

HOSPITAL ADMISSIONS AND MORTALITY WITH A SOCIAL GRADIENT

Introduction

In New Zealand, there are currently large disparities in many measures of child health status between children belonging to different socio-economic groups within the population, and between Māori and Pacific children and children of other ethnicities. Ethnic and/or socioeconomic disparities among children have been observed in rates of skin infections [362], asthma [363], rheumatic fever [364], road traffic crashes [365], meningitis [366], unintentional injuries [367] burns [368], overall mortality, and mortality from injury (both road and non-road traffic injury) [369] and sudden infant death syndrome [370].

The higher hospital admission rates for infectious and respiratory diseases for children in socioeconomically disadvantaged families can be readily understood to arise from poor living conditions: poor quality housing, especially housing that is cold and damp, overcrowded living spaces which facilitate the spread of infection, and inability to pay for adequate heating, nutritious food, and the costs associated with accessing medical care. Since infectious and respiratory diseases are among the most common reasons why children are admitted to hospital, if the infectious disease admission rates of the most deprived children became equal to those of the least deprived children there could be substantial savings for the hospital sector. The causes of socio-economic disparities in admission rates for other medical conditions and for injuries may be less obvious but these disparities undoubtedly exist, and have been well documented, both in New Zealand and in other countries [7,371,372].

This section reports on hospital admission rates and mortality rates for medical conditions and injuries for which there is a social gradient, using data from the National Minimum Dataset and the National Mortality Collection, for children aged 0–14 years.

Data Source and Methods

Indicators

1. Hospital admissions for medical conditions and injuries with a social gradient in children aged 0–14 years
2. Mortality from medical conditions and injuries with a social gradient and sudden unexpected death in infancy (SUDI) in children aged 0–14 years

Data source

Numerator:

Hospital admissions for medical conditions with a social gradient: acute and arranged (arranged = within 7 days of referral) hospital admissions (waiting-list cases and neonates <28 days excluded) with the following ICD-10-AM primary diagnoses: A00–A09, R11, K529 (gastroenteritis); A15–A19 (tuberculosis); A33, A34, A35, A36, A37, A80, B05, B06, B16, B26, B18.0, B18.1, P35.0 or M01.4 (vaccine preventable diseases); A39 (meningococcal disease); B34 (viral infection of unspecified site); E40–E64 or D50–D53 (nutritional deficiencies/anaemias); J00–J03 or J06 (acute upper respiratory infections); J04 (croup/laryngitis/tracheitis/epiglottitis); J12, J10.0 or J11.0 (pneumonia: viral); J13–J16 or J18 (pneumonia: bacterial, non-viral, unspecified); J21 (acute bronchiolitis); J22 (acute lower respiratory infection unspecified); J45–J46, R062 (asthma and wheeze); J47 (bronchiectasis); G00–G01 (meningitis: bacterial); A87, G02 or G03 (meningitis: viral, other, NOS); G40 or G41 (epilepsy or status epilepticus); H65, H66 or H67 (otitis media); I00–I09 (rheumatic fever/heart disease); K40 (inguinal hernia); L00–L08, H00.0, H01.0, J34.0 or L98.0 (skin infections); L20–L30 (dermatitis and eczema); M86 (osteomyelitis); N10, N12, N13.6, N30.0, N30.9 or N39.0 (urinary tract infection); R56.0 (febrile convulsions).

Injury admissions with a social gradient: hospital admissions (emergency department cases, neonates <28 days excluded) with a primary diagnosis of injury (ICD-10-AM S00–T79) and an ICD-10-AM primary external cause code in the following range: V01–V09 (transport: pedestrian); V10–V19 (transport: cyclist); V40–V79 (transport: vehicle occupant); W00–W19 (falls); W20–W49 (mechanical forces: inanimate); W50–W64 (mechanical forces: animate); W85–X19 (thermal injury); X40–X49 (poisoning). In order to ensure comparability over time, all injury cases with an Emergency Department specialty code (M05–M08) on discharge were excluded.

Mortality from conditions with a social gradient: all deaths (neonates <28 days excluded) with a main underlying cause of death in the ICD-10-AM medical and injury categories outlined above. In addition, post-neonatal sudden unexpected deaths in infancy (SUDI) were included if the child was aged between 28 days and 1 year and their main underlying cause of death was SUDI (R95, R96, R98, R99, W75, W78, W79).



Denominator: Statistics NZ estimated resident population

Notes on Interpretation

Note 1: Hospital admissions in neonates (<28 days) were excluded from both indicators. These admissions are more likely to reflect issues arising prior to or at the time of birth (e.g. preterm infants may register multiple admissions as they transition from neonatal intensive care (NICU), through special care baby units (SCBU) to the postnatal ward). Further, the aetiology of respiratory infections and/or other medical conditions arising in these contexts may differ from those arising in the community.

Note 2: For medical conditions, only acute and arranged admissions were included, as waiting list admissions were seen as being more influenced by service capacity (e.g. the demographic profile of those admitted acutely with otitis media may have differed from those admitted from the waiting list for grommets (who in the vast majority of cases also have a primary diagnosis of otitis media)). For injury admissions, however, filtering by admission type was not undertaken. All injury cases with an Emergency Department specialty code (M05–M08) on discharge were excluded however (see the appendix for rationale).

Note 3: Hospital admissions were considered to have a social gradient if rates for those in the most deprived areas (NZDep deciles 9–10) were ≥ 1.8 times higher than for those in the least deprived areas (NZDep deciles 1–2), or where rates for Māori, Pacific or Asian/Indian children were ≥ 1.8 times higher than for European children. In addition, a small number of conditions were included where rates were ≥ 1.5 times higher, they demonstrated a consistent social gradient, and the association was biologically plausible.

Note 4: When considering differences in the magnitude of social gradients between medical and injury admissions note that these rates are not strictly comparable. For technical reasons, Emergency Department (ED) cases have been removed from injury admissions (and social differences in attendance at the ED vs. primary care for minor medical conditions may have accounted for some of the social gradients in medical admission seen). No such differential filtering was applied to mortality data, however, and thus the magnitude of the social differences seen in mortality data is more readily comparable.

Note 5: SUDI rates are traditionally calculated per 1,000 live births. For this analysis the denominator used was children aged 0–14 years, so that the relative contribution SUDI makes to mortality in this age group (as compared to other causes of death) is more readily appreciated. As a result, the SUDI rates in this section are not readily comparable to traditional SUDI mortality rates for those <1 year reported elsewhere.

For further detail on the methodology used see Appendix.

Note 6: In 2013, a number of changes were made to the ICD-10-AM codes included in this indicator. The changes included the broadening of asthma (J45–J46) to asthma and wheeze (J45–J46, R062) to take into account a shift in the way paediatricians were diagnosing asthma in preschool children, and the addition of J22 (unspecified lower respiratory infections), due to the likely overlap with the already included J18.9 (unspecified pneumonia) category. Two additional codes were added to the sudden unexpected death in infancy (SUDI) indicator (W78: inhalation of gastric contents; and W79: inhalation and ingestion of food causing obstruction of the respiratory tract) to ensure consistency with the Child and Youth Mortality Review Committee's SUDI reporting. As a result, the rates in this section are not directly comparable with those presented in NZCYES reports prior to 2013.

New Zealand Distribution and Trends

Distribution by Cause

Hospital admissions: In New Zealand during 2009–2013, asthma and wheeze, bronchiolitis, and acute respiratory infections (excluding croup) made the largest individual contributions to hospitalisations for medical conditions with a social gradient, and infectious and respiratory diseases collectively were responsible for the majority of admissions. Similarly, falls followed by inanimate mechanical forces were the leading causes of injury admissions with a social gradient, although transport injuries as a group also made a significant contribution (**Table 1**).

Mortality: In New Zealand during 2007–2011, SUDI made the single largest contribution to mortality with a social gradient in children aged 0–14 years. This occurred despite the fact that, by definition, all of these deaths occurred during the first year of life. Vehicle occupant deaths made the largest contribution to injury-related deaths, followed by drowning/submersion, and pedestrian injuries. Bacterial, non-viral, or unspecified pneumonia was the leading cause of mortality from medical conditions (**Table 2**).



