THE HEALTH OF MĀORI CHILDREN AND YOUNG PEOPLE WITH CHRONIC CONDITIONS AND DISABILITIES IN NEW ZEALAND
This Report was prepared for the Ministry of Health by Elizabeth Craig, Gabrielle McDonald, Judith Adams, Anne Reddington, Glenda Oben, Jean Simpson and Andrew Wicken on behalf of the New Zealand Child and Youth Epidemiology Service, March 2012

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The Ministry of Health provided the resources for a senior Advisory Group to oversee the production of this report, with the membership of the Advisory Group comprising: Paula Searle, Dr Papaarangi Reid, Dr Jo Baxter, Kodi Hapi and Darna Appleyard.

Te Ohonga Ake

The literal translation of Te Ohonga Ake is the Awakening. In the context of this report it refers to an awakening towards the reality of Māori child and youth health status in New Zealand. While many of us have been acutely aware of poor outcomes for Māori children and young people in this country, this report confirms our concerns and provides strong evidence for everyone to wake up, pay attention and take action to improve the lives of our most precious asset, our mokopuna.

Cover Artwork: Whakapapa – Family Tree by Coree Te Whata-Colley
Na Ta Apirana Ngata

In the first line of his dedication to a mokopuna, Sir Apirana Ngata writes “E tipu e rea mō ngā rā o tō ao”. This dedication is often quoted as a prescription for successful advancement of children and young people in society. His use of “E tipu e rea”, literally an encouragement for a seedling to sprout and develop, is an analogy that acknowledges the development potential of mokopuna upon which the future of humanity depends.

He also uses the expression “mō ngā rā o tō ao” to locate mokopuna dually within their lived realities and within the full potential, possibilities and rights of the modern world they inhabit. The lived realities of children and young people in Aotearoa/New Zealand are not uniform. They are hugely diverse and influenced by many layered factors commonly referred to as the social determinants of health. Children and young people are directly affected by the degree of social inclusion of their whānau. Limited social inclusion results in constrained participation in the social, economic, political and community relationships which in turn impacts health and wellbeing. Research evidence confirms that youthfulness, Māori ethnicity and disability are three important markers of risk of social exclusion in our society and a report on the health of this population is very welcome and long overdue.

Reading this report one recognises that this is a rare compilation of rare data. It is not that chronic conditions and disabilities among young Māori are rare, sadly no. The issue is that our data systems have been not organised to give voice to mokopuna with these conditions through the routine collection and reporting of meaningful indicators with quality data.

Being counted is recognition of our humanity, it means that we matter, our voices are heard, our opinions are valued and our lived realities are recognised and have influence. Being counted is an expression that our fundamental human rights are in place. Mokopuna are dying to be counted.

This report highlights that there is still much for us to do as health workers. The measures used in this report may still conceal situations where diagnoses are missed or delayed, where patients are diagnosed but are not referred appropriately and where barriers exist to access comprehensive health care and social support. Further work is needed to develop a range of indicators and encourage the appropriate collection of complete and comprehensive data. This then will support the development of quality services to promote the rights of mokopuna with chronic conditions and disabilities.

I commend this report as an important signal that we value the voices and rights of mokopuna. Mauri Ora!

Papaarangi Reid
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**INTRODUCTION**

**Report Aims**

This report on the health of Māori children and young people with chronic conditions and disabilities is divided into two main parts.

**Part 1: Children and Young People with Chronic Conditions and Disabilities** aims to:

1. Review the secondary health service utilisation patterns of Māori children and young people with chronic conditions and disabilities, using hospital admission data.
2. Review the distribution of, and risk factors for, overweight and obesity in Māori children using available national survey data.
3. Explore the prevalence of congenital anomalies evident at birth in Māori babies, and consider in more detail, those anomalies which are likely to lead to long term disability.

**Part 2: The New Zealand Children’s Social Health Monitor** then considers how Māori children are faring during the current economic downturn.

It is hoped that the information contained in this report will be of value to those working with Māori children and young people, and may help inform DHB health needs assessments and guide prioritisation and service planning at the population level.

**Report Sections and Indicators**

The structure of this report is based on an *Indicator Framework* developed during the New Zealand Child and Youth Epidemiology Service’s first three years of DHB reporting [1]. It is divided into two main parts, as follows:

**Part 1: Children and Young People with Chronic Conditions and Disabilities**

Part 1 begins with a Viewpoint by Dr Jo Baxter, which reflects on the implications of the report’s findings as they relate to Māori children and young people with chronic conditions and disabilities. Four sub-sections then consider specific child and youth health issues in more detail, with information being presented in the following order:

1. **Chronic Medical Conditions**: This section reviews hospital admissions and mortality for Māori children and young people with any mention of Insulin Dependent or Non-Insulin Dependent Diabetes or Epilepsy or Status Epilepticus in any of the first 15 diagnoses. For each condition, ethnic differences in admissions are presented, before the distribution of admissions by age is considered in the Māori child and youth population. An additional section reviews Cancer incidence and mortality in those aged 0-24 years, using NZ Cancer Registry and National Mortality Collection data.

2. **Obesity, Nutrition and Physical Activity**: This section uses 2006/07 New Zealand Health Survey data to review the prevalence of Overweight and Obesity and some of the risk factors (e.g. soft drink and takeaway consumption, television watching and modes of travel to school) in Māori children.

3. **Conditions Which May be Detected by Antenatal and Neonatal Screening**: This section considers five conditions that may lead to significant long-term disability, and may be detected by routine screening in the antenatal or neonatal periods. The first four, Congenital Anomalies Evident at Birth, Cardiovascular Anomalies, Down Syndrome and Neural Tube Defects, describe the prevalence and distribution of selected congenital and chromosomal anomalies in hospital-born babies. The fifth, Cystic Fibrosis, reviews hospital admissions for Māori children and young people which had any mention of cystic fibrosis in any of the first 15 diagnoses.

4. **Other Disabilities**: As a result of the paucity of other routine data sources, this section reviews hospital admissions for Māori children and young people with any mention of Developmental Delays or Intellectual Disabilities, Cerebral Palsy, and Autism or Other Pervasive Disorders in any of the first 15 diagnoses. For each condition, ethnic
differences in admission rates are explored, before the distribution of admissions by age is reviewed in the Māori child and youth population.

Note on Definitions: The decision to assign a condition to a disability or chronic condition sub-section was loosely aligned with Ministry of Health definitions, with the Ministry defining a disability as “a physical, psychiatric, intellectual, sensory, or age related disability (or a combination of these) which is likely to continue for a minimum of six months and result in a reduction of independent function to the extent that on-going support is required”. Similarly, the assignment of a conditions to a chronic conditions sub-section was loosely aligned with the Ministry’s personal health need definition, “where a person’s level of independent function is reduced by a condition that requires on-going supervision by a health professional” [2].

Part 2: The New Zealand Children’s Social Health Monitor
The NZ Children’s Social Health Monitor is an indicator set developed to monitor the impact of the current economic downturn on child wellbeing. Data on each of the indicators in the New Zealand Children’s Health Monitor is presented, with a view to reviewing how Māori children are faring in the current economic climate.

Data Quality and Interpretation Issues
In the preparation of this report, high quality data were not always available in areas of public health importance. In a number of cases, the authors have opted to utilise data of lesser quality, in order to ensure that such issues do not fall below the public health radar. As a consequence, the reader is strongly urged to read the cautions on interpretation that accompany each indicator in order to gain a better understanding of strengths and weaknesses of the data used. In addition, a number of more specific data quality issues are outlined in the text box below.

Limitations of Hospital Admission Data for Estimating Disability Prevalence
When interpreting the information in the disability and chronic conditions sections of this report, it must be remembered that the data presented primarily reflects secondary health service utilisation, rather than incidence or prevalence estimates for children and young people with chronic conditions and disabilities. While an attempt has been made to identify the number of unique individuals accessing inpatient services with particular conditions over a 5-year period, it is likely that in most cases the numbers presented reflect an undercount, with this undercount varying with the extent to which the condition increases the requirement for inpatient care (e.g. while Māori children and young people with cystic fibrosis accessed inpatient services on average 1.9 times per year, it is likely that many of those with intellectual disabilities did not access inpatient care at all during the same period, and thus do not appear in the data). Further, it is possible that those requiring inpatient management reflect those with conditions at the more severe end of the spectrum (e.g. those with cerebral palsy requiring orthopaedic procedures), with those requiring less intensive therapies being managed primarily in the outpatient context where the absence of diagnostic coding of data makes their utilisation of health services difficult to quantify. Finally, for a number of children and young people, the reason for their admission was for an inter-current illness (e.g. acute respiratory infection) which was unrelated to their chronic condition or disability.

Ethnicity Coding and the Ethnicity Classifications Used in this Report
In New Zealand’s national health collections up to 3 ethnic groups are stored electronically for each event [3]. Because of inconsistencies in the way ethnicity information was collected in national data collections prior to 1996 however, all of the ethnic specific analysis presented in this report are from 1996 onwards, and thus reflect self-identified concepts of ethnicity (see Appendix 5 for a more detailed review). Further, unless otherwise specified, total response ethnicity has been used to identify Māori children and young people (i.e. those identifying as Māori in any of their first three ethnic groups). In contrast, the term non-Māori non-Pacific refers to those children and young people who did not identify as being either Māori or Pacific in any of their first three ethnic groups.

1 The New Zealand Children’s Social Health Monitor is an indicator set developed to monitor the impact of the current economic downturn on child wellbeing. Economic Indicators include: GDP, Income Inequality, Child Poverty, Unemployment Rates and Number of Children Reliant on Benefit Recipients. Child Wellbeing Indicators include: Hospital Admissions and Mortality with a Social Gradient, Infant Mortality, and Hospital Admissions for Injuries Arising from Assault in Children.
Note: While in the Heath Sector, the non-Māori reference group is often used for rate ratio comparisons, the non-Māori non-Pacific reference group was selected by the Advisory Group, on the basis that as a group, these children and young people had the lowest documented exposures to health disparities.

**Undercounting of Māori in National Health Collections**

Despite significant improvements in the quality of ethnicity data since 1996, care must still be taken when interpreting the ethnic specific rates presented in this report, as the potential still remains for Māori children and young people to be undercounted in our national data collections. In a review linking hospital admission and cancer registry data to other more reliable data sources, the authors of Hauora IV [4] found that on average, hospital admission data during 2000–2004 undercounted Māori children by 6%, and Māori young people by 5–6%. For cancer registrations, the undercount was in the order of 1–2% (see Appendix 5). Thus when reviewing the hospital admission data in sections which follow, the reader must bear in mind that none of the rates have been adjusted for undercounting, and thus the rate ratios presented may underestimate, to a variable extent, the magnitude of any ethnic inequalities present.

**Signalling of Statistical Significance and Other Data Quality Issues**

In addition, Appendix 1 outlines the rationale for the use of statistical significance testing in this report and Appendices 3–8 contain information on the data sources used to develop each indicator. Readers are urged to be aware of the contents of these appendices when interpreting the information contained in this report.

In particular, in order to assist the reader to determine whether tests of statistical significance have been used in a particular section, the significance of the associations presented has been signalled in the text with the words *significant*, or *not significant* in italics. Where the words *significant* or *non-significant* do not appear in the text, the associations described do not imply statistical significance or non-significance (see Appendix 1 for further detail).

**Concluding Comments**

This report provides an overview of secondary health service utilisation for Māori children and young people with chronic conditions and disabilities, as well as a snapshot of how Māori children are faring during the current economic downturn. The data presented is at times imperfect, and at best only provides a glimpse of the health needs of these children and young people. However, the current paucity of data should not preclude the health sector from reviewing the disability support services currently available, and from considering whether they are meeting the needs of Māori children, young people and their whānau. In the context of the recent rises in hospital admissions for medical conditions with a social gradient in Māori children, attention to on-going quality improvement will ensure that, over time, the health sector is better able to respond to the needs of Māori children and young people in these crucial areas.
OVERVIEW OF KEY FINDINGS

Table 1 provides a brief overview of the indicators in this year’s report and the main findings as they relate to Māori children and young people.

Children and Young People with Chronic Conditions and Disabilities: In New Zealand during 2005–2009, the overall picture for Māori children and young people with chronic conditions and disabilities was mixed. Hospital admissions for some conditions (e.g. developmental delays, cerebral palsy) were similar to those for non-Māori non-Pacific children and young people, while admissions for other conditions (e.g. cystic fibrosis, insulin dependent diabetes, autism) were significantly lower for Māori children than for their non-Māori non-Pacific peers. For a number of other conditions (e.g. intellectual disabilities, epilepsy, non-insulin dependent diabetes), while rates for Māori children and young people were significantly higher than for non-Māori non-Pacific children and young people, the magnitude of these differences was only small to modest (e.g. epilepsy 1.25 times higher; intellectual disabilities 1.40 times higher; non-insulin dependent diabetes 1.80 times higher). The exceptions were rheumatic fever and bronchiectasis, where hospital admissions for Māori children and young people were far in excess of those for non-Māori non-Pacific children and young people (acute rheumatic fever 23.0 times higher; bronchiectasis 5.4 times higher).

Children’s Social Health Monitor: The impact of the current economic downturn on Māori children and their whānau was reflected in a number of Children’s Social Health Monitor indicators, with unemployment between 2007(Q4) and 2010(Q3) being consistently higher for Māori than for European people, and the largest increases in unemployment being seen in Māori and Pacific groups. Thus by 2010(Q3), unemployment rates were 13.4% for Māori, as compared to 4.7% for European people. There were also on-going increases in the number of children reliant on unemployment and domestic purposes benefit recipients between April 2009 and 2010, and although a breakdown by ethnicity was not available, it is likely that a significant number of these children were Māori. Of further concern, hospital admissions for medical conditions with a social gradient (the majority of which were infectious and respiratory diseases) that had been relatively static for Māori children during the mid-2000s began to rise rapidly after 2007.
Table 1. Overview of the Health of Māori Children and Young People with Chronic Conditions and Disabilities

<table>
<thead>
<tr>
<th>Stream</th>
<th>Indicator</th>
<th>Distribution and Trends for Māori Children and Young People</th>
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<tbody>
<tr>
<td>Chronic Medical Conditions</td>
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</table>
| Rheumatic Fever (Page 23)     | • During 2005–2009, 416 individual Māori children and/or young people were admitted to hospital with acute rheumatic fever listed in any of the first 15 diagnoses, with these children and young people averaging 0.28 admissions per year.  
• Admission rates per 100,000 population (RR 23.0, 95% CI 18.2–29.1) were significantly higher than for non-Māori non-Pacific children and young people.  
• During the same period, 231 individual Māori children and/or young people were admitted to hospital with chronic rheumatic heart disease listed in any of the first 15 diagnoses, with these children and young people averaging 0.38 admissions per year. Admission rates per 100,000 population (RR 7.59, 95% CI 6.39–9.03) were also significantly higher than for non-Māori non-Pacific children and young people. |                                                                |
| Bronchiectasis (Page 27)      | • During 2005–2009, 173 individual Māori children and/or young people were admitted to hospital with bronchiectasis listed in any of the first 15 diagnoses, with these children and young people averaging 1.01 admissions per year.  
• Admission rates per 100,000 population (RR 5.40, 95% CI 4.84–6.02) were significantly higher than for non-Māori non-Pacific children and young people during this period. |                                                                |
| Diabetes (Page 31)            | • **Type 1 or Insulin Dependent Diabetes Mellitus (IDDM):** During 2005–2009, 339 individual Māori children and/or young people were admitted to hospital with IDDM listed in any of the first 15 diagnoses, with these children and young people averaging 0.80 admissions per year. Admission rates per 100,000 population (RR 0.66, 95% CI 0.62–0.70) were significantly lower than for non-Māori non-Pacific children and young people.  
• **Type 2 or Non-Insulin Dependent Diabetes Mellitus (NIDDM):** During the same period, 198 individual Māori children and/or young people were admitted to hospital with NIDDM listed in any of the first 15 diagnoses, with these children and young people averaging 0.39 admissions per year. Admission rates per 100,000 population (RR 1.80, 95% CI 1.59–2.04) were significantly higher than for non-Māori non-Pacific children and young people during this period. |                                                                |
| Epilepsy and Status Epilepticus (Page 37) | • During 2005–2009, 1,029 individual Māori children and/or young people were admitted to hospital with epilepsy or status epilepticus listed in any of the first 15 diagnoses, with these children and young people averaging 0.45 admissions per year. Admission rates per 100,000 population (RR 1.25, 95% CI 1.19–1.31) were significantly higher than for non-Māori non-Pacific children and young people. |                                                                |
| Cancer (Page 41)              | • During 2003–2007, carcinoma in situ of the cervix was the most frequent reason for a notification to the NZ Cancer Registry in Māori children and young people, and accounted for 58.9% of notifications in this age group. Note: Carcinomas in situ are not cancers but rather pre-cancers, which have been included here as, for historical reasons, they are notified to the NZ Cancer Registry.  
• Acute lymphoblastic leukaemia was the second leading reason for notification, followed by cancer of the testis.  
• During the same period, cancers of the bone and cartilage were the leading cause of cancer mortality in Māori children and young people, followed by acute lymphoblastic leukaemia.  
• While NZ Cancer Registry notifications for acute lymphoblastic leukaemia, and cancers of the testis and brain were similar for Māori and non-Māori non-Pacific children and young people, notifications for malignant melanoma / melanoma in situ and carcinoma in situ of the cervix were significantly lower for Māori children and young people. |                                                                |
### Introduction and Overview

#### Antenatal and Neonatal Screening

<table>
<thead>
<tr>
<th>Indicator</th>
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<tr>
<td>Congenital Anomalies Evident at Birth (Page 71)</td>
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</table>

- During 2005–2009, on average 646 Māori babies each year had one or more congenital anomalies evident at birth, equating to around 4.9% of all Māori births.
- The proportion of Māori babies born with one or more congenital anomalies was significantly lower (RR 0.93, 95% CI 0.89–0.96) than for non-Māori non-Pacific babies.
- The types of congenital anomaly identified ranged in severity from minor skin conditions (e.g. non-neoplastic nevus) to more serious anomalies (e.g. Tetralogy of Fallot).

#### Cardiovascular Anomalies (Page 76)

- During 2005–2009, on average 84 Māori babies each year were born with one or more cardiovascular anomalies evident at birth, with this equating to around 0.6% of all Māori births.
- The proportion of Māori babies born with one or more cardiovascular anomalies was not significantly different (RR 0.91, 95% CI 0.81–1.01) from that of non-Māori non-Pacific babies.
- Patent ductus arteriosus (PDA) was the most frequent cardiovascular anomaly identified in Māori babies, with 58.6% of PDAs being in preterm babies (<37 weeks gestation) who had no other cardiovascular anomalies. Atrial septal and ventricular septal defects were the next most frequent anomalies identified in Māori babies.

#### Distribution and Trends for Māori Children and Young People

<table>
<thead>
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<tr>
<td>Overweight and Obesity (Page 51)</td>
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</table>

- In the 2006/07 New Zealand Health Survey (2006/07 NZHS), mean BMI for Māori children aged 2–14 years (19.4, 95% CI 19.1–19.6) was significantly higher than for non-Māori children (18.5, 95% CI 18.4–18.6). There were however, no significant differences in mean BMI between Māori boys and Māori girls.
- The proportion of Māori children who were overweight (25.8%, 95% CI 22.7–28.9) was significantly higher than for non-Māori children (19.5%, 95% CI 17.4–21.6), as was the proportion of Māori children who were obese (Māori 11.9%, 95% CI 10.0–13.8; non-Māori 7.3%, 95% CI 6.1–8.5).

#### Nutrition (Page 56)

- In the 2006/07 NZHS, when age standardised rates for Māori children aged 2–14 years were compared with those of non-Māori children, the following differences emerged:
  - **Breakfast at Home**: The proportion of Māori children who had eaten breakfast at home every day in the previous week (83.6%, 95% CI 81.2%–86.0%) was significantly lower than for non-Māori children (89.2%, 95% CI 87.8–90.5).
  - **Fizzy Drinks**: The proportion of Māori children who had consumed 3 or more fizzy drinks in the previous week (24.7%, 95% CI 21.6–27.9) was significantly higher than for non-Māori children (17.9%, 95% CI 16.1–19.7)
  - **Takeaways / Fast Food**: The proportion of Māori children who had consumed takeaways / fast food three or more times in the previous week (10.1%, 95% CI 8.3–12.0) was significantly higher than for non-Māori children (6.3%, 95% CI 5.1–7.5).

#### Physical Activity (Page 62)

- **Travel to School by Active Means**: In the 2006/07 NZHS, private cars, followed by walking, were the most common ways for children to get to school. Use of active transport for Māori boys was significantly higher than for the total population, while for girls differences did not reach statistical significance. Barriers preventing Māori children using active transport to travel to school included distances being too far, traffic being too busy, it being too dangerous and time constraints. There were no significant differences between Māori and non-Māori children in the barriers cited by parents to their children travelling to school by active means.
- **Television Viewing**: In the 2006/07 NZHS, the proportion of Māori children 5–14 years who watched 2+ hours of television per day (76.1%, 95% CI 72.9–79.3) was significantly higher than for non-Māori children (60.5%, 95% CI 57.9–63.0).

#### Conditions Detectable by Antenatal and Neonatal Screening

- During 2005–2009, on average 84 Māori babies each year were born with one or more cardiovascular anomalies evident at birth, equating to around 0.6% of all Māori births.
- The proportion of Māori babies born with one or more cardiovascular anomalies was significantly different (RR 0.91, 95% CI 0.81–1.01) from that of non-Māori non-Pacific babies.
- Patent ductus arteriosus (PDA) was the most frequent cardiovascular anomaly identified in Māori babies, with 58.6% of PDAs being in preterm babies (<37 weeks gestation) who had no other cardiovascular anomalies. Atrial septal and ventricular septal defects were the next most frequent anomalies identified in Māori babies.
### Antenatal and Neonatal Screening

<table>
<thead>
<tr>
<th>Stream</th>
<th>Indicator</th>
<th>Distribution and Trends for Māori Children and Young People</th>
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</thead>
</table>
|        | Down Syndrome (Page 80) | - During 2005–2009, Down Syndrome was the most frequent chromosomal anomaly identified at birth in Māori babies, accounting for 68.8% of chromosomal anomalies identified during this period.  
- On average, 9 Māori babies each year had Down Syndrome evident at birth, with the proportion of Māori babies with Down Syndrome not being significantly different (RR 0.75, 95% CI 0.54–1.04) from that of non-Māori non-Pacific babies. |
|        | Neural Tube Defects (Page 83) | - During 2005–2009, on average 6 Māori babies each year had one or more neural tube defects (NTDs) evident at birth.  
- The proportion of Māori babies with NTDs was significantly higher (RR 2.65, 95% CI 1.64–4.29) than for non-Māori non-Pacific babies. |
|        | Cystic Fibrosis (Page 86) | - During 2005–2009, 35 individual Māori children and/or young people were admitted to hospital with cystic fibrosis listed in any of the first 15 diagnoses, with these children and young people averaging 1.90 admissions per year.  
- Admission rates per 100,000 population were significantly lower (RR 0.39, 95% CI 0.35–0.44) than for non-Māori non-Pacific children and young people. |

### Other Disabilities

<table>
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<tr>
<th>Stream</th>
<th>Indicator</th>
<th>Distribution and Trends for Māori Children and Young People</th>
</tr>
</thead>
</table>
|        | Developmental Delays and Intellectual Disabilities (Page 93) | - During 2005–2009, 789 individual Māori children and/or young people were admitted to hospital with a developmental delay listed in any of the first 15 diagnoses, with these children and young people averaging 0.34 admissions per year.  
- Admission rates per 100,000 population (RR 1.06, 95% CI 1.00–1.13) were similar to those of non-Māori non-Pacific children and young people.  
- During the same period, 332 individual Māori children and/or young people were admitted to hospital with an intellectual disability listed in any of the first 15 diagnoses, with these children and young people averaging 0.37 admissions per year.  
- Admission rates per 100,000 population were significantly higher (RR 1.40, 95% CI 1.28–1.54) than for non-Māori non-Pacific children and young people. |
|        | Cerebral Palsy (Page 97) | - During 2005–2009, 361 individual Māori children and/or young people were admitted to hospital with cerebral palsy listed in any of the first 15 diagnoses, with these children and young people averaging 0.67 admissions per year.  
- Admission rates per 100,000 population (RR 1.03, 95% CI 0.96–1.09) were similar to those of non-Māori non-Pacific children and young people. |
|        | Autism and Other Pervasive Developmental Disorders (Page 101) | - During 2005–2009, 187 individual Māori children and/or young people were admitted to hospital with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses, with these children and young people averaging 0.36 admissions per year.  
- Admission rates per 100,000 population (RR 0.60, 95% CI 0.54–0.68) were significantly lower than for non-Māori non-Pacific children and young people during this period. |

### Children’s Social Health Monitor

<table>
<thead>
<tr>
<th>Stream</th>
<th>Indicator</th>
<th>Distribution and Trends for Māori Children and Young People</th>
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<tbody>
<tr>
<td></td>
<td>Gross Domestic Product (GDP) (Page 111)</td>
<td>- In New Zealand, GDP decreased for 5 consecutive quarters from March 2008–March 2009. GDP has since increased for five consecutive quarters, with economic activity being up 0.2% in the June 2010 quarter, following a 0.5% increase in the March 2010 quarter.</td>
</tr>
</tbody>
</table>
Introduction and Overview

- **Stream**: Children's Social Health Monitor: Economic Indicators

<table>
<thead>
<tr>
<th>Stream</th>
<th>Indicator</th>
<th>Distribution and Trends for Māori Children and Young People</th>
</tr>
</thead>
</table>
|        | Income Inequality (Page 113) | - In New Zealand during 1984–2009 income inequality, as measured by the P80/P20 ratio and Gini coefficient, was higher after adjusting for housing costs.  
- The most rapid rises in income inequality occurred between the late 1980s and early 1990s. During the early-mid 2000s however, income inequality declined, a change Perry attributes largely to the Working for Families package.  
- Rises in income inequality were again evident between 2007 and 2009, although another year’s data may be required before it is possible to determine whether this is the beginning of an upward trend, or just a statistical fluctuation. |
|        | Child Poverty (Page 116) | - In the NZ Household Economic Survey (NZHES) via Perry [97], only limited analysis by ethnicity was reported because of the relatively small sample sizes for Māori, Pacific and Other ethnic groups. While no time series data is available, Perry notes that poverty rates for Māori children were consistently higher than for European children.  
- In 2009, (after housing cost 60% fixed line measure), around one in three Māori children lived in poor households, as compared to one in six European children (i.e. rates were double those of European children).  
- Perry notes that the higher poverty rates seen in Māori children most likely reflect the relatively high proportion of Māori children living in sole parent beneficiary households (in June 2009, 43% of DPB recipients were Māori). |
|        | Living Standards (Page 119) | - In the 2008 Living Standards Survey 39% of Māori children aged 0–17 years scored four or more on the composite deprivation index, which measured a range of "enforced lacks".  
- When broken down by individual item, those children who scored four or more on the composite deprivation index had much higher exposures to household economising behaviours such as having to wear worn out shoes or clothing, sharing a bed or bedroom, cutting back on fresh fruit and vegetables and postponing doctors visits because of cost. |
|        | Unemployment Rates (Page 120) | - In New Zealand during 2007(Q4)–2010(Q3) unemployment rates were consistently higher for Māori and Pacific peoples than for Asian and European people.  
- While unemployment rates increased for all ethnic groups, absolute increases were greatest for Māori and Pacific people.  
- In 2010(Q3), unemployment rates were 13.4% for Māori, 13.8% for Pacific, 8.2% for Asian and 4.7% for European people. |
|        | Children Reliant on Benefit Recipients (Page 125) | - In New Zealand, the proportion of children aged 0–18 years reliant on a benefit, or benefit recipient, fell from 24.9% in April 2000, to 17.3% in April 2008, before increasing again to 19.7% in April 2010.  
- The proportion of children reliant on unemployment benefit recipients fell from 4.5% of children in 2000, to 0.5% in April 2008, before increasing again to 1.4% in April 2010. The proportion of children reliant on DPB recipients also fell from 17.2% in April 2000, to 13.6% in April 2008, before increasing again to 15.1% in April 2010.  
- While ethnic specific rates were not able to be calculated due to data limitations, it is likely that a significant proportion of the increases seen during the past two years will have been amongst Māori children. |
### Hospital Admissions and Mortality with a Social Gradient (Page 131)

- During 2005–2009, bronchiolitis, asthma and skin infections made the largest individual contributions to hospitalisations for medical conditions with a social gradient in Māori children, although infectious and respiratory diseases collectively were responsible for most admissions. Similarly falls, followed by inanimate mechanical forces (e.g. struck by / caught between), were the leading causes of injury admissions with a social gradient, although transport accidents also made a significant contribution.
- During 2003–2007, SUDI was the leading cause of mortality with a social gradient in Māori children, with vehicle occupant related deaths making the second largest contribution, followed by pedestrian injuries.
- During 2005–2009, hospital admissions for medical conditions with a social gradient were significantly higher for Māori (RR 1.75 95% CI 1.73–1.76) than for non-Māori non-Pacific children, as were injury admissions with a social gradient (Māori RR 1.23 95% CI 1.20–1.25) during this period.
- Hospital admissions for medical conditions with a social gradient in non-Māori non-Pacific children gradually declined during the mid-late 2000s, but increased again (slightly) after 2007. In contrast admissions for Māori children remained relatively static during the mid-2000s, but increased rapidly after 2007.

### Infant Mortality (Page 141)

- During 2003–2007, on average 55 Māori babies each year died in the neonatal period, while a further 67 died in the post-natal period.
- During this period, neonatal mortality rates for Māori babies were not significantly different (RR 1.16, 95% CI 1.00–1.34) from those of non-Māori non-Pacific babies, although post-neonatal mortality rates were significantly higher (RR 3.00, 95% CI 2.54–3.55).
- When cause of death was considered, on average 39 Māori babies each year died from SUDI (neonatal and post-neonatal combined), with rates for Māori babies being significantly higher (RR 5.35, 95% CI 4.11–6.96) than for non-Māori non-Pacific babies during this period.

### Injuries Arising from the Assault, Neglect or Maltreatment of Children (Page 145)

- During 2005–2009, there were on average 81.6 hospital admissions per year for injuries arising from the assault, neglect or maltreatment of Māori children, with admission rates for Māori children being significantly higher (RR 3.41, 95% CI 2.95–3.94) than for non-Māori non-Pacific children.
CHILDREN AND YOUNG PEOPLE WITH CHRONIC CONDITIONS AND DISABILITIES
**VIEWPOINT: THE HEALTH OF MĀORI CHILDREN AND YOUNG PEOPLE WITH CHRONIC CONDITIONS AND DISABILITIES**

**Dr. Joanne Baxter and Dr. Emma Wyeth**

This Section provides an analysis of data for Disabilities and Chronic conditions among Māori children and young people. The importance of disability and chronic conditions as priority health issues for Māori children and youth is evident.

It is useful to place the findings described in this section in the context of findings for Māori children (aged under 15 years) from the 2006 New Zealand Disability Survey [5]. In 2006, 14% of children living in households had a disability and nearly one third of these children were Māori. Approximately 14% (28,000) of Māori children aged 0–14 years were reported to have a disability - 49% of whom had more than one type of disability [5]. Inequalities were evident in the survey and 17% of Māori boys and 12% of Māori girls in this age group were disabled, compared to 11% and 8% of non-Māori, respectively [6].

Special education disability and a chronic condition or health problem were the most common disability types for Māori children, with an estimated 10,800 (5%) and 10,400 (5%) of all Māori children having these disability types. Psychiatric / psychological disability, speaking disability, and hearing disability were the next most common disability types for Māori children aged under 15 years [6].

This section presents disability and chronic conditions in three groups:

(i) Congenital Anomalies Evident at Birth
(ii) Intellectual Disabilities, Development Delay, Cerebral Palsy and Autism
(iii) Selected Chronic Conditions

The sources of data for the analyses are hospitalisation data, cancer registrations and some mortality data. Limitations in the analyses include a lack of data for some conditions including injury-related disability, sensory disability and chronic mental health issues. For these conditions, additional sources of data are needed. It is also difficult from these analyses to determine the severity of the conditions described and the impact that they have on individuals and whānau. Although not comprehensive across all disability areas, this section nevertheless does provide a valuable picture of the nature and extent of disability and chronic conditions experienced by Māori children and young people.

The following describes key findings from this section and discusses relevant issues including inequalities, opportunities for prevention, issues for services and gaps in information and data.

**Down Syndrome, Neural Tube Defects and Cystic Fibrosis**

The analyses comprising Congenital anomalies evident at birth involves hospitalisations for specific conditions that are detected around the time of birth and are recorded as part of the hospitalisation associated with birth or very close to birth. From 2005 to 2009, an average of 646 Māori babies were born with one or more congenital anomalies in each year. This equates to almost one in twenty Māori babies (4.9%) with one anomaly or more evident at birth over this time. The rate for Māori was statistically significantly (albeit slightly) lower than for non-Māori non-Pacific babies (RR 0.93, 95% CI 0.89–0.96).

A diverse range of anomalies evident at birth was found in Māori babies. The findings show a range from more minor anomalies to those that are severe and may be life threatening or associated with significant ongoing health impacts (such as some of the circulatory system or neural tube defects). For Māori babies the most common anomalies were musculoskeletal, with foot related anomalies occurring in just under 1% of Māori babies. It is likely that many of these foot anomalies are talipes (clubfoot), which has been
found to have higher rates among some Māori families where genetic factors have been recognised in the aetiology of clubfoot [7].

Analysis of inequalities for some anomalies and conditions evident at birth (cardiovascular anomalies, Down Syndrome, cystic fibrosis) indicate lower rates among Māori babies, when compared with non-Māori non-Pacific babies, although these differences were not found to be statistically significant. Both cardiovascular anomalies and Down Syndrome are associated with more advanced maternal age and this is likely to be a contributing factor to the trend of lower observed hospitalisation rates among Māori for these and other conditions associated with higher maternal age. Cystic fibrosis has strong genetic and familial risks, which are recognised as being higher among those of European ethnicity.

One exception to the picture of lower or similar rates between Māori and non-Māori non-Pacific babies are neural tube defects with rates among Māori babies found to be significantly higher than those of non-Māori non-Pacific babies (RR 2.65, 95% CI 1.64–4.29). Neural tube defects are associated with younger maternal age and with increasing deprivation. There has been much research emphasising the importance of folate around conception and early pregnancy as a preventive measure for neural tube defects [8]. The findings in this report reinforce the ongoing consideration being given to support folate supplementation during conception and early pregnancy. From a health inequalities perspective there seems real potential for measures such as folate fortification of bread in reducing inequalities.

Developmental Delays and Intellectual Disabilities, Cerebral Palsy, Autism and Other Pervasive Developmental Disorders

The 2006 Disability Survey found around 5% of Māori children under the age of 15 years had a Special Education disability with these disabilities associated with a number of other health and wellbeing needs alongside a need for educational and carer support.

Findings in this report are provided for hospital admission for those with diagnosis of developmental delay (which was associated with hospitalisation among younger Māori children), and with intellectual disability (associated with hospitalisation in later childhood and in youth). Over 2005–2009, a total of 789 individual Māori children were admitted with developmental delay and 332 with intellectual disability in any of the first 15 diagnoses. Additional analyses looking at the reasons for admission highlight the broader range of health issues experienced by children and young people with developmental delay and intellectual disabilities, for example, oral health and epilepsy were the two most common reasons for admission for children with intellectual disabilities.

With regards to ethnic differences, the picture is mixed. Whereas Māori rates were found to be similar to non-Māori non-Pacific rates for developmental delay and cerebral palsy, they were lower for autism and higher for intellectual disability.

Analyses highlighted the high levels of multiple health issues impacting on babies and children with Down Syndrome including heart defects. These findings reinforce the importance of high quality and accessible support and services for children and young people with Down Syndrome and their whānau as carers.

As there is no routine information held on the prevalence of autistic spectrum disorders (ASD), it remains difficult to interpret the very low relative rates of hospitalisation. It is uncertain whether they reflect lower levels within the community or whether they reflect lower utilisation of hospital services by Māori with autism and related disorders. Although little is known about the epidemiology of ASD among Māori, the significant role of whānau support, the importance of adequate health and education services and the valuing of culturally appropriate services and approaches have been recognised as important for Māori children with ASD [9].

Rheumatic Fever, Bronchiectasis, Diabetes, Epilepsy and Cancer

During 2005–2009, 416 Māori children and young people were admitted to hospital for acute rheumatic fever and 231 for chronic rheumatic heart disease. Alarmingly, large
inequalities between Māori and non-Māori non-Pacific children and young people are found (Acute Rheumatic Fever RR 23.0, 95% CI 18.2–29.1 and Chronic Rheumatic Heart Disease RR 7.59, 95% CI 6.39–9.03). Of further concern when rates across time are presented (Figure 1), there appears to be an increasing rate of hospitalisation for both acute and chronic rheumatic disease among Māori but not among non-Māori non-Pacific children and youth. This is a worrying finding, indicating an increase in inequalities. This finding requires further consideration and monitoring and reinforces ongoing calls for effective measures for prevention (both primary and secondary) [10]. In addition, the very strong relationship between hospitalisation for acute rheumatic fever and high deprivation reinforces the continued need to address childhood poverty and ethnic inequalities in unemployment and economic outcomes.

Bronchiectasis is a serious respiratory disease associated with increased risk of recurrent respiratory infections and serious respiratory disability. Bronchiectasis has a strong socioeconomic gradient and is associated with significant ethnic inequalities [11]. The findings in this report are entirely consistent with concerns regarding bronchiectasis and 173 Māori children and young people were hospitalised with bronchiectasis (as any of the first 15 diagnoses, excluding cystic fibrosis). As with acute rheumatic fever, there are significant inequalities with non-Māori non-Pacific children and young people (RR 5.40, 95% CI 4.84–6.02). For bronchiectasis also, there appears to be an increase in hospitalisation rates for Māori over the 2000–2009 time period (Figure 3).

Findings for diabetes show Māori children and young people have lower rates of Insulin Dependent Diabetes (Type I) than non-Māori non-Pacific counterparts (RR 0.66, 95% CI 0.62–0.70), but higher rates of Non-Insulin Dependent Diabetes (NIDDM or Type II) (RR 1.80, 95% CI 1.59–2.04). These NIDDM hospitalisations occurred mainly in older adolescents and young adults and provide a concerning picture of early Type II diabetes occurring in young Māori. As with rheumatic fever and bronchiectasis, there is a strong potential for prevention with regards to Type II diabetes.

Epilepsy hospitalisations during 2005–2009 occurred in 1,029 Māori children and young people with rates higher in Māori than in non-Māori non-Pacific children and young people (RR 1.25, 95% CI 1.19–1.31). These data do not include the cause for epilepsy and a review of epilepsy among young Māori would be important in determining opportunities for prevention and also approaches to care and support. As with other conditions in this section, epilepsy has a significant impact on the lives of children, young people and their whānau. Again, access to affordable and high quality health care and support services is crucial for quality of life and to prevent negative outcomes such as injury and cognitive impairment.

Cancer data is reported for registrations (i.e. at the point of diagnosis) and deaths. The data reflect a range of cancers experienced by Māori children and young people including Leukaemia, Lymphoma, Cancer of Cervix, Testis, Brain and Bone. Carcinoma in situ of the cervix was the most common reason for cancer registration for young Māori women with 438 notifications from 2003–2007, although in reality these notifications are not for cancers but rather pre-cancers, which have been included as, for historical reasons, they are notified to the NZ Cancer Registry. Unexpectedly however, the rates are lower for Māori than for non-Māori young women (RR 0.86, 95% CI 0.78–0.95). This does not reflect the significantly higher rates of mortality for cancer of the cervix found in Māori adult women, when compared with non-Māori.

Health and Education Services

There are clearly significant implications for whānau and services in terms of how best to meet the needs of Māori children and young people with disabilities or chronic health conditions. The 2006 New Zealand Disability Survey again provides valuable information about the use of services by Māori with disabilities. Previous work has shown that inequalities exist for Māori, compared to non-Māori, when it comes to disability support and access to related services [12]. The 2006 New Zealand Disability Survey also includes a number of questions relating to support needs and types of services accessed, with 41%
of all disabled Māori living in households reporting low support needs, 45% reporting medium support needs and 14% reporting high support needs. The rates for low and high support needs were higher than for the disabled non-Māori population and there were higher rates of disabled Māori reporting high support needs compared to disabled non-Māori across the majority of age groups [6].

Parents and caregivers of 10% of Māori disabled children reported needing help with their child’s personal care or household tasks, in the previous 12 months. Parents and caregivers of 4% of Māori disabled children had an unmet need for help with their child’s personal care and 3% reported an unmet need for help with household tasks. Nine percent of disabled Māori children had a reported unmet need for special equipment or technology, compared to 5% of disabled non-Māori children. Approximately 16% of disabled Māori children were using special equipment or technology for assistance with various tasks such as hearing, moving about, seeing, speaking and communicating [6].

Disabled Māori access various health services. In particular, the most common service accessed within the 12 months prior to the Survey was a general practitioner or family doctor, with 86% disabled Māori children accessing such a service – the same rate for disabled non-Māori children. A chemist or pharmacist (for health advice or getting medication only) and a dentist or dental nurse were the next most commonly accessed services by disabled Māori children (67% each compared to 61% and 74%, respectively, for disabled non-Māori children) [6].

At the time just prior to the 2006 New Zealand Disability Survey, 75% of disabled Māori children aged 0–5 years were enrolled in at least one type of early childhood education service (compared to 72% of disabled non-Māori in the same age group). Ninety-nine percent of disabled Māori children aged 5–14 years were enrolled in at least one type of school or other education service (the same as disabled non-Māori children in this age group). Primary or intermediate schools made up the majority of these enrolments (75%), with the remainder enrolled in a secondary school (16%), an area or composite school (9%), a kura kaupapa Māori (5%) and 6% enrolled in ‘other’ types of education. Eighty-four percent of disabled Māori in this latter age group were attending only mainstream classes, with a further 10% attending both a mainstream and a special unit. Approximately 23% of disabled Māori children (aged 0–14 years) were receiving special education support because of a long-term condition or health problem and an estimated 16% had an Individual Education Programme (IEP) or Individual Programme (IP) because of a learning or developmental difficulty (compared to 25% and 23%, respectively for disabled non-Māori children). Forty-three percent of disabled Māori aged 15–24 years old were enrolled in formal education or training, the same rate as for their non-Māori counterparts.

