3 | 3.49 | 1.20 | 1.11–1.29 | Decile 5–6 | 4.97 | 1.73 | 1.65–1.82 |
| Decile 4 | 3.72 | 1.27 | 1.18–1.37 | Decile 7–8 | 6.46 | 2.25 | 2.15–2.36 |
| Decile 5 | 4.75 | 1.63 | 1.52–1.75 | Decile 9–10 | 8.19 | 2.85 | 2.73–2.98 |
| Decile 6 | 5.16 | 1.77 | 1.65–1.89 | Prioritised Ethnicity | | | |
| Decile 7 | 5.91 | 2.02 | 1.89–2.16 | European | 3.46 | 1.00 | |
| Decile 8 | 6.94 | 2.38 | 2.23–2.53 | Māori | 8.05 | 2.33 | 2.26–2.40 |
| Decile 9 | 7.88 | 2.70 | 2.53–2.87 | Pacific | 10.55 | 3.05 | 2.95–3.16 |
| Decile 10 | 8.45 | 2.89 | 2.72–3.08 | Asian/Indian | 4.32 | 1.25 | 1.19–1.32 |
| Gender | | | | | | | |
| Female | 4.39 | 1.00 | | | | | |
| Male | 6.33 | 1.44 | 1.41–1.48 | | | | |
| Young People 15–24 Years | | | | | | | |
| NZ Deprivation Index Decile | | | | NZ Deprivation Index Quintile | | | |
| Decile 1 | 0.68 | 1.00 | | Decile 1–2 | 0.69 | 1.00 | |
| Decile 2 | 0.69 | 1.01 | 0.83–1.24 | Decile 3–4 | 0.86 | 1.26 | 1.10–1.44 |
| Decile 3 | 0.74 | 1.08 | 0.88–1.32 | Decile 5–6 | 1.21 | 1.76 | 1.55–2.00 |
| Decile 4 | 0.98 | 1.43 | 1.19–1.73 | Decile 7–8 | 1.61 | 2.34 | 2.08–2.63 |
| Decile 5 | 1.16 | 1.70 | 1.42–2.05 | Decile 9–10 | 2.07 | 3.01 | 2.69–3.37 |
| Decile 6 | 1.25 | 1.84 | 1.54–2.19 | Prioritised Ethnicity | | | |
| Decile 7 | 1.57 | 2.31 | 1.95–2.74 | European | 1.04 | 1.00 | |
| Decile 8 | 1.63 | 2.40 | 2.03–2.83 | Māori | 2.44 | 2.34 | 2.18–2.50 |
| Decile 9 | 1.89 | 2.78 | 2.36–3.26 | Pacific | 2.73 | 2.61 | 2.39–2.85 |
| Decile 10 | 2.28 | 3.34 | 2.85–3.93 | Asian/Indian | 0.39 | 0.37 | 0.32–0.43 |
| Gender | | | | | | | |
| Female | 1.76 | 1.00 | | | | | |
| Male | 0.98 | 0.56 | 0.53–0.59 | | | | |

Source: Numerator: National Minimum Dataset (Acute and semi-acute admissions only); Denominator: Statistics NZ Estimated Resident Population. Note: Rate is per 1,000; Ethnicity is Level 1 Prioritised; Decile is NZDep2001.



# South Island Distribution and Trends

## South Island DHBs vs. New Zealand

In each of the South Island DHBs during 2006–2010, asthma admissions in children were *significantly* lower than the New Zealand rate. While admissions in young people were also lower than the New Zealand rate in all DHBs, only in the case of Nelson Marlborough, Canterbury, Otago and Southland did these differences reach statistical significance (**Table 75**).

Table 75. Acute and Semi-Acute Hospital Admissions for Asthma in Children and Young People Aged 0−24 Years, South Island DHBs vs. New Zealand 2006−2010

| DHB | Number: Total 2006–2010 | Number: Annual Average | Rate per 1,000 | Rate Ratio | 95% CI |
|---|---|---|---|---|---|
| Asthma | | | | | |
| Children 0–14 Years | | | | | |
| Nelson Marlborough | 465 | 93.0 | 3.60 | 0.67 | 0.61–0.73 |
| West Coast | 141 | 28.2 | 4.47 | 0.83 | 0.70–0.98 |
| Canterbury | 2,201 | 440.2 | 4.59 | 0.85 | 0.82–0.89 |
| South Canterbury | 163 | 32.6 | 3.15 | 0.59 | 0.50–0.68 |
| Otago | 598 | 119.6 | 3.73 | 0.69 | 0.64–0.75 |
| Southland | 499 | 99.8 | 4.59 | 0.85 | 0.78–0.93 |
| New Zealand | 24,030 | 4,806.0 | 5.38 | 1.00 | |
| Young People 15–24 Years | | | | | |
| Nelson Marlborough | 49 | 9.8 | 0.62 | 0.45 | 0.34–0.60 |
| West Coast | 17 | 3.4 | 0.93 | 0.68 | 0.42–1.09 |
| Canterbury | 371 | 74.2 | 1.02 | 0.74 | 0.67–0.83 |
| South Canterbury | 36 | 7.2 | 1.15 | 0.84 | 0.60–1.16 |
| Otago | 94 | 18.8 | 0.55 | 0.40 | 0.33–0.50 |
| Southland | 60 | 12.0 | 0.82 | 0.60 | 0.47–0.78 |
| New Zealand | 4,338 | 867.6 | 1.37 | 1.00 | |