Table 1. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by primary diagnosis, New Zealand 2009–2013

Primary diagnosis	New Zealand			
	Number: total 2009–2013	Number: annual average	Rate per 1,000	Percent of total
Medical conditions				
Asthma and wheeze	31,390	6,278.0	6.95	15.4
Acute bronchiolitis	29,431	5,886.2	6.52	14.4
Acute respiratory infections*	28,418	5,683.6	6.29	13.9
Gastroenteritis	27,325	5,465.0	6.05	13.4
Viral infection of unspecified site	20,882	4,176.4	4.63	10.2
Skin infections	16,273	3,254.6	3.60	8.0
Pneumonia: bacterial, non-viral	13,267	2,653.4	2.94	6.5
Urinary tract infection	7,319	1,463.8	1.62	3.6
Croup/laryngitis/tracheitis/epiglottitis	6,223	1,244.6	1.38	3.1
Epilepsy or status epilepticus	4,471	894.2	0.99	2.2
Dermatitis and eczema	3,586	717.2	0.79	1.8
Febrile convulsions	3,181	636.2	0.70	1.6
Otitis media	2,966	593.2	0.66	1.5
Pneumonia: viral	2,357	471.4	0.52	1.2
Inguinal hernia	1,206	241.2	0.27	0.6
Osteomyelitis	1,172	234.4	0.26	0.6
Rheumatic fever/heart disease	996	199.2	0.22	0.5
Vaccine preventable diseases	943	188.6	0.21	0.5
Meningitis: viral, other, NOS	813	162.6	0.18	0.4
Bronchiectasis	681	136.2	0.15	0.3
Meningococcal disease	355	71.0	0.08	0.2
Nutritional deficiencies/anaemias	325	65.0	0.07	0.2
Meningitis: bacterial	198	39.6	0.04	0.1
Tuberculosis	48	9.6	0.01	0.0
New Zealand total	203,826	40,765.2	45.15	100.0
Injury admissions				
Falls	22,550	4,510.0	4.99	50.1
Mechanical forces: inanimate	11,664	2,332.8	2.58	25.9
Mechanical forces: animate	2,910	582.0	0.64	6.5
Transport: cyclist	2,140	428.0	0.47	4.8
Thermal injury	1,996	399.2	0.44	4.4
Poisoning	1,908	381.6	0.42	4.2
Transport: vehicle occupant	849	169.8	0.19	1.9
Transport: pedestrian	791	158.2	0.18	1.8
Drowning/submersion	167	33.4	0.04	0.4
New Zealand total	44,975	8,995.0	9.96	100.0

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *Injury admissions*: excludes Emergency Department cases



Table 2. Mortality from conditions with a social gradient in children aged 0–14 years (excluding neonates) by main underlying cause of death, New Zealand 2007–2011

Cause of death	Number: total 2007–2011	Number: annual average	Rate per 100,000	Percent of category
Medical conditions				
Pneumonia: bacterial, non-viral	39	7.8	0.87	27.3
Meningococcal disease	24	4.8	0.54	16.8
Epilepsy or status epilepticus	22	4.4	0.49	15.4
Pneumonia: viral	13	2.6	0.29	9.1
Asthma and wheeze	12	2.4	0.27	8.4
Gastroenteritis	11	2.2	0.25	7.7
Meningitis	5	1.0	0.11	3.5
Bronchiectasis	3	0.6	0.07	2.1
Acute bronchiolitis	3	0.6	0.07	2.1
Other conditions	11	2.2	0.25	7.7
Total medical conditions	143	28.6	3.19	100.0
Injuries				
Transport: vehicle occupant	79	15.8	1.76	35.9
Drowning/submersion	50	10.0	1.11	22.7
Transport: pedestrian	36	7.2	0.80	16.4
Mechanical forces: inanimate/animate	15	3.0	0.33	6.8
Thermal injury	14	2.8	0.31	6.4
Transport: cyclist	10	2.0	0.22	4.5
Poisoning	9	1.8	0.20	4.1
Falls	7	1.4	0.16	3.2
Total injuries	220	44.0	4.90	100.0
Post neonatal SUDI				
Post neonatal SUDI	271	54.2	6.04	
Total mortality New Zealand	634	126.8	14.13	

Source: Numerator: National Mortality Collection (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: SUDI numerators are for infants aged 28–364 days only

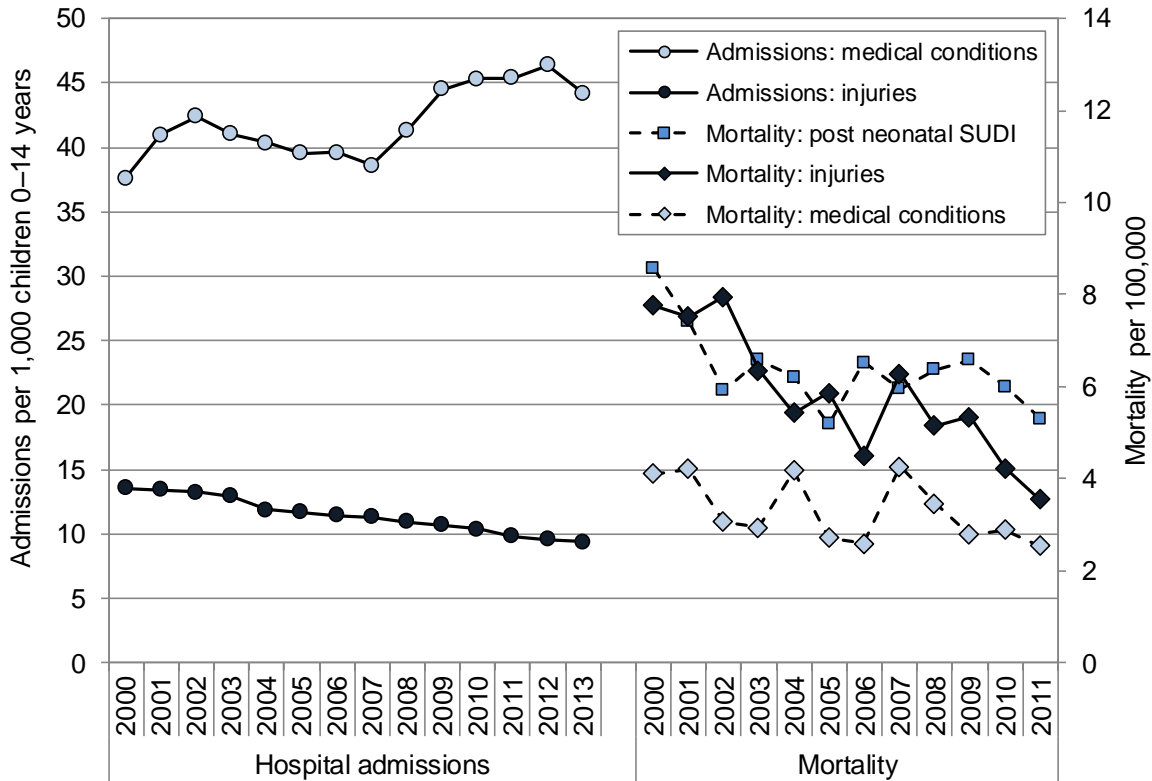
New Zealand Trends

Hospital admissions: In New Zealand, medical admissions with a social gradient increased during the early 2000s, reached a peak in 2002, and then declined until 2007. An upswing in rates was evident from 2007 to 2012. In contrast, injury admissions with a social gradient declined throughout 2000–2013 (**Figure 1**).

Note: Emergency Department (ED) cases are excluded from injury admissions so trends in medical and injury admissions are not comparable. Inconsistencies in DHB reporting of ED cases to the National Minimum Dataset may have affected trends in admissions for medical conditions with a social gradient. Many DHBs were reporting their ED cases from the early 2000s. **Figure 2** shows the increase in admissions in DHBs who changed their reporting practice from 2009, when the Ministry made reporting of ED day cases mandatory. While the increase in numbers is modest, some (but not all) of the increase in medical admissions seen during this period may be due to these changes. See the appendices for further details.

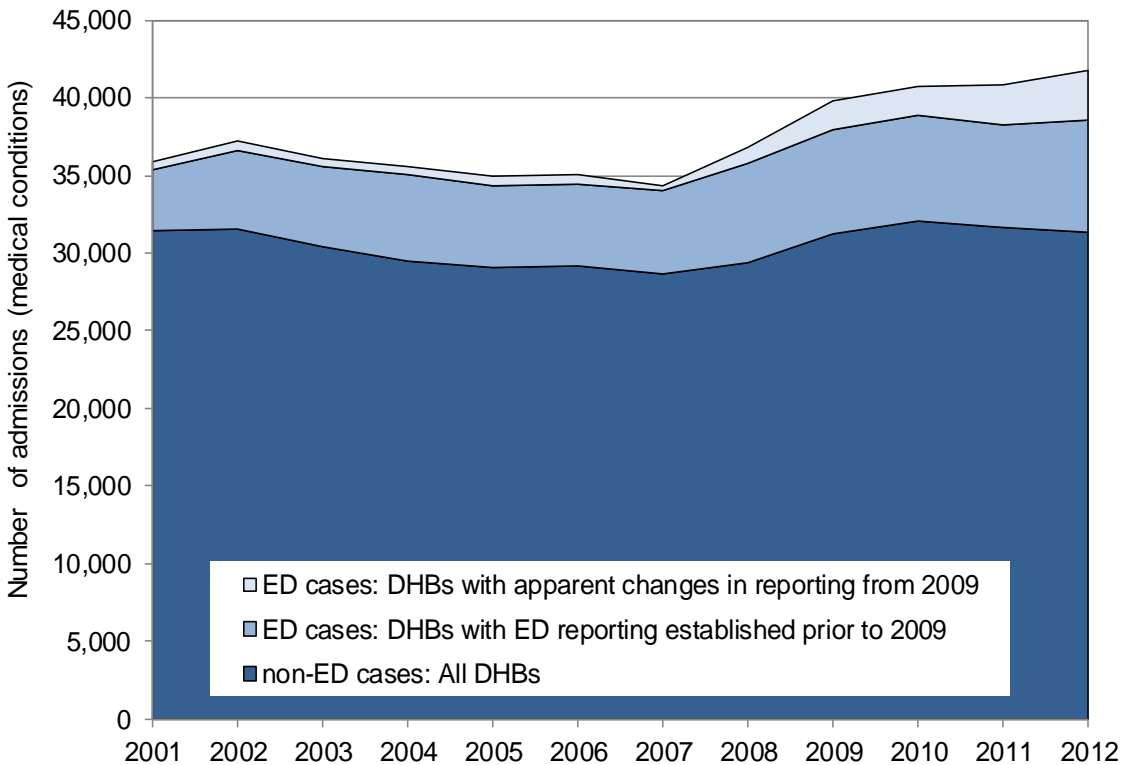
Mortality: In New Zealand, mortality from injuries with a social gradient gradually decreased between 2000 and 2011. Post-neonatal SUDI decreased between 2000 and 2002 and thereafter remained relatively static, while mortality from medical conditions with a social gradient fluctuated throughout 2000–2011 (**Figure 1**).