Discussion

Disability and Chronic Conditions encompass a range of conditions impacting on many Māori children, young people and their whānau. This section provides data from across a diverse range of conditions and many issues are raised in relation to the health of Māori babies, children and young people.

For some of these conditions inequalities were evident when compared with those for non-Māori non-Pacific children and young people. Acute rheumatic fever, chronic rheumatic heart disease, bronchiectasis and Type 2 diabetes have alarmingly high relative rates of hospitalisation among Māori. These findings are consistent with other analyses and the need to address childhood poverty and deprivation alongside preventive measures and accessible and effective care are all needed. The higher rates of neural tube defects among Māori babies have been less well described and require further analysis and the role of prevention explored.

Other conditions described in this section show lower rates among Māori. For some of these there is sufficient understanding to interpret these differences (e.g. those conditions

2 Attending primary or secondary school, polytechnic or university, or some other kind of recognised educational institution or training courses are included in this definition.
associated with higher maternal age). For other areas (e.g. Autism) there remains insufficient information to determine whether this relates to service use or to prevalence in the population. This analysis does highlight some important areas where more understanding among Māori children and young people is required, in order to determine needs, identify areas for prevention and ensure effective services.

The lower rates of notification of carcinoma *in situ* of the cervix among young Māori women are also an important area where further understanding is required. Does this reflect lower rates of pre-cancers or lower rates of detection? This is an urgent issue to consider.

These findings suggest a high level of support needs and service use by Māori children and young people with disabilities. It highlights the importance of primary care as a source of health care, the role of the education sector and the need to ensure full access to education and health support services. The role of whānau in providing support for children and young people with disabilities and chronic conditions is also evident. The importance of acknowledging and supporting whānau as carers is recognised as a crucial component to ensuring outcomes for young Māori with disabilities and chronic conditions [13], [14].

**Conclusion**

Overall the analyses of disabilities and chronic conditions among Māori children and young people strongly indicate the importance of:

1. Effective preventive measures including during pregnancy and childbirth
2. Early detection, and accessible, timely and quality treatment of conditions
3. The provision of accessible and affordable long-term support and care
4. The effectiveness of support from a range of sectors (health, disability support, education and employment)

The findings also highlight a number of areas where more information is required in order to better understand and meet the needs of Māori children and young people.

Many of these disabilities and conditions have an association with social and economic position. At a time of economic recession and significant ethnic inequalities in education levels, unemployment and income, the current and future health and disability impacts of childhood poverty must be recognised and strongly mitigated against.
CHRONIC MEDICAL CONDITIONS
RHEUMATIC FEVER

Introduction
The following section uses the National Minimum Dataset to review hospital admissions for Māori children and young people with acute rheumatic fever or chronic rheumatic heart disease listed in any of the first 15 diagnoses.

Background
Acute rheumatic fever is a delayed inflammatory reaction which develops in response to a group A streptococcal throat infection. It usually occurs in school-age children and may affect the brain, heart, joints, skin or subcutaneous tissue [15]. Recurrent episodes of rheumatic fever may result in the development of rheumatic heart disease, a progressive condition leading to damage, scarring and deformities of the heart valves and chordae tendineae [15].

In New Zealand, acute rheumatic fever and rheumatic heart disease are a significant cause of morbidity amongst Māori children and young people, with one review of acute rheumatic fever hospitalisations during 1996–2005 finding that admission rates for Māori were 10.0 (95% CI 1.7–58.3) times higher than for European / Other peoples. In this cohort, Māori accounted for almost 50% of the total number of cases seen [16]. Risk factors for rheumatic fever include age (school age children), socioeconomic disadvantage and overcrowding [17]. Primary prevention focuses on the adequate treatment of streptococcal throat infections, while secondary prevention aims to ensure that those previously diagnosed with rheumatic fever receive monthly antibiotic prophylaxis, either for 10 years from their first diagnosis or until 21 years of age, to prevent sequelae [17].

Distribution in Māori Children and Young People

Admission Rates and Annual Admissions per Individual

Acute Rheumatic Fever: In New Zealand during 2005–2009, a total of 416 individual Māori children and/or young people were admitted to hospital with acute rheumatic fever listed in any of the first 15 diagnoses, with these children and young people averaging 0.28 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 23.0 95% CI 18.2–29.1) were significantly higher than for non-Māori non-Pacific children and young people during this period (Table 2). Similar differences were seen during 2000–2009 (Figure 1).

Chronic Rheumatic Heart Disease: Similarly, during 2005–2009, a total of 231 individual Māori children and/or young people were admitted to hospital with chronic rheumatic heart disease listed in any of the first 15 diagnoses, with these children and young people averaging 0.38 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 7.59 95% CI 6.39–9.03) were also significantly higher than for non-Māori non-Pacific children and young people (Table 2). Similar differences were also seen during 2000–2009 (Figure 1).

Distribution by Age

In New Zealand during 2005–2009, hospital admissions for Māori children and young people with acute rheumatic fever were infrequent during the pre-school years, but increased rapidly during middle childhood, to reach a peak at 11 years of age, before declining again. While admissions for those with chronic rheumatic heart disease also increased during middle childhood and then declined, another peak in admissions was evident amongst those in their early twenties. The reason for a small peak in chronic rheumatic heart disease admissions in those less than one year is unclear (Figure 2).
Table 2. Hospital Admissions for Children and Young People Aged 0–24 Years with Acute Rheumatic Fever and Chronic Rheumatic Heart Disease by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acute Rheumatic Fever</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>416</td>
<td>581</td>
<td>0.28</td>
<td>34.81</td>
<td>23.0</td>
<td>18.2–29.1</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>62</td>
<td>79</td>
<td>0.25</td>
<td>1.52</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td><strong>Chronic Rheumatic Heart Disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>231</td>
<td>440</td>
<td>0.38</td>
<td>26.37</td>
<td>7.59</td>
<td>6.39–9.03</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>131</td>
<td>181</td>
<td>0.28</td>
<td>3.47</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Acute Rheumatic Fever or Chronic Rheumatic Heart Disease listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

Figure 1. Hospital Admissions for Children and Young People Aged 0–24 Years with Acute Rheumatic Fever or Chronic Rheumatic Heart Disease by Ethnicity, New Zealand 2000–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Acute Rheumatic Fever or Chronic Rheumatic Heart Disease listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.
Figure 2. Hospital Admissions for Māori Children and Young People with Acute Rheumatic Fever or Chronic Rheumatic Heart Disease by Age, New Zealand 2005–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Acute Rheumatic Fever or Chronic Rheumatic Heart Disease listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Rheumatic Fever in the New Zealand child and youth population is available from the *Health of Pacific Children and Young People with Chronic Conditions and Disabilities in New Zealand* [18]. In brief, this report found:

**Distribution by Primary Diagnosis**

**Acute Rheumatic Fever**: In New Zealand during 2005–2009, the majority (89.4%) of admissions for those with acute rheumatic fever (i.e. acute rheumatic fever listed in any of the first 15 diagnoses), had acute rheumatic fever listed as their primary diagnosis (rheumatic fever with heart involvement (48.8%), rheumatic fever without mention of heart involvement (33.2%), or rheumatic chorea (7.4%)). A further 10.6% had other conditions listed as the primary diagnosis (with a small proportion of these admissions being primarily for chronic rheumatic heart disease).

**Chronic Rheumatic Heart Disease**: Similarly, 39.0% of admissions for children and young people with chronic rheumatic heart disease (i.e. chronic rheumatic heart disease listed in any of the first 15 diagnoses), had chronic rheumatic heart disease listed as their primary diagnosis. A further 11.9% had acute rheumatic fever listed as their primary diagnosis and while this raises the possibility of an acute exacerbation of rheumatic fever, being superimposed on pre-existing rheumatic heart disease, this is difficult to conclusively prove from the data used. A further 11.0% had other cardiac conditions such as endocarditis and heart failure listed as the primary diagnosis and again, while these conditions may potentially reflect complications of rheumatic heart disease, the causal links are difficult to determine conclusively from the data used. In addition, a significant minority (11.8%) of those with chronic rheumatic heart disease were admitted for issues associated with pregnancy and childbirth.
**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2005–2009, hospital admissions for those with acute rheumatic fever were significantly higher for males and those living in average-more deprived (NZDep decile 5–10) areas. While gender differences were not evident in hospital admissions for those with chronic rheumatic heart disease, admission rates were also significantly higher for those in average-more deprived (NZDep decile 3–4 and 6–10) areas.

**Summary**

In New Zealand during 2005–2009, 416 individual Māori children and/or young people were admitted to hospital with acute rheumatic fever listed in any of the first 15 diagnoses, with these individual children and young people averaging 0.28 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 23.0 95% CI 18.2–29.1) were significantly higher than for non-Māori non-Pacific children and young people during this period. Similarly, during 2005–2009, 231 individual Māori children and/or young people were admitted to hospital with chronic rheumatic heart disease listed in any of the first 15 diagnoses, with these individual children and young people averaging 0.38 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 7.59 95% CI 6.39–9.03) were also significantly higher than for non-Māori non-Pacific children and young people.

**Data Source and Methods**

**Definition**

1. Hospital Admissions for Children and Young People with Acute Rheumatic Fever or Chronic Rheumatic Heart Disease listed in any of the first 15 diagnoses.

**Data Source**

1. National Minimum Dataset

**Numerator**: Hospital Admissions for Children and Young People Aged 0–24 Years with Acute Rheumatic Fever (ICD-10-AM I00–I02) or Chronic Rheumatic Heart Disease (ICD-10-AM I05–I09) listed in any of the first 15 diagnoses.

**Denominator**: Statistics New Zealand Estimated Resident Population

**Notes on Interpretation**

Unless otherwise specified, this analysis focuses on hospital admissions for children and young people with either acute rheumatic fever or chronic rheumatic heart disease listed in any of the first 15 diagnoses (rather than on the subset of admissions where these diagnoses were listed only as the primary diagnosis). The rationale for this wider focus was the fact that many children and young people with chronic rheumatic heart disease will not be hospitalised for their heart disease per se, but rather for one of its resulting complications. For example, during 2005–2009, only 39.0% of hospitalisations for children and young people with chronic rheumatic heart disease had this listed as the primary diagnosis, with 11.8% being admitted for pregnancy and childbirth, and 11.0% for other cardiovascular diagnoses. If no mention of acute rheumatic fever or chronic rheumatic heart disease was made in any of the first 15 diagnoses, these cases were excluded (even if the patient had been assigned a rheumatic fever related code on a previous admission).

**Indicator Category** Proxy B
Introduction
The following section uses the National Minimum Dataset to review hospital admissions for Māori children and young people with bronchiectasis listed in any of the first 15 diagnoses (Note: children and young people with cystic fibrosis as a cause of their bronchiectasis have been excluded from this analysis; for rationale see Methods below).

Background
The term bronchiectasis originates from Greek, literally meaning ‘stretching of the windpipe’. Bronchiectasis is usually a progressive disease characterised by bronchial dilatation, with or without associated damage to the bronchial wall and lung parenchyma, and is usually accompanied by pus in the bronchial lumen. Clinically, bronchiectasis results in a persistent wet cough, with purulent sputum production in the older child and recurrent respiratory exacerbations [19]. The symptoms result in significant morbidity, with lost school days and multiple absences from work for parents of affected children. Children with extensive bronchiectasis also have a reduced exercise capacity and may have slower growth [19]. Continued problems with untreated or extensive disease may progress to respiratory failure and premature death [20].

In New Zealand bronchiectasis is a disproportionate cause of morbidity for Māori children and young people, with one study reviewing new cases of bronchiectasis in children (0–14 years) during 2001–2002 finding incidence rates of 4.8 per 100,000 for Māori children, as compared to 1.5 per 100,000 for European children. In this study, Māori children accounted for 30% of the new cases identified [21]. Bronchiectasis also has a marked socioeconomic gradient, with 67% of children in another New Zealand study living in NZDep2001 decile 8–10 areas (the most deprived 30% of areas) and 58% living in households where one or more family members smoked [22]. Yet despite recent advances in diagnosis, the aetiology of bronchiectasis often remains unclear, with 50% of paediatric cases in the former New Zealand study having an unknown aetiology (although 37% had a history of recurrent lower respiratory infection and a further 25% were presumed secondary to severe pneumonia [22]).

Distribution in Māori Children and Young People
Admission Rates and Annual Admissions per Individual

In New Zealand during 2005–2009, a total of 173 individual Māori children and/or young people were admitted to hospital with bronchiectasis listed in any of the first 15 diagnoses, with these children and young people averaging 1.01 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 5.40 95% CI 4.84–6.02) were significantly higher than for non-Māori non-Pacific children and young people during this period (Table 3). Similar differences were seen during 2000–2009 (Figure 3).

Table 3. Hospital Admissions for Children and Young People Aged 0–24 Years with Bronchiectasis by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchiectasis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>173</td>
<td>871</td>
<td>1.01</td>
<td>52.19</td>
<td>5.40</td>
<td>4.84–6.02</td>
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<tr>
<td>non-Māori non-Pacific</td>
<td>162</td>
<td>504</td>
<td>0.62</td>
<td>9.67</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Hospital Admissions for Children and Young People Aged 0–24 Years with Bronchiectasis by Ethnicity, New Zealand 2000–2009


Figure 4. Hospital Admissions for Māori Children and Young People Aged 0–24 Years with Bronchiectasis by Age, New Zealand 2005–2009

**Distribution by Age**

In New Zealand during 2005–2009, hospital admissions for Māori children and young people with bronchiectasis (with the exception of the first year) were relatively constant across childhood, but tapered off gradually after 16 years of age (Figure 4).

**New Zealand Level Distribution and Risk Factors**

Additional information on the distribution of Bronchiectasis in the New Zealand child and youth population is available from *the Health of Pacific Children and Young People with Chronic Conditions and Disabilities in New Zealand* [18]. In brief, this report found:

**Distribution by Primary Diagnosis**

In New Zealand during 2005–2009, 55.4% of hospital admissions for children and young people with bronchiectasis (i.e. bronchiectasis listed in any of the first 15 diagnoses), had bronchiectasis listed as the primary diagnosis. A further 11.5% had agranulocytosis or immune deficiencies listed as the primary diagnosis, while 19.8% had pneumonia or other diseases of the respiratory system listed as the primary reason for admission.

**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2005–2009, while gender differences were not evident, hospital admissions for those with bronchiectasis were significantly higher for those in average-more deprived (NZDep decile 5–10) areas.

**Summary**

In New Zealand during 2005–2009, 173 individual Māori children and/or young people were admitted to hospital with bronchiectasis listed in any of the first 15 diagnoses, with these children and young people averaging 1.01 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 5.40 95% CI 4.84–6.02) were significantly higher than for non-Māori non-Pacific children and young people during this period.

**Data Source and Methods**

**Definition**

1. Hospital Admissions for Children and Young People with (non-Cystic Fibrosis) Bronchiectasis

**Data Source**

1. National Minimum Dataset

Numerator: Hospital Admissions for Children and Young People Aged 0–24 Years with Bronchiectasis (ICD-10-AM J47) in any of the first 15 diagnoses. Admissions with Cystic Fibrosis (ICD-10 E84) in any of the first 15 diagnoses were excluded.

Denominator: Statistics New Zealand Estimated Resident Population

**Notes on Interpretation**

Note 1: Unless otherwise specified, this analysis focuses on hospital admissions for children and young people with bronchiectasis listed in any of the first 15 diagnoses (rather than on the subset of admissions where bronchiectasis was listed only as the primary diagnosis). The rationale for this wider focus was the fact that many children and young people with bronchiectasis will not be hospitalised for their bronchiectasis per se, but rather for one of its predisposing conditions or resulting complications. For example, during 2005–2009, only 55.4% of hospitalisations for children and young people with bronchiectasis had bronchiectasis listed as the primary diagnosis, with 11.5% having agranulocytosis or immune deficiencies listed as the primary diagnosis, and a further 19.8% having pneumonia and/or other diseases of the respiratory system listed as the primary reason for admission. If no mention of bronchiectasis was made in any of the first
15 diagnoses, these cases were excluded (even if the patient had been assigned a bronchiectasis related code on a previous admission).

Note 2: Because children and young people with cystic fibrosis usually develop bronchiectasis over time, and because the epidemiology of cystic fibrosis (see Page 86) and non-cystic fibrosis bronchiectasis differ considerably, admissions where cystic fibrosis was mentioned in any of the first 15 diagnoses have been excluded from this analysis.

Note 3: Care must also be taken when interpreting trends in bronchiectasis admissions, as it remains unclear whether any increases seen represent an increase in the underlying burden of disease, an increase in access to hospitalisation, or an increase in the use of High Resolution CT to diagnose bronchiectasis in this population.
Introduction

The following section uses the National Minimum Dataset to review hospital admissions for Māori children and young people with any mention of diabetes in any of the first 15 diagnoses. When considering the health needs of these children and young people, it is worthwhile sub-dividing diabetes into two broad clinical categories:

Type 1 Diabetes

Type 1 diabetes is the commonest form of diabetes in children. It arises from an absolute insulin deficiency, stemming from the autoimmune destruction of beta cells in the pancreas. The risk of Type 1 diabetes increases with the presence of certain genetic markers, although recent rapid increases in incidence, coupled with a 50% discordance amongst identical twins, suggests that as yet unidentified environmental factors may moderate the genetic risk [23].

In New Zealand, the incidence of Type 1 diabetes is lower for Māori than for non-Māori children, with a review of newly diagnosed cases over a two year period during 1999–2000 finding an annual incidence of 5.6 per 100,000 for Māori children (0–14 years) as compared to 21.7 per 100,000 for non-Māori children [24]. Other risk factors identified included age (median age of diagnosis 9.5 years for males and 9.0 years for females) and family history (8.8% of cases had a first degree relative with Type I diabetes [24]). The same study also found that while the incidence of Type 1 diabetes had doubled in New Zealand during the previous three decades, the ethnic (Māori lower than European) and geographical (North Island lower than South Island) differences highlighted in previous reports had persisted [24]. Another review however found that despite a lower incidence, Māori young people who did develop Type 1 diabetes were at a greater risk of both moderate to severe hypoglycaemia, and long-term complications associated with poor metabolic control, than their European counterparts [25].

Type 2 Diabetes

Type 2 diabetes results both from insulin resistance and relative insulin deficiency (i.e. when insulin secretion is insufficient to compensate for insulin resistance). While previously known as ‘adult-onset’ diabetes, Type 2 diabetes is becoming increasingly common in childhood, with the risk of childhood onset being increased by the presence of obesity or a positive family history of Type 2 diabetes [23].

In New Zealand, the incidence of Type 2 diabetes is higher for Māori adolescents than for European adolescents, with a review of newly diagnosed cases over a two year period in 1999–2000 finding an annual incidence of 6.11 per 100,000 for Māori adolescents (10–14 years), as compared to 1.23 per 100,000 for European adolescents [24]. As with Type 1 diabetes, it appears that the incidence of Type 2 diabetes is increasing in adolescents. In one survey of Auckland adolescent diabetes clinic attendees, the authors noted that the proportion of patients with Type 2 diabetes had increased from 1.8% of all patients in 1996, to 11.0% in 2002. In this cohort, the mean age at diagnosis of Type 2 diabetes was 15 years, and the mean body mass index was 34.6 kg/m², with 85% of patients having dyslipidaemia and 28% having systolic hypertension [26].

Note on Terminology: Because the version of ICD-10-AM to which NMDS was mapped utilised the older terminology of Insulin-Dependent and Non-Insulin Dependent diabetes, these terms have been used in the sections which follow. However for most purposes, the term insulin-dependent diabetes (IDDM) in this age group can be assumed to reflect those with Type 1 diabetes, while the term non-insulin dependent diabetes (NIDDM) can be assumed to refer to those with Type 2 diabetes.
Diabetes - 32

Distribution in Māori Children and Young People

Admission Rates and Annual Admissions per Individual

**IDDM:** In New Zealand during 2005–2009, a total of 339 individual Māori children and/or young people were admitted to hospital with IDDM listed in any of the first 15 diagnoses, with these children and young people averaging 0.80 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 0.66 95% CI 0.62–0.70) were significantly lower than for non-Māori non-Pacific children and young people during this period (Table 4). Similar differences were seen during 2000–2009, with admissions for Māori children and young people increasing during this period (Figure 5).

**NIDDM:** During the same period, a total of 198 individual Māori children and/or young people were admitted to hospital with NIDDM listed in any of the first 15 diagnoses, with these children and young people averaging 0.39 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.80 95% CI 1.59–2.04) were significantly higher than for non-Māori non-Pacific children and young people during this period (Table 4). Similar differences were seen during 2000–2009 (Figure 5).

Table 4. Hospital Admissions for Children and Young People Aged 0–24 Years with Insulin Dependent and Non-Insulin Dependent Diabetes by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Māori</td>
<td>339</td>
<td>1349</td>
<td>0.80</td>
<td>80.8</td>
<td>0.66</td>
<td>0.62–0.70</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>2,308</td>
<td>6,408</td>
<td>0.56</td>
<td>122.9</td>
<td>1.00</td>
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<tr>
<td><strong>Non-Insulin Dependent Diabetes</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>198</td>
<td>382</td>
<td>0.39</td>
<td>22.9</td>
<td>1.80</td>
<td>1.59–2.04</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>281</td>
<td>663</td>
<td>0.47</td>
<td>12.7</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>


Distribution by Age

**IDDM and NIDDM:** In New Zealand during 2005–2009, hospitalisations for Māori children and young people with IDDM were relatively infrequent during the first three years of life, but increased in a stepwise fashion between 3 and 4 years, and again between 9 and 10 years of age, with rates then remaining relatively constant from late childhood through until the early twenties. In contrast, hospitalizations for NIDDM were infrequent until 11 years of age, but increased gradually thereafter, reaching their highest point amongst those in their early twenties (Figure 6).

Hospital Admissions by Primary Diagnosis

**Insulin Dependent Diabetes:** In New Zealand during 2005–2009, 72.1% of hospital admissions for Māori children and young people with IDDM (i.e. any mention of IDDM in their first 15 diagnoses) were for diabetes related diagnoses, with ketoacidosis accounting for 36.3% and IDDM without complications for 24.8% of admissions during this period. A further 27.9% of hospitalisations were for diagnoses other than diabetes (Table 5).
Figure 5. Hospital Admissions for Children and Young People Aged 0–24 Years with Insulin Dependent and Non-Insulin Dependent Diabetes by Ethnicity, New Zealand 2000–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with IDDM or NIDDM listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

Figure 6. Hospital Admissions for Māori Children and Young People with Insulin Dependent and Non-Insulin Dependent Diabetes by Age, New Zealand 2005–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with IDDM or NIDDM listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.
Table 5. Hospital Admissions for Māori Children and Young People Aged 0–24 Years with Insulin Dependent Diabetes by Primary Diagnosis, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>No. of Admissions: Total 2005–2009</th>
<th>No. of Admissions: Annual Average</th>
<th>Rate per 100,000</th>
<th>% of Admissions in those with IDDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis other than IDDM</td>
<td>377</td>
<td>75.4</td>
<td>22.6</td>
<td>27.9</td>
</tr>
<tr>
<td>IDDM with Ketoacidosis</td>
<td>490</td>
<td>98.0</td>
<td>29.4</td>
<td>36.3</td>
</tr>
<tr>
<td>IDDM without Complications</td>
<td>335</td>
<td>67.0</td>
<td>20.1</td>
<td>24.8</td>
</tr>
<tr>
<td>IDDM with Other Specified Complications</td>
<td>102</td>
<td>20.4</td>
<td>6.1</td>
<td>7.6</td>
</tr>
<tr>
<td>IDDM with Coma</td>
<td>16</td>
<td>3.2</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>IDDM with Neurological Complications</td>
<td>13</td>
<td>2.6</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>IDDM with Ophthalmic Complications</td>
<td>6</td>
<td>1.2</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>IDDM with Unspecified Complications</td>
<td>6</td>
<td>1.2</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>IDDM with Renal Complications</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Total</td>
<td>1,349</td>
<td>269.8</td>
<td>80.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>


New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Insulin Dependent and non-Insulin Dependent Diabetes in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Hospital Admissions by Primary Diagnosis

Insulin Dependent Diabetes: In New Zealand during 2005–2009, 67.5% of hospital admissions for children and young people with IDDM (i.e. any mention of IDDM in their first 15 diagnoses) were for diabetes related diagnoses, with ketoacidosis accounting for 30.2% and IDDM without complications for 27.9% of admissions during this period. A further 32.5% of hospitalisations were for diagnoses other than diabetes, with gastroenteritis, injuries and poisoning, and respiratory diseases being the most common reasons for non-diabetes related hospitalisations in patients with IDDM.

Non-Insulin Dependent Diabetes: In New Zealand during 2005–2009, 17.8% of hospital admissions for children and young people with NIDDM (i.e. any mention of NIDDM in their first 15 diagnoses) were for diabetes related diagnoses, with NIDDM without complications accounting for 5.6% of admissions during this period. The remaining 82.2% were for non-diabetes related diagnoses, with cystic fibrosis (18.0% of admissions) and pregnancy and childbirth (10.2% of admissions) being the leading causes of non-diabetes related hospitalisations in patients with NIDDM.

Mortality from Diabetes

Main Underlying Cause of Death: In New Zealand during 2003–2007, a total of 9 children and young people aged 0–24 years had IDDM listed as their main underlying cause of death, while one death had NIDDM listed as the main underlying cause, and in a further case the type of diabetes was unspecified. Of those dying from IDDM, 44.4% had diabetic ketoacidosis listed as the primary diabetic complication, with the remainder resulting from circulatory, renal or other specified diabetic complications.

Contributory Causes of Death: In addition, during 2003–2007 a further 3 children and young people aged 0–24 years had IDDM listed as a contributory cause of death, while one had NIDDM listed as a contributory cause, and 5 had other specified or unspecified types of diabetes listed as contributory causes. The main underlying causes of death for those listed with diabetes as a contributory cause included cancer, injuries, cystic fibrosis and other medical conditions.
Distribution by Age

**IDDM Complications**: In New Zealand during 2005–2009, hospitalisations for children and young people with uncomplicated IDDM increased during childhood, reached a peak at 11 years of age and then declined. In contrast, hospitalisations for ketoacidosis in those with IDDM were relatively infrequent during early childhood, but then increased rapidly, reaching a peak amongst those in their late teens.

**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2005–2009, hospitalisations for children and young people with IDDM (i.e. IDDM listed in any of the first 15 diagnoses) were significantly higher for females and those in average-more deprived (NZDep Decile 3–10) areas. Similarly, hospitalisations for children and young people with NIDDM were significantly higher for females and those in average-more deprived areas.

Summary

**IDDM**: In New Zealand during 2005–2009, a total of 339 individual Māori children and/or young people were admitted to hospital with IDDM listed in any of the first 15 diagnoses, with these children and young people averaging 0.80 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 0.66 95% CI 0.62–0.70) were significantly lower than for non-Māori non-Pacific children and young people during this period.

**NIDDM**: During the same period, a total of 198 individual Māori children and/or young people were admitted to hospital with NIDDM listed in any of the first 15 diagnoses, with these children and young people averaging 0.39 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.80 95% CI 1.59–2.04) were significantly higher than for non-Māori non-Pacific children and young people during this period.

Data Source and Methods

**Definition**

1. Hospital Admissions and Mortality for Children and Young People with Insulin Dependent Diabetes
2. Hospital Admissions and Mortality for Children and Young People with Non-Insulin Dependent Diabetes

**Data Source**

1. **National Minimum Dataset**
   - **Numerator**: Hospital Admissions for Children and Young People Aged 0–24 Years with Insulin Dependent Diabetes (ICD-10-AM E10) or Non-Insulin Dependent Diabetes Mellitus (ICD-10-AM E11) in any of the first 15 diagnoses.
   - **Denominator**: Statistics New Zealand Estimated Resident Population

2. **National Mortality Collection**
   - **Numerator**: Mortality for Children and Young People Aged 0–24 Years with Insulin Dependent Diabetes (ICD-10-AM E10) or Non-Insulin Dependent Diabetes Mellitus (ICD-10-AM E11) listed as either the main underlying cause of death, or as a contributory cause of death.
   - **Denominator**: Statistics New Zealand Estimated Resident Population

**Notes on Interpretation**

Unless otherwise specified, this analysis focuses on hospital admissions and mortality for children and young people who had diabetes listed in any of the first 15 diagnoses, or as a main underlying or contributory cause of death (rather than on the subset where diabetes was listed only as the primary diagnosis or main underlying cause of mortality). The rationale for this wider focus was the need to highlight the full spectrum of health issues.
experienced by children and young people with diabetes, and their consequent requirement for acute health services. For example, during 2005–2009, around 2/3 of such hospitalisations for children and young people with IDDM were for diabetes related diagnoses such as ketoacidosis, but the remaining 1/3 were for other diagnoses, a proportion of which may have been more likely because of the diabetes (e.g. some types of infection), or because management may have been more complicated in diabetic patients (e.g. acute gastroenteritis). The presence of a small number of events in diabetic patients which were unrelated to their diabetes however, may slightly overinflate the impact diabetes has on acute service demand. If no mention of diabetes was made in any of the first 15 diagnoses however, these cases were not included (even if the patient had been assigned a diabetes related code on a previous admission).

**Indicator Category** Proxy B
Epilepsy and Status Epilepticus

Introduction
The following section uses the National Minimum Dataset to review hospital admissions for Māori children and young people with any mention of epilepsy or status epilepticus in any of the first 15 diagnoses.

Background
Epilepsy is the most common serious neurological illness in children and young people. It is a cause of significant morbidity for those affected and has significant resource implications for the health care system. Despite its significant impact however, epilepsy is not an entity in itself, but rather a symptom complex arising from a variety of different processes. Causes vary with age, with congenital, developmental and genetic conditions being most commonly associated with the development of epilepsy in childhood, while head trauma, central nervous system infections and tumours may lead to epilepsy at any age [28]. In addition, in a proportion of cases, the underlying cause for the epilepsy is unknown [29].

In New Zealand, while there is little routinely collected information on the health needs of Māori children and young people with epilepsy, the 2006/07 Health Survey estimated a total population prevalence of 5 per 1,000 children aged 0–14 years [30]. In addition, Hauora IV [4] reviewed hospital admissions for epilepsy during 2003–2005 and found that while admissions for Māori and non-Māori children (aged 0–4, 5–9 and 10–14 years) were similar, admissions were higher for Māori than for non-Māori young people aged 15–24 years. In contrast, the authors found no differences between Māori and non-Māori in (all age) epilepsy mortality during 2000–2004 [4].

Distribution in Māori Children and Young People

Admission Rates and Annual Admissions per Individual

In New Zealand during 2005–2009, a total of 1,029 individual Māori children and/or young people were admitted to hospital with epilepsy or status epilepticus listed in any of the first 15 diagnoses, with these children and young people averaging 0.45 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.25 95% CI 1.19–1.31) were significantly higher than for non-Māori non-Pacific children and young people during this period (Table 6). Similar differences were seen during 2000–2009, with admission rates for Māori children and young people declining during the early 2000s, and thereafter remaining relatively static (Figure 7).

Table 6. Hospital Admissions for Children and Young People Aged 0–24 Years with Epilepsy or Status Epilepticus by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epilepsy and Status Epilepticus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>1,029</td>
<td>2,338</td>
<td>0.45</td>
<td>140.1</td>
<td>1.25</td>
<td>1.19–1.31</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>2,471</td>
<td>5,831</td>
<td>0.47</td>
<td>111.9</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Epilepsy or Status Epilepticus listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.
Figure 7. Hospital Admissions for Children and Young People Aged 0–24 Years with Epilepsy or Status Epilepticus by Ethnicity, New Zealand 2000–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Epilepsy or Status Epilepticus listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

Figure 8. Hospital Admissions for Māori Children and Young People with Epilepsy or Status Epilepticus by Age, New Zealand 2005–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Epilepsy or Status Epilepticus listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population.
Distribution by Age

In New Zealand during 2005–2009, hospital admissions for epilepsy and status epilepticus were high amongst Māori infants, with rates then declining gradually during childhood to reach their lowest point at eight years of age. Rates then increased again during the teens and early twenties, to reach a second peak at 22 years of age (Figure 8).

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Epilepsy and Status Epilepticus in the New Zealand child and youth population is available from *the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand* [27]. In brief, this report found:

**Distribution by Cause**

**Primary Diagnosis:** In New Zealand during 2005–2009, 70.5% of all hospital admissions in children and young people with epilepsy or status epilepticus (i.e. these diagnoses mentioned in any of the first 15 diagnoses), were for epilepsy related diagnoses, with generalised idiopathic epilepsy (27.3%) and unspecified epilepsy (21.1%) making the greatest contribution. A further 29.5% of admissions were for conditions unrelated to epilepsy, with respiratory infections and diseases, pregnancy and childbirth, and injuries making the largest contributions in this category.

**Secondary Diagnosis:** During the same period, secondary diagnoses for children and young people admitted with epilepsy or status epilepticus as a primary diagnosis, tended to fall into two main categories: conditions which may have increased the risk of the child or young person developing epilepsy (e.g. cerebral palsy, congenital anomalies of the nervous system); and acute concurrent illnesses such as respiratory infections and otitis media.

**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2005–2009, hospital admissions for epilepsy or status epilepticus were significantly higher for males and those living in average–more deprived (NZDep deciles 3–10) areas.

Summary

In New Zealand during 2005–2009, a total of 1,029 individual Māori children and/or young people were admitted to hospital with epilepsy or status epilepticus listed in any of the first 15 diagnoses, with these children and young people averaging 0.45 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.25 95% CI 1.19–1.31) were significantly higher than for non-Māori non-Pacific children and young people during this period.
Data Source and Methods

Definition
1. Hospital Admissions and Mortality for Children and Young People with Epilepsy or Status Epilepticus

Data Source
1. National Minimum Dataset
   Numerator: Hospital Admissions for Children and Young People Aged 0–24 Years with Epilepsy (ICD-10-AM G40) or Status Epilepticus (ICD-10-AM G41) in any of the first 15 diagnoses.
   Denominator: Statistics New Zealand Estimated Resident Population

2. National Mortality Collection
   Numerator: Mortality in Children and Young People Aged 0–24 Years with Epilepsy (ICD-10-AM G40) or Status Epilepticus (ICD-10-AM G41) listed as either the main underlying cause of death, or as a contributory cause of death.
   Denominator: Statistics New Zealand Estimated Resident Population

Notes on Interpretation
Unless otherwise specified, this analysis focuses on hospital admissions and mortality for children and young people who had epilepsy or status epilepticus listed in any of the first 15 diagnoses, or as a main underlying or contributory cause of death (rather than on the subset where these diagnoses were listed only as the primary diagnosis or main underlying cause of mortality). The rationale for this wider focus was the need to highlight the full spectrum of health issues experienced by children and young people with epilepsy and their consequent requirement for acute health services. For example, during 2005–2009, around 70.5% of hospitalisations for children and young people with epilepsy or status epilepticus had these conditions listed as their primary diagnosis, but a significant minority were admitted for infectious and respiratory diseases, pregnancy related issues or for injuries. Further, a review of the secondary diagnoses of those admitted with a primary diagnosis of epilepsy or status epilepticus indicated that while infections or respiratory diseases contributed to a significant proportion of such admissions, a number of children had other underlying conditions (e.g. cerebral palsy, developmental delay, congenital anomalies of the CNS) which may have increased their risk of developing epilepsy. The presence of a small number of events in patients with epilepsy which were unrelated to the epilepsy itself however, may slightly overinflate the impact epilepsy has on acute service demand. If no mention of epilepsy or status epilepticus was made in any of the first 15 diagnoses, these cases were not included (even if the patient had been assigned an epilepsy related code on a previous admission). Note: Children and young people with febrile convulsions or convulsions NOS were not included in the analysis (unless they also had a diagnosis of epilepsy or status epilepticus), on the basis that for many, such seizures are one off events which do not lead to a subsequent diagnosis of epilepsy.

Indicator Category Proxy B
**Introduction**

The following section uses data from the New Zealand Cancer Registry and the National Mortality Collection to review the incidence of, and mortality from, cancer in Māori children and young people in New Zealand.

**Background**

In New Zealand, there have been two recent reviews of cancer statistics amongst Māori [31] [32]. However, both have focused on adult outcomes, with little information being available for Māori children and young people aged less than 25 years. A third review however, which considered cancer incidence in New Zealand adolescents, found that lymphoid leukaemias, non-Hodgkin lymphomas, astrocytomas, and osteosarcomas were the most frequently diagnosed cancers in Māori children aged 10–14 years. For Māori young people 15–19 years, malignant gonadal germ cell tumours, lymphoid leukaemias, Hodgkin lymphomas and malignant melanomas were the most frequently diagnosed cancers, while for Māori young people 20–24 years, malignant gonadal germ cell tumours, thyroid carcinomas and Hodgkin and non-Hodgkin lymphomas made the greatest contribution [33]. Overall, the review found that cancer incidence was lower for Māori than for non-Māori, although this difference was reduced in older young people once the lower rate of melanoma in Māori was taken into account [33]. In terms of cancer survival, an earlier review of children diagnosed with cancer in New Zealand during 1990–1993 suggested that Māori children had the same survival rates as non-Māori non-Pacific children for all cancers, as well as for acute lymphoblastic leukaemia more specifically [34].

**Distribution in Māori Children and Young People**

**Cancer Registry Notifications**: In New Zealand during 2003–2007, carcinoma in situ of the cervix was the most frequent reason for a notification to the NZ Cancer Registry in Māori children and young people aged 0–24 years, and accounted for 58.9% of notifications in this age group (Note: Carcinomas in situ are pre-cancers rather than cancers and have been included here as, for historical reasons, they are notified to the NZ Cancer Registry. The majority of notifications were in young women aged 15–24 years). Acute lymphoblastic leukaemia was the second leading reason for notification, followed by cancers of the testis (Table 7).

**Cancer Mortality**: In New Zealand during 2003–2007, cancers of the bone and cartilage were the leading cause of cancer mortality in Māori children and young people, followed by acute lymphoblastic leukaemia (Table 8).
### Table 7. Cancer Registry Notifications for Māori Children and Young People Aged 0–24 Years by Cancer Type, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Cancer</th>
<th>Total No. 2003–2007</th>
<th>Annual Average</th>
<th>Rate per 100,000</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Māori Cancer Registry Notifications, New Zealand</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cancers of Lymphoid and Haematopoietic Tissues</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute Lymphoblastic Leukaemia</td>
<td>39</td>
<td>7.8</td>
<td>2.37</td>
<td>5.24</td>
</tr>
<tr>
<td>Non-Hodgkin's Lymphomas</td>
<td>21</td>
<td>4.2</td>
<td>1.28</td>
<td>2.82</td>
</tr>
<tr>
<td>Hodgkin's Disease</td>
<td>11</td>
<td>2.2</td>
<td>0.67</td>
<td>1.48</td>
</tr>
<tr>
<td>Other Neoplasms Lymphoid &amp; Haematopoietic Tissues</td>
<td>11</td>
<td>2.2</td>
<td>0.67</td>
<td>1.48</td>
</tr>
<tr>
<td>Acute Myeloid Leukaemia</td>
<td>8</td>
<td>1.6</td>
<td>0.49</td>
<td>1.08</td>
</tr>
<tr>
<td>Other Myeloid Leukaemias</td>
<td>7</td>
<td>1.4</td>
<td>0.43</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>Cancers and Carcinomas in Situ of Reproductive Organs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcinoma in Situ of Cervix*</td>
<td>438</td>
<td>87.6</td>
<td>152.0</td>
<td>58.9</td>
</tr>
<tr>
<td>Malignant Neoplasm of Testis</td>
<td>33</td>
<td>6.6</td>
<td>3.96</td>
<td>4.44</td>
</tr>
<tr>
<td>Malignant Neoplasm of Ovary</td>
<td>7</td>
<td>1.4</td>
<td>0.86</td>
<td>0.94</td>
</tr>
<tr>
<td>Malignant Neoplasm of Cervix</td>
<td>4</td>
<td>0.8</td>
<td>1.39</td>
<td>0.54</td>
</tr>
<tr>
<td><strong>In Situ or of Uncertain Behaviour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other In Situ Neoplasms</td>
<td>11</td>
<td>2.2</td>
<td>0.67</td>
<td>1.48</td>
</tr>
<tr>
<td>Benign or of Uncertain Behaviour</td>
<td>4</td>
<td>0.8</td>
<td>0.24</td>
<td>0.54</td>
</tr>
<tr>
<td><strong>Melanoma and Melanoma in Situ</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignant Melanoma of Skin</td>
<td>5</td>
<td>1.0</td>
<td>0.30</td>
<td>0.67</td>
</tr>
<tr>
<td>Melanoma in Situ*</td>
<td>3</td>
<td>0.6</td>
<td>0.18</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>Other Cancers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignant Neoplasm of Brain</td>
<td>26</td>
<td>5.2</td>
<td>1.58</td>
<td>3.49</td>
</tr>
<tr>
<td>Malignant Neoplasms Bone and Cartilage</td>
<td>22</td>
<td>4.4</td>
<td>1.34</td>
<td>2.96</td>
</tr>
<tr>
<td>Malignant Neoplasm of Retina</td>
<td>9</td>
<td>1.8</td>
<td>0.55</td>
<td>1.21</td>
</tr>
<tr>
<td>Malignant Neoplasm of Adrenal Gland</td>
<td>8</td>
<td>1.6</td>
<td>0.49</td>
<td>1.08</td>
</tr>
<tr>
<td>Malignant Neoplasm of Kidney (Excluding Renal Pelvis)</td>
<td>7</td>
<td>1.4</td>
<td>0.43</td>
<td>0.94</td>
</tr>
<tr>
<td>Malignant Neoplasm of Thyroid</td>
<td>7</td>
<td>1.4</td>
<td>0.43</td>
<td>0.94</td>
</tr>
<tr>
<td>Other Malignant Neoplasms</td>
<td>63</td>
<td>12.6</td>
<td>3.83</td>
<td>8.47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>744</td>
<td>148.8</td>
<td>174.1</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Numerator: NZ Cancer Registry; Denominator: Statistics NZ Estimated Resident Population. Rates are per 100,000 0–24 years, except for cancers of the testis (per 100,000 males 0–24 years), ovary (per 100,000 females 0–24 years) and cervix (per 100,000 females 15–24 years). *Note: Carcinomas in situ are not cancers but rather pre-cancers. They have been included here as, for historical reasons, they are notified to the NZ Cancer Registry.
Table 8. Cancer Deaths for Māori Children and Young People Aged 0–24 Years by Cancer Type, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Cancer</th>
<th>Total No. 2003–2007</th>
<th>Annual Average</th>
<th>Rate per 100,000</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori Cancer Deaths, New Zealand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancers of Lymphoid and Haematopoietic Tissues</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute Lymphoblastic Leukaemia</td>
<td>11</td>
<td>2.2</td>
<td>0.67</td>
<td>13.8</td>
</tr>
<tr>
<td>Acute Myeloid Leukaemia</td>
<td>6</td>
<td>1.2</td>
<td>0.36</td>
<td>7.50</td>
</tr>
<tr>
<td>Non-Hodgkin’s Lymphomas</td>
<td>6</td>
<td>1.2</td>
<td>0.36</td>
<td>7.50</td>
</tr>
<tr>
<td>All Other Neoplasms Lymphoid &amp; Haematopoietic Tissue</td>
<td>5</td>
<td>1.0</td>
<td>0.30</td>
<td>6.25</td>
</tr>
<tr>
<td>Cancers of Reproductive Organs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignant Neoplasm of Testis</td>
<td>4</td>
<td>0.8</td>
<td>0.48</td>
<td>5.00</td>
</tr>
<tr>
<td>Other Cancers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malignant Neoplasms Bone and Cartilage</td>
<td>12</td>
<td>2.4</td>
<td>0.73</td>
<td>15.0</td>
</tr>
<tr>
<td>Malignant Neoplasm of Brain</td>
<td>10</td>
<td>2.0</td>
<td>0.61</td>
<td>12.5</td>
</tr>
<tr>
<td>Malignant Neoplasm of Adrenal Gland</td>
<td>3</td>
<td>0.6</td>
<td>0.18</td>
<td>3.75</td>
</tr>
<tr>
<td>All Other Cancers</td>
<td>23</td>
<td>4.6</td>
<td>1.40</td>
<td>28.8</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>16.0</td>
<td>5.10</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Numerator: National Mortality Collection; Denominator: Statistics NZ Estimated Resident Population. Rates are per 100,000 0–24 years, except for Cancers of the Testis (per 100,000 males 0–24 years), Ovary (per 100,000 females 0–24 years) and Cervix (per 100,000 females 15–24 years).