Source: Numerator: National Minimum Dataset (Acute and semi-acute admissions only); Denominator: Statistics NZ Estimated Resident Population

## South Island Trends

In Nelson Marlborough, South Canterbury, Canterbury and the West Coast during 2000−2010, asthma admissions in children fluctuated, although rates in Canterbury young people exhibited a general downward trend. In Otago, admissions exhibited a general upward trend in children but a downward trend in young people, while in Southland, admissions in children decreased during the early-mid 2000s, but increased rapidly after 2006-07, while admissions in young people decreased during the early-mid 2000s, but increased more gradually after 2004-05 (**Figure 65**).

## South Island Distribution by Ethnicity

In Canterbury during 2000–2010, hospital admissions for asthma were generally higher for Pacific > Māori > European > Asian/Indian children and young people, while in Nelson Marlborough, Otago and Southland asthma admissions were generally higher for Māori than for European children and young people. Ethnic differences in South Canterbury and the West Coast were less consistent from year to year (**Figure 66**).

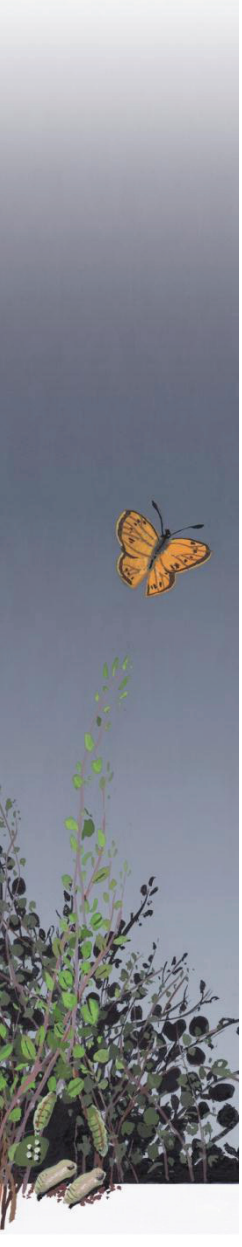
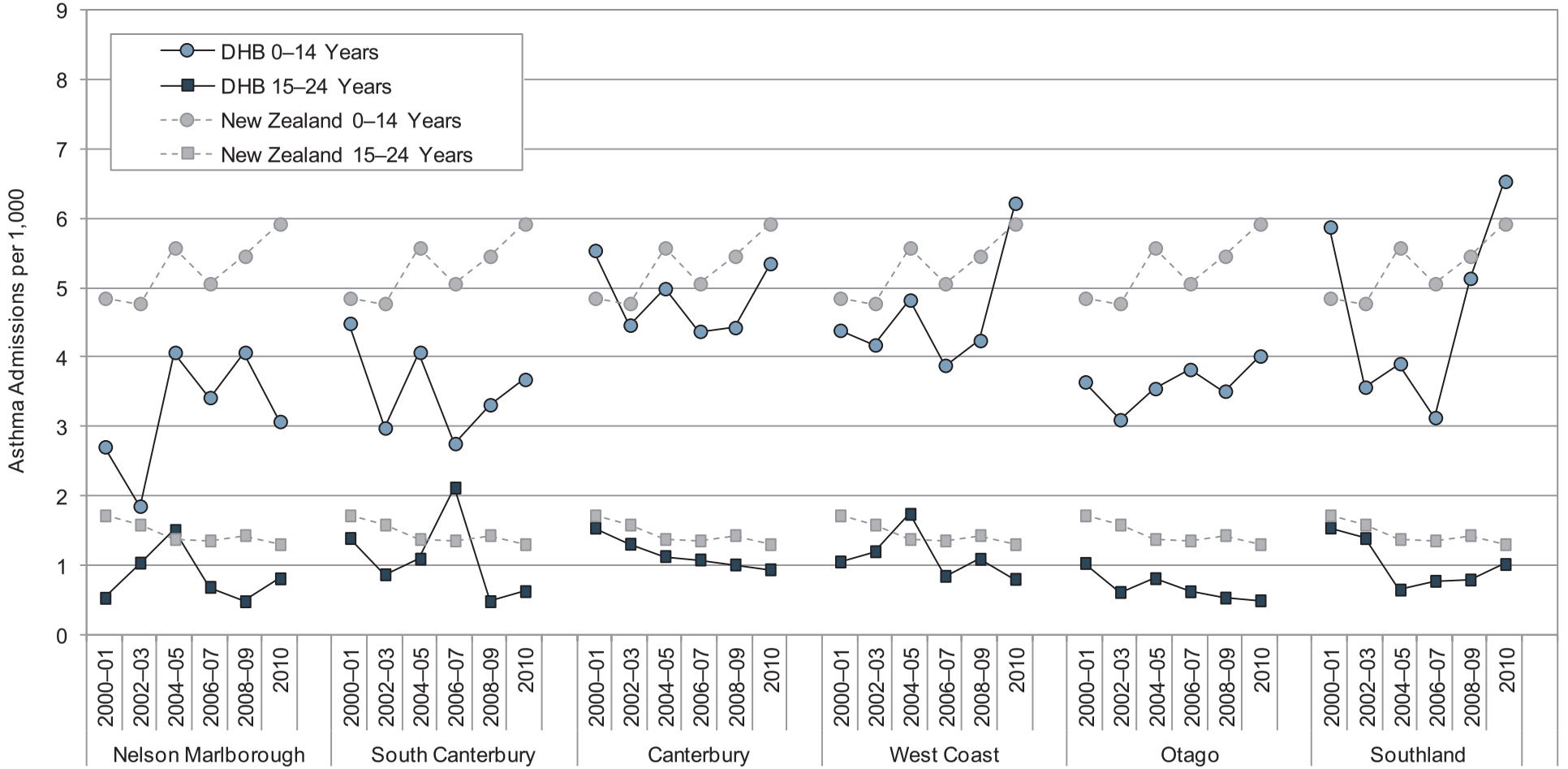
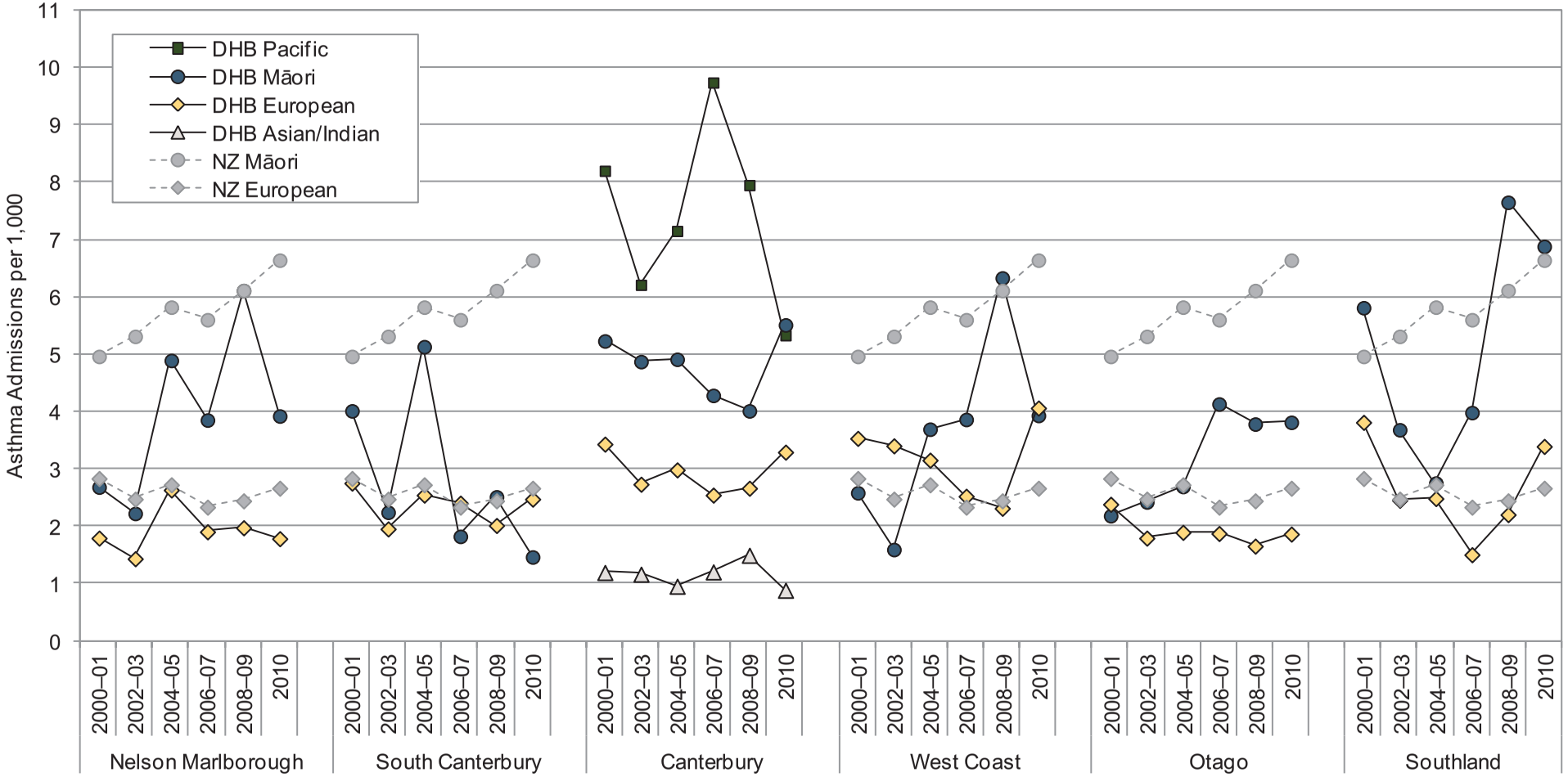


Figure 65. Acute and Semi-Acute Hospital Admissions for Asthma in Children and Young People Aged 0−24 Years, South Island DHBs vs. New Zealand 2000−2010



