

The Health Status
of
Children and Young People
in
Canterbury



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The Health Status of Children and Young People in Canterbury 2006



Report prepared for Canterbury DHB

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This Report was produced as a result of a contract with UniServices Auckland on behalf of the NZ Child and Youth Epidemiology Service. While every endeavour has been made to use accurate data in this Report, there are currently some variations in the way data is collected from District Health Boards and other agencies that may result in errors, omissions and inaccuracies in the information contained in this Report. Auckland UniServices does not accept liability for any inaccuracies arising from the use of this data in the production of these reports, or for any losses arising as a consequence thereof.

Our native fern has become a powerful symbol which all New Zealanders can identify with. By taking a step back and viewing its foundations you can see that it is supported by an entire network or whānau. All play a crucial part, from the babies and children to the teenagers and young adults. As you will notice there are strong healthy stems surrounding the base, symbolic of the adults, not seen but very much a part of the structure. They give a sense of direction and purpose as they protect the young. Nature has a gentle way of showing us all what is fundamental to its survival. It is nourished by its past, protected by the present and looks forward to the future.

Tania Milne 2005

TABLE OF CONTENTS

Table of Contents	3
List of Figures	5
List of Tables.....	9
Introduction & Executive Summary	13
SECTION 1. THE POTENTIAL INFLUENCE OF REGIONAL DEMOGRAPHY ON CHILD & YOUTH HEALTH OUTCOMES IN CANTERBURY	25
DHB Demography.....	26
The Likely Effects of DHB Demography on Health Outcomes at a Regional Level	29
SECTION 2. HEALTH IN THE PERINATAL PERIOD & FIRST YEAR OF LIFE.....	33
Introduction	34
Births	35
Low Birth Weight.....	37
Breastfeeding.....	42
Infant Mortality	45
Bronchiolitis	52
Whooping Cough / Pertussis	56
SECTION 3. THE HEALTH STATUS OF CHILDREN 0-14 YEARS	61
Introduction	62
Hospital Admissions & Deaths: An Overview	63
Asthma	65
Bronchiectasis	69
Cancer.....	73
Gastroenteritis	78
Hearing Loss in Early Childhood.....	82
Injury, Drowning & Poisoning in Childhood.....	85
Injury: Non-Accidental & Child Abuse	91
Meningococcal Infection.....	96
Oral Health in Children	100
Pneumonia.....	104
Potentially Avoidable Hospital Admissions	108
Rheumatic Fever	113
Serious Skin Infections.....	117
Tuberculosis	122

SECTION 4. THE HEALTH STATUS OF YOUNG PEOPLE 15-24 YEARS	127
Introduction	128
Hospital Admissions & Deaths: An Overview	129
Injuries in Young People.....	131
Mental Health Issues in Young People	139
Sexually Transmitted Infections.....	149
Teenage Pregnancy	152
APPENDICES.....	156
Appendix 1: The Birth Registration Dataset.....	157
Appendix 2: The National Minimum Dataset.....	158
Appendix 3: The Mortality Collection	162
Appendix 4: ESR Sexual Health Data.....	163
Appendix 5: The NZ Cancer Registry.....	164
Appendix 6: The Measurement of Ethnicity	165
Appendix 7: The NZ Deprivation Index	168
Appendix 8. Avoidable Hospital Admissions	169
REFERENCES.....	170

LIST OF FIGURES

Figure 1. Distribution of Children and Young People in the Canterbury Region by Age and Ethnicity at the 2001 Census.	27
Figure 2. Distribution of Children and Young People at the 2001 Census by NZ Deprivation Index Decile, Canterbury vs. New Zealand.....	28
Figure 3. Rates of Small for Gestational Age, Preterm Birth & Low Birth Weight, NZ Singleton Live Births 1980-2005.	39
Figure 4. Rates of Preterm Birth and Small for Gestational Age, Canterbury vs. New Zealand for Singleton Live Births 1980-2005.....	39
Figure 5. Rates of Small for Gestational Age by Baby's Ethnic Group, Canterbury Singleton Live Births 1996-2005.....	40
Figure 6. Rates of Preterm Birth by Baby's Ethnic Group, Canterbury Singleton Live Births 1996-2005.....	40
Figure 7. Exclusive / Full Breastfeeding Rates at <6 Weeks by Ethnicity, Canterbury vs. New Zealand, June 2005-June 2006.	43
Figure 8. Exclusive / Full Breastfeeding Rates at 3 Months by Ethnicity, Canterbury vs. New Zealand, June 2005-June 2006.	43
Figure 9. Exclusive / Full Breastfeeding Rates at 6 Months by Ethnicity, Canterbury vs. New Zealand, June 2005-June 2006.	44
Figure 10. Infant Mortality by Cause, New Zealand 1988-2003.	46
Figure 11. Total Infant Mortality, Neonatal Mortality and Post-Neonatal Mortality, Canterbury vs. New Zealand 1990-2003.....	47
Figure 12. Neonatal Mortality (0-28 days) by Age and Cause, New Zealand 1999-2003.....	48
Figure 13. Post-Neonatal Mortality (29-365 days) by Age & Cause, New Zealand 1999-2003.	50
Figure 14. Hospital Admission Rates (1988-2005) and Deaths (1988-2003) due to Bronchiolitis, New Zealand Children Aged <1 Year.	53
Figure 15. Hospital Admission Rates (2001-2005) and Deaths (1999-2003) due to Bronchiolitis by Age, New Zealand Children 0-5 Years.	54
Figure 16. Hospital Admissions due to Bronchiolitis in Infants < 1 Year, Canterbury vs. New Zealand 1990-2005.....	54
Figure 17. Hospital Admissions for Bronchiolitis by Ethnicity Amongst Infants < 1 Year, Canterbury 1996-2005.....	55
Figure 18. Hospital Admissions due to Pertussis, New Zealand Children <1 Year, 1988-2005.	57
Figure 19. Hospital Admission Rates (2001-2005) and Deaths (1999-2003) due to Pertussis by Age, New Zealand Children and Young People Aged 0-24 Years.	58
Figure 20. Hospital Admissions Due to Pertussis in Infants < 1 Year, Canterbury vs. New Zealand 1990-2005.....	58

Figure 21. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Asthma, New Zealand Children and Young People 0-24 Years.	66
Figure 22. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Asthma by Age, New Zealand Children and Young People 0-24 Years.	67
Figure 23. Hospital Admissions due to Asthma in Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	67
Figure 24. Hospital Admissions for Asthma by Ethnicity in Children and Young People 0-24 Years, Canterbury 1996-2005.	68
Figure 25. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Bronchiectasis, New Zealand Children and Young People 0-24 Years.	70
Figure 26. Hospital Admissions due to Bronchiectasis by Age, New Zealand Children and Young People 0-24 Years 2001-2005.	71
Figure 27. Hospital Admissions due to Bronchiectasis Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	71
Figure 28. Notifications to the NZ Cancer Registry for Carcinoma in Situ of the Cervix by Age, NZ Women 15-24 Years 2000-2004.	77
Figure 29. Hospital Admission Rates (1988-2005) and Deaths (1988-2003) due to Gastroenteritis, New Zealand Children and Young People 0-24 Years.	79
Figure 30. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Gastroenteritis by Age, New Zealand Children and Young People 0-24 Years.	80
Figure 31. Hospital Admissions due to Gastroenteritis Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	80
Figure 32. Hospital Admissions for Gastroenteritis amongst Children and Young People 0-24 Years, Canterbury 1996-2005.	81
Figure 33. Audiometry Failure Rates at School Entry (5 yrs), Canterbury vs. New Zealand, Years Ending June 1993-2006.	84
Figure 34. Hospital Admissions (1990-2005) and Deaths (1990-2003) due to Injury in Children 0-14 Years, the Canterbury Region vs. New Zealand.	87
Figure 35. Hospital Admissions due to Injury by Ethnicity in Children 0-14 Years, the Canterbury Region 1996-2005.	87
Figure 36. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Land Transport Accident by Age, New Zealand Children and Young People 0-24 Years.	88
Figure 37. Hospital Admission Rates (1990-2005) and Deaths (1990-2003) due to Land Transport Accidents Amongst Children 0-14 Years, Canterbury vs. New Zealand.	89
Figure 38. Hospital Admissions (1988-2005) and Deaths (1988-2003) from Assault, Neglect & Maltreatment, NZ Children 0-14 years.	93
Figure 39. Hospital Admission Rates vs. Deaths for Assault, Neglect and Maltreatment by Age for NZ Children 0-14 years, 2001-2005 (Admissions) and 1999-2003 (Deaths).	93
Figure 40. Hospital Admissions due to Assault, Neglect and Maltreatment of Children 0-14 Years, Canterbury vs. New Zealand, 1990-2005.	95

Figure 41. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Meningococcal Disease, New Zealand Children and Young People 0-24 Years.	97
Figure 42. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Meningococcal Disease by Age, New Zealand Children and Young People 0-24 Years.	98
Figure 43. Hospital Admissions due to Meningococcal Infection Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	98
Figure 44. Percentage of Children Caries Free at 5 yrs, Canterbury* vs. NZ 1990-2005	102
Figure 45. Mean DMFT Scores at 12 yrs, Canterbury* vs. NZ 1990-2005.....	102
Figure 46. Percentage of Children Caries Free at 5 Years by Ethnicity, Canterbury vs. New Zealand 2005	103
Figure 47. Mean DMFT Scores at 12 Years by Ethnicity, Canterbury vs. New Zealand 2005	103
Figure 48. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Pneumonia, New Zealand Children and Young People 0-24 Years.	105
Figure 49. Hospital Admission Rates (2001-2005) and Deaths (1999-2003) due to Pneumonia by Age, New Zealand Children & Young People 0-24 Years.	106
Figure 50. Hospital Admissions due to Pneumonia Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	106
Figure 51. Hospital Admissions due to Pneumonia by Ethnicity for Children and Young People 0-24 Years, Canterbury 1996-2005.	107
Figure 52. Ambulatory Sensitive and Population Preventable Hospital Admissions, New Zealand Children (0-14 years) and Young People (15-24 years) 1988-2005.	110
Figure 53. Ambulatory Sensitive and Population Preventable Hospital Admissions by Age, New Zealand Children and Young People, 2001-2005.....	110
Figure 54. Ambulatory Sensitive Hospital Admissions Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	111
Figure 55. Ambulatory Sensitive Hospital Admissions by Ethnicity in Children and Young People 0-24 Years, Canterbury 1996-2005.	111
Figure 56. Hospital Admissions (1988-2005) & Deaths (1988-2003) due to Acute Rheumatic Fever & Rheumatic Heart Disease, NZ Children & Young People 0-24 Years. ..	114
Figure 57. Hospital Admissions due to Acute Rheumatic Fever & Rheumatic Heart Disease by Age, NZ Children & Young People 0-24 Years 2001-2005.	115
Figure 58. Hospital Admissions due to Rheumatic Fever & Rheumatic Heart Disease in Children and Young People 0-24 yrs, Canterbury vs. NZ 1990-2005.....	115
Figure 59. Hospital Admissions due to Serious Skin Infections, New Zealand Children and Young People 0-24 Years 1988-2005.	119
Figure 60. Hospital Admissions due to Serious Skin Infection by Age, New Zealand Children and Young People 0-24 Years, 2001-2005.....	119
Figure 61. Hospital Admissions due to Serious Skin Infection Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.	120

Figure 62. Hospital Admissions for Serious Skin Infections Amongst Children and Young People 0-24 Years by Ethnicity, Canterbury 1996-2005.....	120
Figure 63. Hospital Admissions Due to Tuberculosis, New Zealand Children and Young People 0-24 Years, 1988-2005.	123
Figure 64. Hospital Admission Rates for Tuberculosis by Age, New Zealand Children and Young People 0-24 Years, 2001-2005.	124
Figure 65. Hospital Admissions due to TB Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.....	124
Figure 66. Hospital Admissions (1990-2005) and Deaths (1990-2003) due to Injury in Young People 15-24 Years, the Canterbury Region vs. New Zealand.	133
Figure 67. Hospital Admissions due to Injury by Ethnicity in Young People 15-24 Years, the Canterbury Region 1996-2005.	134
Figure 68. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Land Transport Accidents by Age, New Zealand Children and Young People 0-24 Years.....	134
Figure 69. Hospital Admissions (1990-2005) and Deaths (1990-2003) due to Land Transport Accidents in Young People 15-24 Years, Canterbury vs. New Zealand.....	135
Figure 70. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Assault by Age and Gender, New Zealand Young People 15-24 Years.....	136
Figure 71. Hospital Admissions due to Assault in Young People 15-24 Years, Canterbury vs. New Zealand 1990-2005.	137
Figure 72. Hospital Admission Rates for Mental Health Issues by Age and Diagnosis, New Zealand Young People (15-24 yrs), 2000-2004.	142
Figure 73. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Self Inflicted Injury, New Zealand Young People 15-24 Years.	146
Figure 74. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Self Inflicted Injury by Age and Gender, New Zealand Young People 15-24 Years.	146
Figure 75. Hospital Admission Rates for Self Harm (1990-2005) and Deaths due to Suicide (1990-2003) Amongst Young People 15-24 Years, Canterbury vs. New Zealand.	147
Figure 76. Teenage Pregnancy Rates for New Zealand Women, 1980-2004.....	153
Figure 77. Birth Rates by Maternal Age and Ethnicity, New Zealand 2001-2005	153
Figure 78. Teenage Birth Rates, Canterbury vs. New Zealand 1990-2005.	154
Figure 79. Teenage Birth Rates by Maternal Ethnic Group, Canterbury 1996-2005.	155

LIST OF TABLES

Table 1. The Distribution of Children and Young People in NZ and Canterbury by Ethnicity at the 2001 Census.....	27
Table 2. NZDep Index Decile and Child & Youth Health Outcomes, New Zealand 2001-2005 (Admissions) / 1999-2003 (Deaths).	30
Table 3. Ethnicity and Child and Youth Health Outcomes, New Zealand 2001-2005 (Admissions) / 1999-2003 (Deaths)	31
Table 4. Annual Number of Births by Baby's Ethnic Group, Canterbury 1996-2005.	35
Table 5. Distribution of Births by Baby's Ethnic Group, NZ and Canterbury 2005.	35
Table 6. Distribution of Births by NZDep Index Decile, NZ and the Canterbury Region 2005.	36
Table 7. Risk Factors for Preterm Birth, NZ Singleton Live Births 2001-2005.....	38
Table 8. Risk Factors for Small for Gestational Age, NZ Singleton Live Births 2001-2005..	38
Table 9. Risk Factors for Infant Mortality due to SIDS, NZ 1999-03.	46
Table 10. Risk Factors for Infant Mortality due to Congenital Anomalies, NZ 1999-2003....	47
Table 11. Risk Factors for Infant Mortality due to Extreme Prematurity and Other Perinatal Conditions, NZ 1999-2003.....	47
Table 12. Most Frequent Causes of Neonatal Mortality (0-28 days) in NZ, 1999-2003.	49
Table 13. Most Frequent Causes of Neonatal Mortality (0-28 days), Canterbury 1999-2003.	49
Table 14. Causes of Post-Neonatal Mortality (29-364 days) NZ, 1999-2003.	50
Table 15. Causes of Post-Neonatal Mortality (29-364 days) Canterbury, 1999-2003.....	50
Table 16. Risk Factors for Hospital Admission due to Bronchiolitis, New Zealand Infants <1 Year, 2001-2005.....	53
Table 17. Risk Factors for Hospital Admission due to Pertussis, New Zealand Children <1 Year of Age, 2001-2005.....	57
Table 18. Most Frequent Causes of Mortality Outside the Neonatal Period, Canterbury Children 0-14 yrs, 2001-2003.....	63
Table 19. Post-Neonatal Hospital Admissions for Children 0-14 Yrs, Canterbury 2003-05...	64
Table 20. Risk Factors for Hospital Admission due to Asthma, New Zealand Children 0-14 years, 2001-2005.	66
Table 21. Risk Factors for Hospital Admission due to Bronchiectasis, New Zealand Children and Young People 0-24 Years, 2001-2005.....	70
Table 22. Cancer Registrations in Children 0-14 Years, NZ and Canterbury 2000-2004.	74
Table 23. Cancer Deaths in Children 0-14 Years, NZ and Canterbury 2000-2003.	74
Table 24. Cancer Registrations for Young People 15-24 yrs, NZ and Canterbury 2000-2004.	75
Table 25. Cancer Deaths in Young People 15-24 Years, NZ and Canterbury 2000-2003.	76

Table 26. Risk Factors for Cancer Registry Notifications due to Carcinoma in Situ of the Cervix, New Zealand Women 15-24 Years, 2000-2004.	76
Table 27. Risk Factors for Hospital Admission due to Gastroenteritis, New Zealand Children 0-14 years, 2001-2005.	79
Table 28. New Entrant Coverage Rates at 5 Years, Canterbury DHB vs. New Zealand, Years Ending June 2005-06.	83
Table 29. Most Frequent Causes of Injury Related Hospital Admission due to Children (0-14 yrs) in New Zealand and the Canterbury Region during 2003-2005.	86
Table 30. Causes of Injury Related Death for Children (0-14 yrs), New Zealand 2001-2003.	86
Table 31. Causes of Injury Related Death for Children (0-14 yrs), Canterbury 2001-2003.	86
Table 32. Risk Factors for Hospital Admission due to Land Transport Accidents, New Zealand Children 0-14 years, 2001-2005.	89
Table 33. Risk Factors for Hospital Admission due to Assault, Neglect & Maltreatment, NZ Children 0-14 years 2001-2005.	92
Table 34. Nature of Injury by Age Group, for New Zealand Children Hospitalised with Assault, Neglect and Maltreatment, 2001-2005.	94
Table 35. Risk Factors for Hospital Admission due to Meningococcal Disease, New Zealand Children & Young People 0-24 Years, 2001-2005.	97
Table 36. Risk Factors for Hospital Admission due to Pneumonia, New Zealand Children 0-14 years, 2001-2005.	105
Table 37. Risk Factors for Ambulatory Sensitive Hospital Admissions for Children 0-14 Years, New Zealand 2001-2005.	109
Table 38. Risk Factors for Ambulatory Sensitive Hospital Admissions for Young People 15-24 Years, New Zealand 2001-2005.	109
Table 39. Risk Factors for Hospital Admission due to Acute Rheumatic Fever, New Zealand Children and Young People 0-24 years, 2001-2005.	114
Table 40. Risk Factors for Hospital Admission due to Serious Skin Infection, New Zealand Children 0-14 years, 2001-2005.	118
Table 41. Risk Factors for Hospital Admission due to Serious Skin Infection, New Zealand Young People 15-24 years, 2001-2005.	118
Table 42. Risk Factors for Hospital Admission due to TB, New Zealand Children and Young People 0-24 years, 2001-2005.	123
Table 43. Mortality for Young People (15-24 yrs) in the Canterbury Region 2001-2003	129
Table 44. Hospital Admissions for Young People (15-24 yrs), Canterbury Region 2003-05.	130
Table 45. Most Frequent Causes of Injury Related Hospital Admission due to Young People (15-24 yrs) in New Zealand and the Canterbury Region during 2003-2005.	132
Table 46. Causes of Injury Related Mortality for Young People (15-24 yrs), NZ 2001-2003.	132
Table 47. Injury Related Mortality for Young People 15-24 yrs, Canterbury 2001-03.	133

Table 48. Risk Factors for Hospital Admission due to Land Transport Accidents, New Zealand Young People 15-24 years, 2001-2005.	135
Table 49. Risk Factors for Hospital Admission due to Assault, New Zealand Young People 15-24 Years, 2001-2005.	136
Table 50. The Number of Calls to Youthline's Youth Help Line Service in the Canterbury Region during 2005-2006.	140
Table 51. The Main Reasons for Calling Youthline's Youth Help Line in New Zealand between Sept 2005 and Sept 2006.	141
Table 52. The Most Frequent Reasons for Hospital Admission for Mental Health Issues in Young People (15-24 yrs), New Zealand and the Canterbury Region, 2000-2004.	142
Table 53. Ethnicity, NZDep Index Decile and Risk of Hospital Admission for Schizophrenia, NZ Young People 15-24 Years, 2000-2004.	143
Table 54. Ethnicity, NZDep Index Decile and Risk of Hospital Admission for Depression, NZ Young People 15-24 Years, 2000-2004.	143
Table 55. Ethnicity, NZDep Index Decile and Risk of Hospital Admission for Bipolar Affective Disorder, NZ Young People 15-24 Years, 2000-2004.	144
Table 56. Risk Factors for Suicide, NZ Young People 15-24 Years, 1999-2003.	147
Table 57. Sexual Health and Family Planning Clinic Notifications of Sexually Transmitted Infections in Young People <25 Years, Canterbury 2001-2005*.	151
Table 58. Teenage Birth Rates (Excluding Terminations & Miscarriages) by Ethnicity and NZ Deprivation Index Decile, New Zealand 2001-2005.	154
Table 59. Variables used in the NZDep2001 Index of Deprivation [88].	168
Table 60. Conditions Considered to be Ambulatory Sensitive and Population Preventable by Ministry of Health in 2004 [51].	169

INTRODUCTION & EXECUTIVE SUMMARY

Introduction

Children and young people make up approximately 1/3 of the Canterbury population and an understanding of the factors that contribute to their wellbeing is vital, not only for ensuring the health status of the current generation of Canterbury children and young people, but also for ensuring the ongoing health of the Canterbury population, as each successive birth cohort grows into maturity. This report is the first of a 2-part series which explores the health status of children and young people in the Canterbury Region, and fits into the 2006-2007 reporting cycle as follows:

1. Report 1 (2006): A Review of the Health Status of Children and Young People
2. Report 2 (2007): A Review of the Determinants of Child and Youth Health

While often not being explicitly stated, much interest in health status assessment in recent years has been on benchmarking, and the ability to assess a DHB's performance based on a basket of key health indicators. The ability to undertake such analyses in a robust manner and in a way that takes into account regional differences in age, ethnic composition and socioeconomic deprivation, while not being impossible, is rendered technically difficult as a result of the fragmented nature of NZ's national datasets and the lack of appropriate denominators in electronic format. In addition, at a DHB level what is often needed is not a comparative analysis, but rather a comprehensive framework within which to consider all of the issues which need to be taken into account when planning and funding child and youth health services at a regional level.

This reporting series thus takes the latter approach and aims to provide those involved in the funding, planning and delivery of services at a regional level, with an understanding of the health needs of children and young people within their region. In doing so it seeks to provide answers to 3 key questions

1. What are the characteristics of the region's child and youth population in terms of age structure, ethnic composition and exposure to socioeconomic disadvantage?
2. Given a knowledge of the ways in which age, ethnicity and socioeconomic disadvantage interact to determine the distribution of adverse health outcomes at a national level, what is the expected health status of the Canterbury child and youth population in terms of a basket of key indicators?
3. What is the actual health status of the Canterbury child and youth population in terms of the same basket of key indicators, and does it differ in any way from what could have been predicted based on a knowledge of regional demography?

This report assists those working at a regional level to answer each of these key questions. It begins by providing a brief overview of regional demography at the time of the 2001 census and explores how this differed from the NZ average. It then goes on to provide an overview of the health outcomes covered in this report and the relationship ethnicity and NZDep Index deprivation had with each. In this context, summary tables are presented which rank each of the outcomes presented in this report by the magnitude of socioeconomic and ethnic disparities occurring at a national level. The health status of children and young people in the Canterbury region is then assessed using the same set of child and youth health outcomes. The analysis is based on a lifecourse approach which breaks child and youth health indicators into 3 main groups:

1. The Health Status of Infants (<1 year)
2. The Health Status of Children (0-14 years)
3. The Health Status of Young People (15-24 years)

Each of these 3 sections follows a standard format, beginning with a guest editorial, written by an expert in the field, whose role is to highlight the major issues they see facing the children and young people in their care. Following this brief overview, indicators of particular importance to the age group are explored in more detail, using a common framework:

1. The health outcome is defined, and a brief summary is provided of its public health significance in the NZ context.
2. Brief notes on the data sources and statistical methods used are then presented. These are supplemented by more detailed information on the strengths and limitations of the various datasets, which appear in Appendices 1-8 at the back of this report.
3. Summary graphs then present an analysis of NZ trends over time for each indicator.
4. The distribution of the outcome by age, ethnicity & NZ Deprivation Index is then presented using national data for the past 5 years. This analysis attempts to quantify the magnitude of socioeconomic and ethnic disparities occurring for each outcome nationally, as well as to provide some context for interpreting regional results.
5. An analysis of regional vs. NZ trends in the health outcome over the past 15 years is then presented (or if time series estimates are not available, then cross sectional tables are presented using the most recent data available).
6. Where numbers permit, ethnic disparities in the health outcome at a regional level are then presented using data from 1996 onwards.

When considering the information presented in each of these sections, there are some real data quality issues which must be taken into account, which may temper the ability to make decisions based on the findings of these reports. These are briefly highlighted in the executive summary that follows, as well as being discussed in more detail in the appendices of this report. The reader, at a minimum, is strongly urged to read Appendix 2, which highlights some of the difficulties associated with interpreting data derived from the National Minimum Dataset (hospital admission data), as well as Appendix 6, which relates to issues associated with the quality of ethnicity data.

It is hoped that this reporting series will provide those delivering health services to children and young people at a regional level with an understanding of the health needs of the populations they serve, as well as some insights into why these might conform to or deviate from the national average. This report however, makes no attempt to prioritise the health needs presented in the sections that follow, or to offer any evidence based solutions to the many issues which are raised. Rather the report is intended to provide DHB staff with sufficient information, so that such decisions can be made at a regional level. For those requiring more direction on evidence based solutions to some of the issues raised in this report, the MOH's Child and Youth Health Toolkit (available on the MOH website) may provide a logical starting place, as it provides an overview of the MOH's suggested starting points in many of these areas.

Executive Summary

Regional Demography

At the time of the 2001 census there were 86,124 children and 59,028 young people residing in Canterbury DHB. While the proportion of European children and young people was higher than the NZ average, the proportion of Māori and Pacific children and young people was lower. In addition, the proportion of children and young people living in affluent areas (NZDep deciles 1-2) was higher than the NZ average, while the proportion of children and young people living in deprived areas (NZDep deciles 9-10) was much lower. Combining this information with a knowledge of the way in which demographic factors modify the distribution of child and youth health outcomes at a regional level, it is possible to predict that Canterbury DHB, with its lower proportions of Māori and Pacific children and young people, would have lower rates for conditions where ethnic disparities are most marked (e.g. meningococcal disease, rheumatic fever). Similarly, the lower proportion of Canterbury children and young people living in the most deprived areas would predict lower rates for conditions where socioeconomic disparities are most marked (e.g. bronchiectasis, serious skin infections, asthma).

Before going on to review the actual health status of children and young people in Canterbury, the following section briefly considers some of the issues associated with data quality in these reports.

Data Quality Issues

Appendices 1-8 contain information on the datasets used in this report and discuss in detail some of their limitations. Readers are urged to be aware of the contents of these Appendices when interpreting the information contained in these reports. A number of items however are of particular importance. These include:

Statistical Significance Testing

Because of the fragmented nature of NZ's national datasets, and the lack of population denominators in electronic format, in undertaking this analysis, the majority of rate calculations had to be undertaken manually in Excel. This meant that in the allocation of resources to undertake this report, a choice needed to be made between providing information on as broad a range of indicators as possible, or providing a more detailed analysis (including relative risks, 95% confidence intervals and standardisation for ethnicity and NZDep) on a much more limited selection. Because this report forms the first in a series, in the first instance it was thought necessary to provide as broad as possible overview on the health status of children and young people in the region, and resources have thus been allocated to this end. Thus in interpreting the findings of this report, none of the comparisons made imply statistical or non-statistical significance and thus the reader must take into account both the magnitude of the difference in regional and NZ rates as well as the consistency of these on a year to year basis. For the majority of indicators contained in this report, a review of trends over time, particularly if they consistently exceed or are lower than the NZ average, will provide sufficient information for funding and planning purposes. In instances however where time series information is unavailable, or where numbers are small (e.g. neonatal and post-neonatal mortality rates) and DHB figures deviate unexpectedly from the NZ average, DHB staff may wish to request more detailed statistical analysis on a case by case basis.

Small Number Reporting

Many of the causes of morbidity and mortality analysed in this report, while being of significant importance to child and youth health, are nevertheless only present in small numbers. In order to prevent, as far as possible, the identification of individual cases in the

sections of the report that follow, in all tables the causes of morbidity / mortality have been aggregated up so that the smallest number reported is 3. For graphs, deaths are reported as rates per 100,000 rather than as individual numbers, and where very small numbers per year are involved, these are discussed only in the text. Where DHB staff feel that they require more detailed information on particular causes of morbidity and mortality, additional (de-identified) information is available on request.

Changes in the way in which Emergency Admissions have been coded over time

Appendix 2 outlines a number of issues with data quality in the Hospital Admission Dataset, and in particular how changes in the way in which emergency department cases have been uploaded to the national minimum dataset over time can profoundly affect time series data for a number of conditions commonly dealt with in the emergency department setting (e.g. injuries, asthma, gastroenteritis). This issue is complex and the reader is strongly urged to read Appendix 2 before considering any of the time series information contained in this report.

Report's Main Findings

THE PERINATAL PERIOD AND FIRST YEAR OF LIFE

Births

During 1996-05, the number of births in the Canterbury Region gradually increased. During 2005, while the proportion of European babies born in Canterbury was higher than the NZ average, the proportion of Māori, Pacific and Indian babies born was lower. During the same period, the proportion of Canterbury babies born into the most deprived areas (NZDep decile 9-10) was much lower than the NZ average, while the proportion born into the most affluent areas (NZDep decile 1-2) was higher.

Low Birth Weight

In NZ during 1980-05, rates of preterm birth increased, while rates of small for gestational age (SGA) declined. In contrast, rates of low birth weight remained relatively static during this period. During 1996-05, rates of preterm birth were highest amongst NZ Indian and Māori babies and those living in the most deprived areas. Rates of SGA were highest amongst NZ Indian, Māori and Asian babies and those living in the most deprived areas.

During 1980-05, rates of preterm birth in Canterbury increased, while rates of small for gestational age declined. Both trends were consistent with those occurring nationally. Throughout this period, rates of SGA in Canterbury were lower than the NZ average, while rates of preterm birth were similar. During 1996-05, rates of SGA amongst Canterbury Māori babies were lower than the NZ Māori average, while rates for Canterbury European babies were similar. For preterm birth, rates amongst Canterbury Māori and European babies were very similar to their respective ethnic specific averages. Despite this, ethnic disparities in birth outcome were evident in the Canterbury region, with rates of SGA and preterm birth being generally higher for Māori than for European babies during this period.

Breastfeeding

During June 2005-06, breastfeeding rates at 6 weeks in Canterbury were highest amongst European / Other women, although when compared to the NZ average, the breastfeeding rates of all of Canterbury's largest ethnic groups were very similar to the NZ average. At 3 months breastfeeding rates were highest amongst Asian women, although again breastfeeding rates for all ethnic groups were either similar to or higher than the NZ average, as they were at 6 months of age. For all ethnic groups however, there was a marked tapering off in exclusive / full breastfeeding rates as infants age increased. In addition, during 2005-06 while none of Canterbury's largest ethnic groups achieved the MOH's 2005 breastfeeding targets of 74% at

6 weeks, European and Asian women achieved the target of 57% at 3 months and all achieved the target of 21% at 6 months of age.

Infant Mortality

In NZ during the past 15 years, deaths due to SIDS and “other causes” have continued to decline, while the reductions in deaths due to congenital anomalies and perinatal conditions seen during the late 80’s / early 90’s have begun to taper off. In contrast, deaths due to extreme prematurity have been increasing, resulting in a small increase in neonatal mortality rates during the past 3-4 years. In NZ during 1999-03, the risk factors for the three most common causes of infant mortality also differed, with the risk of SIDS being higher amongst Māori infants, males and those living in the most deprived areas. In contrast for congenital anomalies, mortality rates were not significantly different for Māori or Pacific infants, or those living in the most deprived areas. While for deaths due to extreme prematurity / perinatal conditions, differences for Māori and Pacific infants and those living in the most deprived areas did reach statistical significance, disparities were much less marked than for SIDS. Similarly, in Canterbury during 1990-03, total and post-neonatal mortality rates declined, while neonatal mortality rates remained relatively static. While small numbers make precise interpretation of these trends difficult, they were generally consistent with those occurring in the rest of NZ. Throughout this period, while rates of total infant mortality were lower than the NZ average, rates of neonatal and post-neonatal mortality were either similar to or lower than the NZ average.

In NZ during 1999-03, the most frequent causes of neonatal deaths were extreme prematurity and congenital anomalies, with anomalies of the cardiovascular and central nervous system playing a particularly prominent role. Birth asphyxia however, was also a relatively important cause of neonatal mortality. For all categories of death (with the exception of SIDS), mortality was higher during the first week of life than at any other point during infancy. In Canterbury during this period, the distribution was similar, with deaths from extreme prematurity and congenital anomalies being the commonest single causes of neonatal deaths.

In NZ during 1999-03 the most frequent causes of post-neonatal mortality were SIDS, followed by congenital anomalies and injury, although conditions arising during the perinatal period still also played a role. In addition, a large number of babies were identified as dying as a result of suffocation or strangulation in bed, although it is possible that some of these may have been coded as SIDS cases in previous years. Mortality was greatest during the first 6 months of life, with progressively fewer deaths occurring as infants approached 1 year of age. In Canterbury during this period, the pattern was similar, with the leading causes of post-neonatal mortality being SIDS and congenital anomalies.

Bronchiolitis

NZ’s hospital admission rates for bronchiolitis have risen steadily in recent years, although data for the 2003-05 period suggest that this trend may be beginning to taper off. In contrast mortality rates, which initially decreased during the early 1990s, have remained static at 1-2 deaths per year during the last 10 years for which data was available. Bronchiolitis is predominantly a disease of infancy, with the majority of hospital admissions and deaths occurring during the first year of life, although a small number also occur between 1-2 years of age. In addition to young age, during 2001-05 hospital admission rates for bronchiolitis in NZ were also higher for Pacific and Māori infants, those living in the most deprived areas, male infants and those living in urban areas.

During the 1990s, hospital admissions for bronchiolitis in Canterbury were similar to the NZ average and increased progressively, in line with national trends. Admission rates reached a peak in 1998-99 and then declined, with rates in Canterbury during the last 6 years being

lower than the NZ average. Hospital admissions for during 1996-05 were highest amongst Canterbury Pacific > Māori and European > Asian infants. During 1990-03 there were no deaths attributed to bronchiolitis in Canterbury.

Pertussis

During the past 17 years, pertussis epidemics have occurred in New Zealand at regular 3-5 year intervals, with hospital admissions in children <1 year old following a similar pattern. In addition, during the past 4 years, 3 deaths were attributed to pertussis in NZ. While pertussis may affect any age group, the disease is most severe amongst children <1 year of age, with the majority of hospital admissions and all recent deaths occurring in this age group. During 2001-05, hospital admissions for pertussis were highest amongst Pacific and Māori infants and those in the most deprived areas.

During 1990-05, Canterbury experienced episodic epidemics of pertussis amongst children <1 year, which occurred in conjunction with the larger national epidemics. During 1990-03 however, no deaths occurred as a result of pertussis in the Canterbury region. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

THE HEALTH OF CHILDREN 0-14 YRS

Hospital Admissions and Mortality

In Canterbury during 2001-03, the leading causes of post-neonatal mortality were SIDS, followed by congenital anomalies and perinatal conditions, while in the 1-14 age group the leading causes of mortality were injuries and congenital anomalies. During 2003-05, the most frequent reasons for acute hospital admission were injury / poisoning, and gastroenteritis, while for arranged admissions the most frequent reasons were for dental conditions and cancer / chemotherapy. For waiting list admissions, the most frequent reasons for admission were for the insertion of grommets, followed by procedures on the tonsils and adenoids.

Asthma

Asthma admissions and deaths among NZ children and young people have declined during the past 17 years, although in the case of hospital admissions for those 0-14 years, this downward trend has ceased in the past 3-4 years. While admissions during 2001-05 were highest amongst children <5 years, mortality during 1999-03 was highest amongst adolescents and those in their early 20s. Hospital admissions amongst children 0-14 years were also higher for those living in the most deprived areas, for Pacific, Māori and Asian / Indian children, males and those living in urban areas.

While during the 1990s, hospital admissions for asthma amongst Canterbury children were generally higher than the NZ average, they were similar to the NZ average during the past 4 years for which data was available. Admission rates for Canterbury young people were similar to the NZ average throughout this period. In Canterbury during 1996-05, hospital admissions for asthma were highest amongst Pacific > Māori > European > Asian / Indian children and young people. In addition, during 1990-03 there were 7 deaths attributed to asthma amongst children and young people (0-24 yrs) in the Canterbury region.

Bronchiectasis

At a national level, hospital admissions for bronchiectasis have increased dramatically during the past decade, while deaths due to bronchiectasis have declined. Care must be taken when interpreting these trends however, as it remains unclear whether they 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. During 2001-05,

hospital admissions were highest amongst children 0-14 years, Pacific & Māori children & young people, those living in the most deprived areas and those in urban areas.

During 1990-05, hospital admissions due to bronchiectasis amongst children and young people in Canterbury were consistently lower than the NZ average. In addition, there were no deaths attributed to bronchiectasis in Canterbury during 1990-2003. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates and thus regional estimates need to be extrapolated from national figures.

Cancer

In NZ during 2000-04, the cancer most frequently notified to the NZ Cancer Registry for children 0-14 years was lymphoid leukaemia, followed by tumours of the brain. The most frequent causes of death were cancers of the brain, followed by lymphoid leukaemia. In Canterbury during this period the pattern was similar, with lymphoid leukaemia followed by cancers of the brain and kidneys being the leading causes of cancer notification, although small numbers meant that regional death data was more difficult to interpret.

In NZ during 2000-04, cervical carcinoma in situ was the leading cause of notification to the NZ Cancer Registry for young people 15-24 yrs, although melanoma was the leading form of invasive disease. The most frequent causes of death were cancers of the brain, followed by tumours of bone and cartilage and lymphoid leukaemia. In Canterbury during this period the pattern was similar, with carcinoma in situ of the cervix being the leading cause of notification to the NZ Cancer Registry, and melanoma being the leading form of invasive disease. Again, small numbers meant that regional death data was difficult to interpret, although brain cancers were the leading cause of cancer mortality during 1999-2003.

Gastroenteritis

Hospital admissions for gastroenteritis amongst New Zealand children and young people have been increasing in recent years, while deaths have remained static at around 1-2 cases per year. During 2001-2005 admissions for gastroenteritis were highest amongst children during their first year of life and tapered off rapidly thereafter. Mortality during 1988-03 also followed a similar pattern. Admission rates for children 0-14 years were also higher amongst those in the most deprived areas, Pacific and Asian / Indian children and those living in urban areas.

During 1990-05, hospital admissions for gastroenteritis amongst Canterbury children were generally higher than the NZ average, while rates for Canterbury young people were similar or lower. During 1996-05, admission rates in Canterbury were highest amongst Māori children and young people. There were however, no deaths attributed to gastroenteritis amongst Canterbury children and young people during 1990-03.

Hearing Screening

During 2005-06 coverage rates for hearing screening at school entry in Canterbury were similar to the NZ average, while audiometry failure rates at school entry were lower.

Injury

In recent years falls, followed by injuries arising from mechanical forces, were the leading causes of injury related hospital admission amongst NZ children, while transport accidents (particularly vehicle occupant / pedestrian) were the leading cause of injury related death. In Canterbury during this period the pattern was similar, with falls, followed by mechanical forces being the leading causes of hospital admission and land transport accidents being the leading cause of death. In comparative terms, during 1990-05, hospital admissions and deaths from injury amongst Canterbury children were generally lower than the NZ average and in addition, remained relatively static, in contrast to the gradual decline in injury related deaths

amongst Canterbury young people during the same period. During 1996-05, injury admission rates were highest amongst Canterbury European and Pacific children.

At a national level, land transport accidents were the leading cause of injury related death in children 0-14 yrs, and in contrast to the progressive fall in mortality amongst young people (15-24 years), land transport related deaths amongst NZ children have remained relatively static during the past 6-8 years. Age however, was a crucial factor associated with risk of land transport accident, with risk of admission increasing progressively throughout childhood, from the lowest point in infancy to a peak at 17 years. Mortality however was much more evenly distributed throughout childhood (peaking later in mid-late adolescence). At a national level, risk of a land transport accident admission was higher amongst Māori and European children, those living in the most deprived areas, males and those in rural areas. In comparative terms, during 1990-05 hospital admissions due to land transport accidents amongst Canterbury children remained relatively static. In addition, both admission rates and mortality were lower than the NZ average during this period.

Child Abuse, Neglect and Maltreatment

While NZ's hospital discharge rates for assault, neglect and maltreatment of children 0-14 years declined steadily during the early 1990s, by 1996-97 they had reached a plateau and thereafter remained static. In contrast, mortality remained relatively static throughout the 15 years for which data was available. In terms of risk factors for assault, neglect and maltreatment, hospital discharges during 2001-05 exhibited a U-shaped distribution with age, with rates being highest amongst those < 2 years and those > 11 years of age. In contrast, mortality rates were highest amongst children <1 year. While the gender balance was relatively even during infancy and early childhood, hospital discharges amongst males became more predominant as adolescence approached. In addition, admission rates for assault, neglect and maltreatment were highest amongst Māori and Pacific children, those living in the most deprived areas, males and those in urban areas.