**Acute Lymphoblastic Leukaemia and Other Cancers of the Lymphoid and Haematopoietic Tissues**

**Distribution in Māori Children and Young People**

In New Zealand during 2003–2007, a total of 39 notifications were received by the NZ Cancer Registry, which related to acute lymphoblastic leukaemia in Māori children and young people. Notification rates for Māori children and young people (RR 0.83 95% CI 0.59–1.19) were similar to those of non-Māori non-Pacific children and young people during this period (Table 9).

Table 9. Cancer Registry Notifications for Children and Young People Aged 0–24 Years with Acute Lymphoblastic Leukaemia by Ethnicity, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Notifications No. 2003–2007</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Lymphoblastic Leukaemia</td>
<td>39</td>
<td>7.8</td>
<td>2.37</td>
<td>0.83</td>
<td>0.59–1.19</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>145</td>
<td>29.0</td>
<td>2.84</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: NZ Cancer Registry; Denominator: Statistics NZ Estimated Resident Population.
New Zealand Level Risk Factors

Additional information on the distribution of Cancers of the Lymphoid and Haematopoietic Tissues in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Age

In New Zealand during 2003–2007, NZ Cancer Registry notifications for acute lymphoblastic leukaemia increased during infancy, reached a peak at 3 years of age and then declined, with the highest rates being evident in those aged 2–5 years. In contrast, notifications for Hodgkin’s disease were more frequent amongst those in their late teens and early twenties.

Distribution by NZ Deprivation Index Decile and Gender

In New Zealand during 2003–2007, there were no significant gender or socioeconomic (as measured by NZ Deprivation Index quintile) differences in NZ Cancer Registry notifications for acute lymphoblastic leukaemia.

Malignant Melanoma and Melanoma in Situ

Distribution in Māori Children and Young People

In New Zealand during 2003–2007, a total of 8 notifications were received by the NZ Cancer Registry, which related to malignant melanoma or melanoma in situ in Māori children and young people. Notification rates for Māori children and young people (RR 0.11 95% CI 0.06–0.23) were significantly lower than for non-Māori non-Pacific children and young people during this period (Table 10).

Table 10. Cancer Registry Notifications for Children and Young People Aged 0–24 Years with Melanoma and Melanoma in Situ by Ethnicity, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Notifications No. 2003–2007</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori</td>
<td>8</td>
<td>1.6</td>
<td>0.49</td>
<td>0.11</td>
<td>0.06–0.23</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>219</td>
<td>43.8</td>
<td>4.30</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: NZ Cancer Registry; Denominator: Statistics NZ Estimated Resident Population.

New Zealand Level Risk Factors

Additional information on the distribution of Malignant Melanoma and Melanoma in Situ in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Age

In New Zealand during 2003–2007, NZ Cancer Registry notifications for malignant melanoma and melanoma in situ were infrequent during childhood but increased during adolescence, with the highest rates being evident in those in their late teens and early twenties.

Distribution by NZ Deprivation Index Decile and Gender

In New Zealand during 2003–2007, NZ Cancer Registry notifications for malignant melanoma and melanoma in situ were significantly higher for females and those living in the least deprived (NZDep deciles 1–2) areas, when compared to those living in the most deprived (NZDep deciles 9–10) areas.
Cancer of the Testis

Distribution in Māori Children and Young People

In New Zealand during 2003–2007, a total of 33 notifications were received by the NZ Cancer Registry, which related to cancer of the testis in Māori children and young people. Notification rates for Māori children and young people (RR 1.26 95% CI 0.84–1.89) were not significantly different from those of non-Māori non-Pacific children and young people during this period (Table 11).

Table 11. Cancer Registry Notifications for Males Aged 0–24 Years with Cancers of the Testis by Ethnicity, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Notifications No. 2003–2007</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori</td>
<td>33</td>
<td>6.6</td>
<td>3.96</td>
<td>1.26</td>
<td>0.84–1.89</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>82</td>
<td>16.4</td>
<td>3.15</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: NZ Cancer Registry; Denominator: Statistics NZ Estimated Resident Population. Rates are per 100,000 males.

New Zealand Level Risk Factors

Additional information on the distribution of Cancers of the Testis in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Age

In New Zealand during 2003–2007, NZ Cancer Registry notifications for cancers of the testis were infrequent during childhood but increased during adolescence, with the highest rates being evident in those in their late teens and early twenties.

Distribution by NZ Deprivation Index Decile

In New Zealand during 2003–2007, no significant socioeconomic gradients were seen in NZ Cancer Registry notifications for cancers of the testis.

Carcinoma in Situ of the Cervix

Distribution in Māori Children and Young People

In New Zealand during 2003–2007, a total of 438 notifications were received by the NZ Cancer Registry, which related to carcinoma in situ of the cervix in young Māori women. Notification rates for young Māori women (RR 0.86 95% CI 0.78–0.95) were significantly lower than for young non-Māori non-Pacific women during this period (Table 12).

Table 12. Cancer Registry Notifications for Young Women Aged 15–24 Years with Carcinoma in Situ of the Cervix by Ethnicity, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Notifications No. 2003–2007</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori</td>
<td>438</td>
<td>87.6</td>
<td>152.0</td>
<td>0.86</td>
<td>0.78–0.95</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>1869</td>
<td>373.8</td>
<td>176.7</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: NZ Cancer Registry (those aged 0–24 years; Note: <3 women were aged <15 years); Denominator: Statistics NZ Estimated Resident Population (all women aged 15–24 years). *Note: Carcinomas in situ are not cancers but rather pre-cancers. They have been included here as for historical reasons they are notified to the NZ Cancer Registry.
New Zealand Level Risk Factors for Carcinoma in Situ and Cancers of the Cervix and Ovaries

Additional information on the distribution of Carcinoma in Situ and Cancers of the Cervix and Ovaries in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Age

In New Zealand during 2003–2007, NZ Cancer Registry notifications for carcinoma in situ of the cervix were relatively infrequent during early adolescence, but increased rapidly thereafter, with the highest rates being evident amongst those in their early twenties. Similarly, the vast majority of notifications for cancer of the cervix were for those in their early twenties. Notifications for cancers of the ovaries occurred from 11 years of age onwards.

Distribution by NZ Deprivation Index Decile

In New Zealand during 2003–2007, NZ Cancer Registry notifications for carcinoma in situ of the cervix were significantly lower for those in the least deprived (NZDep deciles 1–2) areas, when compared to those in average-more deprived (NZDep deciles 3–10) areas.

Cancers of the Brain

Distribution in Māori Children and Young People

Number of Notifications and non-Māori non-Pacific Comparisons

In New Zealand during 2003–2007, a total of 26 notifications were received by the NZ Cancer Registry, which related to cancers of the brain in Māori children and young people. Notification rates for Māori children and young people (RR 0.94 95% CI 0.60–1.45) were not significantly different from those of non-Māori non-Pacific children and young people during this period (Table 13).

Table 13. Cancer Registry Notifications for Children and Young People Aged 0–24 Years with Cancers of the Brain by Ethnicity, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Notifications No. 2003–2007</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancers of the Brain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>26</td>
<td>5.2</td>
<td>1.58</td>
<td>0.94</td>
<td>0.60–1.45</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>86</td>
<td>17.2</td>
<td>1.69</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: NZ Cancer Registry; Denominator: Statistics NZ Estimated Resident Population.

New Zealand Level Risk Factor for Cancers of the Brain and Other Cancers

Additional information on the distribution of Cancers of the Brain and Other Cancers in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Age

In New Zealand during 2003–2007, NZ Cancer Registry notifications for cancers of the retina were more frequent for those under three years of age, while cancers of the brain were more evenly distributed throughout childhood and adolescence, and cancers of the bone and cartilage were more common after 6 years of age. Similarly, notifications for cancers of the kidney and adrenal gland were more common amongst those under 8 years of age, while notifications for cancers of the thyroid were more frequent amongst those in their late teens and early twenties.
**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2003–2007, there were no significant socioeconomic (as measured by NZ Deprivation Index quintile), or gender differences in NZ Cancer Registry notifications for cancers of the brain.

**Summary**

In New Zealand during 2003–2007, carcinoma in situ of the cervix was the most frequent reason for a notification to the NZ Cancer Registry in Māori children and young people, and accounted for 58.9% of notifications in this age group (Note: Carcinomas in situ are not cancers but rather pre-cancers, which have been included here as, for historical reasons, they are notified to the NZ Cancer Registry). Acute lymphoblastic leukaemia was the second leading reason for notification, followed by cancers of the testis.

During the same period, cancers of the bone and cartilage were the leading cause of cancer mortality in Māori children and young people, followed by acute lymphoblastic leukaemia. While NZ Cancer Registry notifications for acute lymphoblastic leukaemia, and cancers of the testis and brain were similar for Māori and non-Māori non-Pacific children and young people, notifications for malignant melanoma / melanoma in situ and carcinoma in situ of the cervix were significantly lower for Māori than for non-Māori non-Pacific children and young people.

**Data Source and Methods**

**Definition**

1. Cancer Registry Notifications for Children and Young People Aged 0–24 Years
2. Cancer Deaths for Children and Young People Aged 0–24 Years

**Data Source**

1. **New Zealand Cancer Registry**
   
   **Numerator:** Cancer Registry Notifications for children and young people aged 0–24 years with cancer site being assigned using ICD-10-AM as follows: Carcinoma in Situ of Cervix (D06), Melanoma in Situ (D03), Hodgkin's Disease (C81), Non-Hodgkin's Lymphomas (C82–C85), Acute Myeloid Leukaemia (C920), Other Myeloid Leukaemias (C921–C929), Acute Lymphoblastic Leukaemia (C910), Other Neoplasms Lymphoid and Haematopoietic Tissues (Remainder C81–C96), Melanoma of Skin (C43), Malignant Neoplasms of the: Brain (C71), Testis (C62), Bone and Cartilage (C40–41), Kidney (Excluding Renal Pelvis) (C64), Adrenal Gland (C74), Ovary (C56), Thyroid (C73), Cervix (C53), Retina (C692), Other Malignant Neoplasms (Remainder C00–C97), Other In Situ Neoplasms (Remainder D00–D09), Benign or of Uncertain Behaviour (D10–D48).
   
   **Denominator:** Statistics New Zealand Estimated Resident Population

2. **National Mortality Collection**
   
   **Numerator:** Cancer Deaths in children and young people aged 0–24 years with the main underlying cause of death in the ranges outlined above.
   
   **Denominator:** Statistics New Zealand Estimated Resident Population

**Notes on Interpretation**

Note 1: For the majority of analyses, and for all national and regional totals, rates per 100,000 children and young people aged 0–24 years have been used. For cancers of the testis however, rates are per 100,000 males aged 0–24 years, while for cancers of the ovaries rates are per 100,000 females 0–24 years. For carcinoma in situ and malignant cancers of the cervix, the numerator includes all women aged 0–24 years (there was only one case <15 years), while the denominator includes any women 15–24 years.

Note 2: Carcinomas in situ are not cancers but rather pre-cancers. They have been included here as, for historical reasons, they are notified to the NZ Cancer Registry.
OVERWEIGHT AND OBESITY

Introduction
The following section reviews the distribution of overweight and obesity in Māori children and young people using data from the 2006/07 New Zealand Health Survey [30]. Some of the issues associated with the measurement of overweight and obesity in children and young people are also briefly considered at the end of this section.

Background
In New Zealand, there was no consistent national monitoring of body mass index (BMI) in children prior to 2002. However one study which collected height, weight and ethnicity data from 870 children aged 11–12 years, attending schools in the Hawke’s Bay in 1989 and again in 2000 found that during this period the risk of being overweight had increased 2.2 fold, while the risk of being obese had increased 3.8 fold. While the greatest proportional increases occurred in European children, in absolute terms the highest obesity rates were seen in Māori and Pacific children, with 24.7% of Māori children being overweight, and 15.3% being obese in 2000, as compared to 18.2% and 5.7% of European children respectively. The authors noted that the statistically significant increases seen in both ethnic groups were consistent with overseas trends [35].

Similarly, the 2002 National Children’s Nutrition Survey found that 19.6% of Māori boys and 30.6% of Māori girls aged 5–14 years were overweight, and that 15.7% of Māori boys and 16.7% of Māori girls were obese, with the mean BMI of both Māori boys and girls being significantly higher than for European / Other boys and girls during this period [36]. More recently however, the 2006/07 New Zealand Health Survey found that the mean BMI for children aged 5–14 years had not changed since the 2002 National Children’s Nutrition Survey, potentially suggesting that the rate of increase in BMI signalled in these earlier studies may have slowed, as it has in adults [30].

Overweight and Obesity

Ethnic Differences in Mean BMI
In the 2006/07 New Zealand Health Survey, mean BMI for Māori children aged 2–14 years (19.4 95% CI 19.1–19.6) was significantly higher than for non-Māori children (18.5 95% CI 18.4–18.6). There were however, no significant differences in mean BMI between Māori boys (19.3 95% CI 19.0–19.6) and Māori girls (19.5 95% CI 19.0–19.9) (Figure 9).

Ethnic Differences in Overweight and Obesity
Similarly, when age standardised rates for Māori children were compared with those of non-Māori children, the proportion of Māori children aged 2–14 years who were overweight (25.8% 95% CI 22.7–28.9) was significantly higher than for non-Māori children (19.5% 95% CI 17.4–21.6), as was the proportion of Māori children who were obese (Māori 11.9% 95% CI 10.0–13.8; non-Māori 7.3% 95% CI 6.1–8.5) (Figure 10).
Figure 9. Mean Body Mass Index (BMI) for Children and Young People Aged 2–14 Years by Ethnicity, 2006/07 New Zealand Health Survey

Source: 2006/07 New Zealand Health Survey; Ethnicity is Total Response; Rates are Age Standardised.

Figure 10. Proportion of Children and Young People 2–14 Years who were Underweight, of Normal Weight, Overweight or Obese by Ethnicity, 2006/07 New Zealand Health Survey

Source: 2006/07 New Zealand Health Survey; Ethnicity is Total Response; Rates are Age Standardised.
**New Zealand Level Distribution and Risk Factors**

Additional information on the distribution of Overweight and Obesity in the New Zealand paediatric population is available from *the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand* [27]. In brief, this report found:

**Age and Gender Differences**

In the 2006/07 New Zealand Health Survey, there were no significant gender or age differences in the (unadjusted) prevalence of overweight or obesity in those aged 2–4 years, 5–9 years, 10–14 years, although higher rates of obesity were seen in those aged 15–24 years (compared to some younger age groups).

**NZ Deprivation Index Decile**

Once standardised for age, children (boys and girls combined) living in the most deprived (NZDep deciles 9–10) areas were significantly more likely to be obese than those living in the least deprived–average (NZDep decile 1–8) areas. Children in the most deprived (NZDep deciles 9–10) areas were also significantly more likely to be overweight than those living in more affluent (NZDep deciles 1–4) areas.

**Summary**

In the 2006/07 New Zealand Health Survey, mean BMI for Māori children aged 2–14 years (19.4 95% CI 19.1–19.6) was significantly higher than for non-Māori children (18.5 95% CI 18.4–18.6). There were however, no significant differences in mean BMI between Māori boys and Māori girls. Similarly, the proportion of Māori children who were overweight (25.8% 95% CI 22.7–28.9) was significantly higher than for non-Māori children (19.5% 95% CI 17.4–21.6), as was the proportion of Māori children who were obese (Māori 11.9% 95% CI 10.0–13.8; non-Māori 7.3% 95% CI 6.1–8.5).

**Data Sources and Methods**

**Definitions**

*Proportion of Children and Young People who are Underweight, Overweight or Obese*

**Data Sources**

*The 2006/07 New Zealand Health Survey (NZHS)*

The 2006/07 NZHS [30] was a cross sectional survey carried out from October 2006 to November 2007, which collected information on 4,921 children from birth to 14 years, and 12,488 adults aged 15 years and over who lived in private dwellings. The child survey included 3,039 European / Other, 1,983 Māori, 798 Pacific and 742 Asian children, with the final response rate for the child questionnaire being 71%, and for the adult questionnaire being 68%. The primary caregiver, in the case of children aged 0–14 years, answered the questionnaire on the child’s behalf. In addition, height and weight measurements were taken on all children aged 2–14 years using standardised equipment and procedures, with waist circumference also being taken if the child was 5+ years of age. The survey results have been weighted to ensure they are representative of New Zealand’s resident population living in permanent dwellings [30].

**Ethnicity:** In the Survey four ethnic groups were reported: Māori, Pacific, Asian and European / Other, with the “Other” category including Middle-Eastern, Latin-American and African ethnic groups. Total response ethnicity was used throughout, with an individual being included in the analysis for each ethnic group to which they affiliated (28.3% of children were assigned to more than one ethnic group). As a result, ethnic groups cannot be directly compared with each other, and thus all interpretations which appear in the text are made with reference to the total population [30].

**Age Standardisation:** In New Zealand, each ethnic group has its own age structure (e.g. the Māori and Pacific populations have a much higher proportion of individuals <25 years of age) and thus when comparisons are made between different ethnic groups (and also...
by NZ Deprivation Index decile, which is unevenly distributed by ethnicity), these differences need to be taken into account. Thus, in the sections which follow, all ethnic and NZ Deprivation Index decile specific analyses have been age standardised (to the World Health Organisation (WHO) world population age distribution - see [30] p16 for a more detailed account). All age / gender graphs however use unadjusted rates, so that the underlying prevalence in the New Zealand population can better be ascertained. Where gender comparisons are made in the text however, these have been adjusted for differences in the underlying age distributions of the two gender groupings [30].

**Measurement of Overweight and Obesity:** International BMI cut-off points were used to classify participants as underweight (or thin in children), normal range, overweight or obese, with the WHO BMI cut off points being used for adults aged 18+ years, while for those aged 2–17 years, BMI cut off points developed by the International Obesity Taskforce were used. These cut off points (see additional technical notes below) are sex and age specific and are designed to coincide with the WHO BMI cut off points for adults at age 18 [37] [38].

The data for the tables and graphs derived from this survey were sourced from [http://www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health#summary](http://www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health#summary)

**Additional Notes on the Measurement of Overweight and Obesity**

**Obesity:** Obesity is defined as an excess in adiposity or body fat mass. Measures of adiposity in current use include weight, weight for height (e.g. BMI), skin fold thickness (e.g. triceps / sub-scapular) and circumferences / diameters (e.g. waist-hip / waist-thigh ratios, mid-upper arm circumferences), each of which has its own reference standards and cut-points [39]. Of these, the most popular is the Body Mass Index (BMI).

Obesity is often assessed using the Body Mass Index (BMI), calculated using the formula

\[ \text{BMI} = \frac{\text{weight (kg)}}{\text{height (m)}^2} \]

Using height and weight to assess adiposity is generally viewed as being reliable, reproducible, non-intrusive and cheap, making BMI one of the most popular measures for obesity, both in New Zealand and overseas. In adults, cut-offs are based on mortality risk or other criteria, with those having a BMI of 25–29.9 kg/m² being traditionally classified as overweight and those with a BMI of 30 kg/m² or over being seen as obese. Using BMI to assess obesity in children however has a number of drawbacks, including the changes in body composition that occur as part of normal growth and with the onset of puberty, and ethnic differences in body composition for a given BMI (which is also an issue for adults) [40]. These issues are discussed in more detail below.

**Changes in Body Composition with Age: The Need for BMI Percentile Charts**

Assessing obesity during childhood and adolescence is more complex than in adults, as both height and body composition change progressively with development. In particular, the proportion of fat mass / total body weight changes significantly during childhood, beginning at around 13–15% in term newborn infants and increasing progressively during the first year of life, to a maximum of 25–26% at 12 months of age. From 12 months to 4–6 years, the proportion of body fat then declines, to a nadir of around 12–16%, before increasing again between the ages of 6–10 years. By early adulthood, the proportion of fat mass is 20–25% for women and 15–20% for men [40]. As a result of these changes, when assessing the level of obesity in an individual child, BMI for age percentile charts are usually used, which extrapolate back the traditional adult cut points of 25–29.9 kg/m² and ≥30 kg/m² to the same points on the BMI distribution during the childhood years e.g. a male child with a BMI > 19.3 at the age of 5 years, is on the same point in the percentile charts as an 18 year old with a BMI of >30, and thus will be classified as obese [37]. As New Zealand to date has not developed its own BMI percentile charts for children, overseas standards must be used. Of these, the most popular were developed by the International Obesity Taskforce (see Cole [37] [38]) using pooled survey data from a number of different countries.
Ethnic Differences in BMI

With no BMI for age percentile charts specifically designed for New Zealand use, there remains a significant amount of debate about the appropriateness of the traditional BMI-for-age cut offs for New Zealand children of different ethnic groups. While a number of studies have suggested that, for a given BMI, Māori and Pacific children have a lower percentage of body fat [41] [42] [43], others have argued that while statistical differences may exist, there are no clinically significant ethnic differences in the relationship between BMI and body composition and that a common standard should be used for children of all ethnic groups [43]. Overseas research also suggests that ethnic differences in body composition may increase during puberty, with differences being much less marked amongst children <8 years of age [44]. Similarly, ethnic differences in the onset of puberty may also make utilisation of a common BMI cut off difficult, with puberty on average, occurring earlier amongst Māori and Pacific groups [45]. Such differences need to be kept in mind when interpreting ethnic specific obesity rates calculated using overseas percentile charts (as used in the 2006/07 NZ Health Survey, which uses the same age specific BMI cut-offs for all ethnic groups), as they may tend to overestimate obesity rates amongst Māori and Pacific children slightly.
NUTRITION

Introduction
The following section reviews the determinants of nutritional intake in Māori children and young people using information from the 2006/07 New Zealand Health Survey [30].

Background
As rates of childhood obesity have increased, attention has turned towards the environments in which children live and the role dietary and lifestyle changes have played in altering the balance between caloric intake and the amount of energy expended on incidental physical activity. While no time series data is available for New Zealand, information from a number of cross sectional surveys suggests that aspects of the current nutritional environment are not conducive to healthy food choices for children. In one survey of 200 primary/intermediate schools, 79% of school canteens offered pies, 57% offered juice and 55% offered sausage rolls. In contrast, filled rolls (the most expensive item) were offered by only 47%, while 30% offered sandwiches and 17% offered fruit [46].

The implications of these findings for Māori children were highlighted by the 2002 National Children’s Nutrition Survey, which suggested that Māori children were significantly more likely to buy some or most of the food they consumed at school from the school tuckshop and were also more likely to consume pies, hamburgers, and fizzy drinks than European/Other children [47]. Further analysis of the same data suggested that amongst Māori children, bringing food from home to school was associated with a lower BMI, while buying food from school was associated with a higher BMI. The authors who undertook this additional analysis concluded that strategies to address childhood obesity amongst Māori children should include efforts to increase breakfast consumption and decrease food purchases away from home, as well to improve the school food environment [48].

Breakfast Eaten at Home
Eating breakfast every day is used in the 2006/07 New Zealand Health survey as a proxy for good nutritional intake, as it has been positively associated with an increased intake of vitamins and minerals, better food choices and higher concentration at school [30]. Further, the 2002 National Children’s Nutrition Survey [36] showed that children who usually eat breakfast at home have, on average, a lower BMI than those who do not, even once other potentially confounding risk factors are taken into account. Children who do not eat breakfast are also more likely to consume unhealthy snacks such as pies, confectionary and soft drinks [30].

Ethnic Differences
When age standardised rates for Māori children were compared with those of non-Māori children, the proportion of Māori children aged 2–14 years who had eaten breakfast at home every day in the previous week (83.6% 95% CI 81.2%–86.0%) was significantly lower than for non-Māori children (89.2% 95% CI 87.8–90.5). The proportion of Māori boys (86.9% 95% CI 84.2–89.6) who had eaten breakfast at home every day in the past week was also significantly higher than for Māori girls (80.1% 95% CI 76.4–83.7) (Figure 11).
Figure 11. Number of Days Breakfast was Eaten at Home in the Previous Week, Children Aged 2–14 Years by Ethnicity, 2006/07 New Zealand Health Survey

Source: 2006/07 New Zealand Health Survey; Ethnicity is Total Response; Rates are Age Standardised.

**New Zealand Level Distribution and Risk Factors**

Additional information on the distribution of breakfast eaten at home in the New Zealand paediatric population is available from *the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand* [27]. In brief, this report found:

**Age and Gender Differences**

In the 2006/07 New Zealand Health Survey, once adjusted for age, boys were significantly more likely (90.0% 95% CI 88.6–91.5) to have eaten breakfast at home every day in the previous week than girls (85.7% 95% CI 83.8–87.6). The proportion eating breakfast at home decreased with increasing age however, with those aged 10–14 years (80.1% 95% CI 77.7–82.6) being significantly less likely to eat breakfast at home every day in the previous week than those aged 2–4 years (95.0% 95% CI 93.5–96.5) and 5–9 years (91.4% 95% CI 89.8–93.0).

**NZ Deprivation Index Decile Differences**

Once adjusted for age, boys living in the most deprived (NZDep decile 9–10) areas (87.3% 95% CI 84.4–90.1) were significantly less likely to have eaten breakfast at home every day in the previous week than boys from the least deprived (NZDep Decile 1–2) areas (93.9% 95% CI 90.8–97.0). No significant differences were seen for girls however.

**Fizzy Drinks**

The consumption of fizzy drinks was included in the 2006/07 New Zealand Health Survey as a result of the strong association between fizzy drinks and an increased risk of obesity and Type 2 diabetes [30], with fizzy drinks being seen as being high in sugar, of little nutritional value and in some studies being seen as replacing more nutritious fluids such as milk in children’s diet.
Ethnic Differences

When age standardised rates for Māori children were compared with those of non-Māori children, the proportion of Māori children aged 2–14 years who had consumed 3 or more fizzy drinks in the previous week (24.7% 95% CI 21.6–27.9) was significantly higher than for non-Māori children (17.9% 95% CI 16.1–19.7). There were no significant differences however, between the proportion of Māori boys (26.5% 95% CI 22.3–30.7) and Māori girls (22.9% 95% CI 19.0–26.7) who had consumed 3 or more fizzy drinks in the previous week (Figure 12).

Figure 12. Number of Fizzy Drinks Consumed in the Previous Week for Children Aged 2–14 Years by Ethnicity, 2006/07 New Zealand Health Survey

Source: 2006/07 New Zealand Health Survey; Ethnicity is Total Response; Rates are Age Standardised.

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of fizzy drink consumption in the New Zealand paediatric population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Age and Gender Differences

In the 2006/07 New Zealand Health Survey, once adjusted for age, boys aged 10–14 years (34.2% 95% CI 30.5–38.0) were significantly more likely to have consumed 3 or more fizzy drinks in the previous week than girls aged 10–14 years (21.1% 95% CI 17.5–24.6). In addition, children aged 10–14 years (27.8% 95% CI 25.3–30.4) were significantly more likely than children aged 2–4 years (13.0% 95% CI 10.2–15.8) to have consumed 3 or more fizzy drinks in the previous week.

NZ Deprivation Index Decile Differences

Once adjusted for age, the proportion of children who had consumed 3 or more fizzy drinks in the previous week was significantly higher for those in the most deprived (NZDep decile 9–10) areas (26.5 95% CI 23.2–29.9) than for those in the least deprived (NZDep decile 1–2) areas (15.3% 95% CI 11.9–18.7). This association was stronger for girls than for boys, with girls in the most deprived (NZDep decile 9–10) areas being almost twice as likely to have consumed 3 or more fizzy drinks in the previous week than those living in less deprived (NZDep decile 1–6) areas.
Takeaways / Fast Food

Questions on takeaways / fast food were included in the 2006/07 New Zealand Health Survey as a number of studies have suggested that eating fast food more than twice a week is associated with an increased risk of weight gain, overweight and obesity, and in addition because fast food is generally high in fat, salt and sugar and low in fibre [30].

Ethnic Differences

When age standardised rates for Māori children were compared with those of non-Māori children, the proportion of Māori children aged 2–14 years who had consumed takeaways / fast food three or more times in the previous week (10.1% 95% CI 8.3–12.0) was significantly higher than for non-Māori children (6.3% 95% CI 5.1–7.5). No significant differences were evident however between the proportion of Māori boys (10.4% 95% CI 8.0–12.8) and girls (9.9% 95% CI 7.1–12.7) who had consumed takeaways / fast food three or more times in the past week (Figure 13).

Figure 13. Number of Times Takeaways / Fast Food Consumed in the Previous Week for Children Aged 2–14 Years by Gender and Ethnicity, 2006/07 New Zealand Health Survey

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of takeaway consumption in the New Zealand paediatric population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Age and Gender Differences

In the 2006/07 New Zealand Health Survey, once adjusted for age, there were no significant gender differences in the proportion of children aged 2–14 years who had consumed takeaways / fast food three or more times in the past week (boys 8.0% 95% CI 6.5–9.5; girls 6.4% 95% CI 5.1–7.6). Similarly, no significant age differences were evident for those aged 2–4 years, 5–9 years and 10–14 years.
NZ Deprivation Index Decile Differences
Once adjusted for age, children living in the most deprived (NZDep decile 9–10) areas (13.9% 95% CI 11.2–16.6%) were significantly more likely to have consumed takeaways / fast food three or more times in the previous week than children living in the least deprived (NZDep deciles 1–2) areas (3.4% 95% CI 1.9–4.9).

Summary
In the 2006/07 NZHS, when age standardised rates for Māori children aged 2–14 years were compared with those of non-Māori children, the following differences emerged:

Breakfast at Home: The proportion of Māori children who had eaten breakfast at home every day in the previous week (83.6% 95% CI 81.2%–86.0%) was significantly lower than for non-Māori children (89.2% 95% CI 87.8–90.5).

Fizzy Drinks: The proportion of Māori children who had consumed 3 or more fizzy drinks in the previous week (24.7% 95% CI 21.6–27.9) was significantly higher than for non-Māori children (17.9% 95% CI 16.1–19.7).

Takeaways / Fast Food: The proportion of Māori children who had consumed takeaways / fast food three or more times in the previous week (10.1% 95% CI 8.3–12.0) was significantly higher than for non-Māori children (6.3% 95% CI 5.1–7.5).

Data Sources and Methods

Definitions
Number of Times Breakfast Was Eaten at Home in the Previous Week in Children Aged 2–14 Years
Number of Fizzy Drinks Consumed in the Previous Week for Children Aged 2–14 Years
Number of Times Takeaways / Fast Food was Consumed in the Past Week for Children Aged 2–14 Years

Data Sources
The 2006/07 New Zealand Health Survey (NZHS)
The 2006/07 NZHS [30] was a cross sectional survey carried out between October 2006 and November 2007, which collected information on 4,921 children from birth to 14 years, and 12,488 adults aged 15 years and over who lived in private dwellings. The child survey included 3,039 European / Other, 1,983 Māori, 798 Pacific and 742 Asian children, with the final response rate for the child questionnaire being 71%, and for the adult questionnaire being 68%. The primary caregiver, in the case of children aged 0–14 years, answered the questionnaire on the child’s behalf. The survey results have been weighted to ensure they are representative of New Zealand’s resident population living in permanent dwellings [30].

Ethnicity: In the Survey four ethnic groups were reported: Māori, Pacific, Asian and European / Other, with the “Other” category including Middle-Eastern, Latin-American and African ethnic groups. Total response ethnicity was used throughout, with an individual being included in the analysis for each ethnic group to which they affiliated (28.3% of children were assigned to more than one ethnic group). As a result, ethnic groups cannot be directly compared with each other, and thus all interpretations which appear in the text are made with reference to the total population [30].

Age Standardisation: In New Zealand, each ethnic group has its own age structure (e.g. the Māori and Pacific populations have a much higher proportion of individuals <25 years of age) and thus when comparisons are made between different ethnic groups (and also by NZ Deprivation Index decile, which is unevenly distributed by ethnicity), these differences need to be taken into account. Thus, in the sections which follow, all ethnic and NZ Deprivation Index decile specific analyses have been age standardised (to the World Health Organisation (WHO) world population age distribution - see [30] p16 for a more detailed account). All age / gender graphs however use unadjusted rates, so that the
underlying prevalence in the New Zealand population can better be ascertained. Where
gender comparisons are made in the text however, these have been adjusted for
differences in the underlying age distributions of the two gender groupings [30].
The data for the tables and graphs derived from this survey were sourced from
PHYSICAL ACTIVITY

Introduction
The following section explores information on physical activity for Māori children and young people using information from the 2006/07 New Zealand Health Survey [30].

Background
The New Zealand Physical Activity Guidelines state that children and young people aged 5–18 years should do 60 minutes or more of moderate-to-vigorous physical activity each day [49]. In this context, moderate physical activity is the equivalent of a brisk walk, and vigorous physical activity is that which causes people to “huff and puff” [50]. Young people aged 18 years or older come under the adult guidelines which recommend 30 minutes of moderate physical activity on most, if not all, days of the week [49].

While no consistent time series data is available on the physical activity patterns of Māori children and young people, the 2002 National Children’s Nutrition Survey found that Māori children were the most active of the three ethnic groups reviewed (Māori, Pacific, European / Other), with 33.0% of Māori boys and 21.8% of Māori girls being in the most active quartile. Māori children were also less likely to be transported to and from school by inactive means (40.8% of boys and 48.2% of girls) than European / Other children (48.3% of boys and 51.6% of girls). A higher proportion of Māori children however, watched television or videos for more than 20 hours per week than European / Other children [36].

Physical Activity

Usual Transport To and From School
Questions on active transport to and from school were included in the 2006/07 New Zealand Health Survey as regular physical activity has been associated with lower cholesterol and blood pressure in children, and with improvements in energy balance [30]. In the section that follows, active transport is defined as the use of any form of physical activity (e.g. walk, bike, skate) to get to school, with multiple responses being permitted (e.g. a child who usually walks to the bus stop and then catches the bus to school). Inactive transport includes travelling to school by car or bus, with the caregivers of children who did not usually travel to school by active means being asked what stops this from happening [30].

Ethnic Differences
When age standardised rates for Māori children were compared with those of non-Māori children, the proportion of Māori children aged 5–14 years who usually travelled to school by active means (50.4% 95% CI 46.1–54.6) was not significantly different to that of non-Māori children (45.9% 95% CI 42.8–49.0). Figure 14 explores the breakdown of usual transport to and from school for Māori and non-Māori children in more detail.
New Zealand Level Distribution and Risk Factors

Additional information on the distribution of transport to and from school in the New Zealand paediatric population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

**Age and Gender Differences in Means of Transport to School**

Private cars were the most common way for children to get to and from school (56.4% 95% CI 54.3–58.6), followed by walking (40.9% 95% CI 38.2–43.5%). There was no significant gender differences in the usual type of transport used to get to and from school with the exception of bicycles, where boys were more likely than girls to cycle to school.

When broken down by age, boys aged 10–14 years (53.7% 95% CI 49.7–57.8) were significantly more likely to use active transport to and from school than boys aged 5–9 years (43.6% 95% CI 38.9–48.2), although differences for girls did not reach statistical significance. Within the passive transport category however, the proportion using private cars was significantly higher for those aged 5–9 years than for those aged 10–14 years, while the proportion using the bus was significantly higher for those aged 10–14 years than for those aged 5–9 years. Within the active transport category, the proportion cycling to school was significantly higher for those aged 10–14 years than for those aged 5–9 years, although the proportion walking was similar.

**NZ Deprivation Index Decile Differences**

There were no statistically significant differences by NZDep deprivation in the proportion of children who used active transport modalities to get to and from school.
Barriers to Using Active Transport to Travel to School

Parents cited a number of barriers which prevented their children using active transport to travel to and from school. These included the distances being too far, the traffic being too busy, it being too dangerous (for reasons other than traffic), the time it would take, the weather, the child not wanting to, or the child having health conditions which prevented them from doing so.

Ethnic Differences

When age standardised rates for Māori children were compared with those of non-Māori children, there were no significant differences in the barriers cited by parents which prevented their children travelling to school by active means (Figure 15).

Figure 15. Barriers to Using Active Transport to Travel to and From School for Children Aged 5–14 Years by Ethnicity, 2006/07 New Zealand Health Survey

Source: 2006/07 New Zealand Health Survey; Ethnicity is Total Response; Rates are Age Standardised

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of barriers to the use of active transport to and from school in the New Zealand paediatric population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Age and Gender Differences

Overall, there were no significant gender differences in the reasons given for children not being able to travel to school by active means, although when broken down by age, the fact that it was too far was more commonly cited for children aged 10–14 years (74.2 95% CI 69.9–78.4) than for children aged 5–9 years (61.4 95% CI 56.4–66.4).
Sedentary Time

Number of Hours of Television Watched

The number of hours of television watched was included in the 2006/07 New Zealand Health Survey as television watching is a very sedentary behaviour and time spent watching television displaces opportunities for more physical activities. Television watching also exposes children to advertising which may impact negatively on healthy food choices, with some studies also suggesting that watching two or more hours of television per day in childhood increases the risk of obesity [30].

Ethnic Differences

Similarly, when age standardised rates for Māori children were compared with those of non-Māori children, the proportion of Māori children aged 5–14 years who watched two or more hours of television per day (76.1% 95% CI 72.9–79.3) was significantly higher than for non-Māori children (60.5% 95% CI 57.9–63.0). Figure 16 reviews the number of hours television was usually watched per day for Māori and non-Māori children.

Figure 16. Number of Hours Television Usually Watched per Day for Children Aged 5–14 Years by Ethnicity, 2006/07 New Zealand Health Survey

![Figure 16](chart)

Source: 2006/07 New Zealand Health Survey; Ethnicity is Total Response; Rates are Age Standardised

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of television watching in the New Zealand paediatric population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Age and Gender Differences

Overall, 64.1% (95% CI 62.1–66.2) of children aged 5–14 years usually watched two or more hours of television per day. Once adjusted for age, there were no significant gender differences in the number of hours children usually watched television each day. Children aged 10–14 years (71.8% 95% CI 69.3–74.3) however, were significantly more likely to watch television for two or more hours per day than children aged 5–9 years (56.3% 95% CI 53.0–59.7).
NZ Deprivation Index Decile Differences

Once adjusted for age, children living in the most deprived (NZDep deciles 9–10) areas (72.7% 95% CI 68.4–77.0) were significantly more likely to watch television for two or more hours per day than children living in the least deprived (NZDep decile 1–2) areas (51.1% 95% CI 46.5–55.8).

Summary

Travel to School by Active Means: In the 2006/07 NZHS, private cars, followed by walking, were the most common ways for children to get to school. Use of active transport for Māori boys was significantly higher than for the total population, while for girls differences did not reach statistical significance. Barriers preventing Māori children using active transport to travel to school included distances being too far, traffic being too busy, it being too dangerous and time constraints. When age standardised rates for Māori children were compared with those of non-Māori children, there were no significant differences in the barriers cited by parents, to their children travelling to school by active means.

Television Viewing: In the 2006/07 NZHS, the proportion of Māori children aged 5–14 years who watched two or more hours of television per day (76.1% 95% CI 72.9–79.3) was significantly higher than for non-Māori children (60.5% 95% CI 57.9–63.0).