Figure 1. Hospital admissions (2000–2013) and mortality (2000–2011) from conditions with a social gradient in New Zealand children aged 0–14 years (excluding neonates)



Source: Numerator Admissions: National Minimum Dataset; Numerator Mortality: National Mortality Collection
 Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *injury*: excludes emergency department cases

Figure 2. Hospital admissions for medical conditions with a social gradient in children aged 0–14 years by health specialty on discharge and DHB reporting practice, New Zealand 2001–2012



Source: National Minimum Dataset. Acute and arranged admissions only; Note: ED cases are those with a health specialty code on discharge of M05–M08



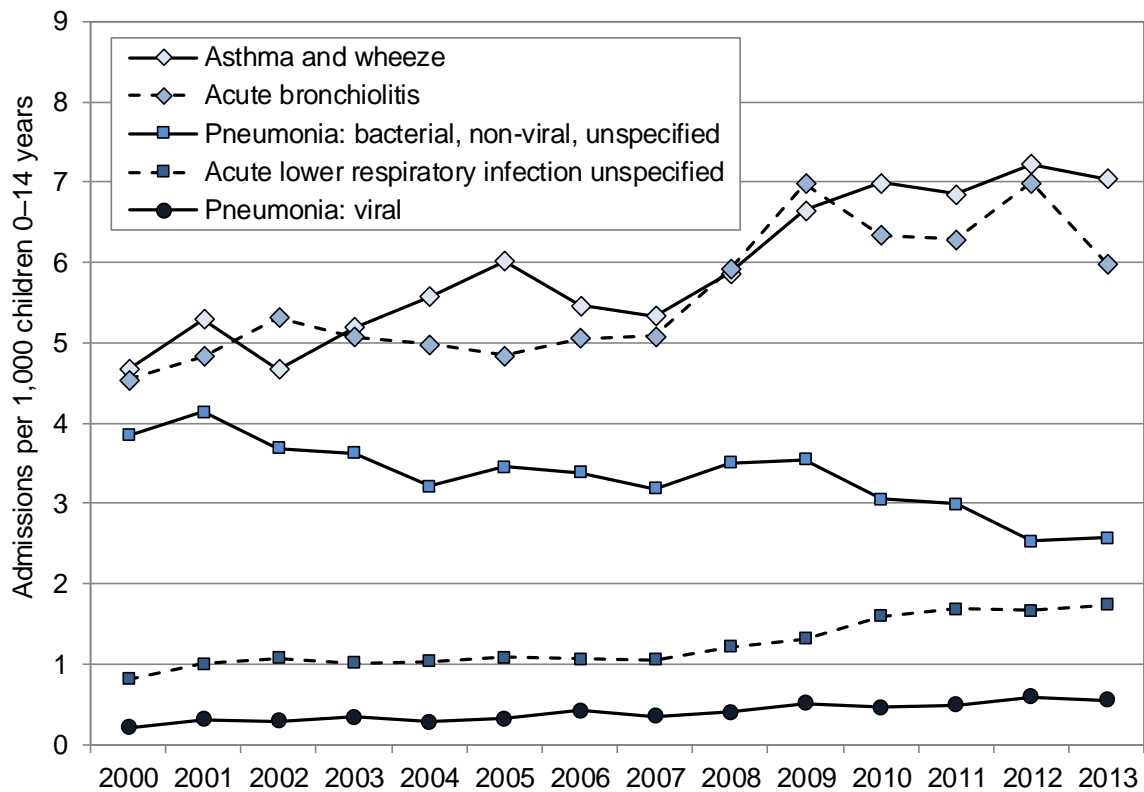
Trends in Hospital Admissions by Primary Diagnosis

Lower respiratory conditions: Since 2000, hospital admissions for bronchiolitis and asthma and wheeze increased in children aged 0–14 years, as did admissions for viral pneumonia. Admissions for bacterial, non-viral, or unspecified pneumonia declined. Admissions for unspecified acute lower respiratory infections were relatively stable during 2000–2006, and increased thereafter (**Figure 3**).

Upper respiratory tract and unspecified viral infections: While trends in admissions for acute upper respiratory infections and viral infections of unspecified site were variable during the early-to-mid 2000s, since 2007 both have exhibited a general upward trend. Admissions for croup/laryngitis/tracheitis/epiglottitis were static, while admissions for otitis media declined after 2007 (Figure 4).

Other medical conditions: During 2000–2013, hospital admissions for gastroenteritis, skin infections, dermatitis and eczema, and urinary tract infections in children aged 0–14 years all exhibited a general upward trend, while admissions for inguinal hernias declined. Trends for a number of other conditions were more variable (**Figure 5, Figure 6**).

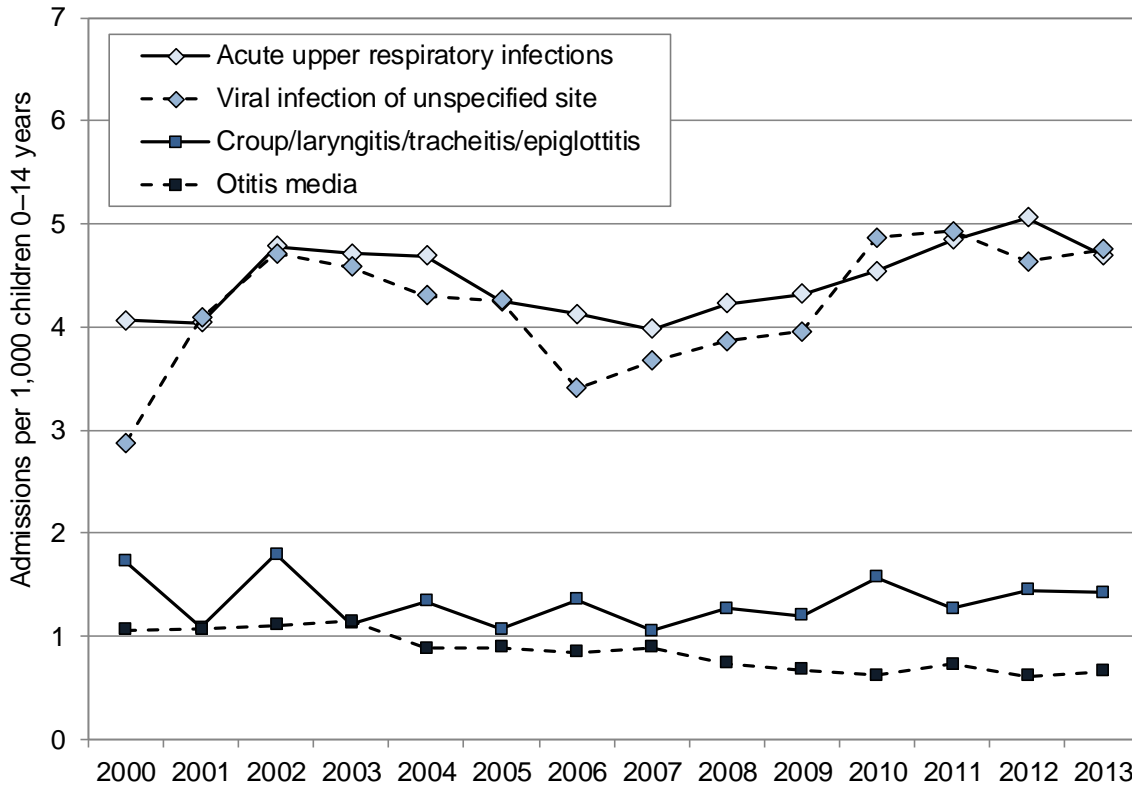
Figure 3. Hospital admissions for lower respiratory conditions with a social gradient in children aged 0–14 years (excluding neonates), New Zealand 2000–2013



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population;
Note: Acute and arranged admissions only

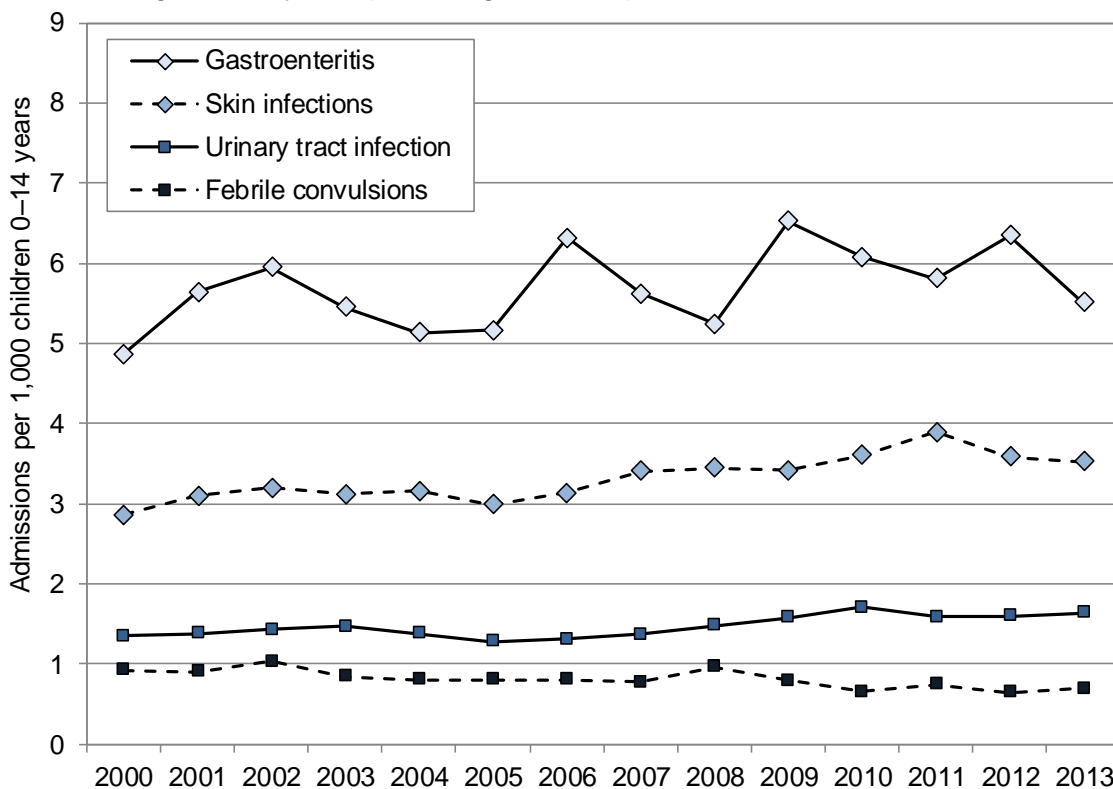


Figure 4. Hospital admissions for acute upper respiratory tract infections and unspecified viral infections in children aged 0–14 years (excluding neonates), New Zealand 2000–2013