During 1990-05, hospital admissions for assault, neglect and maltreatment of children in Canterbury were generally higher than the NZ average. In addition, during 1990-03 there were a total of 10 deaths amongst children 0-14 years attributed to assault in the Canterbury region, although none occurred during the last 4 years for which data was available. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

Meningococcal Disease

Since 1991 NZ has experienced a large increase in the number of hospital admissions and deaths due to meningococcal infection, although 2004-05 hospital admission figures suggest that this may be beginning to taper off. In NZ during 2001-05, both admissions and mortality were highest amongst children <5 years of age, although a smaller peak in mortality occurred amongst those in their mid to late teens. In addition, admissions were higher for Pacific and Māori children & young people, those in the most deprived areas, males and those in urban areas.

In Canterbury, hospital admissions for meningococcal disease increased rapidly during the early 1990s, reached a peak in 1996-97 and thereafter began to slowly decline. Throughout this period, admission rates in Canterbury were consistently lower than the NZ average. In addition, a total of 8 deaths were attributed to meningococcal disease amongst Canterbury children and young people during 1990-03. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

Oral Health

During 2005, only 0.6% of Canterbury children aged 5 years had access to fluoridated drinking water. This information is based on the fluoridation status of the child's school however, rather than the area in which they lived. During the past decade, the percentage of Canterbury children who were caries free at 5 years was higher than the NZ non-fluoridated average, but consistently lower than the NZ fluoridated average. In contrast, mean DMFT scores at 12 years were very similar to the NZ non-fluoridated average.

During 2005, the percentage of Māori children in Canterbury who were caries free was higher than the NZ Māori non-fluoridated average, but lower than the NZ Māori fluoridated average. For European children, rates were very similar to the NZ European average. During the same period, the mean DMFT scores of Canterbury Māori children were lower than the NZ Māori non-fluoridated average, but higher than the NZ Māori fluoridated average. A similar pattern occurred for European children.

Pneumonia

While pneumonia mortality amongst NZ children and young people has declined in recent years, hospital admissions have remained relatively static. During 2001-05 pneumonia admission rates were highest amongst infants and children 1-2 years, those living in the most deprived areas, Pacific and Māori children, males and those in urban areas. Mortality was highest for those <1 year of age.

While during the 1990s, hospital admission rates for Canterbury children were similar to the NZ average, progressive declines during the late 90s / early 2000s saw admission rates being lower than the NZ average during the last 6 years for which data was available. Throughout this period, admission rates for Canterbury young people were similar to the NZ average. During 1996-05, hospital admissions for pneumonia were highest amongst Canterbury Pacific > Māori and European > Asian / Indian children and young people. In addition, during 1990-03, 6 deaths amongst children and young people in Canterbury were attributed to pneumonia.

Potentially Avoidable Hospital Admissions

New Zealand's ambulatory sensitive and population preventable hospital admissions have gradually increased during the past 17 years. During 2001-05, ambulatory sensitive admissions were highest amongst children <6 years, Pacific and Māori children and young people and those living in the most deprived areas.

During 1990-05, ambulatory sensitive admissions amongst Canterbury children and young people increased at a rate similar to the NZ average. While ambulatory sensitive admissions for children were similar to the NZ average, admission rates for young people were slightly lower. During 1996-05, ambulatory sensitive admissions were higher amongst Canterbury Pacific >European and Māori >Asian / Indian children and young people.

Rheumatic Fever

Acute rheumatic fever and rheumatic heart disease admissions have remained relatively static in NZ during the past 10 years, while deaths have averaged 1-3 per year during the same period. During 2001-05 hospital admissions for acute rheumatic fever peaked in late childhood to early adolescence, while admissions for rheumatic heart disease were relatively constant after 5 years of age. In contrast, deaths due to rheumatic fever and rheumatic heart disease were most frequent during the teenage years. During 2001-05, rates of acute rheumatic fever were higher amongst those living in the most deprived areas, Pacific and Māori children and young people, males and those living in urban areas.

During 1990-05 hospital admissions for acute rheumatic fever and rheumatic heart disease in Canterbury were consistently lower than the NZ average. There was one death attributed to

rheumatic heart disease during this period, although none occurred during the past 10 years for which data was available. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

Serious Skin Infections

While one young person died of serious skin infection in NZ during the past 15 years, hospital admission rates amongst both children and young people have risen progressively, with the most rapid increases occurring during the mid-late 1990s. During 2001-05, hospital admissions due to serious skin infection had a bi-modal distribution, with the highest rates occurring amongst children <5 years of age, followed by young people in their late teens and early 20s. Rates were also higher amongst Māori and Pacific children and young people, males, those living in the most deprived areas and amongst children living in urban areas.

In Canterbury during 1990-05, while hospital admissions for serious skin infections increased for both children and young people, admission rates remained consistently below the NZ average. During 1996-05, admissions for serious skin infections were higher for Pacific > Māori and European > Asian / Indian children and young people. There were however, no deaths attributed to serious skin infections amongst Canterbury children and young people during 1990-03.

Tuberculosis

In NZ during 1988-05, hospital admissions for TB gradually increased, although data for the 2004-05 period suggests that this may be beginning to taper off. In addition, during 1988-03, 3 NZ children and young people died as a result of TB. During 2001-05, while there was a small peak amongst children <4 years of age, TB admissions were highest amongst young people in their late teens and early twenties, those living in the most deprived areas, those of non-European ethnic origin, females and those in urban areas

During 1990-05, hospital admissions for TB in Canterbury were generally lower than the NZ average and during 1990-03 there were no deaths attributed to TB in the region. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

THE HEALTH STATUS OF YOUNG PEOPLE 15-24 YEARS

Hospital Admissions and Mortality

In Canterbury during 2001-03 injury / poisoning followed by suicide were the leading causes of death in young people, while during 2003-05 pregnancy and childbirth were the leading causes of hospital admission. In terms of other hospital admissions, injuries followed by abdominal / pelvic pain were the leading causes of acute admissions, while mental health issues followed by immune disorders were the leading reasons for arranged admission. Surgery on the tonsils and adenoids, followed by procedures on the skin and subcutaneous tissue were the leading causes of waiting list admissions for those 15-24 years.

Injuries

During the past 3 years for which data was available, injuries arising from mechanical forces (e.g. striking against an object or person), followed by falls were the leading causes of hospital admission amongst NZ young people. As a group however, transport accidents accounted for 23.9% of all injury related admissions, with over half of these occurring while young people were the occupants of vehicles. The leading cause of injury related death was transport accidents, with the majority of injuries again occurring while young people were the occupants of a vehicle. Suicide was the second leading cause of death, with deaths from assault being a distant third. In Canterbury during this period the pattern was similar, with

mechanical forces, followed by falls being the leading causes of hospital admission and transport accidents followed by suicide being the leading causes of death. In comparative terms, during 1990-05 hospital admissions due to injury amongst Canterbury young people were consistently lower than the NZ average, while injury mortality during 1990-03 was either similar to or lower than the NZ average. Despite this, a total of 561 young people died as a result of injuries in Canterbury between 1990 and 2003. During 1996-05, injury related hospital admissions in Canterbury were higher amongst European and Pacific > Māori > Asian / Indian young people.

In NZ during 1988-05, hospital admissions and deaths from land transport accidents declined amongst young people 15-24 years. Land transport accidents however were not uniformly distributed by age, with both hospital admissions and deaths rising progressively during adolescence to a peak at 17-18 years of age. Hospital admissions were also higher amongst European and Māori young people, those living in the most deprived areas, males and those in rural areas. In Canterbury during 1990-05, hospital admissions due to land transport accidents were consistently lower than the NZ average, while mortality rates during 1990-03 were either similar to or lower than the NZ average. Despite this, during 1990-03 a total of 247 young people died as a result of land transport accidents in Canterbury.

In contrast to falling land transport accident rates, hospital admissions due to assault in NZ changed little during 1988-05. Mortality trends however were more difficult to interpret due to the smaller number of cases involved. While admissions due to assault were much higher for young men, gender differences in mortality were much less marked, particularly during the teenage years. During 2001-05, assault admissions were also higher for Māori and Pacific young people, those living in the most deprived areas and those in rural areas. In Canterbury during 1990-05, admission rates for assault amongst young people declined, with rates being consistently lower than the NZ average during the last 12 years for which data was available. Despite this, a total of 15 young people died as a result of an assault in Canterbury during 1990-03.

Youth Mental Health

The reasons why young people sought help from Youthline's Helpline Service in 2005-06 suggest that the mental health issues facing young people are diverse and include concerns about interpersonal relationships, difficulties with employment, issues relating to pregnancy, miscarriage and sexuality, eating disorders, family problems and substance abuse. In contrast, the most common reasons for mental health admissions amongst NZ young people 15-24 years during 2000-04 were schizophrenia, followed by depression and bipolar affective disorder. While admission rates tended to increase with age for the majority of mental health issues, this trend was most marked with those admitted with schizophrenia. In addition, the risk factors for these 3 conditions varied markedly, with hospital admissions for schizophrenia being more frequent amongst males, Māori and Pacific young people and those living in the most deprived areas. In contrast, for depression hospital admissions were more frequent amongst females and European young people, with few differences being seen by NZDep decile. Finally, risk of bipolar affective disorder was inconsistently elevated amongst those in the more deprived areas and there was no association with gender, although rates were higher amongst Māori young people.

In Canterbury during 2000-04, the most common reason for an inpatient admission with a mental health issue was depression, followed by bipolar affective disorder. While rates for a number of these admission categories appear to be higher than the NZ average, such figures are difficult to interpret, as many mental health services in NZ are offered on an outpatient

basis, and thus access to inpatient mental health services may fail to accurately reflect the true burden of disease, or access to such services in an ambulatory care setting.

Suicide and Self Harm

NZ's youth suicide rates increased rapidly during the early 1990s, reached a peak in 1996 and thereafter began to decline. While a similar phenomenon occurred for self-inflicted injury admissions during the early-mid 1990s, during the last 8 years for which data was available, admissions for self-inflicted injuries have remained relatively static. While NZ's suicide rates during 1999-03 were highest amongst young men in their early 20s, hospital admissions for self-inflicted injury were highest amongst young women in their mid to late teens. During 2001-05, suicide rates were also higher for Māori young people and those living in rural areas.

During 1990-05, hospital admissions for self inflicted injury in the Canterbury were generally higher than the NZ average. While suicide rates were higher than the NZ average during the early-mid 1990s, rates were more similar to the NZ average during the past 6 years for which data was available. Despite this, during 1990-03 there were a total of 221 suicide deaths amongst young people in the Canterbury region. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

Sexually Transmitted Infections

While no rate data was able to be extrapolated from Sexual Health and Family Planning Clinic data, clinic bases surveillance suggests that chlamydia, gonorrhoea, genital warts and genital herpes were all relatively common infections amongst Canterbury young people during 2001-05.

Teenage Pregnancy

While NZ's teenage birth rates declined during 1980-04, teenage pregnancies did not, with a gradual increase in the number of teenagers seeking a therapeutic abortion. Thus by 2004, for every woman giving birth in her teenage years, there was one corresponding therapeutic abortion. During 2001-05, teenage birth rates in NZ were highest amongst Māori and Pacific women, those living in the most deprived areas and those living in rural areas. Higher teenage birth rates amongst Māori and Pacific women resulted from both a shift to the left in the maternal age distribution (i.e. towards birth at a younger age), as well as from higher overall fertility rates amongst Māori and Pacific women.

During 1990-05, Canterbury's teenage birth rates were consistently lower than the NZ average, while during 1996-05, teenage birth rates in Canterbury were highest amongst Māori > Pacific > European > Asian / Indian women.

**THE POTENTIAL INFLUENCE OF
REGIONAL DEMOGRAPHY
ON CHILD & YOUTH
HEALTH OUTCOMES
IN CANTERBURY**

DHB DEMOGRAPHY

Introduction

Subsequent sections of this report present a review of the health status of children and young people in Canterbury and how their health outcomes compare with the NZ average. National level analyses within each section also demonstrate the profound influence factors such as age, ethnicity and socioeconomic deprivation have on the distribution of child and youth health outcomes at a population level. While Year 2 of this series will consider the issue of socioeconomic deprivation (e.g. regional income, education, employment) in more detail, for the purposes of interpreting this year's report, it is worthwhile reviewing the basic sociodemographic composition of the Canterbury DHB population, so that the regional variations highlighted in this report, can be interpreted within their broader context.

The following section thus begins by comparing the age, ethnic and NZDep distribution of the Canterbury DHB child and youth population with the NZ average at the time of the 2001 Census. It then goes on to review the impacts ethnicity and NZDep had on the distribution of child and youth health outcomes at a national level. For this purpose, summary tables are presented which rank each of the outcomes presented in this report by their socioeconomic and ethnic gradients, allowing the reader to combine a knowledge of their local region's demography, with an understanding of the ways in which ethnicity and socioeconomic circumstances interact to influence the distribution of health outcomes at a regional level.

Notes on Data Sources and Statistical Methods

The demographic information in this section is based on the NZ usual resident population at the time of the 2001 Census. Ethnicity is based on Statistics NZ's prioritised ethnicity groupings (Appendix 6) and the NZ Deprivation Index decile distributions are derived from NZDep 2001 (matched to DHB catchment at the Census Area Unit level). The methods for calculating the relative risks presented in the summary tables that follow are described in more detail in the various sections of the report to which the respective indicators pertain.

Overview of DHB Demography

At the time of the 2001 census there were 86,124 children and 59,028 young people residing in the Canterbury DHB. While the proportion of European children and young people was higher than the NZ average, the proportion of Māori and Pacific children and young people was lower (**Table 1**).

While the proportion of children and young people living in the most affluent areas (NZDep deciles 1-2) was higher than the NZ average, the proportion of children and young people living in the most deprived areas (NZDep decile 10) was much lower (**Figure 2**). In addition, the distribution of children and young people by NZDep also varied by ethnicity, with 43.9% of Pacific, 31.4% of Māori and 17.4% of European children and young people living in the more deprived areas (NZDep deciles 8-10), as compared to 73% of Pacific, 57% of Māori and 24% of European children and young people at a national level.

Table 1. The Distribution of Children and Young People in NZ and Canterbury by Ethnicity at the 2001 Census.

Ethnic Group	New Zealand		Canterbury	
	Number	%	Number	%
Children 0-14 Years				
European	496,626	58.6	66858	77.6
Māori	196,470	23.2	10554	12.3
Pacific	69,597	8.2	2460	2.9
Asian / Indian	50,946	6.0	3705	4.3
Other	6,449	0.8	618	0.7
Not Stated	27,651	3.3	1929	2.2
Total	847,739	100.0	86124	100.0
Young People 15-24 Years				
European	305,361	60.5	45099	76.4
Māori	91,614	18.1	5394	9.1
Pacific	35,415	7.0	1458	2.5
Asian / Indian	48,843	9.7	5046	8.5
Other	4,281	0.9	471	0.8
Not Stated	19,527	3.9	1560	2.6
Total	505,041	100.0	59028	100.0
Total 0-24 Years				
Total	1,352,780	100.0	145152	100.0

Figure 1. Distribution of Children and Young People in the Canterbury Region by Age and Ethnicity at the 2001 Census.

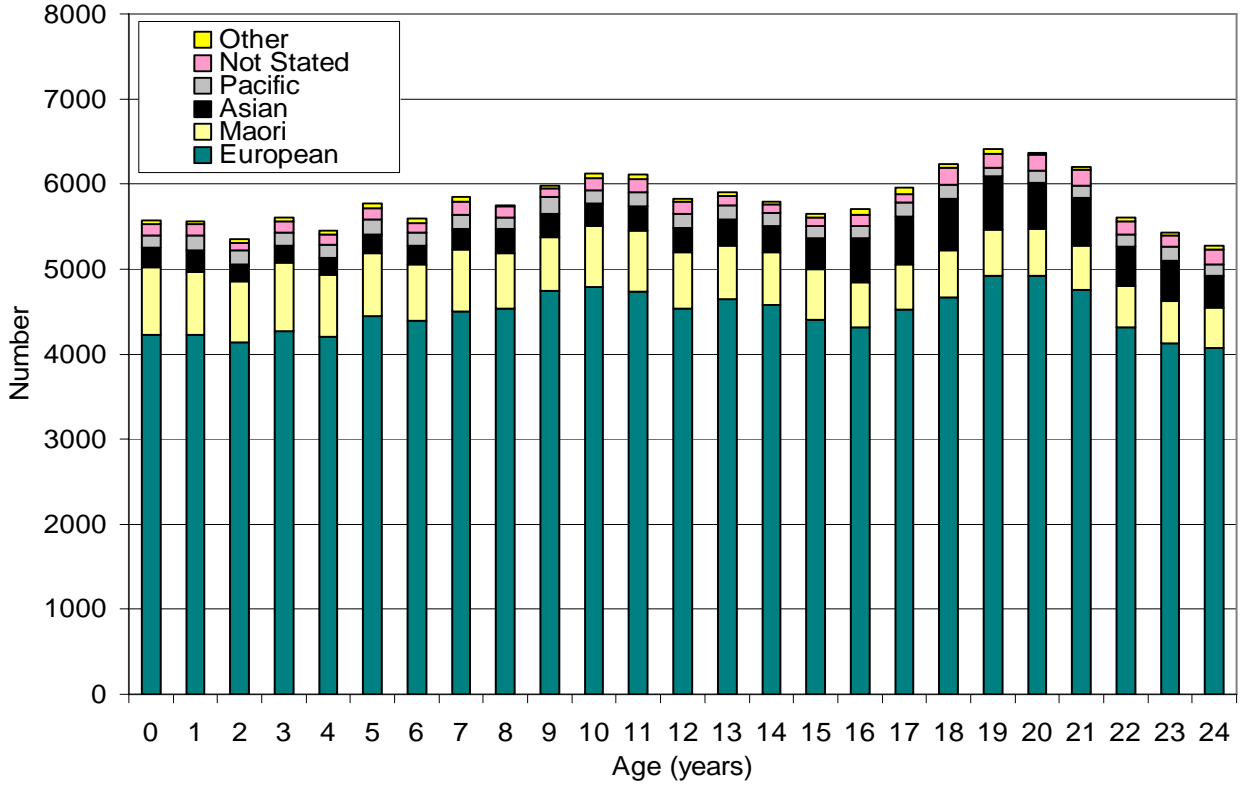
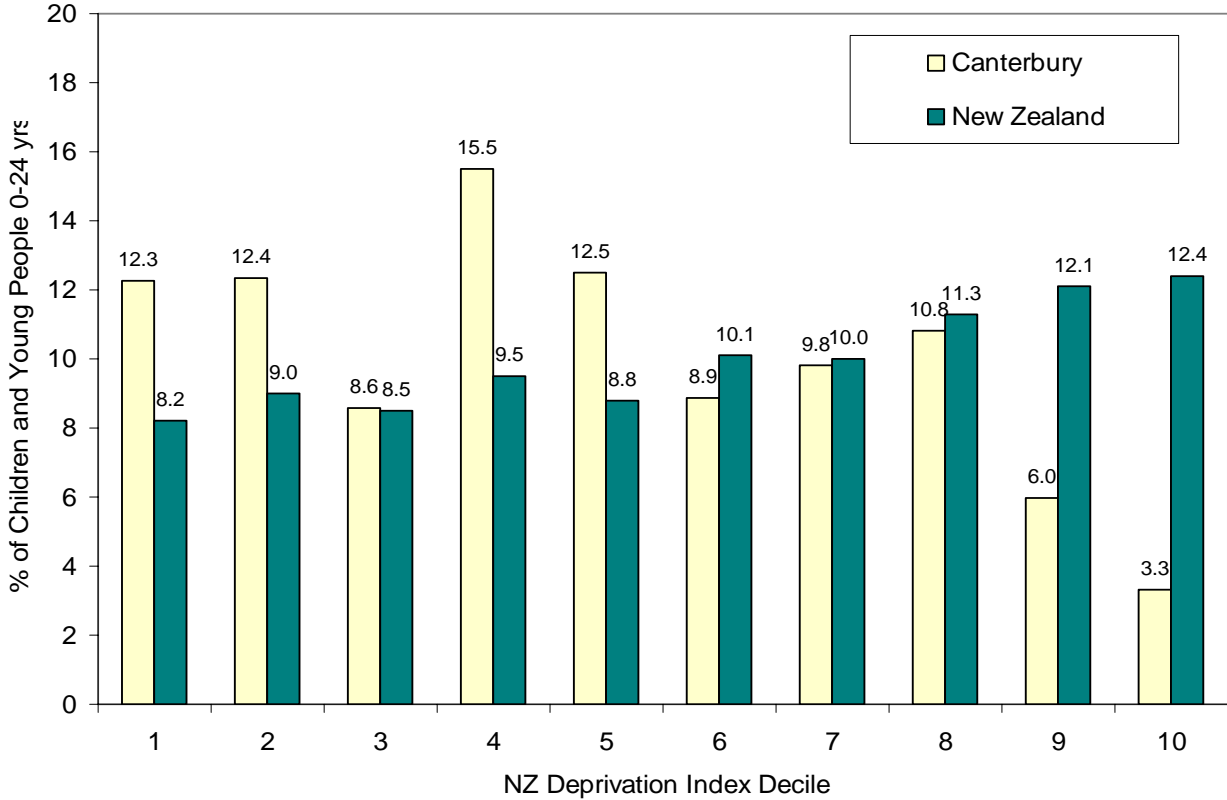


Figure 2. Distribution of Children and Young People at the 2001 Census by NZ Deprivation Index Decile, Canterbury vs. New Zealand.



In Summary

At the time of the 2001 census there were 86,124 children and 59,028 young people residing in Canterbury DHB. While the proportion of European children and young people was higher than the NZ average, the proportion of Māori and Pacific children and young people was lower. In addition, the proportion of children and young people living in the most affluent areas (NZDep deciles 1-2) was higher than the NZ average, while the proportion of children and young people living in the most deprived areas (NZDep deciles 9-10) was much lower.

The distribution of children and young people by NZDep also varied by ethnicity, with 43.9% of Pacific, 31.4% of Māori and 17.4% of European children and young people living in the more deprived areas (NZDep deciles 8-10), as compared to 73% of Pacific, 57% of Māori and 24% of European children and young people nationally. Such figures potentially suggest that for health outcomes for which there are marked socioeconomic or ethnic disparities, rates for Canterbury children and young people are likely to be lower than the NZ average.

THE LIKELY EFFECTS OF DHB DEMOGRAPHY ON HEALTH OUTCOMES AT A REGIONAL LEVEL

While the planning and delivery of appropriate health services may go some way to meeting the health needs of a regional population, it is likely that that in many cases the size and scope of these health needs will be profoundly influenced by the age structure, geography and socioeconomic status of those living within the region. In the case of Canterbury DHB, as the previous section has suggested, while the region has a higher proportion of European children and young people than the NZ average, it has a lower proportion of Māori and Pacific children and young people. In addition, once its largest ethnic groups were broken down by NZDep decile, the proportion of Māori, Pacific and European children and young people living in the most deprived (decile 8-10) NZDep areas was lower than the NZ average.

In attempting to understand the reasons for the size and scope of the health needs experienced by Canterbury DHB's children and young people, it is necessary to combine this knowledge of DHB demography with the information contained in the two tables which follow (**Table 2**, **Table 3**), which summarise the effects NZDep deprivation and ethnicity had on the distribution of child and youth health outcomes at a national level. A brief perusal of these tables would suggest that Canterbury, with its lower proportions of Māori and Pacific children and young people might as a consequence, have lower rates of those conditions for which ethnic disparities are most marked (e.g. rheumatic fever, bronchiectasis). Similarly, the lower proportions of Canterbury children and young people living in the most deprived areas would suggest that for conditions where the key determinant is relative socioeconomic deprivation, Canterbury children and young people should experience lower rates than the NZ average. While it is beyond the scope of this section to undertake such an analysis for each of the indicators presented in this report, where the health outcomes of Canterbury children and young people vary significantly from the NZ average, it may be worthwhile for the reader to undertake such an analysis, in order to determine the likely contribution population demography had on shaping the burden of disease at the regional level.

Data Sources and Statistical Methods

The following tables review the distribution of child and youth health outcomes in NZ by Deprivation Index decile and ethnicity. The tables are based on the Relative Risks calculated in the later sections of this report, and are for the total NZ population for the period 2001-2005 (due to space constraints 95% confidence intervals are provided only in the original sections of this report). The relative risks are calculated by dividing the rate of a particular outcome e.g. rheumatic fever, in the category of interest (e.g. Decile 10) by the rate in the reference (usually the lowest risk) category (e.g. Decile 1), thus providing an estimate of how many times higher the risk of disease is in one category compared to another.

While a comparison of risk between those in Decile 1 (the most affluent 10% of small areas) and Decile 10 (the most deprived 10% of small areas), i.e. the "Social Gradient (10)", is likely to provide the most sensitive assessment of the effects of socioeconomic deprivation, where numbers are small (total number of outcomes <1,000), comparisons between Decile 1-2 (the most affluent 20% of small areas) and Deciles 9-10 (the most deprived 20% of small areas), i.e. the "Social Gradient (20)", are likely to yield a more stable statistical estimate. Thus where possible the "Social Gradient (10)" should be used to assess / compare the likely impacts of socioeconomic disadvantage on child and youth health outcomes, but for relatively rare outcomes, the "Social Gradient (20)" should be used instead, both to assess the magnitude of the likely effect and to compare this with other child and youth health indicators (i.e. "Social Gradient (20)" estimates should only be compared with other "Social Gradient (20)" estimates, not with "Social Gradient (10)" estimates, which are measuring slightly different effects.

Table 2. NZDep Index Decile and Child & Youth Health Outcomes, New Zealand 2001-2005 (Admissions) / 1999-2003 (Deaths).

Indicator	*Social Gradient (10)			*Social Gradient (20)		
	Decile 1	Decile 5	Decile 10	Decile 1-2	Decile 5-6	Decile 9-10
Infants <1 Year						
Preterm Birth	1.00	1.08	1.21	1.00	1.09	1.17
SGA Birth	1.00	1.14	1.63	1.00	1.18	1.57
Infant Mortality: Congenital Anomalies				1.00	1.09	1.34
Infant Mortality: Preterm & Perinatal				1.00	1.20	1.82
Pertussis Admissions<1yr				1.00	1.23	2.98
Bronchiolitis Admissions <1yr	1.00	1.47	5.08	1.00	1.55	4.13
Infant Mortality: SIDS				1.00	3.2	8.66
Children 0-14 Years						
Gastroenteritis Admissions	1.00	1.10	1.61	1.00	1.20	1.69
Land Transport Accident Admissions	1.00	1.26	1.78	1.00	1.26	1.72
Ambulatory Sensitive Admissions	1.00	1.31	2.20	1.00	1.35	2.15
Asthma Admissions	1.00	1.37	2.60	1.00	1.52	2.65
Pneumonia Admissions	1.00	1.31	3.68	1.00	1.42	3.27
Skin Infections Admissions	1.00	1.24	3.94	1.00	1.40	3.53
Child Abuse Admissions				1.00	1.72	4.00
Young People 15-24 Years						
Carcinoma in Situ of the Cervix	1.00	1.32	1.08	1.00	1.48	1.32
Land Transport Accident Admissions	1.00	1.23	1.51	1.00	1.14	1.31
Youth Suicide Deaths				1.00	1.38	1.29
Ambulatory Sensitive Admissions	1.00	1.19	1.84	1.00	1.19	1.61
Skin Infection Admissions	1.00	1.19	1.90	1.00	1.27	1.66
Teenage Births	1.00	3.14	10.02	1.00	2.93	6.50
Children and Young People 0-24 Years						
Meningococcal Disease Admissions	1.00	1.91	4.78	1.00	1.66	3.96
Tuberculosis Admissions				1.00	2.06	4.50
Bronchiectasis Admissions	1.00	1.85	11.88	1.00	2.44	8.37
Acute Rheumatic Fever Admissions				1.00	3.13	13.56

Note: Relative Risk compares risk to children and young people living in the most affluent areas (NZDep deciles 1-2). Relative Risks are unadjusted. *Social Gradient: see methods section.

Table 3. Ethnicity and Child and Youth Health Outcomes, New Zealand 2001-2005 (Admissions) / 1999-2003 (Deaths)

Indicator	Māori	Pacific	European	Asian / Indian
Infants <1 Year				
Infant Mortality: Congenital Anomalies	0.97	1.23	1.00	0.99
Preterm Birth	1.12	0.95	1.00	Asian 0.96 Indian 1.20
Infant Mortality: Preterm & Perinatal	1.32	1.59	1.00	0.71
SGA Birth	1.59	0.82	1.00	Asian 1.66 Indian 3.72
Pertussis Admissions <1yr	2.65	3.55	1.00	0.43
Bronchiolitis Admissions <1yr	3.48	5.04	1.00	0.58
Infant Mortality: SIDS	5.71	1.74	1.00	0.69
Children 0-14 Years				
Gastroenteritis Admissions	0.88	1.49	1.00	1.15
Land Transport Accident Admissions	1.22	0.78	1.00	0.46
Ambulatory Sensitive Admissions	1.42	2.04	1.00	0.86
Asthma Admissions	2.14	3.05	1.00	1.15
Pneumonia Admissions	2.08	5.09	1.00	1.05
Skin Infection Admissions	2.79	4.49	1.00	0.94
Child Abuse Admissions	2.83	2.58	1.00	0.71
Young People 15-14 years				
Carcinoma in Situ of the Cervix	0.68	0.16	1.00	0.10
Land Transport Accident Admissions	1.06	0.49	1.00	0.35
Ambulatory Sensitive Admissions	1.34	1.28	1.00	0.45
Skin Infection Admissions	1.30	1.25	1.00	0.27
Youth Suicide Deaths	1.83	1.22	1.00	0.75
Teenage Births	5.08	2.97	1.00	0.36
Children and Young People 0-24 Years				
Meningococcal Disease Admissions	2.34	4.46	1.00	0.30
Bronchiectasis Admissions	4.23	11.32	1.00	0.47
Acute Rheumatic Fever Admissions	24.2	54.58	1.00	1.24
Tuberculosis Admissions	10.23	43.16	1.00	50.26

Note: Relative Risk Compares Risk to European Children and Young People. Relative Risks are unadjusted.

**HEALTH STATUS IN THE
PERINATAL PERIOD
& FIRST YEAR
OF LIFE**

INTRODUCTION

By Professor Barry Taylor

A recent movie is entitled "the butterfly effect". The more technical expression of this understanding which derives from CHAOS theory is "sensitive dependence on initial conditions" (Lorenz, New York Academy of Sciences, 1963).

The following information gives us a picture of the current "initial conditions" experienced by infants in New Zealand. It is more important than most aspects of adult experience because a small event in infancy can dramatically affect adult experience.

Recent evidence strongly supports the importance of the first 3 years of life setting the tone and trajectory for life and thus, we need to look carefully at the experience of infants in New Zealand and make sure that we set our sights high in the care of infants. This report begins to tell us, often at a relatively superficial level, what this is and gives us some objective measures to discover trends over time.

Many important variables are not measured routinely or are not available. Perhaps, most important of these are measures that relate to early psychological processes, and in particular infant attachment or bonding. It will be a challenge for the future for us as a society to look carefully at how well we are doing - this is a good beginning.

BIRTHS

Introduction

As in other developed countries, the fertility rates of NZ women are declining. On only 2 occasions during the past 20 years have NZ's fertility rates risen above replacement levels [1]. While fewer NZ women in their teens and 20s are having children, births to those over 30 years are increasing. Fertility rates also vary significantly by ethnicity, with Māori and Pacific women having both higher fertility rates and on average younger maternal ages than women of European origin [2].

The following section briefly reviews the numbers of births occurring in the Canterbury Region during the past 10 years, as well the ethnic and NZDep distribution of births during 2005. Additional detail on ethnic specific fertility rates is provided in a later section of this report, which explores teenage birth rates at a national and regional level.

Notes on Data Sources and Statistical Methods

The birth information in this section was derived from the Birth Registration Dataset (Appendix 1) which contains information on all live and stillborn babies 20+ weeks gestation born in New Zealand. In this analysis births are presented by birth registration year rather than year of birth, ethnicity is that supplied by parents on their child's birth registration form and NZDep Index decile is based on the usual residential address at the time of birth registration.

Births in New Zealand and the Canterbury Region

Table 4. Annual Number of Births by Baby's Ethnic Group, Canterbury 1996-2005.

Year	European	Māori	Pacific	Asian	Indian	Other	Total
1996	4262	834	182	187	25	48	5538
1997	4359	850	188	216	37	33	5683
1998	3804	721	185	189	19	54	4972
1999	4208	811	193	236	27	46	5593
2000	4173	884	203	239	20	46	5565
2001	4356	821	185	221	24	64	5671
2002	4009	866	175	224	29	51	5354
2003	4198	860	216	310	36	65	5685
2004	4135	1076	228	340	55	81	6095
2005	4434	940	248	319	51	87	6079

Table 5. Distribution of Births by Baby's Ethnic Group, NZ and Canterbury 2005.

Baby's Ethnicity	New Zealand		Canterbury Region	
	Number	% of births	Number	% of births
European	29273	49.6	4434	72.9
Māori	17094	29.0	940	15.5
Pacific	6278	10.6	248	4.1
Asian	3627	6.1	319	5.2
Indian	1913	3.2	51	0.8
Other	827	1.4	87	1.4
Total	59012	100.0	6079	100.0

Table 6. Distribution of Births by NZDep Index Decile, NZ and the Canterbury Region 2005.

NZ Deprivation Index Decile	New Zealand		Canterbury Region	
	Number	% of births	Number	% of births
1	4478	7.6	734	12.1
2	4870	8.3	757	12.4
3	4772	8.1	471	7.7
4	5300	9.0	983	16.1
5	4838	8.2	787	12.9
6	5909	10.0	489	8.0
7	5691	9.7	589	9.7
8	7165	12.2	699	11.5
9	7362	12.5	374	6.1
10	8436	14.3	204	3.4
Total	58821	100.0	6087	100.0

In Summary

During 1996-05, the number of births in the Canterbury Region gradually increased (**Table 4**). During 2005, while the proportion of European babies born in Canterbury was higher than the NZ average, the proportion of Māori, Pacific and Indian babies born was lower (**Table 5**). During the same period, the proportion of Canterbury babies born into the most deprived areas (NZDep decile 9-10) was much lower than the NZ average, while the proportion born into the most affluent areas (NZDep decile 1-2) was higher (**Table 6**).

LOW BIRTH WEIGHT

Introduction

Low Birth Weight (LBW) defined as a birth weight <2,500g, is determined by two factors, the duration of gestation and fetal growth. Babies are born LBW either because they are preterm (<37 weeks) or because they have failed to grow adequately in utero. LBW is a frequently used perinatal indicator in developing countries as it predicts neonatal morbidity and mortality, is easy to measure and requires no knowledge of pregnancy duration. In developed countries however, where access to ultrasound scanning and antenatal care is readily available, it has been suggested that combining preterm birth and fetal growth restriction into a single indicator hinders preventative interventions, as the causes of the two conditions differ [3]. Thus in the following section, preterm birth and fetal growth restriction will be treated as separate entities and their distributions and risk factor profiles reviewed in turn.

Preterm Birth

Definition: Birth <37 completed weeks of gestation.

NZ's preterm birth rates are increasing, with the largest increases occurring amongst European / Other women [2] and those in the most affluent NZDep small areas [4]. Preterm rates are highest amongst Indian>Māori>European>Asian>Pacific women and are marginally elevated amongst those in the most deprived areas [2]. While infants born prematurely have higher neonatal mortality and morbidity, it is difficult to determine whether NZ's rising preterm rates will have detrimental impacts, as it is difficult to determine whether increases are due to increasing obstetric intervention and the selective delivery of high risk babies (as occurs overseas) or whether they reflect a true rise in spontaneous preterm birth [5].

Intrauterine Growth Restriction / Small for Gestational Age

Definition: Intrauterine growth restriction (IUGR) refers to a baby who has failed to reach its full in-utero growth potential. Because a baby's growth potential is often unknown, small for gestational age (SGA: birth weight <10th percentile for gestational age), is often used as a proxy for IUGR in statistical reports.

NZ's SGA rates have decreased in recent years, with the largest decreases occurring amongst Pacific and Māori women. Using NZ population percentile charts, SGA rates are highest amongst Indian>Asian>Māori>European>Pacific women and are significantly elevated amongst those living in the most deprived areas [2]. Other known risk factors include maternal smoking and poor nutritional status [6]. While NZ's SGA rates are decreasing, socioeconomic disparities in SGA are not. This is of concern as SGA has been associated with higher neonatal morbidity and mortality and it has been suggested that babies who are growth restricted at birth have a greater risk of coronary heart disease and diabetes in later life [7].

Notes on Data Sources and Statistical Methods

The information on birth outcomes in this section was derived from the Birth Registration Dataset (Appendix 1) which contains information on all live and stillborn babies 20+ weeks gestation born in New Zealand. In this analysis the dataset was limited to singleton live births 20+ weeks gestation (i.e. multiple pregnancies and stillborn babies were excluded). Preterm births included all live born babies 20-36 weeks gestation, while SGA rates (birth weight <10th percentile for gestational age) were calculated using birth weight percentile charts derived from New Zealand birth registration data for the years 1990-1991 [8]. Because of rising birth weights since this time however, SGA rates in later years may be lower than the conventional 10%. Baby's ethnicity was that as supplied by parents on their child's birth registration form.

Adverse Birth Outcomes in NZ: Trends and Risk Factors

In NZ during 1980-05, rates of preterm birth increased, while rates of small for gestational age (SGA) declined. In contrast, rates of low birth weight remained relatively static during this period (**Figure 3**).

During 2001-05, rates of preterm birth were highest among Indian and Māori babies and those in the most deprived areas (**Table 7**). Similarly, rates of SGA were highest among Indian, Asian and Māori babies and those living in the most deprived areas (**Table 8**).

Table 7. Risk Factors for Preterm Birth, NZ Singleton Live Births 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	5.62	1.00	0.92-1.09	1-2	5.69	1.00	0.95-1.06
2	5.75	1.02	0.94-1.10	3-4	5.72	1.00	0.95-1.06
3	5.60	1.00	0.92-1.08	5-6	6.26	1.09	1.03-1.15
4	5.82	1.03	0.95-1.11	7-8	6.37	1.11	1.05-1.17
5	6.07	1.08	1.00-1.17	9-10	6.70	1.17	1.11-1.23
6	6.41	1.13	1.05-1.22	Baby's Ethnicity			
7	6.48	1.14	1.06-1.23	Māori	6.79	1.12	1.08-1.16
8	6.28	1.11	1.03-1.19	Pacific	5.69	0.95	0.90-1.00
9	6.52	1.15	1.07-1.23	European	6.02	1.00	
10	6.85	1.21	1.13-1.30	Asian	5.74	0.96	0.90-1.03
				Indian	7.35	1.20	1.10-1.31
Urban Rural				Gender			
Urban	6.30	1.00		Male	6.60	1.13	1.10-1.16
Rural	6.06	0.97	0.94-1.00	Female	5.82	1.00	

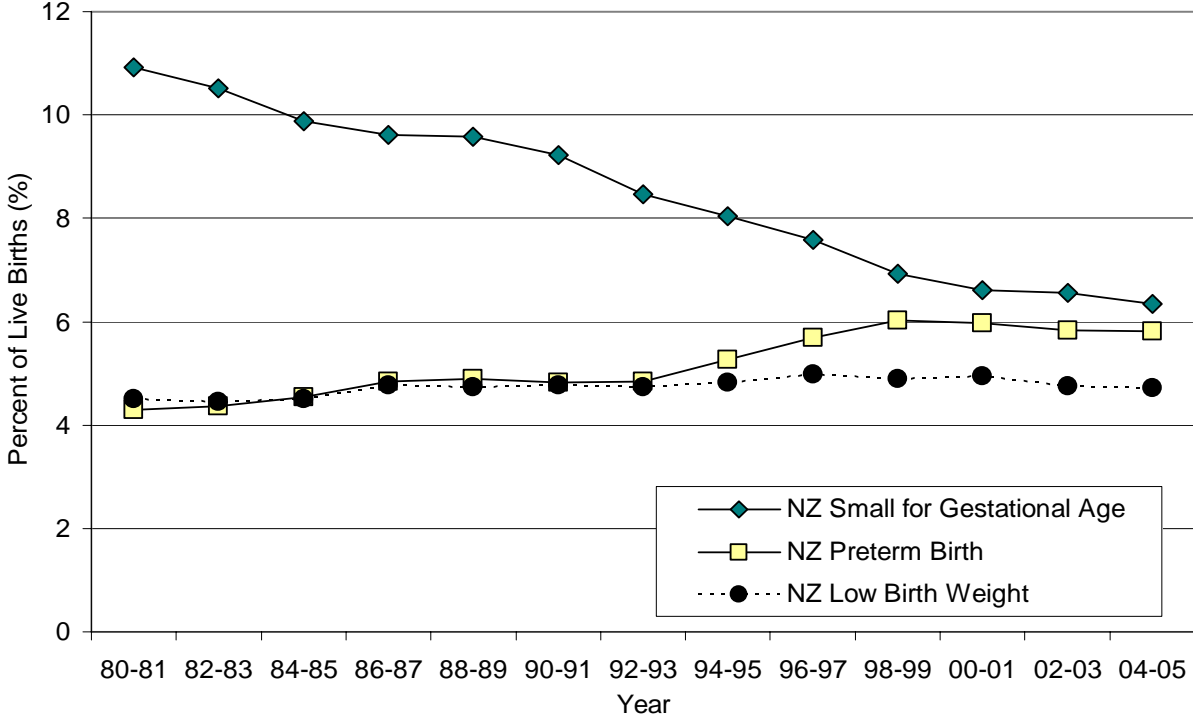
* rate per 100 live births per year, relative risks are unadjusted

Table 8. Risk Factors for Small for Gestational Age, NZ Singleton Live Births 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	5.15	1.00	0.92-1.09	1-2	5.32	1.00	
2	5.48	1.06	0.98-1.15	3-4	5.84	1.09	1.03-1.15
3	5.80	1.12	1.03-1.22	5-6	6.32	1.18	1.12-1.25
4	5.88	1.13	1.04-1.22	7-8	7.60	1.40	1.33-1.47
5	5.91	1.14	1.05-1.24	9-10	8.60	1.57	1.50-1.65
6	6.67	1.28	1.19-1.38	Baby's Ethnicity			
7	7.14	1.36	1.26-1.47	Māori	8.91	1.59	1.54-1.64
8	7.98	1.51	1.41-1.62	Pacific	4.41	0.82	0.77-0.87
9	8.53	1.60	1.49-1.72	European	5.42	1.00	
10	8.67	1.63	1.52-1.75	Asian	9.33	1.66	1.57-1.75
				Indian	23.64	3.72	3.53-3.92
Urban Rural				Gender			
Urban	7.05	1.00		Male	7.11	1.04	1.01-1.07
Rural	6.80	0.97	0.94-1.00	Female	6.83	1.00	

* rate per 100 live births per year, relative risks are unadjusted

Figure 3. Rates of Small for Gestational Age, Preterm Birth & Low Birth Weight, NZ Singleton Live Births 1980-2005.