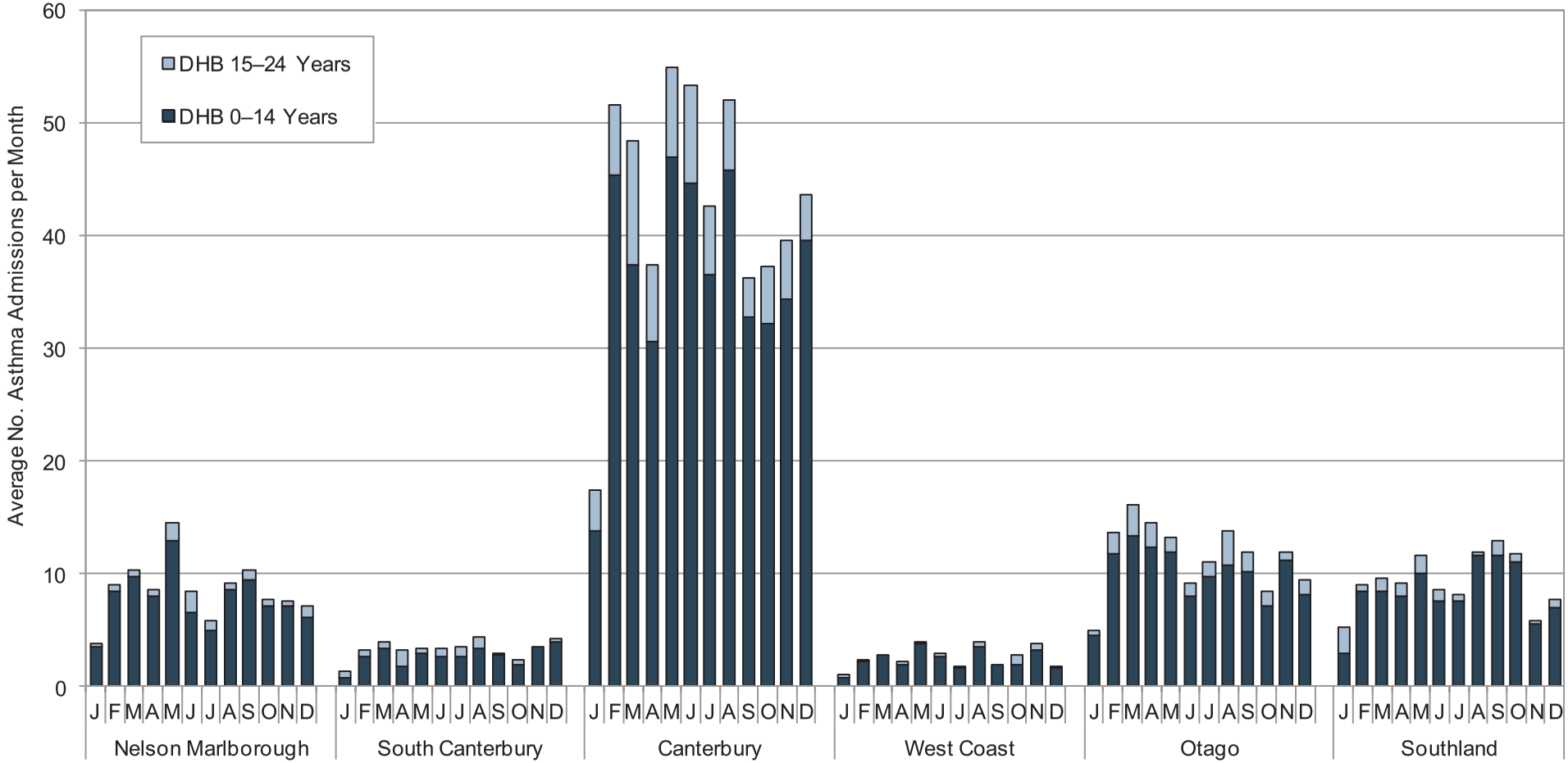

Source: Numerator: National Minimum Dataset (Acute and semi-acute admissions only); Denominator: Statistics NZ Estimated Resident Population

Figure 66. Acute and Semi-Acute Hospital Admissions for Asthma in Children and Young People 0−24 Years by Ethnicity, South Island DHBs vs. New Zealand 2000−2010




Source: Numerator: National Minimum Dataset (Acute and semi-acute admissions only); Denominator: Statistics NZ Estimated Resident Population. Ethnicity is Level 1 Prioritised.

Figure 67. Average Number of Acute and Semi-Acute Hospital Admissions for Asthma in Children and Young People 0−24 Years by Month, the South Island DHBs 2006−2010




Source: National Minimum Dataset (Acute and semi-acute admissions only)

### South Island Distribution by Season

In the South Island during 2006–2010, while no consistent seasonal variations were evident, asthma admissions in children and young people were lower during January in all DHBs (**Figure 67**).

## Summary

In New Zealand during 2000–2010, asthma admissions in children gradually increased, while admissions in young people were more static after 2004–2005. On average during 2000–2008, five children or young people each year, died as the result of asthma. During 2006–2010, admissions were relatively infrequent during infancy but increased rapidly thereafter, reaching a peak at 2 years of age. In contrast, asthma deaths were most frequent amongst those in their late teens and early twenties. Asthma admissions in children were also *significantly* higher for males, Pacific > Māori > Asian/Indian > European children and those living in average-to-more deprived (NZDep decile 3–10) areas. In contrast, asthma admissions in young people were *significantly* higher for females, Pacific and Māori > European > Asian/Indian young people, and those in average-to-more deprived (NZDep decile 4–10) areas.

