MIDDLE EAR CONDITIONS: OTITIS MEDIA AND GROMMETS

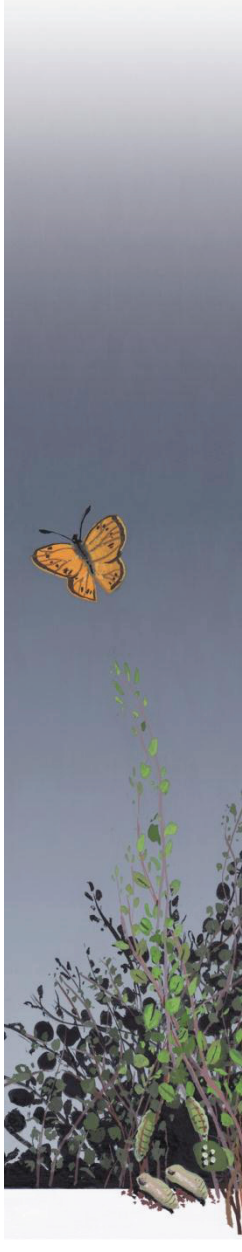
Introduction

Otitis media is one of the most common childhood infections presenting in primary care, and is also a frequent reason for antibiotic treatment and hospitalisation for surgical intervention [114]. It can be subdivided into two related categories:

Acute Otitis Media (AOM): AOM is caused by inflammation of the middle ear and is usually viral or bacterial in origin. Symptoms often follow an upper respiratory infection and include fever, irritability, ear pain and hearing loss, and on examination a red, opaque, bulging eardrum may be present +/− a purulent ear discharge [115]. Risk factors include age (peak incidence 6-11 months), a lack of breastfeeding, parental smoking and attendance at day care. In the acute phase, management includes pain relief, observation (selected mild cases) and antibiotics [114]. Complications include perforation of the eardrum, mastoiditis and labyrinthitis (infection of the inner ear). In the longer term, some children develop recurrent acute otitis media and/or chronic middle ear effusions, for which surgical management may be indicated [115].

Otitis Media with Effusion (OME): OME is defined as the presence of a middle ear effusion (fluid) without signs or symptoms of acute infection. It may arise de-novo or following an episode of acute otitis media [114]. Approximately 90% of children have an episode of OME prior to school entry [116], with the peak incidence being around 1 year of age [114]. While OME is common, most episodes resolve spontaneously (in one series 28% resolved by 3 months, 42% by 6 months and 59% by 9 months [114]), and thus if children are not at particular risk for speech, language or learning problems (e.g. children with Down Syndrome or cranio-facial abnormalities), they may be managed with watchful waiting for at least 3 months [116]. Even with effusions persisting > 3 months, intervention may be unnecessary in asymptomatic children, but follow up is still required at 3-6 month intervals until the effusion has disappeared, significant hearing loss is identified, or structural abnormalities of the eardrum or middle ear are suspected. The decision to opt for surgical intervention is usually made on the basis of the child's hearing status, associated symptoms and developmental risk, and in most cases involves the insertion of grommets [116].

For children with long-standing (>3-6 months) bilateral OME, or recurrent AOM, grommets (ventilation or tympanostomy tubes) are often considered, with a view to restoring normal hearing. The procedure (which improves ventilation and pressure regulation in the middle ear) involves making a small incision in the eardrum (with or without the aspiration of middle ear fluid) and the insertion of a small ventilation tube. On average, grommets remain in the eardrum for 6–12 months before falling out [117]. In terms of their effectiveness, a recent Cochrane review noted that a meta-analysis of three high quality trials which randomised children to receive either bilateral grommets or no grommets indicated a hearing improvement of only 4.2 dB at six to nine months (95% CI 2.39 - 6.00) and no difference at 12-18 months in the children who had received grommets compared to those who had not. The review did not identify any studies which reported an effect of grommets on speech or language development or behavioural, cognitive or quality of life outcomes however only a few studies attempted to measure these. (Note: children at high risk of speech or developmental problems were excluded from these trials.) [118] Another Cochrane review concluded that in children under three years of age with recurrent otitis media, grommets reduce the number of episodes of acute otitis media in the first six months after surgery by an average of 1.5 episodes per child (from 2.2 to 0.67 episodes) [119].



The following section uses data from the National Minimum Dataset to explore acute hospital admission for otitis media in children, as well as arranged and waiting list admissions for the insertion of grommets.

Data Sources and Methods

Indicators

1. *Acute Hospital Admissions for Otitis Media in Children Aged 0–14 Years*

2. *Acute Hospital Admissions for Other Conditions of the Middle Ear and Mastoid in Children Aged 0–14 Years*

Numerator: National Minimum Dataset: Acute hospital admissions for children aged 0–14 years with an ICD-10-AM primary diagnosis of Otitis Media (H65–H67) or Other Conditions of the Middle Ear and Mastoid: Eustachian Tube Disorders (H68, H69); Mastoiditis and Related Disorders (H70); Cholesteatoma of the Middle Ear (H71); Perforation/Other Disorders of the Tympanic Membrane (H72–73); and Other Disorders of the Middle Ear/Mastoid (H74–75).

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

3. *Arranged and Waiting List Admissions for the Insertion of Grommets in Children Aged 0–14 Years*

Numerator: National Minimum Dataset: Arranged and Waiting List Admissions for the Insertion of Grommets (ICD-10-AM primary procedure codes 4163200 and 4163201).

Notes on Interpretation

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

While the majority of children admitted acutely with a primary diagnosis of otitis media do not receive a surgical intervention, the majority of children admitted from the waiting list with the same primary diagnosis do, with the most common operative procedure being the insertion of grommets. For arranged admissions the picture is more mixed, with some patients being admitted semi-acutely for the non-surgical management of otitis media, and others for an operative intervention such as grommets. On balance however, more arranged admissions with a primary diagnosis of otitis media are for surgical interventions, and thus in this section arranged admissions have been grouped with the waiting list category (in contrast to other sections where acute and arranged admission are considered together).

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 Distribution by Primary Diagnosis

Conditions of the Middle Ear and Mastoid: In New Zealand during 2006–2010, otitis media was the most frequent primary diagnosis in those admitted acutely with conditions of the middle ear and mastoid, accounting for 93.1% of admissions in this category. Mastoiditis and related disorders was the second most frequent reason for admission (**Table 59**).

Grommets: In New Zealand during 2006–2010, otitis media was the most frequent primary diagnosis in arranged/waiting list admissions for the insertion of grommets, and accounted for 95.2% of admissions in this category. Perforations/other disorders tympanic membrane was the second most frequent primary diagnosis (**Table 60**).

New Zealand Trends

In New Zealand during 2000–2010, arranged/waiting list admissions for the insertion of grommets declined, while acute admissions for otitis media declined during the early 2000s, but were more static after 2004–05 (**Figure 41**).

New Zealand Distribution by Age and Ethnicity

Otitis Media: In New Zealand during 2006–2010, acute admissions for otitis media were highest in infants and one year olds, with rates declining rapidly thereafter. When broken

down by ethnicity, admission rates were higher for Māori and Pacific > European > Asian children during the first four years, although ethnic differences were less consistent thereafter (**Figure 42**).

Grommets: In contrast, in New Zealand during 2006–2010, arranged/waiting list admissions for the insertion of grommets were relatively infrequent during the first year of life, but increased rapidly thereafter. Rates were highest in European children at one year of age, in Māori children at two years of age, in Asian/Indian children at four years of age and in Pacific children at six years of age. Overall, during the first four years admission rates were higher for European and Māori > Pacific > Asian/Indian children, while after six years of age, admissions were higher for Pacific > Māori > European > Asian/Indian children (**Figure 42**).

Table 59. Acute Hospital Admissions for Conditions of the Middle Ear and Mastoid in Children Aged 0–14 Years by Primary Diagnosis, New Zealand 2006–2010

Primary Diagnosis	Number: Total 2006–2010	Number: Annual Average	Rate per 1,000	Percent (%)
New Zealand				
Conditions of Middle Ear and Mastoid				
Otitis Media	2,679	535.8	0.60	93.1
Mastoiditis and Related Disorders	158	31.6	0.04	5.5
Perforation/Other Disorders Tympanic Membrane	29	5.8	0.01	1.0
Cholesteatoma Middle Ear	6	1.2	<0.01	0.2
Other Disorders Middle Ear/Mastoid	6	1.2	<0.01	0.2
Eustachian Tube Disorders	<3	s	s	s
New Zealand Total	2,879	575.8	0.64	100.0

Source: Numerator: National Minimum Dataset (Acute admissions only); Denominator: Statistics NZ Estimated Resident Population. Note: s: suppressed due to small numbers

Table 60. Arranged/Waiting List Hospital Admissions for Grommets in Children Aged 0–14 Years by Primary Diagnosis, New Zealand 2006–2010

Primary Diagnosis	Number: Total 2006–2010	Number: Annual Average	Rate per 1,000	Percent (%)
New Zealand				
Grommets				
Otitis Media	25,055	5,011	5.61	95.2
Perforation/Other Disorders Tympanic Membrane	542	108.4	0.12	2.1
Eustachian Tube Disorders	133	26.6	0.03	0.5
Hypertrophy Tonsils/Adenoids	112	22.4	0.03	0.4
Other Disorders Middle Ear/Mastoid	88	17.6	0.02	0.3
Chronic Tonsillitis	75	15.0	0.02	0.3
Sleep Apnoea	41	8.2	0.01	0.2
Cholesteatoma Middle Ear	9	1.8	<0.01	<0.1
Mastoiditis and Related Disorders	6	1.2	<0.01	<0.1
Other / Unspecified Chronic Diseases Tonsils/Adenoids	4	0.8	<0.01	<0.1
Other Diagnoses	260	52.0	0.06	1.0
New Zealand Total	26,325	5,265	5.90	100.0