Adverse Birth Outcomes in the Canterbury Region

Figure 4. Rates of Preterm Birth and Small for Gestational Age, Canterbury vs. New Zealand for Singleton Live Births 1980-2005.

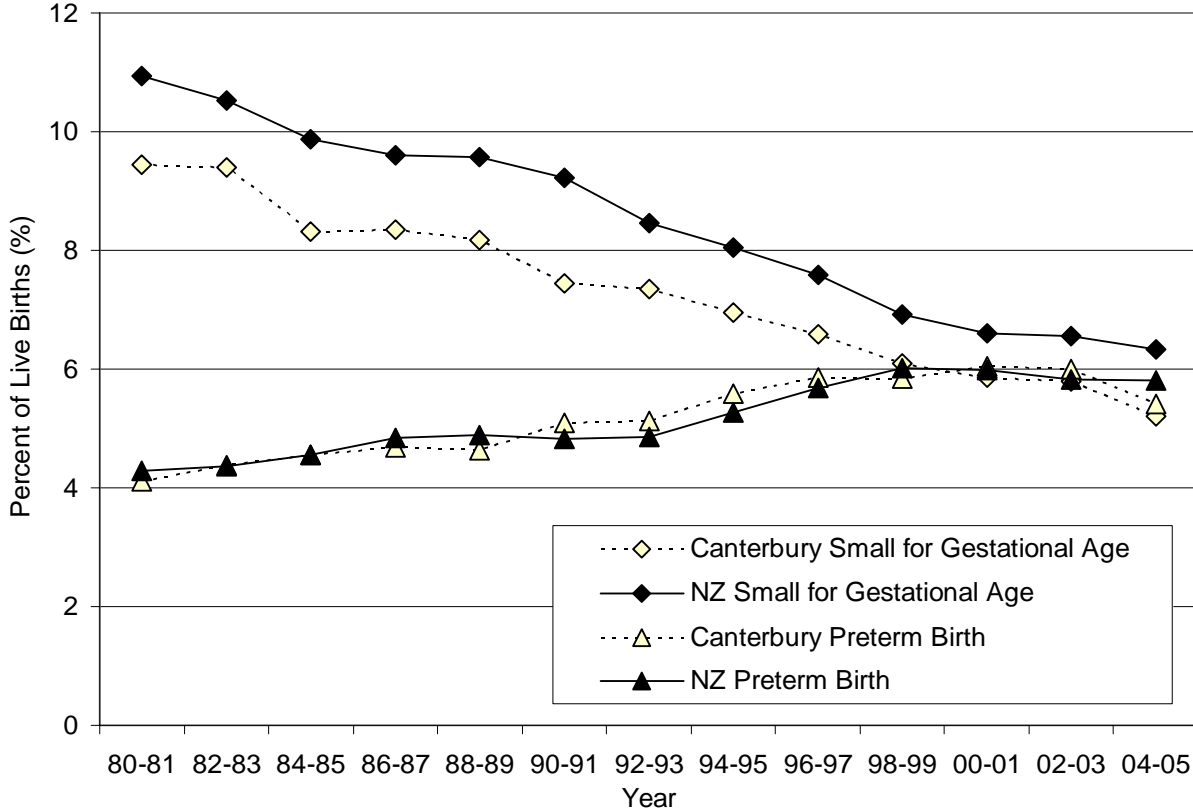


Figure 5. Rates of Small for Gestational Age by Baby's Ethnic Group, Canterbury Singleton Live Births 1996-2005.

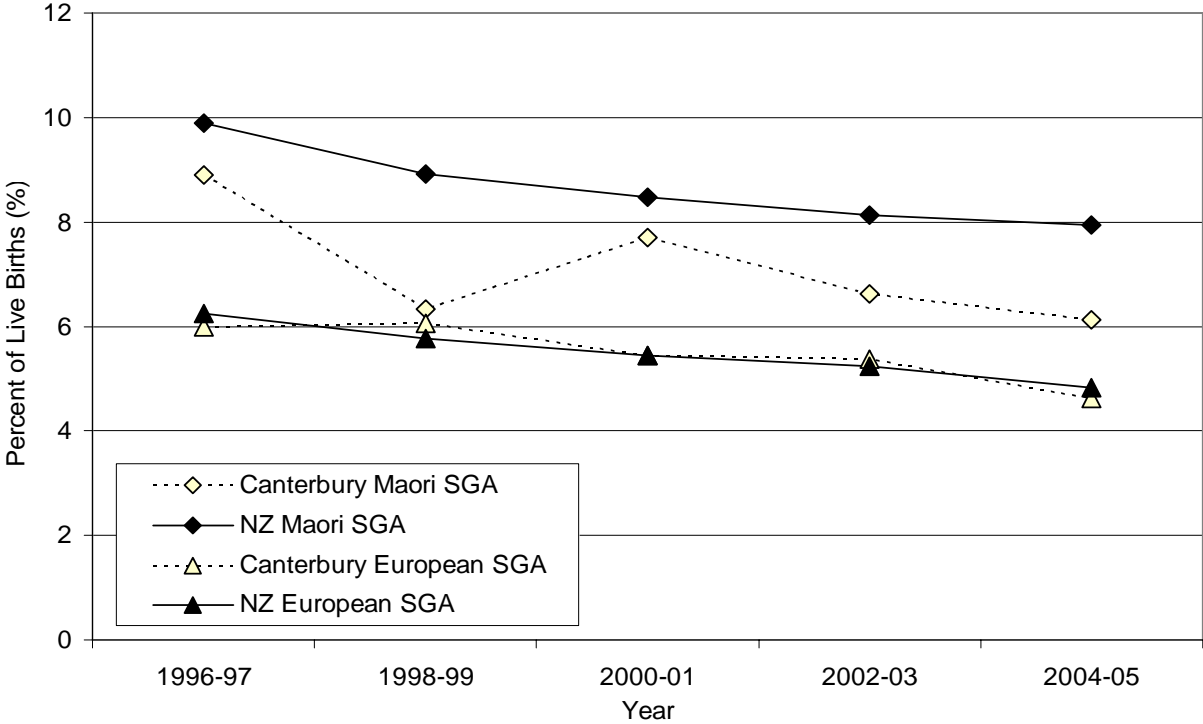
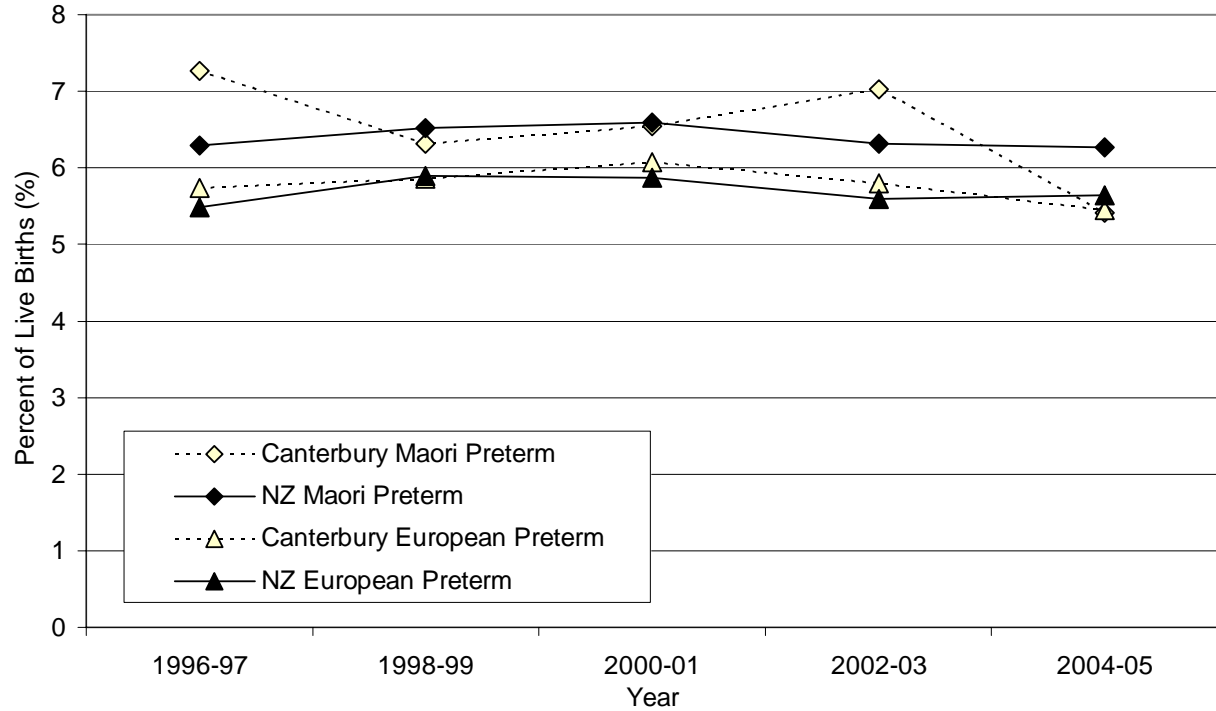


Figure 6. Rates of Preterm Birth by Baby's Ethnic Group, Canterbury Singleton Live Births 1996-2005.



During 1980-2005, rates of preterm birth in the Canterbury Region increased, while rates of small for gestational age declined. Both trends were consistent with those occurring nationally. Throughout this period, rates of SGA in Canterbury were lower than the NZ average, while rates of preterm birth were similar (**Figure 4**).

During 1996-05, rates of SGA amongst Canterbury Māori babies were lower than the NZ Māori average, while rates for Canterbury European babies were similar (**Figure 5**). For preterm birth, rates amongst Canterbury Māori and European babies were very similar to their respective ethnic specific averages (**Figure 6**). Despite this, ethnic disparities in birth outcome were evident in the Canterbury region, with rates of SGA and preterm birth being generally higher for Māori than for European babies during this period.

In Summary

In NZ during 1980-05, rates of preterm birth increased, while rates of small for gestational age (SGA) declined. In contrast, rates of low birth weight remained relatively static. During 1996-05, rates of preterm birth were highest amongst NZ Indian and Māori babies and those living in the most deprived areas. Rates of SGA were highest amongst NZ Indian, Māori and Asian babies and those living in the most deprived areas.

During 1980-05, rates of preterm birth in Canterbury increased, while rates of small for gestational age declined. Both trends were consistent with those occurring nationally. Throughout this period, rates of SGA in Canterbury were lower than the NZ average, while rates of preterm birth were similar. During 1996-05, rates of SGA amongst Canterbury Māori babies were lower than the NZ Māori average, while rates for Canterbury European babies were similar. For preterm birth, rates amongst Canterbury Māori and European babies were very similar to their respective ethnic specific averages. Despite this, ethnic disparities in birth outcome were evident in Canterbury, with rates of SGA and preterm birth being generally higher for Māori than for European babies during this period.

BREASTFEEDING

Introduction

Breastfeeding meets a term infant's nutritional needs for the first 4-6 months of life, as well as providing protection against conditions such as diarrhoea, respiratory infections, otitis media, SIDS, diabetes, Chron's disease, asthma and atopy [9]. The WHO recommends "*exclusive breastfeeding for 6 months, with introduction of complementary food and continued breastfeeding thereafter*" (WHO 2001).

In 1999 the Ministry of Health adopted the following breastfeeding definitions [10].

Exclusive	The infant has never had, to the mother's knowledge, any water, formula or other liquid or solid food. Only breast milk, from the breast or expressed, and prescribed medicines have been given from birth.
Fully	The infant has taken breast milk only and no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours (matches WHO exclusive rate indicator)
Partial	The infant has taken some breast milk and some infant formula or other solid food in the past 48 hours.
Artificial	The infant has had no breast milk but has had alternative liquid such as infant formula, with or without solid food in the past 48 hours.

Using these definitions and in line with WHO recommendations, in 2002 the Ministry of Health set the following breastfeeding targets for NZ [10]

1. Increase breastfeeding (exclusive/fully) at 6 wks to 74% by 2005 and 90% by 2010.
2. Increase breastfeeding (exclusive/fully) at 3 mths to 57% by 2005 and 70% by 2010.
3. Increase breastfeeding (exclusive/fully) at 6 mths to 21% by 2005 and 27% by 2010.

While to date NZ's breastfeeding rates have compared favourably with other OECD countries, they remain below the MOH's 2002 targets and in addition, are consistently lower for Māori and Pacific women [10]. While breastfeeding rates are high at birth they often decline significantly thereafter, with barriers to meeting breastfeeding targets including paternal attitudes, socioeconomic factors, returning to work, lack of workplace support, poor initiation of breastfeeding, and perceived inadequate milk supply [10]. At a DHB level one of the key initiatives to promote breastfeeding is the "Baby Friendly Hospital Initiative" which aims to encourage hospitals and health care facilities to adopt practices that fully protect, promote and support exclusive breastfeeding from birth.

The following sections review the breastfeeding rates of Canterbury women at 6 weeks, 3 months and 6 months using Plunket data.

Notes on Data Sources and Statistical Methods

Plunket have information on breastfeeding rates dating back to 1922, with more detailed information (e.g. by ethnicity & DHB) being available in recent years. Plunket currently enrol about 85% of the new baby population, although Māori and Pacific Island people may be potentially under-reported in these samples. Data for this section was obtained from Plunket, with breastfeeding rates at <6 weeks including those aged 2 weeks-5 weeks 6 days, at 3 months including those aged 10 weeks-15 weeks, 6 days and at 6 months including those aged 16 weeks - 7 months, 4 weeks.

Breastfeeding Rates in Canterbury

Figure 7. Exclusive / Full Breastfeeding Rates at <6 Weeks by Ethnicity, Canterbury vs. New Zealand, June 2005-June 2006.

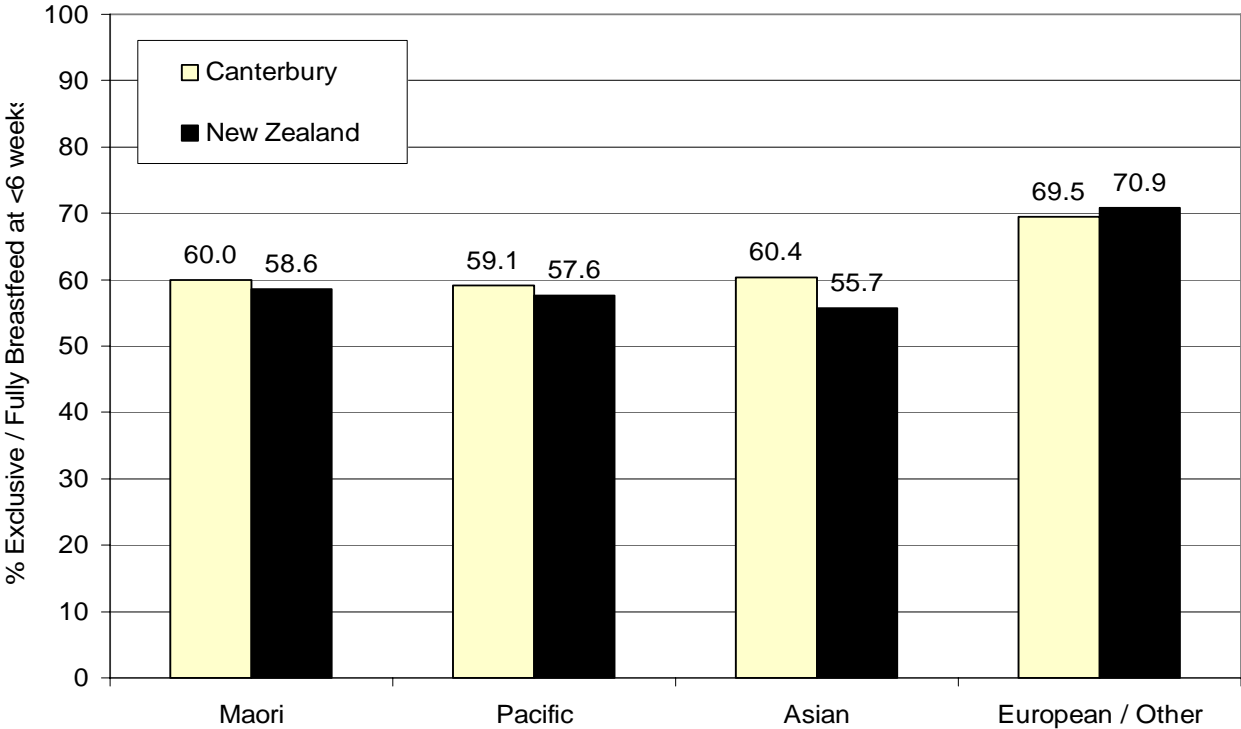


Figure 8. Exclusive / Full Breastfeeding Rates at 3 Months by Ethnicity, Canterbury vs. New Zealand, June 2005-June 2006.

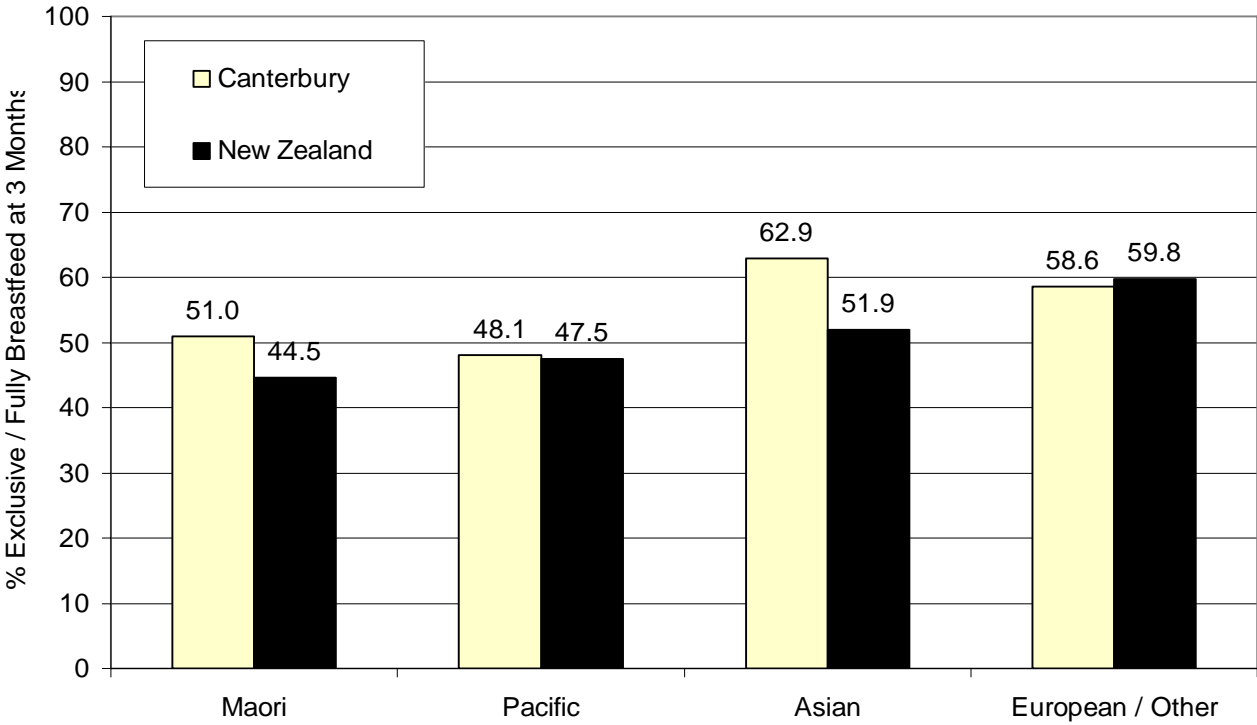
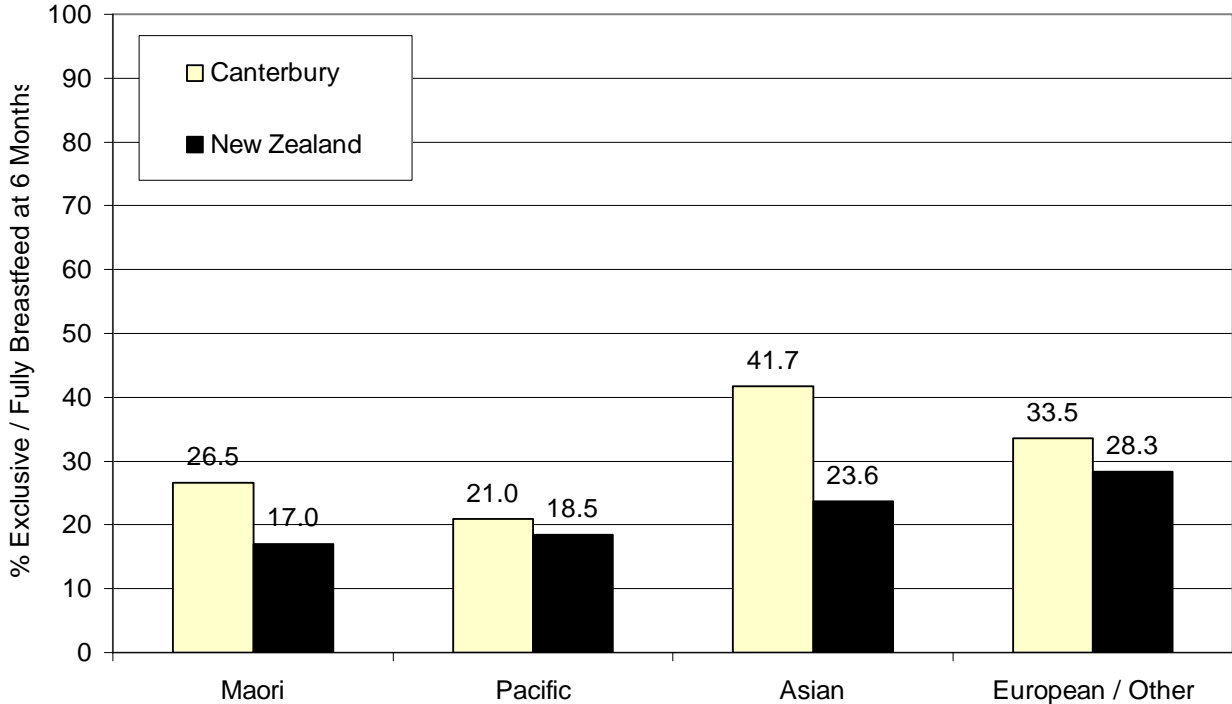


Figure 9. Exclusive / Full Breastfeeding Rates at 6 Months by Ethnicity, Canterbury vs. New Zealand, June 2005-June 2006.



In Summary

During June 2005-06, breastfeeding rates at 6 weeks in Canterbury were highest amongst European / Other women, although when compared to the NZ average, the breastfeeding rates of all of Canterbury’s largest ethnic groups were very similar to the NZ average (**Figure 7**). At 3 months breastfeeding rates were highest amongst Asian women, although again breastfeeding rates for all ethnic groups were either similar to or higher than the NZ average (**Figure 8**), as they were at 6 months of age (**Figure 9**). For all ethnic groups however, there was a marked tapering off in exclusive / full breastfeeding rates as infants age increased. In addition, during 2005-06 while none of Canterbury’s largest ethnic groups achieved the MOH’s 2005 breastfeeding targets of 74% at 6 weeks, European and Asian women achieved the target of 57% at 3 months and all achieved the target of 21% at 6 months of age.

INFANT MORTALITY

Introduction

Mortality during the first year of life is higher than at any other point during childhood or adolescence and has traditionally been broken down into 3 categories:

Total Infant Mortality: Death of a live born infant prior to their first birthday.

Neonatal Mortality: Death of a live born infant during the first 28 days of life.

Post-Neonatal Mortality: Death of a live born infant >28 days but <365 days of life.

In NZ, infant mortality has been declining since the 1930s [11], with the most recent decreases being attributed to a fall in Sudden Infant Death Syndrome (SIDS) [12]. Declines however have not been equal for all ethnic groups, with higher SIDS rates amongst Māori since the National Cot Death Campaign began being attributed to a differing risk factor profiles within the Māori community [13]. While risk of total infant mortality is generally higher amongst, Pacific>Māori>European/Other babies, males and those living in the most deprived areas [11], analyses of total infant mortality may be of limited utility, if evidence based prevention strategies are to be developed which will reduce infant mortality in NZ in future years. This is because, while in the neonatal period many of the causes of infant mortality have their origins in the perinatal period (e.g. extreme prematurity, congenital anomalies), in the post-neonatal period issues such as SIDS, pneumonia & injuries play a much greater role.

The following section reviews infant mortality in New Zealand and the Canterbury Region using information available from the National Mortality Collection and the Birth Registration Dataset. It begins by reviewing trends and risk factors for total infant mortality and its sub-categories (SIDS, congenital anomalies, perinatal conditions) in New Zealand during the past 16 years, before exploring the causes of neonatal and post-neonatal mortality in more detail.

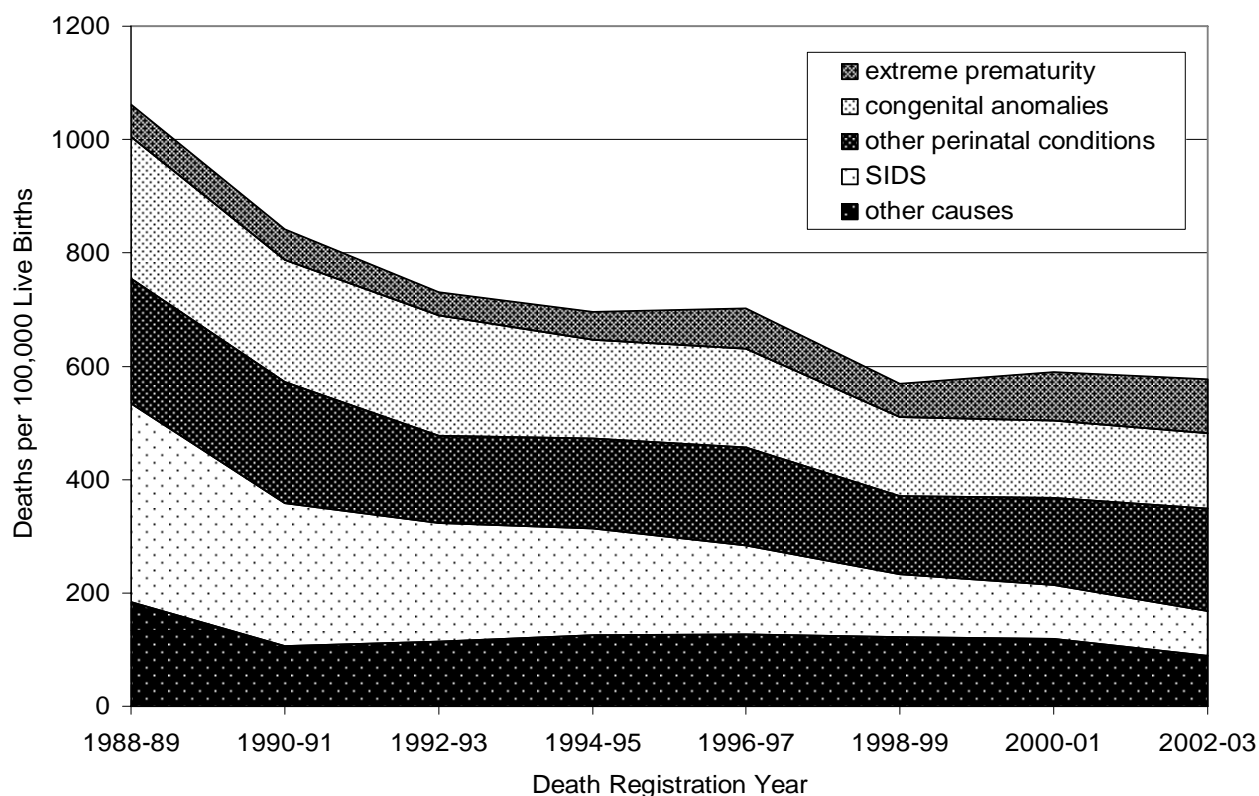
Notes on Data Sources and Statistical Methods

Infant mortality rates in this analysis were calculated by dividing the total number of deaths <1 year of age (National Mortality Collection Appendix 3) by the number of live births (Birth Registration Dataset Appendix 1) registered during the same year. Total infant mortality included all infants dying <365 days of age, while neonatal mortality included infants dying <29 days of age and post-neonatal mortality included infants dying between 29 and 364 days inclusive. Mortality rates for extreme prematurity (ICD-9 765.0; ICD-10 P072), congenital anomalies (ICD-9 740-759; ICD-10 Q00-Q99), perinatal conditions (ICD-9 760-779; ICD-10 P00-P96) and SIDS (ICD-9 798.0; ICD-10 R95) were calculated by dividing the number of deaths in each category of interest, by the number of live births registered during the same year. Ethnic specific mortality rates were calculated by dividing the number of category specific deaths in each ethnic group, by the number of live born babies during the same year. Similar procedures were used to calculate NZDep specific rates for the period 1999-2003. Relative risks were calculated by dividing infant mortality rates in each category of interest by those of the reference category (NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Total Infant Mortality in NZ: Trends a Risk Factors

In NZ during the past 16 years, deaths due to SIDS and “other causes” have continued to decline, while the reductions in deaths due to congenital anomalies and perinatal conditions seen during the late 80’s / early 90’s have begun to taper off in recent years. In contrast, deaths due to extreme prematurity have increased during the past 3-4 years (**Figure 10**).

Figure 10. Infant Mortality by Cause, New Zealand 1988-2003.



In NZ during 1999-03, the risk factors for the three most common causes of infant mortality also differed, with the risk of SIDS being significantly higher amongst Māori infants, males and those living in the most deprived areas (**Table 9**). In contrast for congenital anomalies, mortality rates were not significantly different for Māori or Pacific infants, or those living in the most deprived areas (**Table 10**). While for deaths due to extreme prematurity / perinatal conditions, differences for Māori and Pacific infants and those living in the most deprived areas did reach statistical significance, disparities were much less marked than for SIDS (**Table 11**).

Table 9. Risk Factors for Infant Mortality due to SIDS, NZ 1999-03.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	20.6	1.00		Māori	225.1	5.71	4.24-7.68
3-4	50.3	2.45	1.14-5.27	Pacific	68.6	1.74	1.06-2.87
5-6	65.7	3.20	1.53-6.67	European	39.4	1.00	
7-8	101.0	4.91	2.44-9.88	Asian / Indian	27.2	0.69	0.30-1.60
9-10	178.2	8.66	4.41-17.01	Gender			
				Male	117.4	1.75	1.36-2.26
				Female	66.9	1.00	

* rate per 100,000 live births per year, relative risks are unadjusted

Table 10. Risk Factors for Infant Mortality due to Congenital Anomalies, NZ 1999-2003.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	121.2	1.00		Māori	129.1	0.97	0.76-1.23
3-4	119.6	0.99	0.68-1.44	Pacific	163.5	1.23	0.90-1.68
5-6	131.5	1.09	0.76-1.56	European	133.1	1.00	
7-8	127.1	1.05	0.74-1.49	Asian / Indian	131.6	0.99	0.67-1.46
9-10	162.0	1.34	0.97-1.85	Gender			
				Male	147.3	1.20	0.98-1.4
				Female	122.3	1.00	

* rate per 100,000 live births per year, relative risks are unadjusted

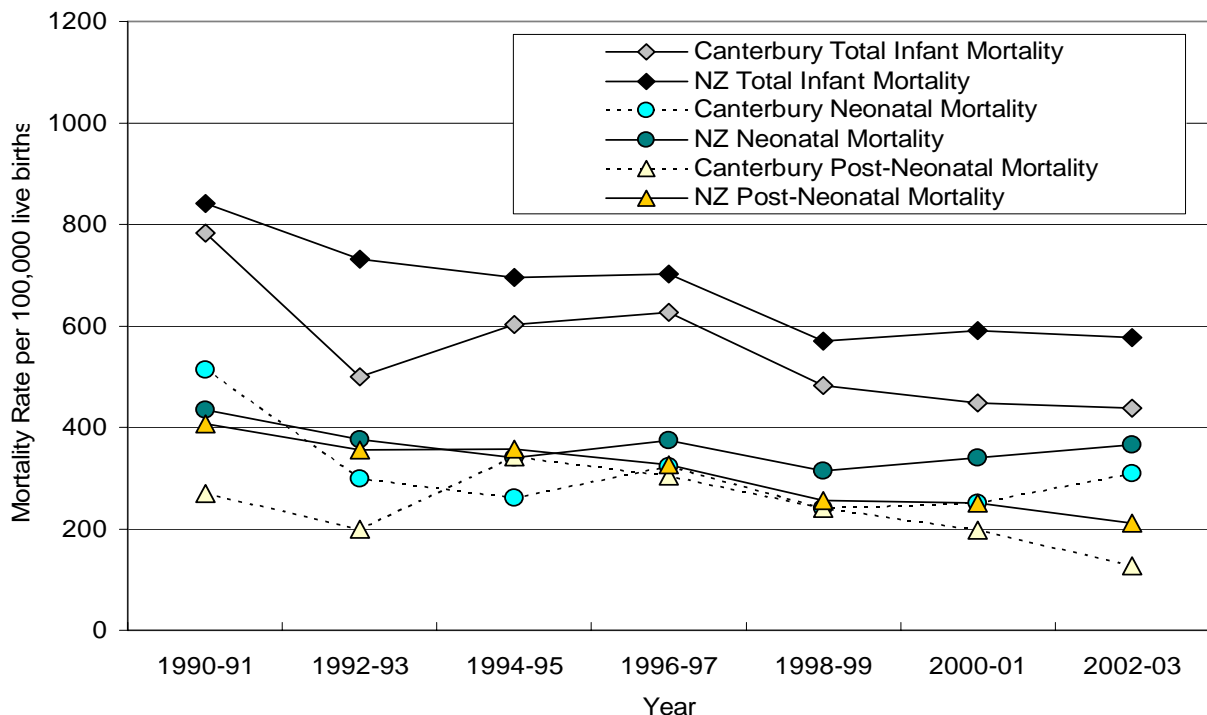
Table 11. Risk Factors for Infant Mortality due to Extreme Prematurity and Other Perinatal Conditions, NZ 1999-2003.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	176.1	1.00		Māori	289.3	1.32	1.11-1.56
3-4	235.3	1.34	1.00-1.79	Pacific	347.2	1.59	1.28-1.98
5-6	211.0	1.20	0.90-1.61	European	218.2	1.00	
7-8	257.8	1.46	1.11-1.92	Asian / Indian	154.3	0.71	0.50-1.01
9-10	320.5	1.82	1.41-2.35	Gender			
				Male	184.1	1.28	1.06-1.54
				Female	144.1	1.00	

* rate per 100,000 live births per year, relative risks are unadjusted

Total Infant Mortality in the Canterbury Region

Figure 11. Total Infant Mortality, Neonatal Mortality and Post-Neonatal Mortality, Canterbury vs. New Zealand 1990-2003.

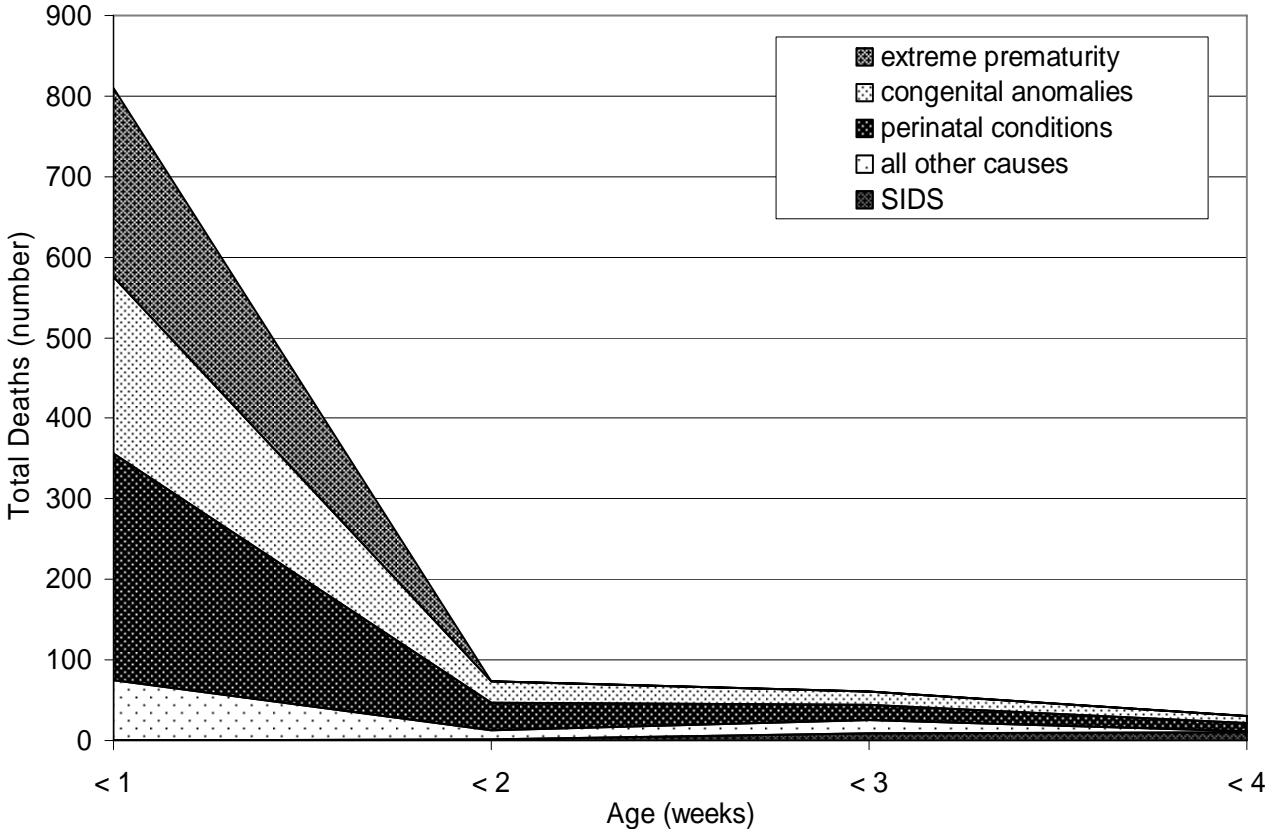


In the Canterbury Region during 1990-03, total and post-neonatal mortality rates declined, while neonatal mortality rates remained relatively static. While small numbers make precise interpretation of these trends difficult, they were generally consistent with those occurring in the rest of NZ. Throughout this period, while rates of total infant mortality in Canterbury were lower than the NZ average, rates of neonatal and post-neonatal mortality were either similar to or lower than the NZ average (Figure 11).

Neonatal Mortality in NZ and the Canterbury Region

During 1999-03 in New Zealand, the most frequent causes of death in the neonatal period were extreme prematurity and congenital anomalies, with anomalies of the cardiovascular and central nervous system playing a particularly prominent role. Birth asphyxia however, was also a relatively important cause of neonatal death (Table 12). For all categories of death (with the exception of SIDS), mortality was higher during the first week of life than at any other point during infancy (Figure 12). In the Canterbury Region during this period, the distribution was similar, with deaths from extreme prematurity and congenital anomalies being the commonest single causes of neonatal deaths (Table 13). Care should be taken however when comparing NZ and regional cause specific rates, due to the small number of cases involved.

Figure 12. Neonatal Mortality (0-28 days) by Age and Cause, New Zealand 1999-2003.



*Numbers are per 5 year period

Table 12. Most Frequent Causes of Neonatal Mortality (0-28 days) in NZ, 1999-2003.

Cause of Death	New Zealand		
	*Rate	% of deaths	
Extreme Prematurity	83.4	24.1	
Congenital Anomaly: CVS*	30.5	96.1	8.8
Congenital Anomaly: CNS*	12.4		3.6
Congenital Anomaly: Other	53.2		15.4
Intrauterine / Birth Asphyxia	22.0	6.3	
SIDS	7.1	2.1	
Suffocate Strangulate in Bed	1.8	0.5	
Other Causes	135.6	39.2	
Total	346.1	100.0	

* Rates per 100,000 live births per year; CVS: cardiovascular system; CNS: central nervous system

Table 13. Most Frequent Causes of Neonatal Mortality (0-28 days), Canterbury 1999-2003.

Cause of Death	Canterbury		
	Number	*Rate	% of deaths
Extreme Prematurity	17	61.3	21.8
Congenital Anomaly: CVS*	6	21.6	7.7
Congenital Anomaly: CNS*	4	14.4	5.1
Congenital Anomaly: Other	10	36.1	12.8
Other Causes	41	147.9	52.6
Total	78	281.4	100.0

*Numbers are per 5 year period; Rates per 100,000 live births per year; CVS: cardiovascular system; CNS: central nervous system

Post-Neonatal Mortality in NZ and the Canterbury Region

In NZ during 1999-03 the most frequent causes of post-neonatal mortality were SIDS, followed by congenital anomalies and injury, although conditions arising during the perinatal period still also played a role. In addition, a large number of babies were identified as dying as a result of suffocation or strangulation in bed, although it is possible that some of these may have been coded as SIDS cases in previous years (**Table 14**). Mortality was greatest during the first 6 months of life, with progressively fewer deaths due to SIDS, congenital anomalies or perinatal conditions occurring as infants approached 1 year of age (**Figure 13**). In the Canterbury Region during this period, the distribution of mortality was similar, with the leading causes of post-neonatal mortality being SIDS and congenital anomalies (**Table 15**). Care should be taken when comparing regional cause specific mortality rates however, due to the small number of cases involved.