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population; Note: Acute and arranged admissions only

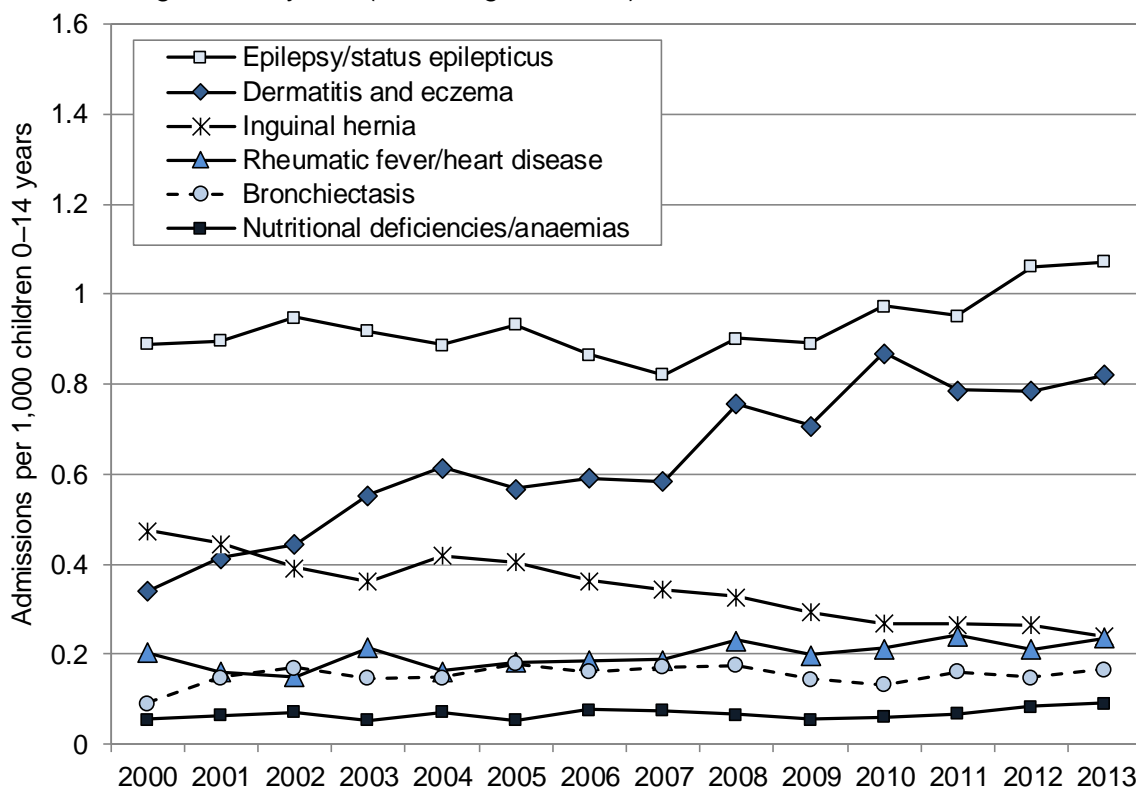
Figure 5. Hospital admissions for selected acute medical conditions with a social gradient in children aged 0–14 years (excluding neonates), New Zealand 2000–2013



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population; Note: Acute and arranged admissions only



Figure 6. Hospital admissions for selected chronic medical conditions with a social gradient in children aged 0–14 years (excluding neonates), New Zealand 2000–2013



Source: Numerator: National Minimum Dataset; Denominator: Statistics NZ Estimated Resident Population; Note: Acute and arranged admissions only

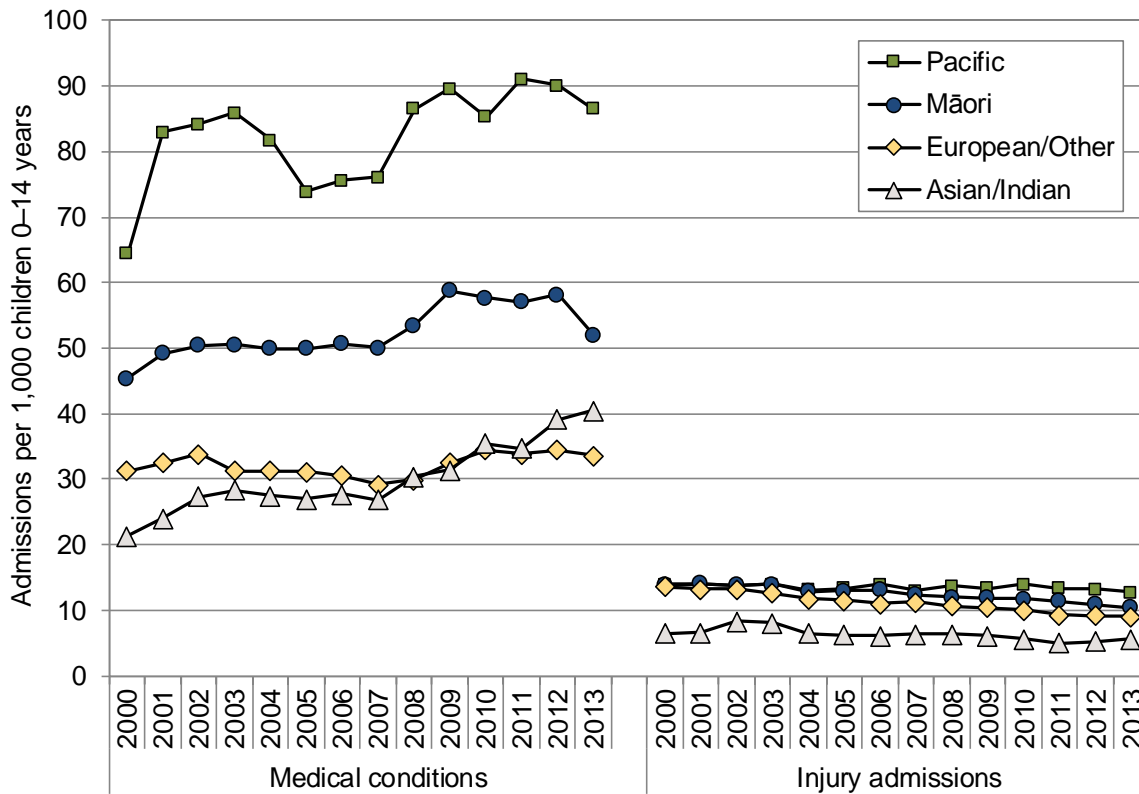
Trends in Hospital Admissions by Ethnicity

Medical conditions: During 2000–2013, hospitalisations for medical conditions with a social gradient were consistently higher for Pacific and Māori compared to European/Other and Asian/Indian children. For Pacific children, admissions increased during the early 2000s, reached a peak in 2003 and then declined. An upswing in rates was again evident during 2007–2009. For Māori children, rates were static during the mid-2000s, but then increased during 2007–2009, while the rates were relatively static during the mid-2000s for European/Other children and for Asian/Indian children, they did increase from 2007 (Figure 7).

Injuries: During 2000–2013, injury admissions with a social gradient were higher for Pacific and Māori, followed by European/Other, and Asian/Indian children. Admission rates declined for Pacific, Māori, and European/Other children during 2000–2013; however, the rate of decline was faster for European/Other, followed by Māori children. Thus ethnic differences were greater in 2013 than in 2000. Trends for Asian/Indian children were more variable (Figure 7).