In each of the South Island DHBs during 2006–2010, asthma admissions in children were *significantly* lower than the New Zealand rate. While admissions in young people were also lower than the New Zealand rate in all DHBs, only in the case of Nelson Marlborough, Canterbury, Otago and Southland did these differences reach statistical significance. In Canterbury during 2000–2010, admissions were generally higher for Pacific > Māori > European > Asian/Indian children and young people, while in Nelson Marlborough, Otago and Southland asthma admissions were generally higher for Māori than for European children and young people. Ethnic differences in South Canterbury and the West Coast were less consistent from year to year.

## Local Policy Documents and Evidence-Based Reviews Relevant to the Prevention and Management of Asthma

In New Zealand there are no policy documents which focus solely on the prevention of asthma in children and young people. A range of documents however consider approaches to respiratory and infectious diseases more generally, and these are reviewed in other sections of this report:

1. **Generic Approaches to Infectious & Respiratory Disease:** Table 46 on Page 166
2. **The Prevention of Second Hand Smoke Exposure:** Table 47 on Page 168
3. **Interventions Aimed at Housing and Household Crowding:** Table 48 on Page 170
4. **Interventions to Improve Breastfeeding:** Table 27 on Page 107

A range of international reviews and guidelines also consider the most appropriate management of asthma in children and young people and these are considered in **Table 76**.

Table 76. Local Policy Documents and Evidence-Based Reviews Relevant to the Prevention and Management of Asthma in Children and Young People

| Ministry of Health Policy Documents |
|---|
| In New Zealand there are no Government policy documents which focus solely on the prevention of asthma, although population approaches to asthma are discussed on pages 86-93 of the **Child and Youth Health Toolkit**: http://www.moh.govt.nz/moh.nsf/pagesmh/5411/$File/childandyouthhealthtoolkit.pdf . |
| **International Guidelines** |
| Cincinnati Children's Hospital Medical Center. 2010. **Evidence-based care guideline for management of acute asthma exacerbation in children**. Cincinnati Children's Hospital Medical Center. http://www.cincinnatichildrens.org/assets/0/78/1067/2709/2777/2793/9199/6318985e-a921-4d93-95b7-33b6a827f9a5.pdf<br>These guidelines focus primarily on the management of an acute exacerbation of asthma in emergency department and inpatient settings. All of the recommendations in the guidelines are accompanied by references to the literature but there is no grading of the evidence. |
| Global Initiative for Asthma (GINA). 2009. **Global Strategy for the Diagnosis and Management of Asthma in Children 5 Years and Younger**. Global Initiative for Asthma (GINA). http://www.ginasthma.org/uploads/users/files/GINA_Under5_2009_CorxAug11.pdf<br>This is a relatively brief and prescriptive evidence-based guideline from the Global Initiative for Asthma (GINA). Statements in the guideline are accompanied references to the relevant literature and by a letter grade indicating the quality of the evidence on which they are based however the research evidence is not discussed. |
| British Thoracic Society, Scottish Intercollegiate Guidelines Network. 2008, revised 2011. **British Guideline on the Management of Asthma: A national clinical guideline**. London, Edinburgh: British Thoracic Society, Scottish Intercollegiate Guidelines Network. http://www.sign.ac.uk/pdf/sign101.pdf<br>These comprehensive, evidence-based guidelines cover diagnosis, non-pharmacological and pharmacological management, inhaler devices, management of acute asthma in people of various ages including children under and over the age of two, special situations, organisation and delivery of care and audit, and patient education and self-management. Statements summarising the literature are accompanied by a grade indicating the quality of the evidence (Grade1 = meta-analysis of RCTs, 2 = case-control or cohort studies, 3 = case reports/case series, 4 = expert opinion.) Recommendations in the guideline are accompanied by a grade (A-D) indicating the strength of the evidence on which they are based. |
| National Heart Lung and Blood Institute, National Asthma Education and Prevention Program. 2007. **Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma**. U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung and Blood Institute. http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf<br>These very comprehensive guidelines are endorsed by the American Academy of Pediatrics. The guidelines are organised around the four components that the expert panel considered essential for effective asthma management: measures of assessment and monitoring, education for a patient-clinician partnership, control of the environmental factors and comorbid conditions that affect asthma, and pharmacologic therapy. Section four deals with asthma in particular age groups. Recommendations in the guidelines are accompanied by a letter grade indicating the strength of the evidence on which they are based and an indication of how strongly the expert panel recommended (or not) the intervention in question (recommended, should be considered, may be considered, not recommended).The level of evidence is indicated according to the Jadad Scale (A= large, high quality RCTs, B= few, small RCTs, non-typical population, C = non randomised trials and observational studies, D= expert opinion). |
| National Asthma Council Australia. 2006. **Asthma Management Handbook 2006** Melbourne: National Asthma Council Australia. http://www.nationalasthma.org.au/uploads/handbook/370-amh2006_web_5.pdf<br>This Australian handbook is primarily for the use of GPs but also can be used by asthma educators, community pharmacists, nurses, ambulance officers and others. It is based on the GINA, British Thoracic Society and New Zealand guidelines and uses the Australian NHMRC levels of evidence classification. |
| Paediatric Society of New Zealand. 2005. **Best Practice Evidence Based Guideline: Management of Asthma in Children aged 1-15 years**. Paediatric Society of New Zealand. http://www.paediatrics.org.nz/files/guidelines/Asthmaendorsed.pdf<br>These guidelines were adapted from the paediatric sections of the 2002 asthma guideline produced by the British Thoracic Society and Scottish Intercollegiate Guidelines Network. They take account of the particular needs of Māori and Pacific children and the availability and funding of pharmaceutical products here. |