Table 14. Causes of Post-Neonatal Mortality (29-364 days) NZ, 1999-2003.

Cause of Death	New Zealand			
	Rate*		% of Deaths	
SIDS	85.5		36.0	
Suffocate Strangulate in Bed	18.1		7.6	
Congenital Anomaly: CVS*	14.6	39.1	6.1	16.4
Congenital Anomaly: Other*	24.5		10.3	
Injuries	10.6		4.5	
Meningococcal	5.7		2.4	
Pneumonia	7.5		3.1	
Perinatal Conditions	19.2		8.1	
Other Specified Causes	39.8		16.7	
Unspecified Causes	12.1		5.1	
Total	237.5		100.0	

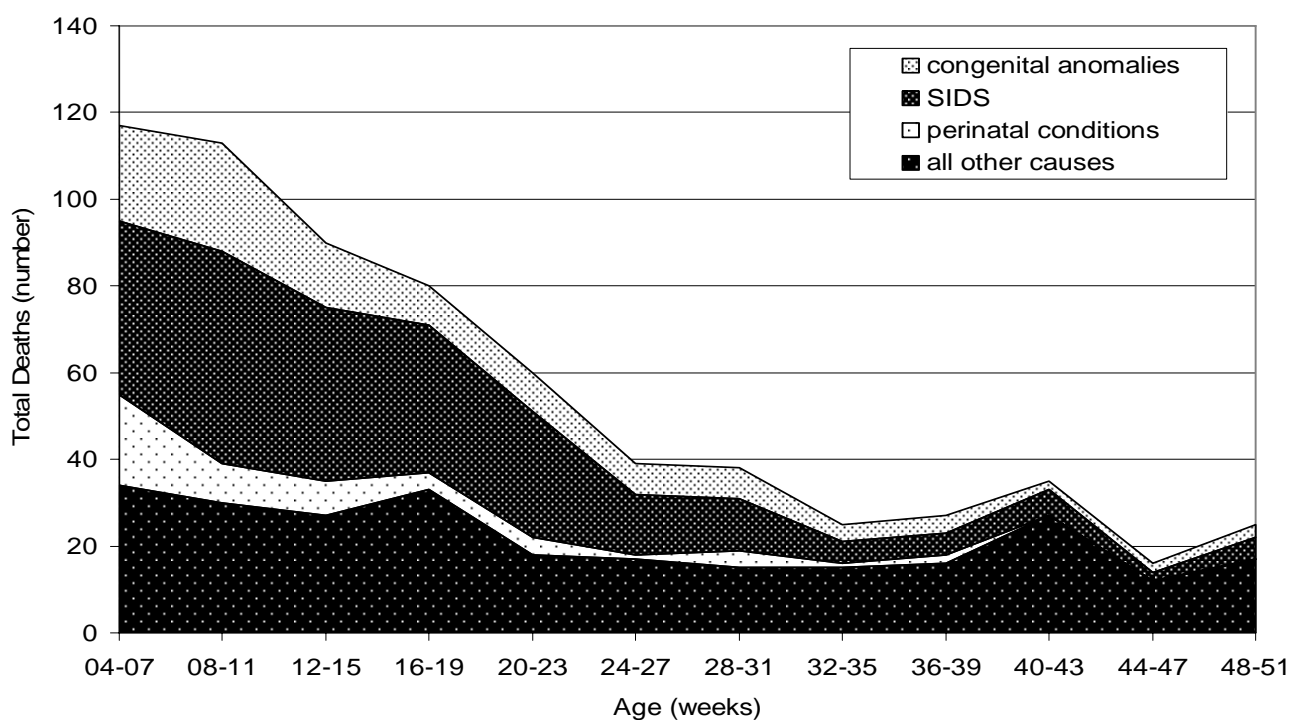
*Rates per 100,000 live births per year; CVS: cardiovascular system; Other: includes central nervous system and other anomalies.

Table 15. Causes of Post-Neonatal Mortality (29-364 days) Canterbury, 1999-2003.

Cause of Death	Canterbury		
	Number	Rate*	% of Deaths
SIDS	19	68.5	38.0
Congenital Anomaly: CVS	7	25.3	14.0
Congenital Anomaly: Other	3	10.8	6.0
Perinatal Conditions	9	32.5	18.0
Injuries	5	18.0	10.0
Other Causes	7	25.3	14.0
Total	50	180.4	100.0

* Numbers are per 5 year period; Rates per 100,000 live births per year.

Figure 13. Post-Neonatal Mortality (29-365 days) by Age & Cause, New Zealand 1999-2003.



*Numbers are per 5 year period

In Summary

In NZ during the past 15 years, deaths due to SIDS and “other causes” have continued to decline, while the reductions in deaths due to congenital anomalies and perinatal conditions seen during the late 80’s / early 90’s have begun to taper off. In contrast, deaths due to extreme prematurity have been increasing, resulting in a small increase in neonatal mortality rates during the past 3-4 years. In NZ during 1999-03, the risk factors for the three most common causes of infant mortality also differed, with the risk of SIDS being higher amongst Māori infants, males and those living in the most deprived areas. In contrast for congenital anomalies, mortality rates were not significantly different for Māori or Pacific infants, or those living in the most deprived areas. While for deaths due to extreme prematurity / perinatal conditions, differences for Māori and Pacific infants and those living in the most deprived areas did reach statistical significance, disparities were much less marked than for SIDS. Similarly, in Canterbury during 1990-03, total and post-neonatal mortality rates declined, while neonatal mortality rates remained relatively static. While small numbers make precise interpretation of these trends difficult, they were generally consistent with those occurring in the rest of NZ. Throughout this period, rates of total infant mortality in Canterbury were lower than the NZ average, while rates of neonatal and post-neonatal mortality were either similar to or lower than the NZ average.

In NZ during 1999-03, the most frequent causes of neonatal mortality were extreme prematurity and congenital anomalies, with anomalies of the cardiovascular and central nervous system playing a particularly prominent role. Birth asphyxia however, was also a relatively important cause of neonatal death. For all categories of death (with the exception of SIDS), mortality was higher during the first week of life than at any other point during infancy. In Canterbury during this period, the distribution was similar, with deaths from extreme prematurity and congenital anomalies being the commonest single causes of neonatal deaths.

In NZ during 1999-03 the most frequent causes of post-neonatal mortality were SIDS, followed by congenital anomalies and injury, although conditions arising during the perinatal period still also played a role. In addition, a large number of babies were identified as dying as a result of suffocation or strangulation in bed, although it is possible that some of these may have been coded as SIDS cases in previous years. Mortality was greatest during the first 6 months of life, with progressively fewer deaths occurring as infants approached 1 year of age. In Canterbury during this period, the distribution of mortality was similar, with the leading causes of post-neonatal mortality being SIDS and congenital anomalies.

BRONCHIOLITIS

Introduction

Bronchiolitis is an acute viral infection of the lower respiratory tract, commonly caused by the respiratory syncytial virus (RSV), although parainfluenza, influenza and other viruses have also been implicated. RSV is transmitted by contact with infected nasal secretions and less frequently, by aerosol spread. Its incubation period is 2-8 days, and following a prodromal phase, acute illness usually lasts 3-7 days, with gradual recovery over a 1-2 week period. Symptoms include runny nose, cough, low grade fever, expiratory wheeze and respiratory distress. Treatment is usually supportive, with severely affected infants being admitted to hospital for oxygen and fluid supplementation [14].

RSV is common, with overseas estimates suggesting >50% of infants are infected during the first year of life and >80% by the age of 2 years. Epidemics occur during winter months, and although there are only 2 major RSV strains (A&B), numerous genotypes, subtypes and frequent shifts in the dominant strain meant that infants may remain susceptible to reinfection from year to year, or even within the same season. Of those infected, 1-2% require hospital admission [14], with the case fatality rate of those admitted being around 2% [15]. Risk of hospital admission is increased by factors such as male sex, young age (<6 months), birth during the first 1/2 of the RSV season, overcrowding, the presence of siblings and attendance at day care [16]. In addition, socioeconomic disadvantage, lack of breastfeeding and maternal smoking have been implicated in a number of studies [15].

The following section reviews hospital admission and mortality rates for bronchiolitis amongst children <1 year of age in NZ and the Canterbury region, using information available from the National Minimum Dataset and the Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions <1 year of age with a primary diagnosis of bronchiolitis (ICD-9 466.1; ICD-10 J21) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to bronchiolitis occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of bronchiolitis in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of bronchiolitis admissions <1 year in each NZDep Index decile (see Appendix 7) by the number of infants <1 year living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing bronchiolitis admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Bronchiolitis in New Zealand: Trends and Risk Factors

NZ's hospital admission rates for bronchiolitis in children <1 year of age have risen steadily in recent years, although data for the 2004-05 period suggest that this trend may be beginning to taper off. In contrast mortality rates, which initially decreased during the early 1990s, have remained relatively static at 1-2 deaths per year, during the last 10 years for which data was available (**Figure 14**).

Bronchiolitis is predominantly a disease of infancy, with the majority of hospital admissions and deaths occurring during the first year of life, although a small number also occur between 1-2 years of age (Figure 15). In addition to young age, during 2001-05 hospital admission rates for bronchiolitis in NZ were also higher amongst Pacific and Māori infants, those living in the most deprived areas, male infants and those living in urban areas (Table 16).

Figure 14. Hospital Admission Rates (1988-2005) and Deaths (1988-2003) due to Bronchiolitis, New Zealand Children Aged <1 Year.

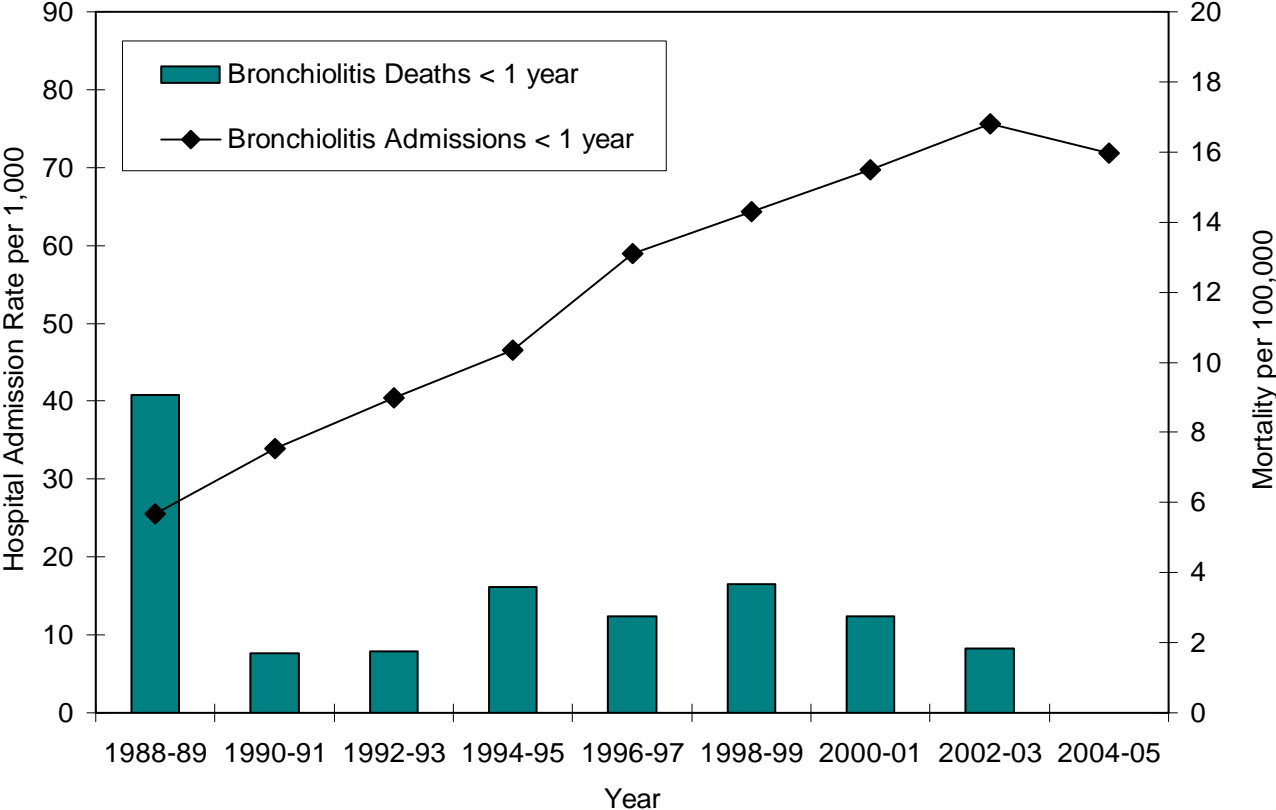
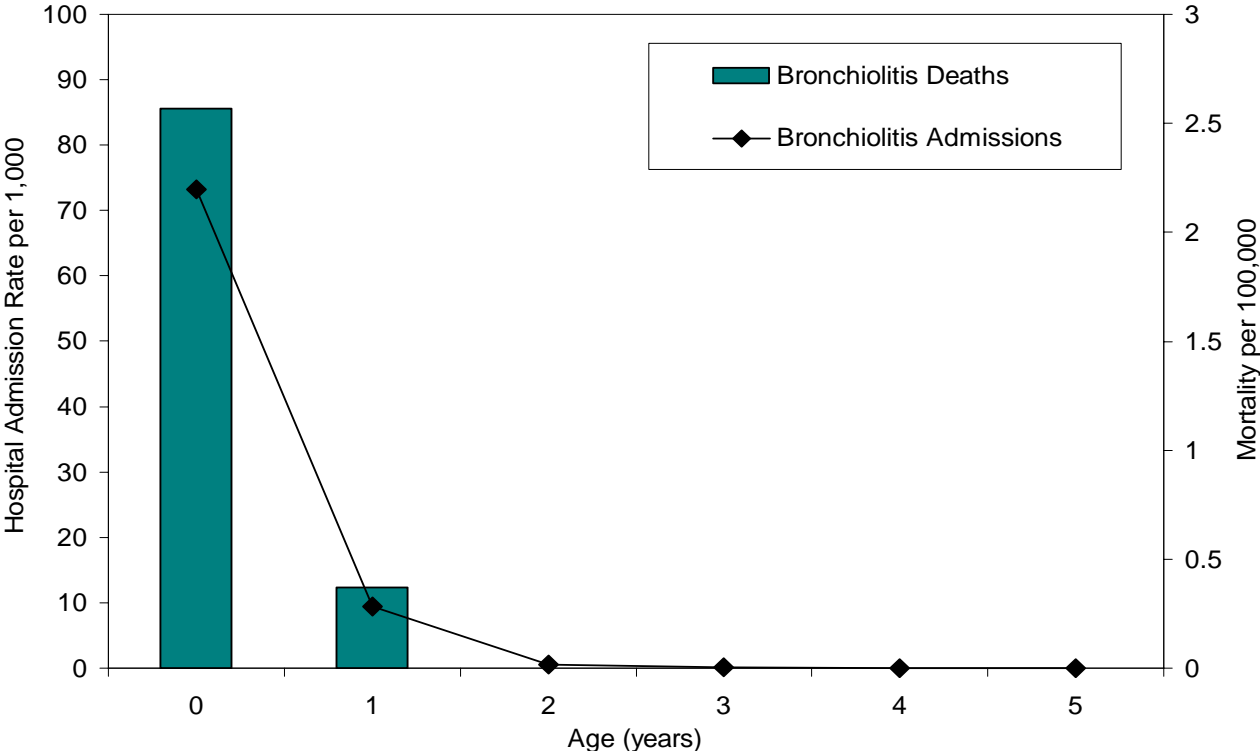


Table 16. Risk Factors for Hospital Admission due to Bronchiolitis, New Zealand Infants <1 Year, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	32.7	1.00		1-2	34.1	1.00	
2	35.5	1.08	0.98-1.20	3-4	41.6	1.21	1.13-1.30
3	34.9	1.07	0.96-1.18	5-6	53.9	1.55	1.46-1.65
4	47.7	1.44	1.31-1.59	7-8	80.7	2.26	2.13-2.40
5	48.8	1.47	1.34-1.62	9-10	157.8	4.13	3.91-4.36
6	58.6	1.75	1.60-1.92	Ethnicity			
7	74.5	2.19	2.01-2.39	Māori	149.3	3.48	3.37-3.60
8	86.2	2.51	2.30-2.73	Pacific	231.2	5.04	4.86-5.22
9	122.8	3.46	3.18-3.76	European	38.7	1.00	
10	191.5	5.08	4.69-5.51	Asian / Indian	22.0	0.58	0.52-0.64
Urban Rural				Gender			
Urban	87.1	1.00		Male	97.9	1.57	1.53-1.62
Rural	64.7	0.76	0.74-0.78	Female	60.1	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Figure 15. Hospital Admission Rates (2001-2005) and Deaths (1999-2003) due to Bronchiolitis by Age, New Zealand Children 0-5 Years.



Bronchiolitis in the Canterbury Region

Figure 16. Hospital Admissions due to Bronchiolitis in Infants < 1 Year, Canterbury vs. New Zealand 1990-2005.

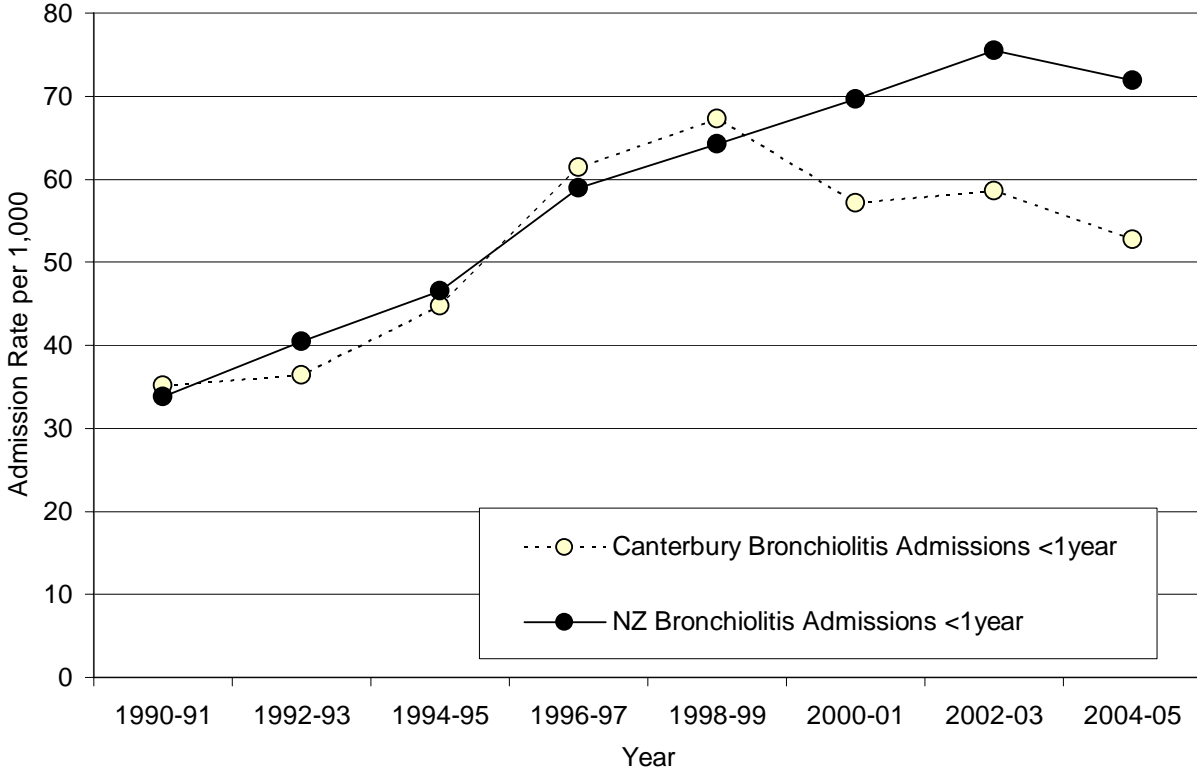
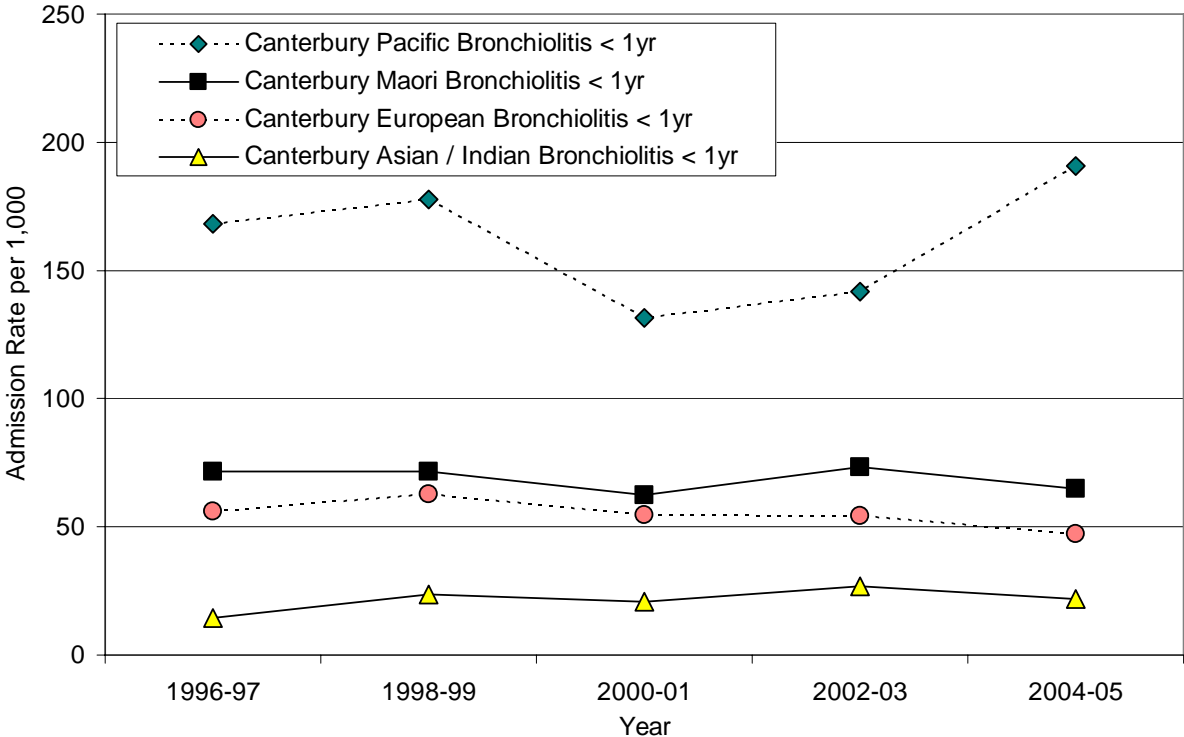


Figure 17. Hospital Admissions for Bronchiolitis by Ethnicity Amongst Infants < 1 Year, Canterbury 1996-2005.



During the 1990s, hospital admission rates for bronchiolitis in Canterbury were similar to the NZ average and increased progressively, in line with national trends. Admission rates reached a peak in 1998-99 however and then declined, with rates in Canterbury during the last 6 years being lower than the NZ average (Figure 16). Hospital admissions for bronchiolitis in Canterbury during 1996-05 were highest amongst Pacific > Māori and European > Asian infants (Figure 17). During 1990-03 there were no deaths attributed to bronchiolitis in Canterbury.

In Summary

NZ’s hospital admission rates for bronchiolitis have risen steadily in recent years, although data for the 2003-05 period suggest that this trend may be beginning to taper off. In contrast mortality rates, which initially decreased during the early 1990s, have remained static at 1-2 deaths per year during the last 10 years for which data was available. Bronchiolitis is predominantly a disease of infancy, with the majority of hospital admissions and deaths occurring during the first year of life, although a small number also occur between 1-2 years of age. In addition to young age, during 2001-05 hospital admissions for bronchiolitis in NZ were also higher amongst Pacific and Māori infants, those living in the most deprived areas, male infants and those living in urban areas.

During the 1990s, hospital admission rates for bronchiolitis in Canterbury were similar to the NZ average and increased progressively, in line with national trends. Admission rates reached a peak in 1998-99 and then declined, with rates in Canterbury during the last 6 years being lower than the NZ average. Admissions for bronchiolitis in Canterbury during 1996-05 were highest amongst Pacific > Māori and European > Asian infants, although during 1990-03 there were no deaths attributed to bronchiolitis in the Canterbury region.

WHOOPIING COUGH / PERTUSSIS

Introduction

Pertussis is a highly contagious, bacterial respiratory infection caused by the organism *Bordetella Pertussis*. Infection is droplet spread and occurs most commonly in unimmunised infants and children <4 years of age. The incubation period of 7-14 days is followed by 6-8 weeks of illness divided into 3 distinct stages: a catarrhal stage (10-14 days) associated with runny nose, sneezing and dry cough; a paroxysmal stage (4-6 weeks) associated with a paroxysmal cough often ending in an inspiratory whoop; and a convalescent stage (1-2 weeks) [17]. Pertussis is of particular concern if acquired during the first year of life, when mortality rates are at their highest [18]. While in New Zealand mortality has been low in recent years (0-1 deaths per year), morbidity remains high, with hospitalised infants often requiring oxygen, suction, (+/-) intubation during the paroxysmal phase [19].

Routine pertussis vaccination began in NZ in 1960, with the current schedule recommending vaccination at 6 weeks, 3 months and 5 months of age. Booster doses are recommended at 15 months and 4 years [18]. Yet, despite the widespread availability of vaccine, NZ's hospital admission rates for pertussis are 5-10 times higher than those of England / Wales and the USA [19] and epidemics occur at regular 4-5 year intervals, the most recent beginning in late 2004 [20]. In terms of reducing the burden of disease, evidence would suggest that improving on-time delivery of immunisation to children during the first year of life could be expected to significantly decrease hospital admission rates in NZ [19].

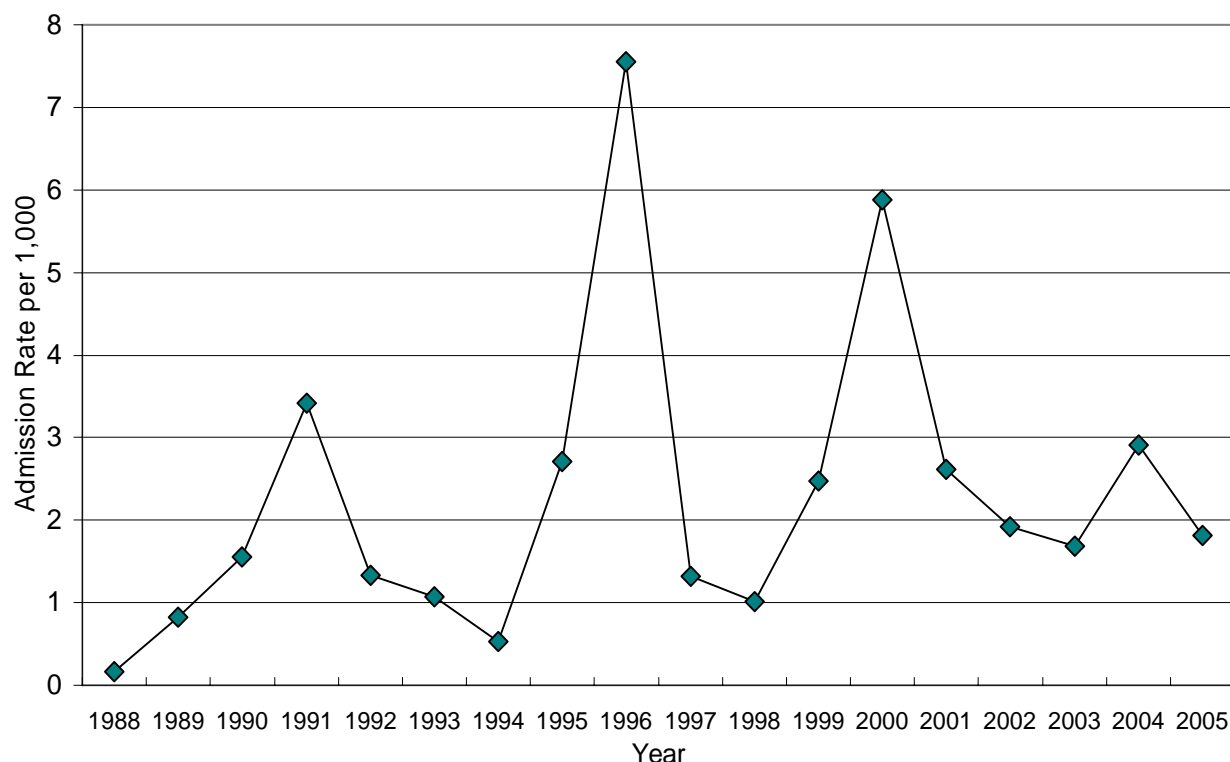
The followings sections review pertussis morbidity and mortality in NZ and the Canterbury region using two separate data sources; hospital admissions during the first year of life (NMDS Appendix 2); deaths due to pertussis 0-24 years (the NZ Mortality Collection Appendix 3).

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions <1 year of age with a primary diagnosis of pertussis (ICD-9 033; ICD-10 A37) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to pertussis occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of pertussis in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of pertussis admissions <1 year in each NZDep Index decile (see Appendix 7) by the number of infants <1 year living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing pertussis admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Pertussis in New Zealand: Trends and Risk Factors

Figure 18. Hospital Admissions due to Pertussis, New Zealand Children <1 Year, 1988-2005.



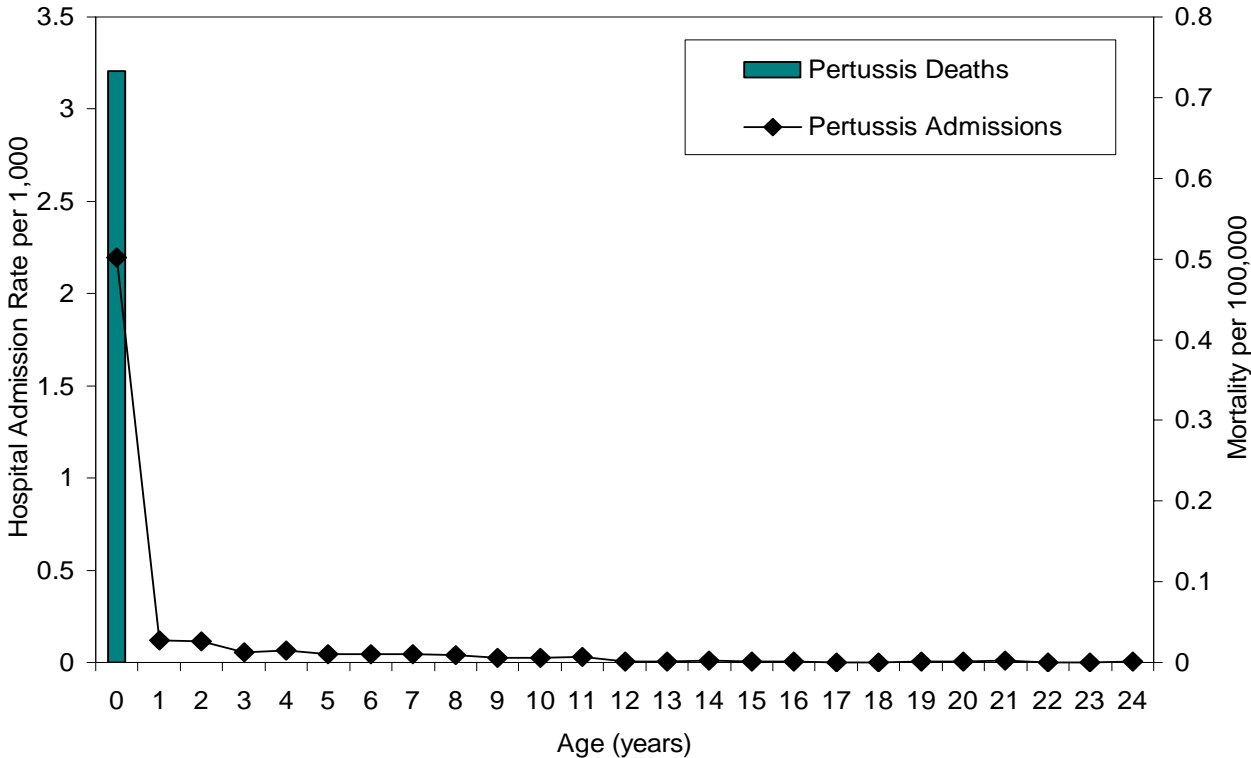
During the past 17 years, pertussis epidemics have occurred in New Zealand at regular 3-5 year intervals, with hospital admissions for children <1 year following a similar pattern. In addition, during the past 4 years for which data was available, a total of 3 deaths were attributed to pertussis in NZ (**Figure 18**). While pertussis may affect any age group, it is amongst children <1 year of age that the disease is most severe, with the majority of hospital admissions and all recent deaths occurring in this age group (**Figure 19**). During 2001-05 hospital admissions for pertussis amongst children <1 year were highest amongst Pacific and Māori infants and those living in the most deprived areas (**Table 17**).

Table 17. Risk Factors for Hospital Admission due to Pertussis, New Zealand Children <1 Year of Age, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	1.39	1.00		Māori	3.65	2.65	2.19-3.19
3-4	1.08	0.78	0.53-1.13	Pacific	4.91	3.55	2.85-4.43
5-6	1.72	1.23	0.89-1.71	European	1.38	1.00	
7-8	1.87	1.35	0.98-1.85	Asian / Indian	0.59	0.43	0.24-0.79
9-10	4.16	2.98	2.25-3.95	Gender			
Urban Rural				Male			
Urban	2.29	1.00		Female	2.32	1.00	
Rural	2.08	0.90	0.76-1.08				

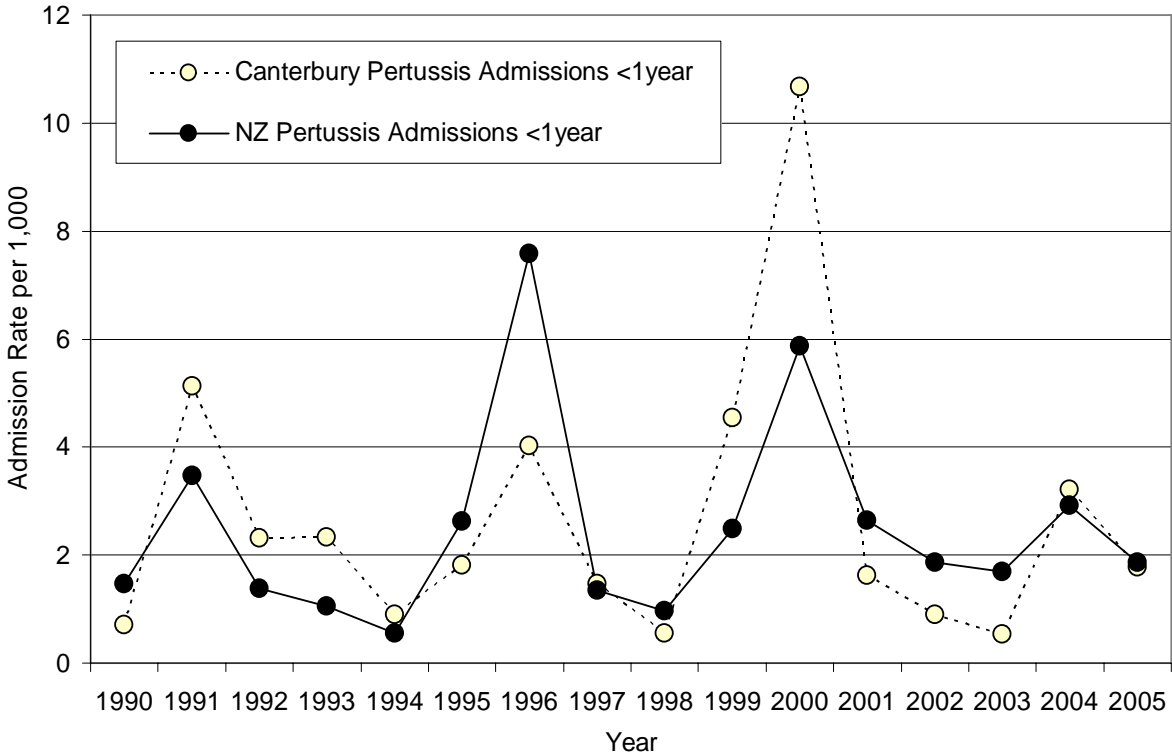
* rate per 1,000 per year, relative risks are unadjusted

Figure 19. Hospital Admission Rates (2001-2005) and Deaths (1999-2003) due to Pertussis by Age, New Zealand Children and Young People Aged 0-24 Years.



Pertussis in the Canterbury Region

Figure 20. Hospital Admissions Due to Pertussis in Infants < 1 Year, Canterbury vs. New Zealand 1990-2005.



During 1990-05, the Canterbury Region experienced episodic epidemics of pertussis amongst children <1 year, which occurred in conjunction with the larger national epidemics. During 1990-03 however, no deaths occurred as a result of pertussis in the Canterbury region (**Figure 20**). Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

In Summary

During the past 17 years, pertussis epidemics have occurred in New Zealand at regular 3-5 year intervals, with hospital admissions in children <1 year old following a similar pattern. In addition, during the past 4 years for which data was available, 3 deaths were attributed to pertussis in NZ. While pertussis may affect any age group, the disease is most severe amongst children <1 year of age, with the majority of hospital admissions and all recent deaths occurring in this age group. During 2001-05, hospital admissions for pertussis <1 year were highest amongst Pacific and Māori infants and those in the most deprived areas.

During 1990-05, Canterbury experienced episodic epidemics of pertussis amongst children <1 year, which occurred in conjunction with the larger national epidemics. During 1990-03 however, no deaths occurred as a result of pertussis in the Canterbury region. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

**THE HEALTH STATUS
OF CHILDREN
0-14 YEARS**

INTRODUCTION

By Dr Alison Vogel

Children in New Zealand after the first year of life have the lowest risk of death of any group in the population. Most deaths are due to injury, with smaller numbers due to cancers especially of the brain. Injury is also a major cause of hospital admissions. Falls cause almost half of the injury hospitalisations. Traffic accident admissions and deaths increase dramatically in the later teenage years with peaks at around 17-18.

Medical admissions are concentrated in young children. All hospital staff are well aware of the huge impact of respiratory infections, especially bronchiolitis, in young babies. There has been a steady rise in admissions for bronchiolitis since the late 1980s (paralleling a worldwide trend) which appears to have tapered off in 2004. The large winter peak in these admissions has major impact on staffing needs. Respiratory infections are regarded in the definition as completely ambulatory sensitive. Bronchiolitis is viral in origin as is a significant proportion of pneumonia in young children. Crowding, passive smoke exposure and lack of breastfeeding are the potentially modifiable risks most significantly associated with these illnesses and there is little that can be done in primary care to reduce the severity of illness once the child is ill. Gastroenteritis and skin infections are ambulatory sensitive admissions which have increased considerably over the last 15 years. Both pre primary strategies (breastfeeding; hand washing; insect eradication; first aid care), and appropriate primary care management have the potential to reduce admission rates.

Inequities by deprivation are highest for bronchiectasis, rheumatic fever, TB, child abuse and bronchiolitis admissions. Ethnic disparities in admissions are highest for rheumatic fever, bronchiectasis, TB, meningococcal disease, pneumonia, bronchiolitis and skin infections, all of which have the greatest impact on Pacific children.

There is a continuing need for improvements in provision of preventative care and screening. Continuing peaks in pertussis admissions and the ongoing small number of deaths indicate the potential impact of improving immunisation rates. By mid 2006 all areas should have completed the MeNZB rollout with an anticipated significant reduction in the burden of this frightening disease. Hearing loss is detected late- on average at over 2 years of age. Neonatal screening is about to be piloted for national rollout and this should help to address this issue. Just under half of New Zealand children receive fluoridated water, and children in non-fluoridated areas have poorer dental health outcomes. While most children of primary and intermediate age are enrolled with the school dental service there is much room for improvement in the enrolment and assessment of preschoolers and adolescents.

There are other important issues for children and their families that this first report has not been able to address. Two key issues are the impact of chronic conditions and disability (including mental health conditions), and the increasing prevalence of overweight and obesity. Both need consideration in DHB strategic planning for child and youth health, and as a consequence will be covered in Year 2 of this reporting series.

HOSPITAL ADMISSIONS & DEATHS: AN OVERVIEW

Introduction

Before presenting an analysis of individual child health outcomes and their determinants at a population level, it is first necessary to provide a brief overview of most common reasons for hospital admission and mortality amongst 0-14 year olds in the region during the past 3 years. It is hoped that the brief summary tables presented below will provide the reader with an overall framework, within which to consider the relative importance of the various issues covered in the later sections of this report.

Notes on Data Sources and Statistical Methods

The hospital admission rates in this analysis were calculated by dividing the total number of hospital admissions for children 0-14 years (excluding those arising in the neonatal (0-28 days) period) by census denominators for the period 2003-2005. Numerators were drawn from publicly funded hospital discharges (inpatient and day patient) in the 0-14 age bracket, with the reason for admission being derived from the primary diagnosis (ICD-10 code) as recorded in the NMDS (Appendix 2). To maintain consistency with the injury and mental health sections that follow, injury and mental health inpatient admissions with an Emergency Medicine specialty code (M05-M08) on discharge were excluded from this analysis (see Appendix 2 for the rationale for this).