Figure 7. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by ethnicity, New Zealand 2000–2013



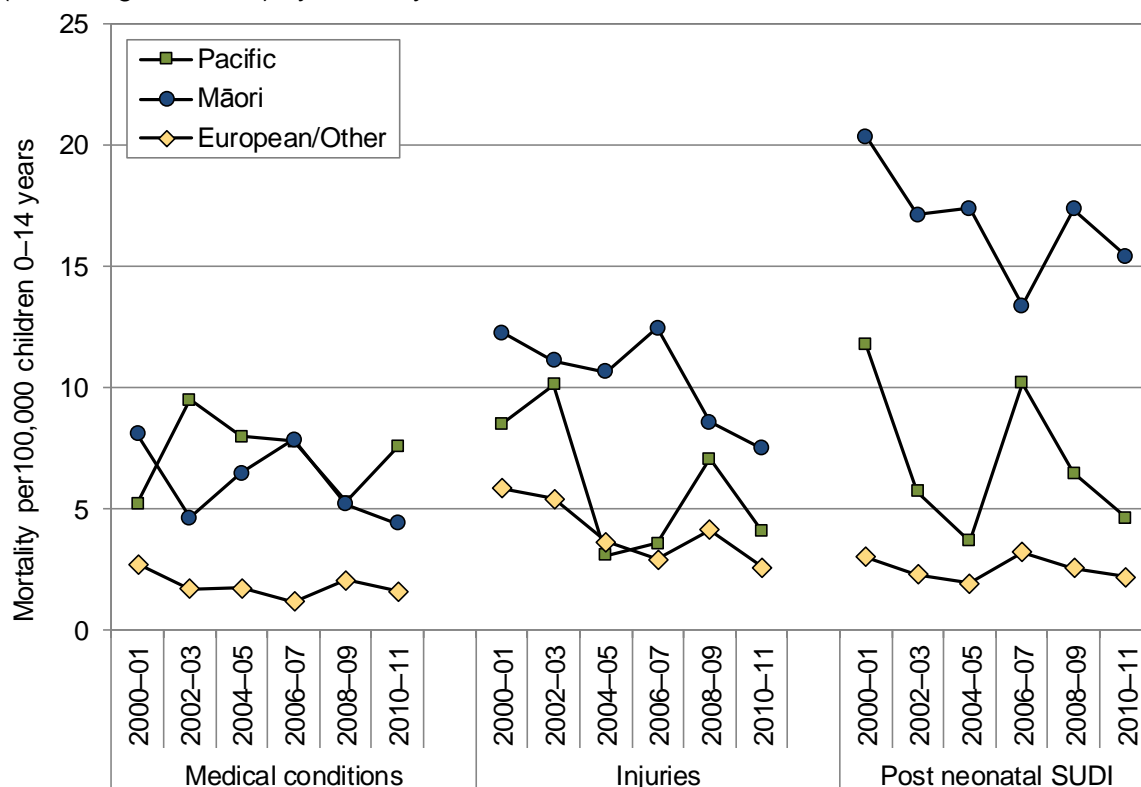
Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *Injury*: excludes emergency department cases; Ethnicity is level 1 prioritised

Trends in Mortality by Ethnicity

During 2000–2011, SUDI mortality was consistently higher for Māori infants, followed by Pacific, compared to European/Other infants, while the mortality rate from medical conditions with a social gradient was generally higher for Māori and Pacific children than for European/Other children. The mortality rate from injuries with a social gradient was higher for Māori children than for Pacific, and European/Other children (**Figure 8**).



Figure 8. Mortality from conditions with a social gradient in children aged 0–14 years (excluding neonates) by ethnicity, New Zealand 2000–2011



Source: Numerator: National Mortality Collection (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: SUDI deaths are for infants aged 28–364 days only; Ethnicity is level 1 prioritised

Distribution of Hospital Admissions by Ethnicity, Gender and NZDep Index Decile

Medical conditions: During 2009–2013, hospital admissions for medical conditions with a social gradient, were *significantly higher* for Pacific, Māori and Asian/Indian compared to European/Other children. Admissions were also *significantly higher* for males, and for those from the less to most deprived areas (NZDep06 deciles 3–10) (**Table 3**).

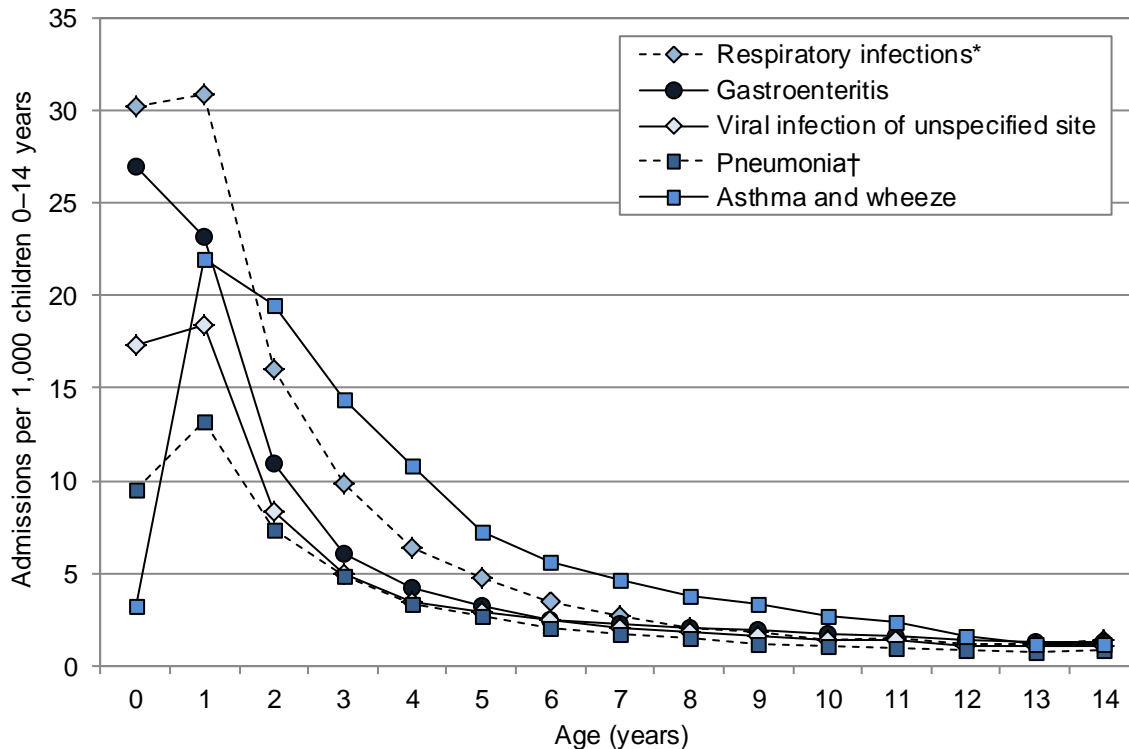
Injuries: Similarly during 2009–2013, hospital admissions for injuries with a social gradient were *significantly higher* for Pacific and Māori compared to European/Other children and *significantly lower* for Asian/Indian children. Admissions were also *significantly higher* for males, and for those from average to most deprived areas (NZDep06 deciles 5–10) (**Table 3**). While the magnitude of the social differences appeared less for injury than for medical admissions, there are technical reasons for this (See Note 4 in Methods box).

Hospital Admissions for Selected Conditions

The top 70% of hospital admissions for conditions with a social gradient among children aged 0–14 years are respiratory and infectious conditions. The majority of the most common causes are found among children under 5 years of age with the exception of bronchiolitis where 85% of the cases are infants under 1 year of age (**Figure 9**).



Figure 9. Hospital admissions for selected conditions with a social gradient in children aged 0–14 years (excluding neonates), by age, New Zealand 2009–2013



Source: Numerator: National Minimum Dataset (neonates removed, acute and arranged admissions only); Denominator: Statistics NZ Estimated Resident Population; Note: * respiratory infections includes: acute upper respiratory infections, croup/laryngitis/tracheitis and unspecified acute lower respiratory infections; † pneumonia includes: bacteria, non-viral, viral and unspecified pneumonia

Distribution of Mortality by Ethnicity, Gender and NZDep Index Decile

During 2007–2011, mortality from medical conditions with a social gradient, when compared to European/Other children, was *significantly higher* for Pacific and Māori children. The mortality rate was also *significantly higher* for males, and for those from the average to most deprived areas (NZDep06 deciles 5–10) (**Table 4**).

Mortality from injuries with a social gradient was *significantly higher* for Māori children, when compared to European/Other children, and *significantly lower* for Asian/Indian children. Mortality was also *significantly higher* for males, and for those from the more deprived areas (NZDep06 deciles 7–10) (**Table 4**). Differences in SUDI mortality are considered in the Infant Mortality section.



Table 3. Distribution of hospital admissions with a social gradient in children aged 0–14 years (excluding neonates) by ethnicity, gender and NZ Deprivation Index decile, New Zealand 2009–2013

Hospital admissions in children 0–14 years							
Medical conditions							
Variable	Rate	Rate ratio	95% CI	Variable	Rate	Rate ratio	95% CI
NZ Deprivation Index decile				NZ Deprivation Index quintile			
Decile 1	25.78	1.00		Deciles 1–2	25.97	1.00	
Decile 2	26.14	1.01	0.99–1.04	Deciles 3–4	30.76	1.18	1.16–1.21
Decile 3	30.16	1.17	1.14–1.20	Deciles 5–6	38.82	1.49	1.47–1.52
Decile 4	31.38	1.22	1.19–1.25	Deciles 7–8	50.68	1.95	1.92–1.98
Decile 5	36.42	1.41	1.38–1.45	Deciles 9–10	70.94	2.73	2.69–2.77
Decile 6	41.43	1.61	1.57–1.65	Prioritised ethnicity			
Decile 7	47.55	1.84	1.80–1.89	Māori	56.71	1.68	1.66–1.70
Decile 8	53.39	2.07	2.03–2.12	Pacific	88.52	2.62	2.59–2.65
Decile 9	65.45	2.54	2.48–2.59	Asian/Indian	36.39	1.08	1.06–1.10
Decile 10	75.86	2.94	2.88–3.00	European/Other	33.76	1.00	
Gender							
Female	40.52	1.00					
Male	49.55	1.22	1.21–1.23				
Injuries							
Variable	Rate	Rate ratio	95% CI	Variable	Rate	Rate ratio	95% CI
NZ Deprivation Index decile				NZ Deprivation Index quintile			
Decile 1	8.03	1.00		Deciles 1–2	8.01	1.00	
Decile 2	7.99	1.00	0.95–1.04	Deciles 3–4	8.07	1.01	0.97–1.04
Decile 3	7.75	0.97	0.92–1.01	Deciles 5–6	8.83	1.10	1.07–1.14
Decile 4	8.38	1.04	1.00–1.10	Deciles 7–8	10.08	1.26	1.22–1.30
Decile 5	8.54	1.06	1.02–1.11	Deciles 9–10	13.46	1.68	1.63–1.73
Decile 6	9.15	1.14	1.09–1.19	Prioritised ethnicity			
Decile 7	9.65	1.20	1.15–1.26	Māori	11.23	1.18	1.15–1.20
Decile 8	10.46	1.30	1.25–1.36	Pacific	13.31	1.39	1.35–1.43
Decile 9	12.48	1.55	1.49–1.62	Asian/Indian	5.48	0.57	0.55–0.60
Decile 10	14.34	1.79	1.72–1.86	European/Other	9.56	1.00	
Gender							
Female	8.06	1.00					
Male	11.77	1.46	1.43–1.49				