Source: Numerator: National Minimum Dataset (Arranged and waiting list admissions only); Denominator: Statistics NZ Estimated Resident Population

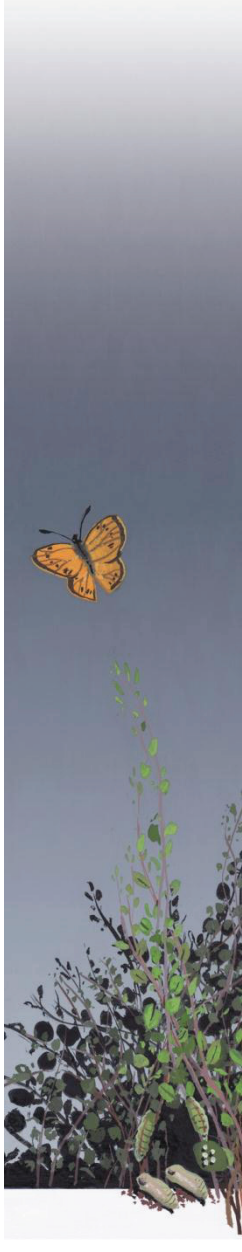
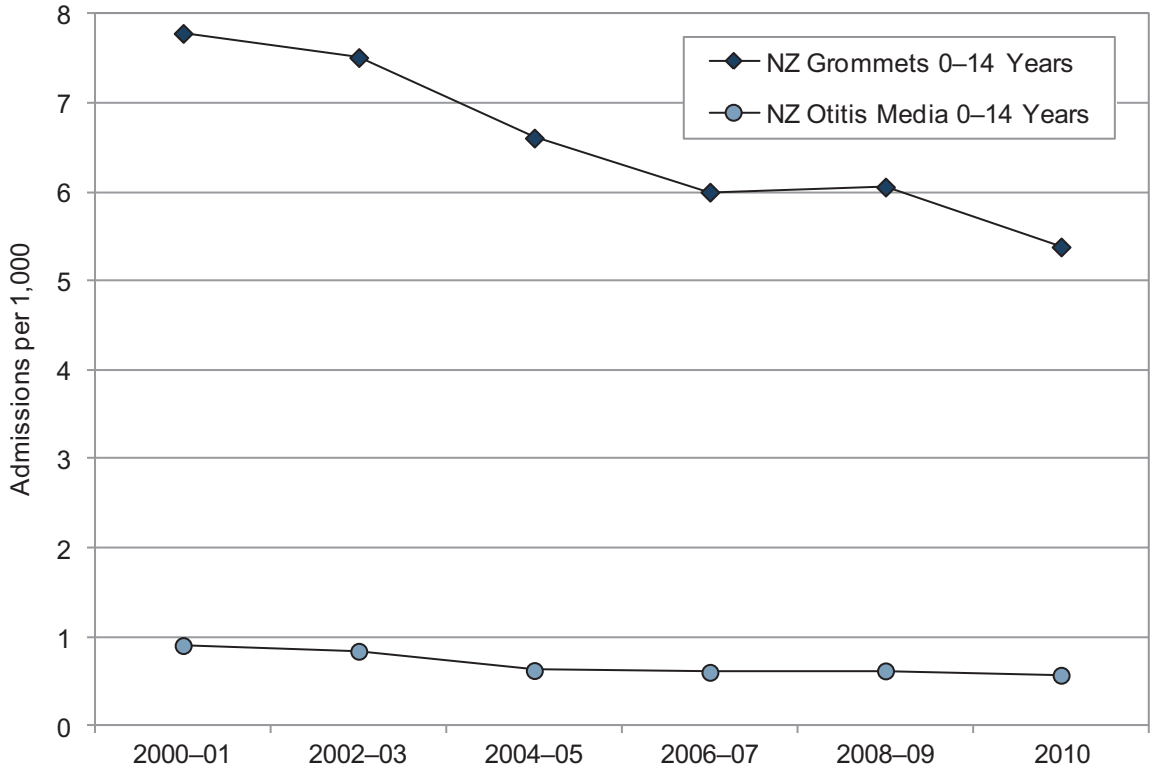
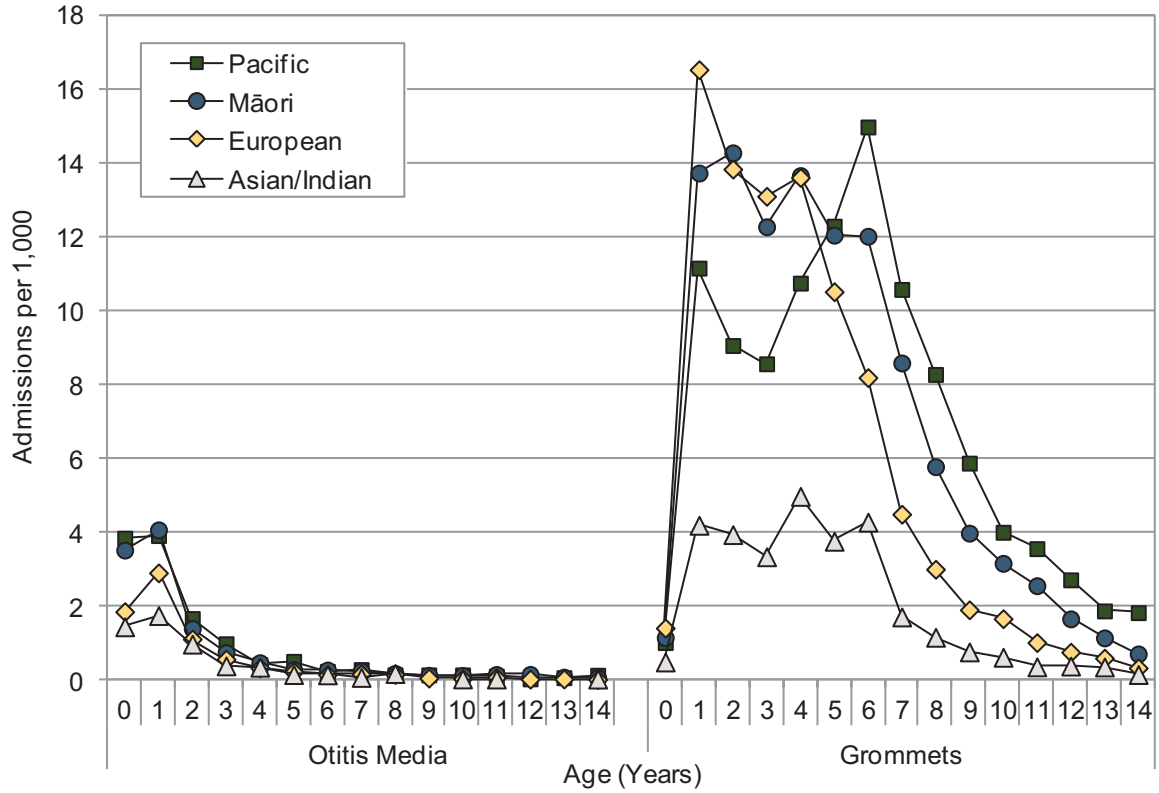


Figure 41. Acute Hospital Admissions for Otitis Media and Arranged/Waiting List Admissions for Grommets in Children Aged 0–14 Years, New Zealand 2000–2010



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population

Figure 42. Acute Hospital Admissions for Otitis Media and Arranged/Waiting List Admissions for Grommets in Children Aged 0–14 Years by Age and Ethnicity, New Zealand 2006–2010



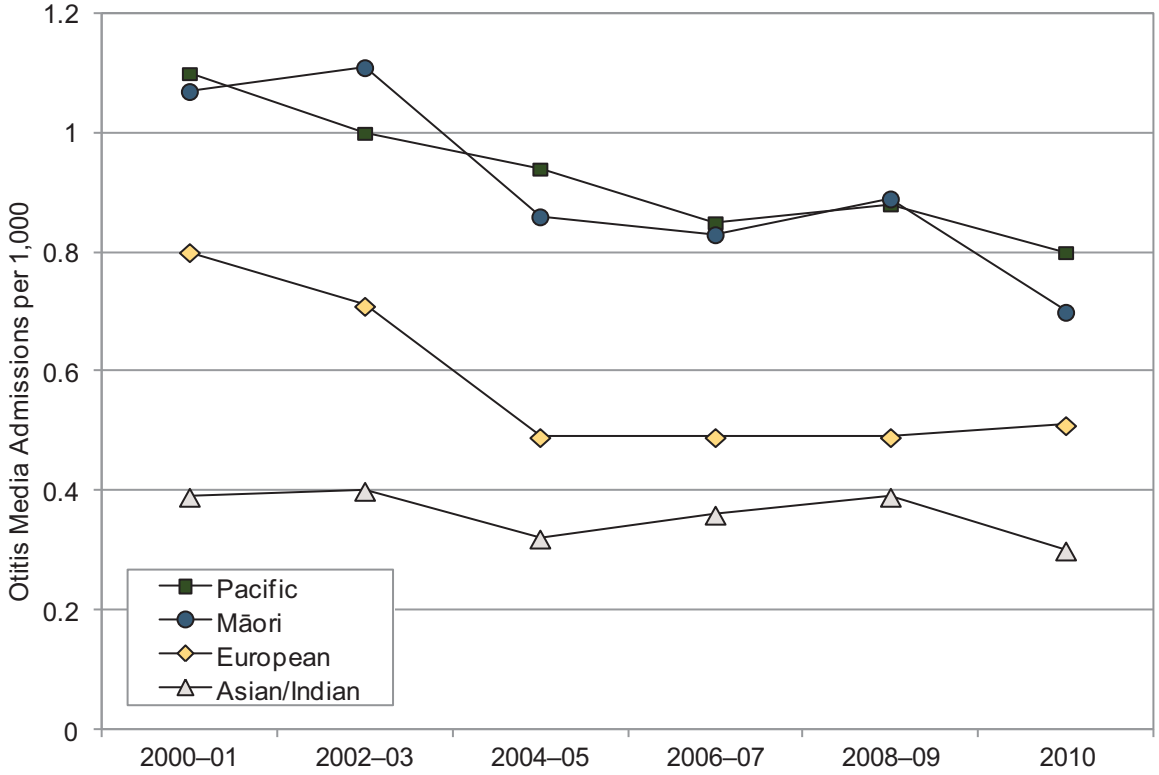
Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population. Note: Ethnicity is Level 1 Prioritised.