Table 18. Most Frequent Causes of Mortality Outside the Neonatal Period, Canterbury Children 0-14 yrs, 2001-2003.

Cause of Death	Number	Rate*	% of Deaths
Post-Neonatal (29-364 days)			
SIDS	8	48.0	33.3
Congenital Anomalies	6	36.0	25.0
Perinatal Conditions	6	36.0	25.0
Other Causes	4	24.0	16.7
Total	24	143.9	100.0
Children 1-14 years			
Injury / Poisoning	22	9.0	47.8
Congenital Anomalies	6	2.5	13.0
Cancers	4	1.6	8.7
Other Causes	14	5.7	30.4
Total	46	18.9	100.0

*Rates are per 100,000 per year; Numbers are per 3 year period.

Table 19. Post-Neonatal Hospital Admissions for Children 0-14 Yrs, Canterbury 2003-05.

Diagnosis	Total Number	Rate*	% of Type	% of Total
Acute Admissions (by Diagnosis)				
Injury & Poisoning	2105	8.0	11.6	7.1
Gastroenteritis	1401	5.3	7.8	4.7
Acute URTI	1399	5.3	7.7	4.7
Asthma	1384	5.2	7.7	4.7
Viral Infections NOS	1127	4.3	6.2	3.8
Bronchiolitis	936	3.5	5.2	3.2
Abdominal Pain	595	2.3	3.3	2.0
Pneumonia	545	2.1	3.0	1.8
Urinary Tract Infection	319	1.2	1.8	1.1
Skin Infections	318	1.2	1.8	1.1
Other Causes	7942	30.1	43.9	26.8
Total	18071	68.4	100.0	61.1
Arranged Admissions (by Diagnosis)				
Dental Conditions	875	3.3	23.6	3.0
Cancer / Chemotherapy	749	2.8	20.2	2.5
Mental Health	123	0.5	3.3	0.4
Metabolic Disorders	118	0.4	3.2	0.4
Constipation	92	0.3	2.5	0.3
Other Causes	1746	6.6	47.2	5.9
Total	3703	14.0	100.0	12.5
Waiting List Admissions (by Procedure)				
Grommets	1879	7.1	30.5	6.3
Tonsils and Adenoids	789	3.0	12.8	2.7
Skin / Subcutaneous	287	1.1	4.7	1.0
Inguinal Hernia Repair	247	0.9	4.0	0.8
Orchidopexy	157	0.6	2.5	0.5
Other Procedures	2621	9.9	42.5	8.9
No Procedure Listed	181	0.7	2.9	0.6
Total	6161	23.3	100.0	20.8
ACC Covered Admissions				
ACC Covered	1661	6.3	100.0	5.6
Total	29596	112.0	100.0	100.0

*Rates are per 1,000 per year; Numbers are per 3 year period.

In Summary

In Canterbury during 2001-03, the leading causes of post-neonatal mortality were SIDS, followed by congenital anomalies and perinatal conditions, while in the 1-14 age group the leading causes of mortality were injuries and congenital anomalies (**Table 18**). During 2003-05, the most frequent reasons for acute hospital admission were injury / poisoning, and gastroenteritis, while for arranged admissions the most frequent reasons were for dental conditions and cancer / chemotherapy. The most frequent reasons for a waiting list admission were for the insertion of grommets, followed by procedures on the tonsils and adenoids (**Table 19**).

ASTHMA

Introduction

Asthma is a chronic inflammatory disorder, which causes narrowing of the airways in the lower respiratory tract as a result of bronchial smooth muscle constriction, swelling, inflammation and mucus production. Episodic airflow obstruction leads to symptoms such as shortness of breath, wheezing, prolonged expiration and an irritative cough. Attacks in children are most commonly triggered by viral infections but may also be associated with hypersensitivity to substances such as pollen, mould, house dust mite, foods, animal dander, cigarette smoke, chemicals or drugs. Asthma may also be triggered by exercise, exposure to cold air or psychological stress [17].

NZ has one of the highest reported prevalences of asthma in the world [21], with 25% of children aged 6-7 years and 30% of adolescents 13-14 years reporting asthma symptoms in one recent survey [22]. While asthma prevalence is thought to be highest amongst Māori > European > Pacific children, symptom severity is highest amongst Māori and Pacific children [23]. Ethnic disparities have also been reported in hospital admission rates, with admissions for Māori children being higher than for non-Māori children, particularly in rural areas [24]. While from a public health perspective, addressing issues such as exposure to tobacco smoke, use of preventer medication and access to primary health care may assist in reducing disparities in the severity of asthma symptoms / hospital admission rates [23], it remains unclear what population level interventions will be of value in reducing the underlying prevalence of asthma in NZ's children and young people.

The following section reviews hospital admission and mortality rates for asthma amongst children (0-14 years) and young people (15-24 years) in NZ and the Canterbury region using information available from the National Minimum Dataset & the Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions with a primary diagnosis of asthma (ICD-9 493; ICD-10 J45-46) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) for children (0-14 years) and young people (15-25 years) as recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to asthma occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of asthma in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates for children (0-14 years) during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of children (0-14 years) admitted with asthma in each NZDep Index decile (see Appendix 7) by the number of children 0-14 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing asthma admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Asthma in NZ: Trends and Risk Factors

Asthma admission and mortality rates for NZ children and young people have declined during the past 17 years, although in the case of hospital admissions for children 0-14 years, this downward trend has ceased during the past 3-4 years (**Figure 21**). While hospital admissions

during 2001-05 were highest amongst children <5 years (peak between 1 & 2 years of age), mortality during 1999-03 was highest amongst adolescents and those in their early 20s (Figure 22). Hospital admission rates amongst children 0-14 years were also higher for those living in the most deprived areas, for Pacific, Māori and Asian / Indian children, males and those living in urban areas (Table 20).

Figure 21. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Asthma, New Zealand Children and Young People 0-24 Years.

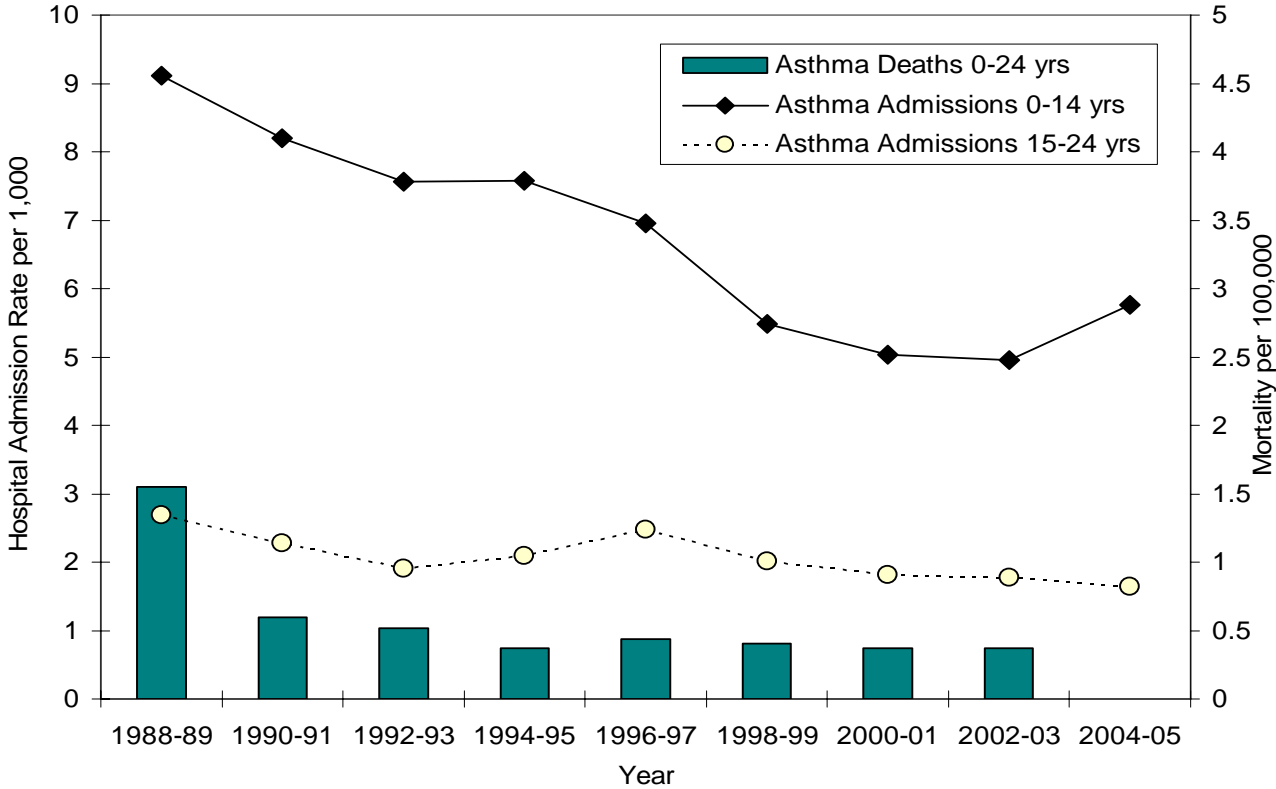
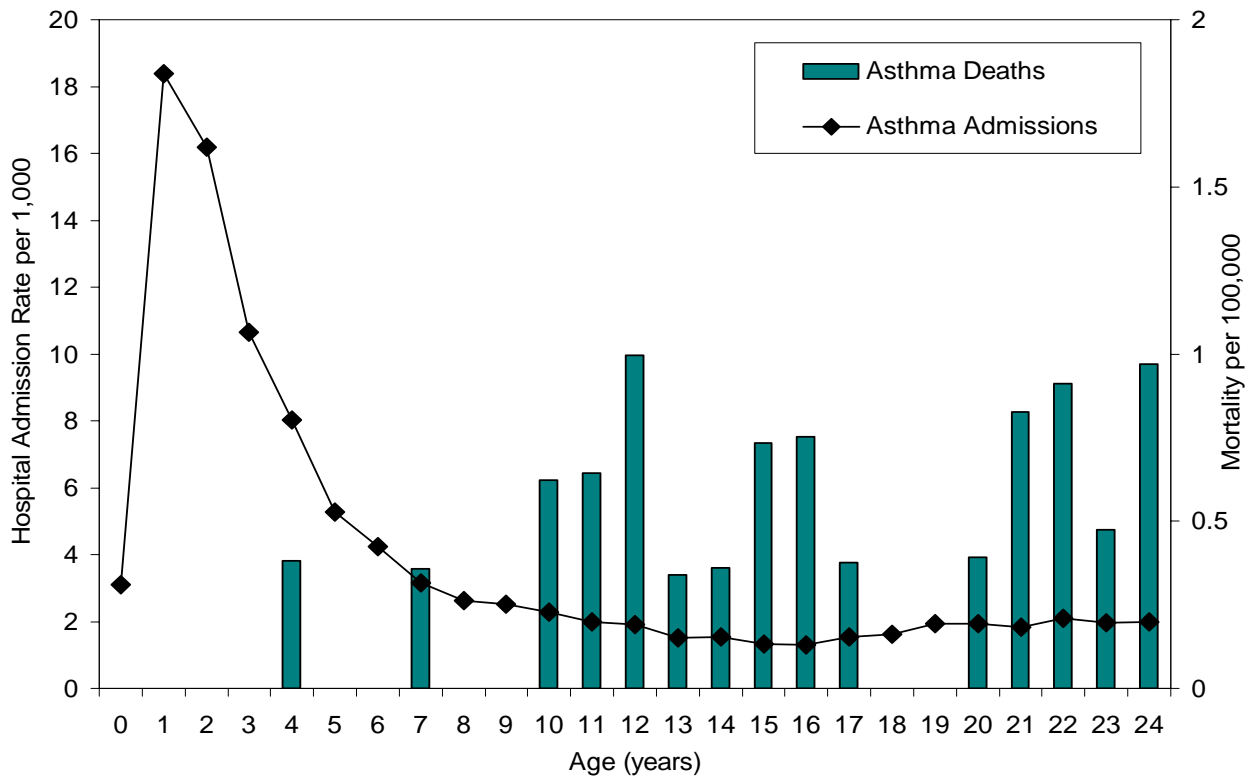


Table 20. Risk Factors for Hospital Admission due to Asthma, New Zealand Children 0-14 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	3.25	1.00		1-2	3.13	1.00	
2	3.02	0.93	0.86-1.01	3-4	3.78	1.20	1.14-1.27
3	3.41	1.05	0.97-1.13	5-6	4.76	1.52	1.44-1.60
4	4.11	1.26	1.17-1.36	7-8	6.17	1.96	1.87-2.06
5	4.48	1.37	1.28-1.48	9-10	8.35	2.65	2.53-2.78
6	5.03	1.54	1.44-1.66	Ethnicity			
7	5.73	1.76	1.64-1.88	Māori	7.94	2.14	2.07-2.20
8	6.58	2.01	1.88-2.15	Pacific	11.40	3.05	2.95-3.17
9	8.18	2.50	2.34-2.67	European	3.70	1.00	
10	8.50	2.60	2.44-2.77	Asian / Indian	4.25	1.15	1.08-1.22
Urban Rural				Gender			
Urban	6.41	1.00		Male	6.22	1.38	1.35-1.42
Rural	3.82	0.60	0.58-0.62	Female	4.49	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Figure 22. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Asthma by Age, New Zealand Children and Young People 0-24 Years.



Asthma in the Canterbury Region

Figure 23. Hospital Admissions due to Asthma in Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.

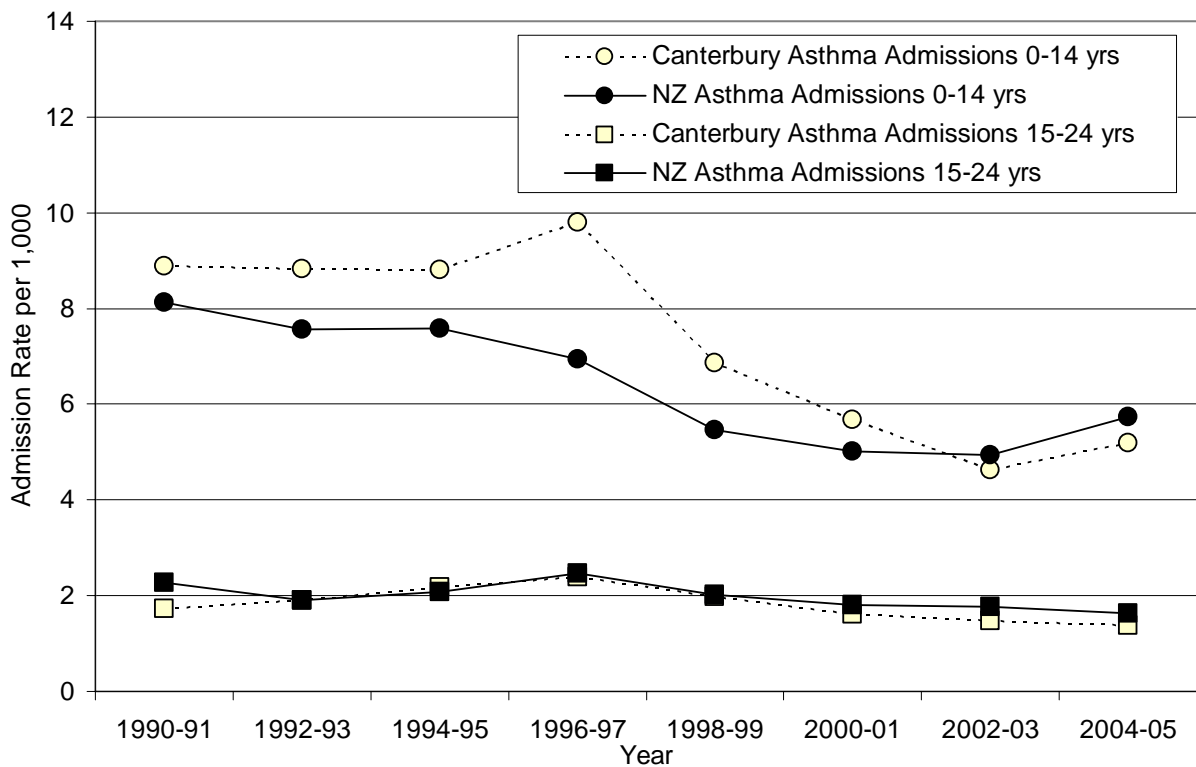
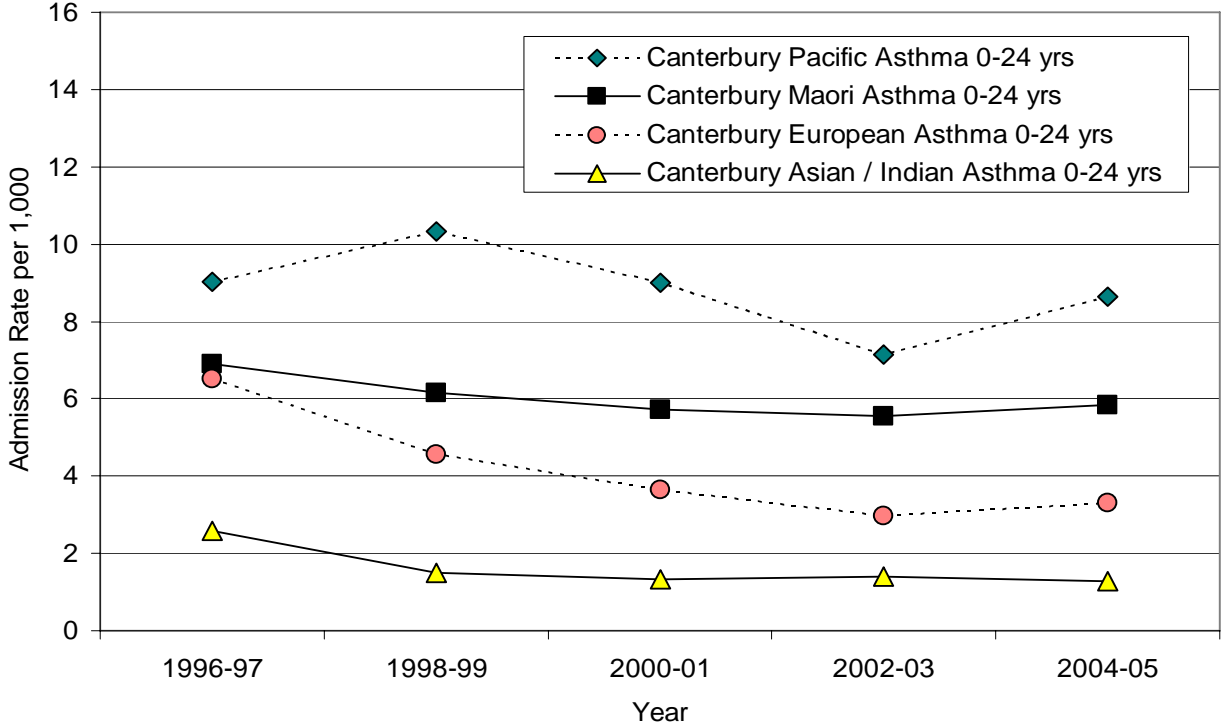


Figure 24. Hospital Admissions for Asthma by Ethnicity in Children and Young People 0-24 Years, Canterbury 1996-2005.



While during the 1990s, hospital admissions for asthma in amongst Canterbury children were generally higher than the NZ average, they were similar to the NZ average during the past 4 years for which data was available. Admissions for Canterbury young people were similar to the NZ average throughout this period. (Figure 23). During 1996-2005, hospital admissions for asthma were highest amongst Canterbury Pacific > Māori > European > Asian / Indian children and young people (Figure 24), while during 1990-03, there were 7 deaths attributed to asthma amongst children and young people in the Canterbury region.

In Summary

Asthma admissions and deaths among NZ children and young people have declined during the past 17 years, although in the case of hospital admissions for those 0-14 years, this downward trend has ceased in the past 3-4 years. While hospital admissions during 2001-05 were highest amongst children <5 years, mortality during 1999-03 was highest amongst adolescents and those in their early 20s. Hospital admissions amongst children 0-14 years were also higher for those living in the most deprived areas, for Pacific, Māori and Asian / Indian children, males and those living in urban areas.

While during the 1990s, hospital admissions for asthma amongst Canterbury children were generally higher than the NZ average, they were similar to the NZ average during the past 4 years for which data was available. Admissions for Canterbury young people were similar to the NZ average throughout this period. During 1996-05, hospital admissions for asthma were highest amongst Canterbury Pacific > Māori > European > Asian / Indian children and young people and during 1990-03, there were 7 deaths attributed to asthma children and young people (0-24 yrs) in the Canterbury region.

BRONCHIECTASIS

Introduction

Bronchiectasis originates from Greek literally meaning ‘stretching of the windpipe’. Bronchiectasis not due to cystic fibrosis is usually a progressive disease defined pathologically as bronchial dilatation, with or without associated bronchial wall and lung parenchymal damage, and classically with pus in the bronchial lumen. It is clinically characterised by a persistent wet cough with purulent sputum production in the older child, and recurrent respiratory exacerbations. The symptoms result in significant morbidity with lost schooldays and multiple absences from work for parents of affected children. Children with extensive bronchiectasis have a reduced exercise capacity, may have slower growth [25], with finger clubbing and persistent coarse crackles on examination. Continued problems with untreated or extensive disease may progress to respiratory failure and premature death [26].

The estimated prevalence for NZ children is 7 times higher than the only country (Finland) for which comparable incidence figures are available [27]. By their 15th birthday, 1:1700 NZ children will be diagnosed with Bronchiectasis, with the incidence being 3 times higher for Māori and 12 times higher for Pacific children compared with their European equivalents [27]. Bronchiectasis also demonstrates a marked socioeconomic gradient, with 67% of children in one study living in NZDep deciles 8-10 (the most deprived 30% of small areas) and 58% living in households where one or more family members smoked [28]. Yet despite recent advances in the diagnosis of Bronchiectasis, its aetiology often remains unclear, with 50% of paediatric cases in one NZ study having an unknown aetiology (although 37% had a history of recurrent lower respiratory tract infection and a further 25% were presumed secondary to severe pneumonia [28]).

The following section reviews hospital admission and mortality rates for bronchiectasis amongst children and young people (0-24 years) in New Zealand and the Canterbury region using information available from the National Minimum Dataset and the Mortality Collection.

Notes on Data Sources and Statistical Methods

Because of the tendency for children and young people with an underlying diagnosis of bronchiectasis to be admitted with a lower respiratory tract infection, hospital admission rates in this analysis were calculated by dividing the total number of admissions 0-24 years with a diagnosis of bronchiectasis (ICD-9 494; ICD-10 J47) appearing in any of the first 5 diagnostic fields, by census denominators for the period 1988-2005. While numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset (Appendix 2), in order to eliminate those children and young people whose underlying cause of bronchiectasis was cystic fibrosis, all cases with cystic fibrosis also listed within the first 5 diagnostic codes were specifically excluded. Denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers, mortality was reported as the total number of deaths due to bronchiectasis occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a diagnosis of bronchiectasis in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of bronchiectasis admissions 0-24 years in each NZDep Index decile (see Appendix 7) by the number of those 0-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing bronchiectasis admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Bronchiectasis in NZ: Trends and Risk Factors

Hospital admissions for bronchiectasis have increased dramatically in NZ during the past decade, while deaths due to bronchiectasis have declined (Figure 25). During 2001-05, hospital admissions were highest amongst children 0-14 years (Figure 26), Pacific & Māori children & young people, those living in the most deprived areas and those in urban areas (Table 21).

Figure 25. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Bronchiectasis, New Zealand Children and Young People 0-24 Years.

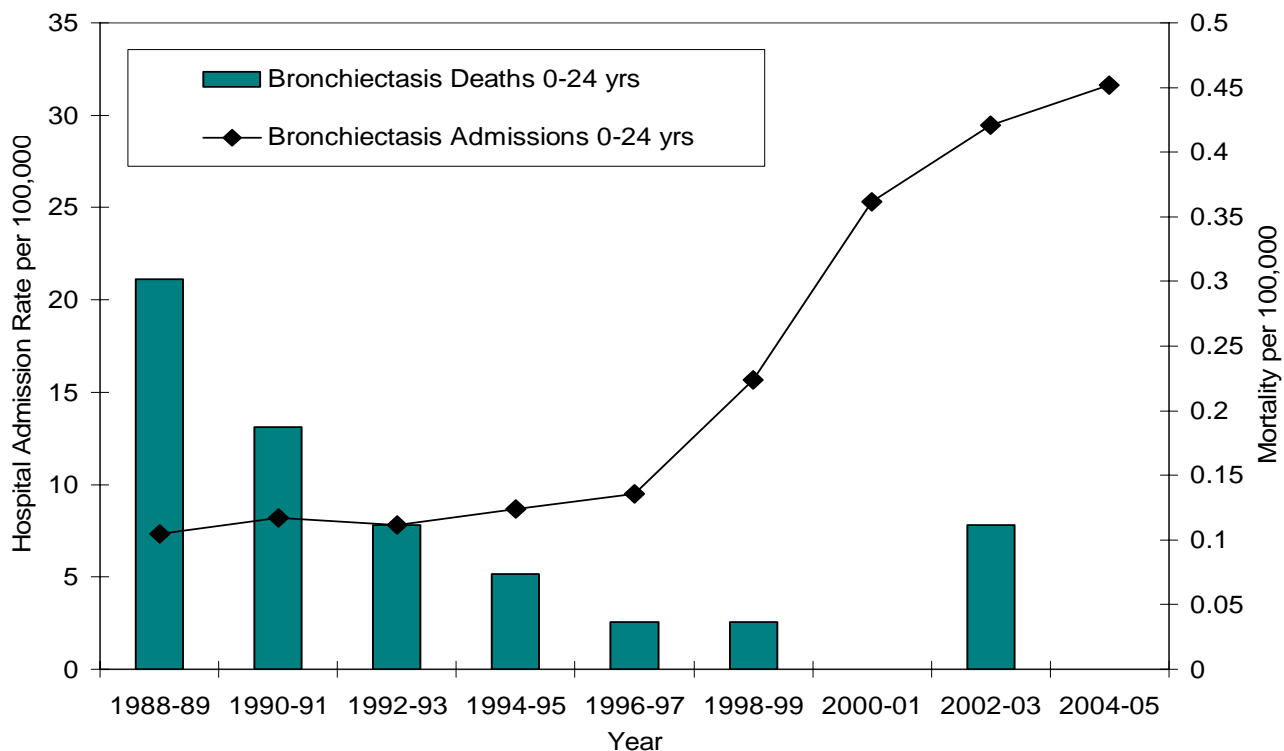
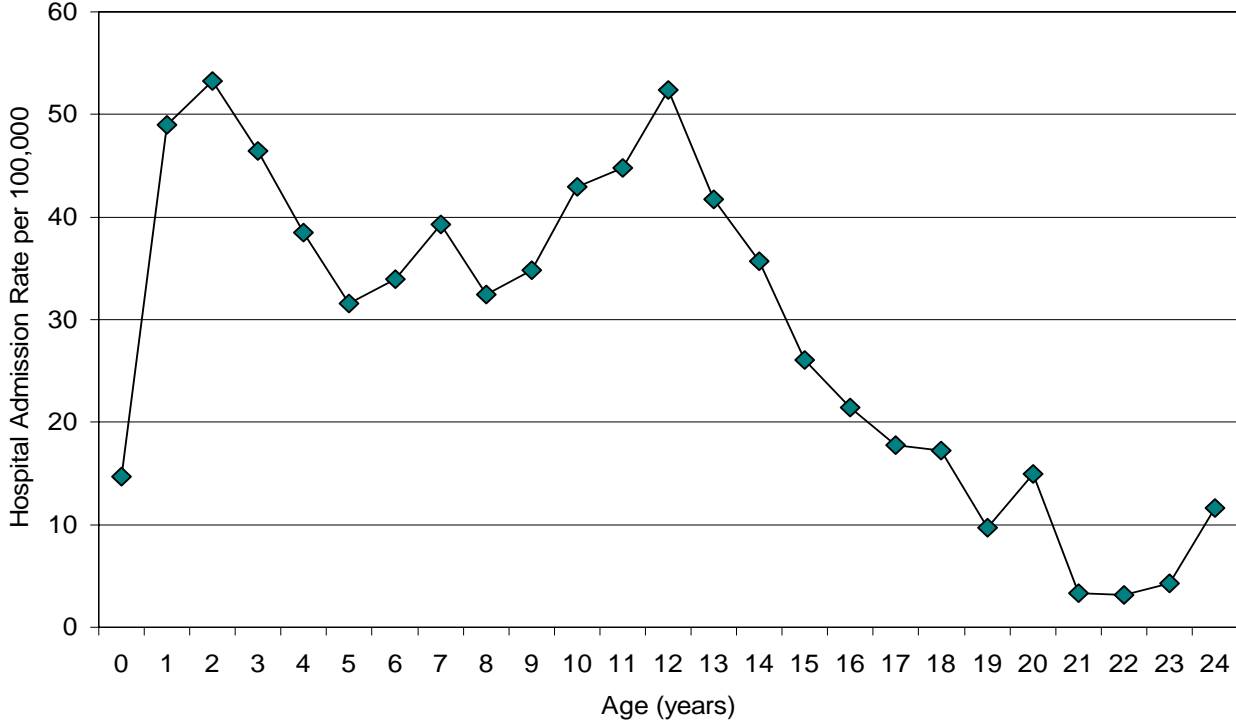


Table 21. Risk Factors for Hospital Admission due to Bronchiectasis, New Zealand Children and Young People 0-24 Years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	6.92	1.00		1-2	8.09	1.00	
2	9.17	1.33	0.88-1.99	3-4	16.69	2.06	1.62-2.63
3	16.77	2.42	1.67-3.52	5-6	19.77	2.44	1.93-3.10
4	16.62	2.40	1.66-3.47	7-8	27.85	3.44	2.75-4.31
5	12.80	1.85	1.26-2.72	9-10	67.76	8.37	6.79-10.33
6	26.20	3.79	2.67-5.36	Ethnicity			
7	18.87	2.73	1.91-3.90	Māori	50.85	4.23	3.76-4.75
8	36.24	5.24	3.74-7.33	Pacific	136.28	11.32	10.09-12.71
9	52.92	7.65	5.51-10.62	European	12.02	1.00	
10	82.25	11.88	8.60-16.41	Asian / Indian	5.62	0.47	0.33-0.67
Urban Rural				Gender			
Urban	40.69	1.00		Male	28.55	0.91	0.83-0.99
Rural	10.68	0.26	0.23-0.30	Female	31.49	1.00	

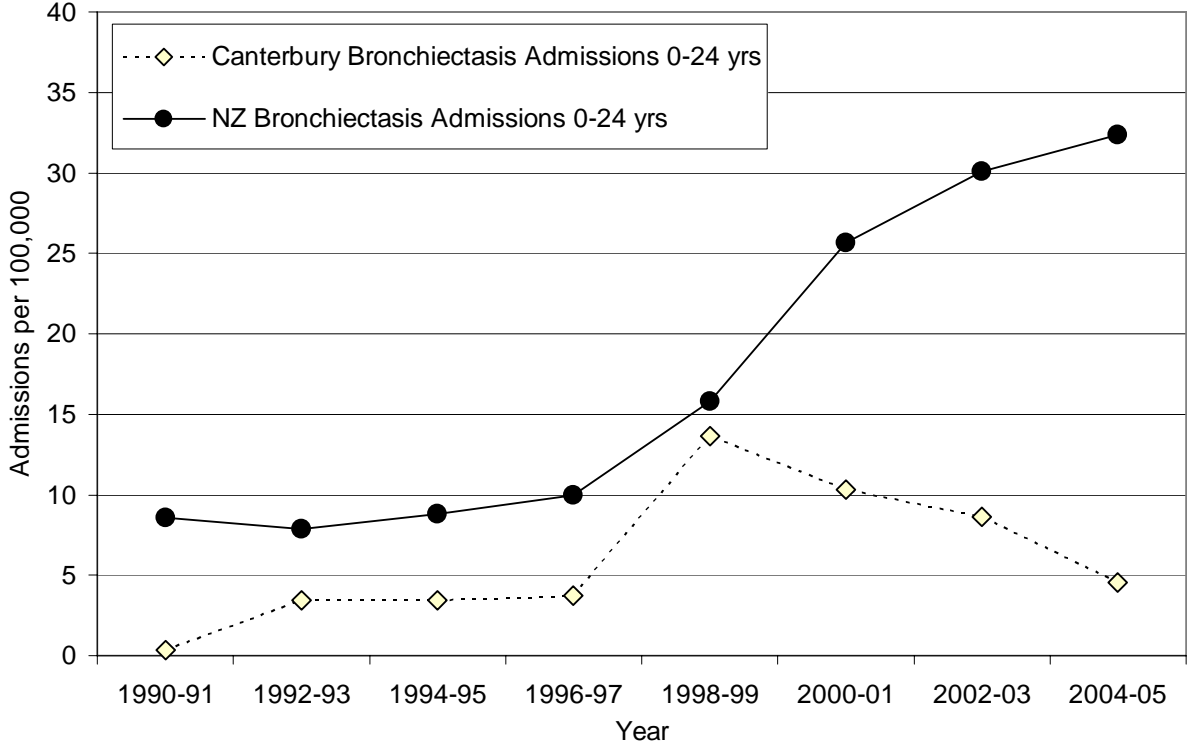
* rate per 100,000 per year, relative risks are unadjusted

Figure 26. Hospital Admissions due to Bronchiectasis by Age, New Zealand Children and Young People 0-24 Years 2001-2005.



Bronchiectasis in the Canterbury Region

Figure 27. Hospital Admissions due to Bronchiectasis Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.



During 1990-05, hospital admissions due to bronchiectasis amongst children and young people in Canterbury were consistently lower than the NZ average. In addition, there were no deaths attributed to bronchiectasis in Canterbury during 1990-03 (**Figure 27**). Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates and thus regional estimates need to be extrapolated from national figures.

In Summary

At a national level, hospital admissions for bronchiectasis have increased dramatically during the past decade, while deaths due to bronchiectasis have declined. Care must be taken when interpreting these trends however, as it remains unclear whether they 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. During 2001-05, hospital admissions were highest amongst children 0-14 years, Pacific & Māori children & young people, those living in the most deprived areas and those in urban areas.

During 1990-05, hospital admissions due to bronchiectasis amongst children and young people in Canterbury were consistently lower than the NZ average. In addition, there were no deaths attributed to bronchiectasis in Canterbury during 1990-03. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates and thus regional estimates need to be extrapolated from national figures.

CANCER

Introduction

Cancer in NZ children is relatively rare, with just over 1/3 of cases being attributed to leukaemia. Other causes, in descending order of frequency are brain, bone and connective tissue, non-Hodgkin's lymphoma and kidney. These 5 sites account for >80% of childhood cancer registrations and >70% of childhood cancer deaths [29]. Since 1956, the incidence of childhood cancer in NZ has increased (for males, from 13 per 100,000 in 1956 to 17 per 100,000 in the early 1980s and thereafter has remained stable; for females, from 10 per 100,000 in 1956 to 15 per 100,000 in 1996, although the rate of increase has slowed during the past 15 years). In contrast, cancer mortality has declined steadily, from 8 (males) / 7 (females) per 100,000 in 1956 to 5 (males) / 4 (females) per 100,000 in 1997. Projections suggest that these opposing trends in incidence (increasing) and mortality (decreasing) will continue into the near future [29].

In terms of known risk factors, a wide range of familial and genetic syndromes have been associated with childhood cancer overseas. Studies on the links between genetic factors and the environment however have been more inconsistent. In addition, few solely environmental risk factors have been established, although ionising radiation and infective agents have been implicated in a number of specific situations [30]. Thus, from a population health point of view, further research is necessary before sound evidence based primary prevention strategies can be developed which address the incidence of childhood cancer in this country. In terms of reducing the impact of childhood cancer once it has developed however, while treatment is very successful in preventing death in the majority of cases, families of children newly diagnosed with cancer can still expect multiple hospital admissions, treatments with severe side effects, and a great disruption to many aspects of their everyday life [31]. Thus ensuring the equitable access to specialist health services, family support and the reimbursement of travel / associated costs remains of considerable importance in reducing the burden cancer places on the families of children and young people in this country.

The following section reviews the incidence of cancer in New Zealand and Canterbury using two different data sources; Cancer notifications to the NZ Cancer Registry and deaths attributed to cancer in the NZ Mortality Collection.

Notes on Data Sources and Statistical Methods

The cancer incidence estimates in this section are derived from notifications to the New Zealand Cancer Registry (Appendix 5) for the period 1999-2004, with the site of the cancer (ICD-10 myeloid leukaemia C29; lymphoid leukaemia C91, Hodgkin's lymphoma C81, other lymphomas C82-C85, brain C71, testis C62, melanoma C43, bone and cartilage C40-41, kidney C64, adrenal C74, ovary C56, thyroid C73, cervix 53 and carcinoma in situ of cervix D06) being assigned using standard ICD-10 codes. Information on cancer deaths was obtained from the National Mortality Collection (Appendix 3) but because of subtle differences in the coding between the ICD-9 and ICD-10 coding systems, only information for the 2000-2004 period was utilised. Denominators were derived from the usual resident populations at the 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. For cervical carcinoma-in-situ, age-specific notification rates (2000-04) were calculated by dividing the (5 year) total number of notifications for carcinoma-in-situ in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific notification rates during 2000-2004. NZDep specific notification rates were calculated by dividing the total number of carcinoma-in-situ notifications in each NZDep Index decile (see Appendix 7) by the number of young women in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing carcinoma in situ notifications in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info software program.

Cancer Notifications & Deaths in NZ and the Canterbury Region

Table 22. Cancer Registrations in Children 0-14 Years, NZ and Canterbury 2000-2004.

Cancer Site	Number*	Rate*	%
New Zealand			
Leukaemia: Lymphoid	183	4.31	26.8
Leukaemia: Myeloid	38	0.90	5.56
Brain	106	2.50	15.5
Kidney	45	1.06	6.59
Bone and Cartilage	41	0.97	6.00
Adrenal	27	0.64	3.95
Lymphoma: Hodgkin	16	0.38	2.34
Lymphoma: Other	32	0.75	4.69
Other Cancers	195	4.60	28.6
Total	683	16.1	100.0
Canterbury			
Leukaemia: Lymphoid	22	5.07	29.3
Leukaemia: Myeloid	4	0.92	5.33
Brain	10	2.30	13.3
Kidney	10	2.30	13.3
Adrenal	6	1.38	8.00
Lymphomas	6	1.38	8.00
Bone and Cartilage	3	0.69	4.00
All Other Cancers	14	3.23	18.7
Total	75	17.3	100.0

*Numbers are per 5 year period; Rates are per 100,000 per year

Table 23. Cancer Deaths in Children 0-14 Years, NZ and Canterbury 2000-2003.

Cancer Site	Number*	Rate*	%
New Zealand			
Brain	49	1.45	37.69
Leukaemia: Lymphoid	19	0.56	14.62
Leukaemia: Myeloid	10	0.30	7.69
Bone and Cartilage	9	0.27	6.92
Adrenal	6	0.18	4.62
Kidney	4	0.12	3.08
Lymphomas	4	0.12	3.08
Other Cancers	29	0.86	22.31
Total	130	3.86	100.0
Canterbury			
All Cancers	5	1.45	100.0

*Numbers are per 4 year period; Rates are per 100,000 per year

In NZ during 2000-04, the cancer most frequently notified to the NZ Cancer Registry for children 0-14 years was lymphoid leukaemia, followed by tumours of the brain (**Table 22**). The most frequent causes of death were cancers of the brain, followed by lymphoid leukaemia (**Table 23**). In Canterbury during this period the pattern was similar, with lymphoid leukaemia followed by cancers of the brain and kidneys being the leading causes of cancer notification, although small numbers meant that regional death data was more difficult to interpret.

In NZ during 2000-04, cervical carcinoma in situ was the leading cause of notification to the NZ Cancer Registry for young people 15-24 yrs, although melanoma was the leading form of invasive disease (**Table 24**). The most frequent causes of death were cancers of the brain, followed by tumours of bone and cartilage and lymphoid leukaemia (**Table 25**). In Canterbury during this period the pattern was similar, with carcinoma in situ of the cervix being the leading cause of notification to the NZ Cancer Registry, and melanoma being the leading form of invasive disease. Again, small numbers meant that regional death data was difficult to interpret, although brain cancers were the leading cause of cancer mortality during this period.

Table 24. Cancer Registrations for Young People 15-24 yrs, NZ and Canterbury 2000-2004.

Cancer Site	Number*	Rate*	%
New Zealand			
Cervix: Carcinoma in Situ	2600	210.1	74.3
Cervix: Malignant	16	1.29	0.46
Melanoma: Malignant	169	6.79	4.83
Melanoma: In Situ	64	2.57	1.83
Testis	84	6.71	2.40
Lymphoma: Hodgkin	66	2.65	1.89
Lymphoma: Other	34	1.37	0.94
Thyroid	48	1.93	1.37
Brain	45	1.81	1.29
Bone and Cartilage	48	1.93	1.37
Leukaemia: Lymphoid	41	1.65	1.17
Leukaemia: Myeloid	34	1.37	0.97
Ovary	38	3.07	1.09
Other Cancers	213	8.56	6.09
Total	3500		100.0
Canterbury			
Cervix: Carcinoma in Situ	280	193.3	70.4
Cervix: Malignant	3	2.07	0.75
Melanoma: Malignant	20	6.90	5.03
Melanoma: In Situ	8	2.76	2.01
Testis	17	11.7	4.27
Lymphoma: Hodgkin	10	3.45	2.51
Thyroid	8	2.76	2.01
Brain	7	2.42	1.76
Leukaemia	7	2.42	1.76
Ovary	5	3.45	1.26
Bone and Cartilage	4	1.38	1.01
Other Cancers	29	10.0	7.29
Total	398		100.0

*Numbers are per 5 year period; Rates are per 100,000 per year; Rates for cancers of reproductive organs are gender specific

Table 25. Cancer Deaths in Young People 15-24 Years, NZ and Canterbury 2000-2003.