Data Sources and Methods

Definitions
- Transport to and from School for Children Aged 5–14 Years
- Proportion of Children and Young People 5–24 Years Meeting Screen Time Guidelines
- Number of Hours Television Usually Watched per day for Children Aged 5–14 Years

Data Sources

The 2006/07 New Zealand Health Survey (NZHS)

The 2006/07 NZHS [30] was a cross sectional survey carried out between October 2006 and November 2007, which collected information on 4,921 children from birth to 14 years, and 12,488 adults aged 15 years and over who lived in private dwellings. The child survey included 3,039 European / Other, 1,983 Māori, 798 Pacific and 742 Asian children, with the final response rate for the child questionnaire being 71%, and for the adult questionnaire being 68%. The primary caregiver, in the case of children aged 0–14 years, answered the questionnaire on the child’s behalf. The survey results have been weighted to ensure they are representative of New Zealand’s resident population living in permanent dwellings [30].

Ethnicity: In the Survey four ethnic groups were reported: Māori, Pacific, Asian and European / Other, with the “Other” category including Middle-Eastern, Latin-American and African ethnic groups. Total response ethnicity was used throughout, with an individual being included in the analysis for each ethnic group to which they affiliated (28.3% of children were assigned to more than one ethnic group). As a result, ethnic groups cannot be directly compared with each other, and thus all interpretations which appear in the text are made with reference to the total population [30].

Age Standardisation: In New Zealand, each ethnic group has its own age structure (e.g. the Māori and Pacific populations have a much higher proportion of individuals <25 years of age) and thus when comparisons are made between different ethnic groups (and also by NZ Deprivation Index decile, which is unevenly distributed by ethnicity), these differences need to be taken into account. Thus, in the sections which follow, all ethnic and NZ Deprivation Index decile specific analyses have been age standardised (to the World Health Organisation (WHO) world population age distribution - see [30] p16 for a more detailed account). All age / gender graphs however use unadjusted rates, so that the underlying prevalence in the New Zealand population can better be ascertained. Where gender comparisons are made in the text however, these have been adjusted for differences in the underlying age distributions of the two gender groupings [30].

The data for the tables and graphs derived from this survey were sourced from http://www.moh.govt.nz/moh.nsf/indexmh/portrait-of-health#summary
CONDITIONS DETECTABLE BY ANTENATAL AND NEONATAL SCREENING
Antenatal and Neonatal Screening

Introduction

In New Zealand, a small number of babies each year are born with inborn errors of metabolism (e.g. galactosaemia), which if left untreated, may lead to permanent organ damage within a relatively short period of time [51]. Further, overseas research suggests that up to 25% of babies with severe forms of congenital heart disease are discharged from hospital undiagnosed [52]. Even for non life-threatening conditions, delayed diagnosis may lead to the loss of opportunities for early intervention (e.g. congenital hearing loss, which can be identified at birth with newborn hearing screening versus at an average age of 35.1 months if screening is based on the presence of risk factors [53]).

The early detection of such conditions thus confers significant advantage, with antenatal diagnosis also providing the opportunity to identify additional congenital or chromosomal abnormalities, to discuss pregnancy options with parents, and to plan for delivery in a tertiary centre, if additional services are to be required [54]. For a number of conditions however (e.g. congenital deafness, inborn errors of metabolism where the placenta clears metabolites in-utero) antenatal diagnosis is not possible, and in such cases early detection in the neonatal period becomes of critical importance.

Current Screening Programmes for Identifying Congenital Anomalies and Inborn Errors of Metabolism

In New Zealand, a number of screening programmes have been established to detect congenital anomalies and inborn errors of metabolism in the antenatal period, or as soon as possible after birth. These are considered in more detail in the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. The main screening Programmes outlined in this report included:

Screening During the Antenatal Period

Antenatal Screening for Down Syndrome and Other Conditions

Antenatal screening for Down Syndrome and other conditions has been available to pregnant women since 1968 [55], although concerns during the mid-2000s that the current screening processes were ad-hoc [56], led to the National Screening Unit introducing a range of quality improvements, including the release of best practice guidelines for maternity providers in 2009 [55]. These guidelines suggest that all pregnant women be offered antenatal screening for Down Syndrome and other conditions in either the first trimester (a blood test measuring two serum markers, plus an ultrasound to assess nuchal translucency), or second trimester (a blood test that measures four maternal serum markers). After undergoing screening, all women who are deemed to be at an increased risk of having a baby with Down Syndrome or other conditions should then be offered an obstetric referral to discuss diagnostic testing options including chorionic villus sampling and amniocentesis. Maternity providers should also provide advice about the availability of genetic counselling services, to women with an increased risk [55].

In addition, while not being part of a formal screening programme, ultrasounds are frequently undertaken between 18–20 weeks of gestation to screen for obvious structural anomalies [55].

Screening During the Neonatal Period

Newborn Examination

The Well Child / Tamariki Ora Schedule recommends that a detailed clinical examination be undertaken within 48 hours of birth (initial examination usually undertaken at birth), with a further clinical examination being undertaken within 7 days, and another at 4–6 weeks (at the time of discharge from maternity services) [57]. At the initial (newborn) examination the Schedule recommends that clinicians undertake a thorough assessment that includes: the child’s overall health and wellbeing, weight, length and head circumference, and a
more detailed examination of their hips, cardiovascular system (heart, umbilicus, and femoral pulses), eyes (red reflex), colour, respiration, tone, Moro reflex, grasp reflex, movements, skin, head, fontanelles, ears, mouth, lungs, abdomen, umbilicus, genitalia, anus, spine, and limbs [58].

Newborn Metabolic Screening Programme
When New Zealand first commenced newborn metabolic screening in 1969, screening was initially undertaken only for phenylketonuria (PKU) [51]. The current Newborn Metabolic Screening Programme however, screens for 28 metabolic disorders [51], including congenital hypothyroidism, cystic fibrosis, a range of amino acid and fatty acid oxidation disorders, congenital adrenal hyperplasia, galactosaemia and biotinidase deficiency. Lead Maternity Carers (LMCs) are responsible for undertaking newborn metabolic screening, with the National Screening Unit recommending that LMCs take samples when the baby is 48 hours old (as samples taken earlier may be negative due to the placenta eliminating abnormal metabolites, while samples taken later may result in a lost window for early intervention [51]).

Universal Newborn Hearing Screening and Early Intervention Programme
In New Zealand each year, around 135–170 babies are born with mild to profound permanent congenital hearing loss, representing an incidence of 3 per 1,000 births [59]. In response to concerns regarding the late age of diagnosis (average age 35.1 months when screening was based on risk factors [53]), the establishment of the Universal Newborn Hearing Screening and Early Intervention Programme was announced in the 2006 Budget. The Programme has been rolled out progressively across the country, with screening now under way in all 20 DHBs. At least 32 babies with hearing losses have been identified by the Programme during this period [60]. For babies born in hospital, screening is offered in most cases before the baby goes home, with those born elsewhere, or not managing to be screened prior to discharge being able to access screening on an outpatient basis. Screening is usually undertaken while the baby is asleep or quietly resting, with two types of screening being available: Automated Otoacoustic Emissions (AOAE) and Automated Auditory Brainstem Response (AABR).

Conditions Detectable by Antenatal and Newborn Screening
The sections that follow briefly review a number of conditions which are potentially detectable by antenatal or neonatal screening, with a view to determining the relative contribution each might make to future health service demand for Māori children and young people.

The conditions reviewed are:

- Congenital Anomalies Evident at Birth (Page 71)
- Cardiovascular Anomalies Evident at Birth (Page 76)
- Down Syndrome (Page 80)
- Neural Tube Defects (Page 83)
- Cystic Fibrosis (Page 86)

Note: While the Universal Newborn Hearing Screening and Early Intervention Programme means that congenital hearing losses are now detectable in the neonatal period, the first screening data from the Programme will not be released until mid-2011, and thus congenital hearing loss will be reviewed in next year’s report.
CONGENITAL ANOMALIES EVIDENT AT BIRTH

Introduction
In New Zealand, information on selected congenital anomalies evident at birth is reported to the International Clearinghouse for Birth Defects Surveillance and Research [61], although a lack of ethnic specific analyses means that these reports are unable to provide any insights into the prevalence of congenital anomalies in Māori babies. Other research however, suggests that Māori babies may experience higher rates of some specific congenital anomalies (e.g. talipes equinovarus (club foot) [7] and cleft palate [62]). Understanding the overall distribution and determinants of congenital anomalies is important however, as the 2006 Household Disability Survey found that of an estimated 28,200 Māori children (0–14 years) who were disabled, 14,100 (50%) had a disability that had been present since birth [6].

In order to address this information gap, the following section uses the National Minimum (Hospital Admission) Dataset to review the number of congenital anomalies evident at birth in Māori babies, as well as the number of Māori babies born with one or more congenital anomalies. In reviewing this data, the reader is urged to bear in mind that the analysis includes all congenital anomalies in the ICD-10-AM Q00–Q99 range, irrespective of whether they were minor (e.g. skin tags) or major (e.g. spina bifida), and thus the overall prevalence estimates given for some categories may be higher than for overseas estimates which consider only major anomalies. In addition, while this section aims to provide a cross-sectional overview of the types of congenital anomalies seen in the current Māori birth cohort, later sections consider cardiovascular anomalies, Down Syndrome and Neural Tube Defects in more detail.

Distribution and Trends for Māori Babies

Annual Number of Births and non-Māori non-Pacific Comparisons
In New Zealand during 2005–2009, on average 646 Māori babies each year were born with one or more congenital anomalies evident at birth, with this equating to around 4.9% of all Māori births. During this period, the proportion of Māori babies born with one or more congenital anomalies was significantly lower (RR 0.93 95% CI 0.89–0.96) than for non-Māori non-Pacific babies (Table 14).

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of Babies: Total 2005–2009</th>
<th>Number of Babies: Annual Average</th>
<th>Rate per 100,000 Births*</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Congenital Anomaly</td>
<td>3,231</td>
<td>646</td>
<td>4,939.4</td>
<td>0.93</td>
<td>0.89–0.96</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>10,745</td>
<td>2,149</td>
<td>5,332.7</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Congenital Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: Rate per 100,000 refers to number of babies with one or more anomalies, rather than number of anomalies. Rate Ratios are Unadjusted.

Trends for Māori Babies
In New Zealand, the proportion of Māori babies with one or more congenital anomalies evident at birth remained relatively static during the early-mid 2000s, but then decreased after 2007. On average during 2000–2009, 617 Māori babies per year had one or more congenital anomalies evident at birth, although the severity of these anomalies varied considerably. During 2009, this equated to 3.9% of all Māori births (Figure 17).
Figure 17. Babies with Congenital Anomalies Evident at Birth by Ethnicity, New Zealand Hospital Births 2000–2009

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Congenital Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: Rate per 100,000 refers to number of babies with one or more anomalies, rather than number of anomalies.

Distribution by Congenital Anomaly Type

Amongst Māori babies during 2005–2009, a large number of congenital anomalies were evident at the time of birth, with these ranging in severity from minor skin conditions (e.g. non-neoplastic nevus), through to more serious anomalies (e.g. Tetralogy of Fallot). When interpreting the information in Table 15 and Table 16 however, it must be remembered that the figures presented relate to the number of anomalies detected, rather than the number of babies, with many Māori babies having more than one anomaly.

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of congenital anomalies in the New Zealand birth cohort is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Maternal Age

In New Zealand during 2005–2009, while the largest number of babies born with congenital anomalies had mothers who were aged 30–34 years, the risk of congenital anomalies rose with increasing maternal age, with babies whose mothers were aged 40+ years having rates 1.35 (95% CI 1.24–1.48) times higher than those whose mothers gave birth in their teens.

Distribution by NZ Deprivation Index Quintile and Gender

In New Zealand during 2005–2009, while no socioeconomic differences (as measured by NZ Deprivation Index quintile) were evident, the proportion of babies with one or more congenital anomalies evident at birth was significantly higher for males.
Table 15. Congenital Anomalies Evident at Birth in Māori Babies, New Zealand 2005-2009 (Table 1 of 2)

<table>
<thead>
<tr>
<th>Congenital Anomaly</th>
<th>Number: Total 2005–2009</th>
<th>Number: Annual Average</th>
<th>Number of Anomalies per 100,000 Births*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anencephaly</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Encephalocele</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Microcephaly</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Congenital Hydrocephalus</td>
<td>11</td>
<td>2.2</td>
<td>16.8</td>
</tr>
<tr>
<td>Other Brain Malformations</td>
<td>31</td>
<td>6.2</td>
<td>47.4</td>
</tr>
<tr>
<td>Spina Bifida</td>
<td>27</td>
<td>5.4</td>
<td>41.3</td>
</tr>
<tr>
<td>Other Spinal Cord Malformations</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Other CNS Malformations</td>
<td>6</td>
<td>1.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Total Malformations of Nervous System</td>
<td>94</td>
<td>18.8</td>
<td>143.7</td>
</tr>
<tr>
<td>Eyelid / Lacrimal / Eye / Orbit Malformations</td>
<td>19</td>
<td>3.8</td>
<td>29.0</td>
</tr>
<tr>
<td>Ear Malformations Impairing Hearing</td>
<td>7</td>
<td>1.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Accessory Auricle</td>
<td>107</td>
<td>21.4</td>
<td>163.6</td>
</tr>
<tr>
<td>Other Ear Malformations</td>
<td>51</td>
<td>10.2</td>
<td>78.0</td>
</tr>
<tr>
<td>Other Face / Neck Malformations</td>
<td>35</td>
<td>7.0</td>
<td>53.5</td>
</tr>
<tr>
<td>Total Malformations of Eye, Ear, Face and Neck</td>
<td>219</td>
<td>43.8</td>
<td>334.8</td>
</tr>
<tr>
<td>Malformations Cardiac Chambers / Connections</td>
<td>43</td>
<td>8.6</td>
<td>65.7</td>
</tr>
<tr>
<td>Ventricular Septal Defect</td>
<td>91</td>
<td>18.2</td>
<td>139.1</td>
</tr>
<tr>
<td>Atrial Septal Defect</td>
<td>135</td>
<td>27.0</td>
<td>206.4</td>
</tr>
<tr>
<td>Atrioventricular Septal Defect</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Tetralogy of Fallot</td>
<td>20</td>
<td>4.0</td>
<td>30.6</td>
</tr>
<tr>
<td>Pulmonary / Tricuspid Valve Malformations</td>
<td>19</td>
<td>3.8</td>
<td>29.0</td>
</tr>
<tr>
<td>Aortic / Mitral Valve Malformations</td>
<td>24</td>
<td>4.8</td>
<td>36.7</td>
</tr>
<tr>
<td>Other Heart Malformations</td>
<td>82</td>
<td>16.4</td>
<td>125.4</td>
</tr>
<tr>
<td>Patent Ductus Arteriosus</td>
<td>295</td>
<td>59.0</td>
<td>451.0</td>
</tr>
<tr>
<td>Malformations Great Arteries (Excluding PDA)</td>
<td>43</td>
<td>8.6</td>
<td>65.7</td>
</tr>
<tr>
<td>Malformations Great Veins</td>
<td>7</td>
<td>1.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Other Peripheral Vascular Malformations</td>
<td>53</td>
<td>10.6</td>
<td>81.0</td>
</tr>
<tr>
<td>Other Circulatory Malformations</td>
<td>110</td>
<td>22.0</td>
<td>168.2</td>
</tr>
<tr>
<td>Total Malformations of Circulatory System</td>
<td>931</td>
<td>186.2</td>
<td>1,423.3</td>
</tr>
<tr>
<td>Nose Malformations</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Trachea / Bronchus Malformations</td>
<td>21</td>
<td>4.2</td>
<td>32.1</td>
</tr>
<tr>
<td>Lung Malformations</td>
<td>25</td>
<td>5.0</td>
<td>38.2</td>
</tr>
<tr>
<td>Other Respiratory Malformations</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Total Malformations of Respiratory System</td>
<td>56</td>
<td>11.2</td>
<td>85.6</td>
</tr>
<tr>
<td>Ankyloglossia (Tongue Tie)</td>
<td>153</td>
<td>30.6</td>
<td>233.9</td>
</tr>
<tr>
<td>Tongue / Mouth / Pharynx Malformations</td>
<td>8</td>
<td>1.6</td>
<td>12.2</td>
</tr>
<tr>
<td>Oesophagus / Upper Alimentary Malformations</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Intestinal Malformations</td>
<td>43</td>
<td>8.6</td>
<td>65.7</td>
</tr>
<tr>
<td>Other Digestive Malformations</td>
<td>7</td>
<td>1.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Total Other Malformations of Digestive System</td>
<td>220</td>
<td>44.0</td>
<td>336.3</td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Congenital Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: *Anomalies per 100,000 Births refers to total number of anomalies rather than number of babies, as some babies have more than one anomaly; s denotes rates suppressed due to small numbers.
Table 16. Congenital Anomalies Evident at Birth in Māori Babies, New Zealand 2005–2009 (Table 2 of 2)

<table>
<thead>
<tr>
<th>Congenital Anomaly</th>
<th>Number: Total 2005–2009</th>
<th>Number: Annual Average</th>
<th>Number of Anomalies per 100,000 Births*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleft Palate</td>
<td>50</td>
<td>10.0</td>
<td>76.4</td>
</tr>
<tr>
<td>Cleft Lip</td>
<td>10</td>
<td>2.0</td>
<td>15.3</td>
</tr>
<tr>
<td>Cleft Palate and Lip</td>
<td>30</td>
<td>6.0</td>
<td>45.9</td>
</tr>
<tr>
<td>Total Cleft Lip and Palate</td>
<td>90</td>
<td>18.0</td>
<td>137.6</td>
</tr>
<tr>
<td>Female Genital Malformations</td>
<td>14</td>
<td>2.8</td>
<td>21.4</td>
</tr>
<tr>
<td>Undescended Testicle</td>
<td>327</td>
<td>65.4</td>
<td>499.9</td>
</tr>
<tr>
<td>Hypospadias</td>
<td>139</td>
<td>27.8</td>
<td>212.5</td>
</tr>
<tr>
<td>Other Male Genital Malformations</td>
<td>40</td>
<td>8.0</td>
<td>61.2</td>
</tr>
<tr>
<td>Indeterminate Sex / Pseudohermaphroditism</td>
<td>8</td>
<td>1.6</td>
<td>12.2</td>
</tr>
<tr>
<td>Total Malformations of the Genital Organs</td>
<td>528</td>
<td>105.6</td>
<td>807.2</td>
</tr>
<tr>
<td>Renal Agenesis / Reduction Defects</td>
<td>19</td>
<td>3.8</td>
<td>29.0</td>
</tr>
<tr>
<td>Cystic Kidney Disease</td>
<td>38</td>
<td>7.6</td>
<td>58.1</td>
</tr>
<tr>
<td>Renal Pelvis Obstruction / Ureter Malformations</td>
<td>57</td>
<td>11.4</td>
<td>87.1</td>
</tr>
<tr>
<td>Other Kidney / Urinary Malformations</td>
<td>66</td>
<td>13.2</td>
<td>100.9</td>
</tr>
<tr>
<td>Total Malformations of the Urinary System</td>
<td>180</td>
<td>36.0</td>
<td>275.2</td>
</tr>
<tr>
<td>Congenital Dislocation Hip</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Congenital Subluxation Hip</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Other Deformities Hip</td>
<td>70</td>
<td>14.0</td>
<td>107.0</td>
</tr>
<tr>
<td>Foot Deformities</td>
<td>602</td>
<td>120.4</td>
<td>920.3</td>
</tr>
<tr>
<td>Other Musculoskeletal Malformations</td>
<td>136</td>
<td>27.2</td>
<td>207.9</td>
</tr>
<tr>
<td>Polydactyly</td>
<td>94</td>
<td>18.8</td>
<td>143.7</td>
</tr>
<tr>
<td>Syndactyly</td>
<td>25</td>
<td>5.0</td>
<td>38.2</td>
</tr>
<tr>
<td>Reduction Defects / Other Limb Malformations</td>
<td>37</td>
<td>7.4</td>
<td>56.6</td>
</tr>
<tr>
<td>Skull / Facial Bones / Spine / Thorax Malformation</td>
<td>61</td>
<td>12.2</td>
<td>93.3</td>
</tr>
<tr>
<td>Osteochondrodysplasia</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Total Malformations of the Musculoskeletal System</td>
<td>1,042</td>
<td>208.4</td>
<td>1,593.0</td>
</tr>
<tr>
<td>Ichthysis</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Non-Neoplastic Naevus</td>
<td>226</td>
<td>45.2</td>
<td>345.5</td>
</tr>
<tr>
<td>Other Skin Malformations</td>
<td>295</td>
<td>59.0</td>
<td>451.0</td>
</tr>
<tr>
<td>Breast Malformations</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Other Integument Malformations</td>
<td>127</td>
<td>25.4</td>
<td>194.2</td>
</tr>
<tr>
<td>Other Malformations</td>
<td>68</td>
<td>13.6</td>
<td>104.0</td>
</tr>
<tr>
<td>Total Other Congenital Malformations</td>
<td>721</td>
<td>144.2</td>
<td>1,102.2</td>
</tr>
<tr>
<td>Down Syndrome</td>
<td>45</td>
<td>9.0</td>
<td>68.8</td>
</tr>
<tr>
<td>Edwards and Patau Syndromes</td>
<td>17</td>
<td>3.4</td>
<td>26.0</td>
</tr>
<tr>
<td>Monosomies / Autosomal Deletions / Rearrangements</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Turners Syndrome</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Sex Chromosome Anomalies Male Phenotype</td>
<td>6</td>
<td>1.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Other Chromosome Anomalies</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Total Chromosomal Anomalies</td>
<td>75</td>
<td>15.0</td>
<td>114.7</td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Congenital Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: * Anomalies per 100,000 Births refers to total number of anomalies rather than number of babies, as some babies have more than one anomaly; “s” denotes rates suppressed due to small numbers.
Summary

In New Zealand during 2005–2009, on average 646 Māori babies each year were born with one or more congenital anomalies evident at birth, with this equating to around 4.9% of all Māori births. During this period, the proportion of Māori babies born with one or more congenital anomalies was significantly lower (RR 0.93 95% CI 0.89–0.96) than for non-Māori non-Pacific babies. The types of congenital anomaly identified however, ranged in severity from minor skin conditions (e.g. non-neoplastic nevus) through to more serious anomalies (e.g. Tetralogy of Fallot).

Data Source and Methods

Definition
1. Number of Congenital Anomalies Evident at the Time of Birth (by Anomaly Type)
2. Number of Babies with One or More Congenital Anomalies Evident at the Time of Birth (by Anomaly Type)

Data Source
1. National Minimum Dataset
   Numerator: Hospital Admissions with Event Type = Birth and a Congenital Anomaly (Q00–Q99) listed in any of the first 15 diagnoses.
   Denominator: All Hospital Admissions with Event Type = Birth

Notes on Interpretation
The analysis includes all admissions recorded in the National Minimum Dataset where the Event Type was listed as a Birth (Note: Only one birth event is allowed per NHI number, with babies being born prior to hospital admission, or being readmitted shortly after discharge being listed as a routine inpatient event). Thus the analysis does not include babies born prior to hospital admission, babies born at home, or babies whose congenital anomaly was overlooked at the time of initial hospital discharge, but who re-presented shortly thereafter. Further, the methodology used may significantly undercount those conditions where the congenital or chromosomal anomaly usually only becomes evident at a later age, when the child fails to achieve their normal developmental milestones (e.g. many chromosomal or CNS anomalies), or where the condition may be difficult to detect on routine newborn examination.

Further, because of the large number of ICD-10 diagnoses within the Q00–Q99 range, and the lack of additional supporting information, no attempt has been made to grade the severity of the congenital anomalies identified. The reader must thus bear in mind that in the analyses that follow, minor anomalies such as skin tags and undescended testicle (many of which subsequently spontaneously descend), or anomalies that may in some cases be considered a part of normal physiological development (e.g. isolated patent ductus arteriosus in preterm babies), have been counted equally alongside more serious anomalies such as spina bifida, Down Syndrome, and Tetralogy of Fallot in the rate calculations. Thus when considering the impact congenital anomalies might have on children’s subsequent developmental trajectories, or on future health service demand, the reader is urged to consider the information presented on an anomaly by anomaly basis.

For a list of the ICD-10 codes used to assign anomaly type see Table 40 and Table 41 in Appendix 7.

Indicator Category Ideal B
CARDIOVASCULAR ANOMALIES

Introduction
The following section uses data from the National Minimum Dataset to review the number of Māori babies with cardiovascular anomalies evident at the time of birth.

Background
While there is little information on the incidence of cardiovascular anomalies amongst Māori babies, overseas the incidence of severe congenital heart disease (CHD) (e.g. transposition of the great arteries, Tetralogy of Fallot) requiring expert cardiological care has been estimated at 2.5–3.0 per 1,000 live births, with moderately severe forms of CHD (e.g. large atrial septal defects, complex forms of ventricular septal defects) accounting for another 3 per 1,000 live births. The overall incidence increases to 75 per 1,000, however, if minor anomalies (e.g. small ventricular septal defects, atrial septal defects, or patent ductus arteriosus) are included, with international variations in rates largely being attributed to differences in the detection and reporting of these minor anomalies [63].

In tertiary centres dealing with the diagnosis and management of fetal cardiac anomalies, a high degree of diagnostic accuracy is possible, with most (but not all) major forms of CHD being possible to detect antenatally [52]. In the majority of cases, however, congenital heart disease will occur in low risk groups and will only be detected antenatally if examination of the fetal heart is included as part of routine obstetric ultrasound screening (e.g. using a four chamber view of the fetal heart). In such cases, detection rates are likely to depend on the level of sonographer training and experience, the adequacy of the equipment available, and the time allowed for sonographers to undertake each routine examination [52]. Investing in such resources is important, however, as early detection confers significant advantages in that it provides an opportunity to exclude associated extra-cardiac and chromosomal abnormalities, discuss pregnancy options, prepare parents, and plan for delivery in a tertiary centre [54].

Distribution and Trends for Māori Babies

Annual Number of Births and non-Māori non-Pacific Comparisons
In New Zealand during 2005–2009, on average 84 Māori babies each year were born with one or more cardiovascular anomalies evident at birth, with this equating to around 0.6% of all Māori births. During this period, the proportion of Māori babies born with one or more cardiovascular anomalies was not significantly different (RR 0.91 95% CI 0.81–1.01) from that of non-Māori non-Pacific babies (Table 17).

Table 17. Babies with Cardiovascular Anomalies Evident at Birth by Ethnicity, New Zealand Hospital Births 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of Babies: Total 2005–2009</th>
<th>Number of Babies: Annual Average</th>
<th>Rate per 100,000 Births*</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Cardiovascular Anomaly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>421</td>
<td>84</td>
<td>643.6</td>
<td>0.91</td>
<td>0.81–1.01</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>1,428</td>
<td>286</td>
<td>708.7</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Cardiovascular Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: Rate per 100,000 refers to number of babies with one or more CVS anomalies, rather than the number of anomalies; Preterm (<37 weeks) babies with Isolated Patent Ductus Arteriosus excluded.
Distribution by Cardiovascular Anomaly Type

In New Zealand during 2005–2009, patent ductus arteriosus (PDA) was the most frequent cardiovascular anomaly identified at the time of birth in Māori babies, with 58.6% of PDAs being in preterm babies (<37 weeks gestation) who had no other cardiovascular anomalies (see Methods section for rationale for exclusion of these cases from subsequent analyses). Atrial septal and ventricular septal defects were the next most frequent causes of cardiovascular anomalies in Māori infants (Table 18).

Table 18. Cardiovascular Anomalies Evident at Birth in Māori Babies, New Zealand Hospital Births 2005–2009

<table>
<thead>
<tr>
<th>Cardiovascular Anomaly</th>
<th>Number: Total 2005–2009</th>
<th>Number: Annual Average</th>
<th>Number of Anomalies per 100,000 Births*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori Babies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malformations Cardiac Chambers / Connections</td>
<td>43</td>
<td>8.6</td>
<td>65.7</td>
</tr>
<tr>
<td>Ventricular Septal Defect</td>
<td>91</td>
<td>18.2</td>
<td>139.1</td>
</tr>
<tr>
<td>Atrial Septal Defect</td>
<td>135</td>
<td>27.0</td>
<td>206.4</td>
</tr>
<tr>
<td>Atrioventricular Septal Defect</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Tetralogy of Fallot</td>
<td>20</td>
<td>4.0</td>
<td>30.6</td>
</tr>
<tr>
<td>Pulmonary / Tricuspid Valve Malformations</td>
<td>19</td>
<td>3.8</td>
<td>29.0</td>
</tr>
<tr>
<td>Aortic / Mitral Valve Malformations</td>
<td>24</td>
<td>4.8</td>
<td>36.7</td>
</tr>
<tr>
<td>Other Heart Malformations</td>
<td>82</td>
<td>16.4</td>
<td>125.4</td>
</tr>
<tr>
<td>Patent Ductus Arteriosus</td>
<td>295</td>
<td>59.0</td>
<td>451.0</td>
</tr>
<tr>
<td>Malformations Great Arteries (Excluding PDA)</td>
<td>43</td>
<td>8.6</td>
<td>65.7</td>
</tr>
<tr>
<td>Malformations Great Veins</td>
<td>7</td>
<td>1.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Other Peripheral Vascular Malformations</td>
<td>53</td>
<td>10.6</td>
<td>81.0</td>
</tr>
<tr>
<td>Other Circulatory Malformations</td>
<td>110</td>
<td>22.0</td>
<td>168.2</td>
</tr>
<tr>
<td>Total Malformations of Circulatory System</td>
<td>931</td>
<td>186.2</td>
<td>1,423.3</td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Cardiovascular Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: Anomalies per 100,000 Births refers to total number of anomalies rather than number of babies, as some babies have more than one anomaly; Patent Ductus Arteriosus includes 173 cases of Isolated PDA in preterm infants (<37 weeks), which have been excluded in subsequent analyses.

Trends for Māori Babies

In New Zealand during 2000–2009, the proportion of Māori babies born with one or more cardiovascular anomalies evident at birth fluctuated, with numbers averaging 73.7 cases per year during this period (Figure 18).

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of cardiovascular anomalies in the New Zealand birth cohort is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Maternal Age

In New Zealand during 2005–2009, while the largest number of babies born with cardiovascular anomalies had mothers who were aged 30–34 years, the risk of cardiovascular anomalies rose progressively with increasing maternal age, with babies whose mothers were aged 40+ years having rates which were 2.03 (95% CI 1.59–2.58) times higher than those whose mothers gave birth in their teens.
**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2005–2009, no significant gender or socioeconomic (as measured by NZ Deprivation Index decile) differences were seen in the proportion of babies with cardiovascular anomalies evident at birth.

**Figure 18. Babies with Cardiovascular Anomalies Evident at Birth by Ethnicity, New Zealand Hospital Births 2000–2009**

![Graph showing distribution by ethnicity and year]

*Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Cardiovascular Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Rate per 100,000 refers to number of babies with one or more CVS anomalies, rather than the number of anomalies; Preterm (<37 weeks) babies with Isolated Patent Ductus Arteriosus excluded.*

**Summary**

In New Zealand during 2005–2009, on average 84 Māori babies each year were born with one or more cardiovascular anomalies evident at birth, with this equating to around 0.6% of all Māori births. During this period, the proportion of Māori babies born with one or more cardiovascular anomalies was not *significantly* different (RR 0.91 95% CI 0.81–1.01) from that of non-Māori non-Pacific babies. Patent ductus arteriosus (PDA) was the most frequent cardiovascular anomaly identified at birth in Māori babies, with 58.6% of PDAs being in preterm babies (<37 weeks gestation) who had no other cardiovascular anomalies. Atrial septal and ventricular septal defects were the next most frequent anomalies identified.
Data Source and Methods

Definition
1. Number of Cardiovascular Anomalies Evident at Birth (by Anomaly Type)
2. Number of Babies with one or more Cardiovascular Anomalies Evident at Birth (by Anomaly Type)

Data Source
1. National Minimum Dataset

Numerator: Hospital Admissions with Event Type = Birth and a Cardiovascular Anomaly (ICD-10 Q20–Q28) listed in any of the first 15 diagnoses.

Denominator: All Hospital Admissions with Event Type = Birth

Notes on Interpretation
The analysis includes all admissions recorded in the National Minimum Dataset where the Event Type was listed as a Birth (Note: Only one birth event is allowed per NHI number, with babies being born prior to hospital admission, or being readmitted shortly after discharge being listed as a routine inpatient event). Thus the analysis does not include babies born prior to hospital admission, babies born at home, or babies whose cardiovascular anomaly was overlooked at the time of initial hospital discharge, but who re-presented shortly thereafter. Further, the methodology used may significantly undercount those cardiovascular anomalies that are difficult to detect on routine newborn examination.

Note: In the analysis that follows, 58.6% of patent ductus arteriosus (PDA) cases identified during 2005–2009 were in preterm babies (<37 weeks gestation) who had no other cardiovascular anomalies. Prematurity is known to increase the risk of PDA as a result of increased exposure to hypoxia and underdeveloped heart and lungs. Because 18.6% of all cardiovascular anomalies identified during 2005–2009 were isolated PDAs in preterm infants, because many of these babies would not have experienced a PDA had they been born at term, and because the analysis of risk factors for cardiovascular anomalies may have inadvertently been distorted by the risk factor profiles of those babies being born prematurely, after the first initial overview tables, preterm (<37 weeks) babies with isolated PDAs (i.e. a PDA with no other cardiovascular anomaly) have been excluded from rate calculations.

For a list of the ICD-10 codes used to assign cardiovascular anomaly types see Table 40 and Table 41 in Appendix 7.

Indicator Category Ideal B
**Down Syndrome**

### Introduction

The following section uses information from the National Minimum Dataset to review the number of Māori hospital births where Down Syndrome was evident at the time of birth.

### Background

Down Syndrome is the most common (non sex-linked) chromosomal anomaly in live born babies, with the diagnosis usually being made in-utero, or at the time of birth. Children with Down Syndrome have a range of clinical features including reduced growth (height ~ 3rd percentile), slow cognitive development, low muscle tone and joint laxity, and an increased risk of a number of medical conditions (e.g. congenital heart disease, thyroid dysfunction, cataracts, hearing problems), which may affect their quality of life [64]. Approximately 95% of children with Down Syndrome have an extra chromosome 21 (trisomy 21), with the remaining 5% having either translocations (3%) or mosaicism (2%) [65].

While there is little information on the prevalence of Down Syndrome amongst Māori children and young people, approximately 90 babies in New Zealand each year are born with Down Syndrome [55]. The Ministry of Health has also released a set of guidelines on the clinical assessment and management of children and young people with Down Syndrome [64], that outline the range of clinical and support services that children and young people may require at different stages of their development (e.g. parental counselling, breastfeeding support, the identification and management of other congenital anomalies and medical conditions, and access to early intervention, disability support services and special education) [64]. In addition, the National Screening Unit has also released a set of guidelines for maternity providers [55], which outline recommended best practice in the area of antenatal screening (see Page 69 for further details).

### Distribution and Trends for Māori Babies

#### Annual Number of Births and non-Māori non-Pacific Comparisons

In New Zealand during 2005–2009, on average 9 Māori babies each year had Down Syndrome evident at birth, with the proportion of Māori babies with Down Syndrome not being significantly different (RR 0.75 95% CI 0.54–1.04) from that of non-Māori non-Pacific babies (Table 19).


<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of Babies: Total 2005–2009</th>
<th>Number of Babies: Annual Average</th>
<th>Rate per 100,000 Births*</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori</td>
<td>45</td>
<td>9</td>
<td>68.8</td>
<td>0.75</td>
<td>0.54–1.04</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>185</td>
<td>37</td>
<td>91.8</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and Down Syndrome listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note: Rate per 100,000 refers to number of babies with Down Syndrome.

### Distribution by Chromosomal Anomaly Type

In New Zealand during 2005–2009, Down Syndrome was the most frequent chromosomal anomaly identified at the time of birth in Māori babies, accounting for 68.8% of chromosomal anomalies during this period. Such figures may significantly underestimate the prevalence of chromosomal anomalies however, as in the absence of karyotyping, many anomalies (e.g. sex chromosome anomalies) may be undetectable at routine newborn examination (Table 20).
Table 20. Chromosomal Anomalies Evident at Birth in Māori Babies, New Zealand Hospital Births 2005–2009

<table>
<thead>
<tr>
<th>Chromosomal Anomaly</th>
<th>Number: Total 2005–2009</th>
<th>Number: Annual Average</th>
<th>Number of Anomalies per 100,000 Births*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori Babies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down Syndrome</td>
<td>45</td>
<td>9.0</td>
<td>68.8</td>
</tr>
<tr>
<td>Edwards and Patau Syndromes</td>
<td>17</td>
<td>3.4</td>
<td>26.0</td>
</tr>
<tr>
<td>Monosomies / Autosomal Deletions / Rearrangements</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Turners Syndrome</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Sex Chromosome Anomalies Male Phenotype</td>
<td>6</td>
<td>1.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Other Chromosome Anomalies</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Total Chromosomal Anomalies</td>
<td>75</td>
<td>15.0</td>
<td>114.7</td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset: Numerator: Hospital Admissions with Event Type = Birth and a Chromosomal Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth; * Anomalies per 100,000 Births refers to total number of anomalies rather than number of babies, as some babies have more than one anomaly. "s" denotes rates suppressed due to small numbers.

Figure 19. Babies with Down Syndrome Evident at Birth by Ethnicity, New Zealand Hospital Births 2000–2009

Source: National Minimum Dataset: Numerator: Hospital Admissions with Event Type = Birth and Down Syndrome listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth

Trends for Māori Babies

In New Zealand during 2000–2009, on average 7.9 Māori babies per year were identified as having Down Syndrome at the time of birth, with numbers fluctuating markedly during this period (Figure 19).
New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Down Syndrome in the New Zealand birth cohort is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

**Babies with Down Syndrome and Other Congenital Anomalies**

In New Zealand during 2005–2009, 51.9% of babies with Down Syndrome evident at the time of birth had one or more co-existing cardiovascular anomalies, with the most frequent being atrial septal defects and patent ductus arteriosus, followed by ventricular septal defects and atrioventricular septal defects. A smaller proportion had anomalies of other organ systems.

**Distribution by Maternal Age**

In New Zealand during 2005–2009, while the highest absolute numbers of babies with Down Syndrome were born to women aged 35–39 years, Down Syndrome rates rose exponentially with maternal age, with the highest rates being evident in babies whose mothers were 40+ years. Such differences likely arise because of the small number of women giving birth after 40+ years.

**Distribution by NZDep Index Decile and Gender**

In New Zealand during 2005–2009, there were no significant socioeconomic or gender differences in the proportion of babies identified with Down Syndrome at the time of birth.

**Summary**

In New Zealand during 2005–2009, Down Syndrome was the most frequent chromosomal anomaly identified at birth in Māori babies, accounting for 68.8% of chromosomal anomalies identified during this period. On average, 9 Māori babies each year had Down Syndrome evident at birth, with the proportion of Māori babies with Down Syndrome not being significantly different (RR 0.75 95% CI 0.54–1.04) from that of non-Māori non-Pacific babies.

**Data Source and Methods**

**Definition**

1. Babies with Down Syndrome Evident at the Time of Birth

**Data Source**

1. **National Minimum Dataset**
   Numerator: Hospital Admissions with Event Type = Birth and Down Syndrome (ICD-10-AM Q90) listed in any of the first 15 diagnoses
   Denominator: All Hospital Admissions with Event Type = Birth

**Notes on Interpretation**

The analysis includes all admissions recorded in the National Minimum Dataset where the Event Type was listed as a Birth (Note: Only one birth event is allowed per NHI number, with admissions for babies being born prior to hospital admission, or being readmitted shortly after discharge being listed as a routine inpatient event). Thus the analysis does not include babies born prior to hospital admission, babies born at home, or babies whose Down Syndrome was overlooked at the time of initial hospital discharge, but who represented shortly thereafter.

For a list of the ICD-10-AM codes used to assign Other Chromosomal Anomalies and co-existing Congenital Anomalies see Appendix 7.
NEURAL TUBE DEFECTS

Introduction
The following section uses information from the National Minimum Dataset to review the number of Māori babies who had neural tube defects identified at the time of birth.

Background
Neural Tube Defects (NTDs) are congenital malformations that result from abnormal closure of the neural tube between the 3rd and 4th week of gestation. They can result in structural defects anywhere along the neuroaxis, from the developing brain to the sacrum. NTDs are generally divided into two groups:

1. Those affecting cranial structures i.e. anencephaly and encephalocele
2. Those affecting spinal structures i.e. spina bifida

Cranial malformations are generally the most clinically obvious and are often incompatible with life. In contrast, spina bifida can range from a severe open defect leading to muscle weakness, loss of skin sensation and problems with bowel and bladder control, to defects that are less easily detected [66]. Associated central nervous system anomalies, hydrocephalus, and later scoliosis or kyphosis, may further complicate the clinical picture.

In New Zealand there is little recent information on the prevalence of NTDs in Māori babies, although older studies suggest that rates were lower for Māori than for non-Māori parents in the late 1970s-early 1980s [67] [68]. The reason for these differences is unclear however, as the aetiology of NTDs is complex, although generally thought to arise from a combination of genetic and environmental factors. A number of studies have also shown that folic acid supplementation prior to or at conception reduces the risk of NTDs. As a consequence, there has been significant recent debate regarding the fortification of New Zealand’s food supply with folic acid [69].

Distribution for Māori Babies

Annual Number of Births and non-Māori non-Pacific Comparisons

In New Zealand during 2005–2009 on average 6 Māori babies each year had one or more neural tube defects evident at birth, with the proportion of Māori babies with neural tube defects being significantly higher (RR 2.65 95% CI 1.64–4.29) than for non-Māori non-Pacific babies (Table 21).


<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number of Babies: Total 2005–2009</th>
<th>Number of Babies: Annual Average</th>
<th>Rate per 100,000 Births*</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neural Tube Defects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>31</td>
<td>6</td>
<td>47.4</td>
<td>2.65</td>
<td>1.64–4.29</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>36</td>
<td>7</td>
<td>17.9</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Neural Tube Defect listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Rate Ratios are unadjusted. Note 1: Rate per 100,000 Births refers to number of babies with one or more Neural Tube Defects.