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *Injury*: excludes emergency department cases; Rates are per 1,000; Rate ratios are unadjusted; Ethnicity is level 1 prioritised; Decile is NZDep06



Table 4. Distribution of mortality with a social gradient in children aged 0–14 years by ethnicity, gender and NZ Deprivation Index quintile, New Zealand 2007–2011

Mortality in children 0–14 years							
Medical conditions							
Variable	Rate	Rate ratio	95% CI	Variable	Rate	Rate ratio	95% CI
NZ Deprivation Index quintile				Prioritised ethnicity			
Deciles 1–2	1.07	1.00		Māori	6.01	3.69	2.50–5.44
Deciles 3–4	1.89	1.77	0.78–4.05	Pacific	7.29	4.47	2.81–7.13
Deciles 5–6	2.71	2.55	1.18–5.51	Asian/Indian	0.93	0.57	0.20–1.60
Deciles 7–8	2.90	2.73	1.28–5.80	European/Other	1.63	1.00	
Deciles 9–10	6.36	5.97	2.98–12.0	Gender			
				Female	2.51	1.00	
				Male	3.83	1.52	1.09–2.13
Injuries							
Variable	Rate	Rate ratio	95% CI	Variable	Rate	Rate ratio	95% CI
NZ Deprivation Index quintile				Prioritised ethnicity			
Deciles 1–2	2.37	1.00		Māori	8.70	2.38	1.79–3.17
Deciles 3–4	4.41	1.86	1.07–3.23	Pacific	5.41	1.48	0.94–2.34
Deciles 5–6	3.30	1.40	0.79–2.48	Asian/Indian	1.63	0.45	0.21–0.96
Deciles 7–8	4.30	1.82	1.06–3.11	European/Other	3.66	1.00	
Deciles 9–10	8.80	3.72	2.29–6.02	Gender			
				Female	3.84	1.00	
				Male	5.92	1.54	1.17–2.02

Source: Numerator: National Mortality Collection (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: Rates are per 100,000; Rate ratios are unadjusted; Ethnicity is level 1 prioritised; Decile is NZDep06

South Island DHBs Distribution and Trends

South Island DHBs vs. New Zealand

During 2009–2013, hospital admissions for medical conditions with a social gradient were *significantly lower* than the New Zealand rate for all South Island DHBs, while hospital admissions for injuries with a social gradient were *significantly lower* than the New Zealand rate in Nelson Marlborough and in Southern DHB (**Table 5**).



Table 5. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates), South Island DHBs vs. New Zealand 2009–2013

DHB/Area	Number: total 2009– 2013	Number: annual average	Rate per 1,000	Rate ratio	95% CI
Children 0–14 years					
Medical conditions					
Nelson Marlborough	3,594	719	26.88	0.60	0.58–0.61
South Canterbury	1,221	244	23.07	0.51	0.48–0.54
Canterbury	17,492	3,498	37.01	0.82	0.81–0.83
West Coast	878	176	27.67	0.61	0.57–0.65
Southern	9,898	1,980	35.47	0.79	0.77–0.80
New Zealand	203,826	40,765	45.15	1.00	
Injuries					
Nelson Marlborough	1,070	214	8.00	0.80	0.76–0.85
South Canterbury	496	99	9.37	0.94	0.86–1.03
Canterbury	4,869	974	10.30	1.03	1.00–1.06
West Coast	345	69	10.87	1.09	0.98–1.21
Southern	2,235	447	8.01	0.80	0.77–0.84
New Zealand	44,975	8,995	9.96	1.00	

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *Injury*: exclude emergency department cases

Distribution of Hospital Admissions by Primary Diagnosis

Medical conditions: In all South Island DHBs during 2009–2013, asthma and wheeze and gastroenteritis were among the largest individual contributions to hospitalisations for medical conditions with a social gradient. In Infectious and respiratory diseases collectively were responsible for the majority of medical admissions during this period (**Table 6–Table 10**).

Injuries: In all five of the South Island DHBs during 2009–2013, falls, followed by inanimate mechanical forces, were the most frequent reasons for injury admissions with a social gradient, although transport injuries as a group also had a sizeable contribution (**Table 6–Table 10**).



Table 6. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by primary diagnosis, Nelson Marlborough 2009–2013

Primary diagnosis	Nelson Marlborough			
	Number: total 2009–2013	Number: annual average	Rate per 1,000	Percent of total
Children 0–14 years				
Medical conditions				
Acute upper respiratory infections*	531	106.2	3.97	14.8
Asthma and wheeze	527	105.4	3.94	14.7
Gastroenteritis	489	97.8	3.66	13.6
Viral infection of unspecified site	435	87.0	3.25	12.1
Acute bronchiolitis	396	79.2	2.96	11.0
Croup/laryngitis/tracheitis/epiglottitis	197	39.4	1.47	5.5
Pneumonia: bacterial, non-viral	174	34.8	1.30	4.8
Skin infections	166	33.2	1.24	4.6
Acute lower respiratory infection unspecified	133	26.6	0.99	3.7
Urinary tract infection	123	24.6	0.92	3.4
Epilepsy or status epilepticus	94	18.8	0.70	2.6
Febrile convulsions	73	14.6	0.55	2.0
Dermatitis and eczema	69	13.8	0.52	1.9
Otitis media	57	11.4	0.43	1.6
Inguinal hernia	25	5.0	0.19	0.7
Pneumonia: viral	22	4.4	0.16	0.6
Vaccine preventable diseases	19	3.8	0.14	0.5
Osteomyelitis	16	3.2	0.12	0.4
Meningitis: viral, other, NOS	16	3.2	0.12	0.4
Nutritional deficiencies/anaemias	12	2.4	0.09	0.3
Rheumatic fever/heart disease	8	1.6	0.06	0.2
Bronchiectasis	6	1.2	0.04	0.2
Meningitis: bacterial	5	1.0	0.04	0.1
Tuberculosis	<3	s	s	s
Nelson Marlborough total	3,594	718.8	26.90	100.0
Injuries				
Falls	553	110.6	4.14	51.7
Mechanical forces: inanimate	213	42.6	1.59	19.9
Poisoning	85	17.0	0.64	7.9
Transport: cyclist	74	14.8	0.55	6.9
Mechanical forces: animate	52	10.4	0.39	4.9
Thermal injury	45	9.0	0.34	4.2
Transport: vehicle occupant	27	5.4	0.20	2.5
Transport: pedestrian	19	3.8	0.14	1.8
Drowning/submersion	<3	s	s	s
Nelson Marlborough total	1,070	214.0	7.95	100.0

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *injury*: exclude emergency department cases; *Upper respiratory infections exclude croup; s: suppressed due to small numbers



Table 7. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by primary diagnosis, South Canterbury 2009–2013

Primary diagnosis	South Canterbury			
	Number: total 2009–2013	Number: annual average	Rate per 1,000	Percent of total
Children 0–14 years				
Medical conditions				
Gastroenteritis	229	45.8	4.33	18.8
Viral infection of unspecified site	150	30.0	2.83	12.3
Asthma and wheeze	148	29.6	2.80	12.1
Acute upper respiratory infections*	147	29.4	2.78	12.0
Acute bronchiolitis	133	26.6	2.51	10.9
Croup/laryngitis/tracheitis/epiglottitis	65	13.0	1.23	5.3
Skin infections	61	12.2	1.15	5.0
Pneumonia: bacterial, non-viral	51	10.2	0.96	4.2
Febrile convulsions	50	10.0	0.94	4.1
Urinary tract infection	35	7.0	0.66	2.9
Dermatitis and eczema	35	7.0	0.66	2.9
Acute lower respiratory infection unspecified	31	6.2	0.59	2.5
Otitis media	22	4.4	0.42	1.8
Pneumonia: viral	22	4.4	0.42	1.8
Epilepsy or status epilepticus	21	4.2	0.40	1.7
Inguinal hernia	8	1.6	0.15	0.7
Vaccine preventable diseases	5	1.0	0.09	0.4
Osteomyelitis	4	0.8	0.08	0.3
Nutritional deficiencies/anaemias	3	0.6	0.06	0.2
Meningococcal disease	<3	s	s	s
South Canterbury total	1,221	244.2	23.10	100.0
Injuries				
Falls	252	50.4	4.76	50.8
Mechanical forces: inanimate	93	18.6	1.76	18.8
Poisoning	36	7.2	0.68	7.3
Mechanical forces: animate	25	5.0	0.47	5.0
Transport: cyclist	44	8.8	0.83	8.9
Thermal injury	22	4.4	0.42	4.4
Transport: vehicle occupant	13	2.6	0.25	2.6
Transport: pedestrian	10	2.0	0.19	2.0
Drowning/submersion	<3	s	s	s
South Canterbury total	496	99.2	9.40	100.0