**Systematic and Other Reviews From the International Literature**

There are now hundreds of Cochrane reviews relating to asthma in children and therefore it is not possible to summarise them all in this report. The Cochrane reviews that are included here meet the following criteria:

1. They relate to a non-pharmaceutical intervention for which there is evidence of effectiveness from RCTs, and
2. They consider an intervention that has potential at a population level to either prevent asthma or reduce asthma exacerbations and hospital admissions.

At the end of this section is a list some of the (mostly) non-pharmaceutical interventions that have been the subject of Cochrane reviews and have been found to be either ineffective or lacking evidence for their effectiveness or otherwise.

National Institute for Health and Clinical Excellence. 2010. **Omalizumab for the treatment of severe persistent allergic asthma in children aged 6 to 11 years**. London: National Institute for Health and Clinical Excellence. http://www.nice.org.uk/nicemedia/live/13256/51345/51345.pdf

Omalizumab (Xolair®) is a monoclonal antibody that binds to immunoglobulin E (IgE) used in the treatment of severe and persistent allergic asthma. The appraisal committee concluded that, in children aged 6 to 11 years with severe persistent allergic asthma, Omalizumab in addition to optimised standard care is more clinically effective than optimised standard care alone in terms of reducing clinically significant exacerbations only if a child has experienced three or more clinically significant exacerbations in the previous year. In these cases the committee considered that the most plausible incremental cost effectiveness ratio was £82,600 per QALY gained, which the committee noted was substantially higher than is normally considered to be a cost-effective use of NHS resources. For this reason the committee concluded that Omalizumab could not be recommended for the treatment of severe persistent allergic asthma in children aged 6 to 11 years.

Abramson MJ, Puy RM, Weiner JM. 2010. **Injection allergen immunotherapy for asthma**. Cochrane Database of Systematic Reviews, 2010(8), Art. No.: CD001186. DOI: 10.1002/14651858.CD001186.pub2.

The use of allergen specific immunotherapy is a controversial treatment for asthma because although RCTs have demonstrated that it can be beneficial there is a slight risk of severe anaphylaxis which may be fatal. In recent years new methods of allergen delivery and new allergen preparations have become available. This updated review included 88 RCTs (13 of which were new since the previous Cochrane review on this topic). Numbers of trials for the various allergens were: house dust mite 42, pollen 27, animal dander 10, *Cladosporium* mould 2, latex 6 and multiple allergens 6. Overall, immunotherapy produced significant improvement in asthma symptom scores (standardised mean difference* -0.59, 95% CI -0.83 to -0.35) with a number needed to treat (NNT) to prevent one person experiencing deterioration in asthma symptoms of 4 (95% CI 3–5). Overall Immunotherapy also produced a significant reduction in medication scores (SMD -0.53, 95% CI -0.80 to -0.27) with a NNT to prevent one person requiring increased medication of 5 (95% CI 4–7). It produced a significant reduction in allergen-specific bronchial hyper-reactivity and some reduction in non-specific bronchial hyper-reactivity. It had no consistent effect on lung function. For every nine patients treated with immunotherapy one would be expected to develop a systemic reaction (usually wheezing or rash but rarely anaphylaxis) and for every 16 patients treated with immunotherapy one would be expected to develop a local adverse reaction (e.g. swelling at the injection site). *Note: the standardised mean difference (SMD) is a technical term with a somewhat complicated definition but, in very general terms, larger (more negative) values of SMD usually indicate more effective interventions. SMDs allow comparisons between interventions whose outcomes that have been measured in different ways or in different units.

Bailey EJ, Cates CJ, Kruske SG, et al. 2009. **Culture-specific programs for children and adults from minority groups who have asthma**. Cochrane Database of Systematic Reviews, 2009(2), Issue 2. Art. No.: CD006580. DOI:10.1002/14651858.CD006580.pub4.

This review aimed to determine whether culture-specific asthma programmes produced better outcomes than regular asthma programmes for children and adults with asthma who belong to minority groups. The review included four RCTs: two in the U.S. with Hispanic and/or African American children, one with Indian children in the U.K. and one with island Puerto Rican children. In total results for 617 participants aged from five to 59 years were pooled in a meta-analysis. Compared to regular asthma programmes, culturally specific programmes improved asthma-related quality of life in adults, improved asthma knowledge scores in children, and in a single study, reduced asthma exacerbations in children (risk ratio for hospitalisations 0.32, 95%CI 0.15–0.70). The authors concluded that the current limited data show that culturally specific asthma programs improve some, but not all asthma outcomes.

Boyd M, Lasserson TJ, McKean MC, et al. 2009. **Interventions for educating children who are at risk of asthma-related emergency department attendance**. Cochrane Database of Systematic Reviews, 2009(2), Art. No.: CD001290.DOI: 10.1002/14651858.CD001290.pub2.