Distribution by Nervous System Anomaly Type

In New Zealand during 2005–2009, a total of 34 neural tube defects (27 spina bifida, 7 anencephaly / encephalocele) were identified in Māori babies at the time of birth, with this equating to 6.8 anomalies per year. Neural tube defects accounted for 36.2% of all nervous system anomalies during this period. (Note: The unit of analysis in this table is the
number of anomalies identified, rather than the number of Māori babies with one or more anomalies (Table 22).

Table 22. Nervous System Anomalies Evident at Birth in Māori Babies, New Zealand Hospital Births 2005–2009

<table>
<thead>
<tr>
<th>Congenital Anomaly</th>
<th>Number: Total 2005–2009</th>
<th>Number: Annual Average</th>
<th>Number of Anomalies per 100,000 Births¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori Babies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anencephaly (NTD)²</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Encephalocele (NTD)²</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Microcephaly</td>
<td>9</td>
<td>1.8</td>
<td>13.8</td>
</tr>
<tr>
<td>Congenital Hydrocephalus</td>
<td>11</td>
<td>2.2</td>
<td>16.8</td>
</tr>
<tr>
<td>Other Brain Malformations</td>
<td>31</td>
<td>6.2</td>
<td>47.4</td>
</tr>
<tr>
<td>Spina Bifida (NTD)²</td>
<td>27</td>
<td>5.4</td>
<td>41.3</td>
</tr>
<tr>
<td>Other Spinal Cord Malformations</td>
<td>&lt;5</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>Other CNS Malformations</td>
<td>6</td>
<td>1.2</td>
<td>9.2</td>
</tr>
<tr>
<td>Total Malformations of Nervous System</td>
<td>94</td>
<td>18.8</td>
<td>143.7</td>
</tr>
</tbody>
</table>

Source: National Minimum Dataset; Numerator: Hospital Admissions with Event Type = Birth and a Nervous System Anomaly listed in any of the first 15 diagnoses; Denominator: All Hospital Admissions with Event Type = Birth. Note 1: Anomalies per 100,000 Births refers to total number of anomalies rather than number of babies, as some babies have more than one anomaly; Note 2: NTD denotes Neural Tube Defect; “s” denotes rates suppressed due to small numbers.
Trends for Māori Babies

In New Zealand during 2000–2009 on average, 4.2 Māori babies per year had one or more neural tube defects evident at the time of birth, with large year to year fluctuations being evident during this period (possibly as a result of small numbers) (Figure 20).

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Neural Tube Defects in the New Zealand birth cohort is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Maternal Age

In New Zealand during 2005–2009, neural tube defects evident at the time of birth were highest amongst babies born to teenage women, and lowest amongst those born to women 30+ years.

Distribution by NZ Deprivation Index Decile and Gender

In New Zealand during 2005–2009, neural tube defects evident at the time of birth were significantly higher for those living in the most deprived (NZDep Decile 9–10) areas, and for babies born to teenage mothers (versus mothers aged 20–39 years).

Summary

In New Zealand during 2005–2009, a total of 34 neural tube defects (27 spina bifida, 7 anencephaly / encephalocele) were identified in Māori babies at the time of birth, with this equating to 6.8 anomalies per year. Neural tube defects accounted for 36.2% of all nervous system anomalies during this period. When the unit of analysis was the number of babies with one or more neural tube defects (rather than the number of neural tube defects), on average 6 Māori babies each year had one or more neural tube defects evident at birth, with the proportion of Māori babies with neural tube defects being significantly higher (RR 2.65 95% CI 1.64–4.29) than for non-Māori non-Pacific babies.

Data Source and Methods

Definition

1. Babies with Neural Tube Defects Evident at the Time of Birth

Data Source

1. National Minimum Dataset

Numerator: Hospital Admissions with Event Type = Birth and Anencephaly (ICD-10 Q00), Encephalocele (ICD-10 Q01), or Spina Bifida (ICD-10 Q05) listed in any of the first 15 diagnoses.

Denominator: All Hospital Admissions with Event Type = Birth

Notes on Interpretation

The analysis includes all admissions recorded in the National Minimum Dataset where the Event Type was listed as a Birth (Note: Only one birth event is allowed per NHI number, with admissions for babies being born prior to hospital admission, or being readmitted shortly after discharge being listed as a routine inpatient event). Thus the analysis does not include babies born prior to hospital admission, babies born at home, or babies whose neural tube defect was overlooked at the time of initial hospital discharge, but who represented shortly thereafter.

For a list of the ICD-10 codes used to define other anomalies of the Nervous System see Appendix 7.
Cystic Fibrosis

Introduction
The following section uses the National Minimum Dataset and Mortality Collection to review hospitalisations and mortality in Māori children and young people with cystic fibrosis.

Background
In New Zealand, there is little research specifically considering the health needs of Māori children and young people with cystic fibrosis, with the available evidence suggesting that the prevalence of cystic fibrosis is much lower for Māori than for European children and young people [70]. This is likely because of the genetic origins of the condition, with the highest rates internationally being seen in populations of northern European descent [71].

Diagnosis is usually made in the newborn period, with cystic fibrosis being part of New Zealand’s Newborn Metabolic Screening Programme (which utilises a heel prick blood spot to measure immunoreactive trypsinogen (IRT), with a very high IRT concentration suggesting pancreatic injury consistent with (but not specific to) cystic fibrosis). In older children and adults, the diagnosis is usually made when a clinical history characteristic of cystic fibrosis is accompanied by biochemical and genetic markers (which typically include a sweat test) [71]. Clinical manifestations include meconium ileus, with around 15% of infants with CF being born with this obstructive condition, due to inspissated material in the small and large bowel. In addition, 85–90% of infants develop pancreatic insufficiency, with typical signs being greasy stools, abdominal bloating and poor weight gain. While the lungs of children with CF are normal in appearance at birth, they quickly become infected and inflamed. Chronic airway infection may then progress to bronchiectasis, gas trapping and hypoxaemia [71]. The outlook for those affected with cystic fibrosis has improved steadily in the past two decades however, largely as a result of earlier diagnosis, more aggressive treatment, and the provision of care in specialised centres [71]. In the US, the projected life expectancy for those with CF has increased from 31 years to 37 years over the past decade, while in the UK a model predicting that a child born with CF today will typically live to be 50 years of age, is seen as being realistic [71].

Distribution in Māori Children and Young People

Admission Rates and Annual Admissions per Individual
In New Zealand during 2005–2009, a total of 35 individual Māori children and/or young people were admitted to hospital with cystic fibrosis listed in any of the first 15 diagnoses, with these children and young people averaging 1.90 admissions per year. Admission rates per 100,000 population were significantly lower for Māori (RR 0.39 95% CI 0.35–0.44) than for non-Māori non-Pacific children and young people during this period (Table 23). Similar differences were seen during 2000–2009 (Figure 21).

Table 23. Hospital Admissions for Children and Young People Aged 0–24 Years with Cystic Fibrosis by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cystic Fibrosis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>35</td>
<td>333</td>
<td>1.90</td>
<td>20.0</td>
<td>0.39</td>
<td>0.35–0.44</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>327</td>
<td>2,675</td>
<td>1.64</td>
<td>51.3</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Figure 21. Hospital Admissions for Children and Young People Aged 0–24 Years with Cystic Fibrosis by Ethnicity, New Zealand 2000–2009

Figure 22. Hospital Admissions for Māori Children and Young People with Cystic Fibrosis by Age, New Zealand 2005–2009
Distribution by Age

In New Zealand during 2005–2009, hospital admissions for Māori children and young people with cystic fibrosis were most frequent amongst those 5–15 years, with a marked drop off in admissions occurring after 16 years of age (Figure 22).

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of cystic fibrosis in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Hospital Admissions by Diagnosis

Primary Diagnosis: In New Zealand during 2005–2009, 84.6% of hospital admissions for children and young people with cystic fibrosis (i.e. cystic fibrosis listed in any of the first 15 diagnoses) had cystic fibrosis listed as the primary diagnosis, with the remainder having a variety of infectious and respiratory diseases, digestive system problems and other issues listed as the primary reason for admission.

Secondary Diagnosis: Of hospitalised children and young people who had cystic fibrosis listed as the primary reason for their admission during 2005–2009, the vast majority had a secondary diagnosis listed, with additional diagnoses including a range of infectious (e.g. pseudomonas, staphylococcus aureus, aspergillosis), respiratory (e.g. bronchiectasis, pneumonia) and other (e.g. diabetes and pancreatic problems) complications.

Mortality from Cystic Fibrosis

In New Zealand during 2003–2007, a total of 24 children and young people had cystic fibrosis listed as the main underlying cause of death. None, however, had cystic fibrosis listed as an additional contributory cause.

Distribution by NZ Depprivation Index Decile and Gender

In New Zealand during 2005–2009, hospital admissions for children and young people with cystic fibrosis were similar for males and females, and no marked social gradients were evident (with rates being highest for those living in average NZDep decile areas, and significantly lower for those in the most deprived (decile 10) areas).

Summary

In New Zealand during 2005–2009, a total of 35 individual Māori children and/or young people were admitted to hospital with cystic fibrosis listed in any of the first 15 diagnoses, with these children and young people averaging 1.90 admissions per year. Admission rates per 100,000 population were significantly lower for Māori (RR 0.39 95% CI 0.35–0.44) than for non-Māori non-Pacific children and young people during this period.

Data Source and Methods

Definition

1. Hospital Admissions and Mortality for Children and Young People with Cystic Fibrosis

Data Source

1. National Minimum Dataset

Numerator: Hospital Admissions for Children and Young People Aged 0–24 Years with Cystic Fibrosis (ICD-10-AM E84) in any of the first 15 diagnoses.
Denominator: Statistics New Zealand Estimated Resident Population

2. National Mortality Collection

Numerator: Mortality for Children and Young People Aged 0–24 Years with Cystic Fibrosis (ICD-10-AM E84) listed as either the main underlying cause of death, or as a contributory cause of death.
Denominator: Statistics New Zealand Estimated Resident Population
Notes on Interpretation

Unless otherwise specified, this analysis focuses on hospital admissions and mortality for children and young people who had cystic fibrosis listed in any of the first 15 diagnoses, or as a main underlying or contributory cause of death (rather than on the subset where cystic fibrosis was listed only as the primary diagnosis or main underlying cause of mortality). The rationale for this wider focus was the need to highlight the full spectrum of health issues experienced by children and young people with cystic fibrosis, and their consequent requirement for acute health services. For example, during 2005–2009, around 85% of hospitalisations for children and young people with cystic fibrosis had cystic fibrosis listed as the primary diagnosis, but a significant minority were admitted for infectious and respiratory diseases, digestive system problems or for other reasons. Further a review of the secondary diagnoses of those admitted with a primary diagnosis of cystic fibrosis indicated that a significant proportion of such admissions were for infections or respiratory or digestive system complications. The presence of a small number of events in patients with cystic fibrosis that were unrelated to the diagnosis of cystic fibrosis itself however, may slightly overinflate the impact cystic fibrosis has on acute service demand. If no mention of cystic fibrosis was made in any of the first 15 diagnoses however, these cases were not included (even if the patient had been assigned a cystic fibrosis related code on a previous admission).
Developmental Delays and Intellectual Disabilities

Introduction

The section that follows uses the National Minimum Dataset to review hospital admissions for Māori children and young people with any mention of a developmental delay or intellectual disability in any of the first 15 diagnoses.

Background

Global developmental delay is usually defined as a significant delay in two or more developmental domains including gross or fine motor, speech/language, cognitive, social/personal and activities of daily living [72]. While delays in some children (especially if mild) are transient, for many they may signal future intellectual disability [72]. A number of definitions are also in use for intellectual disability, with the American Association on Mental Retardation (AAMR) 1992 definition defining mental retardation with reference to three domains: intelligence (IQ), adaptive behaviour, and systems of supports [72]. More recently the term intellectual disability is being increasingly used in preference to mental retardation [72]. In general, developmental delays are diagnosed in children less than 5 years of age, with intellectual disabilities not usually being diagnosed until children are at least 5 years, when standardised measures of developmental skills (including IQ) become more reliable [72].

In New Zealand there is little research on the health needs of Māori children and young people with developmental delays or intellectual disabilities, although the 2006 New Zealand Disability Survey estimated that 2% (n=4,500) of Māori children (0–14 years) had a global developmental delay or an intellectual disability [6]. From a health perspective, it is likely that these children will require a variety of services, including routine well child care (e.g. immunisation, monitoring of growth and development), and the management of commonly related medical conditions (e.g. epilepsy, vision and hearing problems) [73].

From a cultural perspective, the authors of Hauora IV note that if Māori with disabilities are to achieve maximum functioning and wellness as Māori, action will be required to ensure quality Māori-specific and mainstream disability support services which meet high professional and cultural standards, greater attention will need to be paid to culturally appropriate needs assessment and service coordination, and levels of service funding will need to reflect the additional resources required to meet cultural needs [4]. Similar recommendations were made by the National Health Committee, when reviewing the experiences of Māori adults with intellectual disabilities during the early 2000s [74].

Distribution in Māori Children and Young People

Admission Rates and Annual Admissions per Individual

Developmental Delays: In New Zealand during 2005–2009, a total of 789 individual Māori children and/or young people were admitted to hospital with a developmental delay listed in any of the first 15 diagnoses, with these children and young people averaging 0.34 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.06 95% CI 1.00–1.13) were similar to those of non-Māori non-Pacific children and young people during this period (Table 24). While rates were similar during 2000–2009, admissions for both ethnic groups declined during this period (Figure 23).

Intellectual Disabilities: In New Zealand during 2005–2009, a total of 332 individual Māori children and/or young people were admitted to hospital with an intellectual disability listed in any of the first 15 diagnoses, with these children and young people averaging 0.37 admissions per year. Admission rates per 100,000 population were significantly higher for Māori (RR 1.40 95% CI 1.28–1.54) than for non-Māori non-Pacific children and young people during this period (Table 24). During the early 2000s, however, admission rates for
Māori and non-Māori non-Pacific children and young people with intellectual disabilities were more similar (Figure 23).

Table 24. Hospital Admissions for Children and Young People Aged 0–24 Years with Developmental Delays or Intellectual Disabilities by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developmental Delay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>789</td>
<td>1,344</td>
<td>0.34</td>
<td>80.5</td>
<td>1.06</td>
<td>1.00–1.13</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>2,518</td>
<td>3,955</td>
<td>0.31</td>
<td>75.9</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Intellectual Disabilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>332</td>
<td>616</td>
<td>0.37</td>
<td>36.9</td>
<td>1.40</td>
<td>1.28–1.54</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>802</td>
<td>1,372</td>
<td>0.34</td>
<td>26.3</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with a Developmental Delay or an Intellectual Disability listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

Figure 23. Hospital Admissions for Children and Young People Aged 0–24 Years with Developmental Delays or Intellectual Disabilities by Ethnicity, New Zealand 2000–2009

Distribution by Age

In New Zealand during 2005–2009, hospitalisations for Māori children and young people with developmental delays were highest during the first year of life, with rates dropping away rapidly thereafter. In contrast, hospitalisations for children and young people with intellectual disabilities were relatively infrequent during the pre-school years, but increased gradually during childhood and adolescence, to reach a peak amongst those in their early twenties (Figure 24).
Figure 24. Hospital Admissions for Māori Children and Young People with Developmental Delays or Intellectual Disabilities by Age, New Zealand 2005–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with a Developmental Delay or an Intellectual Disability listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Developmental Delays and Intellectual Disabilities in the New Zealand child and youth population is available from the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

New Zealand Distribution by Primary Diagnosis

In New Zealand during 2005–2009, 23.6% of hospitalisations for children and young people with developmental delays (i.e. a developmental delay listed in any of the first 15 diagnoses) had the developmental delay listed as the primary diagnosis. A further 15.5% had respiratory infections and diseases listed as the primary diagnosis, while 8.9% were admitted primarily for epilepsy or convulsions. Similarly, during 2005–2009 only 7.2% of hospitalisations for children and young people with intellectual disabilities had their intellectual disability listed as the primary diagnosis, with 14.7% being admitted for dental caries or other oral health issues, and 13.1% for epilepsy or convulsions.

Distribution by NZ Deprivation Index Decile and Gender

In New Zealand during 2005–2009, hospitalisations for children and young people with developmental delays and intellectual disabilities were both significantly higher for males and those living in average-more deprived (NZDep deciles 5–10) areas.

Summary

In New Zealand during 2005–2009, 789 individual Māori children and/or young people were admitted to hospital with a developmental delay listed in any of the first 15 diagnoses, with these children and young people averaging 0.34 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.06 95% CI 1.00–1.13) were similar to those of non-Māori non-Pacific children and young people. Similarly,
332 individual Māori children and/or young people were admitted to hospital with an intellectual disability listed in any of the first 15 diagnoses, with these children and young people averaging 0.37 admissions per year. Admission rates per 100,000 population were significantly higher for Māori (RR 1.40 95% CI 1.28–1.54) than for non-Māori non-Pacific children and young people during this period.

Data Source and Methods

Definition
1. Hospital Admissions for Children and Young People with Developmental Delays
2. Hospital Admissions for Children and Young People with Intellectual Disabilities

Data Source
1. National Minimum Dataset
   Numerator: Hospital Admissions for Children and Young People Aged 0–24 Years with Developmental Delays (ICD-10-AM R62) or Intellectual Disabilities (ICD-10-AM Mental Retardation F70–79) in any of the first 15 diagnoses.
   Denominator: Statistics New Zealand Estimated Resident Population

Notes on Interpretation
Unless otherwise specified, this analysis focuses on hospital admissions for children and young people who had developmental delays or intellectual disabilities listed in any of the first 15 diagnoses (rather than on the subset of admissions where these diagnoses were listed only as the primary diagnosis). The rationale for this wider focus was the fact that the majority of children and young people with developmental delays or intellectual disabilities were not hospitalised primarily as a result of these conditions, but rather for a range of other diagnoses, some of which may have been associated with the delay or intellectual disability (e.g. autism, congenital anomalies), and some of which were unrelated. For example, during 2005–2009, only 23.6% of hospitalisations for children and young people with developmental delays had the delay listed as the primary diagnosis, with 15.5% being admitted for respiratory infections / diseases, and 8.9% for epilepsy or convulsions. If no mention was made of developmental delays or intellectual disabilities in any of the first 15 diagnoses, however, these cases were not included (even if the patient had been assigned one of these diagnoses on a previous admission).

Further, as many children and young people with developmental delays or intellectual disabilities are managed predominantly in the outpatient or primary care setting (e.g. in contrast to cystic fibrosis where frequent hospitalisation often occurs), it is likely that the analysis of hospital admission data presented in this section significantly underestimates the number of children and young people with developmental delays or intellectual disabilities. The rationale for the methodology used, however, was the absence of other more reliable sources of information on children and young people with these diagnoses, and the importance of this group of children and young people in paediatric practice.

Indicator Category Bookmark B
CEREBRAL PALSY

Introduction
The following section reviews hospital admissions for Māori children and young people with any mention of cerebral palsy in any of the first 15 diagnoses.

Background
Cerebral palsy refers to a group of disorders of movement or posture arising from a non-progressive insult to the central nervous system during early development. The insult may occur prior to, during or shortly after birth and while being non-progressive, its physical consequences can evolve over time [75]. The clinical presentation may also vary. One study [75] noted that, of children with cerebral palsy in one cohort, ~84% had predominantly spastic cerebral palsy (characterised by weakness, increased muscle tone, overactive reflexes and a tendency to contractures), 8.3% had predominantly dyskinetic cerebral palsy (characterised by involuntary movements that disappear during sleep) and 6.6% had predominantly ataxic cerebral palsy (characterised by problems with coordination, gait and rapid movements of the distal extremities) [73]. In addition, while cerebral palsy refers solely to the motor impairment, features such as seizures, intellectual impairment and learning disabilities are also common [73].

In New Zealand, while there is little information on the prevalence or health needs of Māori children and young people with cerebral palsy, the authors of Hauora IV noted that mortality from infantile cerebral palsy was significantly higher (79%) for Māori than for non-Māori [4]. Overseas, research also suggests that the prevalence of cerebral palsy maybe increasing, rising from around 1.5 per 1,000 live births in the 1960s to around 2.5 per 1,000 in the 1990s. The proportion of low birth weight babies increased during this period, possibly as the result of increased survival among very premature babies [76]. With half of all cerebral palsy cases occurring in infants of normal birth weight, however, and with asphyxiation at birth accounting for only a small percentage of cases [77], research has now turned to other exposures during pregnancy and immediately after birth (e.g. intrauterine infection / inflammation and perinatal coagulation disorders) as possible causes [77].

Distribution in Māori Children and Young People
Admission Rates and Annual Admissions per Individual
In New Zealand during 2005–2009, a total of 361 individual Māori children and/or young people were admitted to hospital with cerebral palsy listed in any of the first 15 diagnoses, with these children and young people averaging 0.67 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.03 95% CI 0.96–1.09) were similar to those of non-Māori non-Pacific children and young people (Table 25). Similar patterns were seen during 2000–2009 (Figure 25).

Table 25. Hospital Admissions for Children and Young People Aged 0–24 Years with Cerebral Palsy by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori</td>
<td>361</td>
<td>1,209</td>
<td>0.67</td>
<td>72.4</td>
<td>1.03</td>
<td>0.96–1.09</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>1,145</td>
<td>3,682</td>
<td>0.64</td>
<td>70.6</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset, Acute and Arranged Admissions by primary diagnosis for children and young people with Cerebral Palsy listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population.
Figure 25. Hospital Admissions for Children and Young People Aged 0–24 Years with Cerebral Palsy by Ethnicity, New Zealand 2000–2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Cerebral Palsy listed in any of the first 15 diagnoses; Denominator: Statistics NZ Estimated Resident Population.

Figure 26. Hospital Admissions for Māori Children and Young People with Cerebral Palsy by Age, New Zealand 2005–2009

Distribution by Age

In New Zealand during 2005–2009, hospital admissions for Māori children and young people with cerebral palsy increased during infancy, reached a peak at three years of age, and then gradually declined, with a second peak in admissions being evident amongst those in their early twenties (Figure 26).

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Cerebral Palsy in the New Zealand child and youth population is available from *the Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand* [27]. In brief, this report found:

Distribution by Primary Diagnosis and Procedure

Acute and Arranged Admissions: In New Zealand during 2005–2009, only 5.0% of acute and arranged hospital admissions in children and young people with cerebral palsy (i.e. any mention of cerebral palsy in their first 15 diagnoses) had cerebral palsy listed as their primary diagnosis, with 10.8% of admissions being for epilepsy or convulsions and 14.5% being for respiratory infections / diseases collectively. Overall, acute and arranged admissions made up 57.6% of admissions for children and young people with cerebral palsy during this period.

Waiting List Admissions: During the same period, 42.4% of admissions in children and young people with cerebral palsy were from the waiting list, with orthopaedic procedures accounting for 46.8% of waiting list admissions, and for 19.8% of all admissions in children and young people with cerebral palsy. Dental procedures and the insertion of gastrostomy tubes and buttons made a smaller contribution.

Distribution by NZ Deprivation Index Decile and Gender

In New Zealand during 2005–2009, hospital admissions for children and young people with cerebral palsy were significantly higher for males and those living in average-more deprived (NZDep deciles 4–10) areas.

Summary

In New Zealand during 2005–2009, a total of 361 individual Māori children and/or young people were admitted to hospital with cerebral palsy listed in any of the first 15 diagnoses, with these children and young people averaging 0.67 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 1.03 95% CI 0.96–1.09) were similar to those of non-Māori non-Pacific children and young people during this period.

Data Source and Methods

Definition

1. Hospital Admissions and Mortality for Children and Young People with Cerebral Palsy

Data Source

1. National Minimum Dataset
   - **Numerator:** Hospital Admissions for Children and Young People Aged 0–24 Years with Cerebral Palsy (ICD-10-AM G80) in any of the first 15 diagnoses.
   - **Denominator:** Statistics New Zealand Estimated Resident Population

2. National Mortality Collection
   - **Numerator:** Mortality for Children and Young People Aged 0–24 Years with Cerebral Palsy (ICD-10-AM G80) listed as either the main underlying cause of death, or as a contributory cause.
   - **Denominator:** Statistics New Zealand Estimated Resident Population
Notes on Interpretation

Unless otherwise specified, this analysis focuses on hospital admissions and mortality for children and young people who had cerebral palsy listed in any of the first 15 diagnoses, or as a main underlying or contributory cause of death (rather than on the subset of admissions or deaths where cerebral palsy was listed only as the primary diagnosis or main underlying cause of mortality). The rationale for this wider focus was the need to highlight the full spectrum of health issues experienced by children and young people with cerebral palsy, and their consequent requirement for health services. For example, during 2005–2009, only 5% of acute or arranged hospitalisations for children and young people with cerebral palsy had cerebral palsy listed as the primary diagnosis, with for example 10.8% being admitted for epilepsy or seizures. Similarly 42.4% of admissions were from the waiting list, with a significant proportion being for orthopaedic procedures. The presence of a small number of hospital admissions in patients with cerebral palsy that were unrelated to their cerebral palsy (e.g. acute upper respiratory infections), however, may slightly overinflate the impact cerebral palsy has on acute service demand. If no mention of cerebral palsy was made in any of the first 15 diagnoses, however, these cases were not included (even if the patient had been assigned a cerebral palsy related code on a previous admission).
AUTISM AND OTHER PERVERSIVE DEVELOPMENTAL DISORDERS

Introduction

The following section uses the National Minimum dataset to review hospital admissions for Māori children and young people with any mention of Autism or Other Pervasive Developmental Disorders in any of the first 15 diagnoses.

Background

Pervasive Developmental Disorders are a group of developmental disorders characterised by poor or absent communication, social isolation and unusual behaviours. They include Autism, Asperger Syndrome, Pervasive Developmental Disorder NOS, Rett Syndrome and Childhood Disintegrative Disorder. Of these, autism is most studied and is associated with severe difficulties with social interaction and communication and with behaviours and interests that are restricted or stereotyped. Onset is usually at less than 3 years, with delayed language development being a common reason for presentation. Many children with autism never speak, or if they do so their language often has unusual intonation, echolalia (a repetition of what is said) or pronoun reversal. Other features include impaired eye gaze, a lack of social reciprocity, limited or absent peer relationships and difficulties in developing imaginative play. Children are often pre-occupied with non-functional features of objects, such as taste or smell and stereotyped movements are often present (e.g. hand flapping or finger flicking) [78]. At present the cause of autism remains unknown, although higher rates of seizures, persistent primitive reflexes and intellectual impairments suggest central nervous system involvement. A genetic basis is also likely, as recurrence rates in families are high, but the mode of transmission remains unknown [78].

In New Zealand there is no routinely collected information on the prevalence of Autism or Asperger Syndrome in Māori children, although the 2006/07 NZ Health Survey estimated a prevalence of 40 per 10,000 for Autism Spectrum Disorders (ASD) in the total population [30]. Despite this paucity of data, recent research involving the parents and whānau of Māori children with ASD suggests a range of health and disability support services may be required including: staff to explain to parents what ASD is and the services and entitlements available, and to assist them to access these services; the need to increase ASD expertise amongst Māori medium education and service providers, and to increase bicultural and bilingual expertise in mainstream services; the need for more culturally appropriate assessment measures and procedures; and the need to increase ASD-related financial assistance to parents. The same research also found that ASD-related impairments may have limited children’s involvement in culturally valued activities such as kapa haka, learning te reo and staying on the marae [9].

Distribution in Māori Children and Young People

Admission Rates and Annual Admissions per Individual

In New Zealand during 2005–2009, a total of 187 individual Māori children and/or young people were admitted to hospital with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses, with these children and young people averaging 0.36 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 0.60 95% CI 0.54–0.68) were significantly lower than for non-Māori non-Pacific children and young people during this period (Table 26). Similar differences were seen during 2000–2009 (Figure 27).
Table 26. Hospital Admissions for Children and Young People Aged 0–24 Years with Autism or Other Pervasive Developmental Disorders by Ethnicity, New Zealand 2005-2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total No. Individuals 2005–2009</th>
<th>Total No. Admissions 2005–2009</th>
<th>Average No. Admissions per Individual per Year</th>
<th>Admission Rate per 100,000 Total Population</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Māori</td>
<td>187</td>
<td>337</td>
<td>0.36</td>
<td>20.2</td>
<td>0.60</td>
<td>0.54–0.68</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>1,084</td>
<td>1,744</td>
<td>0.32</td>
<td>33.5</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Autism or Other Pervasive Developmental Disorders listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

Figure 27. Hospital Admissions for Children and Young People Aged 0–24 Years with Autism or Other Pervasive Developmental Disorders by Ethnicity, New Zealand 2000-2009

Source: Numerator: National Minimum Dataset, Hospital Admissions for children and young people with Autism or Other Pervasive Developmental Disorders listed in any of the first 15 diagnoses. Denominator: Statistics NZ Estimated Resident Population.

**Distribution by Age**

In New Zealand during 2005–2009, hospital admissions for Māori children and young people with autism and other pervasive developmental disorders increased rapidly during the pre-school years, reached a peak at seven years of age and then gradually declined, with a small increase in rates being evident amongst those in their early twenties (Figure 28).
New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Autism and Other Pervasive Developmental Disorders in the New Zealand child and youth population is available from the *Health of Children and Young People with Chronic Conditions and Disabilities in New Zealand* [27]. In brief, this report found:

**Distribution by Primary Diagnosis**

In New Zealand during 2005–2009, autism or other pervasive developmental disorders were listed as the primary diagnosis in only 12.1% of hospitalisations for children and young people with pervasive developmental disorders (i.e. with these conditions listed in any of the first 15 diagnoses). Of this 12.1%, 61.9% had childhood autism listed as the primary diagnosis, while 34.0% had pervasive developmental disorder NOS and 4.2% had other pervasive developmental disorders listed as the primary diagnosis. Overall, 20.1% of admissions in children and young people with pervasive developmental disorders were for dental caries or other oral health problems, while a further 9.9% were for epilepsy or convulsions.

**Distribution by NZ Deprivation Index Decile and Gender**

In New Zealand during 2005–2009, hospital admissions for children and young people with autism and other pervasive developmental disorders were *significantly* higher for males. No consistent socioeconomic gradients were evident, however, with admission rates being similar for those living in the most and least deprived NZDep areas.
Summary

In New Zealand during 2005–2009, a total of 187 individual Māori children and/or young people were admitted to hospital with autism or other pervasive developmental disorders listed in any of the first 15 diagnoses, with these children and young people averaging 0.36 admissions per year. Admission rates per 100,000 population for Māori children and young people (RR 0.60 95% CI 0.54–0.68) were significantly lower than for non-Māori non-Pacific children and young people during this period.

Data Source and Methods

Definition
1. Hospital Admissions for Children and Young People with Autism and Other Pervasive Developmental Disorders in any of the first 15 diagnoses.

Data Source
1. National Minimum Dataset
   Numerator: Hospital Admissions for Children and Young People Aged 0–24 Years with Autism and Other Pervasive Developmental Disorders (ICD-10-AM F84) in any of the first 15 diagnoses.
   Denominator: Statistics New Zealand Estimated Resident Population.

Notes on Interpretation

Unless otherwise specified, this analysis focuses on hospital admissions for children and young people who had autism or other pervasive developmental disorders listed in any of the first 15 diagnoses (rather than on the subset of admissions where autism or other pervasive developmental disorders were listed only as the primary diagnosis). The rationale for this wider focus was the fact that the majority of children and young people with pervasive developmental disorders were not hospitalised primarily as a result of their pervasive developmental disorder per se, but rather for a range of other diagnoses, some of which were potentially more likely to be a result of their pervasive developmental disorder, and some which were unrelated. For example, during 2005–2009, only 12.1% of hospitalisations for children and young people with autism or other pervasive developmental disorders had these diagnoses listed as the primary diagnosis, with 20.1% being admitted for dental caries or other oral health related problems, and 9.9% for epilepsy or convulsions. If no mention of pervasive developmental disorders was made in any of the first 15 diagnoses, however, these cases were not included (even if the patient had been assigned a pervasive developmental disorder related code on a previous admission).

Further, as many children and young people with autism and other pervasive developmental disorders are managed predominantly in the outpatient or primary care setting (e.g. in contrast to cystic fibrosis where frequent hospitalisation often occurs), it is likely that the analysis of hospital admission data presented in this section significantly underestimates the number of children and young people with autism or other pervasive developmental disorders. The rationale for the methodology used, however, was the absence of other more reliable sources of information on children and young people with these diagnoses.
INTRODUCTION TO THE CHILDREN’S SOCIAL HEALTH MONITOR

In New Zealand, there are currently large disparities in child health status, with Māori and Pacific children and those living in more deprived areas experiencing a disproportionate burden of morbidity and mortality [1]. Such disparities have persisted, despite one of the longest periods of economic growth in recent decades, as well as historically low unemployment rates.

Since late 2007 however, New Zealand’s macroeconomic environment has changed rapidly, with current projections being for a significant economic downturn, followed by a slow and fragile recovery [79]. Given that large disparities in health status are evident for socioeconomically vulnerable children, even during periods of economic prosperity, it is possible that as the downturn progresses, and more families become reliant on Government assistance, some of the adaptations families make in order to meet their basic household needs may result in unintended health consequences for children.

During 2009, a Working Group of health professionals from a range of organisations³ was formed with a view to developing an indicator set to monitor the impact of the economic downturn on child wellbeing. This indicator set, called the New Zealand Children’s Social Health Monitor (NZCSHM), currently comprises 5 Economic and 4 Health and Wellbeing Indicators, and data on each of these indicators is presented in this year’s report, with a view to assessing how Māori children are faring in the current economic climate.

Economic Indicators: Gross Domestic Product (GDP) (Page 111)
Income Inequality (Page 112)
Child Poverty and Living Standards (Page 116)
Unemployment Rates (Page 120)
Children Reliant on Benefit Recipients (Page 125)

Health and Wellbeing Indicators: Hospital Admissions and Mortality with a Social Gradient (Page 131)
Infant Mortality (Page 139)
Injuries Arising from the Assault, Neglect or Maltreatment of Children (Page 145)

Note: A more detailed explanation of the rationale for monitoring child health during the economic downturn was presented in the 2009 Determinants of Health for Pacific Children and Young People in New Zealand report [80] and the reader is referred to this report for additional information on these issues.

³ The Paediatric Society of New Zealand, the Population Child Health Special Interest Group of the Royal Australasian College of Physicians, the New Zealand Child and Youth Epidemiology Service, TAHA (the Well Pacific Mother and Infant Service), the Māori SIDS Programme, the Kia Mataara Well Child Consortium, the New Zealand Council of Christian Social Services, and academics from the Universities of Auckland and Otago.
THE CHILDREN’S SOCIAL HEALTH MONITOR:
ECONOMIC INDICATORS
GROSS DOMESTIC PRODUCT (GDP)

Introduction
The following section briefly reviews changes in New Zealand’s GDP since June 2006.

Background
Gross Domestic Product (GDP) is defined as “the total market value of goods and services produced within a given period, after deducting the cost of goods utilised in the process of production” [81]. GDP is often used as a measure of the size of the economy, with nominal GDP being expressed in current dollar prices, and real GDP being expressed in constant dollar prices (i.e. the dollar value of a particular year, after adjustment for inflation).

Changes in real GDP are often used as a measure of economic growth, or the strength of the economy [81], with a recession typically being defined as two consecutive quarters of negative growth [82]. Recessions are often characterised by high unemployment, stagnant wages and a fall in retail sales, and though usually not lasting longer than a year [82], they may have significant implications for child wellbeing.

New Zealand entered a recession at the end of June 2008 (after 2 consecutive quarters of negative growth), and technically left the recession at the end of June 2009 (although growth in the June quarter (0.1%) was extremely close to zero [83]). Since that time New Zealand has had five consecutive quarters of positive growth, although in the most recent quarter (June 2010), this growth was only 0.2% [84].

New Zealand Trends
Production Based Measure of GDP
In New Zealand, GDP decreased for 5 consecutive quarters from March 2008–March 2009. GDP has since increased for five consecutive quarters, with economic activity being up 0.2% in the June 2010 quarter, following a 0.5% increase in the March 2010 quarter. Economic activity for the year ending June 2010 was up 0.7% when compared to the year ending June 2009, with this being the first annual increase in economic activity since a 1.5% rise in the year ended September 2008 [84] (Figure 29).

During the June 2010 quarter, construction increased by 6.4%, real estate and business services by 0.9%, and retail trade by 1.5%, while manufacturing declined by 4.0% and communication services by 2.6% [84].

Summary
In New Zealand, GDP decreased for 5 consecutive quarters from March 2008–March 2009. GDP has since increased for five consecutive quarters, with economic activity being up 0.2% in the June 2010 quarter, following a 0.5% increase in the March 2010 quarter. Economic activity for the year ending June 2010 was up 0.7% when compared to the year ending June 2009, with this being the first annual increase in economic activity since a 1.5% rise in the year ended September 2008 [84].
Figure 29. Gross Domestic Product (GDP): Percentage Change from Previous Quarter, New Zealand June 2006 to June 2010

Source: Statistics New Zealand: Seasonally adjusted chain volume series measured in 1995/96 prices

Data Source and Methods
Definition
*Gross Domestic Product (GDP): Percent Change from Previous Quarter*

GDP is the total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports. A recession is defined as 2 consecutive quarters of negative growth (as measured by GDP).

Data Source

Indicator Category: Ideal B

Notes on Interpretation
Three approaches can be used to calculate GDP:

- **Production Approach**: This method calculates what each separate producer adds to the value of final output, by deducting intermediate consumption from gross output. Value added is summed for all producers.

- **Income Approach**: This approach measures the incomes received by the owners of the factors of production. These represent the returns to the labour and capital employed such as wages and salaries, and profits.

- **Expenditure Approach**: This method sums the values of all final demands, that is, final consumption expenditures (of households, government and private non-profit institutions serving households), changes in inventories, gross capital formation, and net exports.

Conceptually, both the production and expenditure approaches of measuring GDP are the same. However, as each series uses independent data and estimation techniques, some differences between the alternative measures arise. The expenditure approach series has historically shown more quarterly volatility and is more likely to be subject to timing and valuation problems. For these reasons, the production-based measure is the preferred measure for short-term quarter-on-quarter and annual changes [85]
**Introduction**

The following section explores income inequalities in New Zealand since 1984 using two different measures, the P80/P20 Ratio and the Gini Coefficient. While no ethnic specific data is currently available for these two measures, income inequalities are likely to have a significant impact on Māori children and young people, via the pathways outlined below.

**Background**

There has been much recent debate regarding the influence of income inequalities on population health. While it is widely acknowledged that poverty plays a crucial role in shaping health disparities, authors such as Wilkinson and Marmot [86] argue that income inequality itself also plays a role, via its links to psychosocial pathways associated with relative disadvantage. In their view, it is not absolute material deprivation which shapes health at the population level, but rather the effects inequalities have on psychosocial outcomes such as the degree of control over work, anxiety, depression and social affiliations [86]. Others such as Lynch [87] however, suggest that it is the lack of material resources (e.g. differentials in access to adequate nutrition, housing and healthcare), coupled with a systematic underinvestment in human, physical, health and social infrastructure (e.g. the types and quality of education, health services, transportation, recreational facilities and public housing available) that have the greatest impact [88].

**New Zealand Trends**

**Income Inequality: P80/P20 Ratio**

In New Zealand during 1984–2009, income inequality as measured by the P80/P20 ratio, was higher after adjusting for housing costs than prior to this adjustment. The most rapid rises in income inequality occurred during 1988–1992. While income inequality also rose during 1994–2004, the rate of increase was slower. During 2004–2009, the P80/P20 ratio fell, a decline in income inequality which Perry attributes largely to the Working for Families package [89] (Figure 30).

**Income Inequality: Gini Coefficient**

In New Zealand during 1984–2009, income inequality as measured by the Gini Coefficient, was also higher after adjusting for housing costs than prior to this adjustment. The most rapid rises in income inequality during this period also occurred between the late 1980s and early 1990s. Using both the Before and After Housing Cost measures, the Gini Coefficient declined between 2001–2007, a decline which Perry again attributes to the impact of the Working for Families Package. Perry notes however, that another year’s data is required, before it is possible to determine whether the rise in income inequality seen between 2007–2009 is real, or just a statistical fluctuation [89] (Figure 31).

**Summary**

In New Zealand during 1984–2009 income inequality, as measured by the P80/P20 ratio and Gini coefficient, was higher after adjusting for housing costs than prior to this adjustment. The most rapid rises in income inequality occurred between the late 1980s and early 1990s. During the early-mid 2000s however, income inequality declined, a change Perry attributes largely to the Working for Families package. Rises in income inequality were again evident between 2007 and 2009, although another year’s data may be required, before it is possible to determine whether this is the beginning of an upward trend, or just a statistical fluctuation [89].
Figure 30. Income Inequality in New Zealand as Assessed by the P80/P20 Ratio for the 1984–2009 HES Years


Figure 31. Income Inequality in New Zealand as Assessed by the Gini Coefficient for the 1984–2009 HES Years

### Definition

1. **Income Inequality as Measured by the P80/P20 Ratio**
2. **Income Inequality as Measured by the Gini Coefficient**

### Data Source

Statistics New Zealand Household Economic Surveys (NZHES n=2,800–3,500 households per survey) via Perry 2010 [89].

Note: The P80/P20 Ratio and Gini coefficient are monitored by the Ministry of Social Development using NZHES data [89], which was available 2-yearly from 1982–1998, and 3-yearly thereafter. Since 2007, income data has become available annually through the new NZHES Incomes Survey. The full NZHES (including expenditure data) however remains 3-yearly. For more detail on methodology used see Perry 2010 [89].