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *injury*: exclude emergency department cases; *Upper respiratory infections exclude croup; s: suppressed due to small numbers



Table 8. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by primary diagnosis, Canterbury 2009–2013

Primary diagnosis	Canterbury			
	Number: total 2009–2013	Number: annual average	Rate per 1,000	Percent of total
Children 0–14 years				
Medical conditions				
Asthma and wheeze	3,639	727.8	7.70	20.8
Acute upper respiratory infections*	2,711	542.2	5.74	15.5
Gastroenteritis	2,312	462.4	4.89	13.2
Acute bronchiolitis	1,738	347.6	3.68	9.9
Viral infection of unspecified site	1,684	336.8	3.56	9.6
Acute lower respiratory infection unspecified	906	181.2	1.92	5.2
Skin infections	818	163.6	1.73	4.7
Pneumonia: bacterial, non-viral	731	146.2	1.55	4.2
Croup/laryngitis/tracheitis/epiglottitis	648	129.6	1.37	3.7
Urinary tract infection	628	125.6	1.33	3.6
Epilepsy or status epilepticus	400	80.0	0.85	2.3
Otitis media	283	56.6	0.60	1.6
Dermatitis and eczema	268	53.6	0.57	1.5
Febrile convulsions	179	35.8	0.38	1.0
Pneumonia: viral	110	22.0	0.23	0.6
Vaccine preventable diseases	98	19.6	0.21	0.6
Inguinal hernia	95	19.0	0.20	0.5
Osteomyelitis	78	15.6	0.17	0.4
Meningitis: viral, other, NOS	53	10.6	0.11	0.3
Nutritional deficiencies/anaemias	39	7.8	0.08	0.2
Bronchiectasis	23	4.6	0.05	0.1
Meningococcal disease	20	4.0	0.04	0.1
Rheumatic fever/heart disease	17	3.4	0.04	0.1
Meningitis: bacterial	13	2.6	0.03	0.1
Tuberculosis	<3	s	s	s
Canterbury total	17,492	3,498.4	37.01	100.0
Injuries				
Falls	2,554	510.8	5.40	52.5
Mechanical forces: inanimate	1,126	225.2	2.38	23.1
Poisoning	363	72.6	0.77	7.5
Mechanical forces: animate	331	66.2	0.70	6.8
Transport: cyclist	212	42.4	0.45	4.4
Thermal injury	168	33.6	0.36	3.5
Transport: pedestrian	51	10.2	0.11	1.0
Transport: vehicle occupant	49	9.8	0.10	1.0
Drowning/submersion	15	3.0	0.03	0.3
Canterbury total	4,869	973.8	10.30	100.0

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *injury*: exclude emergency department cases; *Upper respiratory infections exclude croup; s: suppressed due to small numbers



Table 9. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by primary diagnosis, West Coast 2009–2013

Primary diagnosis	West Coast			
	Number: total 2009–2013	Number: annual average	Rate per 1,000	Percent of total
Children 0–14 years				
Medical conditions				
Asthma and wheeze	149	29.8	4.70	17.0
Gastroenteritis	136	27.2	4.29	15.5
Acute upper respiratory infections*	122	24.4	3.85	13.9
Viral infection of unspecified site	103	20.6	3.25	11.7
Acute bronchiolitis	91	18.2	2.87	10.4
Pneumonia: bacterial, non-viral	70	14.0	2.21	8.0
Acute lower respiratory infection unspecified	36	7.2	1.13	4.1
Croup/laryngitis/tracheitis/epiglottitis	32	6.4	1.01	3.6
Febrile convulsions	24	4.8	0.76	2.7
Skin infections	22	4.4	0.69	2.5
Urinary tract infection	18	3.6	0.57	2.1
Epilepsy or status epilepticus	17	3.4	0.54	1.9
Pneumonia: viral	13	2.6	0.41	1.5
Otitis media	9	1.8	0.28	1.0
Inguinal hernia	8	1.6	0.25	0.9
Osteomyelitis	7	1.4	0.22	0.8
Dermatitis and eczema	6	1.2	0.19	0.7
Bronchiectasis	5	1.0	0.16	0.6
Meningococcal disease	4	0.8	0.13	0.5
Vaccine preventable diseases	3	0.6	0.09	0.3
Meningitis: viral, other, NOS	3	0.6	0.09	0.3
West Coast total	878	175.6	27.7	100.0
Injuries				
Falls	170	34.0	5.36	49.3
Mechanical forces: inanimate	73	14.6	2.30	21.2
Transport: cyclist	21	4.2	0.66	6.1
Poisoning	15	3.0	0.47	4.3
Mechanical forces: animate	29	5.8	0.91	8.4
Thermal injury	18	3.6	0.57	5.2
Transport: vehicle occupant	14	2.8	0.44	4.1
Transport: pedestrian	3	0.6	0.09	0.9
Drowning/submersion	<3	s	s	s
West Coast total	345	69.0	11.0	100.0

Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *injury*: exclude emergency department cases; *Upper respiratory infections exclude croup; s: suppressed due to small numbers



Table 10. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by primary diagnosis, Southern DHB 2009–2013

Primary diagnosis	Southern DHB			
	Number: total 2009–2013	Number: annual average	Rate per 1,000	Percent of total
Children 0–14 years				
Medical conditions				
Gastroenteritis	1,667	333.4	5.97	16.8
Asthma and wheeze	1,655	331.0	5.93	16.7
Acute upper respiratory infections*	1,446	289.2	5.18	14.6
Acute bronchiolitis	1,230	246.0	4.41	12.4
Viral infection of unspecified site	746	149.2	2.67	7.5
Skin infections	461	92.2	1.65	4.7
Acute lower respiratory infection unspecified	434	86.8	1.56	4.4
Pneumonia: bacterial, non-viral	421	84.2	1.51	4.3
Croup/laryngitis/tracheitis/epiglottitis	383	76.6	1.37	3.9
Epilepsy or status epilepticus	318	63.6	1.14	3.2
Urinary tract infection	308	61.6	1.10	3.1
Otitis media	215	43.0	0.77	2.2
Dermatitis and eczema	151	30.2	0.54	1.5
Febrile convulsions	112	22.4	0.40	1.1
Inguinal hernia	92	18.4	0.33	0.9
Pneumonia: viral	84	16.8	0.30	0.8
Vaccine preventable diseases	53	10.6	0.19	0.5
Osteomyelitis	50	10.0	0.18	0.5
Meningitis: viral, other, NOS	24	4.8	0.09	0.2
Meningococcal disease	18	3.6	0.06	0.2
Nutritional deficiencies/anaemias	14	2.8	0.05	0.1
Bronchiectasis	11	2.2	0.04	0.1
Meningitis: bacterial	5	1.0	0.02	0.1
Southern DHB total	9,898	1,979.6	35.5	100.0
Injuries				
Falls	1,122	224.4	4.02	50.2
Mechanical forces: inanimate	502	100.4	1.80	22.5
Poisoning	177	35.4	0.63	7.9
Mechanical forces: animate	142	28.4	0.51	6.4
Transport: cyclist	132	26.4	0.47	5.9
Thermal injury	85	17.0	0.30	3.8
Transport: vehicle occupant	38	7.6	0.14	1.7
Transport: pedestrian	28	5.6	0.10	1.3
Drowning/submersion	9	1.8	0.03	0.4
Southern DHB total	2,235	447.0	8.0	100.0

Source: Numerator: National Minimum Dataset (Neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged admissions only; *injury*: exclude emergency department cases; *Upper respiratory infections exclude croup



Distribution of Mortality by Cause

In the South Island DHBs during 2007–2011, a number of children died from medical conditions and injuries with a social gradient, and from post-neonatal SUDI (**Table 11**).

Table 11. Mortality from conditions with a social gradient in children aged 0–14 years (excluding neonates) by main underlying cause of death, South Island DHBs 2007–2011

Cause of death	Number: total 2007–2011	Number: annual average	Rate per 100,000
Nelson Marlborough			
Medical conditions	<3	s	s
Injuries	5	1.0	3.77
SUDI (infant)	<3	s	s
Nelson Marlborough total	8	1.6	6.03
South Canterbury			
Medical conditions	<3	s	s
Injuries	<3	s	s
SUDI (infant)	<3	s	s
South Canterbury total	4	0.8	7.55
Canterbury			
Medical conditions	6	1.2	1.27
Injuries	18	3.6	3.82
SUDI (infant)	20	4.0	4.24
Canterbury total	44	8.8	9.34
West Coast			
Medical conditions	0	0.0	0.00
Injuries	<3	s	s
SUDI (infant)	0	0.0	0.00
West Coast total	<3	s	s
Southern DHB			
Medical conditions	10	2.0	3.61
Injuries	9	1.8	3.25
SUDI (infant)	10	2.0	3.61
Southern DHB total	29	5.8	10.48

Source: Numerator: National Mortality Collection (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: s: suppressed due to small numbers

Trends in Hospital Admissions

Medical conditions: In the South Island DHBs during 2000–2013, large year to year variations made trends in hospital admissions for medical conditions with a social gradient difficult to interpret. However, rates in all five South Island DHBs were generally lower than the New Zealand rate (**Figure 10**).