This review considered 38 RCTs or quasi-RCTs (7843 children in total) of asthma education interventions for children who had attended the emergency department for exacerbations of asthma. Compared to control situations educational interventions aimed at the children, their parents, or both significantly reduced the risk of future emergency department visits (RR 0.73, 95% CI 0.65 to 0.81, n = 3008) and the risk of hospital admissions (RR 0.79, 95% CI 0.69 to 0.92, n = 4019) and also the numbers of unscheduled doctor visits (RR 0.68, 95% CI 0.57 to 0.81, n = 1009). There was little data on other outcomes such as $FEV_1$, use of "rescue" medication, symptoms or quality of life. The review authors state that it is unclear what types of educational interventions are best for reducing use of acute medical care services.

Bhogal KS, Zemek RL, Ducharme F. 2006. **Written action plans for asthma in children**. Cochrane Database of Systematic Reviews, 2006(3), Art. No.: CD005306. DOI: 10.1002/14651858.CD005306.pub2.

Asthma guidelines all recommend written asthma plans (WAPs) which consist of instructions for the management of chronic symptoms and also for the prevention and management of exacerbations. This review included four trials (3 RCTs and one quasi-RCT, 355 children in total) which compared symptom-based WAPs and peak flow-based WAPs. Children using symptom-based WAPs had a lower risk of exacerbation requiring an acute care visit (5 comparisons, RR 0.73, 95% CI 0.55–0.99). Five children would need to use a symptom based plan rather than a peak flow plan to prevent one acute care visit (NNT = 5, 95% CI 5–138). Children preferred symptom monitoring to using a peak flow meter (2 comparisons, RR 1.21, 95% CI 1.00 to 1.46), but parents did not have a preference (2 comparisons, RR 0.96, 95% CI 0.18 to 2.11). Children assigned to symptom based plans had 50% fewer symptomatic days per week (2 comparisons, mean difference 0.45 days/week, 95% CI 0.04–0.26). There were no significant differences between children using symptom based and those using peak flow based plans in rates of exacerbations requiring oral steroids or hospital admission, or in lung function, symptom score, school absenteeism, quality of life or withdrawals from the study. The review authors concluded that symptom based WAPs were superior to peak flow based WAPs for preventing acute care visits but they were unable to say whether this was due to greater adherence to symptom monitoring, earlier identification of deteriorations, higher thresholds for presenting to acute care, or the specific treatment recommendations in the plan.

Maas T, Kaper J, Sheikh A, et al. 2009. **Mono and multifaceted inhalant and/or food allergen reduction interventions for preventing asthma in children at high risk of developing asthma**. Cochrane Database of Systematic Reviews, 2009(3), Art. No.: CD006480. DOI: 10.1002/14651858.CD006480.pub2.
Content updated after new search for studies, republished with no change to conclusions in issue 4, 2011.

Monofaceted interventions consist of reducing exposure to either food or inhalant allergens and multifaceted interventions consist of reducing exposure to both food and inhalant allergens. This review included three multifaceted and six monofaceted intervention studies with a total of 3271 child participants. Children were recruited into the studies at or before birth. Allergen reduction measures started either prenatally or at birth and continued through postnatal life for at least four months. The children were followed up later in life to see whether or not they had developed asthma. Compared to usual care, multifaceted interventions reduced the number of children who were diagnosed with asthma by a physician at less than five years of age (OR 0.72, 95% CI 0.54 – 0.96) and the number of children older than five years who were diagnosed with asthma as defined by respiratory symptoms and lung function criteria (OR 0.52, 95% CI 0.32 – 0.85). There were no significant differences in the proportions of children who developed asthma between the monofaceted intervention groups and the control groups in under-five or over five year old children.

Indirect comparison between multifaceted and monofaceted interventions did not indicate a significant difference between the two in either age group in reducing the frequency of asthma diagnoses or the likelihood of nocturnal coughing at follow up. There was a difference between the multifaceted and the monofaceted interventions in parent-reported wheezing however this difference disappeared in the sensitivity analysis when data on study participants on-treatment only was analysed (instead of data on study participants who it was intended to treat). The most significant of the authors' conclusions was "In children who are at risk of developing childhood asthma, multifaceted interventions, characterised by dietary allergen reduction and environmental remediation, reduce the odds of a physician diagnosis of asthma later in childhood by half. This translates to a number needed to treat (NNT) of 17."

National Institute for Health and Clinical Excellence. 2007. **Inhaled corticosteroids for the treatment of chronic asthma in children under the age of 12 years**. London: National Institute for Health and Clinical Excellence. http://www.nice.org.uk/nicemedia/live/11892/38421/38421.pdf

This technology appraisal provides guidance on the options for inhaled corticosteroid treatment in children with asthma. It discusses the various pharmaceutical products available, their costs and the available evidence on their effectiveness and cost-effectiveness. It states that when a child under the age of 12 years requires treatment with both inhaled corticosteroids and a long-acting beta-2 agonist the use of a combination inhaler is a recommended as an option, with the decision as to whether to use a combination inhaler or two separate inhalers being made on an individual basis taking into account therapeutic need and likely patient compliance.