Table 61. Acute Hospital Admissions for Otitis Media in Children Aged 0−14 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
New Zealand							
Otitis Media							
NZ Deprivation Index Decile				NZ Deprivation Index Quintile			
Decile 1	0.35	1.00		Decile 1–2	0.34	1.00	
Decile 2	0.32	0.93	0.74–1.16	Decile 3–4	0.41	1.22	1.04–1.43
Decile 3	0.38	1.09	0.87–1.37	Decile 5–6	0.55	1.61	1.39–1.87
Decile 4	0.44	1.25	1.01–1.55	Decile 7–8	0.68	2.00	1.74–2.30
Decile 5	0.49	1.40	1.13–1.73	Decile 9–10	0.94	2.77	2.43–3.16
Decile 6	0.59	1.69	1.38–2.06	Prioritised Ethnicity			
Decile 7	0.64	1.83	1.50–2.23	European	0.49	1.00	
Decile 8	0.71	2.01	1.66–2.43	Māori	0.83	1.68	1.54–1.83
Decile 9	0.98	2.80	2.33–3.35	Pacific	0.85	1.73	1.54–1.95
Decile 10	0.90	2.57	2.15–3.07	Asian/Indian	0.36	0.73	0.61–0.86
Gender							
Female	0.54	1.00					
Male	0.66	1.22	1.13–1.32				

Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population.
Note: Rate is per 1,000; Ethnicity is Level 1 Prioritised; Decile is NZDep2001.

Figure 43. Acute Hospital Admissions for Otitis Media in Children Aged 0−14 Years by Ethnicity, New Zealand 2000−2010



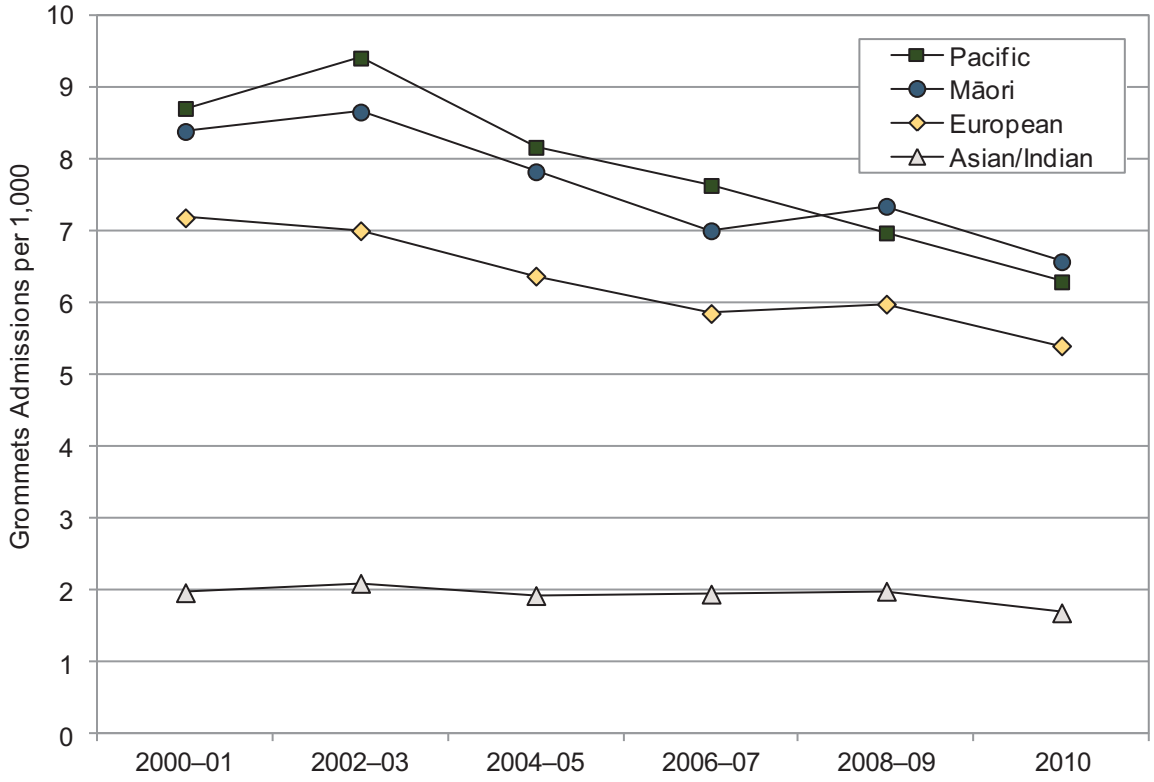
Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population.
Note: Ethnicity is Level 1 Prioritised.

Table 62. Arranged/Waiting List Admissions for Grommets in Children Aged 0−14 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
New Zealand							
Grommets							
NZ Deprivation Index Decile				NZ Deprivation Index Quintile			
Decile 1	3.45	1.00		Decile 1–2	3.64	1.00	
Decile 2	3.84	1.11	1.04–1.19	Decile 3–4	4.68	1.29	1.23–1.35
Decile 3	4.60	1.33	1.25–1.43	Decile 5–6	6.23	1.71	1.64–1.79
Decile 4	4.75	1.38	1.29–1.47	Decile 7–8	7.22	1.98	1.90–2.07
Decile 5	5.99	1.74	1.63–1.86	Decile 9–10	7.32	2.01	1.93–2.10
Decile 6	6.43	1.87	1.75–1.98	Prioritised Ethnicity			
Decile 7	6.88	1.99	1.87–2.12	European	5.81	1.00	
Decile 8	7.51	2.18	2.05–2.31	Māori	7.05	1.21	1.18–1.25
Decile 9	7.73	2.24	2.11–2.38	Pacific	7.09	1.22	1.17–1.27
Decile 10	6.96	2.02	1.90–2.14	Asian/Indian	1.91	0.33	0.31–0.35
Gender							
Female	4.88	1.00					
Male	6.87	1.41	1.37–1.44				

Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population.
Note: Rate is per 1,000; Ethnicity is Level 1 Prioritised. Decile is NZDep2001.

Figure 44. Arranged/Waiting List Hospital Admissions for Grommets in Children Aged 0−14 Years by Ethnicity, New Zealand 2000−2010



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population.
Note: Ethnicity is Level 1 Prioritised.

New Zealand Distribution by Ethnicity, NZDep Index Decile and Gender

Otitis Media: In New Zealand during 2006–2010, acute admissions for otitis media were *significantly* higher for males, for Pacific and Māori > European > Asian/Indian children and those living in average-to-more deprived (NZDep decile 4–10) areas (**Table 61**). Similar ethnic differences were seen during 2000–2010 (**Figure 43**).

Grommets: Similarly, during 2006–2010 arranged/waiting list admissions for the insertion of grommets were *significantly* higher for males and for Pacific and Māori > European > Asian/Indian children. Admission rates were *significantly* lower for those living in the least deprived (NZDep decile 1) areas (**Table 62**). Similar ethnic differences were seen during 2000–2010 (**Figure 44**).

South Island Distribution and Trends

South Island DHBs vs. New Zealand

In Nelson Marlborough, the West Coast, Canterbury, South Canterbury and Otago during 2006–2010, acute admissions for otitis media were lower than the New Zealand rate, although only in Nelson Marlborough and South Canterbury did these differences reach statistical significance. The rate in Southland however was *significantly* higher than the New Zealand rate. In contrast, arranged/waiting list admissions for the insertion of grommets were *significantly* lower than the New Zealand rate in the West Coast and Canterbury, but *significantly* higher in South Canterbury, Otago and Southland. The rate in Nelson Marlborough however, was similar to the New Zealand rate (**Table 63**).