### Indicator Category

Proxy B

### Notes on Interpretation

**P80/P20 Ratio**: When individuals are ranked by equivalised household income and then divided into 100 equal groups, each group is called a percentile. If the ranking starts with the lowest income, then the income at the top of the 20th percentile is denoted P20 and the income at the top of the 80th percentile is called P80. The ratio of the value at the top of the 80th percentile to the value at the top of the 20th percentile is called the P80/P20 ratio and is often used as a measure of income inequality (e.g. a P80/P20 ratio of 3.0 indicates that those at the top of the 80th percentile have incomes 3.0x higher than those at the top of the 20th percentile). In general, the higher the ratio, the greater is the level of inequality [89].

**Gini Coefficient**: The Lorenz curve is a graph with the horizontal axis showing the cumulative % of people in a population ranked by their income. The vertical axis shows the corresponding cumulative % of equivalised disposable household income (i.e. the graph shows the income share of any selected cumulative proportion of the population). The diagonal line represents a situation of perfect equality (i.e. all people having the same income). The Gini coefficient is derived from the Lorenz curve and is the ratio of the area between the actual Lorenz curve and the diagonal (or line of equality), compared to the total area under the diagonal. When the Gini coefficient = 0 all people have the same level of income. When it approaches 1, one person receives all the income (i.e. it is an overall measure of income inequality: the higher the number, the greater the level of inequality) [90]. When comparing changes in income distributions over time, the Gini coefficient is more sensitive to changes in the more dense low-to-middle parts of the distribution, than it is to changes towards the ends of the distribution [89].

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The Children’s Social Health Monitor - 115
CHILD POVERTY AND LIVING STANDARDS

Introduction

In New Zealand, the Ministry of Social Development has periodically reviewed the socioeconomic wellbeing of families with children using information from two data sources:

1. The New Zealand Household Economic Survey, which can be used to assess the proportion of families with children who live below the income poverty line [89].

2. The New Zealand Living Standards Survey, which uses the Economic Living Standards Index (NZELSI) to assess the proportion of families with children who live in severe or significant hardship [91].

This section uses information from these data sources to assess the proportion of Māori children living in poverty, or exposed to severe or significant hardship in recent years.

Children Living in Households Below the Poverty Line

Child Poverty Rates by Ethnicity

In the NZ Household Economic Survey (NZHES) via Perry [89], only limited analyses by ethnic group were reported because of the relatively small sample sizes for Māori, Pacific and Other ethnic groups in the survey data. While no time series data was available, Perry noted that poverty rates for Māori children were consistently higher than for European children, irrespective of the measure used. Thus, in 2009, using the AHC 60% fixed line measure, around one in three Māori children lived in poor households, as compared to one in six European children (i.e. rates were double those of European children). Perry notes that the higher poverty rates seen in Māori children most likely reflect the relatively high proportion of Māori children living in sole parent beneficiary households (in June 2009, 43% of DPB recipients were Māori) [89].

A number of risk factors for child poverty such as family composition and size, and parental employment status are also of relevance to Māori children and these are reviewed briefly below.

Child Poverty Trends: <60% of 2007 Median, After Housing Costs

Child Poverty by Number of Children in Household and Child's Age

Number of Children: In New Zealand during 1986–2009, child poverty rates for households with 3+ children were consistently higher than for households with 1–2 children (Figure 32). (Comment: Perry notes that in 2009, children from these larger households made up 48% of all poor children [89]).

Age of Children: In New Zealand during 1986–2001, poverty rates for younger children (0–6 years and 7–11 years) were higher than for older children (12–17 years). Differences after 2001 were less consistent [89] (Figure 32).

Child Poverty Trends by Household Type and Work Status of Adults in Household

Household Type: In New Zealand, child poverty rates for children in both sole-parent and two-parent households increased rapidly between 1988 and 1992. In absolute terms however, poverty rose most rapidly for children in sole-parent households, with rates reaching a peak of 84% in 1992 (two-parent: rates peaked at 37% in 1994). While rates for both household types declined between 2001 and 2007, during 2007–2009 child poverty rates for those in sole-parent households remained higher than their 1980s levels, while rates for two-parent households were similar4 (Figure 33).

4 Perry notes that ≈1/3 sole parent families live in wider households with other adults, and that children living in these “other” households have significantly lower poverty rates than those living in sole parent households, because of the greater household resources available to them [89].
Figure 32. Proportion of Dependent Children Living Below the 60% Income Poverty Threshold (2007 Median, After Housing Costs) by Number of Children in Household and Age, New Zealand 1986–2009 HES Years


Figure 33. Proportion of Dependent Children Living Below the 60% Income Poverty Threshold (2007 Median, After Housing Costs) by Household Type and Work Status of Adults in the Household, New Zealand 1986–2009 HES Years

Work Status of Adults in Household: In New Zealand, child poverty rates for children in workless households, or where no adults worked full time, increased rapidly during 1988–1992. Poverty rates for children in these households remained elevated during the 1990s (range 78%–88%), before declining during 2001–2007. Even at their nadir in 2007, poverty rates for children in these households remained much higher than 1980s levels. In contrast, increases in child poverty for households where an adult worked full time, or was self employed, were much less marked, with rates in 2007–2009 being similar to those in the 1980s\(^5\) (Figure 33).

**Summary: Child Poverty**

In the NZ Household Economic Survey (NZHES) via Perry [89], only limited analysis by ethnicity was reported because of the relatively small sample sizes for Māori, Pacific and Other ethnic groups. While no time series data is available, Perry notes that poverty rates for Māori children were consistently higher than for European children, irrespective of the measure used. Thus, in 2009, using the AHC 60% fixed line measure, around one in three Māori children lived in poor households, as compared to one in six European children (i.e. rates were double those of European children). Perry notes that the higher poverty rates seen in Māori children most likely reflect the relatively high proportion of Māori children living in sole parent beneficiary households (in June 2009, 43% of DPB recipients were Māori).

### Data Source and Methods

**Definition**

1. Proportion of children with equivalised disposable household income < 50% or <60% current median
2. Proportion of children with equivalised disposable household income < 50% or <60% 2007 median (adjusted for movements in consumer prices)

**Data Source**

Statistics New Zealand Household Economic Survey (NZHES n=2,800–3,500 households per survey) via Perry 2010 [89]. Note: Child Poverty measures are reported on by the Ministry of Social Development using NZHES data [89], which was available 2-yearly from 1982–1998, and 3-yearly thereafter. Since 2007, income data has become available annually through the new HES Incomes Survey. The full NZHES (including expenditure data) however remains 3-yearly. For more detail see Perry 2010 [89].

**Interpretation**

Relative poverty measures set a poverty benchmark that rises and falls with changes in national median incomes (i.e. poverty is defined in relation to the incomes of others in society). Constant-value poverty measures select a median at a set point in time (e.g. 2007) and then adjust forward and back in time for changes in consumer prices (i.e. they seek to maintain a constant buying power for the poverty benchmark over time). Most income poverty measures use equivalised disposable household income (i.e. after tax household income adjusted for family size and composition). Both measures can be calculated before or after taking housing costs into account. For more detail on the methodology used see Perry 2010 [89].

**Ethnicity Classification Used**

In the NZHES the ethnicity of individuals aged 15+ years is as reported by the individual. Children <15 years are attributed with the ethnicity of the survey respondent in the years to HES 2004. Starting with HES 2007, ethnicity for children is recorded, with the information coming from either the children themselves or from their parents. No analysis was carried out by household or family ethnicity as ethnicity was seen as a characteristic of individuals. For respondents reporting more than one ethnicity, the ethnicity attributed was determined by prioritisation: Māori, Pacific Island, Other and then European/Pākeha [89].

\(^5\) Perry notes that during the 1980s, children in workless households were ≈2x as likely to be in poor households; during 1992-2004 this had risen to ≈3-4x higher, and by 2007-2009 it was ≈6-7x higher [89].
Living Standards of Families with Dependent Children

The Ministry of Social Development has undertaken three national Living Standards Surveys, in 2000, 2004 and 2008. The 2008 Survey collected information from 5000 households on their material circumstances, including ownership and quality of household durables, their ability to keep the house warm, pay the bills, have broken down appliances repaired, and pursue hobbies and other interests [92]. The following section briefly reviews the living standards of Māori children aged 0–17 years, using the 2008 Living Standards Survey’s composite index of deprivation.

Figure 34. Proportion of Children Aged 0–17 Years with Deprivation Scores of Four or More by Ethnicity and Family Income Source, NZ Living Standards Survey 2008

Proportion of Children with High Deprivation Scores
In the 2008 Living Standards Survey 39% of Māori children aged 0–17 years scored four or more on the composite deprivation index, which measured a range of “enforced lacks”, as outlined in the Methods box above (Figure 34). When broken down by individual item, those children who scored four or more on the composite deprivation index had much higher exposures to household economising behaviours such as having to wear worn out shoes or clothing, sharing a bed or bedroom, cutting back on fresh fruit and vegetables and postponing doctors visits because of cost (Table 27).
Table 27. Restrictions Experienced by Children, by the Deprivation Score of their Family, NZ Living Standards Survey 2008

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>0</th>
<th>1</th>
<th>2–3</th>
<th>4–5</th>
<th>6+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Distribution of children across the DEP scores</strong></td>
<td>100</td>
<td>41</td>
<td>18</td>
<td>18</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td><strong>Average number of children per family</strong></td>
<td>2.2</td>
<td>2.3</td>
<td>2.5</td>
<td>2.7</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td><strong>Enforced lacks of children's items</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Friends to birthday party</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>Waterproof coat</td>
<td>8</td>
<td>-</td>
<td>2</td>
<td>8</td>
<td>11</td>
<td>39</td>
</tr>
<tr>
<td>Separate bed</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>Separate bedrooms for children of opposite sex (10+ yr)</td>
<td>8</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>14</td>
<td>24</td>
</tr>
<tr>
<td>All school uniform items required by the school</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td><strong>Economising 'a lot' on children's items to keep down costs to afford other basics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children continued to wear worn out shoes/clothes</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>15</td>
<td>39</td>
</tr>
<tr>
<td>Postponed child's visit to doctor</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>Did not pick up prescription for children</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Unable to pay for school trip</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Went without music, dance, kapa haka, art etc</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>18</td>
<td>37</td>
</tr>
<tr>
<td>Involvement in sport had to be limited</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td><strong>Multiple deprivation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4+ of the 11 children's items above</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>11</td>
<td>35</td>
</tr>
<tr>
<td>5+ of the 11 children's items above</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>6+ of the 11 children's items above</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td><strong>Children's serious health problems reported by respondent</strong></td>
<td>28</td>
<td>22</td>
<td>25</td>
<td>31</td>
<td>35</td>
<td>43</td>
</tr>
<tr>
<td><strong>Enforced lacks reported by respondent in child's family</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keep main rooms warm</td>
<td>9</td>
<td>-</td>
<td>3</td>
<td>8</td>
<td>18</td>
<td>37</td>
</tr>
<tr>
<td>Meal with meat/chicken/fish at least each second day</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>18</td>
</tr>
<tr>
<td>Cut back/did without fresh fruit and vegetables</td>
<td>14</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>32</td>
<td>63</td>
</tr>
<tr>
<td>Postponed visit to doctor</td>
<td>14</td>
<td>-</td>
<td>4</td>
<td>18</td>
<td>38</td>
<td>65</td>
</tr>
<tr>
<td>One weeks holiday away from home in last year</td>
<td>33</td>
<td>14</td>
<td>28</td>
<td>42</td>
<td>52</td>
<td>73</td>
</tr>
<tr>
<td>Home computer</td>
<td>8</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>Internet access</td>
<td>9</td>
<td>-</td>
<td>7</td>
<td>9</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td><strong>Housing and local community conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical condition of house (poor/very poor)</td>
<td>7</td>
<td>-</td>
<td>3</td>
<td>7</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>Major difficulty to keep house warm in winter</td>
<td>22</td>
<td>9</td>
<td>13</td>
<td>27</td>
<td>38</td>
<td>58</td>
</tr>
<tr>
<td>Dampness or mould (major problem)</td>
<td>17</td>
<td>5</td>
<td>13</td>
<td>18</td>
<td>37</td>
<td>49</td>
</tr>
<tr>
<td>Crime or vandalism in the area (major problem)</td>
<td>11</td>
<td>6</td>
<td>6</td>
<td>11</td>
<td>13</td>
<td>31</td>
</tr>
</tbody>
</table>

Source: NZ 2008 Living Standards Survey [92]

**Summary**

In the 2008 Living Standards Survey 39% of Māori children aged 0–17 years scored four or more on the composite deprivation index, which measured a range of "enforced lacks". When broken down by individual item, those children who scored four or more on the composite deprivation index had much higher exposures to household economising behaviours such as having to wear worn out shoes or clothing, sharing a bed or bedroom, cutting back on fresh fruit and vegetables and postponing doctors visits because of cost.
Data Source and Methods

Definition
Proportion of Children Aged 0–17 Years with Deprivation Scores of Four or More

Data Source
The Ministry of Social Development’s 2008 Living Standards Survey [92]

In the 2008 Living Standards Survey, respondents provided information about themselves and others in their Economic Family Unit (EFU). A respondent’s EFU comprised the respondent and partner (if any), together with their dependent children in the household (if any). This was a narrower concept than the census family unit which includes other family members such as adult children and parents of adult children.

In the survey, total response ethnicity was used, meaning that categories were not mutually exclusive, as one person could be in two or more categories depending on their response. When the analysis was repeated using prioritised ethnicity however, the change in classification had minimal impact on the results.

Deprivation Index Used in 2008 Living Standards Survey
In the 2008 Living Standards Survey, a 14 item material deprivation index was used to compare the relative positions of different population groups. Each item in the index assessed an ‘enforced lack’, with items being divided into two categories: ownership / participation, where an item was wanted but not possessed because of cost; and economising items, which focused on cutting back or going without in order to pay for other basic needs. The deprivation score for each respondent was the sum of all enforced lacks, with a cut off of 4+ being used as a measure of material hardship, as it represented the 15% of the population experiencing the most hardship (and was thus seen as being equivalent to the MSD’s income poverty measures).

14 Items (Enforced Lacks) Included in 2008 Living Standards Survey Deprivation Index

Ownership/Participation
- A Good Bed
- Ability to Keep Main Rooms Adequately Warm
- Suitable Clothes for Important or Special Occasions
- Home Contents Insurance
- Presents for Family and Friends on Special Occasions

Economising ‘A Lot’ (To Keep Down Costs to Help Pay for Other Basics)
- Continued Wearing Worn Out Clothing
- Continued Wearing Worn Out Shoes
- Went Without or Cut Back On Fresh Fruit and Vegetables
- Bought Cheaper or Less Meat than Wanted
- Postponed Visits to the Doctor
- Did Not Pick Up a Prescription
- Put Up With Feeling Cold to Save on Heating Costs
- Went Without or Cut Back On Visits to Family or Friends
- Did Not go to a Funeral (Tangi) You Wanted to
**UNEMPLOYMENT RATES**

**Introduction**

The following section uses information from Statistics New Zealand’s Quarterly Household Labour Force Surveys, to review unemployment rates during the past two decades. Such information is of relevance for Māori children and young people two reasons:

Firstly, research suggests that children in families where their parents are unemployed have higher rates of psychosomatic symptoms, chronic illnesses and low wellbeing [93] with these negative effects potentially being mediated via the impact unemployment has on parents’ mental health, self esteem and parenting [93][94].

Secondly, research suggests that for young people, unemployment leads to a range of negative psychological outcomes including depression, anxiety and low self esteem, which are in turn associated with adverse outcomes such as heavy tobacco, alcohol and drug use; and higher mortality from suicide and accidents [95]. On a more positive note, research also suggests that this psychological distress decreases once young people find permanent employment, or return to further education [95].

**New Zealand Distribution and Trends**

**Seasonally Adjusted Unemployment Rates**

In New Zealand during 1986–2010(Q3), the highest unemployment rates were seen in the third quarter of 1991, when rates reached 11.2%. During the 2000s, rates reached their lowest point, at 3.5% in the December 2007 quarter, before climbing again to reach a peak of 7.1% in the December quarter of 2009. By the quarter ending September 2010, the seasonally adjusted unemployment rate had fallen to 6.4%, with seasonally adjusted unemployment numbers decreasing by 10,000 to 150,000 (Figure 35).

Figure 35. Seasonally Adjusted Unemployment Rates, New Zealand Quarter 1 (March) 1986 to Quarter 3 (September) 2010

![Seasonally Adjusted Unemployment Rates](chart.png)

Source: Statistics New Zealand, Household Labour Force Survey; Rates Have Been Seasonally Adjusted
Unemployment Rates by Ethnicity

In New Zealand during 2007(Q4)–2010(Q3) unemployment rates were consistently higher for Māori and Pacific peoples than for Asian and European people. While unemployment rates increased for all ethnic groups, in absolute terms, increases were greatest for Māori and Pacific people. Thus by 2010(Q3), unemployment rates were 13.4% for Māori, 13.8% for Pacific, 8.2% for Asian and 4.7% for European people (Figure 36).

Figure 36. Quarterly Unemployment Rates by Total Response Ethnicity, New Zealand Quarter 4 (December) 2007 to Quarter 3 (September) 2010

Unemployment Rates by Age

In New Zealand during September 1987–2010, unemployment rates were consistently higher for younger people (15–19 years > 20–24 years > 25–29 years > 35–39 years and 45–49 years). During the year ending September 2010, annual unemployment rates rose to 25.0% for those aged 15–19 years and to 12.3% for those aged 20–24 years.

Unemployment Rates by Age and Gender

In New Zealand during 1987–2010, there were no consistent gender differences in annual unemployment rates amongst young people aged 15–24 years. During the year ending September 2010, unemployment rates for those aged 15–19 years were 26.1% for females and 24.0% for males, while for those aged 20–24 years, rates were 11.6% for females and 12.8% for males.

Unemployment Rates by Qualification

In New Zealand during the years ending September 1987–2010, unemployment rates were higher for those with no qualifications > school qualifications, or post school but no school qualifications > both post school and school qualifications. In the year ending September 2010, unemployment rates were 10.6% for those with no qualifications, 8.0%
for those with a school qualification, 7.5% for those with post school but no school qualifications and 4.4% for those with both post school and school qualifications.

**Duration of Unemployment**

In New Zealand during the years ending September 1987–2010, duration of unemployment varied markedly, and in a manner consistent with prevailing unemployment rates. Thus the highest proportion of people unemployed for 53+ weeks occurred during the early / mid 1990s, when unemployment rates were at their peak, while the highest proportion unemployed for only 1–4 weeks occurred in the mid-2000s, when unemployment rates were at their lowest.

**Summary**

In New Zealand during 2007(Q4)–2010(Q3) unemployment rates were consistently higher for Māori and Pacific peoples than for Asian and European people. While unemployment rates increased for all ethnic groups, in absolute terms, increases were greatest for Māori and Pacific people. Thus by 2010(Q3), unemployment rates were 13.4% for Māori, 13.8% for Pacific, 8.2% for Asian and 4.7% for European people.

**Data Source and Methods**

**Definition**

Unemployment Rate: The number of unemployed people expressed as a percentage of the labour force.

**Data Source**


**Notes on Interpretation**

Unemployed refers to all people in the working-age population who during the reference week were without a paid job, were available for work and [96]:

(a) had actively sought work in the past four weeks ending with the reference week,

(b) OR had a new job to start within four weeks

Note 1: A person whose only job search method in the previous four weeks has been to look at job advertisements in the newspapers is not considered to be actively seeking work.

Note 2: Seasonal adjustment makes data for adjacent quarters more comparable by smoothing out the effects of any regular seasonal events. This ensures the underlying movements in time series are more visible. Each quarter, the seasonal adjustment process is applied to the latest and all previous quarters. This means that seasonally adjusted estimates for previously published quarters may change slightly [96].
**CHILDREN RELIANT ON BENEFIT RECIPIENTS**

**Introduction**

The following section reviews the number of children aged 0–18 years who were dependent on benefit recipients during April 2000–2010, using information from the Ministry of Social Development’s SWIFTT database. Unfortunately information on the ethnicity of children reliant on benefit recipients is not routinely collected in the SWIFTT database (only the ethnicity of the benefit recipient is recorded) and thus ethnic specific rates were not able to be calculated for this indicator. Nevertheless, with unemployment rates both being higher and increasing more rapidly in numerical terms amongst Māori whānau during the past two years (see previous section) it is likely that a significant proportion of the increases seen in this indicator during the past two years will have been amongst Māori children.

**New Zealand Distribution and Trends**

**Total Number of Children Reliant on a Benefit or Benefit Recipient**

In New Zealand, the number of children aged 0–18 years who were reliant on a benefit, or benefit recipient, fell from 272,638 in April 2000, to 201,083 in April 2008, before increasing again to 232,231 in April 2010. A large proportion of this variation was due to changes in the number of children relying on unemployment benefit recipients, with numbers in this category falling from 49,499 in April 2000, to 5,289 in April 2008, before increasing again to 16,380 in April 2010. Similarly the number of children reliant on DPB recipients fell from 188,216 in April 2000, to 158,173 in April 2008, before increasing again to 177,226 in April 2010 (**Table 28**).

**Proportion of All New Zealand Children Reliant on a Benefit Recipient**

In New Zealand the proportion of children aged 0–18 years who were reliant on a benefit, or benefit recipient, fell from 24.9% in April 2000 to 17.3% in April 2008, before increasing again to 19.7% in April 2010. A large proportion of the initial decline was due to a fall in the number of children reliant on unemployment benefit recipients (from 4.5% of children in 2000 to 0.5% in April 2008 → to 1.4% in April 2010). While the proportion of children reliant on DPB recipients also fell (17.2% of children in April 2000, to 13.6% in April 2008, to 15.1% in April 2010) (**Figure 37**), the rate of decline was much slower than for unemployment benefits, meaning that in relative terms, the proportion of benefit dependent children reliant on DPB recipients actually increased, from 69.0% of all benefit dependent children in April 2000, to 76.3% in April 2010 (**Table 28**).

**Age Distribution**

During April 2010, the proportion of children reliant on a benefit, or benefit recipient, was highest amongst those 0–4 years of age. Rates then tapered off rapidly, reaching a plateau in middle childhood (6–9 years). After 10 years of age however, rates again declined, reaching their lowest point at 18 years of age (**Figure 38**).

**Summary**

In New Zealand, the proportion of children aged 0–18 years who were reliant on a benefit, or benefit recipient, fell from 24.9% in April 2000, to 17.3% in April 2008, before increasing again to 19.7% in April 2010. The proportion of children reliant on unemployment benefit recipients fell from 4.5% of children in 2000, to 0.5% in April 2008, before increasing again to 1.4% in April 2010. The proportion of children reliant on DPB recipients also fell from 17.2% in April 2000, to 13.6% in April 2008, before increasing again to 15.1% in April 2010. While ethnic specific rates were not able to be calculated due to data limitations, it is likely that a significant proportion of the increases seen during the past two years will have been amongst Māori children.
Figure 37. Proportion of All Children Aged 0–18 Years Who Were Reliant on a Benefit or Benefit Recipient by Benefit Type, New Zealand April 2000–2010

Source: Numerator: Ministry of Social Development; Denominator: Statistics NZ Estimated Resident Population; For Composition of Other Benefits, see Methods Section; Non Benefit Assistance not included.

Figure 38. Proportion of All Children Aged 0–18 Years Who Were Reliant on a Benefit or Benefit Recipient by Age and Benefit Type, New Zealand April 2010

Source: Numerator: Ministry of Social Development; Denominator: Statistics NZ Estimated Resident Population; For Composition of Other Benefits, see Methods Section; Non Benefit Assistance not included.
### Table 28. Number of Children Aged 0–18 Years Who Were Reliant on a Benefit or Benefit Recipient by Benefit Type, New Zealand April 2000–2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Purposes</th>
<th>Unemployment</th>
<th>Invalid's</th>
<th>Sickness</th>
<th>Other Benefits</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Number</td>
<td>Number</td>
<td>Number</td>
<td>Number</td>
<td>Number</td>
</tr>
<tr>
<td>2000</td>
<td>188,216</td>
<td>49,499</td>
<td>11,120</td>
<td>11,295</td>
<td>12,508</td>
<td>272,638</td>
</tr>
<tr>
<td>2001</td>
<td>187,791</td>
<td>43,245</td>
<td>12,122</td>
<td>11,253</td>
<td>12,117</td>
<td>266,528</td>
</tr>
<tr>
<td>2002</td>
<td>187,207</td>
<td>36,342</td>
<td>13,219</td>
<td>11,983</td>
<td>10,209</td>
<td>258,960</td>
</tr>
<tr>
<td>2003</td>
<td>186,184</td>
<td>30,067</td>
<td>14,225</td>
<td>12,119</td>
<td>9,798</td>
<td>252,393</td>
</tr>
<tr>
<td>2004</td>
<td>185,610</td>
<td>20,663</td>
<td>15,053</td>
<td>13,182</td>
<td>9,572</td>
<td>244,080</td>
</tr>
<tr>
<td>2005</td>
<td>180,035</td>
<td>15,134</td>
<td>15,214</td>
<td>13,636</td>
<td>9,261</td>
<td>233,280</td>
</tr>
<tr>
<td>2006</td>
<td>172,995</td>
<td>12,069</td>
<td>15,332</td>
<td>13,797</td>
<td>9,430</td>
<td>223,623</td>
</tr>
<tr>
<td>2007</td>
<td>160,634</td>
<td>7,819</td>
<td>15,247</td>
<td>13,515</td>
<td>9,172</td>
<td>206,387</td>
</tr>
<tr>
<td>2008</td>
<td>158,173</td>
<td>5,289</td>
<td>15,962</td>
<td>12,128</td>
<td>9,531</td>
<td>201,083</td>
</tr>
<tr>
<td>2009</td>
<td>167,142</td>
<td>11,581</td>
<td>15,800</td>
<td>12,482</td>
<td>9,573</td>
<td>216,578</td>
</tr>
<tr>
<td>2010</td>
<td>177,226</td>
<td>16,380</td>
<td>15,116</td>
<td>13,752</td>
<td>9,757</td>
<td>232,231</td>
</tr>
</tbody>
</table>

Source: Ministry of Social Development. *Note: % refers to % of children relying on benefit recipients, rather than % of all children. For Composition of Other Benefits, see Methods Section; Non Benefit Assistance not included.*
Data Source and Methods

Definition
Children Reliant on a Benefit or a Benefit Recipient by Benefit Type

Data Source
Numerator: Number of Children Aged 0–18 years who were reliant on a Benefit or Benefit Recipient as recorded in the Ministry of Social Development’s SWIFTT\(^6\) database

Notes on Interpretation
Data was provided by the MSD from their SWIFTT database which records information on recipients of financial assistance through Work and Income for 2000–2010. All figures refer to the number of children who were dependent on a benefit or benefit recipient as at the end of April and provide no information on those receiving assistance at other times.
To be eligible for a benefit, clients must have insufficient income to support themselves and any dependents and meet the eligibility criteria for benefits. These are:

**Domestic Purposes Benefit – Sole Parent (DPB-SP) and Emergency Maintenance Allowance:** This benefit provides income support for sole parents living with their dependent children under 18 years, who meet an income test and are New Zealand citizens or permanent residents. To be eligible, a parent must be 18 years or older OR have been legally married or in a civil union. A 16 or 17 year old sole parent who has never been married may be eligible to receive an Emergency Maintenance Allowance. This emergency benefit can also be paid to sole parents aged 18 and over who do not meet specific criteria for DPB-SP or other benefits.

**Unemployment Benefits:** Unemployment benefits are available to people who are available for and actively seeking full time work. Clients must be aged 18+ years, or 16–17 years and living with a spouse or partner and dependent children. Those receiving unemployment benefits are subject to a full time work test, as are their spouses or partners if they have no dependent children, or if their youngest dependent child is aged 14+ years. Applicants must have continuously lived in New Zealand for 2 years or more. An Unemployment Benefit-Hardship is available to those who do not meet these criteria but who are not successfully able to support themselves through paid employment or by other means.

**Sickness Benefit:** To be eligible for a Sickness Benefit people need to be 18 years of age, or 16–17 years of age and either 27+ weeks pregnant or living with a partner and children they support. They must have had to stop working or reduce their hours because of sickness, injury, pregnancy or disability OR, if unemployed or working part time, find it hard to look for or do full time work for the same reasons. To qualify, a person’s (and their partner’s) income must be below a certain level and they must have a medical certificate, the first of which can last for only up to 4 weeks. For pregnant women, payments may continue for up to 13 weeks after the birth of their child. At least 2 years’ residence is required, though a benefit may be granted in cases of hardship.

**Invalid’s Benefit:** To be eligible for an Invalid’s Benefit, people need to be 16+ years of age and unable to work 15+ hours a week because of a sickness, injury or disability which is expected to last at least 2 years OR their life expectancy is <2 years and they are unable to regularly work 15+ hours a week OR they are blind with a specified level of visual impairment. A doctor’s certificate is required and an applicant must be a New Zealand citizen or permanent resident and have lived in New Zealand for 10+ years.

**Other Benefits:** These include DPB Women Alone and Caring for Sick or Infirm, NZ Superannuation, Veterans and Transitional Retirement Benefit, Emergency Benefits and Widows Benefit, Independent Youth Benefit, Unemployment Benefit Training and Unemployment Benefit Training Hardship, Unemployment Benefit Student Hardship.

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\(^6\) SWIFTT is the income support database developed by the New Zealand Income Support Service to calculate, provide and record income support payments and related client history [97]
HOSPITAL ADMISSIONS AND MORTALITY WITH A SOCIAL GRADIENT IN CHILDREN

Introduction

The following section uses data from the National Minimum Dataset and the National Mortality collection to review hospital admissions for, and mortality from, a range of socially sensitive medical conditions and injuries in Māori children since 2000.

Background

In New Zealand, many child health outcomes exhibit a social gradient, with hospital admissions and mortality from socioeconomic sensitive conditions being several times higher for Māori than for European children [1]. Such disparities have persisted, despite one of the longest periods of economic growth in recent decades, as well as historically low unemployment rates.

As earlier sections of this report have demonstrated, New Zealand’s macroeconomic environment has changed markedly since late 2007, with rises in unemployment disproportionately impacting on Māori whānau and increases also being seen in the number of children reliant on benefit recipients. The impact of these changes on socially sensitive health outcomes remains unclear however, as international evidence suggests that the effects may vary, not only with the magnitude and duration of any economic downturn, but also with the Government’s social policy responses, and the extent to which New Zealand can maintain an effective social safety net for those most affected. Further, the adaptations families make to their changed economic circumstances (e.g. cutting back on heating and doctor’s visits vs. cigarettes and takeaways), are also important, with the net impact of such positive / negative adaptations on health outcomes for Māori children being difficult to predict (for a more detailed review see Craig et al 2009 [80]).

Distribution and Trends for Māori Children

Distribution by Cause

Hospital Admissions: In New Zealand during 2005–2009, bronchiolitis, asthma and skin infections made the largest individual contributions to hospitalisations for medical conditions with a social gradient in Māori children, although infectious and respiratory diseases collectively were responsible for the majority of admissions. Similarly falls, followed by inanimate mechanical forces (e.g. struck by / caught between) were the leading causes of injury admissions with a social gradient, although transport accidents as a group also made a significant contribution (Table 29).

Mortality: In New Zealand during 2003–2007, SUDI made the single largest contribution to mortality with a social gradient in Māori 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 related deaths made the second largest contribution, followed by pedestrian injuries, while bacterial / non-viral pneumonia was the leading cause of mortality from medical conditions (Table 30).
Table 29. Hospital Admissions for Conditions with a Social Gradient in Māori Children Aged 0–14 Years, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Māori Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number: Total 2005-2009</td>
</tr>
<tr>
<td><strong>Medical Conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Acute Bronchiolitis</td>
<td>11,433</td>
</tr>
<tr>
<td>Asthma</td>
<td>8,441</td>
</tr>
<tr>
<td>Skin Infections</td>
<td>5,581</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>5,369</td>
</tr>
<tr>
<td>Acute Upper Respiratory Infections Excl Croup</td>
<td>5,231</td>
</tr>
<tr>
<td>Bacterial/Non-Viral Pneumonia</td>
<td>4,721</td>
</tr>
<tr>
<td>Viral Infection of Unspecified Site</td>
<td>3,992</td>
</tr>
<tr>
<td>Urinary Tract Infection</td>
<td>1,378</td>
</tr>
<tr>
<td>Croup/Laryngitis/Tracheitis/Epiglottitis</td>
<td>1,322</td>
</tr>
<tr>
<td>Dermatitis and Eczema</td>
<td>1,272</td>
</tr>
<tr>
<td>Otitis Media</td>
<td>1,226</td>
</tr>
<tr>
<td>Febrile Convulsions</td>
<td>1,005</td>
</tr>
<tr>
<td>Epilepsy/ Status</td>
<td>950</td>
</tr>
<tr>
<td>Inguinal Hernia</td>
<td>537</td>
</tr>
<tr>
<td>Viral Pneumonia</td>
<td>503</td>
</tr>
<tr>
<td>Rheumatic Fever/Heart Disease</td>
<td>474</td>
</tr>
<tr>
<td>Bronchiectasis</td>
<td>359</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>318</td>
</tr>
<tr>
<td>Viral/Other/NOS Meningitis</td>
<td>239</td>
</tr>
<tr>
<td>Meningococcal Disease</td>
<td>236</td>
</tr>
<tr>
<td>Vaccine Preventable Diseases</td>
<td>162</td>
</tr>
<tr>
<td>Bacterial Meningitis</td>
<td>112</td>
</tr>
<tr>
<td>Nutritional Deficiencies/Anaemias</td>
<td>71</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>23</td>
</tr>
<tr>
<td>Total Medical Conditions</td>
<td>54,955</td>
</tr>
<tr>
<td><strong>Injury Admissions</strong></td>
<td></td>
</tr>
<tr>
<td>Falls</td>
<td>6,158</td>
</tr>
<tr>
<td>Mechanical Forces: Inanimate</td>
<td>3,670</td>
</tr>
<tr>
<td>Transport: Cyclist</td>
<td>752</td>
</tr>
<tr>
<td>Electricity / Fire / Burns</td>
<td>732</td>
</tr>
<tr>
<td>Accidental Poisoning</td>
<td>670</td>
</tr>
<tr>
<td>Transport: Vehicle Occupant</td>
<td>485</td>
</tr>
<tr>
<td>Mechanical Forces: Animate</td>
<td>411</td>
</tr>
<tr>
<td>Transport: Pedestrian</td>
<td>391</td>
</tr>
<tr>
<td>Drowning / Submersion</td>
<td>62</td>
</tr>
<tr>
<td>Total Injury Admissions</td>
<td>13,331</td>
</tr>
</tbody>
</table>

Table 30. Mortality from Conditions with a Social Gradient in Māori Children Aged 0–14 Years (excluding Neonates) by Cause, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number: Total 2003–2007</th>
<th>Number: Annual Average</th>
<th>Rate per 100,000</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical Conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial/Non-Viral Pneumonia</td>
<td>25</td>
<td>5.0</td>
<td>2.32</td>
<td>35.2</td>
</tr>
<tr>
<td>Viral Pneumonia</td>
<td>8</td>
<td>1.6</td>
<td>0.74</td>
<td>11.3</td>
</tr>
<tr>
<td>Epilepsy/ Status Epileptics</td>
<td>7</td>
<td>1.4</td>
<td>0.65</td>
<td>9.9</td>
</tr>
<tr>
<td>Meningococcal Disease</td>
<td>6</td>
<td>1.2</td>
<td>0.56</td>
<td>8.5</td>
</tr>
<tr>
<td>Bacterial Meningitis</td>
<td>5</td>
<td>1.0</td>
<td>0.46</td>
<td>7.0</td>
</tr>
<tr>
<td>Asthma and Bronchiolitis</td>
<td>7</td>
<td>1.4</td>
<td>0.65</td>
<td>9.9</td>
</tr>
<tr>
<td>Other Medical Conditions</td>
<td>13</td>
<td>2.6</td>
<td>1.21</td>
<td>18.3</td>
</tr>
<tr>
<td><strong>Total Medical Conditions</strong></td>
<td>71</td>
<td>14.2</td>
<td>6.59</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport: Vehicle Occupant</td>
<td>49</td>
<td>9.8</td>
<td>4.55</td>
<td>38.6</td>
</tr>
<tr>
<td>Transport: Pedestrian</td>
<td>28</td>
<td>5.6</td>
<td>2.60</td>
<td>22.0</td>
</tr>
<tr>
<td>Drowning / Submersion</td>
<td>24</td>
<td>4.8</td>
<td>2.23</td>
<td>18.9</td>
</tr>
<tr>
<td>Electricity / Fire / Burns</td>
<td>7</td>
<td>1.4</td>
<td>0.65</td>
<td>5.5</td>
</tr>
<tr>
<td>Mechanical Forces: Inanimate</td>
<td>6</td>
<td>1.2</td>
<td>0.56</td>
<td>4.7</td>
</tr>
<tr>
<td>Transport: Cyclist</td>
<td>5</td>
<td>1.0</td>
<td>0.46</td>
<td>3.9</td>
</tr>
<tr>
<td>Falls</td>
<td>5</td>
<td>1.0</td>
<td>0.46</td>
<td>3.9</td>
</tr>
<tr>
<td>Accidental Poisoning</td>
<td>3</td>
<td>0.6</td>
<td>0.28</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Total Injuries</strong></td>
<td>127</td>
<td>25.4</td>
<td>11.79</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Post Neonatal SUDI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUDI (Infant)</td>
<td>170</td>
<td>34.0</td>
<td>15.78</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>368</td>
<td>73.6</td>
<td>34.16</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Numerator: National Mortality Collection (Neonates removed); Denominator: Statistics NZ Estimated Resident Population. Note SUDI deaths are for infants aged 29–364 days only.

Māori and non-Māori non-Pacific Comparisons

**Hospital Admissions:** In New Zealand during 2005–2009, hospital admissions for medical conditions with a social gradient were significantly higher for Māori (RR 1.75 95% CI 1.73–1.76) than for non-Māori non-Pacific children, as were injury admissions with a social gradient (Māori RR 1.23 95% CI 1.20–1.25) during this period (Table 31). Similar differences were seen during 2000–2009. In terms of trends however, hospital admissions for medical conditions with a social gradient in non-Māori non-Pacific children gradually declined during the mid–late 2000s, but increased again (slightly) after 2007. In contrast admissions for Māori children remained relatively static during the mid-2000s, but increased rapidly after 2007 (Figure 39).

**Mortality:** In New Zealand during 2003–2007, mortality with a social gradient was also significantly higher for Māori children (medical conditions: RR 4.97 95% CI 3.37–7.35; injuries: RR 3.21 95% CI 2.49–4.15) than for non-Māori non-Pacific children (Table 32). Similar differences were seen during 2000–2007 (Figure 40).
Table 31. Hospital Admissions for Conditions with a Social Gradient for Children Aged 0–14 Years (excluding Neonates) by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Admissions No. 2005–2009</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 1,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>54,955</td>
<td>10,991</td>
<td>51.1</td>
<td>1.75</td>
<td>1.73–1.76</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>86,492</td>
<td>17,298</td>
<td>29.3</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Injury Admissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>13,331</td>
<td>2,666</td>
<td>12.4</td>
<td>1.23</td>
<td>1.20–1.25</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>29,897</td>
<td>5,979</td>
<td>10.1</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>


Figure 39. Hospital Admissions for Conditions with a Social Gradient in Children Aged 0–14 Years (excluding Neonates) by Ethnicity, New Zealand 2000–2009

Table 32. Mortality from Conditions with a Social Gradient in Children Aged 0–14 Years (excluding Neonates) by Ethnicity, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Deaths 2003–2007</th>
<th>Deaths: No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical Conditions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>39</td>
<td>7.8</td>
<td>1.32</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td><strong>Injuries</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>127</td>
<td>25.4</td>
<td>11.79</td>
<td>3.21</td>
<td>2.49–4.15</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>108</td>
<td>21.6</td>
<td>3.67</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

SUDI (see Infant Mortality Section)

Source: Numerator: National Mortality Collection (Neonates Removed); Denominator: Statistics NZ Estimated Resident Population; Rates are per 100,000.

Figure 40. Mortality from Conditions with a Social Gradient in Children Aged 0–14 Years (excluding Neonates) by Ethnicity, New Zealand 2000–2007

**Distribution by Ethnicity and NZDep Deprivation**

**Medical Conditions:** In New Zealand during 2005–2009, hospital admissions for medical conditions with a social gradient in Māori and non-Māori non-Pacific children both increased with increasing NZDep deprivation, but at each level of NZDep deprivation, admission rates were higher for Māori children (Figure 41).

**Injury Admissions:** Similarly during 2005–2009, hospital admissions for injuries with a social gradient in Māori and non-Māori non-Pacific children both increased with increasing NZDep deprivation, although in contrast to medical conditions, at each level of NZDep deprivation, injury admissions for Māori children were more similar to those of non-Māori non-Pacific children (Figure 42).

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Figure 41. Hospital Admissions for Medical Conditions with a Social Gradient in Children Aged 0–14 Years by NZDep Index Decile and Ethnicity, New Zealand 2005–2009

Source: Numerator: National Minimum Dataset (Acute and Arranged Admissions only; Neonates Removed); Denominator: Statistics NZ Estimated Resident Population.

Figure 42. Hospital Admissions for Injuries with a Social Gradient in Children Aged 0–14 Years by NZDep Index Decile and Ethnicity, New Zealand 2005–2009

Source: Numerator: National Minimum Dataset (Emergency Department Cases and Neonates Removed); Denominator: Statistics NZ Estimated Resident Population.
Distribution by District Health Board for Māori Children

Medical Conditions: In New Zealand during 2005–2009, hospital admissions for medical conditions with a social gradient for Māori children were significantly higher than for non-Māori non-Pacific children in each of New Zealand’s DHBs, with the exception of the West Coast, where rates were similar. Care should be taken when interpreting the figures presented however, as it remains unclear whether the variations seen reflect real regional differences in the magnitude of ethnic inequalities, or differences in the way ethnicity data is collected and coded in the hospital admissions dataset (Table 33).