Injuries: In all five of the South Island DHBs during 2000–2013, hospital admissions for injuries with a social gradient exhibited a general downward (**Figure 10**).

Trends in Medical Admissions by Ethnicity

In Canterbury and Southern DHB during 2000–2013, hospital admissions for medical conditions with a social gradient were higher for Pacific children than for Māori and European/Other and for Asian/Indian children, while in the remaining South Island DHBs admissions were generally higher for Māori than for European/Other children (**Figure 11**).



Trends in Injury Admissions by Ethnicity

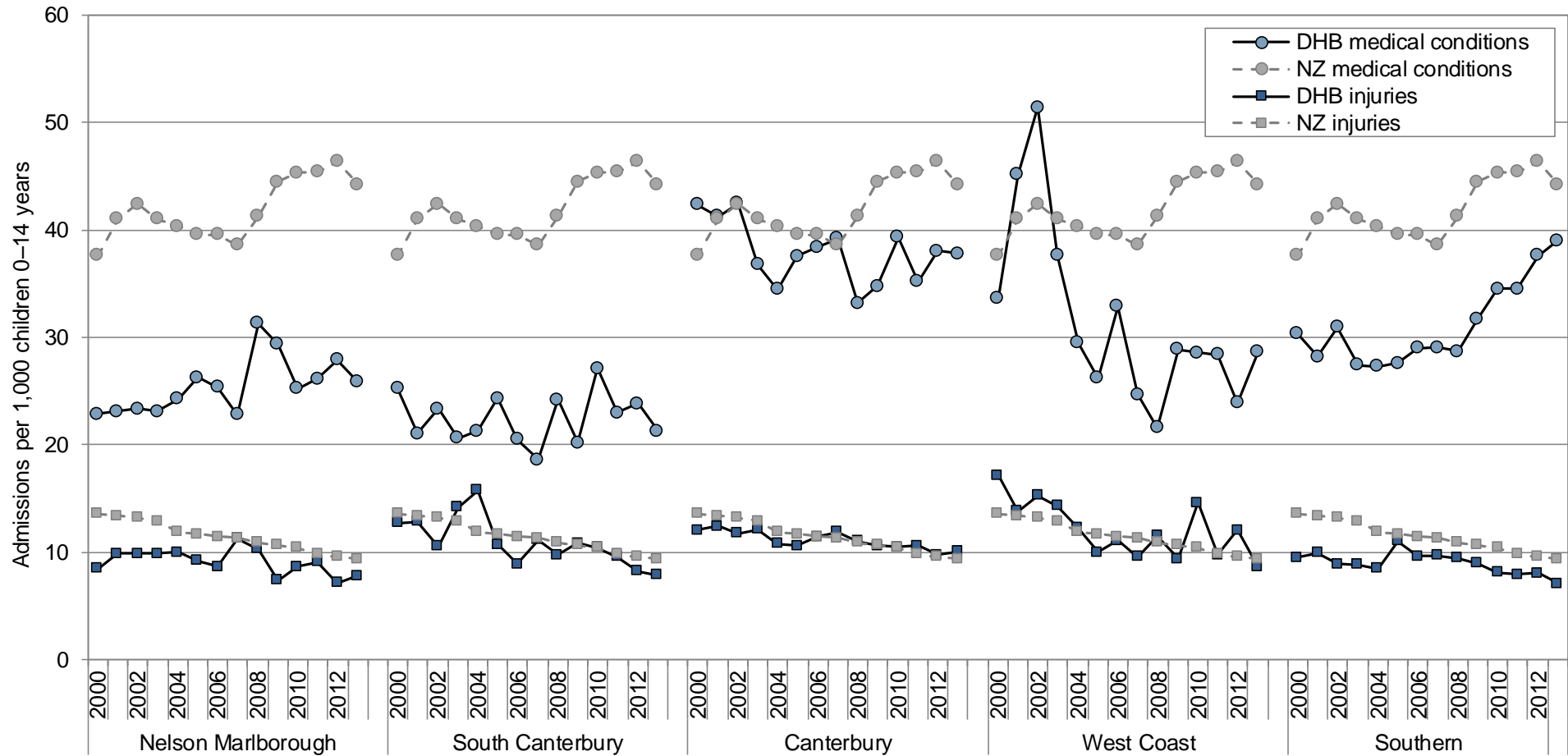
In the South Island DHBs during 2000–2013, ethnic differences in hospital admissions for injuries with a social gradient were less consistent (**Figure 11**). Rates were not presented for Pacific and Asian/Indian children due to the small number of injury admissions.

Local Policy Documents and Evidence-Based Reviews Relevant to the Prevention of Socioeconomically Sensitive Hospital Admissions and Mortality in Children

Given the complex causal pathways leading to socioeconomic gradients in hospital admissions and mortality during childhood, it is likely that an integrated policy framework covering a range of areas (e.g. housing, income support, exposure to second-hand cigarette smoke, immunisation) will be required, if reductions in admissions and mortality are to be achieved. Brief overviews are provided in other chapters of local policy documents and evidence-based reviews that consider policies to address the social determinants of health, the relationship between household crowding and health, the prevention of second-hand cigarette exposure in children, cessation of smoking in pregnancy and immunisation and interventions aimed at increasing immunisation coverage.

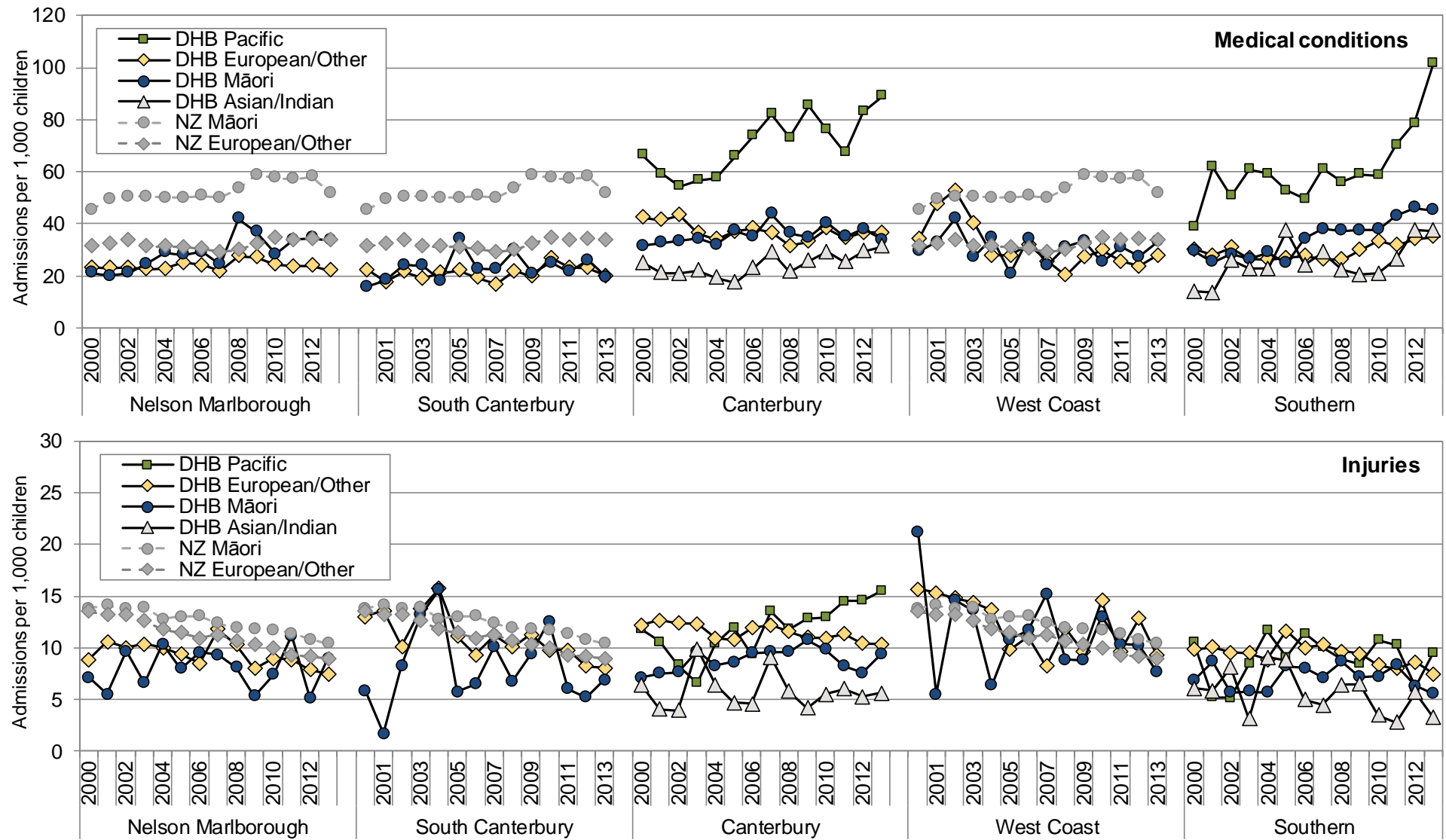


Figure 10. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates), South Island DHBs vs. New Zealand 2000–2013



Source: Numerator: National Minimum Dataset (neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: *Medical conditions*: acute and arranged only; *injury*: excludes emergency department cases

Figure 11. Hospital admissions for conditions with a social gradient in children aged 0–14 years (excluding neonates) by ethnicity, South Island DHBs vs. New Zealand 2000–2013



Source: Numerator: National Minimum Dataset (acute and arranged admissions only, neonates removed); Denominator: Statistics NZ Estimated Resident Population; Note: Ethnicity is Level 1 prioritised