Table 63. Acute Hospital Admissions for Otitis Media and Arranged/Waiting List Admissions for Grommets in Children Aged 0−14 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
Otitis Media					
Nelson Marlborough	58	11.6	0.45	0.75	0.58–0.97
West Coast	17	3.4	0.54	0.90	0.56–1.45
Canterbury	263	52.6	0.55	0.91	0.80–1.04
South Canterbury	16	3.2	0.31	0.52	0.32–0.84
Otago	79	15.8	0.49	0.82	0.66–1.03
Southland	86	17.2	0.79	1.32	1.06–1.63
New Zealand	2,679	535.8	0.60	1.00	
Grommets					
Nelson Marlborough	730	146.0	5.65	0.96	0.89–1.03
West Coast	129	25.8	4.09	0.69	0.58–0.82
Canterbury	2,517	503.4	5.25	0.89	0.85–0.93
South Canterbury	440	88.0	8.50	1.44	1.31–1.58
Otago	1,343	268.6	8.37	1.42	1.34–1.50
Southland	1,086	217.2	10.0	1.69	1.59–1.80
New Zealand	26,325	5,265.0	5.90	1.00	

Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population

South Island Distribution by Cause

Conditions of the Middle Ear and Mastoid: In the South Island during 2006–2010, otitis media was the most frequent primary diagnosis in those admitted acutely with conditions of the middle ear and mastoid, accounting for >93% of admissions in this category in each of the South Island DHBs during this period.(**Table 64**).

Table 64. Acute Hospital Admissions for Conditions of the Middle Ear and Mastoid in Children Aged 0−14 Years by Primary Diagnosis, South Island DHBs 2006−2010

Primary Diagnosis	Number: Total 2006–2010	Number: Annual Average	Rate per 1,000	Percent (%)
Conditions of Middle Ear and Mastoid				
Nelson Marlborough				
Otitis Media	58	11.6	0.45	93.5
Mastoiditis and Related Disorders	3	0.6	0.02	4.8
Perforation/Other Disorders Tympanic Membrane	<3	s	s	s
Nelson Marlborough Total	62	12.4	0.48	100.0
South Canterbury				
Otitis Media	16	3.2	0.31	94.1
Mastoiditis and Related Disorders	<3	s	s	s
South Canterbury Total	17	3.4	0.33	100.0
Canterbury				
Otitis Media	263	52.6	0.55	94.9
Mastoiditis and Related Disorders	12	2.4	0.03	4.3
Perforation/Other Disorders Tympanic Membrane	<3	s	s	s
Canterbury Total	277	55.4	0.58	100.0
West Coast				
Otitis Media	17	3.4	0.54	100.0
West Coast Total	17	3.4	0.54	100.0
Otago				
Otitis Media	79	15.8	0.49	94.0
Mastoiditis and Related Disorders	4	0.8	0.02	4.8
Other Disorders Middle Ear/Mastoid	<3	s	s	s
Otago Total	84	16.8	0.52	100.0
Southland				
Otitis Media	86	17.2	0.79	94.5
Mastoiditis and Related Disorders	5	1.0	0.05	5.5
Southland Total	91	18.2	0.84	100.0

Source: Numerator: National Minimum Dataset (Acute admissions only); Denominator: Statistics NZ Estimated Resident Population. Note: s: suppressed due to small numbers.

Grommets: Similarly during 2006–2010, otitis media was the most frequent primary diagnosis in arranged/waiting list admissions for the insertion of grommets, accounting for >88% of admissions in each of the South Island DHBs during this period (**Table 65**).

Table 65. Arranged/Waiting List Hospital Admissions for Grommets in Children Aged 0−14 Years by Primary Diagnosis, South Island DHBs 2006−2010

Primary Diagnosis	Number: Total 2006–2010	Number: Annual Average	Rate per 1,000	Percent (%)
Grommets				
Nelson Marlborough				
Otitis Media	686	137.2	5.31	94.0
Hypertrophy Tonsils/Adenoids	15	3.0	0.12	2.1
Chronic Tonsillitis	10	2.0	0.08	1.4
Perforation/Other Disorders Tympanic Membrane	5	1.0	0.04	0.7
Other Disorders Middle Ear/Mastoid	3	0.6	0.02	0.4
Other Diagnoses	11	2.2	0.09	1.5
Nelson Marlborough Total	730	146.0	5.65	100.0
South Canterbury				
Otitis Media	433	86.6	8.37	98.4
Eustachian Tube Disorders	4	0.8	0.08	0.9
Other Diagnoses	3	0.6	0.06	0.7
South Canterbury Total	440	88.0	8.50	100.0
Canterbury				
Otitis Media	2,465	493.0	5.14	97.9
Perforation/Other Disorders Tympanic Membrane	25	5.0	0.05	1.0
Sleep Apnoea	8	1.6	0.02	0.3
Other Disorders Middle Ear/Mastoid	5	1.0	0.01	0.2
Other Diagnoses	14	2.8	0.03	0.6
Canterbury Total	2,517	503.4	5.25	100.0
West Coast				
Otitis Media	121	24.2	3.84	93.8
Perforation/Other Disorders Tympanic Membrane	4	0.8	0.13	3.1
Other Diagnoses	4	0.8	0.13	3.1
West Coast Total	129	25.8	4.09	100.0
Otago				
Otitis Media	1,189	237.8	7.41	88.5
Hypertrophy Tonsils/Adenoids	72	14.4	0.45	5.4
Chronic Tonsillitis	46	9.2	0.29	3.4
Sleep Apnoea	7	1.4	0.04	0.5
Eustachian Tube Disorders	6	1.2	0.04	0.4
Other Disorders Middle Ear/Mastoid	3	0.6	0.02	0.2
Perforation/Other Disorders Tympanic Membrane	3	0.6	0.02	0.2
Other Diagnoses	17	3.4	0.11	1.3
Otago Total	1,343	268.6	8.37	100.0
Southland				
Otitis Media	1,065	213.0	9.79	98.1
Other Disorders Middle Ear/Mastoid	7	1.4	0.06	0.6
Chronic Tonsillitis	3	0.6	0.03	0.3
Other Diagnoses	11	2.2	0.10	1.0
Southland Total	1,086	217.2	9.98	100.0

Source: Numerator: National Minimum Dataset (Arranged/waiting list admissions only); Denominator: Statistics NZ Estimated Resident Population