Cancer Site	Number*	Rate*	%
New Zealand			
Brain	22	1.10	16.79
Bone and Cartilage	17	0.85	12.98
Leukaemia: Lymphoid	16	0.80	12.21
Leukaemia: Myeloid	7	0.35	5.34
Melanoma: Malignant	9	0.45	6.87
Lymphomas	11	0.55	8.40
Testis	4	0.40	3.05
Other Cancers	45	2.25	34.35
Total	131	6.75	100.0
Canterbury			
Brain	3	1.28	21.4
Other Cancers	11	4.70	78.6
Total	14	5.98	100.0

*Numbers are per 4 year period; Rates are per 100,000 per year; Rates for cancers of reproductive organs are gender specific

Cervical Cancer and Carcinoma in Situ

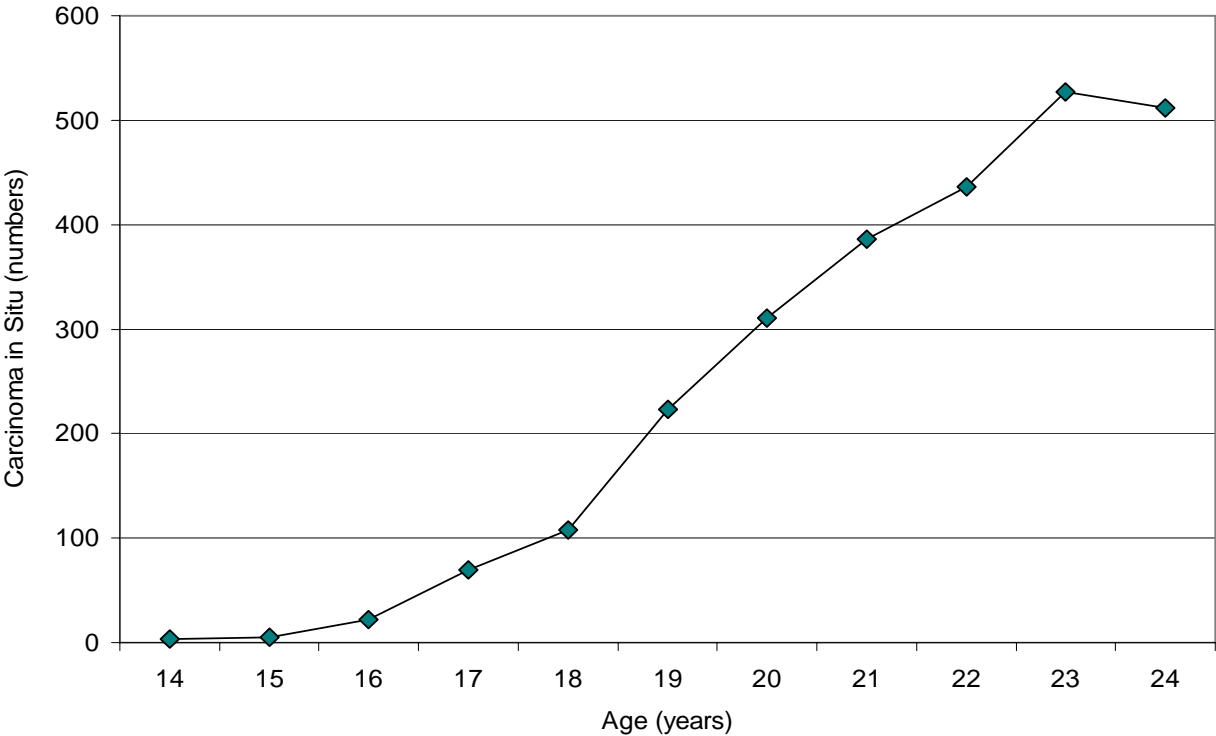
As suggested above, carcinoma in situ of the cervix was the neoplasm most frequently notified to the NZ Cancer Registry for those in the 15-25 age group, possibly as a result of the National Cervical Screening Programme. Notifications for carcinoma in situ in this age group increased progressively with age (**Figure 28**) but inconsistently with increasing NZDep deprivation. In addition, rates of carcinoma in situ were highest amongst European young women (**Table 26**). These figures however should be interpreted with caution, as it remains unclear the extent to which they reflect access to the National Cervical Screening, as opposed to the underlying risk of cervical cancer in the NZ youth population.

Table 26. Risk Factors for Cancer Registry Notifications due to Carcinoma in Situ of the Cervix, New Zealand Women 15-24 Years, 2000-2004.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	172.6	1.00		1-2	151.8	1.00	
2	132.9	0.77	0.61-0.97	3-4	204.3	1.35	1.16-1.56
3	186.6	1.08	0.88-1.33	5-6	225.4	1.48	1.29-1.71
4	220.3	1.28	1.05-1.56	7-8	251.5	1.66	1.45-1.90
5	228.5	1.32	1.09-1.61	9-10	201.1	1.32	1.16-1.52
6	222.8	1.29	1.06-1.57	Ethnicity			
7	299.5	1.73	1.44-2.08	Māori	188.7	0.68	0.62-0.76
8	209.6	1.21	1.00-1.47	Pacific	44.4	0.16	0.12-0.22
9	212.7	1.23	1.03-1.48	European	276.3	1.00	
10	186.7	1.08	0.89-1.31	Asian / Indian	27.1	0.10	0.07-0.14

* Rates are per 100,000 per year

Figure 28. Notifications to the NZ Cancer Registry for Carcinoma in Situ of the Cervix by Age, NZ Women 15-24 Years 2000-2004.



In Summary

In NZ during 2000-04, the cancer most frequently notified to the NZ Cancer Registry for children 0-14 years was lymphoid leukaemia, followed by tumours of the brain. The most frequent causes of death were cancers of the brain, followed by lymphoid leukaemia. In Canterbury during this period the pattern was similar, with lymphoid leukaemia followed by cancers of the brain and kidneys being the leading causes of cancer notification, although small numbers meant that regional death data was more difficult to interpret.

In NZ during 2000-04, cervical carcinoma in situ was the leading cause of notification to the NZ Cancer Registry for young people 15-24 yrs, although melanoma was the leading form of invasive disease. The most frequent causes of death were cancers of the brain, followed by tumours of bone and cartilage and lymphoid leukaemia. In Canterbury during this period the pattern was similar, with carcinoma in situ of the cervix being the leading cause of notification to the NZ Cancer Registry and melanoma being the leading form of invasive disease. Again, small numbers meant that regional death data was difficult to interpret, although brain cancers were the leading cause of cancer mortality during this period.

GASTROENTERITIS

Introduction

Acute gastroenteritis is a clinical syndrome produced by a variety of viral, bacterial and parasitic organisms. It results in inflammation of the stomach and intestines, leading to anorexia, nausea, vomiting, diarrhoea, fever, and abdominal discomfort. Onset is often abrupt and may result in the rapid loss of fluids and electrolytes [17]. Transmission is generally by the faecal-oral route, with the incubation period varying depending on the causative organism. In terms of aetiology, in one recent NZ study, 56% of hospital admissions with gastroenteritis (< 5 years of age) were of unknown aetiology, 41% were attributed to viruses and the remaining 3% to bacterial or parasitic causes [32].

In NZ gastroenteritis is one of the top 10 causes of hospital admission amongst children, with admissions peaking during the winter months. [32]. Risk factors include young age (highest <2 years), Māori and Pacific ethnicity [32], a lack of breastfeeding, and attendance at day care settings [33]. In terms of reducing the burden of disease, it has been suggested that up to 60% of hospital admissions for gastroenteritis <5 years may be attributable to rotavirus infection [32]. While currently an expensive rotavirus vaccine is available in the USA, it is hoped that the cost per dose will decrease as production increases, potentially offering an avenue for prevention in future years. In the meantime, improved access to oral rehydration solutions in the primary care setting and initiatives to promote breastfeeding may be of value in reducing admission rates at a population level.

The following section reviews hospital admission and mortality rates for gastroenteritis amongst children (0-14 years) and young people (15-24 years) in NZ and the Canterbury region, using information from the National Minimum Dataset & the Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions with a primary diagnosis of gastroenteritis (ICD-9 001-009, 558.9, 787.0; ICD-10 A00-A09, K52, R11) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) for children (0-14 years) and young people (15-25 years) as recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers, mortality was reported as the total number of deaths due to gastroenteritis occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of gastroenteritis in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates for children (0-14 years) during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of children (0-14 years) admitted with gastroenteritis in each NZDep Index decile (see Appendix 7) by the number of children living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing gastroenteritis admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Gastroenteritis in NZ: Trends and Risk Factors

Hospital admissions for gastroenteritis amongst New Zealand children and young people have been increasing in recent years, while deaths have remained static at around 1-2 cases per year (**Figure 29**). During 2001-2005 admission rates for gastroenteritis were highest amongst children during their first year of life and tapered off rapidly thereafter. Mortality during

1988-2003 also followed a similar pattern (**Figure 30**). Admission rates for children 0-14 years were also higher amongst those living in the most deprived areas, Pacific and Asian / Indian children and those living in urban areas (**Table 27**).

Figure 29. Hospital Admission Rates (1988-2005) and Deaths (1988-2003) due to Gastroenteritis, New Zealand Children and Young People 0-24 Years.

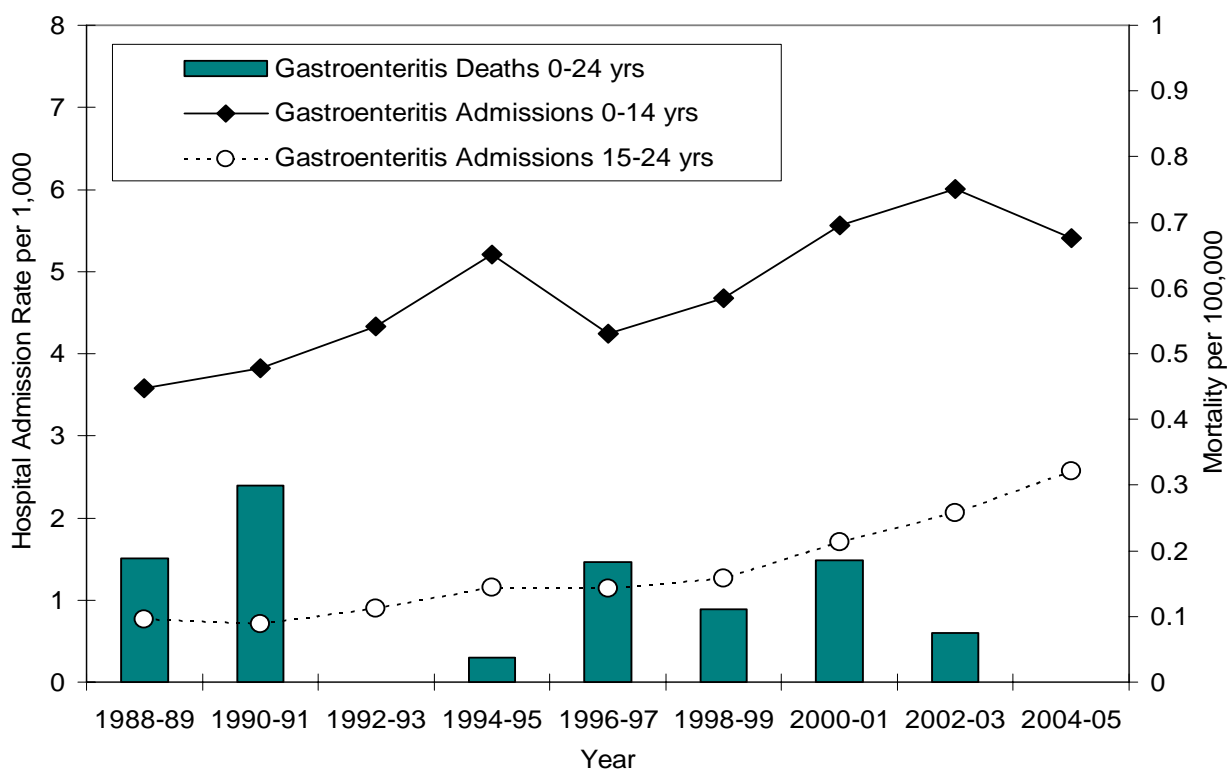
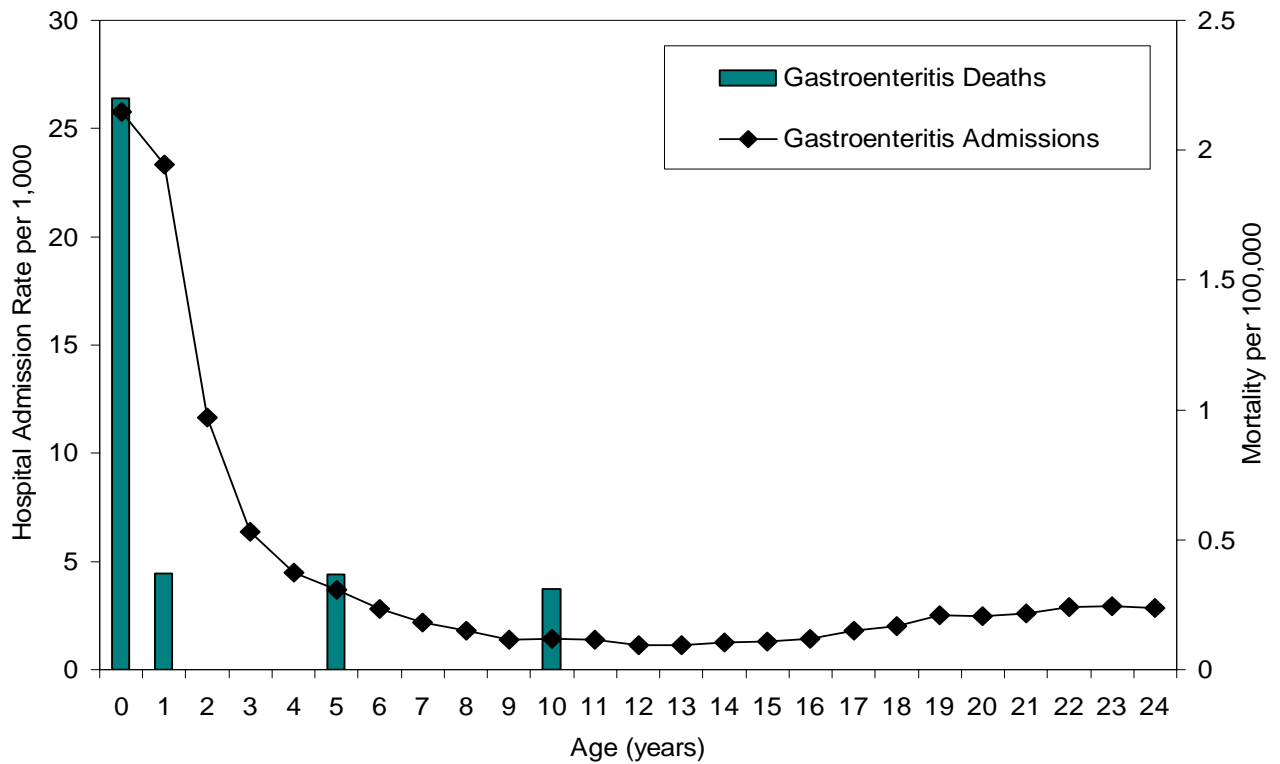


Table 27. Risk Factors for Hospital Admission due to Gastroenteritis, New Zealand Children 0-14 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	4.64	1.00		1-2	4.43	1.00	
2	4.24	0.91	0.85-0.98	3-4	4.78	1.08	1.03-1.13
3	4.54	0.98	0.91-1.05	5-6	5.31	1.20	1.14-1.25
4	5.01	1.08	1.01-1.15	7-8	6.56	1.48	1.41-1.54
5	5.12	1.10	1.03-1.18	9-10	7.50	1.69	1.62-1.76
6	5.48	1.18	1.11-1.26	Ethnicity			
7	6.18	1.33	1.25-1.41	Māori	4.97	0.88	0.86-0.91
8	6.91	1.48	1.40-1.58	Pacific	8.38	1.49	1.43-1.55
9	7.49	1.61	1.52-1.71	European	5.62	1.00	
10	7.51	1.61	1.52-1.71	Asian / Indian	6.46	1.15	1.09-1.21
Urban Rural				Gender			
Urban	6.70	1.00		Male	5.96	1.06	1.03-1.09
Rural	4.41	0.66	0.64-0.68	Female	5.62	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Figure 30. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Gastroenteritis by Age, New Zealand Children and Young People 0-24 Years.



Gastroenteritis in the Canterbury Region

Figure 31. Hospital Admissions due to Gastroenteritis Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.

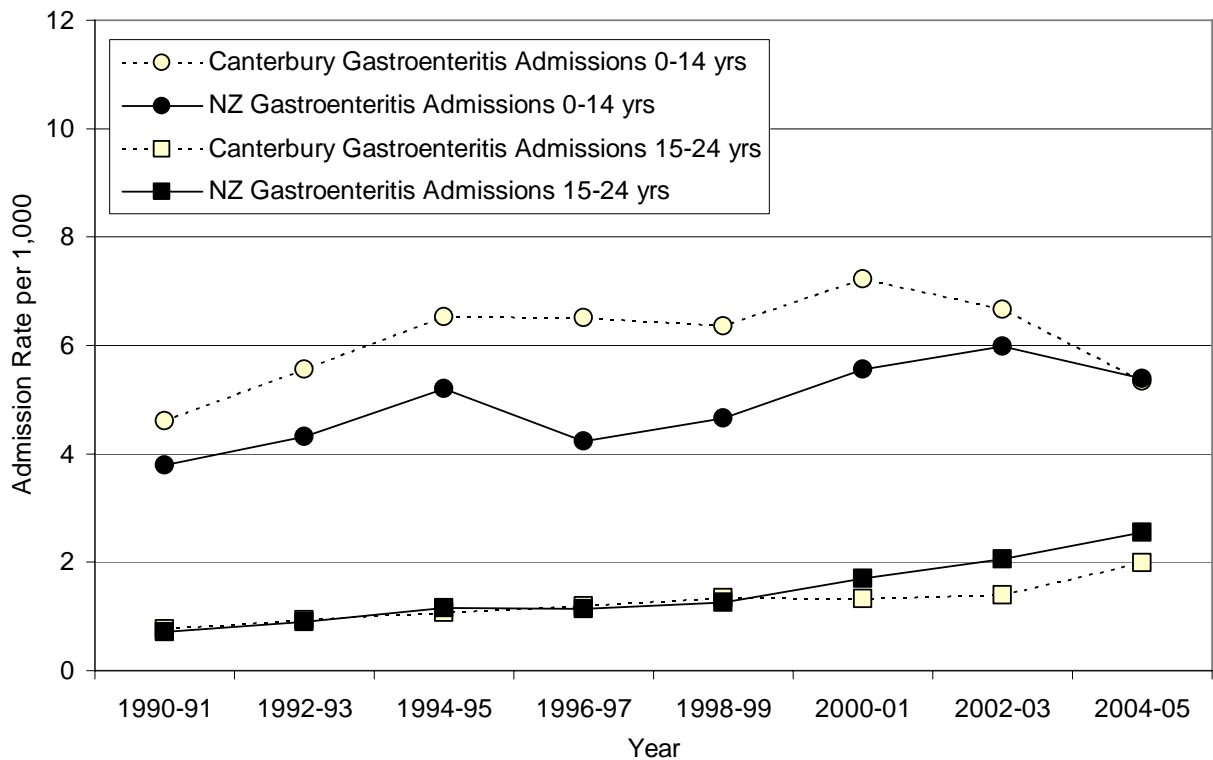
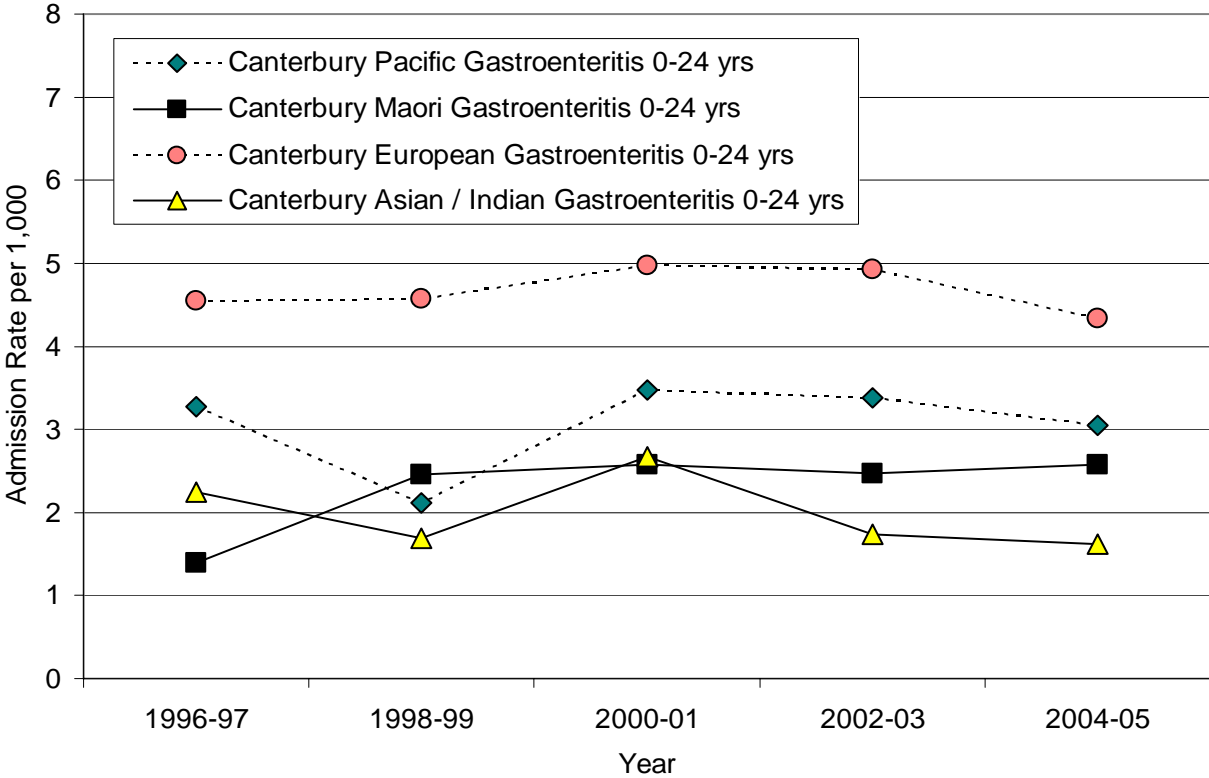


Figure 32. Hospital Admissions for Gastroenteritis amongst Children and Young People 0-24 Years, Canterbury 1996-2005.



During 1990-05, hospital admissions for gastroenteritis amongst Canterbury children were generally higher than the NZ average, while rates for Canterbury young people were similar or lower (Figure 31). During 1996-2005, admission rates in Canterbury were highest amongst Māori children and young people (Figure 32). There were however, no deaths attributed to gastroenteritis amongst Canterbury children and young people during 1990-03.

In Summary

Hospital admissions for gastroenteritis amongst NZ children and young people have been increasing in recent years, while deaths have remained static at around 1-2 cases per year. During 2001-05 admission rates for gastroenteritis were highest amongst children during their first year of life and tapered off rapidly thereafter. Mortality during 1988-03 also followed a similar pattern. Admission rates for children 0-14 years were also higher amongst those living in the most deprived areas, Pacific and Asian / Indian children and those living in urban areas.

During 1990-05, hospital admissions for gastroenteritis amongst Canterbury children were generally higher than the NZ average, while rates for Canterbury’s young people were similar or lower. During 1996-05, admission rates in Canterbury were highest amongst Māori children and young people, although no deaths were attributed to gastroenteritis amongst Canterbury children and young people during 1990-03.

HEARING LOSS IN EARLY CHILDHOOD

Introduction

Hearing in infants and young children is essential for speech and language development and its loss during early life may lead to disability, the extent of which depending on the severity and timing of the loss [34]. Hearing loss is often divided into two categories: sensorineural hearing loss, arising from problems in the cochlear or auditory nerve (often due to inherited conditions, congenital anomalies, extreme prematurity or in-utero infections [34]) and conductive hearing loss arising from problems in the middle or external ear (often the result of chronic otitis media with effusion).

NZ's Well Child – Tamariki Ora National Schedule outlines the following timeframe for the screening and surveillance of young children for hearing loss

1. Newborn (0-5 days): LMC / paediatrician to screen children for risk factors of sensorineural hearing loss e.g. severe neonatal jaundice, extreme prematurity, in-utero infections, cranio-facial anomalies, family history of congenital hearing loss. Where risk factors present, children referred to audiological centre for diagnostic assessment.
2. Hearing Surveillance and Surveillance for Otitis Media with Effusion by Well Child Provider at 6 week, 3, 5, 10, 15 and 24 month visits and referral if hearing impairment or otitis media with effusion suspected.
3. Age 3 Years: Screening at registered pre-school venues using tympanometry to detect chronic middle ear effusion. Immediate referral if evidence of obstruction or perforation, otherwise referral following 2 failed tympanometry tests with a 10-16 week test-retest interval.
4. Age 5 Years: Screening of all school new entrants with audiometry and tympanometry to detect undiagnosed hearing loss or persistent middle ear disorder. Immediate referral if hearing loss is marked, otherwise referral following 2 failed tests with a 10-16 week test-retest interval.

Despite this comprehensive schedule, evidence would suggest that the screening of newborn infants for “risk criteria” has not led to a reduction in the age of detection of hearing loss, with the average age at detection during 1991-2000 being 28.6 months and “risk factor” approaches only picking up 40% of children [35]. The following section reviews the results of screening for hearing loss at school entry in the Canterbury region and contrasts these with those occurring in the rest of New Zealand.

Notes on Data Sources and Statistical Methods

The hearing screening information used in this section was obtained from the National Audiology Centre's annual reports for the period 2005-06. The National Audiology centre in turn receives this information from Vision Hearing Technicians and Public Health Nurses employed by DHBs and Health Trusts throughout NZ. Coverage rates were calculated by dividing the number of new entrants screened by school enrolments at the beginning of the same year. Failure rates were calculated using the methodology outlined below.

Hearing Screening Results at Pre-School and School Entry

The National Audiology Centre is responsible for the co-ordination of the National Hearing and Vision Screening Programme and collates and publishes national hearing data in their annual reports. The following information is derived from the National Audiology Centres annual screening statistics for the years ending June 2005-2006 [36].

New Entrant Screening at 5 years

Hearing Screening coverage is calculated by dividing the total numbers screened by the number of children enrolled in each educational region at the beginning of July.

A failure of pure tone audiometry is defined as:

- At least two thresholds 45dB or greater (this result is an immediate referral to audiology services if tympanometry is normal, or to the GP or specialist ear nurse if the tympanometry is abnormal).
- At least one threshold exceeding the screening levels of 30dB (500Hz) or 20dB (1000-4000Hz)- this results in the child being scheduled for a retest at the next visit (in 10-16 weeks time)

Nationally the coverage for screening at school entry during July 05-June 06 was 99%, with an audiometric failure rate of 6.6%.

Table 28 summarises the new entrant coverage rates for Canterbury for the years ending June 2005-2006. During this period, Canterbury's coverage rates for hearing screening at school entry were similar to the national average.

Figure 33 compares Canterbury's new entrant audiometry failure rates with the New Zealand average for the years ending June 1993-2006. While there were some year to year fluctuations, in general audiometry failure rates in Canterbury were lower than the NZ average during this period.

Table 28. New Entrant Coverage Rates at 5 Years, Canterbury DHB vs. New Zealand, Years Ending June 2005-06

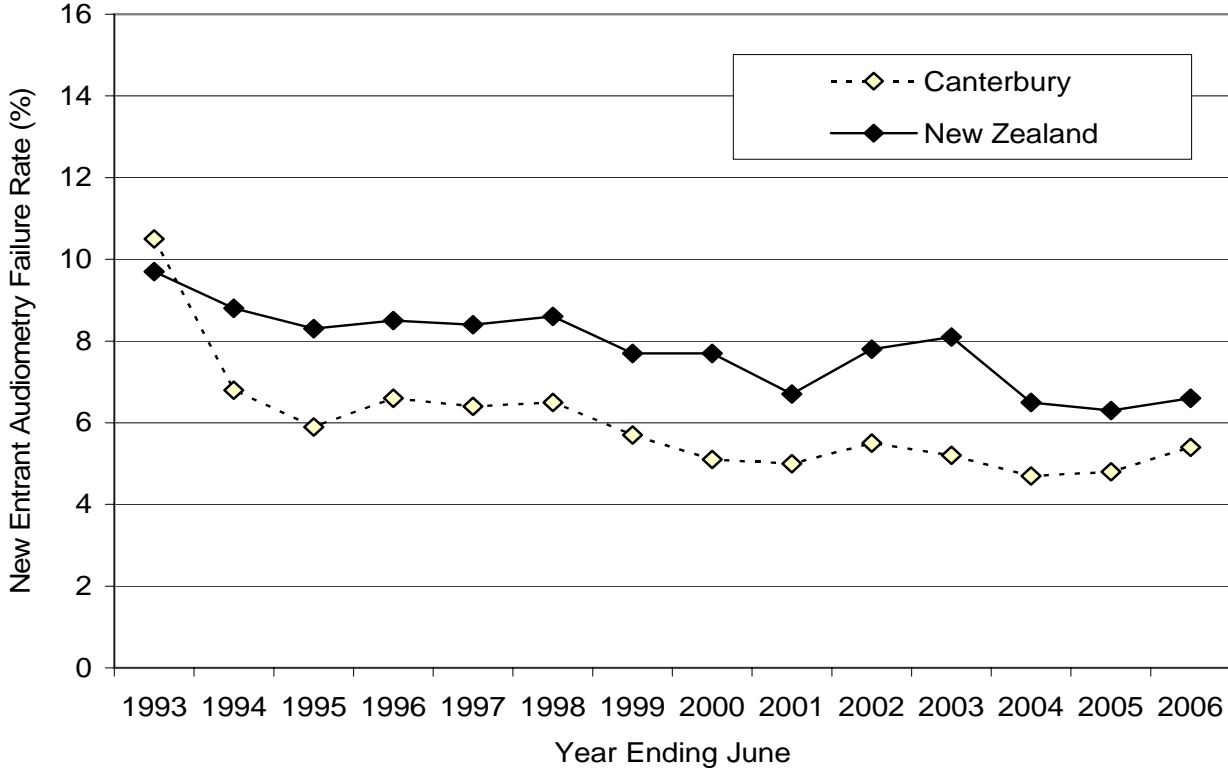
	July 04-June 05	July 05-June 06
Canterbury	90%	94%
New Zealand	89%	99%

Source National Audiology Centre

In Summary

During 2005-06 coverage rates for hearing screening at school entry in Canterbury were similar to the NZ average, while audiometry failure rates at school entry were generally lower.

Figure 33. Audiometry Failure Rates at School Entry (5 yrs), Canterbury vs. New Zealand, Years Ending June 1993-2006.



INJURY, DROWNING & POISONING IN CHILDHOOD

Introduction

Outside of the perinatal period, injury is the leading cause of mortality for NZ children, with deaths due to motor vehicle accidents being the leading cause of injury related death [37, 38] and falls being the leading cause of injury related hospital admission [39]. While males are over represented in nearly all injury categories, the type of injury also varies significantly with developmental stage of the child (e.g. deaths due to choking are highest amongst infants, while drowning deaths are highest amongst children 1-4 years [37]). In terms of interventions aimed at addressing the high rates of injury amongst NZ children, a number of existing prevention strategies have shown promise (e.g. child restraints, traffic calming), others remain inadequately implemented (e.g. pool fencing) and others (e.g. interventions to reduce child non-traffic (e.g. driveway) deaths) remain to be developed and tested [37].

The following section briefly reviews the leading causes of injury related hospital admission and death for children 0-14 years, both in New Zealand and the Canterbury Region (the later youth health section reviews the same information for young people 15-24 years). While injuries arising from Land Transport Accidents are reviewed in some detail, injuries of a non-accidental nature (i.e. assault) are covered in the following section on Child Abuse.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of injury related hospital admissions for children 0-14 years, by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatient and day patient) with a primary diagnosis of injury (ICD9 800-995: ICD 10 S00-T79), excluding those with an external cause code ICD-9 E870-879: ICD-10 Y40-Y84 (complications of medical or surgical care), ICD-9 E930-949 (adverse effects of drugs in therapeutic use) and ICD-9 E929, E969, E959 (late effects (>1 year) of injury). Land Transport Accidents (ICD-9 E800-829, E846-848: ICD-10 V01-V89, V98-99) were considered in more detail. In addition, as outlined in Appendix 2, to ensure comparability from region to region, all cases with an Emergency Department Specialty Code on discharge were excluded from this analysis, as were cases who died whilst in hospital (to avoid double counting in both morbidity and mortality data). Cause of injury was assigned using the supplementary E code relating to each injury admission. Denominators were derived from the usual resident NZ and DHB populations as estimated at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Mortality rates were calculated by dividing the total number of injury related deaths (ICD-9 E800-995: ICD-10 V01-Y36) by census population denominators for the periods 1988-2003. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of Land Transport Accident admissions in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates for children during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of children admitted as a result of a Land Transport Accident in each NZDep Index decile (see Appendix 7) by the number of children 0-14 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Childhood Injury in NZ: Trends and Risk Factors

During the past 3 years for which data was available falls, followed by injuries arising from mechanical forces (e.g. striking against an object / person) were the leading causes of injury related hospital admission for children 0-14 years (**Table 29**). Transport accidents and in particular injuries sustained while a vehicle occupant / pedestrian were the leading cause of injury related mortality (**Table 30**). In Canterbury during this period the pattern was similar,

with falls, followed by mechanical forces being the leading causes of hospital admission and land transport accidents being the leading cause of death (**Table 31**). (Note: there may be some cross over between accidental threats to breathing and SIDS in this age group, with the majority of these deaths occurring during infancy and whilst in bed).

Table 29. Most Frequent Causes of Injury Related Hospital Admission due to Children (0-14 yrs) in New Zealand and the Canterbury Region during 2003-2005.

Injury Type	New Zealand		Canterbury		
	*Rate	%	*Number	*Rate	%
Falls	637.2	44.5	1588	601.1	44.4
Mechanical Forces*	369.4	25.8	767	290.3	21.5
Transport Accident: Cyclist	83.8	5.9	184	69.7	5.1
Transport Accident: Occupant	32.6	2.3	65	24.6	1.8
Transport Accident: Pedestrian	29.0	2.0	65	24.6	1.8
Transport Accident: Motorbike*	26.1	1.8	58	22.0	1.6
Other Transport Accident	32.7	2.3	73	27.6	2.0
Accidental Poisoning	62.1	4.3	306	115.8	8.6
Electricity / Fire / Burns	50.1	3.5	119	45.0	3.3
Assault	19.1	1.3	87	32.9	2.4
Intentional Self Harm	11.1	0.8	46	17.4	1.3
Other Causes	74.5	5.2	216	81.8	6.0
Total	1427.7	100.0	3574	1352.9	100.0

*rates are per 100,000 per year; Number is per 3 year period; Mechanical forces includes being accidentally struck / crushed / injured by an object / implement / person / animal: Motorbike includes 3 wheeler.

Table 30. Causes of Injury Related Death for Children (0-14 yrs), New Zealand 2001-2003.

Injury Type	New Zealand	
	*Rate	%
Transport Accident	5.0	43.6
Accidental Threat to Breathing*	2.0	17.3
Drowning / Submersion	1.7	14.9
Assault	0.7	6.2
Electricity / Fire / Burns	0.9	8.3
Other Causes	1.1	9.7
Total	11.4	100.0

*rates are per 100,000 per year; Number is per 3 year period. Note comments in infant mortality section relating to the possible cross over in coding between accidental threats to breathing and SIDS in the first year of life.

Table 31. Causes of Injury Related Death for Children (0-14 yrs), Canterbury 2001-2003.

Injury Type	Canterbury		
	*Number	*Rate	%
Transport Accident	9	3.5	36.0
Accidental Threat to Breathing*	6	2.3	24.0
Drowning / Submersion	5	1.9	20.0
Electricity / Fire / Burns	3	1.2	12.0
Other Causes	2	0.8	8.0
Total	25	9.6	100.0

*rates are per 100,000 per year; Number is per 3 year period. Note comments in infant mortality section relating to the possible cross over in coding between accidental threats to breathing and SIDS in the first year of life.

Figure 34. Hospital Admissions (1990-2005) and Deaths (1990-2003) due to Injury in Children 0-14 Years, the Canterbury Region vs. New Zealand.

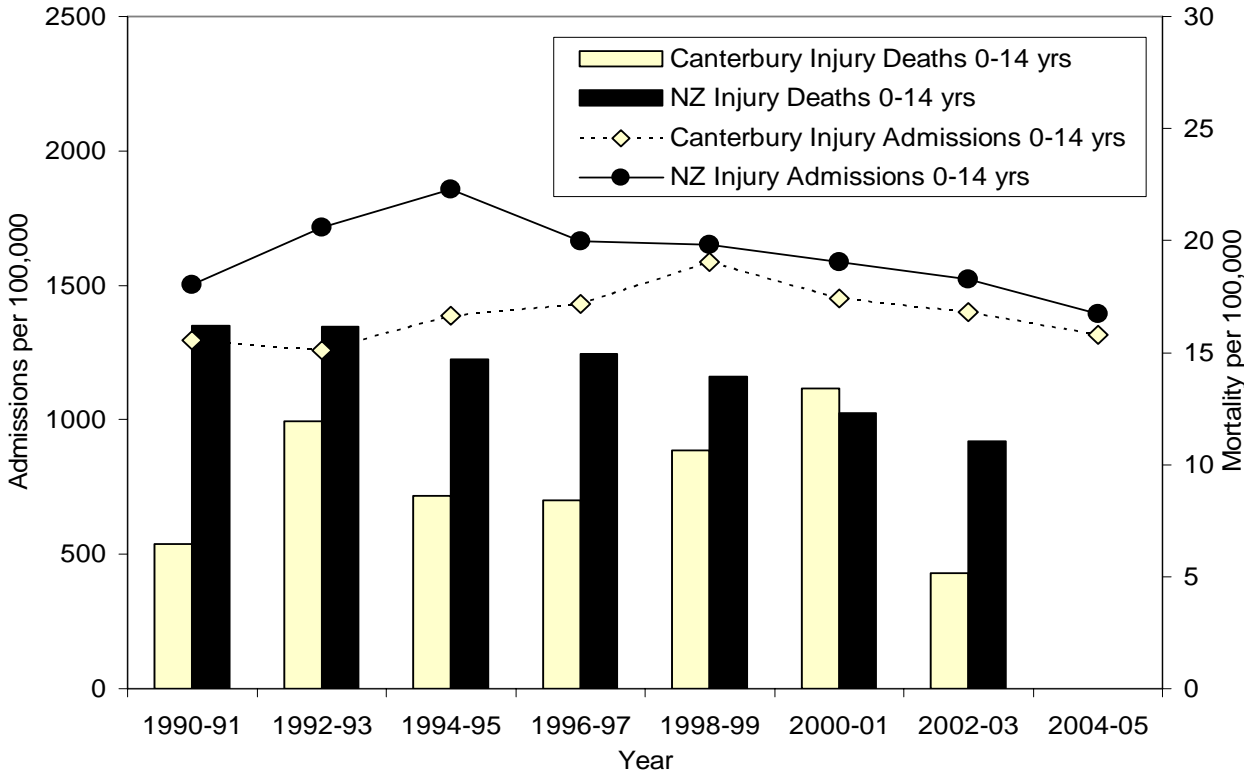
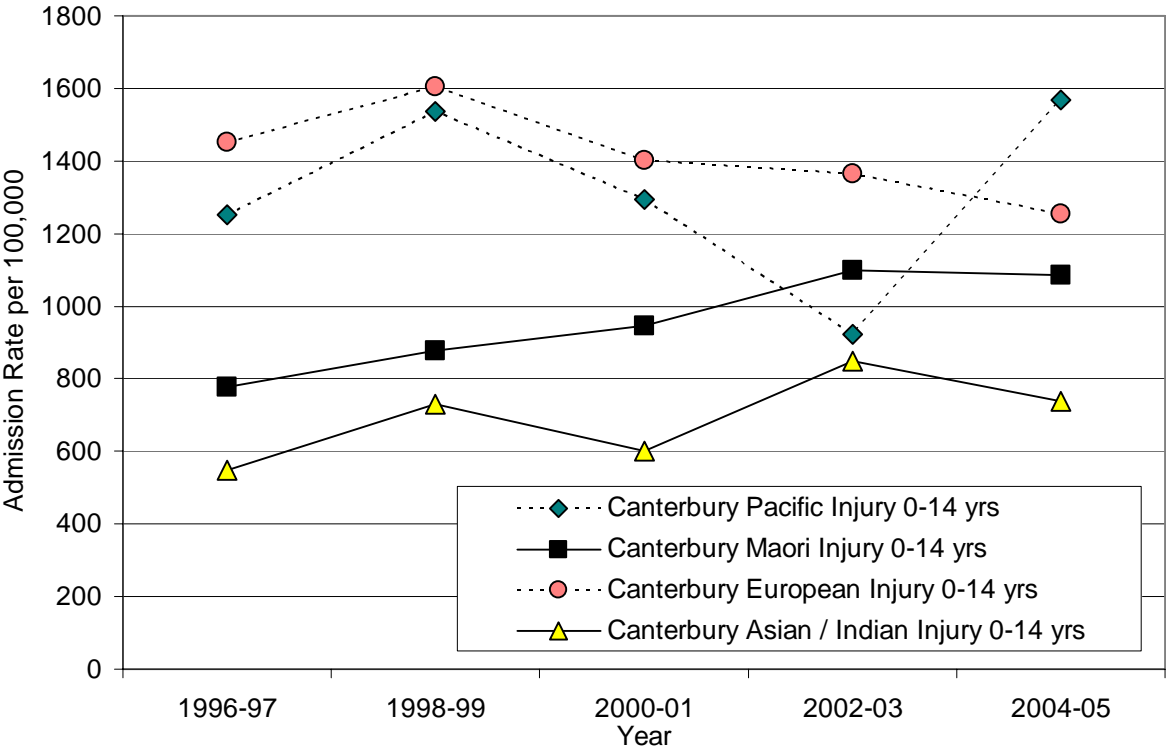


Figure 35. Hospital Admissions due to Injury by Ethnicity in Children 0-14 Years, the Canterbury Region 1996-2005.