Table 33. Hospital Admissions for Medical Conditions with a Social Gradient in Children Aged 0–14 Years by District Health Board and Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>DHB</th>
<th>Total Māori Admissions 2005–2009</th>
<th>Māori Admissions: Annual Average</th>
<th>Māori Admission Rate per 1,000</th>
<th>non-Māori non-Pacific Admission Rate per 1,000</th>
<th>Rate Ratio*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>4,783</td>
<td>956.6</td>
<td>57.0</td>
<td>27.8</td>
<td>2.05</td>
<td>1.96–2.15</td>
</tr>
<tr>
<td>Waitemata</td>
<td>4,679</td>
<td>935.8</td>
<td>55.0</td>
<td>28.1</td>
<td>1.96</td>
<td>1.89–2.02</td>
</tr>
<tr>
<td>Auckland</td>
<td>2,827</td>
<td>565.4</td>
<td>58.0</td>
<td>31.4</td>
<td>1.85</td>
<td>1.77–1.92</td>
</tr>
<tr>
<td>Counties Manukau</td>
<td>8,043</td>
<td>1,608.6</td>
<td>56.9</td>
<td>27.8</td>
<td>2.05</td>
<td>1.99–2.11</td>
</tr>
<tr>
<td>Waikato</td>
<td>5,075</td>
<td>1,015.0</td>
<td>39.7</td>
<td>22.6</td>
<td>1.75</td>
<td>1.69–1.82</td>
</tr>
<tr>
<td>Lakes</td>
<td>3,909</td>
<td>781.8</td>
<td>67.1</td>
<td>37.6</td>
<td>1.78</td>
<td>1.70–1.88</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>5,517</td>
<td>1,103.4</td>
<td>63.9</td>
<td>37.9</td>
<td>1.68</td>
<td>1.62–1.75</td>
</tr>
<tr>
<td>Tairawhiti</td>
<td>2,499</td>
<td>499.8</td>
<td>69.7</td>
<td>37.7</td>
<td>1.85</td>
<td>1.71–2.00</td>
</tr>
<tr>
<td>Taranaki</td>
<td>1,120</td>
<td>224.0</td>
<td>37.2</td>
<td>26.5</td>
<td>1.41</td>
<td>1.31–1.51</td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>3,324</td>
<td>664.8</td>
<td>51.6</td>
<td>23.5</td>
<td>2.20</td>
<td>2.08–2.31</td>
</tr>
<tr>
<td>Whanganui</td>
<td>1,892</td>
<td>378.4</td>
<td>71.6</td>
<td>42.8</td>
<td>1.67</td>
<td>1.57–1.78</td>
</tr>
<tr>
<td>MidCentral</td>
<td>1,947</td>
<td>389.4</td>
<td>37.1</td>
<td>29.2</td>
<td>1.27</td>
<td>1.20–1.34</td>
</tr>
<tr>
<td>Hutt Valley</td>
<td>2,542</td>
<td>508.4</td>
<td>62.7</td>
<td>44.6</td>
<td>1.41</td>
<td>1.34–1.47</td>
</tr>
<tr>
<td>Capital and Coast</td>
<td>1,641</td>
<td>328.2</td>
<td>35.3</td>
<td>25.3</td>
<td>1.40</td>
<td>1.32–1.47</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>568</td>
<td>113.6</td>
<td>53.7</td>
<td>29.3</td>
<td>1.83</td>
<td>1.65–2.03</td>
</tr>
<tr>
<td>Nelson Marlborough</td>
<td>629</td>
<td>125.8</td>
<td>31.7</td>
<td>24.7</td>
<td>1.28</td>
<td>1.18–1.40</td>
</tr>
<tr>
<td>West Coast</td>
<td>148</td>
<td>29.6</td>
<td>25.7</td>
<td>25.8</td>
<td>0.99</td>
<td>0.83–1.19</td>
</tr>
<tr>
<td>Canterbury</td>
<td>2,145</td>
<td>429.0</td>
<td>33.5</td>
<td>31.7</td>
<td>1.06</td>
<td>1.01–1.11</td>
</tr>
<tr>
<td>South Canterbury</td>
<td>168</td>
<td>33.6</td>
<td>27.0</td>
<td>20.3</td>
<td>1.33</td>
<td>1.13–1.56</td>
</tr>
<tr>
<td>Otago</td>
<td>592</td>
<td>118.4</td>
<td>29.2</td>
<td>23.4</td>
<td>1.25</td>
<td>1.15–1.36</td>
</tr>
<tr>
<td>Southland</td>
<td>818</td>
<td>163.6</td>
<td>40.2</td>
<td>32.1</td>
<td>1.25</td>
<td>1.16–1.35</td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset (Acute and Arranged Admissions only; Neonates Removed); Denominator: Statistics NZ Estimated Resident Population; *Rate Ratio compares rates for Māori and non-Māori non-Pacific children within the DHB.

Injury Admissions: In New Zealand during 2005–2009, injury admissions with a social gradient were also significantly higher for Māori than for non-Māori non-Pacific children in eleven DHBs. Rates were similar to those of non-Māori non-Pacific children in six other DHBs however, and significantly lower than for non-Māori non-Pacific children in four DHBs (Table 34). Again care should be taken when interpreting regional differences, for the reasons outlined above.
Table 34. Hospital Admissions for Injuries with a Social Gradient in Children Aged 0–14 Years by District Health Board and Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>DHB</th>
<th>Total Māori Admissions 2005–2009</th>
<th>Māori Admissions: Annual Average</th>
<th>Māori Admission Rate per 1,000</th>
<th>non-Māori non-Pacific Admission Rate per 1,000</th>
<th>Rate Ratio*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury Admissions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northland</td>
<td>1,218</td>
<td>243.6</td>
<td>14.5</td>
<td>11.3</td>
<td>1.28</td>
<td>1.18–1.39</td>
</tr>
<tr>
<td>Waitemata</td>
<td>969</td>
<td>193.8</td>
<td>11.4</td>
<td>9.8</td>
<td>1.17</td>
<td>1.09–1.25</td>
</tr>
<tr>
<td>Auckland</td>
<td>584</td>
<td>116.8</td>
<td>12.0</td>
<td>8.2</td>
<td>1.46</td>
<td>1.34–1.60</td>
</tr>
<tr>
<td>Counties Manukau</td>
<td>2,091</td>
<td>418.2</td>
<td>14.8</td>
<td>10.0</td>
<td>1.48</td>
<td>1.40–1.56</td>
</tr>
<tr>
<td>Waikato</td>
<td>1,294</td>
<td>258.8</td>
<td>10.1</td>
<td>8.9</td>
<td>1.14</td>
<td>1.06–1.22</td>
</tr>
<tr>
<td>Lakes</td>
<td>773</td>
<td>154.6</td>
<td>13.3</td>
<td>10.0</td>
<td>1.33</td>
<td>1.20–1.48</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>1,322</td>
<td>264.4</td>
<td>15.3</td>
<td>11.8</td>
<td>1.29</td>
<td>1.20–1.39</td>
</tr>
<tr>
<td>Tairawhiti</td>
<td>670</td>
<td>134.0</td>
<td>18.7</td>
<td>17.0</td>
<td>1.10</td>
<td>0.96–1.25</td>
</tr>
<tr>
<td>Taranaki</td>
<td>243</td>
<td>48.6</td>
<td>8.1</td>
<td>9.6</td>
<td>0.84</td>
<td>0.73–0.97</td>
</tr>
<tr>
<td>Hawke's Bay</td>
<td>912</td>
<td>182.4</td>
<td>14.2</td>
<td>11.0</td>
<td>1.29</td>
<td>1.18–1.41</td>
</tr>
<tr>
<td>Whanganui</td>
<td>411</td>
<td>82.2</td>
<td>15.6</td>
<td>12.6</td>
<td>1.24</td>
<td>1.09–1.41</td>
</tr>
<tr>
<td>MidCentral</td>
<td>478</td>
<td>95.6</td>
<td>9.1</td>
<td>10.0</td>
<td>0.91</td>
<td>0.82–1.01</td>
</tr>
<tr>
<td>Hutt Valley</td>
<td>531</td>
<td>106.2</td>
<td>13.1</td>
<td>11.0</td>
<td>1.19</td>
<td>1.07–1.32</td>
</tr>
<tr>
<td>Capital and Coast</td>
<td>467</td>
<td>93.4</td>
<td>10.1</td>
<td>8.9</td>
<td>1.13</td>
<td>1.02–1.26</td>
</tr>
<tr>
<td>Wairarapa</td>
<td>147</td>
<td>29.4</td>
<td>13.9</td>
<td>14.0</td>
<td>0.99</td>
<td>0.82–1.20</td>
</tr>
<tr>
<td>Nelson Marlborough</td>
<td>158</td>
<td>31.6</td>
<td>8.0</td>
<td>9.3</td>
<td>0.86</td>
<td>0.72–1.01</td>
</tr>
<tr>
<td>West Coast</td>
<td>60</td>
<td>12.0</td>
<td>10.4</td>
<td>10.0</td>
<td>1.04</td>
<td>0.79–1.38</td>
</tr>
<tr>
<td>Canterbury</td>
<td>602</td>
<td>120.4</td>
<td>9.4</td>
<td>10.9</td>
<td>0.86</td>
<td>0.79–0.94</td>
</tr>
<tr>
<td>South Canterbury</td>
<td>51</td>
<td>10.2</td>
<td>8.2</td>
<td>10.7</td>
<td>0.76</td>
<td>0.57–1.02</td>
</tr>
<tr>
<td>Otago</td>
<td>145</td>
<td>29.0</td>
<td>7.2</td>
<td>9.1</td>
<td>0.78</td>
<td>0.66–0.93</td>
</tr>
<tr>
<td>Southland</td>
<td>178</td>
<td>35.6</td>
<td>8.8</td>
<td>11.2</td>
<td>0.78</td>
<td>0.67–0.92</td>
</tr>
</tbody>
</table>

Source: Numerator: National Minimum Dataset (Emergency Department Cases and Neonates Removed); Denominator: Statistics NZ Estimated Resident Population; *Rate Ratio compares rates for Māori and non-Māori non-Pacific children within the DHB.

New Zealand Level Distribution and Risk Factors

Additional information on the distribution of Hospital Admissions with a Social Gradient in New Zealand children is available from the Health of Pacific Children and Young People with Chronic Conditions and Disabilities in New Zealand [18]. In brief, this report found:

**Distribution by Gender and NZDep Deprivation**

Hospital Admissions: In New Zealand during 2005–2009, hospital admissions for medical conditions with a social gradient were significantly higher for males and those in average–more deprived (NZDep decile 3–10) areas. Similarly, injury admissions with a social gradient were significantly higher for males and those in average–more deprived (NZDep decile 4–10) areas.

Mortality: In New Zealand during 2003–2007, mortality from medical conditions with a social gradient was significantly higher for those in more deprived (Decile 7–10) areas. Similarly mortality from injuries with a social gradient was significantly higher for males and those in more deprived (Decile 7–10) areas.
Summary

In New Zealand during 2005–2009, bronchiolitis, asthma and skin infections made the largest individual contributions to hospitalisations for medical conditions with a social gradient in Māori children, although infectious and respiratory diseases collectively were responsible for most admissions. Similarly falls, followed by inanimate mechanical forces (e.g. struck by / caught between) were the leading causes of injury admissions with a social gradient, although transport accidents also made a significant contribution. During 2003–2007, SUDI was the leading cause of mortality with a social gradient in Māori children, with vehicle occupant related deaths making the second largest contribution, followed by pedestrian injuries.

During 2005–2009, hospital admissions for medical conditions with a social gradient were significantly higher for Māori (RR 1.75 95% CI 1.73–1.76) than for non-Māori non-Pacific children, as were injury admissions with a social gradient (Māori RR 1.23 95% CI 1.20–1.25) during this period. Similar differences were seen during 2000–2009. In terms of trends however, hospital admissions for medical conditions with a social gradient in non-Māori non-Pacific children gradually declined during the mid-late 2000s, but increased again (slightly) after 2007. In contrast admissions for Māori children remained relatively static during the mid-2000s, but increased rapidly after 2007.

Data Source and Methods

Definition

1. Hospital Admissions for Medical Conditions with a Social Gradient in Children Aged 0–14 Years
2. Injury Admissions with a Social Gradient in Children Aged 0–14 Years
3. Mortality with a Social Gradient in Children Aged 0–14 Years

Data Source

For details of the methodology used to derive these indicators see Appendix 8.

Numerator:

Medical Conditions: Acute and Arranged (within 7 days of referral) Hospital Admissions (Waiting List, ACC Cases and neonates <29 days excluded) in children aged 0–14 years 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 (Viral Pneumonia); J13–J16 or J18 (Bacterial / Non-Viral Pneumonia); J21 (Acute Bronchiolitis); J45 or J46 (Asthma); J47 (Bronchiectasis); G00 or G01 (Bacterial Meningitis); A87, G02 or G03 (Viral / Other / NOS Meningitis); G40 or G41 (Epilepsy/ 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: Hospital admissions (emergency department cases, neonates <29 days excluded) in children 0–14 years, 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 (Electricity / Fire / Burns); X40–X49 (Accidental Poisoning); In order to ensure comparability over time, all injury cases with an Emergency Department Specialty Code (M05–M08) on discharge were excluded.
Mortality with a Social Gradient: All deaths in children 0–14 years, (neonates <29 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 29 days and 1 year and their main underlying cause of death was SUDI (ICD-10-AM R95, W75, R99).

Denominator: NZ Statistics NZ Estimated Resident Population

Indicator Category Proxy B–C

Notes on Interpretation (For Further Detail See Appendix 8)
Note 1: Hospital admissions in neonates (<29 days) were excluded from both indicators, as these admissions are more likely to reflect issues arising prior to / at the time of birth, (e.g. preterm infants may register multiple admissions as they transition from intensive care (NICU), through special care nurseries (SCBU) to the postnatal ward), and respiratory infections / other medical conditions arising in these contexts are likely to differ in their aetiology from those arising in the community.

Note 2: For medical conditions, only acute and arranged admissions have been included, as Waiting List admissions tend to reflect service capacity, rather than actual health need (e.g. inclusion of these admissions would result in a large number of children with otitis media with effusion (OME) and chronic tonsillitis being included (for grommets and tonsillectomies), whose demographic profile is very different from children attending hospital acutely for similar diseases). For injury admissions however, filtering by admission type could not occur, as a number of DHBs admitted injury cases under (now discontinued) ACC admission codes, making it difficult to distinguish between acute and waiting list admissions in this context. As with other injury data in these reports however, all injury cases with an Emergency Department Specialty Code (M05–M08) on discharge were excluded (see Appendix 3 for rationale).

Note 3: Hospital admissions were considered to have a social gradient if rates for those in the most deprived (NZDep Decile 9–10) areas were ≥1.8 times higher than for those in the least deprived (NZDep Decile 1–2) areas, or where rates for Māori, Pacific or Asian 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 the magnitude of social gradients between medical and injury admissions, it must be remembered that these differences are not strictly comparable, as for technical reasons emergency department cases have been removed from injury admissions (and social differences in attendance at the Emergency Department vs. primary care for minor medical conditions may have accounted for some (but not all) of the social gradients in medical admission seen). No such differential filtering occurred for mortality data however, and thus the magnitude of the social differences seen is more readily comparable.

Note 5: 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 1 for further discussion of this issue).

Note 6: SUDI rates are traditionally calculated per 1,000 live births. For this analysis rates per 100,000 children aged 0–14 years have been calculated, 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 comparable to traditional SUDI mortality rates for those <1 year reported elsewhere.
INFANT MORTALITY

Introduction
The following section uses information from the National Mortality Collection to review neonatal, post neonatal and total infant mortality in Māori infants since 1996.

Background
Infant mortality is often used as a barometer of the social wellbeing of a country [98]. In New Zealand, both neonatal and post neonatal mortality are higher for Māori than for European infants, with neonatal mortality during 2002–2006 being 1.22 (95% CI 1.06–1.42) times higher for Māori than for European infants, and post-neonatal mortality being 3.03 (95% CI 2.52–3.63) times higher. When broken down by cause however, the greatest disparities are seen for SUDI, with rates for Māori babies being 5.74 (95% CI 4.32–7.63) times higher than for European babies during 2002–2006 [80].

In attempting to understand the reasons for these disparities, a recent review of SIDS-related knowledge and infant care practices among Māori mothers in South Auckland found that knowledge about SIDS prevention was much lower amongst Māori than European mothers, with more Māori infants sleeping prone and having stopped breastfeeding earlier. Although co-sleeping rates were similar, bed sharing increased to 65% for some part of the night, with more than half of Māori mothers smoking in pregnancy, 21% sharing a bed with their infant, and potentially unsafe soft objects (e.g. rolled blankets or pillows) being used by a third to help maintain sleep position. Tipene-Leach et al concluded that appropriate health promotion measures needed to be developed which were of relevance to Māori whanau [99].

Distribution and Trends for Māori Infants
Distribution by Cause
In New Zealand during 2003–2007, extreme prematurity and congenital anomalies were the leading causes of neonatal mortality in Māori babies, although intrauterine / birth asphyxia also made a significant contribution. In contrast, SUDI was the leading cause of post-neonatal mortality, followed by congenital anomalies (Table 35).

Annual Numbers and non-Māori non-Pacific Comparisons
In New Zealand during 2003–2007, on average 55 Māori babies each year died in the neonatal period, while a further 67 died in the post-natal period. During this period, neonatal mortality rates for Māori babies were not significantly different (RR 1.16 95% CI 1.00–1.34) from those of non-Māori non-Pacific babies, while post-neonatal mortality rates were significantly higher (RR 3.00 95% CI 2.54–3.55). When cause of death was considered, on average 39 Māori babies each year died from SUDI (neonatal and post-neonatal combined), with rates for Māori babies being significantly higher (RR 5.35 95% CI 4.11–6.96) than for non-Māori non-Pacific babies during this period (Table 36). Similar differences were seen during 1996–2007, although neonatal mortality rates were higher for Māori than for non-Māori non-Pacific infants for the majority of this period (Figure 43).

New Zealand Level Distribution and Risk Factors
Additional information on the distribution of Infant Mortality in the New Zealand population is available from the Health Status of Children and Young People with Chronic Conditions and Disabilities in New Zealand [27]. In brief, this report found:

Distribution by Gender and NZ Deprivation Index Decile
In New Zealand during 2003–2007, neonatal and post neonatal mortality were both significantly higher for males and those in more deprived areas. SUDI was significantly higher for those in average to more deprived areas.
Table 35. Neonatal and Post Neonatal Mortality in Māori Infants by Cause, New Zealand 2003–2007

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Number: Total 2003–2007</th>
<th>Number: Annual Average</th>
<th>Rate per 100,000</th>
<th>Percent of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori Infants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Prematurity</td>
<td>85</td>
<td>17.0</td>
<td>98.3</td>
<td>30.8</td>
</tr>
<tr>
<td>Congenital Anomalies</td>
<td>48</td>
<td>9.6</td>
<td>55.5</td>
<td>17.4</td>
</tr>
<tr>
<td>Intrauterine / Birth Asphyxia</td>
<td>17</td>
<td>3.4</td>
<td>19.7</td>
<td>6.2</td>
</tr>
<tr>
<td>Other Perinatal Conditions</td>
<td>86</td>
<td>17.2</td>
<td>99.4</td>
<td>31.2</td>
</tr>
<tr>
<td>SUDI: SIDS or Unspecified</td>
<td>15</td>
<td>3.0</td>
<td>17.3</td>
<td>5.4</td>
</tr>
<tr>
<td>SUDI: Suffocation / Strangulation in Bed</td>
<td>12</td>
<td>2.4</td>
<td>13.9</td>
<td>4.3</td>
</tr>
<tr>
<td>Other Causes</td>
<td>13</td>
<td>2.6</td>
<td>15.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Total Neonatal Mortality</td>
<td>276</td>
<td>55.2</td>
<td>319.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Post Neonatal Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori Infants</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUDI: SIDS</td>
<td>116</td>
<td>23.2</td>
<td>134.1</td>
<td>34.5</td>
</tr>
<tr>
<td>SUDI: Suffocation / Strangulation in Bed</td>
<td>47</td>
<td>9.4</td>
<td>54.3</td>
<td>14.0</td>
</tr>
<tr>
<td>SUDI: Unspecified</td>
<td>7</td>
<td>1.4</td>
<td>8.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Congenital Anomalies</td>
<td>36</td>
<td>7.2</td>
<td>41.6</td>
<td>10.7</td>
</tr>
<tr>
<td>Prematurity / Asphyxia / Other Perinatal Conditions</td>
<td>23</td>
<td>4.6</td>
<td>26.6</td>
<td>6.8</td>
</tr>
<tr>
<td>Injury / Poisoning</td>
<td>20</td>
<td>4.0</td>
<td>23.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Other Causes</td>
<td>87</td>
<td>17.4</td>
<td>100.6</td>
<td>25.9</td>
</tr>
<tr>
<td>Total Post Neonatal Mortality</td>
<td>336</td>
<td>67.2</td>
<td>388.5</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>612</td>
<td>122.4</td>
<td>707.7</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset.


<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Number: Total 2003–2007</th>
<th>Number: Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>276</td>
<td>55</td>
<td>319.2</td>
<td>1.16</td>
<td>1.00–1.34</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>499</td>
<td>100</td>
<td>276.0</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Post Neonatal Mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>336</td>
<td>67</td>
<td>388.5</td>
<td>3.00</td>
<td>2.54–3.55</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>234</td>
<td>47</td>
<td>129.4</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Sudden Unexpected Death in Infancy (SUDI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori</td>
<td>197</td>
<td>39</td>
<td>227.8</td>
<td>5.35</td>
<td>4.11–6.96</td>
</tr>
<tr>
<td>non-Māori non-Pacific</td>
<td>77</td>
<td>15</td>
<td>42.6</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Source: Numerator: National Mortality Collection; Denominator: Birth Registration Dataset; Rates are per 100,000, Rate Ratios are Unadjusted. SUDI includes deaths occurring during the neonatal AND post neonatal periods.
Summary

In New Zealand during 2003–2007, on average 55 Māori babies each year died in the neonatal period, while a further 67 died in the post-natal period. During this period, neonatal mortality rates for Māori babies were not significantly different (RR 1.16 95% CI 1.00–1.34) from those of non-Māori non-Pacific babies, while post-neonatal mortality rates were significantly higher (RR 3.00 95% CI 2.54–3.55). When cause of death was considered, on average 39 Māori babies each year died from SUDI (neonatal and post-neonatal combined), with rates for Māori babies being significantly higher (RR 5.35 95% CI 4.11–6.96) than for non-Māori non-Pacific babies during this period.

Data Source and Methods

Definition
1. Total Infant Mortality: Death of a live born infant prior to 365 days of life
2. Neonatal Mortality: Death of a live born infant in the first 28 days of life
3. Post-Neonatal Mortality: Death of a live born infant after 28 days but prior to 365 days
4. Sudden Unexpected Death in Infancy (SUDI): Death of a live born infant <365 days of life, where the cause of death is attributed to SIDS, Accidental Suffocation / Strangulation in Bed or Ill-Defined/Unspecified Causes

Data Sources
Numerator: National Mortality Collection: All deaths in the first year of life, using the definitions for total, neonatal and post neonatal mortality outlined above. Cause of death was derived from the main underlying cause of death (clinical code) as follows: Extreme Prematurity (ICD-10 P072), Congenital Anomalies (ICD-10 Q00–Q99), Perinatal Conditions (ICD-10 P00–P96); SIDS (ICD-10 R95); SUDI (ICD-10 R95, W75, R99).
Denominator: Birth Registration Dataset: All live births 20+ weeks gestation.

Notes on Interpretation
Note 1: See Appendix 4 for an overview of the dataset used.
Note 2: 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 1 for further discussion of this issue).
INJURIES ARISING FROM THE ASSAULT, NEGLECT OR MALTREATMENT OF CHILDREN

Introduction
The following section explores hospital admissions and mortality from injuries arising from the assault, neglect or maltreatment of Māori children aged 0–14 years using information from the National Minimum Dataset and the National Mortality Collection.

Background
Longitudinal studies suggest that 4–10% of New Zealand children experience physical abuse and 11–20% experience sexual abuse during childhood and that the long term consequences for these children are significant [100]. During the 1990s, New Zealand ranked 3rd highest amongst rich nations for its child maltreatment death rates [101], with 49 children younger than 15 years dying as a result of maltreatment between 1996 and 2000. This situation does not appear to have improved over time, with mortality rates almost doubling during the late 1980s and changing very little since then [102]. Mortality represents the tip of the iceberg however, with the number of notifications to Child Youth and Family (CYF) for possible abuse or neglect increasing each year. In 2008, a total of 104,181 notifications were recorded by CYF and of these, 48,957 were deemed to require further action [80]. This is of concern, as in addition to the physical effects, research has shown that survivors of childhood abuse often suffer long term psychological sequelae including depression, post-traumatic stress disorder, substance abuse, suicide / suicide attempts and high risk sexual behaviour [103].

Distribution and Trends for Māori Children

Admission Rates by Ethnicity
In New Zealand during 2005–2009, there were on average 81.6 hospital admissions for injuries arising from the assault, neglect or maltreatment of Māori children, with admission rates for Māori children being significantly higher (RR 3.41 95% CI 2.95–3.94) than for non-Māori non-Pacific children during this period (Table 37). While admission rates for Māori children were also higher than for non-Māori non-Pacific children during 2000–2009, admissions for Māori children increased after 2002–03, while admissions for non-Māori non-Pacific children gradually declined (Figure 44).

Distribution by Age
In New Zealand during 2005–2009, hospital admissions for injuries arising from the assault, neglect or maltreatment of Māori children exhibited a J-shaped distribution with age, with rates being highest for infants <1 year, followed by those > 11 years of age (Figure 45).

Table 37. Hospital Admissions due to Injuries Arising from the Assault, Neglect or Maltreatment of Children 0–14 Years by Ethnicity, New Zealand 2005–2009

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Total Admissions No. 2005–2009</th>
<th>Admissions No. Annual Average</th>
<th>Rate per 100,000</th>
<th>Rate Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injuries Arising from the Assault, Neglect or Maltreatment of Children</td>
<td>408</td>
<td>81.6</td>
<td>37.9</td>
<td>3.41</td>
<td>2.95–3.94</td>
</tr>
<tr>
<td>Māori</td>
<td>329</td>
<td>65.8</td>
<td>11.1</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Figure 44. Hospital Admissions due to Injuries Arising from the Assault, Neglect or Maltreatment of Children 0–14 Years by Ethnicity, New Zealand 2000–2009

![Graph showing hospital admissions per 100,000 for Māori and non-Māori non-Pacific populations by year from 2000-01 to 2008-09.](image)


Figure 45. Hospital Admissions due to Injuries Arising from the Assault, Neglect or Maltreatment of Māori Children and Young People by Age, New Zealand 2005–2009

![Bar graph showing hospital admissions per 100,000 for Māori population by age from 0 to 14 years.](image)

Additional information on the distribution of injuries arising from the assault, neglect or maltreatment of children in the New Zealand population is available from *the Health of Pacific Children and Young People with Chronic Conditions and Disabilities in New Zealand* [18]. In brief, this report found:

### New Zealand Trends

In New Zealand during 2000–2007, mortality from injuries arising from the assault, neglect or maltreatment of children remained relatively static, with deaths averaging 8 per year during this period. Similarly admissions for the assault, neglect or maltreatment of children declined only marginally during 2000–2009.

### New Zealand Distribution by Gender and NZ Deprivation Index Decile

In New Zealand during 2005–2009, hospital admissions for injuries arising from the assault, neglect or maltreatment of children were significantly higher for males and those living in the more deprived areas.

### Nature of the Injury Sustained

During 2005–2009, the type of intentional injury leading to hospital admission varied with the age of the child, with those in the 0–4 year age bracket tending to be assigned an ICD-10 Y07 “Maltreatment” code (including mental cruelty, physical abuse, sexual abuse or torture), while older children (particularly males aged 13–14 years) were more likely to be assigned to ICD-10 Y04 “Assault by Bodily Force” (including unarmed brawl or fight). While it is tempting to speculate that this reflects a transition towards assaults occurring in non-family contexts as children approach adolescence, the ICD-10 5th digit (describing the relationship of the victim to the perpetrator) was most frequently 9 (unspecified person), making such hypotheses difficult to substantiate. As a result of this likely transition however, the report consider only pre-school (0–4 years) and primary school (5–12 years) age children.

During 2005–2009, the most common types of injury sustained as the result of the assault, neglect or maltreatment of children aged 0–4 years were subdural haemorrhages and superficial scalp injuries, followed by fractures of the skull and face and fractures of the femur. For children aged 5–12 years, head and upper limb injuries predominated, with superficial scalp injuries and fractures of the skull and facial bones being amongst the most common injuries.

### Summary

In New Zealand during 2005–2009, there were on average 81.6 hospital admissions per year for injuries arising from the assault, neglect or maltreatment of Māori children, with admissions for Māori children being *significantly* higher (RR 3.41 95% CI 2.95–3.94) than for non-Māori non-Pacific children. While admissions for Māori children were also higher than for non-Māori non-Pacific children during 2000–2009, admissions for Māori children increased after 2002–03, while admissions for non-Māori non-Pacific children declined.
Data Source and Methods

Definition
1. Hospitalisations for Injuries Arising From the Assault / Neglect / Maltreatment of Children Aged 0–14 Years
2. Deaths from Injuries Arising from the Assault / Neglect / Maltreatment of Children Aged 0–14 Years

Data Source
1. Hospital Admissions
   Numerator: National Minimum Dataset: Hospital admissions of children (0–14 years) with a primary diagnosis of injury (ICD-10-AM S00–T79) and an external cause code of intentional injury (ICD-10-AM X85–Y09) in any of the first 10 External Cause codes. As outlined in Appendix 3, in order to ensure comparability over time, all cases with an Emergency Department Specialty Code (M05–M08) on discharge were excluded.

2. Mortality
   Numerator: National Mortality Collection: Deaths in children (0–14 years) with a clinical code (cause of death) of Intentional Injury (ICD-10-AM X85–Y09).
   Denominator: NZ Statistics NZ Estimated Resident Population

Interpretation
The limitations of the National Minimum Dataset are discussed at length in Appendix 3. The reader is urged to review this Appendix before interpreting any trends based on hospital admission data.
APPENDIX 1: STATISTICAL SIGNIFICANCE TESTING AND ITS USE IN THIS REPORT

Understanding Statistical Significance Testing

Inferential statistics are used when a researcher wishes to use a sample to draw conclusions about the population as a whole (e.g. weighing a class of 10 year old boys, in order to estimate the average weight of all 10 year old boys in New Zealand). Any measurements based on a sample however, even if drawn at random, will always differ from that of the population as a whole, simply because of chance. Similarly, when a researcher wishes to determine whether the risk of a particular condition (e.g. lung cancer) is truly different between two groups (smokers and non-smokers), they must also consider the possibility that the differences observed arose from chance variations in the populations sampled.

Over time, statisticians have developed a range of measures to quantify the uncertainty associated with random sampling error (i.e. to quantify the level of confidence we can have that the average weight of boys in our sample reflects the true weight of all 10 year old boys, or that the rates of lung cancer in smokers are really different to those in non-smokers). Of these measures, two of the most frequently used are:

**P values:** The p value from a statistical test tells us the probability that we would have seen a difference at least as large as the one observed, if there were no real differences between the groups studied. For example, if statistical testing of the difference in lung cancer rates between smokers and non-smokers resulted in a p value of 0.01, this tells us that the probability of such a difference occurring if the two groups were identical is 0.01 or 1%. Traditionally, results are considered to be statistically significant (i.e. unlikely to be due to chance) if the probability is <0.05 (i.e. less than 5%) [104].

**Confidence Intervals:** A 95% Confidence Interval suggests that if you were to repeat the sampling process 100 times, 95 times out of 100 the confidence interval would include the true value. In general terms, if the 95% confidence intervals of two samples overlap, there is no significant difference between them (i.e. the p value would be ≥0.05), whereas if they do not overlap, they can be assumed to be statistically different at the 95% confidence level (i.e. the p value would be <0.05) [104].

The Use of Statistical Significance Testing in this Report

In the preparation of this report a large range of data sources were used. For the purposes of statistical significance testing however, these data sources can be considered as belonging of one of two groups: Population Surveys and Routine Administrative Datasets. The relevance of statistical testing to each of these data sources is described separately below:

**Population Surveys:** A number of indicators in this report utilise data derived from national surveys (e.g. 2006/07 New Zealand Health Survey), where information from a sample has been used to make inferences about the population as a whole. In this context statistical significance testing is appropriate, and where such information is available in published reports, it has been incorporated into the text accompanying each graph or table (i.e. the words significant, or not significant in italics are used to imply that a test of statistical significance has been applied to the data and that the significance of the associations are as indicated). In a small number of cases however information on statistical significance was not available in published reports, and in such cases any associations described do not imply statistical significance.

**Numbers and Rates Derived from Routine Administrative Data:** A large number of the indicators in this report are based on data derived from New Zealand’s administrative datasets (e.g. National Minimum Dataset, National Mortality Collection), which capture
information on all of the events occurring in a particular category. Such datasets can thus be viewed as providing information on the entire population, rather than a sample and as a consequence, 95% confidence intervals are not required to quantify the precision of the estimate (e.g. the number of leukaemia deaths in 2003–2007, although small, is not an estimate but rather reflects the total number of deaths during this period). As a consequence, 95% confidence intervals have not been provided for any of the descriptive data (numbers, proportions, rates) presented in this report, on the basis that the numbers presented are derived from the total population under study.

Rate Ratios Derived from Routine Administrative Data: In considering whether statistical significance testing is ever required when using total population data, Rothman [105] notes that if one wishes only to consider descriptive information (e.g. rates) relating to the population in question (e.g. New Zealand), then statistical significance testing is probably not required (as per the argument above). If however, one wishes to use total population data to explore biological phenomena more generally, then the same population can also be considered to be a sample of a larger super-population, for which statistical significance testing may be required (e.g. the fact that SIDS in New Zealand is 10 times higher in the most deprived NZDep areas might be used to make inferences about the impact of the socioeconomic environment on SIDS mortality more generally (i.e. outside of New Zealand, or the 5 year period concerned)). Similarly, in the local context the strength of observed associations is likely to vary with the time period under study (e.g. in updating 5-year asthma admission data from 2004–2008 to 2005–2009, rate ratios for Pacific children are likely to change due to random fluctuations in annual rates, even though the data utilised includes all admissions recorded for that particular 5-year period). Thus in this report, whenever measures of association (i.e. rate ratios) are presented, 95% confidence intervals have been provided on the assumption that the reader may wish to use such measures to infer wider relationships between the variables under study [105].

The Signalling of Statistical Significance in this Report
In order to assist the reader to identify whether tests of statistical significance have been applied in a particular section, the significance of the associations presented has been signalled in the text with the words significant, or not significant in italics. Where the words significant or non-significant do not appear in the text, then the associations described do not imply statistical significance or non-significance.
Appendix 2: Data Quality Grading System for Indicators in This Report

One of the central aims of the initial Child and Youth Health Indicator project undertaken by the Paediatric Society was to develop an overall map of all of the issues which needed to be taken into account when planning child and youth health services and strategies at a population level. Yet very early on in the course of consultation it became apparent that adequate data sources were available for only a fraction of the issues that those working in the health sector considered important to child and youth health. In order to ensure that issues for which adequate data was available did not take undue precedence over those for which reliable data was lacking, it was decided that a set of indicator selection criteria would be developed, which awarded a high priority to issues of public health importance. Where an issue was deemed to have met these criteria but where routine data sources were lacking, “non-traditional” data sources would then be considered, in order to ensure that the issue did not fall below the public health radar.

Such an approach however, meant that many of the indicators included in the Indicator Framework may not have met the stricter data quality criteria utilised by other Government agencies. In order to highlight the impacts that such data quality issues may have had on the interpretability of the data, it was felt necessary to grade each indicator on the degree to which it captured the issue it was designed to measure, as well as the quality of its data source. Thus each indicator in the framework was assigned to one of three categories: Ideal, Proxy or Bookmark, and an assessment made as to whether its data sources were Excellent (A), Adequate (B), or whether Further Work (C) was required in order to improve the interpretability of the indicator (Table 38). These categories are outlined below:

**Ideal Indicators:** An indicator was considered ideal if it offered the potential to measure the total extent of a particular issue e.g. because the birth registration dataset captures >99% of births in New Zealand and information on gestational age is >98% complete, the preterm birth indicator derived from this dataset was considered ideal, in that it allowed conclusions to be drawn about trends in the incidence of preterm birth over time.

**Proxy Indicators:** In many cases, while it was not possible to measure the full extent of an issue, it was possible to assess the number of children and young people attending publicly funded services for its management. For example, while hospital admission data is unable to provide any commentary on the total number of injuries occurring in the community (as many injuries are treated in primary care, or at home), such data is nevertheless useful for assessing the workload such injuries create for secondary and tertiary services. One of the chief limitations of proxy indicators, however, is the variable extent to which they capture the total burden of morbidity (e.g. while nearly all non-fatal cases of meningococcal disease are likely to be captured by hospital admission data, the same datasets are likely to record only a fraction of gastroenteritis cases occurring in the community). While it is generally assumed that if admission thresholds remain constant (i.e. that children with a given level of severity for a condition will be managed in the same way), then such indicators can be used to track trends in the underlying burden of morbidity, in reality such thresholds are very seldom static and vary in ways which are both predictable (e.g. the introduction of pulse oximetry altering admission thresholds for infants with bronchiolitis over time) and unpredictable (e.g. differences in the ways in which DHBs upload their emergency department cases to the National Minimum Dataset). Thus while being of considerable utility in planning for future health service demand, such indicators are less useful for tracking temporal trends in the total burden of morbidity occurring in the community.

**Bookmark Indicators:** In many cases, consultation suggested that there was a need for indicators in areas where no data sources existed. For example, indicators to assess the prevalence of disability amongst New Zealand children by diagnostic category (e.g. autism, cerebral palsy) and by degree of functional impairment (e.g. visual acuity, degree of
hearing loss). While more traditional approaches to indicator development might have suggested that such issues should be excluded from the monitoring framework until such time as high quality data sources could be developed, such approaches may also have inadvertently resulted in the needs of children and young people with these conditions slipping below the public health radar, and as a consequence being awarded a lesser priority in resource allocation decisions. Thus it was decided that a number of “Bookmark Indicators” should be created, which served to highlight particular issues until such time as more appropriate data sources could be developed. Where possible, such indicators would use currently available data sources to capture particular facets of the wider issue. For example, over time sections on Mental Health have included indicators such as: Children Calling Telephone Based Counselling Services, Inpatient Hospital Admissions for Mental Health Issues and Hospital Admissions and Mortality from Self Inflicted Injuries. While it is acknowledged that collectively these indicators fail to capture the full scope of child and youth mental health issues (the majority of which are managed on an outpatient basis and are thus not adequately represented by inpatient hospital admissions), it is nevertheless hoped that these indicators will serve as a “Bookmark” for child and youth mental health issues, until such time as better indicators can be developed.
Table 38. Indicator Categories Based on the Type of the Indicator and the Quality of its Data Source

<table>
<thead>
<tr>
<th>Indicator Type</th>
<th>Data Quality</th>
<th>Data Quality</th>
<th>Data Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Excellent (A)</td>
<td>Adequate (B)</td>
<td>Further Work Required (C)</td>
</tr>
<tr>
<td>Ideal</td>
<td>Measures total extent of an issue and data quality permits appropriate interpretation of trends and population level differences (No NZ indicators currently in this category)</td>
<td>Measures total extent of an issue and data quality permits adequate interpretation of information once the limitations of the datasets have been outlined e.g. Interpretation of trends in highest attainment at school leaving requires an understanding of changes associated with the roll out of the NCEA which began in 2002. While such changes make interpretation of trends difficult, improvements in data quality per se are unlikely to improve this situation</td>
<td>Measures total extent of an issue but data quality limits appropriate interpretation e.g. While theoretically the MOH’s two oral health indicators provide near complete coverage of children at 5 and 12 years of age, in reality information is only collected on those who have completed treatment, potentially discounting the poor oral health status of children still undergoing treatment for dental caries at these points in time</td>
</tr>
<tr>
<td>Proxy</td>
<td>Measures attendances at publicly funded services for management of an issue and data quality permits appropriate interpretation of trends and population level differences (No NZ indicators currently in this category)</td>
<td>Measures attendances at publicly funded services for management of an issue and data quality permits adequate interpretation once the limitations of the datasets have been outlined e.g. Hospital admission data, when combined with mortality data, provides a reasonable overview of the incidence of invasive meningococcal disease. While a number of data quality issues apply to all indicators derived from these datasets (e.g. accuracy of coding), such limitations are unlikely to significantly hinder the interpretation of the data in this context</td>
<td>Measures attendances at publicly funded services for management of an issue but data quality currently limits appropriate interpretation e.g. Because of the inconsistent manner in which some DHBs have uploaded their emergency department cases to the hospital admission dataset over time, it is difficult to interpret trends in hospital admissions for minor injuries with any certainty. Thus while cross sectional analyses provide an overview of the types if injuries presenting to secondary and tertiary services, interpretation of trend data is significantly impeded by the quality of the datasets</td>
</tr>
<tr>
<td>Bookmark</td>
<td>Measures one facet of a wider issue, or provides a brief overview of the literature in an area where no data sources currently exist. Data quality for isolated facets permits appropriate interpretation. (No NZ indicators currently in this category)</td>
<td>Measures one facet of a wider issue, or provides a brief overview of the literature in an area where no data sources currently exist. Data quality for isolated facets permits adequate interpretation once the limitations of the datasets have been outlined e.g. The 2006/07 New Zealand Health Survey provides a reasonable snapshot of overweight and obesity amongst New Zealand children at a single point in time. For this isolated snapshot, data quality permits adequate interpretation of the issues covered by this survey</td>
<td>Measures one facet of a wider issue, or provides a brief overview of the literature in an area where no data sources currently exist. Data quality for isolated facets limits appropriate interpretation e.g. In the absence of routine data on the extent of alcohol related harm amongst New Zealand young people, an analysis of hospital admissions with mention of alcohol in any of the first 15 diagnostic codes provides a snapshot of the types of issues presenting to secondary care services. Significant data quality issues however preclude this data being used to make any inferences about trends in alcohol related harm</td>
</tr>
</tbody>
</table>
**APPENDIX 3: THE NATIONAL MINIMUM DATASET**

**Mode of Data Collection**

The National Minimum Dataset (NMDS) is New Zealand’s national hospital discharge data collection and is maintained by the Ministry of Health. The information contained in the dataset has been submitted by public hospitals in a pre-agreed electronic format since 1993. Private hospital discharges for publicly funded events (e.g. births, geriatric care) have been submitted since 1997. The original NMDS was implemented in 1993, with public hospital information back loaded to 1988 [3]. Information contained in the NMDS includes principal and additional diagnoses, procedures, external causes of injury, length of stay and sub-specialty code and demographic information such as age, ethnicity and usual area of residence.