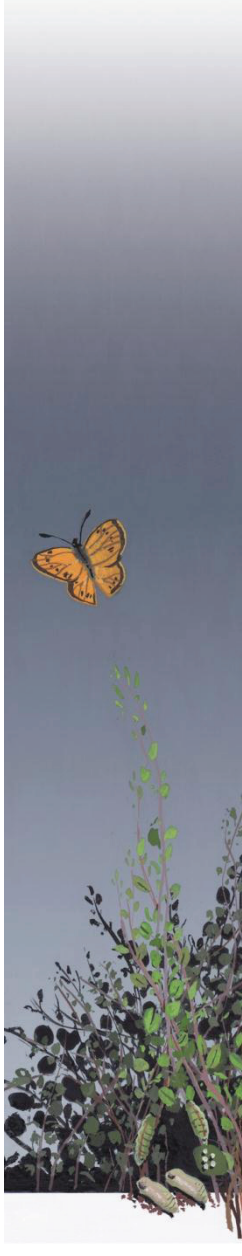
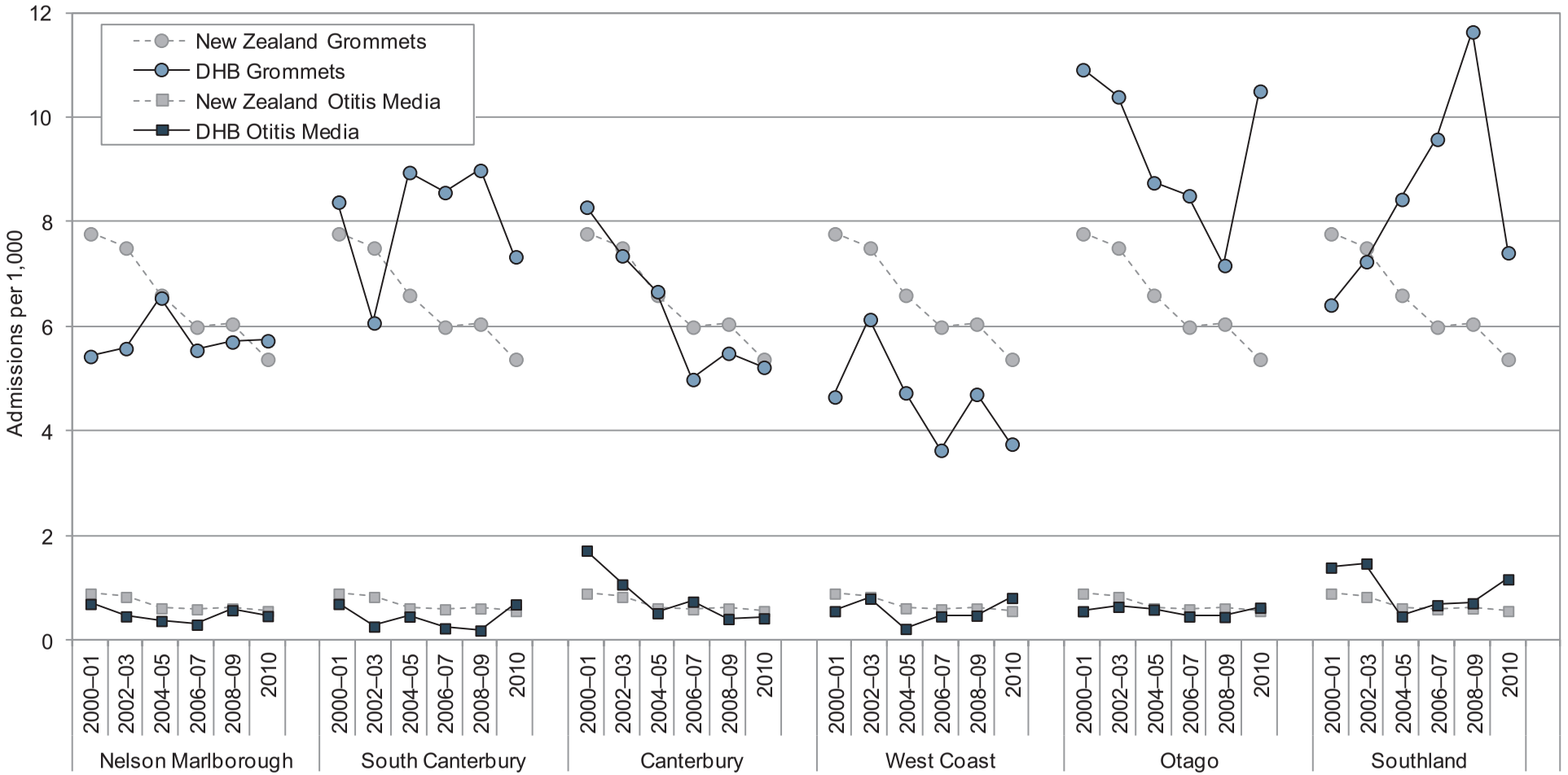
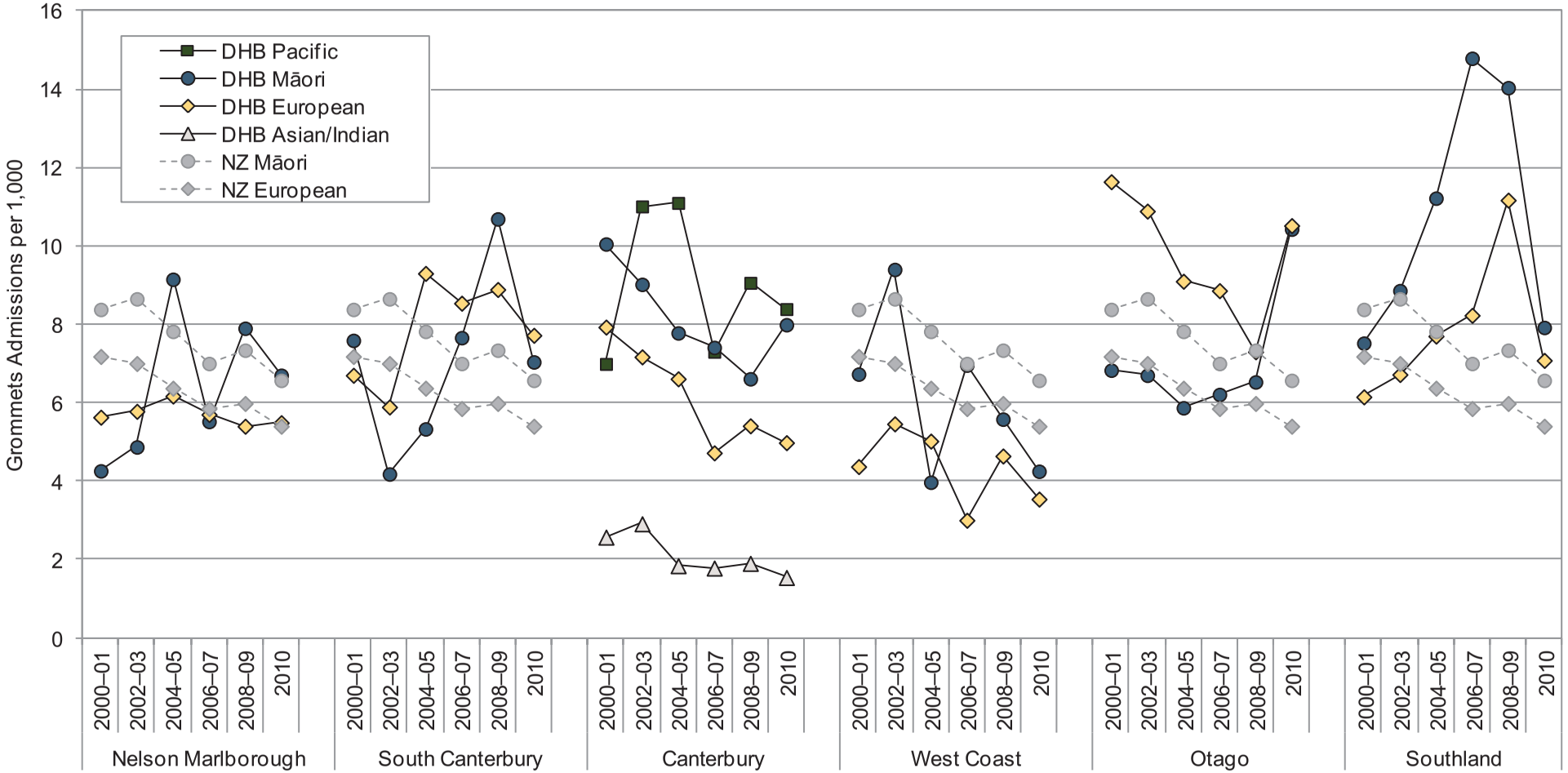


Figure 45. Acute Hospital Admissions for Otitis Media and Arranged/Waiting List Admissions for Grommets in Children Aged 0−14 Years, South Island DHBs vs. New Zealand 2000−2010



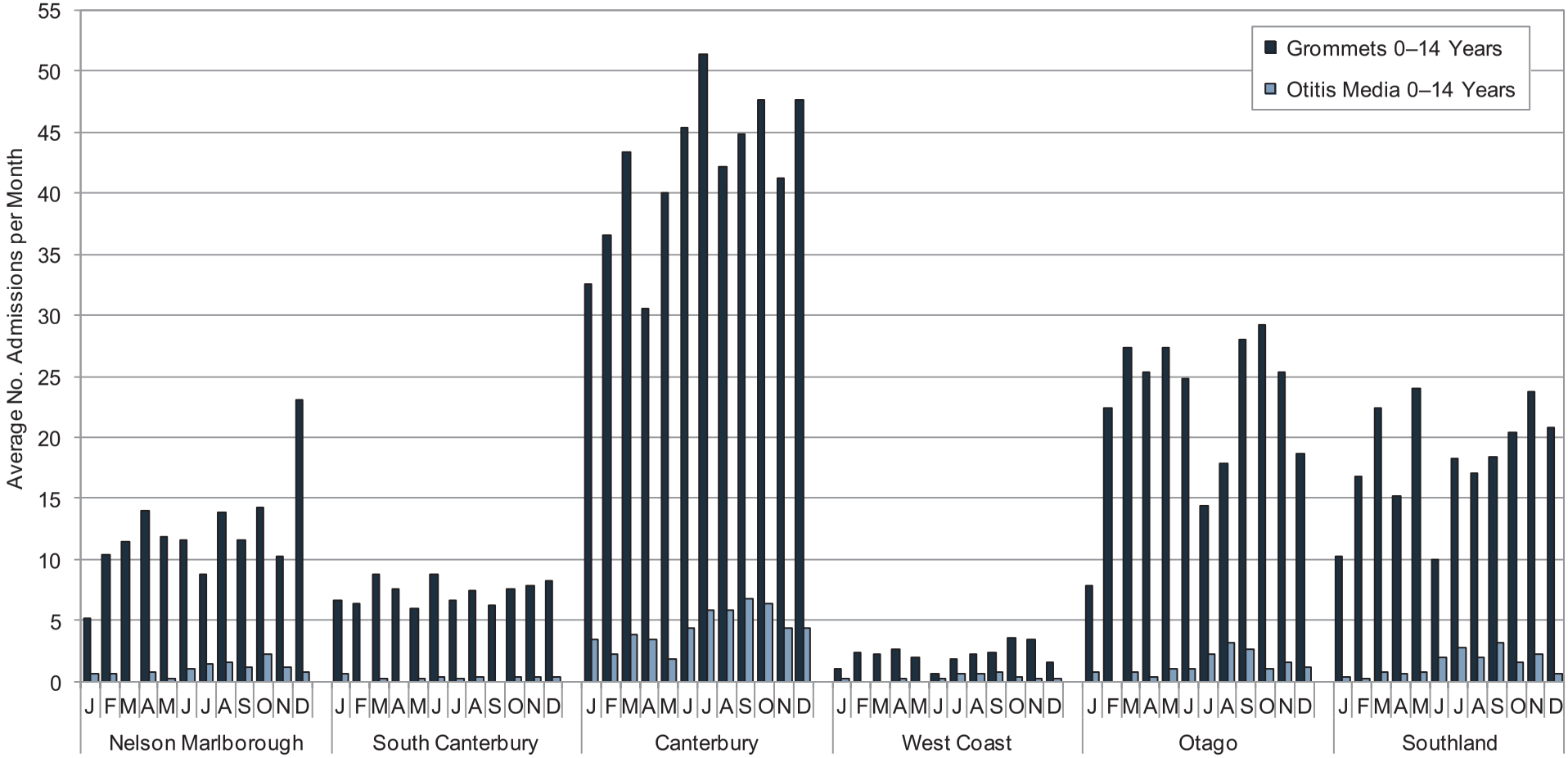
Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population

Figure 46. Arranged/Waiting List Hospital Admissions for Grommets in Children Aged 0−14 Years by Ethnicity, South Island DHBs vs. New Zealand 2000−2010



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population. Note: Ethnicity is Level 1 Prioritised.