During 1990-2005, hospital admissions and deaths from injury amongst Canterbury children were generally lower than the NZ average (Figure 34) and in addition, remained relatively static, in contrast to the gradual decline in injury related deaths amongst Canterbury young people during the same period (see youth injury section). During 1996-2005, admission rates were highest amongst European and Pacific children in the Canterbury region (Figure 35).

Land Transport Accidents in NZ

In contrast to the marked fall in mortality from land transport (including vehicle occupant, pedestrian, motorbike and cycle) accidents amongst young people (15-24 years), land transport hospital admissions and mortality amongst New Zealand children (0-14 years) have remained relatively static during the past 6-8 years. Age however, was a crucial factor associated with risk of land transport accident, with risk of hospital admission (2001-2005) increasing progressively throughout childhood, from the lowest point in infancy to a peak at 17 years. Mortality (1999-2003) however was much more evenly distributed throughout the childhood years (Figure 36). Risk of land transport accidents was also higher amongst Māori and European children, those living in the most deprived areas, males and those in rural areas (Table 32).

Figure 36. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Land Transport Accident by Age, New Zealand Children and Young People 0-24 Years.

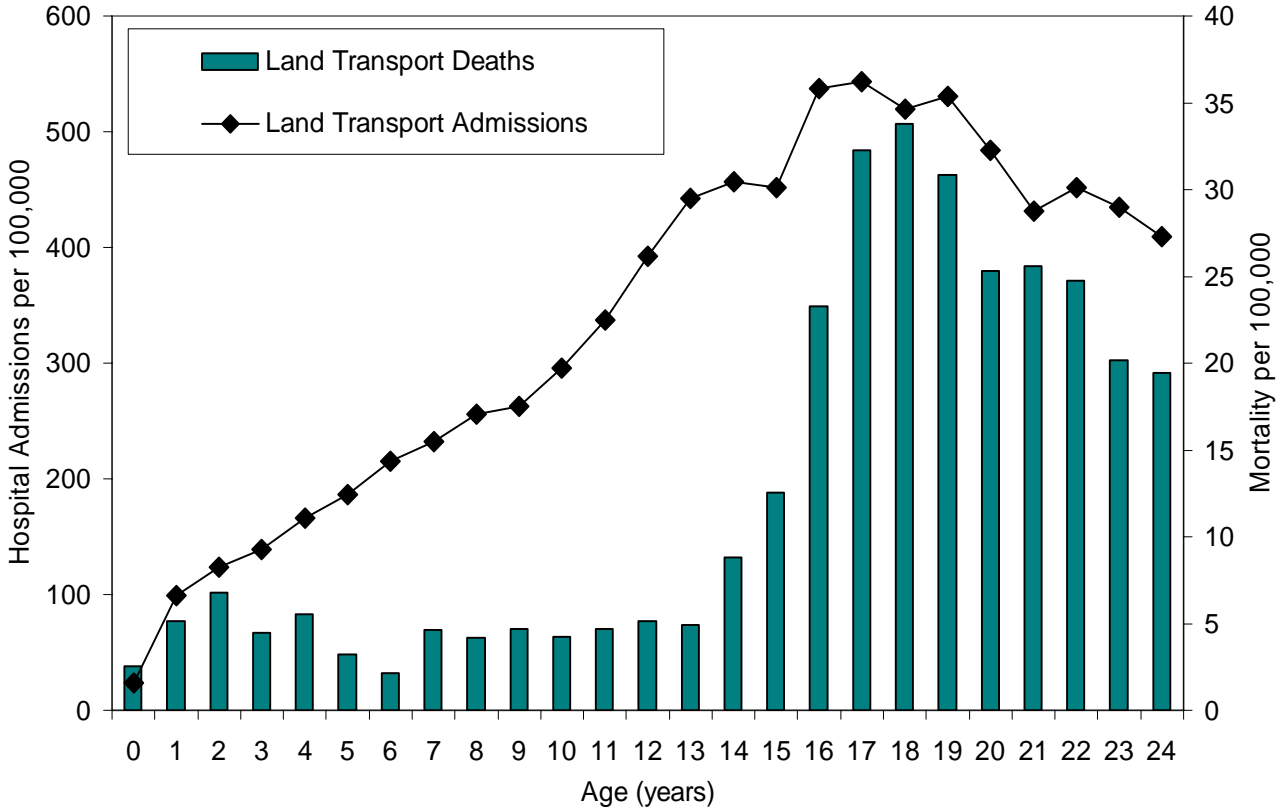


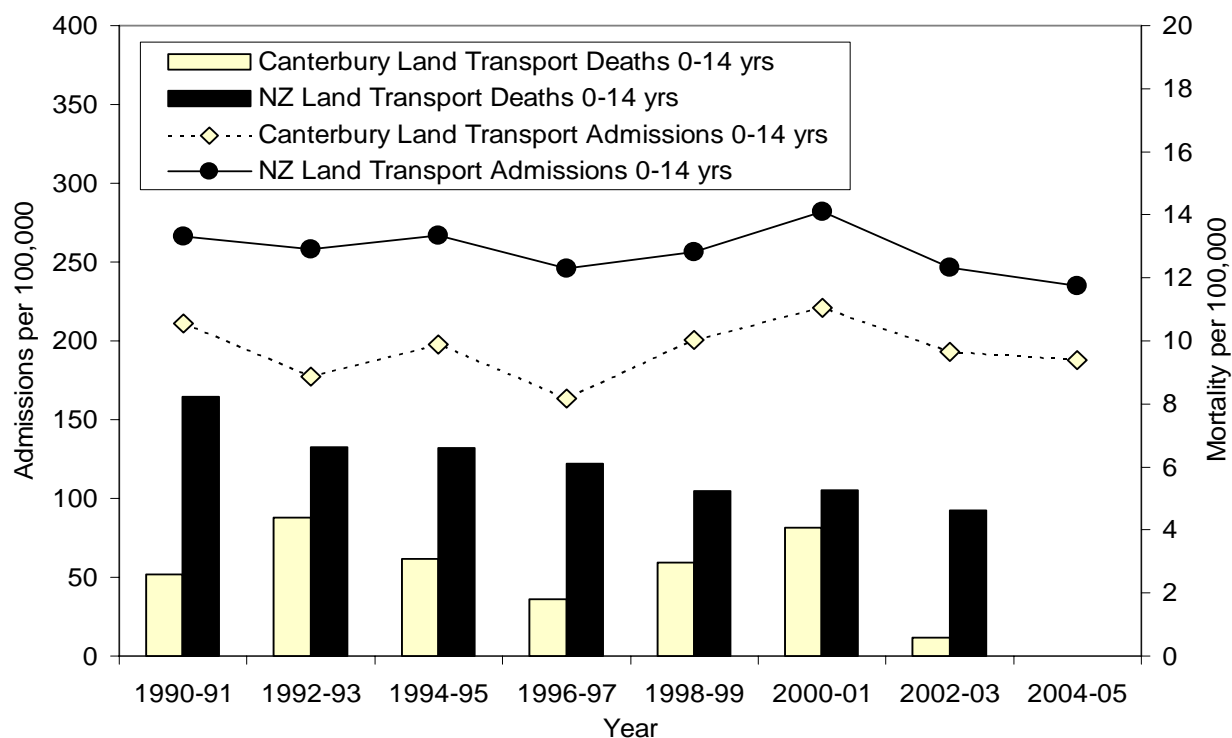
Table 32. Risk Factors for Hospital Admission due to Land Transport Accidents, New Zealand Children 0-14 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	154.2	1.00		1-2	149.5	1.00	
2	145.1	0.94	0.84-1.06	3-4	175.3	1.17	1.08-1.27
3	166.8	1.08	0.97-1.21	5-6	188.4	1.26	1.17-1.36
4	182.9	1.19	1.06-1.32	7-8	214.5	1.43	1.33-1.54
5	194.2	1.26	1.13-1.40	9-10	257.9	1.72	1.61-1.85
6	183.3	1.19	1.07-1.32	Ethnicity			
7	222.5	1.44	1.30-1.60	Māori	246.4	1.22	1.16-1.28
8	207.5	1.34	1.21-1.49	Pacific	158.2	0.78	0.72-0.86
9	238.3	1.54	1.40-1.71	European	201.8	1.00	
10	274.7	1.78	1.62-1.96	Asian / Indian	93.6	0.46	0.41-0.53
Urban Rural				Gender			
Urban	146.6	1.00		Male	258.0	1.79	1.71-1.87
Rural	221.1	1.51	1.44-1.58	Female	144.2	1.00	

* rate per 100,000 per year, relative risks are unadjusted

Land Transport Accidents in the Canterbury Region

Figure 37. Hospital Admission Rates (1990-2005) and Deaths (1990-2003) due to Land Transport Accidents Amongst Children 0-14 Years, Canterbury vs. New Zealand.



During 1990-2005 hospital admissions due to land transport accidents amongst Canterbury children remained relatively static. In addition, both admission rates and mortality were lower than the NZ average during this period (Figure 37).

In Summary

In recent years falls, followed by injuries arising from mechanical forces, were the leading causes of injury related hospital admission amongst NZ children, while transport accidents were the leading cause of injury related death. In Canterbury during this period the pattern was similar, with falls, followed by mechanical forces being the leading causes of hospital admission and land transport accidents being the leading cause of death. In comparative terms, during 1990-05, hospital admissions and deaths from injury amongst Canterbury children were generally lower than the NZ average and in addition, remained relatively static, in contrast to the gradual decline in injury related deaths amongst Canterbury young people during the same period. During 1996-05, injury admission rates were highest amongst Canterbury European and Pacific children.

At a national level, land transport accidents were the leading cause of injury related death in children 0-14 yrs, and in contrast to the progressive fall in mortality amongst young people, have remained relatively static during the past 6-8 years. Age however, was a crucial factor associated with risk of land transport accident, with risk of admission increasing progressively throughout childhood, from the lowest point in infancy to a peak at 17 years. Mortality however was much more evenly distributed throughout childhood (peaking later in mid-late adolescence). At a national level, risk of a land transport accident admission was also higher amongst Māori and European children, those living in the most deprived areas, males and those in rural areas. In comparative terms, during 1990-05 hospital admissions due to land transport accidents amongst Canterbury children remained relatively static. In addition, both admission rates and mortality were lower than the NZ average during this period.

INJURY: NON-ACCIDENTAL & CHILD ABUSE

Introduction

During the 1990s NZ ranked 3rd highest amongst rich nations for its child maltreatment death rates. Between 1996 and 2000, 49 children under the age of 15 years died as a result of maltreatment, with the highest rates being amongst those <5 years of age. Mortality rates for Māori averaged 2 per 100,000 during this period, as compared to 1 per 100,000 for non-Māori children. The situation does not appear to have improved over time, with NZ's childhood maltreatment mortality rates almost doubling during the late 1980s and changing very little since then [40].

Mortality rates however represent the tip of the iceberg, with the number of notifications to the Department of Child Youth and Family (CYFS) for possible abuse or neglect increasing each year. In the year ending June 2004, a total of 43,314 notifications were received by (CYFS) (a 23% increase over the previous year) and of these, 36,066 were considered to require further action [41]. Of 1999/2000 cases requiring further action, 50% were found to involve substantiated abuse, neglect or behavioural / relationship problems [41]. This is of concern, as in addition to 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 & high risk sexual behaviour [42].

The following section reviews hospital admissions and deaths from assault, neglect and maltreatment for New Zealand children (0-14 yrs) using two different data sources, the National Minimum Dataset (Hospital Discharges) and the NZ Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of intentional injuries (ICD-9 E960-968; ICD-10 X85-Y09) to children 0-14 years by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients, excluding those with an A&E discharge code M05-M08) as recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Mortality rates were calculated by dividing the total number of deaths attributed to intentional injury (ICD-9 E960-968; ICD-10 X85-Y09) in children 0-14 years (Mortality Collection Appendix 3), by the same census denominators. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of assault admissions in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of assault admissions (0-14 yrs) in each NZDep Index decile (see Appendix 7) by the number of children living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing assault admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Childhood Assault & Maltreatment in NZ: Trends & Risk Factors

While NZ's hospital discharge rates for assault, neglect and maltreatment of children 0-14 years declined steadily during the early 1990s, by 1996-97 they had reached a plateau and thereafter remained static. In contrast, mortality rates remained relatively static throughout the 18 years for which data was available (**Figure 38**).

During 2001-2005 hospital discharges for assault, neglect and maltreatment exhibited a U-shaped distribution by age, with rates being highest amongst those < 2 years and those > 11 years of age. In contrast, mortality rates were highest amongst children < 1 year. While the gender balance was relatively even during infancy and early childhood, hospital discharges amongst males became more predominant as adolescence approached (**Figure 39**). In addition, admission rates for assault, neglect and maltreatment were highest amongst Māori and Pacific children, those living in the most deprived areas, males and those in urban areas (**Table 33**).

During 2001-2005, the type of assault leading to hospital admission varied by 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 those in the 10-14 year age bracket 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 reflected to a transition away from assaults occurring within the family environment as age increased, 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.

During 2001-2005 the most common type of injury in children 0-4 years hospitalised for assault / maltreatment was superficial head injury, followed by subdural haematomas and fractures, while for children 10-14 years nasal fractures followed by upper limb fractures predominated (**Table 34**).

Table 33. Risk Factors for Hospital Admission due to Assault, Neglect & Maltreatment, NZ Children 0-14 years 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	8.9	1.00		Māori	36.1	2.83	2.43-3.30
3-4	12.3	1.38	1.01-1.89	Pacific	32.9	2.58	2.09-3.18
5-6	15.3	1.72	1.28-2.32	European	12.7	1.00	
7-8	22.7	2.55	1.94-3.36	Asian / Indian	9.1	0.71	0.47-1.07
9-10	35.6	4.00	3.09-5.18				
Urban Rural				Gender			
Urban	20.4	1.00		Male	26.0	1.86	1.61-2.14
Rural	13.2	0.65	0.55-0.76	Female	14.0	1.00	

* Rate per 100,000 per year, RR: relative risks are unadjusted

Figure 38. Hospital Admissions (1988-2005) and Deaths (1988-2003) from Assault, Neglect & Maltreatment, NZ Children 0-14 years.

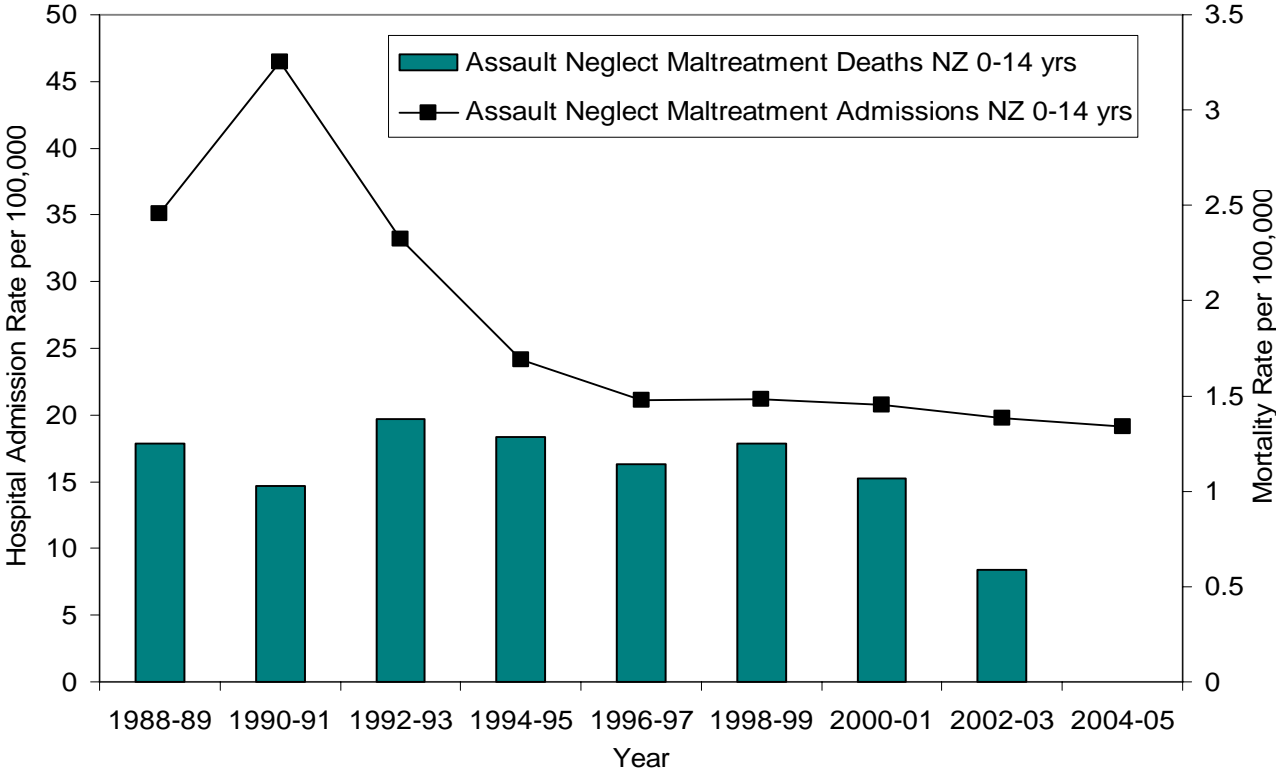


Figure 39. Hospital Admission Rates vs. Deaths for Assault, Neglect and Maltreatment by Age for NZ Children 0-14 years, 2001-2005 (Admissions) and 1999-2003 (Deaths).

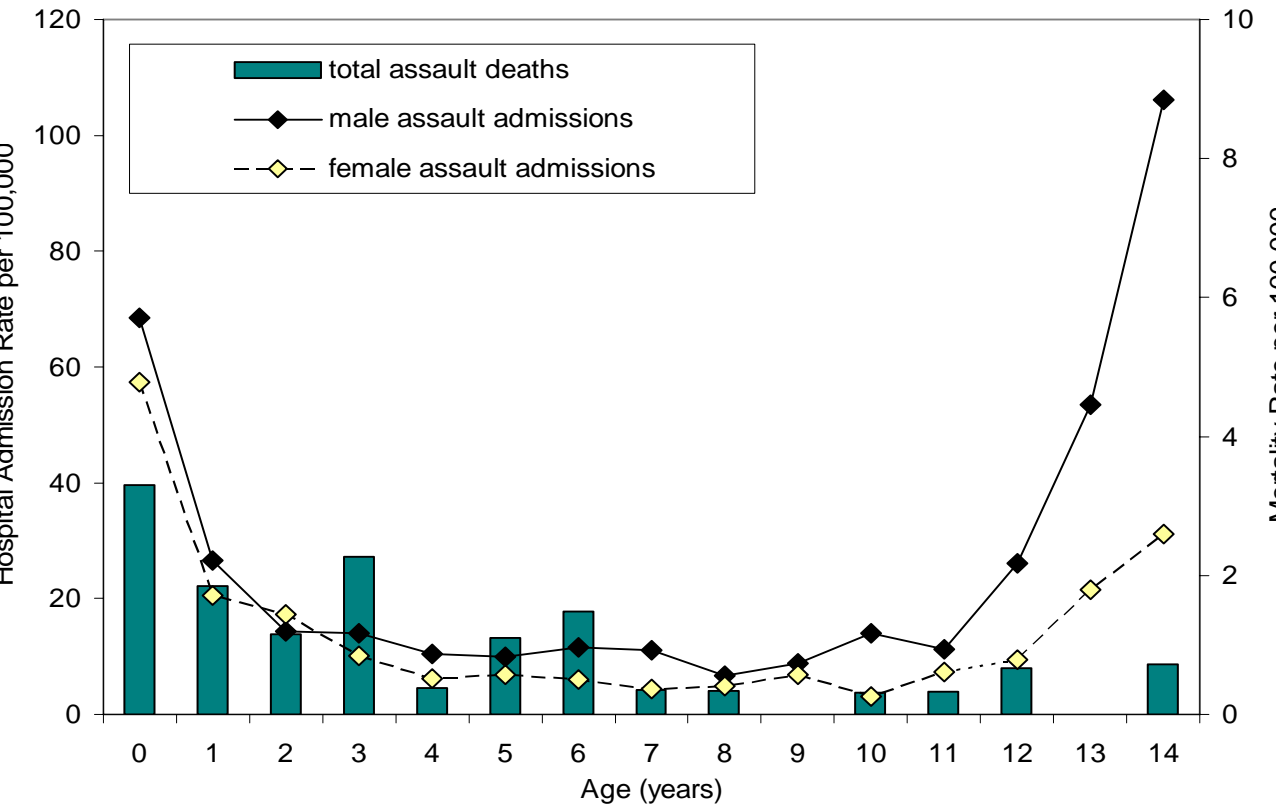


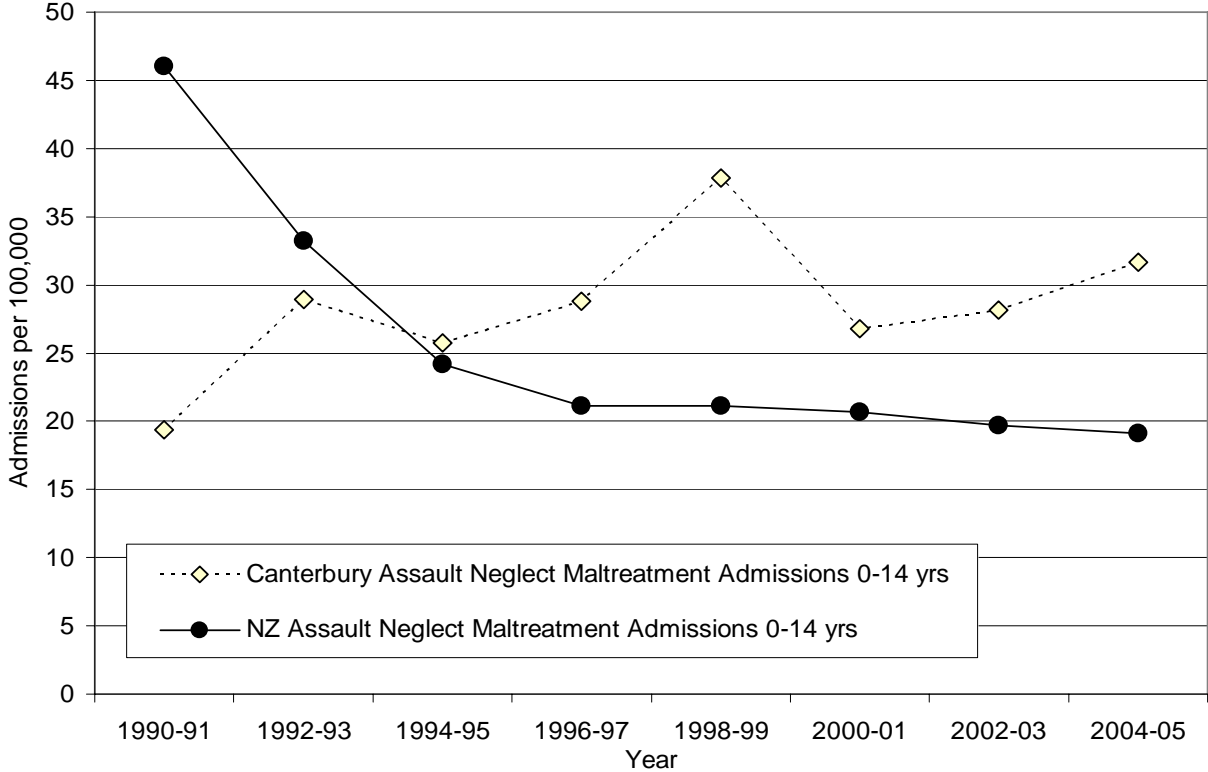
Table 34. Nature of Injury by Age Group, for New Zealand Children Hospitalised with Assault, Neglect and Maltreatment, 2001-2005.

Nature of Injury	New Zealand	
	Number	%
Age 0-4 years		
Superficial Head Injury	63	18.6
Subdural Haemorrhage	61	18.0
Fractured Femur	25	7.4
Upper Limb Fracture	24	7.1
Skull / Face Fracture	22	6.5
Other Injuries	143	42.3
Total	338	100.0
Age 5-9 years		
Superficial Head Injury	17	15.3
Upper Limb Fracture	12	10.8
Open Head Wound	10	9.0
Skull / Face Fracture	5	4.5
Other Injuries	67	60.4
Total	111	100.0
Age 10-14 years		
Fractured Nasal Bones	66	15.8
Upper Limb Fracture	53	12.7
Concussion	38	9.1
Superficial Head Injury	18	4.3
Other Injuries	243	58.1
Total	418	100.0

Childhood Assault and Maltreatment in the Canterbury Region

During 1990-05, hospital admissions for assault, neglect and maltreatment of children in Canterbury were generally higher than the NZ average. In addition, during 1990-03 there were a total of 10 deaths amongst children 0-14 years attributed to assault in the Canterbury region, although none occurred during the last 4 years for which data was available (**Figure 40**). Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

Figure 40. Hospital Admissions due to Assault, Neglect and Maltreatment of Children 0-14 Years, Canterbury vs. New Zealand, 1990-2005.



In Summary

While NZ’s hospital discharge rates for assault, neglect and maltreatment of children 0-14 years declined steadily during the early 1990s, by 1996-97 they had reached a plateau and thereafter remained static. In contrast, mortality rates remained relatively static throughout the 15 years for which data was available. In terms of risk factors for assault, neglect and maltreatment, hospital discharges during 2001-05 exhibited a U-shaped distribution by age, with rates being highest amongst those < 2 years and those > 11 years of age. In contrast, mortality rates were highest amongst children <1 year. While the gender balance was relatively even during infancy and early childhood, hospital discharges amongst males became more predominant as adolescence approached. In addition, admission rates for assault, neglect and maltreatment were highest amongst Māori and Pacific children, those living in the most deprived areas, males and those in urban areas

During 1990-05, hospital admissions for assault, neglect and maltreatment of children in Canterbury were generally higher than the NZ average. In addition, during 1990-03 there were a total of 10 deaths amongst children 0-14 years attributed to assault in the Canterbury region, although none occurred during the last 4 years for which data was available. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

MENINGOCOCCAL INFECTION

Introduction

Neisseria meningitidis is a non-motile gram-negative diplococcus (bacteria) frequently found in the nose and throat of asymptomatic carriers. Symptoms of invasive disease include fever, headache, drowsiness, irritability, vomiting and a petechial rash. Without appropriate antibiotic treatment, death from septicaemia or meningitis may occur within a relatively short period of time (hours). While meningococcal infections are only moderately communicable, crowded conditions concentrate the number of carriers and may reduce individual resistance to the organism [17].

New Zealand has been in the midst of an epidemic of serogroup B meningococcal disease since mid-1991, with earlier Ministry of Health prevention strategies focusing on epidemiological surveillance, public awareness campaigns, contact tracing and the offering of prophylactic antibiotics. Clinical trials of a tailor-made meningococcal B vaccine began in 2002 however, and following regulatory approval in July 2004, roll out of the MeNZB Vaccine Campaign occurred across the country (for those 6 months-19 years) during 2004-2005 [43]. While at the time of writing it is too early to evaluate the impact of this campaign, it is likely that it will result in a significant reduction in the number of cases of invasive meningococcal disease occurring in NZ children and young people during the next few years.

The following section reviews morbidity and mortality from meningococcal disease amongst children and young people in NZ and the Canterbury region using two separate data sources; hospital admission data from the NMDS and death certificate data from the National Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions 0-24 years with a primary diagnosis of meningococcal disease (ICD-9 036; ICD-10 A39) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to meningococcal disease occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of meningococcal infection in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of meningococcal disease admissions 0-24 years in each NZDep Index decile (see Appendix 7) by the number of those 0-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing meningococcal disease admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Meningococcal Disease in NZ: Trends and Risk Factors

Since 1991 NZ has experienced a large increase in the number of hospital admissions and deaths due to meningococcal infection, although 2004-05 hospital admission figures suggest that this may be beginning to taper off (**Figure 41**). In NZ during 2001-2005, both admissions and mortality were highest amongst children <5 years of age, although a smaller peak in mortality occurred amongst those in their mid to late teens (**Figure 42**). In addition,

admissions were higher for Pacific and Māori children & young people, those in the most deprived areas, males and those in urban areas (Table 35).

Figure 41. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Meningococcal Disease, New Zealand Children and Young People 0-24 Years.

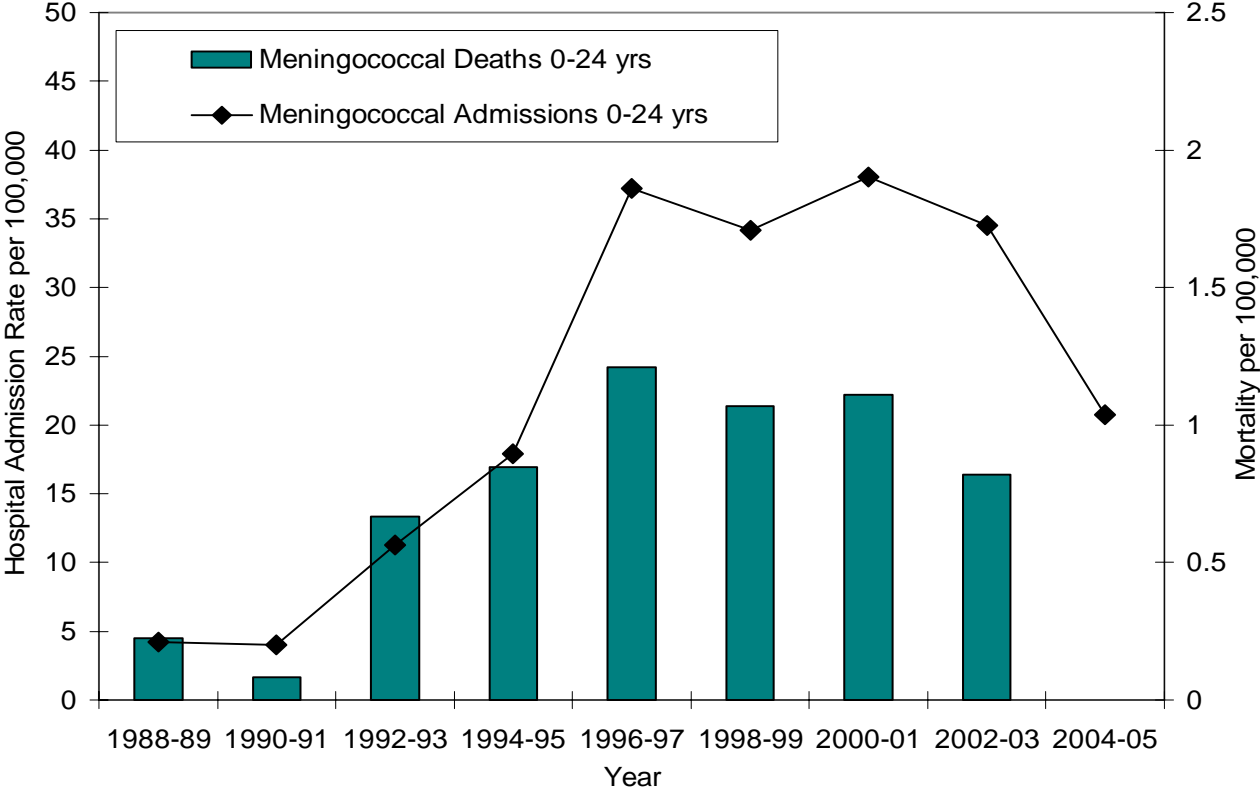
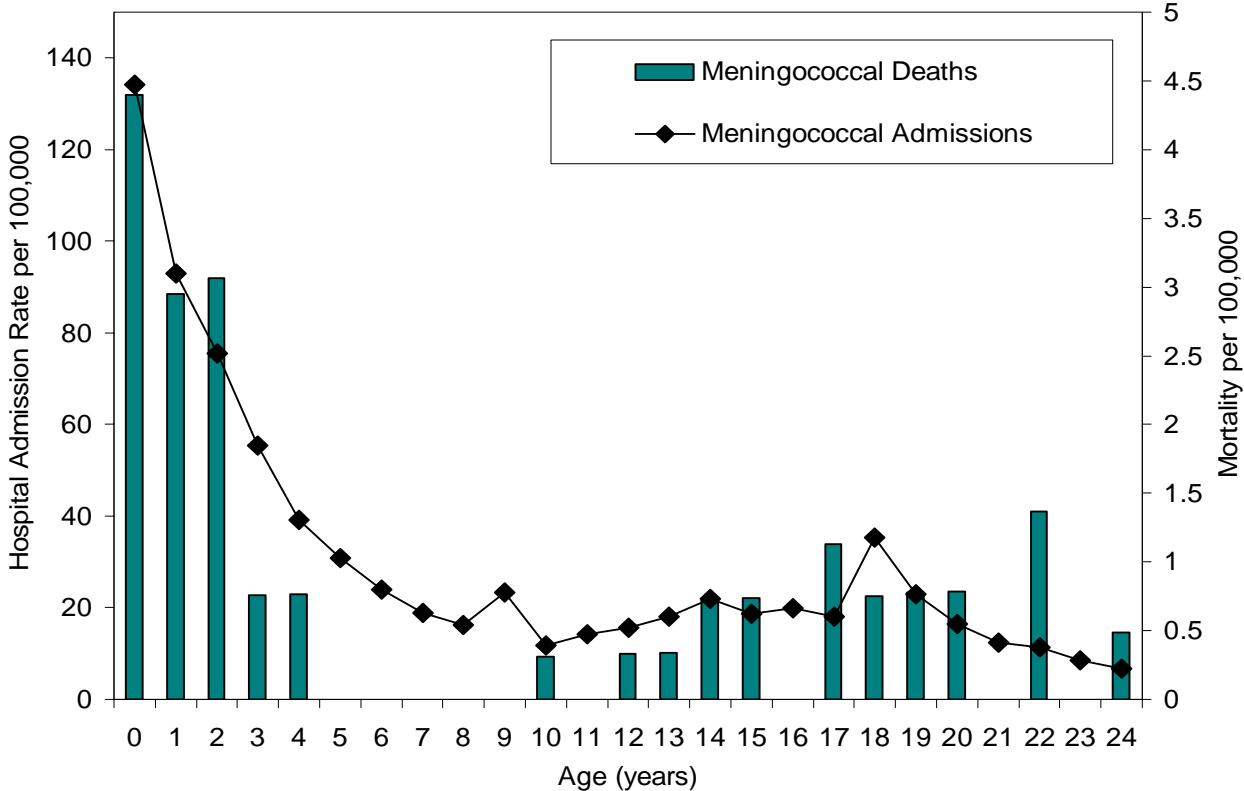


Table 35. Risk Factors for Hospital Admission due to Meningococcal Disease, New Zealand Children & Young People 0-24 Years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	14.5	1.00		1-2	14.3	1.00	
2	14.1	0.98	0.72-1.31	3-4	16.4	1.15	0.94-1.41
3	13.4	0.92	0.67-1.26	5-6	23.7	1.66	1.37-2.00
4	19.2	1.32	1.00-1.74	7-8	34.4	2.40	2.02-2.87
5	27.8	1.91	1.47-2.49	9-10	56.6	3.96	3.35-4.66
6	19.9	1.37	1.04-1.80	Ethnicity			
7	30.4	2.09	1.62-2.70	Māori	47.4	2.34	2.11-2.60
8	38.2	2.62	2.05-3.36	Pacific	90.2	4.46	3.99-4.99
9	43.3	2.98	2.34-3.79	European	20.2	1.00	
10	69.6	4.78	3.79-6.03	Asian / Indian	6.2	0.30	0.22-0.43
Urban Rural				Gender			
Urban	32.9	1.00		Male	34.7	1.31	1.20-1.43
Rural	27.1	0.82	0.75-0.90	Female	26.6	1.00	

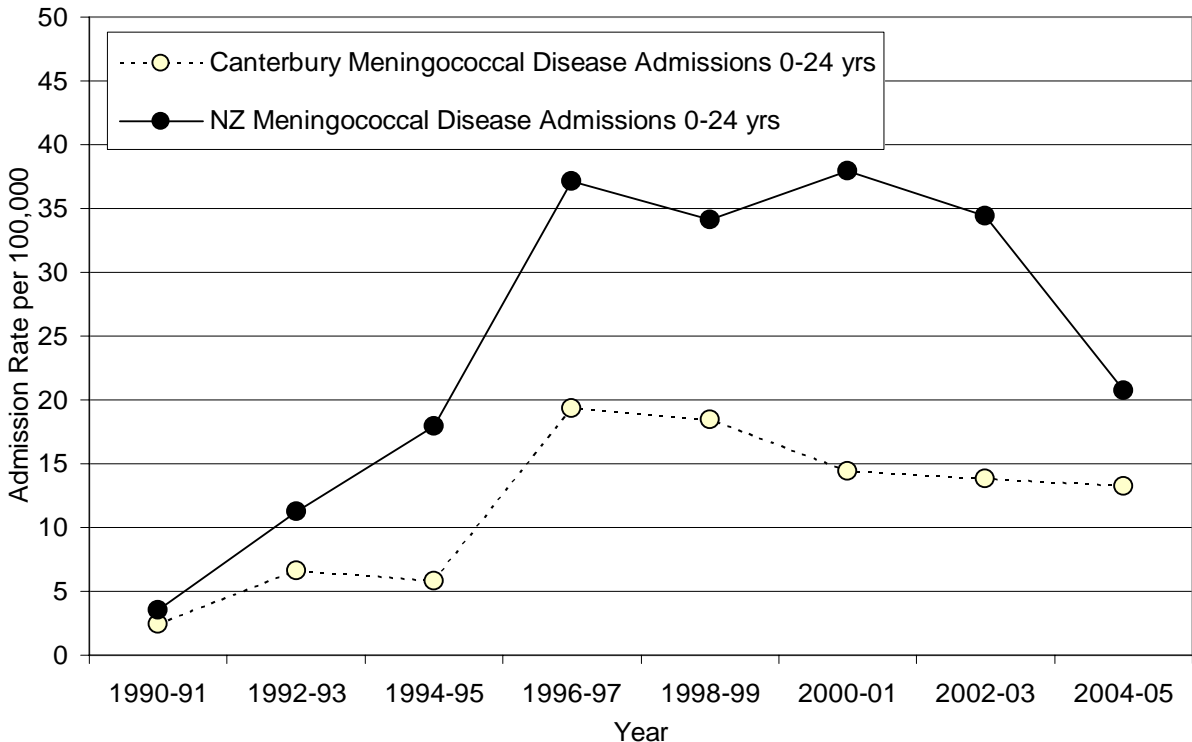
* rate per 100,000 per year, relative risks are unadjusted

Figure 42. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Meningococcal Disease by Age, New Zealand Children and Young People 0-24 Years.



Meningococcal Disease in the Canterbury Region

Figure 43. Hospital Admissions due to Meningococcal Infection Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.



In Canterbury, hospital admissions for meningococcal disease increased rapidly during the early 1990s, reached a peak in 1996-97 and thereafter began to slowly decline. Throughout this period, admission rates in Canterbury were consistently lower than the NZ average (**Figure 43**). In addition, a total of 8 deaths were attributed to meningococcal disease amongst Canterbury children and young people during 1990-2003. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

In Summary

Since 1991 NZ has experienced a large increase in the number of hospital admissions and deaths due to meningococcal infection, although 2004-05 hospital admission figures suggest that this may be beginning to taper off. In NZ during 2001-05, both admissions and mortality were highest amongst children <5 years of age, although a smaller peak in mortality occurred amongst those in their mid to late teens. In addition, admissions were higher for Pacific and Māori children & young people, those in the most deprived areas, males and those in urban areas.

In Canterbury, hospital admissions for meningococcal disease increased rapidly during the early 1990s, reached a peak in 1996-97 and thereafter began to slowly decline. Throughout this period, admission rates in Canterbury were consistently lower than the NZ average. In addition, a total of 8 deaths were attributed to meningococcal disease amongst Canterbury children and young people during 1990-03. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

ORAL HEALTH IN CHILDREN

Introduction

While up until the early 1990s, dental caries rates amongst NZ children were gradually declining, in more recent years rates have become static or even increased slightly. Large ethnic, socioeconomic and regional disparities also remain, with Māori and Pacific children and those living in socioeconomic disadvantage being consistently more likely to experience poorer oral health outcomes [44]. In addition, while water fluoridation has been shown to reduce dental decay by up to 50%, and to be particularly effective in reducing socioeconomic and ethnic disparities in dental caries [45], during 2005 only 48% of NZ 5 year olds lived in communities with fluoridated water supplies [46].