National Institute for Clinical Excellence. 2002. **Inhaler devices for routine treatment of chronic asthma in older children (aged 5–15 years)**. London: National Institute for Clinical Excellence. http://www.nice.org.uk/nicemedia/live/11450/32338/32338.pdf

This technology appraisal provides guidance on the use of inhalers in children between five and twelve who have chronic asthma. It recommends a press-and-breathe pressurised metered dose inhaler with a suitable spacer device as the first choice for the delivery of inhaled corticosteroids. There is a discussion of important issues relating to inhaler use such as inhaler technique, adherence to treatment and individual capabilities, lifestyles and preferences. There is also a report of the findings of a systematic review which considered the evidence on clinical effectiveness, ease of use, preference, compliance, and cost effectiveness of the various drugs and delivery systems.

Wolf F, Guevara JP, Grum CM, et al. 2002. **Educational interventions for asthma in children**. Cochrane Database of Systematic Reviews, 2002(4), Issue 4. Art. No.: CD000326. DOI: 10.1002/14651858.CD000326.

This review included 32 studies (RCTs and CCTs, 3706 participants) assessing educational self-management programmes for children and adolescents aged two to18 years. Such programmes produced a modest improvement in measures of airflow and modest improvements in days absent from school, days of restricted activity and emergency room visits and possibly asthma-disturbed sleep nights. Education was most beneficial (for most outcomes) for children with more severe asthma. The authors were not able to say which type of educational intervention is best because of the difficulty of making direct comparisons between the studies.

National Institute for Clinical Excellence. 2000. **Guidance on the use of inhaler systems (devices) in children under the age of 5 years with chronic asthma**. London: National Institute for Clinical Excellence. http://www.nice.org.uk/nicemedia/live/11400/32073/32073.pdf

This technology appraisal provides guidance on the use of inhalers in children under the age of five who have chronic asthma. It states that the first choice option should be a pressurised metered dose inhaler and spacer system, with a facemask if necessary. If this is not effective then nebulised therapy or, in children aged 3 to five years, a dry powder inhaler may be considered depending on the child's condition. There is a discussion of the available evidence on the relative effectiveness of the various devices.

Interventions that have been the subject of **Cochrane Reviews** but have been found to be either ineffective, marginally effective, or lacking evidence for their effectiveness or otherwise include: Written individualised management plans, Tele-healthcare, Acupuncture, Indigenous healthcare workers, Influenza vaccines, Family therapy, Pneumococcal vaccine, Vitamin C, Alexander technique, Ionisers, Psychological interventions, Parent-initiated corticosteroid therapy, Humidity control, Physical training, Tailored interventions based on sputum eosinophils or exhaled nitric oxide, Homeopathy, Pet allergen control measures, Primary care based clinics, House dust mite control measures, Feather vs. non-feather bedding, Herbal remedies, Tartrazine avoidance and Selenium supplementation.

**Other Relevant Publications**

TMG Associates. 2009. **Literature Review Respiratory Health for Māori**. Wellington: The Asthma and Respiratory Foundation of New Zealand (Inc.). http://www.asthmafoundation.org.nz/files/PDF-files/Combined_Literarture_Review_Asthma__Respiratory_Foundation_2009_TMG_associates_Ltd.pdf

Chapter 1 of this publication deals with asthma. It covers the epidemiology of asthma in Māori and discusses the research that has been done to understand and change the disproportionate burden of asthma experienced by Māori. Disparities exist in exposure to tobacco smoke, use of preventer medication and access to primary health care and, although there is little evidence of successful interventions to reduce the burden of asthma in Māori, reducing these disparities are likely to be of considerable benefit. Partnership with Māori is crucial for health care providers achieving better outcomes.

The Asthma and Respiratory Foundation of New Zealand, Innes Asher and Cass Byrnes, editors. 2006. **Trying to Catch our Breath: The burden of preventable breathing disorders in children and young people**. Wellington: The Asthma and Respiratory Foundation of New Zealand. http://www.asthmanz.co.nz/files/PDF-files/Burden_FullDocument.pdf

Chapter 13 of this publication deals specifically with asthma. It discusses ISAAC (The International Study of Asthma and Allergies in Childhood) which New Zealand is part of, hospital admission rates, medication use, and the economic costs associated with asthma. Recommendations for improving care for children with asthma include: reducing financial and geographic barriers to accessing health care, reducing financial barriers to accessing pharmaceuticals, improving housing, reducing exposure to smoking and air pollution, specific DHB strategies for Māori and Pacific children and children in rural and remote areas, and implementing the Paediatric Society's best practice guideline.

Holt Shaun, Beasley Richard. 2002. **The Burden of Asthma in New Zealand**. Wellington: Asthma and Respiratory Foundation of New Zealand (Inc.) and Medical Research Institute of New Zealand. http://www.asthmafoundation.org.nz/files/PDF-files/burdenfull.pdf

This report provides a comprehensive picture of asthma in New Zealand under the headings of prevalence, morbidity, mortality and economic burden. The Asthma and Respiratory Foundation recommends removing financial and other barriers to accessing primary care and asthma medications and an integrated approach to asthma management which includes diagnosis, assessment of severity, provision of asthma education and written asthma management plans and regular reviews of asthma control and medications.