Figure 47. Average Number of Acute Hospital Admissions for Otitis Media and Arranged/ Waiting List Admissions for Grommets in Children Aged 0−14 Years by Month, the South Island DHBs 2006−2010



Source: National Minimum Dataset

South Island Trends

In Nelson Marlborough and South Canterbury during 2000–2010, acute admissions for otitis media and arrange/waiting list admissions for grommets were relatively static, while in Canterbury, admissions for both outcomes declined during the early 2000s, but became more static from 2006–07 onwards. In the West Coast, arranged/waiting list admissions for grommets declined during the mid-2000s and then fluctuated, while acute admissions for otitis media were more static. In Otago, acute admissions for otitis media were relatively static, while arranged/waiting list admissions for grommets declined during the early-mid 2000s, but increased again in 2010. In Southland, acute admissions for otitis media declined during the mid-2000s, and then gradually increased again, while arranged/waiting list admissions for grommets increased during the early-mid 2000s, but then decreased during 2010 (**Figure 45**).

South Island Distribution by Ethnicity

In Canterbury during 2000–2010, arranged/waiting list admissions for the insertion of grommets were generally higher for Pacific and Māori > European > Asian/Indian children, while in the West Coast and Southland admissions were generally higher for Māori than for European children. In Otago (with the exception of 2010) admissions were higher for European than for Māori children, while in Nelson Marlborough and South Canterbury ethnic differences were less consistent (**Figure 46**). Small numbers prevented a more detailed review of differences in acute otitis media admissions by ethnicity.

South Island Distribution by Season

In the South Island during 2006–2010, there were no consistent seasonal variations in arranged/waiting list admissions for the insertion of grommets, although acute admissions for otitis media were higher in winter and spring in some DHBs (**Figure 47**).

Summary

In New Zealand during 2006–2010, otitis media was the most frequent primary diagnosis in those admitted acutely with conditions of the middle ear and mastoid, as well as for those admitted semi-acutely/from the waiting list for the insertion of grommets. When broken down by age, acute admissions for otitis media were highest in infants and one year olds, with rates declining rapidly thereafter. Rates were higher for Māori and Pacific > European > Asian/Indian children during the first four years, although ethnic differences were less consistent thereafter. In contrast, arranged/waiting list admissions for the insertion of grommets were relatively infrequent during the first year of life, but increased rapidly thereafter. Rates reached their highest point in European children at one year, in Māori children at two years, in Asian/Indian children at four years and in Pacific children at six years of age. Overall, during the first four years admission rates were higher for European and Māori > Pacific > Asian/Indian children, while after six years of age, admissions were higher for Pacific > Māori > European > Asian/Indian children.

In the South Island during 2006–2010, otitis media was the most frequent primary diagnosis in those admitted acutely with conditions of the middle ear and mastoid, as well as for those admitted semi-acutely/from the waiting list for the insertion of grommets. In Nelson Marlborough, the West Coast, Canterbury, South Canterbury and Otago, acute admissions for otitis media were lower than the New Zealand rate, although only in Nelson Marlborough and South Canterbury did these differences reach statistical significance. Rates in Southland were *significantly* higher than the New Zealand rate. In contrast, grommets admissions were *significantly* lower than the New Zealand rate in the West Coast and Canterbury, but *significantly* higher in South Canterbury, Otago and Southland. Rates in Nelson Marlborough were similar to the New Zealand rate. In Canterbury, grommets admissions were generally higher for Pacific and Māori > European > Asian/Indian children, while in the West Coast and Southland admissions were generally higher for Māori than for European children. In Otago (with the exception of 2010) admissions were higher for European than for Māori children, while in Nelson Marlborough and South Canterbury ethnic differences were less consistent.

Local Policy Documents and Evidence-Based Reviews Relevant to Otitis Media and Grommets

In New Zealand there are no policy documents which focus solely on the prevention of otitis media. 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 and 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 number of local policy documents however consider screening for acquired hearing losses in children, and these are considered in **Table 66**, along with a range of international reviews and guidelines which consider the most appropriate management of otitis media and the indications for grommets in children.

Table 66. Local Policy Documents and Evidence-Based Reviews Relevant to the Identification of Acquired Hearing Losses, or the Management of Otitis Media (including Grommets)

Ministry of Health Policy Documents
Ministry of Health. 2009. **National Vision and Hearing Screening Protocols**. Wellington: Ministry of Health. http://www.moh.govt.nz/moh.nsf/pagesmh/9663/$File/national-vision-and-hearing-screening-protocols-nov09.pdf This document describes the best practice for Vision Hearing Technicians (VHTs) who deliver the National Vision and Hearing screening programme. The hearing component of the programme involves targeted tympanometry screening of three-year-olds for groups at high risk of harm from glue ear (at DHBs discretion), screening audiometry (and tympanometry if required) for four-year-olds as part of the B4 School Check, catch up screening for new entrants (audiometry +/− tympanometry) who did not have screening as part of a B4 school check, or who require follow up from a B4 School check, and screening audiometry or threshold audiometry (depending on the age/ability of the child) for children in special circumstances and migrant children.
Ministry of Health. 2008. **The B4 School Check: A handbook for practitioners**. Wellington: Ministry of Health. http://www.moh.govt.nz/moh.nsf/pagesmh/10080/$File/b4sc-practitionershandbook-march2010.pdf The B4 School Check includes vision and hearing screening. Section 4 of this publication provides brief information on childhood hearing impairment and provides guidance for practitioners on audiometry screening of four, five and six year old children using the sweep test and, if the sweep test is equivocal or abnormal, tympanometry.
Ministry of Health. 2004. **Child and Youth Health Toolkit**. Wellington: Ministry of Health. http://www.moh.govt.nz/moh.nsf/pagesmh/5411/$File/childandyouthhealthtoolkit.pdf This toolkit is aimed at DHB staff and others wishing to improve child and youth health. Chapter 11 (pp. 59-64), while now superseded by the B4 School Check screening protocol, outlines a range of strategies DHBs might use to address the hearing-related health needs of children in their regions.
Ministry of Health. 2002. **Well Child-Tamariki Ora. National Schedule Handbook**. Wellington: Ministry of Health. http://www.moh.govt.nz/moh.nsf/pagesmh/1745/$File/well-child-national-schedule-handbook.pdf Information on new born baby hearing (now superseded by the new born hearing screening programme) and hearing surveillance at well child contacts is contained on pp. 79-83.Pp. 89-91 cover surveillance for otitis media with effusion.
International Guidelines
National Collaborating Centre for Women's and Children's Health. 2008. **Surgical management of children with otitis media with effusion (OME)**. London: RCOG Press. http://www.nice.org.uk/nicemedia/live/11928/39633/39633.pdf These evidence-based guidelines cover the surgical management of OME in children <12 years including specific recommendations for children with Down syndrome and cleft palate. They cover assessment, diagnosis and indications for specialist referral, indications for surgical intervention, the effectiveness of surgical and non-surgical interventions, information for parents and carers and recommendations for research. They state that children with persistent bilateral OME documented over a period of three months with a hearing level in the better ear of 25-39 dBHL should be considered for surgery. The following treatments are not recommended as non-surgical interventions: antibiotics, topical/systemic antihistamines, decongestants or steroids, homeopathy, cranial osteopathy, acupuncture, dietary modifications, probiotics, immunostimulants or massage. Hearing aids should be offered to children with persistent bilateral hearing loss for whom surgery is contraindicated or unacceptable and autoinflation (forced exhalation with closed mouth and nose to reopen the Eustachian tube) may be considered during the observation period for cooperative children. Each section in the guidelines includes a review of the evidence and an evidence summary. Appendix C provides an economic evaluation of alternative management. The evidence tables on which the guidelines were based can be found at: http://www.nice.org.uk/nicemedia/live/11928/39639/39639.pdf

American Academy of Pediatrics Subcommittee on Management of Acute Otitis Media. 2004. **Diagnosis and management of acute otitis media**. Pediatrics, 113(5), 1451-65.http://pediatrics.aappublications.org/content/113/5/1451.full.html

This U.S. guideline provides evidence-based recommendations for primary care physicians for the management of uncomplicated acute otitis media (AOM) in children from two months to 12 years of age. A statement following each recommendation explains the evidence level and the risk/benefit ratio. The guideline provides criteria for choosing whether to prescribe antibiotics or to recommend observation and pain relief only. Antibiotics (Amoxicillin as a first choice) are recommended in children aged <6 months whether the diagnosis is certain or not, in children 6 months to 2 years if the diagnosis is certain or the illness is severe and in children over 2 years only if the diagnosis is certain and the illness is severe. Effective strategies for prevention are stated to be limiting attendance at childcare and breastfeeding for at least 6 months, and less well-proven preventive strategies are avoiding supine bottle feeding and the use of pacifiers after six months and eliminating exposure to tobacco smoke. Influenza and pneumococcal vaccines may have a small effect in preventing AOM. Complementary medicines are not recommended.

The evidence report on which the guideline is based has been published separately as:

Marcy M, Takata G, Chan LS. 2001. **Management of Acute Otitis Media. Evidence Report/Technology Assessment No. 15. AHRQ Publication No. 01-E010 : ; 2001**. Rockville, MD: Agency for Healthcare Research and Quality.