**Dataset Quality and Changes in Coding Over Time**

There are a number of key issues which must be taken into account when interpreting information from the NMDS. Many of these issues arise as a result of regional differences in the way in which data is coded and uploaded to the NMDS. These include:

1. Inconsistencies in the way in which different providers upload day cases to the NMDS, and how this has changed over time.
2. The changeover from the ICD-9 to ICD-10 coding system, and irregularities in the way in which diagnoses and procedures are allocated ICD codes.
3. Changes in the way in which ethnicity information has been collected over time and across regions (Appendix 5).

The following sections discuss the first two of these issues, while the third is discussed in Appendix 5, which reviews the way in which ethnicity information is collected and coded within the health sector.

**1. Inconsistencies in the Uploading of Day-Cases to the NMDS**

One of the key issues with time series analysis using hospital discharge data is the variability with which different providers upload day cases to the NMDS. Day cases are defined as cases that are admitted and discharged on the same day, with the “three hour rule” (treatment time >3 hours) traditionally being utilised to define an admission event. In contrast patients who spend at least one (mid)night in hospital are classified as inpatients irrespective of their length of stay [106].

In the past, there have been significant regional variations in the way in which different providers have uploaded their day cases to the NMDS, leading to problems with both time series analysis and regional comparisons. These inconsistencies have included:

1. During the mid 1990’s, a number of providers began to include A&E events as day cases if the total time in the Emergency Department (including waiting time) exceeded 3 hours, rather than uploading only those whose actual treatment time exceeded 3 hours [106]. NZHIS provided feedback which rectified this anomaly and since January 1995 the correct procedure has been used (these additional cases were coded using medical and surgical sub-specialty codes and are thus difficult to filter out using traditional Emergency sub-specialty filters).

2. Over time, a number of providers have become more efficient at recording the time of first treatment within the Emergency Department (rather than time of attendance) and thus during the late 1990s and early 2000s have become more efficient in identifying emergency department cases which meet the 3-hour treatment rule and are thus eligible to be uploaded to the NMDS. This has resulted in a large number of additional cases being uploaded to the NMDS, particularly in the upper North Island.
3. In addition, some providers admit cases to their short stay observation units while other providers do not, leading to regional variations in the appearance of day cases in the NMDS [107].

Previous Attempts to Address Inconsistent Uploading at the Analytical Stage

When producing their annual Hospital Throughput reports, the Ministry of Health has adopted the following filter to ensure regional and time series comparability with respect to day patient admissions [107]. In its analyses it excludes all cases where:

1. the admission and discharge date are the same (length of stay = 0)
2. and the patient was discharged alive
3. and the health specialty code on discharge is that of Emergency Medicine (M05, M06, M07, and M08).

While this coding filter succeeds in ensuring a degree of comparability between regions and across time (although it fails to correct the anomalies occurring during the mid 1990s when A&E cases were uploaded using medical sub-specialty codes), the exclusion of emergency day cases from time series analysis has a number of limitations including:

1. Exclusion of only those with a length of stay of 0 days means that those emergency cases who begin their treatment late at night and are discharged in the early hours of the following morning (up ¼ of emergency cases have a length of stay of 1 day in some DHBs) are included as genuine hospital admissions, whereas those who begin their treatment early in the morning and are discharged late in the afternoon or the evening of the same day are excluded.

2. With a move towards the development of specialist paediatric emergency departments in larger urban centres (e.g. Auckland), there remains the possibility that some larger DHBs are now seeing and treating a number of acute medical patients within the emergency setting, while in regional centres similar patients continue to be assessed on the paediatric medical ward / assessment unit and thus receive a paediatric medical specialty code. The exclusion of all emergency presentations from time series and sub-regional analysis may thus differentially exclude a large portion of the workload occurring in large urban centres where access to specialist advice and treatment is available within the Emergency Department setting.

The potential impact of inconsistent uploading of day cases to the NMDS is likely to be greatest for those conditions most commonly treated in the emergency department setting. Analysis of 2001–2003 hospital admission data suggests that more than one third of NMDS emergency department discharges for those 0–24 years were due to injury, with another third being due to ambulatory sensitive conditions (e.g. asthma, gastroenteritis, respiratory infections). In contrast, only 2% of those presenting with bacterial meningitis and 4% of those with septic arthritis were discharged with an emergency sub-specialty code.

Further sub-analysis of these two admission categories however demonstrated that inclusion / exclusion of emergency department admissions had quite different effects depending on the category of admission under study (injury vs. ambulatory sensitive admissions) and whether the region had access to a specialist Paediatric Emergency Department. In this analysis the Wider Auckland Region, (comprising one third of the NZ population and whose residents have access to specialist Paediatric Emergency Departments) was compared to the rest of NZ. For ambulatory sensitive admissions, exclusion of emergency department cases resulted in Auckland’s admission rates being consistently lower than in the rest of New Zealand. It was only when emergency cases were included in this analysis that Auckland’s admission rates began to approximate those of the rest of NZ. In contrast for injuries, inclusion of emergency department cases resulted in hospital admissions in the Auckland Region consistently exceeding the rest of New Zealand. It was only when emergency cases were excluded from the analysis that Auckland’s injury admission rates began to approximate those of the rest of NZ. (These
Appendices and References

findings occurred despite Auckland having a similar proportion of children living in the most deprived NZDep small areas as the rest of NZ).

Loosely interpreted, the findings of this analysis suggest that the workload of large specialist paediatric emergency departments must not be discounted when examining trends in ambulatory sensitive or other medical admissions, as it is only when emergency cases are included in the analysis that the admission rates of the Wider Auckland Region (with its access to Specialist Paediatric Emergency care) begin to approximate the rest of NZ. In contrast, it is possible that specialist paediatric emergency departments have much less of an influence on admission thresholds for injury, with these being handled in a similar manner by different emergency departments across the country. Thus for injury data, the greater tendency for some emergency departments to upload their cases to the NMDS must be taken into account in any analysis.

Implications for Interpreting Time Series Analyses in This Report
Throughout this report, analysis of time series and other information has been undertaken using unfiltered hospital admission data, with the exception of the injury and poisoning sections. Here emergency department discharges have been filtered out of the dataset, in an attempt to address some of the inconsistencies discussed above. Despite such an approach, there remains the potential for the inconsistent uploading of day cases to significantly influence the time series analyses presented in this report. In particular, such practices may lead to an overestimate of the number of medical admissions commonly treated in the emergency department setting (e.g. asthma, skin infections, respiratory tract infections), while at the same time the filtering out of injury/poisoning emergency cases may lead to undercounting for a number of more minor types of injury. Nevertheless, the filtering process utilised in this report are thought to provide the best balance when considering hospital admissions amongst those 0–24 years. Despite this, the reader must bear in mind that a potential for significant residual bias remains, when interpreting the time series analyses presented in this report.

2. Data Quality and Coding Changes over Time (ICD-9 and ICD-10)

Changeover from ICD-9 to ICD-10 Coding
From 1988 until June 1999, clinical information in the NMDS was coded using versions of the ICD-9 classification system (ICD-9 CM until June 1995, then ICD-9-CM-A until June 1999). From July 1999 onwards, the ICD-10-AM classification system has been used, although for time series analysis, back and forward mapping between the two classification systems is possible using pre-defined algorithms [3].

The introduction of ICD-10-AM represents the most significant change in the International Classification of Diseases (ICD) in over 50 years and uses an alphanumeric coding system for diseases in which the first character of the code is always a letter followed by several numbers. This has allowed for the expansion of the number of codes to provide for recently recognised conditions and to provide greater specificity about common diseases (there are about 8,000 categories in ICD-10-AM as compared to 5,000 in ICD-9). While for most conditions there is a reasonable one-to-one correspondence between ICD-9 and ICD-10 codes, for some this may lead to some irregularities in time series analysis [108]. Where possible such irregularities will be highlighted in the text, although care should still be taken when interpreting time series analysis across the 1999–2000 period as some conditions may not be directly comparable between the two coding systems.

Accuracy of ICD Coding
In recent years the Ministry of Health has undertaken a number of reviews of the quality of ICD coding in the NMDS. In the latest audit 2708 events were audited over 10 sites during a 3 month period during 2001/2002. Overall the audit found that 22% of events required a change in coding, although this also included changes at the fourth and fifth character level. The average ICD code change was 16%, with changes to the principal diagnosis being 11%, to additional diagnoses being 23% and to procedure coding being 11%. There were 1625 external causes of injury codes, of which 15% were re-coded differently [109]. These findings were similar to an audit undertaken a year previously.
While the potential for such coding errors must be taken into consideration when interpreting the findings of this report, it may be that the 16% error rate is an overestimate, as in the majority of the analyses undertaken in this report, only the principal diagnosis (with an error rate of 11%) is used to describe the reason for admission. In addition, for most admissions the diagnostic category (e.g. lower respiratory tract infections) is assigned using information at the 3 digit level (with the 16% error rate also including issues with coding at the 4th or 5th digit level).

3. Ethnicity Information in the NMDS
The reader is referred to Appendix 5 for a discussion of this issue.

Conclusion
In general the inconsistencies outlined above tend to make time series and (regional) comparative analyses based on the NMDS less reliable than those based on Mortality or Birth Registration data (where legislation dictates inclusion criteria and the type of information collected). While hospital discharge data still remains a valuable and reasonably reliable proxy for measuring the health outcomes of children and young people in this country, the reader is cautioned to take into consideration the biases discussed above, when interpreting the findings outlined in this report.
APPENDIX 4: NATIONAL MORTALITY COLLECTION

Mode of Data Collection

The National Mortality Collection is a dataset managed by the Ministry of Health, which contains information on the underlying cause(s) of death, as well as basic demographic data, for all deaths registered in New Zealand since 1988. Fetal and Infant data is a subset of the Mortality Collection, with cases in this subset having additional information on factors such as birth weight and gestational age [110].

Each month Births, Deaths and Marriages send the Ministry of Health electronic death registration information, Medical Certificates of Cause of Death, and Coroner’s reports. Additional information on the cause of death is obtained from the National Minimum Dataset (NMDS), private hospital discharge returns, the NZ Cancer Registry (NZCR), the Department of Courts, the Police, the Land Transport Authority, Water Safety NZ, Media Search and from writing letters to certifying doctors, coroners and medical records officers in public hospitals. Using information from these data sources, an underlying cause of death (ICD-10-AM) is assigned by Ministry of Health staff using the World Health Organisation’s rules and guidelines for mortality coding [110].

Data Quality Issues Relating to the National Mortality Collection

Unlike the NMDS, where information on the principal diagnosis is coded at the hospital level and then forwarded electronically to the Ministry of Health, in the National Mortality Collection each of the approximately 28,000 deaths occurring in New Zealand each year is coded manually by Ministry of Health staff. For most deaths the Medical Certificate of Cause of Death provides the information required, although coders also have access to the information contained in the NMDS, NZ Cancer Registry, LSTA, Police, Water Safety NZ and ESR [111]. As a consequence, while coding is still reliant on the accuracy of the death certificate and other supporting information, there remains the capacity for a uniform approach to the coding which is not possible for hospital admission data.

While there are few published accounts of the quality of coding information contained in the National Mortality Collection, the dataset lacks some of the inconsistencies associated with the NMDS, as the process of death registration is mandated by law and there are few ambiguities as to the inclusion of cases over time. As a consequence, time series analyses derived from this dataset are likely to be more reliable than that provided by the NMDS. One issue that may affect the quality of information derived from this dataset however is the collection of ethnicity data, which is discussed in more detail in Appendix 5 of this report.
**APPENDIX 5: THE MEASUREMENT OF ETHNICITY**

The majority of rates calculated in this report rely on the division of numerators (e.g. hospital admissions, mortality data) by Statistics New Zealand Estimated Resident Population denominators. Calculation of accurate ethnic specific rates relies on the assumption that information on ethnicity is collected in a similar manner in both the numerator and the denominator, and that a single child will be identified similarly in each dataset. In New Zealand this has not always been the case, and in addition the manner of collecting information on ethnicity has varied significantly over time. Since 1996 however, there has been a move to ensure that ethnicity information is collected in a similar manner across all administrative datasets in New Zealand (Census, Hospital Admission, Mortality, Births). The following section briefly reviews how information on ethnicity has been collected in national data collections since the early 1980s and the implications of this for the information contained in this report. For a more detailed review of these issues see [http://www.ethnicity.Māori.nz/](http://www.ethnicity.Māori.nz/)

### 1981 Census and Health Sector Definitions

Earlier definitions of ethnicity in official statistics relied on the concept of fractions of descent, with the 1981 census asking people to decide whether they were fully of one ethnic origin (e.g. Full Pacific, Full Māori) or of more than one origin, what fraction of that ethnic group they identified with (e.g. 7/8 Pacific + 1/8 Māori). When prioritisation was required, those with >50% of Pacific or Māori blood were deemed to meet the ethnic group criteria of the time [112]. A similar approach was used to recording ethnicity in health sector statistics, with birth and death registration forms asking the degree of Pacific or Māori blood of the parents of a newborn baby / the deceased individual. For hospital admissions, ancestry based definitions were also used during the early 1980s, with admission officers often assuming ethnicity, or leaving the question blank [113].

### 1986 Census and Health Sector Definitions

Following a review expressing concern at the relevance of basing ethnicity on fractions of descent, a recommendation was made to move towards self-identified cultural affiliation. Thus the 1986 Census asked the question “What is your ethnic origin?” and people were asked to tick the box or boxes that applied to them. Birth and death registration forms however, continued to use the “fractions of blood” question until 1995, making comparable numerator and denominator data difficult to obtain [112]. For hospital admissions, the move from an ancestry based to a self-identified definition of ethnicity began in the mid-80s, although non-standard forms were used and typically allowed a single ethnicity only [113].

### 1991 Census and Health Sector Definitions

A review suggested that the 1986 ethnicity question was unclear as to whether it was measuring ancestry or cultural affiliation, so the 1991 Census asked two questions:

1. Which ethnic group do you belong to? (tick the box or boxes which apply to you)
2. Have you any NZ Māori ancestry? (if yes, what iwi do you belong to?)

As indicated above however, birth and death registrations continued with ancestry based definitions of ethnicity during this period, while a number of hospitals were beginning to use self-identified definitions in a non standard manner [113].

### 1996 Census and Health Sector Definitions

While the concepts and definitions remained the same as for the 1991 census, the ethnicity question in the 1996 Census differed in that:

- The NZ Māori category was moved to the top of the ethnic categories
- The 1996 question made it more explicit that people could tick more than one box
There was a new “Other European” category with six subgroups. As a result of these changes, there was a large increase in the number of multiple responses, as well as an increase in the Māori ethnic group in the 1996 Census [112]. Within the health sector however, there were much larger changes in the way in which ethnicity information was collected. From late 1995, birth and death registration forms incorporated a new ethnicity question identical to that in the 1996 Census, allowing for an expansion of the number of ethnic groups counted (previously only Māori and Pacific) and resulting in a large increase in the proportion of Pacific and Māori births and deaths. From July 1996 onwards, all hospitals were also required to inquire about ethnicity in a standardised way, with a question that was compatible with the 1996 Census and that allowed multiple ethnic affiliations [113]. A random audit of hospital admission forms conducted by Statistics NZ in 1999 however, indicated that the standard ethnicity question had not yet been implemented by many hospitals. In addition, an assessment of hospital admissions by ethnicity over time showed no large increases in the proportions of Māori and Pacific admissions after the 1996 “changeover”, as had occurred for birth and death statistics, potentially suggesting that the change to a standard form allowing for multiple ethnic affiliations in fact did not occur. Similarities in the number of people reporting a “sole” ethnic group pre and post 1996 also suggest that the way in which information on multiple ethnic affiliations was collected did not change either. Thus while the quality of information available since 1996 has been much better than that previously, there remains some concern that hospitals continue to undercount multiple ethnic identifications and as a result, may continue to undercount Pacific and Māori peoples [113].

2001 Census and Health Sector Definitions

The 2001 Census reverted back to the wording used in the 1991 Census after a review showed that this question provided a better measure of ethnicity based on the current statistical standard [112]. The health sector also continued to use self-identified definitions of ethnicity during this period, with the Ethnicity Data Protocols for the Health and Disability Sector providing guidelines which ensured that the information collected across the sector was consistent with the wording of the 2001 Census (i.e. Which ethnic groups do you belong to (Mark the space or spaces that apply to you)?)

2006 Census and Health Sector Definitions

In 2004, the Ministry of Health released the Ethnicity Data Protocols for the Health and Disability Sector [114], with these protocols being seen as a significant step forward in terms of standardising the collection and reporting of ethnicity data in the health sector [115]. The protocols stipulated that the standard ethnicity question for the health sector was the 2001 Census ethnicity question, with respondents being required to identify their own ethnicity, and with data collectors being unable to assign this on respondent’s behalf, or to transfer this information from another form. The protocols also stipulated that ethnicity data needed to be recorded to a minimum specificity of Level 2 (see below) with systems needing to be able to store, at minimum, three ethnicities, and to utilise standardised prioritisation algorithms, if more than three ethnic groups were reported. In terms of outputs, either: sole / combination, total response, or prioritised ethnicity needed to be reported, with the methods used being clearly described in any report [114].

The following year, Statistics New Zealand’s Review of the Measurement of Ethnicity (RME), culminated in the release of the Statistical Standard for Ethnicity 2005 [116], which recommended that:

1. The 2006 Census ethnicity question use identical wording to the 2001 Census.
2. Within the “Other” ethnic group, that a new category be created, for those identifying as “New Zealander” or “Kiwi”. In previous years these responses had been assigned to the European ethnic group.
3. All collections of official statistics measuring ethnicity have the capacity to record and report six ethnicity responses per individual, or at a minimum, three responses when six could not be implemented immediately.
4. The practice of prioritising ethnicity to one ethnic group should be discontinued.
At the 2006 Census however, a total of 429,429 individuals (11.1% of the NZ population) identified themselves as a New Zealander, with further analysis suggesting that 90% of the increase in those identifying as New Zealanders in 2006, had arisen from those identifying as New Zealand European at the 2001 Census [117]. In 2009 Statistics NZ amended the Standard to reflect these issues [118] with the current recommendation being that future Censuses retain the current ethnicity question (i.e. that New Zealander tick boxes not be introduced) but that alongside the current standard outputs, where New Zealander responses are assigned to the Other ethnicity category, that an alternate classification be introduced, which combines the European and New Zealander ethnic groups into a single European and Other Ethnicity category for use in time series analysis (with those identifying as both European and New Zealanders being counted only once in this combined ethnic group [118].

The Current Recording of Ethnicity in New Zealand’s National Datasets

In New Zealand’s national health collections (e.g. National Minimum Dataset and Mortality Collection, NZ Cancer Registry), up to 3 ethnic groups per person are stored electronically for each event, with data being coded to Level 2 of Statistics New Zealand’s 4 Level Hierarchical Ethnicity Classification System [3]. In this Classification System increasing detail is provided at each level. For example [114]:

- Level 1 (least detailed level) e.g. code 1 is European
- Level 2 e.g. code 12 is Other European
- Level 3 e.g. code 121 is British and Irish
- Level 4 (most detailed level) e.g. code 12111 is Celtic

Māori however, are identified similarly at each level (e.g. Level 1: code 2 is Māori... vs Level 4: code 21111 is Māori), meaning the the restriction of data to Level 2 coding does not impact adversely on the level of detail available for e.g. Māori vs. non-Māori analyses.

For those reporting more than 3 ethnic affiliations, the ethnic groups recorded are prioritised (again at Level 2), with Māori ethnicity taking precedence over Pacific > Asian > Other > European ethnic groups (for further details on the prioritisation algorithms used see [114]. In reality however, less than 0.5% of responses in the National Health Index database have three ethnicities recorded, and thus it is likely that this prioritisation process has limited impact on ethnic specific analyses [114].

Ethnicity Classifications Utilised in this Report and Implications for Interpretation of Results.

Because of inconsistencies in the manner in which ethnicity information was collected prior to 1996, all ethnic specific analysis presented in this report are for the 1996 year onwards, and thus reflect self-identified concepts of ethnicity. Unless otherwise specified, total response ethnicity has been used to identify Māori children and young people (i.e. those identifying as Māori in any of their first three ethnic groups). Non-Māori non-Pacific children and young people are those who did not identify as either Māori or Pacific in any of their first three ethnic groups, with this reference group being selected by the Advisory Group, on the basis that as a group, these children and young people had the lowest documented exposures to health disparities.

Undercounting of Māori in National Health Collections

Despite significant improvements in the quality of ethnicity data in New Zealand’s national health collections since 1996, care must still be taken when interpreting the ethnic specific rates presented in this report, as the potential still remains for Māori children and young people to be undercounted in our national data collections. In a review that linked hospital admission data to other datasets with more reliable ethnicity information (e.g. death registrations and Housing NZ Corporation Tenant data), the authors of Hauora IV [4] found that on average, hospital admission data during 2000–2004 undercounted Māori children (0–14 years) by around 6%, and Māori young people by around 5–6%. For cancer registrations, the undercount was in the order of 1–2% for the same age groups. While the authors of Hauora IV developed a set of adjusters which could be used to minimise the
bias such undercounting introduced when calculating population rates and rate ratios, these (or similar) adjusters were not utilised in this report for the following reasons:

1. Previous research has shown that ethnicity misclassification can change over time, and thus adjusters developed for one period may not be applicable to other periods [119].

2. Research also suggests that ethnic misclassification may vary significantly by DHB [119], and thus that adjusters developed using national level data (as in Hauora IV) may not be applicable to DHB level analyses, with separate adjusters needing to be developed for each DHB.

Further, as the development of adjusters requires the linkage of the dataset under review with another dataset, for which more reliable ethnicity information is available, and as this process is resource intensive, and not without error (particularly if the methodology requires probabilistic linkage of de-identified data) the development of a customised set of period and age specific adjusters was seen as being beyond the scope of the current project. The reader is thus urged to bear in mind that the data presented in this report may undercount Māori to a variable extent (depending on the dataset used) and that in the case of the hospital admission dataset, this undercount may be as high as 5–6%.
The NZ Deprivation Index (NZDep) is a small area index of deprivation, which has been used as a proxy for socioeconomic status in this report. The main concept underpinning small area indices of deprivation is that the socioeconomic environment in which a person lives can confer risks / benefits which may be independent of their own social position within a community [120]. They are thus aggregate measures, providing information about the wider socioeconomic environment in which a person lives, rather than about their individual socioeconomic status.

The NZDep was first created using information from the 1991 census, but has since been updated following each census. The NZDep2006 combines 9 variables from the 2006 census which reflect 8 dimensions of deprivation (Table 39). Each variable represents a standardised proportion of people living in an area who lack a defined material or social resource (e.g. access to a car, income below a particular threshold), with all 9 variables being combined to give a score representing the average degree of deprivation experienced by people in that area. While the NZDep provides deprivation scores at meshblock level (Statistics NZ areas containing approx 90 people), for the purposes of mapping to national datasets, these are aggregated to Census Area Unit level (≈1,000–2,000 people). Individual area scores are then ranked and placed on an ordinal scale from 1 to 10, with decile 1 reflecting the least deprived 10% of small areas and decile 10 reflecting the most deprived 10% of small areas [121].

Table 39. Variables used in the NZDep2006 Index of Deprivation [122]

<table>
<thead>
<tr>
<th>No</th>
<th>Factor</th>
<th>Variable in Order of Decreasing Weight in the Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Income</td>
<td>People aged 18–64 receiving means tested benefit</td>
</tr>
<tr>
<td>2</td>
<td>Employment</td>
<td>People aged 18–64 unemployed</td>
</tr>
<tr>
<td>3</td>
<td>Income</td>
<td>People living in households with income below an income threshold</td>
</tr>
<tr>
<td>4</td>
<td>Communication</td>
<td>People with no access to a telephone</td>
</tr>
<tr>
<td>5</td>
<td>Transport</td>
<td>People with no access to a car</td>
</tr>
<tr>
<td>6</td>
<td>Support</td>
<td>People aged &lt;65 living in a single parent family</td>
</tr>
<tr>
<td>7</td>
<td>Qualifications</td>
<td>People aged 18–64 without any qualifications</td>
</tr>
<tr>
<td>8</td>
<td>Owned Home</td>
<td>People not living in own home</td>
</tr>
<tr>
<td>9</td>
<td>Living Space</td>
<td>People living in households below a bedroom occupancy threshold</td>
</tr>
</tbody>
</table>

The advantage of NZDep is its ability to assign measures of socioeconomic status to the elderly, the unemployed and to children (where income and occupational measures often don’t apply), as well as to provide proxy measures of socioeconomic status for large datasets when other demographic information is lacking. Small area indices have limitations however, as not all individuals in a particular area are accurately represented by their area’s aggregate score. While this may be less of a problem for very affluent or very deprived neighbourhoods, in average areas, aggregate measures may be much less predictive of individual socioeconomic status [120]. Despite these limitations, the NZDep has been shown to be predictive of mortality and morbidity from a number of diseases in New Zealand.

Note: As New Zealand’s national datasets have traditionally continued to use the previous Census’ domicile codes for 1–2 years after any new Census, all of the numerators (e.g. numbers of hospital admissions, deaths) and denominators in this report have been mapped to NZDep2001.
### APPENDIX 7: CONGENITAL ANOMALY CODES

Table 40. ICD-10-AM Congenital Anomaly Coding Used in this Report (Table 1 of 2)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q00</td>
<td>Anencephaly</td>
</tr>
<tr>
<td>Q01</td>
<td>Encephalocele</td>
</tr>
<tr>
<td>Q02</td>
<td>Microcephaly</td>
</tr>
<tr>
<td>Q03</td>
<td>Congenital Hydrocephalus</td>
</tr>
<tr>
<td>Q04</td>
<td>Other Brain Malformations</td>
</tr>
<tr>
<td>Q05</td>
<td>Spina Bifida</td>
</tr>
<tr>
<td>Q06</td>
<td>Other Spinal Cord Malformations</td>
</tr>
<tr>
<td>Q07</td>
<td>Other CNS Malformations</td>
</tr>
<tr>
<td>Q10</td>
<td>Eyelid / Lacrimal / Eye / Orbit Malformations</td>
</tr>
<tr>
<td>Q16</td>
<td>Ear Malformations Impairing Hearing</td>
</tr>
<tr>
<td>Q170</td>
<td>Accessory Auricle</td>
</tr>
<tr>
<td>Q171–Q175</td>
<td>Other Ear Malformations</td>
</tr>
<tr>
<td>Q178–Q179</td>
<td>Other Ear Malformations</td>
</tr>
<tr>
<td>Q18</td>
<td>Other Face / Neck Malformations</td>
</tr>
<tr>
<td>Q20</td>
<td>Malformations Cardiac Chambers / Connections</td>
</tr>
<tr>
<td>Q210</td>
<td>Ventricular Septal Defect</td>
</tr>
<tr>
<td>Q211</td>
<td>Atrial Septal Defect</td>
</tr>
<tr>
<td>Q212</td>
<td>Atrioventricular Septal Defect</td>
</tr>
<tr>
<td>Q213</td>
<td>Tetralogy of Fallot</td>
</tr>
<tr>
<td>Q214, Q218–Q219</td>
<td>Other Cardiac Septal Malformations</td>
</tr>
<tr>
<td>Q22</td>
<td>Pulmonary / Tricuspid Valve Malformations</td>
</tr>
<tr>
<td>Q23</td>
<td>Aortic / Mitral Valve Malformations</td>
</tr>
<tr>
<td>Q24</td>
<td>Other Heart Malformations</td>
</tr>
<tr>
<td>Q250</td>
<td>Patent Ductus Arteriosus</td>
</tr>
<tr>
<td>Q251–Q259</td>
<td>Malformations Great Arteries Excluding PDA</td>
</tr>
<tr>
<td>Q26</td>
<td>Malformations Great Veins</td>
</tr>
<tr>
<td>Q27</td>
<td>Other Peripheral Vascular Malformations</td>
</tr>
<tr>
<td>Q28</td>
<td>Other Circulatory Malformations</td>
</tr>
<tr>
<td>Q30</td>
<td>Nose Malformations</td>
</tr>
<tr>
<td>Q31</td>
<td>Larynx Malformations</td>
</tr>
<tr>
<td>Q32</td>
<td>Trachea / Bronchus Malformations</td>
</tr>
<tr>
<td>Q33</td>
<td>Lung Malformations</td>
</tr>
<tr>
<td>Q34</td>
<td>Other Respiratory Malformations</td>
</tr>
<tr>
<td>Q35–Q37</td>
<td>Cleft Lip and Cleft Palate</td>
</tr>
<tr>
<td>Q35</td>
<td>Cleft Palate</td>
</tr>
<tr>
<td>Q36</td>
<td>Cleft Lip</td>
</tr>
<tr>
<td>Q37</td>
<td>Cleft Palate and Lip</td>
</tr>
</tbody>
</table>
Table 41. ICD-10-AM Congenital Anomaly Coding Used in this Report (Table 2 of 2)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q381</td>
<td>Ankyloglossia Tongue Tie</td>
</tr>
<tr>
<td>Q380,Q382–Q388</td>
<td>Tongue / Mouth / Pharynx Malformations</td>
</tr>
<tr>
<td>Q39–Q40</td>
<td>Oesophagus / Upper Alimentary Malformations</td>
</tr>
<tr>
<td>Q41–Q43</td>
<td>Intestinal Malformations</td>
</tr>
<tr>
<td>Q44–Q45</td>
<td>Other Digestive Malformations</td>
</tr>
<tr>
<td>Q50–Q56</td>
<td>Malformations of Genital Organs</td>
</tr>
<tr>
<td>Q50–Q52</td>
<td>Female Genital Malformations</td>
</tr>
<tr>
<td>Q53</td>
<td>Undescended Testicle</td>
</tr>
<tr>
<td>Q54</td>
<td>Hypospadius</td>
</tr>
<tr>
<td>Q55</td>
<td>Other Male Genital Malformations</td>
</tr>
<tr>
<td>Q56</td>
<td>Indeterminate Sex / Pseudohermaphrodism</td>
</tr>
<tr>
<td>Q60–Q64</td>
<td>Malformations of Urinary System</td>
</tr>
<tr>
<td>Q60</td>
<td>Renal Agenesis / Reduction Defects</td>
</tr>
<tr>
<td>Q61</td>
<td>Cystic Kidney Disease</td>
</tr>
<tr>
<td>Q62</td>
<td>Renal Pelvis Obstruction / Ureter Malformations</td>
</tr>
<tr>
<td>Q63–Q64</td>
<td>Other Kidney / Urinary Malformations</td>
</tr>
<tr>
<td>Q65–Q69</td>
<td>Malformations of Musculoskeletal System</td>
</tr>
<tr>
<td>Q65–Q652</td>
<td>Congenital Dislocation Hip</td>
</tr>
<tr>
<td>Q653–Q655</td>
<td>Congenital Subluxation Hip</td>
</tr>
<tr>
<td>Q656,Q658–Q659</td>
<td>Other Deformities Hip</td>
</tr>
<tr>
<td>Q66</td>
<td>Foot Deformities</td>
</tr>
<tr>
<td>Q67–Q68, Q79</td>
<td>Other Musculoskeletal Malformations</td>
</tr>
<tr>
<td>Q69</td>
<td>Polydactyly</td>
</tr>
<tr>
<td>Q70</td>
<td>Syndactyly</td>
</tr>
<tr>
<td>Q71–Q74</td>
<td>Reduction Defects / Other Limb Malformations</td>
</tr>
<tr>
<td>Q75–Q76</td>
<td>Skull / Facial Bones / Spine / Thorax Malformations</td>
</tr>
<tr>
<td>Q77–Q78</td>
<td>Osteochondrodysplasia</td>
</tr>
<tr>
<td>Q80–Q89</td>
<td>Other Congenital Malformations</td>
</tr>
<tr>
<td>Q80</td>
<td>Ichthyosis</td>
</tr>
<tr>
<td>Q81</td>
<td>Epidermolysis Bullosa</td>
</tr>
<tr>
<td>Q825</td>
<td>Non-Neoplastic Naevus</td>
</tr>
<tr>
<td>Q820–Q824, Q826–Q829</td>
<td>Other Skin Malformations</td>
</tr>
<tr>
<td>Q83</td>
<td>Breast Malformations</td>
</tr>
<tr>
<td>Q84</td>
<td>Other Integument Malformations</td>
</tr>
<tr>
<td>Q85–Q87, Q89</td>
<td>Other Malformations</td>
</tr>
<tr>
<td>Q90–Q99</td>
<td>Chromosomal Abnormalities</td>
</tr>
<tr>
<td>Q90</td>
<td>Down Syndrome</td>
</tr>
<tr>
<td>Q91</td>
<td>Edwards and Patau Syndromes</td>
</tr>
<tr>
<td>Q92</td>
<td>Other Autosomal Trisomies</td>
</tr>
<tr>
<td>Q93,Q95</td>
<td>Monosomies and Autosomal Deletions / Other Rearrangements</td>
</tr>
<tr>
<td>Q96</td>
<td>Turners Syndrome</td>
</tr>
<tr>
<td>Q97</td>
<td>Other Sex Chromosome Anomalies Female Phenotype</td>
</tr>
<tr>
<td>Q98</td>
<td>Sex Chromosome Anomalies Male Phenotype</td>
</tr>
<tr>
<td>Q99</td>
<td>Other Chromosome Anomalies</td>
</tr>
</tbody>
</table>
APPENDIX 8: METHODS USED TO DEVELOP THE CHILDREN’S SOCIAL HEALTH MONITOR

Introduction

In response to deteriorating economic conditions in New Zealand and Australia in the late 2000s, a Working Group of health professionals from a range of organisations with an interest in child health was formed in early 2009. Over the course of the year, this Working Group discussed the conceptualisation of an indicator set to monitor the impact of the recession on child wellbeing, the types of indicators which might be included, and the criteria by which individual indicators should be selected. As a result of these discussions, it was proposed that a Children’s Social Health Monitor be developed, which comprised the following:

1. *A Basket of Indicators to Monitor Prevailing Economic Conditions*: Ideally, indicators would capture different facets of economic wellbeing. For example, in a recession several quarters of negative growth (*GDP*) may precede upswings in *Unemployment Rates*, which in turn will influence the number of *Children Reliant on Benefit Recipients*.

2. *A Basket of Indicators to Monitor Children’s Wellbeing*: Ideally indicators would respond relatively quickly (e.g. months to small number of years) to family’s adaptations to deteriorating economic conditions (e.g. hospitalisations for poverty related conditions) and would provide an overview of family wellbeing from a variety of different perspectives.

Indicator Selection Criteria

In selecting these indicators, it was decided that only routinely collected data sources which were of good quality, and which provided complete population coverage would be used, in order to ensure the indicator set was methodologically robust and could be consistently monitored over time. In order to achieve this aim, the Working Group developed a set of selection criteria, against which candidate indicators were scored. These selection criteria included:

**Conceptual Criteria**

*Criteria for Indicators to Monitor Prevailing Macroeconomic Conditions*

1. Internationally recognised and reported measure of economic performance / wellbeing

2. Should impact on at least one facet of children’s wellbeing (i.e. the pathway(s) via which it impacts on children’s wellbeing should be relatively well understood, or an association between the indicator and wellbeing documented in the literature).

3. Likely to change in response to a recession (i.e. months to small number of years)

*Criteria for Indicators to Monitor Children’s Health and Wellbeing*

1. The condition is likely to be influenced by family’s physical adaptations to worsening economic conditions (e.g. saving on heating to pay for food, moving in with family to save on rent).

2. The condition is likely to be influenced by family’s psychological adaptations to worsening economic conditions (e.g. increased family conflict in response to financial stress).

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7 The Paediatric Society of New Zealand, the Population Child Health Special Interest Group of the Royal Australasian College of Physicians, the New Zealand Child and Youth Epidemiology Service, TAHA (the Well Pacific Mother and Infant Service), the Māori SIDS Programme, the Kia Mataara Well Child Consortium, the New Zealand Council of Christian Social Services, and academics from the Universities of Auckland and Otago
3. The condition exhibits a socioeconomic gradient (e.g. rates are higher in more deprived areas)

4. The condition is likely to respond to changing economic conditions in the short to medium term (e.g. months to 1–2 years)

**Data Quality Criteria**

**Data Quality Criteria (for either of the above indicator categories)**

1. Needs to be routinely collected
2. Available at the national level (i.e. complete coverage of target population)
3. Updated at least annually (although quarterly preferable)
4. Availability of consistent time series data going back several years (i.e. standard and stable method of data collection)
5. Distribution can be broken down by e.g. ethnicity, socioeconomic status, region

**Selection of the Baseline Indicator Set**

In mid-2009 a long list of candidate indicators (selected by means of a scan of the available literature, email consultation with child health networks, and the suggestions of Working Group members) were then scored against each of these criteria by Working Group members and other health professionals (n=20). Those scoring the indicators were also asked to select a Top 5 Economic and Top 5 Health and Wellbeing Indicators for inclusion in the Children’s Social Health Monitor. The resulting Top 5 Economic and Wellbeing indicators (as determined both by criteria scoring and priority ranking) were:

**Economic Indicators:**
- Gross Domestic Product
- Income Inequality
- Child Poverty
- Unemployment Rates
- The Number of Children Reliant on Benefit Recipients

**Child Health and Wellbeing Indicators:**
- Hospital Admissions with a Social Gradient
- Mortality with a Social Gradient
- Infant Mortality
- Hospital Admissions and Mortality from Non-Accidental Injury
- Ambulatory Sensitive Hospital Admissions

**Methodology for Developing the Hospital Admissions and Mortality with a Social Gradient Indicator**

While all of the Top 5 Economic Indicators, and a number of the Child Health and Wellbeing indicators already had established methodologies, the hospital admissions and mortality with a social gradient indicator had to be developed specifically for the Children’s Social Health Monitor. The methodology used to develop this indicator is outlined below:

**Hospital Admissions**

In considering which conditions should be included in the analysis of hospital admissions with a social gradient, the 40 most frequent causes of hospital admission in children aged 0–14 years (excluding neonates) were reviewed, and those exhibiting a social gradient (a rate ratio of ≥1.8 for NZDep Decile 9–10 vs. Decile 1–2; or for Māori, Pacific or Asian vs. European children) were selected. A small number of conditions with rate ratios in the 1.5–1.8 range were also included if they demonstrated a consistent social gradient (i.e. rates increased in a stepwise manner with increasing NZDep deprivation) and the association
was biologically plausible (the plausibility of the association was debated by Working Group members).

**Inclusion and Exclusion Criteria**

Neonatal hospital admissions (<29 days) were excluded on the basis that these admissions are more likely to reflect issues arising prior to / at the time of birth (e.g. preterm infants may register multiple admissions as they transition from intensive care (NICU) → special care nurseries (SCBU) → the postnatal ward), and respiratory infections / other medical conditions arising in these contexts are likely to differ in their aetiology from those arising in the community.

For medical conditions, only acute and arranged hospital admissions were included, as Waiting List admissions are likely to reflect service capacity, rather than the burden of health need. For example, the inclusion of Waiting List admissions would result in a large number of children with otitis media and chronic tonsillitis (who were being admitted for grommets and tonsillectomies) being included, and the demographic profile of these children may be very different from children attending hospital acutely for the same conditions.

For injury admissions, filtering by admission type was not possible, as a number of DHBs admitted injury cases under (now discontinued) ACC admission codes, making it difficult to distinguish between acute and waiting list admissions in this context. As with other NZCYES reports, all injury cases with an Emergency Department Specialty Code (M05–M08) on discharge were excluded as a result of inconsistent uploading of Emergency Department cases across DHBs (see Appendix 3 for further detail). This differential filtering however means that it is not possible to accurately compare the magnitude of the social gradients between the medical condition and injury categories, as they were derived using different methodologies (and social differences in Emergency Department vs. primary care attendances for minor medical conditions may have accounted for some of the social gradients seen). No such differential filtering occurred for mortality data however (see below), and thus the magnitude of the social differences seen in this context is more readily comparable.

**Mortality**

In the case of mortality, because in many instances, the number of deaths from a particular condition was insufficient to calculate reliable rate ratios by NZDep and ethnicity, the rate ratios derived from the analysis of hospital admission data were used to denote category membership. The most frequent causes of mortality in those 0–14 years (excluding neonates) were reviewed however, in order to ensure that no additional conditions making a large contribution to mortality had been missed by the analysis of hospital admission data. This identified two further conditions (which by analysis of mortality data met rate ratio criteria): deaths from drowning and Sudden Unexpected Death in Infancy, which were then included in the coding algorithms (for both hospital admissions and mortality data). A number of deaths were also identified which were attributed to issues arising in the perinatal period (e.g. extreme prematurity, congenital anomalies). However, in order to preserve consistency with previous exclusion criteria (i.e. the exclusion of conditions arising in the perinatal period) these perinatal deaths were not included in coding algorithms.

**In Conclusion**

While it is hoped that over time this indicator set will be expanded and further refined, it is intended that the NZ Child and Youth Epidemiology Service will monitor this core minimum indicator set on an annual basis, until the economic position of New Zealand children improves appreciably.
REFERENCES


51. National Screening Unit. 2010. Guidelines for practitioners providing services within the Newborn Metabolic Screening Programme in New Zealand February 2010. Wellington: National Screening Unit
55. National Screening Unit. 2009. Guidelines for maternity providers offering antenatal screening for Down syndrome and other conditions in New Zealand. Wellington: National Screening Unit