Scottish Intercollegiate Guidelines Network. 2003. **Diagnosis and management of childhood otitis media in primary care: A national clinical guideline**. Edinburgh: Scottish Intercollegiate Guidelines Network. http://www.sign.ac.uk/pdf/sign66.pdf

This evidence-based guideline covers the clinical assessment, treatment, follow up and referral of children with acute otitis media and otitis media with effusion. It also covers the responsibilities of NHS institutions for implementation of the guideline and for audit as well as providing brief information for parents and careers. Statements summarising the research 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.

Systematic and Other Reviews from the International Literature

Simpson SA, Lewis R, van der Voort J, et al. 2011. **Oral or topical nasal steroids for hearing loss associated with otitis media with effusion in children**. Cochrane Database of Systematic Reviews, 2011(5), Art. No.: CD001935. DOI:10.1002/14651858.CD001935.pub3.

This review included 12 studies of medium to high quality with a total of 945 participants. Oral steroids alone were significantly more likely than placebo to lead to resolution of OME in the short term (< 1 month), (pooled data using a fixed effect model, RR 4.48, 95% CI 1.52 – 13.23). Oral steroids plus antibiotic were significantly more likely than placebo plus antibiotic to result in resolution of OME in the short term (random effects model, RR 1.99; 95% CI 1.14 to 3.49; five trials, 409 children). Over the longer term (> 1 month) oral steroids either alone or in combination with antibiotics made no difference to rates of resolution of OME and over both the short and the long term intranasal steroids, either alone or with antibiotics, also made no difference to rates of resolution of OME. Only one study documented hearing loss associated with OME before study entry. There was no evidence that either oral or topical steroid treatment was beneficial in reducing OME-associated hearing loss although only two studies, one of small size (oral steroids) and one of moderate size (oral steroids plus antibiotics) evaluated this outcome.

Browning GG, Rovers MM, Williamson I, et al. 2010. **Grommets (ventilation tubes) for hearing loss associated with otitis media with effusion in children**. Cochrane Database of Systematic Reviews, 2010(10), Art. No.: CD001801. DOI:10.1002/14651858.CD001801.pub3.

Otitis media with effusion (OME) is common in younger children and the surgical insertion of grommets is a treatment option. This review included 10 RCTs involving 1728 children aged one to 12 years with either unilateral or bilateral OME. Three studies randomised ears (i.e. each child received a grommet in only one ear) and seven randomised children to receive either bilateral grommets or no grommets. Grommets were found to have small benefits on hearing which diminished after six to nine months. No studies reported an effect on speech or language development or behavioural, cognitive or quality of life outcomes, however only a few studies attempted to measure these. A meta-analysis of three high quality trials randomising children (523 in total) showed a hearing benefit of only 4 dB (95% CI 2 to 6 dB) at six to nine months and no difference at 12 to 18 months. Similarly, three trials that randomised ears showed hearing in the grommet ear was 10db better (95% CI 5 to 16 dB) at four to six months, 6 dB better at seven to 12 months (95% CI 2 to 10 dB) and 5dB better at 18 to 24 months (95% CI 3 to 8 dB).The authors noted that natural resolution leads to hearing improvement in non-surgically treated children over a similar or shorter time period. They also stated that there have been no studies done in children with established speech, language, developmental or learning problems and therefore it is not possible to draw any conclusions about the benefits or otherwise of grommets for these children.

van den Aardweg TAM, Schilder GMA, Herkert E, et al. 2010. **Adenoidectomy for otitis media in children**. Cochrane Database of Systematic Reviews, 2010(1), Art. No.: CD007810. DOI: 10.1002/14651858.CD007810.pub2.

This review included 14 RCTs (involving a total of 2712 children) assessing the effectiveness of adenoidectomy in children with otitis media. The trials involved a variety of comparisons which limited the possibilities for pooling the results. The most important findings are those from three pooled trials comparing adenoidectomy plus a unilateral tympanostomy tube versus a unilateral tympanostomy tube alone. In these trials the unoperated ear was used as the comparator. At six months the unoperated ears in the children who had had adenoidectomy were 22% less likely to have persistent otitis media with effusion (OME), (95% CI 12% - 32%), and at 12 months there was a 29% risk reduction (95% CI 19 -39%). The authors state that it was more difficult to interpret the findings of the other trials which compared range of other treatment combinations, because the patient population was mixed: some children had recurrent acute otitis media (AOM), some had only OME and some had a combination of the two. The authors concluded that adenoidectomy had only a small and non-significant effect on acute otitis media and on hearing, with the only significant benefit of adenoidectomy in regard to otitis media being promoting the resolution of OME.

Jansen AGSC, Hak E, Veenhoven RH, et al. 2009. **Pneumococcal conjugate vaccines for preventing otitis media**. Cochrane Database of Systematic Reviews, 2009(2), Art. No.: CD001480. DOI:10.1002/14651858.CD001480.pub3.

Pneumococcus is one of the most common bacterial causes of acute otitis media. This review included eight studies reporting on seven RCTs of Pneumococcal conjugate vaccines (PCVs) on otitis media. The studies were of variable quality with three scoring the maximum of five points on the Jadad quality scale, two scoring four and three scoring two. The review authors concluded that "When administered in infancy, PCVs appear to have some protective effect against acute otitis media (AOM), depending on the type of PCV used." They state that the only currently licensed vaccine (the 7-valent vaccine CRM197-PCV7, trade name Prevenar®) appears to produce only marginal (6% to 7%) reductions in AOM. For older children, two trials suggested that vaccination with CRM197-PCV7 had no beneficial effect. Since this review was written, newer vaccines have been licensed (Prevenar 13® and Synflorix®) which provide protection against a greater number of pneumococcal strains and are expected to be more effective at preventing otitis media (see below). From 1 July 2011 the New Zealand immunisation schedule has included Synflorix®.

McDonald S, Langton Hewer CD, Nunez DA. 2008. **Grommets (ventilation tubes) for recurrent acute otitis media in children**. Cochrane Database of Systematic Reviews, 2008(4), Art. No.: CD004741. DOI: 10.1002/14651858.CD004741.pub2.
Content updated after new search for studies (no change to conclusions), published in Issue 6, 2011.

Recurrent otitis media in this review was defined as either 3+ acute middle ear infections in a six month period or 4+ such infections in a year. The reviewers identified two RCTs in children under the age of three, one with 108 participants and one with 68 participants. Based on the results of the larger of these studies they concluded that, in children <3 years with recurrent otitis media, grommets reduce the number of episodes of acute otitis media in the first six months after surgery by an average of 1.5 episodes per child (from 2.2 to 0.67 episodes) and, based on the results of both studies, that children who received grommets are more likely to be symptom-free in the six months after surgery than control children (OR 0.18, 95% CI 0.08 – 0.42). Neither study followed up children for >6 months but the authors state that the short follow up does cover the period when the grommets might be expected to be in situ.

Simpson SA, Thomas CL, van der Linden MK, et al. 2007. **Identification of children in the first four years of life for early treatment for otitis media with effusion**. Cochrane Database of Systematic Reviews, 2007(1), Art. No.: CD004163. DOI: 10.1002/14651858.CD004163.pub2.

This review assessed the evidence for the effects of screening (using tympanometry) and treating (with grommets) children with clinically important otitis media with effusion (OME) in the first four years of life, on language and behavioural outcomes. The authors did not find any RCTs comparing outcomes in children randomised to be screened for OME to those in children not screened. They found three trials (668 participants) evaluating interventions in children with OME identified through screening and these indicated that there was no clinically important benefit of screening and treating OME on language development or behaviour. They noted that although the studies were of high methodological quality, the participation rates of eligible children were quite low which could have led to selection bias. For example, if parents who suspected their child had problems declined to be randomised preferring to seek investigation and treatment elsewhere, this would have reduced the likelihood of finding a significant effect of screening and treatment.

Vaile L, Williamson T, Waddell A, et al. 2006. **Interventions for ear discharge associated with grommets (ventilation tubes)**. Cochrane Database of Systematic Reviews, 2006(2), Art. No.: CD001933. DOI: 10.1002/14651858.CD001933.pub2.

Post-operative otorrhoea (discharge) is a common complication of grommet insertion with a reported incidence ranging from 10% to 50%. The authors reported that there was very little good quality evidence on the best way to treat this problem. They state that, in the U.K., many ENT surgeons treat it with topical antibiotics with or without topical steroids, but general practitioners, mainly because of fears of amino-glycoside ototoxicity, tend not to prescribe these and choose instead systemic broad-spectrum antibiotics. The authors identified one small (79 participants) RCT comparing oral amoxicillin clavulanate to placebo which found a beneficial effect of the antibiotic: RR of discharge after 8 days of antibiotic treatment compared to placebo 0.19, (95% CI 0.07 – 0.49), however in this study both arms of the trial also received daily aural toilet which limits the applicability of the results to primary care. Two studies investigated steroids (one compared oral prednisolone plus oral amoxicillin clavulanate with oral amoxicillin clavulanate alone and one compared topical dexamethasone with topical ciprofloxacin ear drops) and one study compared antibiotic-steroid combination drops (Otosporin®) versus spray (Otomize®). None of these three studies found a significant benefit of a particular treatment over another. The authors were therefore unable to identify the most effective intervention or to assess the associated risks. They state that further research is needed.

Leach AJ, Morris PS. 2006. **Antibiotics for the prevention of acute and chronic suppurative otitis media in children**. Cochrane Database of Systematic Reviews, 2006(4), Art. No.: CD004401. DOI: 10.1002/14651858.CD004401.pub2.
Republished on line with edits Issue 1, 2011.

Acute otitis media (AOM) may lead to tympanic perforation which can progress to chronic suppurative otitis media (CSOM) with constant offensive discharge from the perforated tympanic membrane(s). The associated hearing loss can affect the language development and behaviour of young children. The review included 17 RCTs, 16 of which were used in a meta-analysis. All of these 16 studies included children who were regarded as being at increased risk of otitis media, and in seven studies the children met the accepted criteria for being prone to otitis media (three episodes in the previous six months or four episodes in the previous 12 months). None of the studies reported the proportion of children with recurrent AOM or CSOM at end of treatment and only one study provided data on long-term outcomes. Long term (6+ weeks) antibiotics were found to reduce the risk of any episode of AOM (14 studies, 1461 children, RR 0.65, 95% CI 0.53 to 0.79; random-effects model) and the number of episodes of AOM (13 studies, 1327 children, incidence rate ratio (IRR) 0.51, 95% CI 0.39 to 0.66; random-effects model). Antibiotics will prevent 1.5 episodes of AOM per child-year of treatment. (On average an at-risk child taking antibiotics for a year would have 1.5 rather than 3 episodes per year).

Macfadyen CA, Acuin JM, Gamble CL. 2006. **Systemic antibiotics versus topical treatments for chronically discharging ears with underlying eardrum perforations**. Cochrane Database of Systematic Reviews, 2006(1), Art. No.: CD005608. DOI:10.1002/14651858.CD005608.
Edited (no change to conclusions), published in Issue 1, 2009.

Chronic suppurative otitis media is a chronic infection of the middle ear with perforation of the tympanic membrane and on-going discharge of pus from the ear. This review included nine RCTs (833 participants) of variable, mostly poor, methodological quality. Topical quinolone antibiotics were more effective at clearing discharge at one to two weeks than either systemic non-quinolone antibiotics (2 trials, n=116, RR=3.21, 95% CI 1.88– 5.49) or systemic quinolone antibiotics (3 trials, n=175, RR 3.18, 95% CI 1.88–5.49). Topical and systemic quinolone antibiotics together were more effective than systemic quinolones alone (2 trials, n=90, RR 2.75, 95% CI 1.38 – 5.46) but there was also no clear evidence that topical quinolone treatment plus systemic quinolone treatment was more beneficial than topical quinolone treatment alone (2 trials, n = 135, RR 1.17, 95% CI 0.48 – 2.86). There was no clear evidence that either topical non-quinolone antibiotics (without steroids) or topical antiseptics were more effective than systemic antibiotics (mostly non-quinolones). The review authors noted that evidence regarding safety was weak and stated that more research about the risks of ototoxicity for alternative treatments particularly topical aminogylcosides (which are non-quinolones) is needed.

Griffin GH, Flynn C, Bailey RE, et al. 2006. **Antihistamines and/or decongestants for otitis media with effusion (OME) in children**. Cochrane Database of Systematic Reviews, 2006(4), Art. No.: CD003423. DOI: 10.1002/14651858.CD003423.pub2.

The results of sixteen RCTs (1880 participants) indicated that none of these interventions were beneficial and that 11% of treated subjects experienced adverse effects including gastrointestinal upset, irritability, drowsiness or dizziness. Therefore the authors of this review did not recommend antihistamines, decongestants or antihistamine/decongestant combinations for the treatment of OME.

Perera R, Haynes J, Glasziou P, et al. 2006. **Autoinflation for hearing loss associated with otitis media with effusion**. Cochrane Database of Systematic Reviews, 2006(4), Art. No.: CD006285. DOI: 10.1002/14651858.CD006285.

Autoinflation is a technique for reopening the Eustachian tube (connecting the middle ear with the back of the nasal cavity) and introducing air into the middle ear by raising intranasal pressure. This may be done by forced exhalation with closed mouth and nose, by blowing up a balloon through each nostril, or using an anaesthetic mask or a Politzer device. The authors of this review identified six small RCTs, five in children aged between three and 16 years and one in adults: two used a classic Otovent®, two used a carnival blower + balloon and two used Politzer devices. None of the studies were deemed to be of high quality. All except one of the studies reported beneficial effects in the short term, most commonly measured using tympanometry and/or audiometry (the maximum follow up period was three months). The authors suggest that “Autoinflation is a lower risk intervention than grommets and may be an appropriate alternative” and that further research would be useful.

Macfadyen CA, Acuin JM, Gamble C. 2005. **Topical antibiotics without steroids for chronically discharging ears with underlying eardrum perforations**. Cochrane Database of Systematic Reviews, 2005(4), Art. No.: CD004618. DOI:10.1002/14651858.CD004618.pub2.

This review considered RCTs comparing any topical antibiotic without steroids with any of the following: no drug treatment, aural toilet, topical antiseptics or another topical antibiotic without steroid for the treatment of chronic suppurative otitis media. In total the review included 14 trials (1724 analysed participants or ears) which were generally poorly reported with short follow up periods. Topical quinolone antibiotics were more effective than no drug treatment in clearing discharge at one week (two trials, n =197, RR 0.45, 95% CI 0.34 – 0.59) and they were also more effective than antiseptics at one week (3 trials, n=263, RR 0.52, 95% CI 0.41 – 0.67) and at two to four weeks (4 trials, n = 519, RR 0.58, 95% CI 0.47 - 0.72). There was no significant difference between quinolone and non-quinolone antibiotics. Results from comparisons of non-quinolone antibiotics (without steroids) and antiseptics were mixed, changing over time. The authors state that indirect evidence suggests that a benefit of topical quinolones over non quinolone topical antibiotics cannot be ruled out. They also state that further research is required particularly to clarify the risks of ototoxicity since non-quinolone antibiotics such as aminoglycosides are known to be ototoxic when given systemically and there are concerns that ototoxicity may result from the use of topical aminoglycoside antibiotics where there is a perforated tympanic membrane.

Sanders S, Glasziou PP, Del Mar CB, et al. 2004. **Antibiotics for acute otitis media in children**. Cochrane Database of Systematic Reviews, 2004(1), Art. No.: CD000219. DOI: 10.1002/14651858.CD000219.pub2. Republished online with edits in Issue 4, 2010

The conclusions of this review are based on 10 high quality RCTs in high income countries involving a total of 2928 children. Antibiotics made no difference to pain in the first 24 hours but slightly reduced pain in the next two to seven days. They also made no difference to the risk of perforation, recurrence or abnormal tympanometry (indicating possible hearing loss) after either one month or three months. Antibiotics appear to be most beneficial for children under two years of age with bilateral otitis media, or with both acute otitis media and discharging ears. For other children expectant observation is justified.

In addition to the reviews summarised above, Cochrane Reviews were also available on short course antibiotics, once or twice daily versus three times daily amoxicillin with or without clavulanate, topical analgesia (local anaesthetic ear drops) and zinc supplements. See the **Cochrane Database of Systematic Revie**ws for further details.

Other Relevant Publications

Milne RJ, Vander Hoorn S. 2010. **Burden and cost of hospital admissions for vaccine-preventable paediatric pneumococcal disease and non-typable Haemophilus influenzae otitis media in New Zealand**. Applied Health Economics & Health Policy, 8(5), 281-300.

This study aimed to estimate both the numbers and costs (to the New Zealand Government) of potentially vaccine-preventable paediatric admissions for pneumococcal disease and non-typable Haemophilus influenzae (NTHi) otitis media prior to the inclusion of a pneumococcal vaccine into the immunization programme in 2008. Using admission data from 2000-2007 it was estimated that, prior to the introduction of the vaccine, hospital admissions for pneumococcal meningitis, bacteraemia and pneumonia and for NTHi otitis media cost about NZ$ 10 million annually. Most of these admissions were in children under the age of two and they were particularly Pacific and Māori children and those living in relative socio-economic deprivation.

Gunasekera H, Morris PS, McIntyre P, et al. 2009. **Management of children with otitis media: a summary of evidence from recent systematic reviews**. Journal of Paediatrics & Child Health, 45(10), 554-62; quiz 62-3.

The Australian authors of this review provide a useful summary of the various systematic reviews on aspects of the management of acute otitis media and otitis media with effusion. They state that most children in Australia are given antibiotics at their first consultation for acute otitis media. They also state that diagnosis of either acute otitis media or otitis media with effusion requires the presence of an effusion which can only be detected reliably by tympanometry and/or pneumatic otoscopy but that they have no information on how commonly these diagnostic techniques are used in general practice or paediatric settings in Australia except that neither of these techniques is widely used in Australian Aboriginal Medical Service. (Aboriginal children have some of the world's highest rates of complicated otitis media).

Prymula R, Peeters P, Chrobok V, et al. 2006. **Pneumococcal capsular polysaccharides conjugated to protein D for prevention of acute otitis media caused by both Streptococcus pneumoniae and non-typable Haemophilus influenzae: a randomised double-blind efficacy study**. Lancet, 367(9512), 740-8.

This is the report of the randomised efficacy trial of the vaccine that was the prototype of Synflorix®, the 10-valent pneumococcal non-typable Haemophilus influenza protein D conjugate vaccine recently added to the New Zealand immunisation schedule in place of the seven-valent pneumococcal vaccine Prevenar®. Overall there was a 34% reduction (95% CI 21 - 44) in cases of otitis media in the vaccine group compared to the control group in the period from the third dose at five months, until 24-27 months of age. It is stated that the results confirm that the vaccine not only provides protection against pneumococcal otitis media but also against otitis media due to non-typable *Haemophilus influenzae*.