The School Dental Service was established in 1921 and currently provides basic preventative and restorative dental care for preschoolers, primary and intermediate school children via its team of dental therapists. While enrolment for preschool age children was only 56% in 1997, enrolment of school age children is high (>95%) [45]. Children are seen annually, unless deemed to be at high risk of dental disease, when 6-monthly visits are indicated. After Year 8 (Form 2), adolescents are eligible for dental care under the General Dental Benefit system up until the age of 18 years. This care is provided by private dentists working under contract with local DHBs. Dental caries data is collected and reported annually by the School Dental Service. Since 1988 data has been collected on two key indicators

1. **Percentage of Children Caries Free at 5 Years.** Numerators are derived from the total number of children aged 5 years, whose deciduous teeth are caries free at commencement of School Dental Service care. Denominators are derived from the total number of 5 year olds examined.
2. **Mean DMFT Score at Year 8 (Form 2).** Numerators are derived from the total number of permanent teeth of Year 8 children (12-13 years) that are decayed, missing (due to caries) or filled at the last dental examination before leaving the School Dental Service. Denominators are derived from the total number of children examined in Year 8.

The following section presents regional information on the percentage of children caries free at 5 years and Mean DMFT Scores at Year 8, using information available from the School Dental Service. Where possible, the information provided is categorised by the fluoridation status of the school water supply, as well as the ethnic group to which the children belong.

Notes on Data Sources and Statistical Methods

The oral health indicators used in this section were obtained from the Ministry of Health, which has collated information from the School Dental Service for the period 1990-2005. Data were reported by ethnic group and the fluoridation status of the school water supply, with the % of children caries free at 5 years and mean DMFT scores at 12 years being calculated as outlined above. The unavailability of individual level data however, precluded the estimation of relative risks and socioeconomic disparities for these particular indicators.

Oral Health Status of Canterbury Children

During 2005, School Dental Service statistics indicate that only 0.6% of Canterbury children aged 5 years had access to fluoridated drinking water. This information is based on the fluoridation status of the child's school however, rather than the area in which they lived. Because of this low percentage, the figures in the sections which follow compare the oral

health status of Canterbury children attending schools with non-fluoridated school water supplies, to the NZ fluoridated and non-fluoridated averages.

Figure 44 compares the percentage of Canterbury children who were caries free at 5 years with the NZ fluoridated and non-fluoridated averages during 1990-2005. **Figure 45** shows the same information for mean DMFT scores at 12 years. During the latter part of this period, the percentage of Canterbury children who were caries free at 5 years was higher than the NZ non-fluoridated average, but consistently lower than the NZ fluoridated average. In contrast, mean DMFT scores at 12 years were very similar to the NZ non-fluoridated average.

Figure 46 demonstrates the percentage of Canterbury children in non-fluoridated areas who were caries free at 5 years by ethnicity during 2005. During this period, the percentage of Māori children in Canterbury who were caries free was higher than the NZ Māori non-fluoridated average, but lower than the NZ Māori fluoridated average. For European children, rates were very similar to the NZ European non-fluoridated average. **Figure 47** demonstrates mean DMFT Scores for Canterbury children living in non-fluoridated areas by ethnicity during 2005. During this period the mean DMFT scores of Canterbury Māori children were lower than the NZ Māori non-fluoridated average, but higher than the NZ Māori fluoridated average. A similar pattern occurred for European children.

In Summary

During 2005, only 0.6% of Canterbury children aged 5 years had access to fluoridated drinking water. This information is based on the fluoridation status of the child's school however, rather than the area in which they lived. During the past decade, the percentage of Canterbury children who were caries free at 5 years was higher than the NZ non-fluoridated average, but consistently lower than the NZ fluoridated average. In contrast, mean DMFT scores at 12 years were very similar to the NZ non-fluoridated average.

During 2005, the percentage of Māori children in Canterbury who were caries free was higher than the NZ Māori non-fluoridated average, but lower than the NZ Māori fluoridated average. For European children, rates were very similar to the NZ European non-fluoridated average. During the same period, the mean DMFT scores of Canterbury Māori children were lower than the NZ Māori non-fluoridated average, but higher than the NZ Māori fluoridated average. A similar pattern occurred for European children.

Figure 44. Percentage of Children Caries Free at 5 yrs, Canterbury* vs. NZ 1990-2005

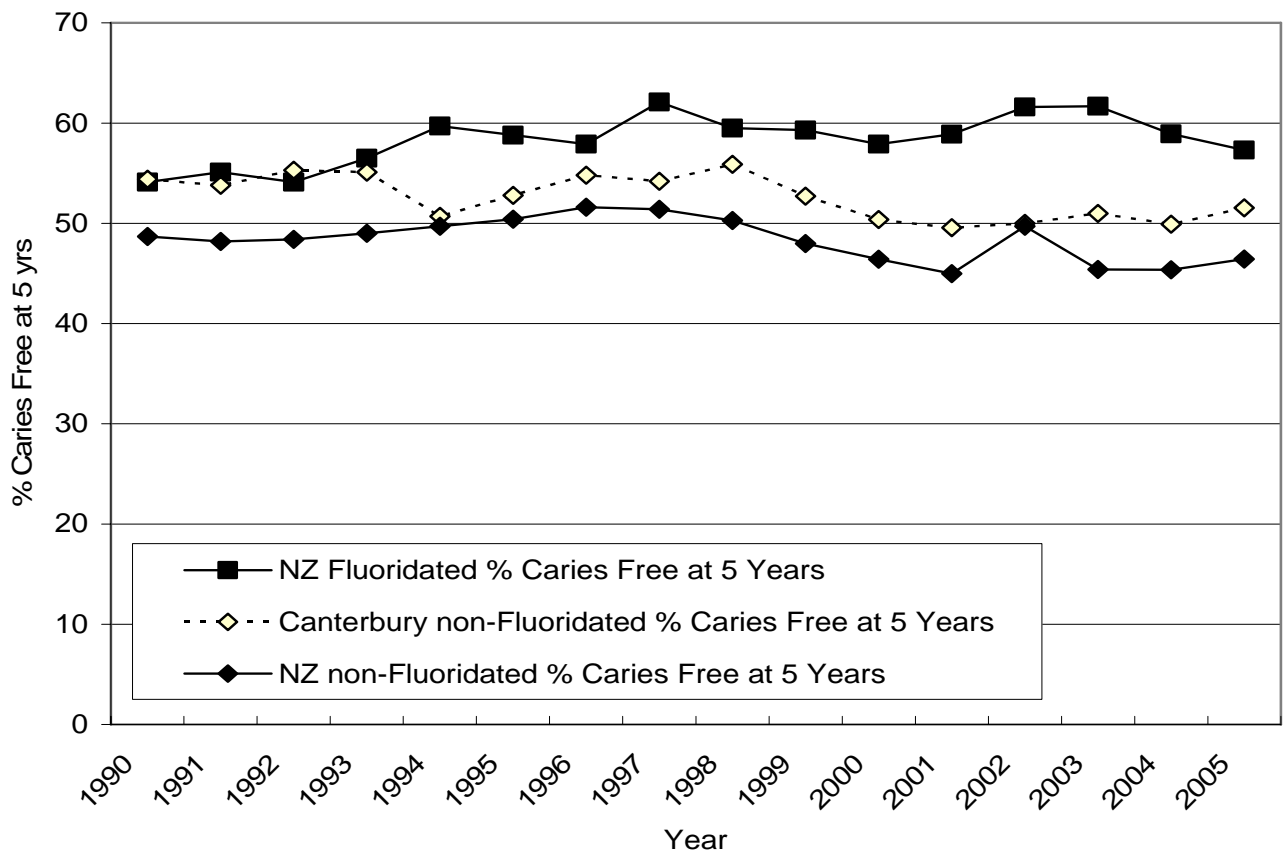
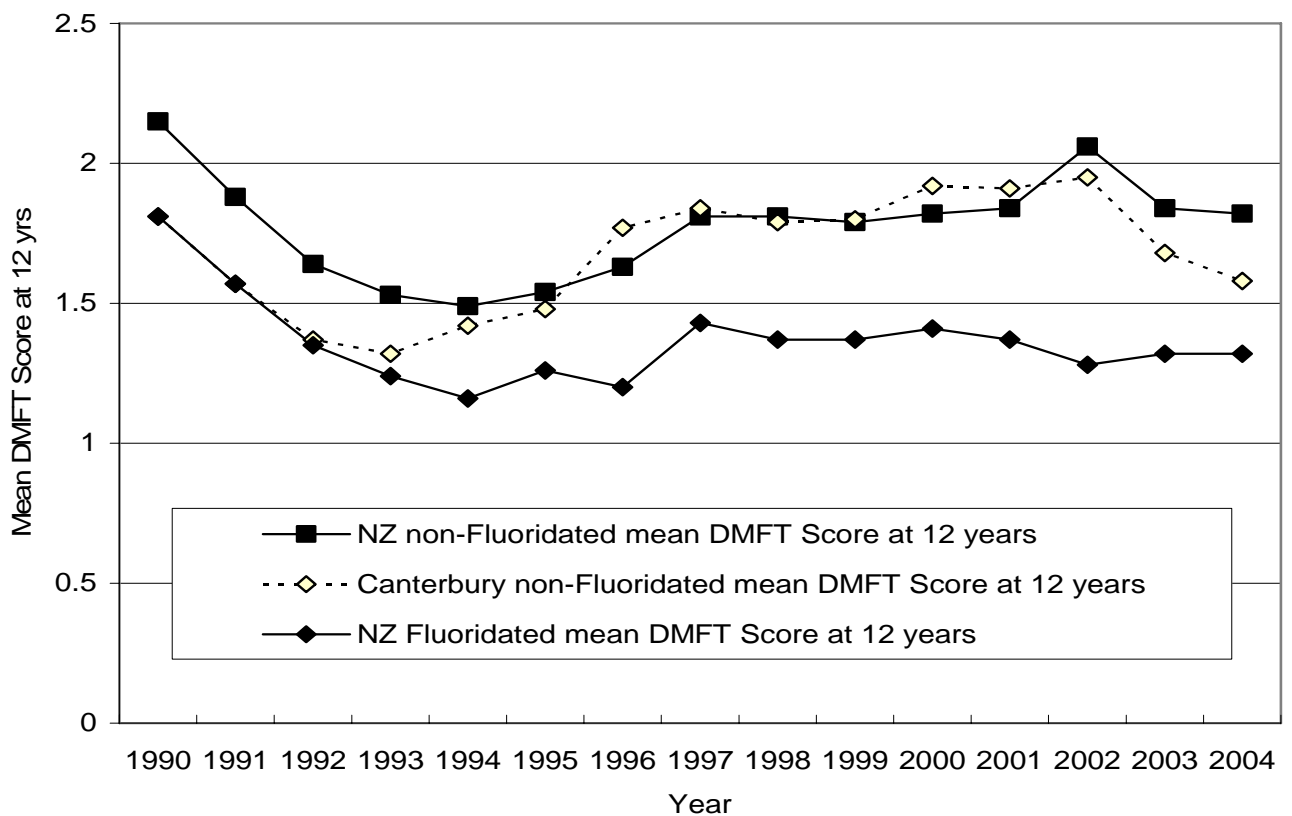


Figure 45. Mean DMFT Scores at 12 yrs, Canterbury* vs. NZ 1990-2005



Source: MOH School Dental Service Data. *South Canterbury included up until 2002

Figure 46. Percentage of Children Caries Free at 5 Years by Ethnicity, Canterbury vs. New Zealand 2005

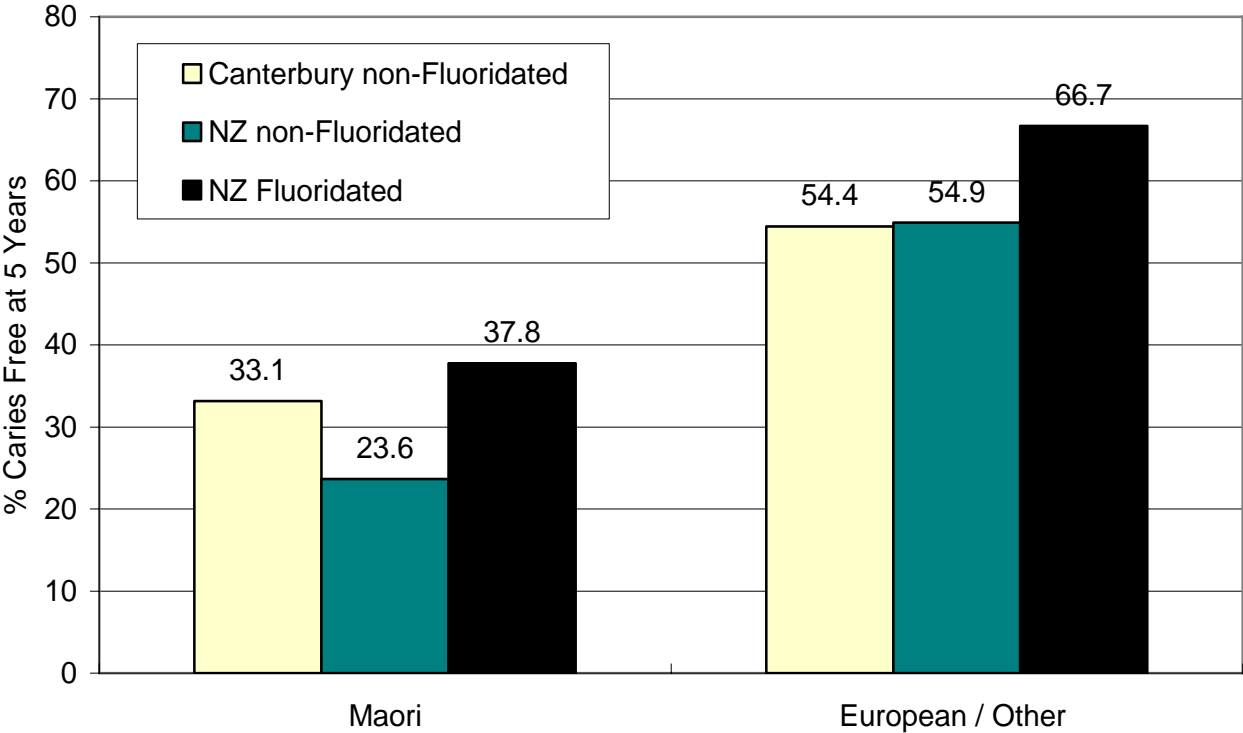
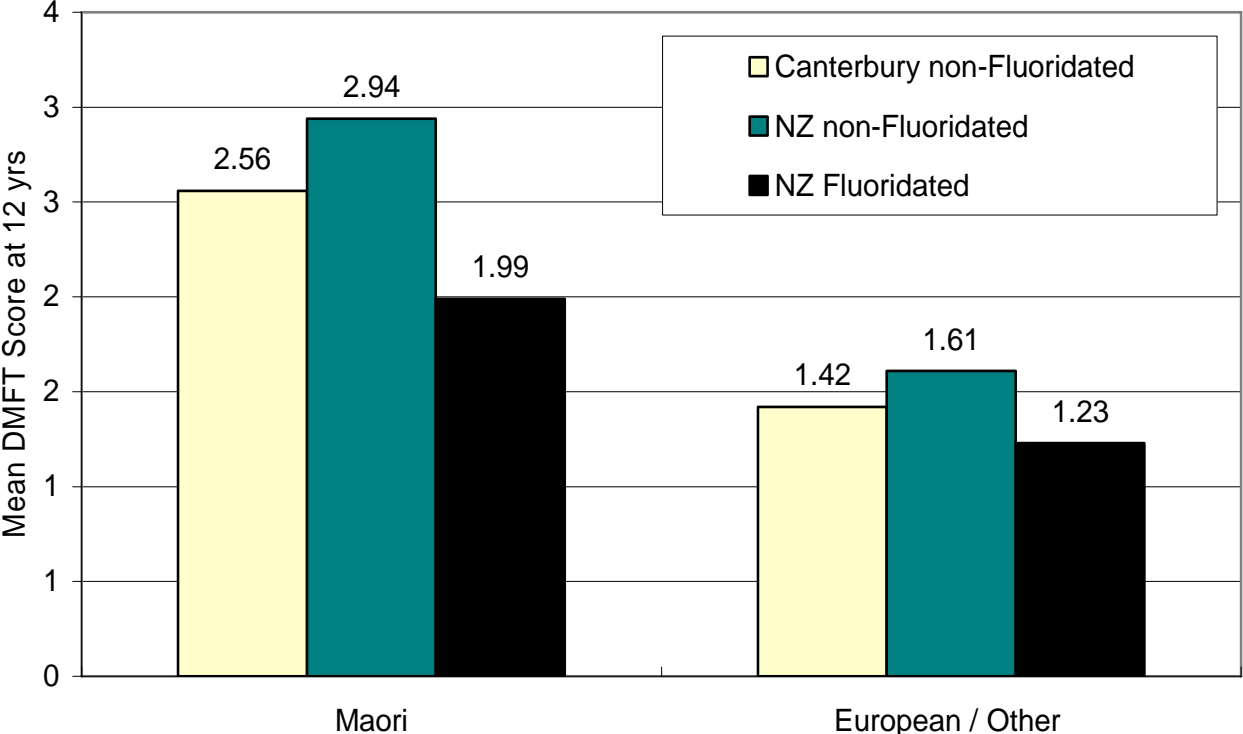


Figure 47. Mean DMFT Scores at 12 Years by Ethnicity, Canterbury vs. New Zealand 2005



PNEUMONIA

Introduction

The term pneumonia refers to a group of acute lower respiratory tract infections which lead to inflammation of the lung tissue. They are usually caused by inhaled micro-organisms from the upper respiratory tract, with the causative agent varying with the age of the child. In neonates, organisms from the mother's birth canal are the most common cause, while in infants > 4 months and preschool children viruses are a frequent cause, with the respiratory syncytial virus (RSV) being of particular importance. The most common bacterial cause after the neonatal period is *S. pneumoniae*, although *Chlamydia pneumoniae* and *Mycoplasma pneumoniae* have also been implicated, particularly in older children and adolescents [47]. Clinical manifestations include chills, fever, rapid pulse, high respiratory rates, cough, purulent sputum, chest pain and abdominal distension [17].

By international standards, NZ's pneumonia hospital admission rates are high. NZ's rates also vary significantly by ethnicity, with Pacific and Māori children having both higher hospital admission rates [48] and more severe disease once admitted, than children of European origin [49]. While risk factors for pneumonia overseas have included low socioeconomic status, poor nutrition, low birth weight, lack of breastfeeding, crowding and indoor smoke, it has been suggested that factors such as poor housing (cold, damp, mould, overcrowding), access to primary healthcare and poor nutrition (e.g. iron deficiency) are particular issues for New Zealand children and young people [48].

The following section reviews hospital admission and mortality rates for pneumonia amongst children (0-14 years) and young people (15-24 years) in NZ and the Canterbury region using information available from the National Minimum Dataset and the Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions with a primary diagnosis of pneumonia (ICD-9 480-486, 487.0; ICD-10 J12-J18, J10.0 J11.0) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) for children (0-14 years) and young people (15-25 years) as recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to pneumonia occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of pneumonia in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates for children (0-14 years) during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of children (0-14 years) admitted with pneumonia in each NZDep Index decile (see Appendix 7) by the number of children 0-14 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing pneumonia admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Pneumonia in New Zealand: Trends and Risk Factors

While pneumonia mortality amongst NZ children and young people has declined in recent years, hospital admissions have remained relatively static (**Figure 48**). During 2001-05 pneumonia admission rates were highest amongst infants and children 1-2 years (**Figure 49**), those living in the most deprived areas, Pacific and Māori children, males and those in urban areas. Mortality was highest for those <1 year of age (**Table 36**).

Figure 48. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Pneumonia, New Zealand Children and Young People 0-24 Years.

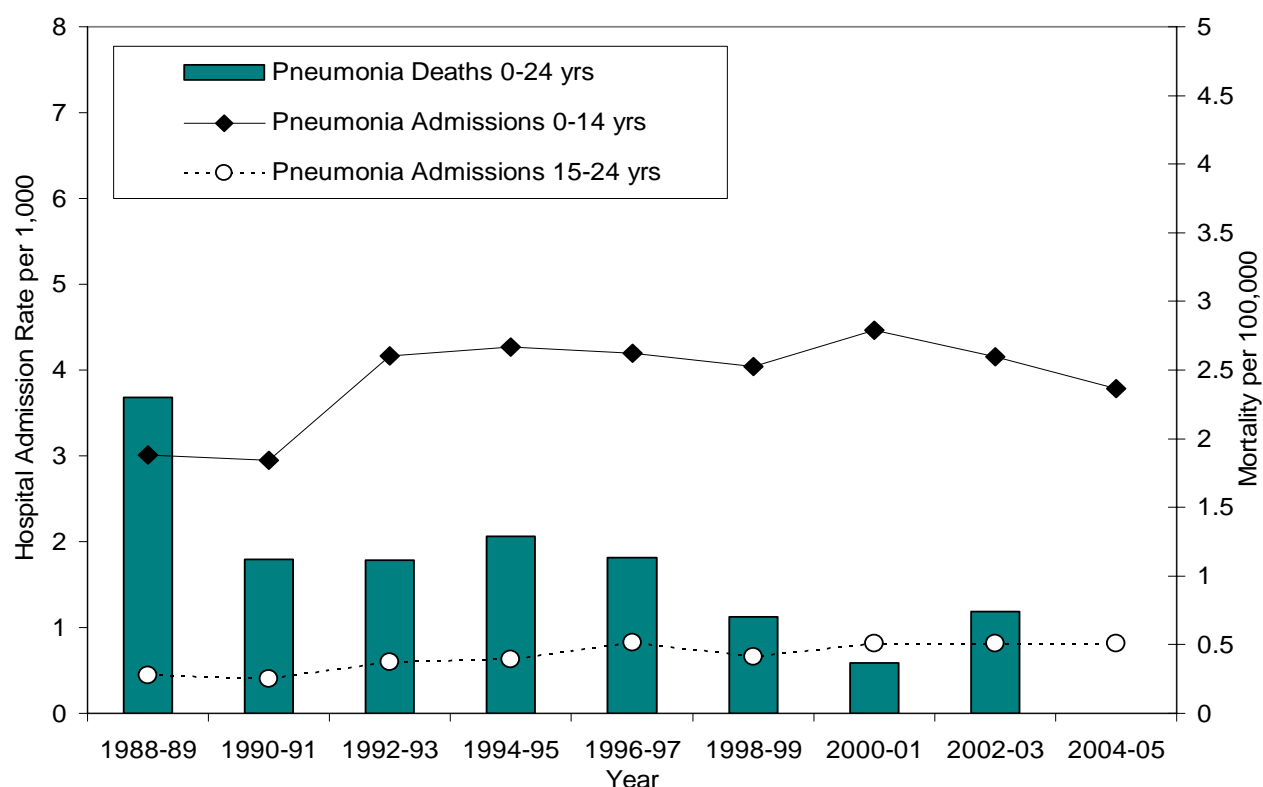
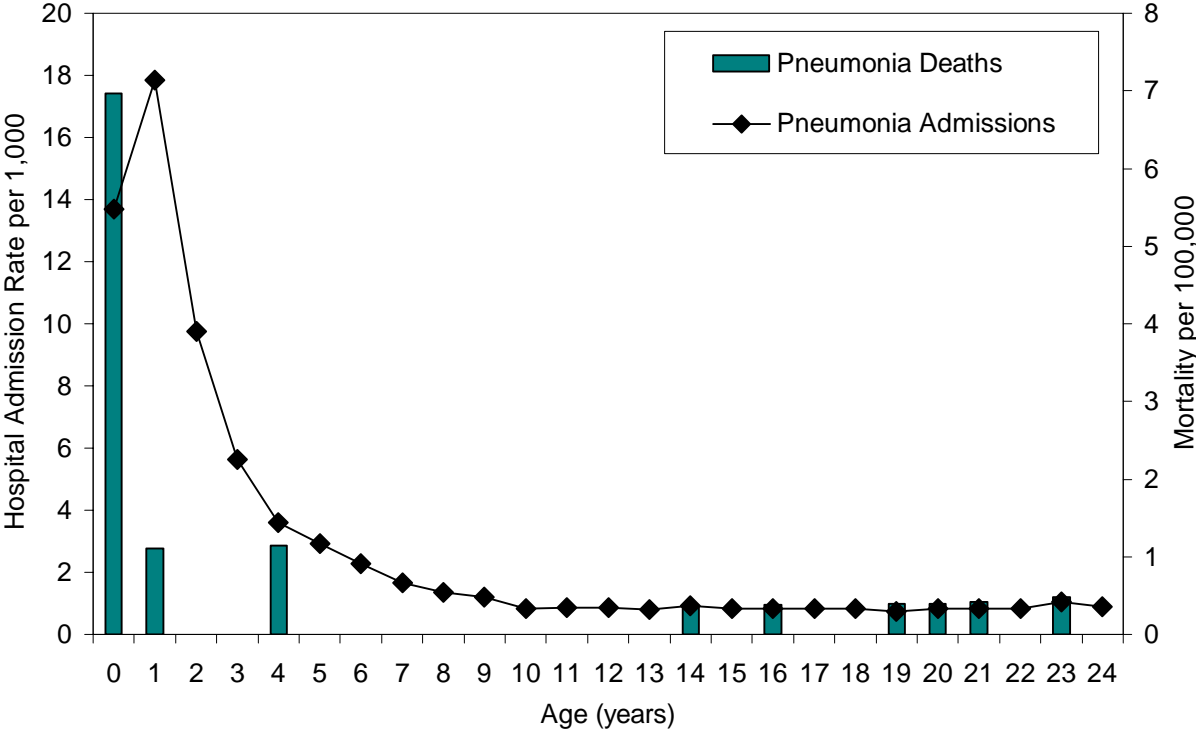


Table 36. Risk Factors for Hospital Admission due to Pneumonia, New Zealand Children 0-14 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	2.34	1.00		1-2	2.28	1.00	
2	2.21	0.94	0.86-1.04	3-4	2.64	1.16	1.09-1.24
3	2.41	1.03	0.94-1.13	5-6	3.24	1.42	1.34-1.51
4	2.84	1.21	1.11-1.33	7-8	4.18	1.83	1.73-1.94
5	3.08	1.31	1.20-1.43	9-10	7.47	3.27	3.10-3.44
6	3.39	1.44	1.33-1.57	Ethnicity			
7	3.68	1.57	1.44-1.70	Māori	5.34	2.08	2.00-2.15
8	4.63	1.97	1.82-2.14	Pacific	13.19	5.09	4.90-5.28
9	6.08	2.58	2.39-2.79	European	2.57	1.00	
10	8.67	3.68	3.42-3.95	Asian / Indian	2.69	1.05	0.97-1.13
Urban Rural				Gender			
Urban	4.99	1.00		Male	4.36	1.12	1.09-1.16
Rural	2.78	0.56	0.54-0.58	Female	3.88	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Figure 49. Hospital Admission Rates (2001-2005) and Deaths (1999-2003) due to Pneumonia by Age, New Zealand Children & Young People 0-24 Years.



Pneumonia in the Canterbury Region

Figure 50. Hospital Admissions due to Pneumonia Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.

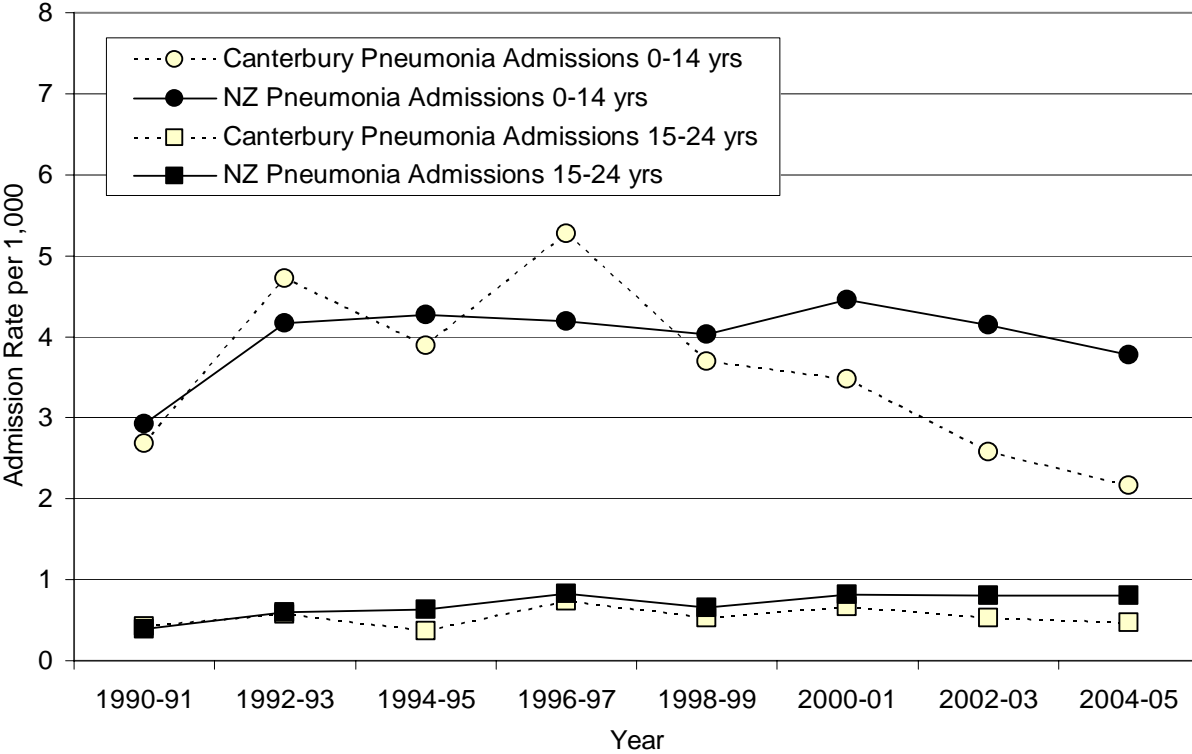
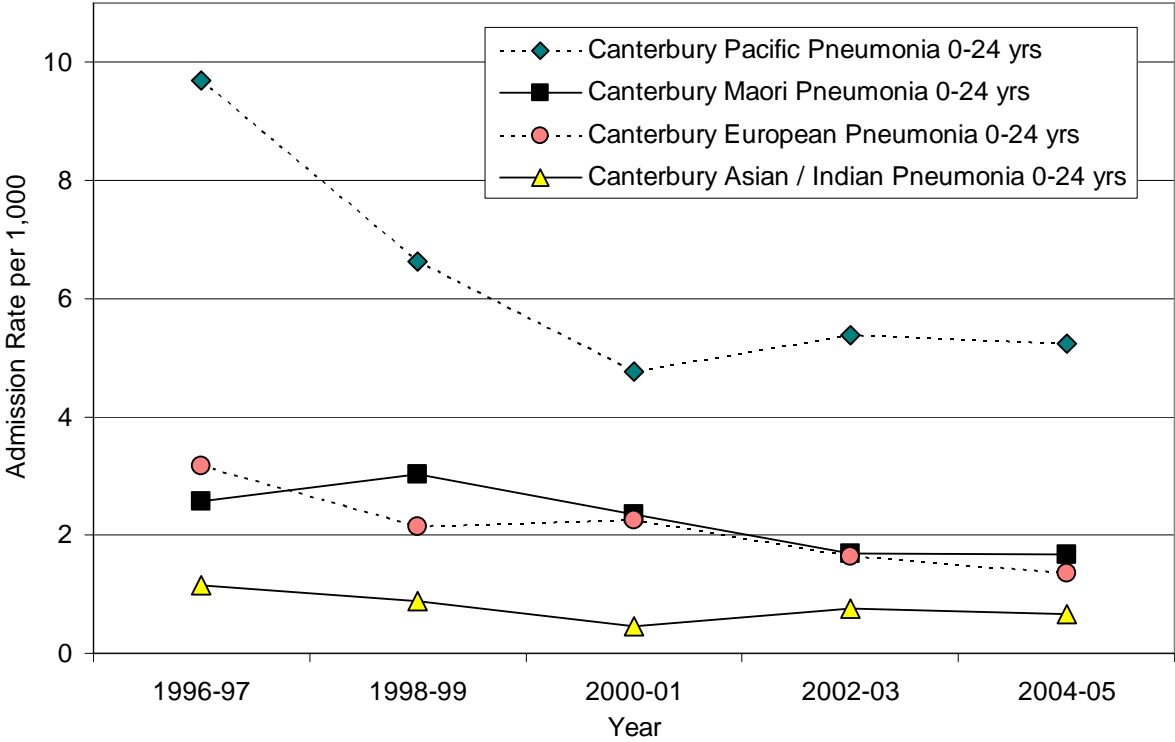


Figure 51. Hospital Admissions due to Pneumonia by Ethnicity for Children and Young People 0-24 Years, Canterbury 1996-2005.



While during the 1990s, hospital admission rates for Canterbury children were similar to the NZ average, progressive declines during the late 90s / early 2000s saw admission rates being lower than the NZ average during the last 6 years for which data was available. Throughout this period, admission rates for Canterbury young people were similar to the NZ average. (Figure 50). During 1996-2005, hospital admissions for pneumonia were highest amongst Canterbury Pacific > Māori and European > Asian / Indian children and young people (Figure 51). In addition, during 1990-2003, a total of 6 deaths amongst children and young people in Canterbury were attributed to pneumonia.

In Summary

While pneumonia mortality amongst NZ children and young people has declined in recent years, hospital admissions have remained relatively static. During 2001-05 pneumonia admissions were highest amongst infants and children 1-2 years, those living in the most deprived areas, Pacific and Māori children, males and those in urban areas. Mortality was highest for those <1 year of age.

While during the 1990s, hospital admission rates for Canterbury children were similar to the NZ average, progressive declines during the late 90s / early 2000s saw admission rates being lower than the NZ average during the last 6 years for which data was available. Throughout this period, admission rates for Canterbury young people were similar to the NZ average. During 1996-05, hospital admissions for pneumonia were highest amongst Canterbury Pacific > Māori and European > Asian / Indian children and young people. In addition, during 1990-03, a total of 6 deaths amongst children and young people in Canterbury were attributed to pneumonia.

POTENTIALLY AVOIDABLE HOSPITAL ADMISSIONS

Introduction

Hospital admissions may be classified as potentially avoidable or unavoidable. This distinction however is a theoretical one, based on a patient's primary diagnosis rather than taking into account individual circumstances [50]. Avoidable hospitalisations are often further divided into those preventable by appropriate management in primary care and those preventable by population level intervention strategies.

Ambulatory Sensitive Admissions are hospital admissions potentially preventable by appropriate primary care (including outpatient services) and are often used as an indicator of access to / effectiveness of primary services [51]. Ambulatory sensitive admissions of importance to children and young people include TB, asthma, gastroenteritis, immunisation preventable diseases, rheumatic fever, dental conditions, respiratory infections, kidney infections, ruptured appendix, sexually transmitted diseases, epilepsy, ENT infections, cellulitis and failure to thrive.

Population Preventable Hospitalisations are hospital admissions which could be prevented by population level intervention strategies e.g. to reduce smoking / sun exposure and are often used to measure the effectiveness of public health approaches to disease prevention (excluding accident prevention). They comprise a range of conditions of particular relevance to adult health (e.g. oral, skin, lung and colorectal cancer, alcohol related conditions, ischaemic heart disease), although a limited number (e.g. TB, HIV/AIDS, nutrition, gastroenteritis, dental) are also of relevance to children and young people.

The following section reviews ambulatory sensitive and population preventable hospital admissions for children and young people in New Zealand and the Canterbury region using information contained in the National Minimum Dataset.

Data Sources and Statistical Methods

The ambulatory sensitive and population preventable discharge rates in this analysis were calculated by dividing the total number of hospital discharges considered ambulatory sensitive or population preventable (using MOH coding tables for primary diagnosis [51]), by census denominators for the period 1988-2005. Numerators were drawn from publicly funded hospital discharges (inpatient and day patient) in the 0-14 and 15-24 age categories as recorded in the NMDS (Appendix 2). In line with MOH guidelines, for some conditions (e.g. TB) only a proportion of the discharge was considered ambulatory sensitive, with the remaining proportion being considered preventable through public health interventions (Appendix 8). Denominators were derived from the usual resident NZ and DHB populations (0-14 and 15-24 years) at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of ambulatory sensitive admissions in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of ambulatory sensitive admissions (0-14 yrs and 15-24 yrs) in each NZDep Index decile (see Appendix 7) by the number of children and young people living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing ambulatory sensitive admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Potentially Avoidable Hospital Admissions in New Zealand: Trends and Risk Factors

New Zealand's ambulatory sensitive and population preventable hospital admissions have gradually increased during the past 18 years (**Figure 52**). During 2001-05, ambulatory sensitive admissions were highest amongst children <6 years (**Figure 53**), Pacific and Māori children and young people and those living in the most deprived areas (**Table 37**, **Table 38**).

Table 37. Risk Factors for Ambulatory Sensitive Hospital Admissions for Children 0-14 Years, New Zealand 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	30.4	1.00		1-2	29.7	1.00	
2	29.0	0.96	0.94-0.99	3-4	33.5	1.12	1.10-1.14
3	30.9	1.01	0.98-1.04	5-6	40.5	1.35	1.33-1.37
4	35.9	1.17	1.14-1.20	7-8	50.8	1.68	1.65-1.71
5	40.2	1.31	1.28-1.34	9-10	66.1	2.15	2.12-2.18
6	40.8	1.33	1.30-1.36	Ethnicity			
7	49.3	1.59	1.55-1.63	Māori	55.5	1.42	1.41-1.44
8	52.2	1.68	1.64-1.72	Pacific	81.9	2.04	2.01-2.07
9	62.4	1.99	1.95-2.03	European	38.4	1.00	
10	69.4	2.20	2.15-2.25	Asian / Indian	32.8	0.86	0.84-0.88
Urban Rural				Gender			
Urban	45.2	1.00		Male	48.9	1.15	1.14-1.16
Rural	33.0	0.74		Female	42.2	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Table 38. Risk Factors for Ambulatory Sensitive Hospital Admissions for Young People 15-24 Years, New Zealand 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	15.6	1.00		1-2	15.5	1.00	
2	15.4	0.98	0.93-1.03	3-4	17.3	1.11	1.07-1.15
3	16.1	1.03	0.98-1.08	5-6	18.5	1.19	1.15-1.23
4	18.3	1.17	1.12-1.23	7-8	21.6	1.39	1.35-1.43
5	18.6	1.19	1.14-1.25	9-10	25.2	1.61	1.56-1.66
6	18.5	1.18	1.13-1.24	Ethnicity			
7	21.4	1.36	1.30-1.42	Māori	26.4	1.34	1.31-1.37
8	21.8	1.39	1.33-1.45	Pacific	25.2	1.28	1.24-1.32
9	22.0	1.40	1.34-1.46	European	19.6	1.00	
10	29.1	1.84	1.76-1.92	Asian / Indian	8.7	0.45	0.43-0.47
Urban Rural				Gender			
Urban	18.0	1.00		Male	17.4	0.75	0.74-0.76
Rural	17.4	0.97	0.95-0.99	Female	23.4	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Figure 52. Ambulatory Sensitive and Population Preventable Hospital Admissions, New Zealand Children (0-14 years) and Young People (15-24 years) 1988-2005.

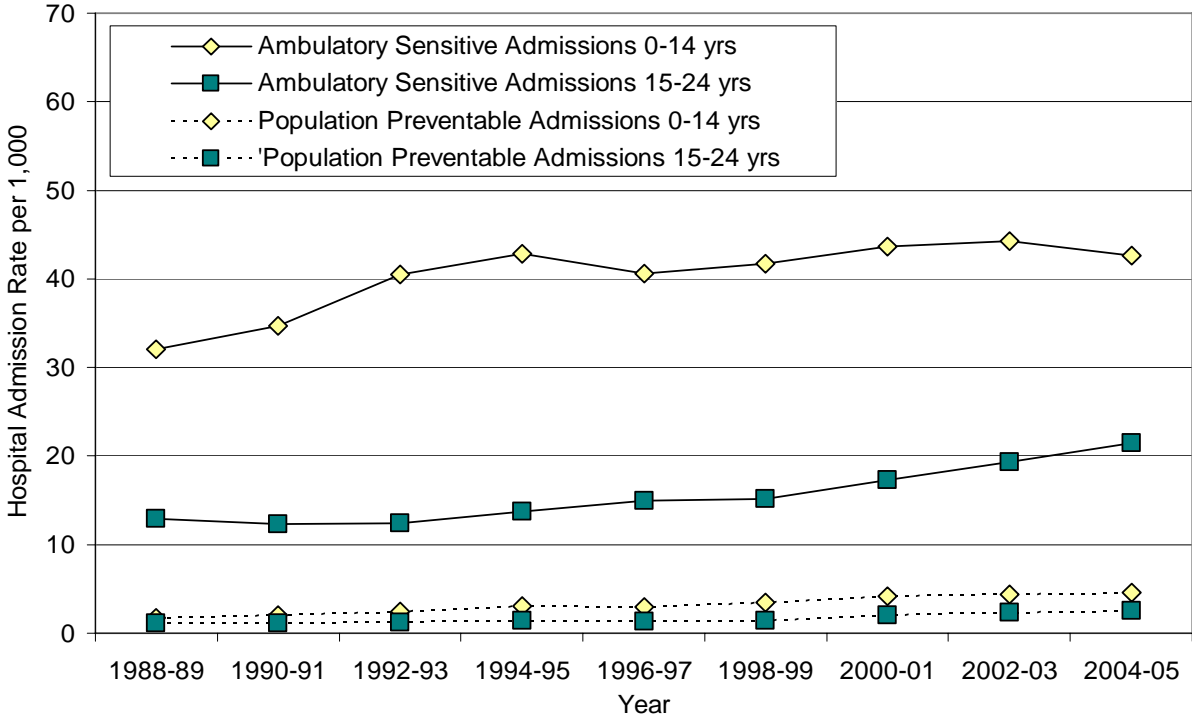
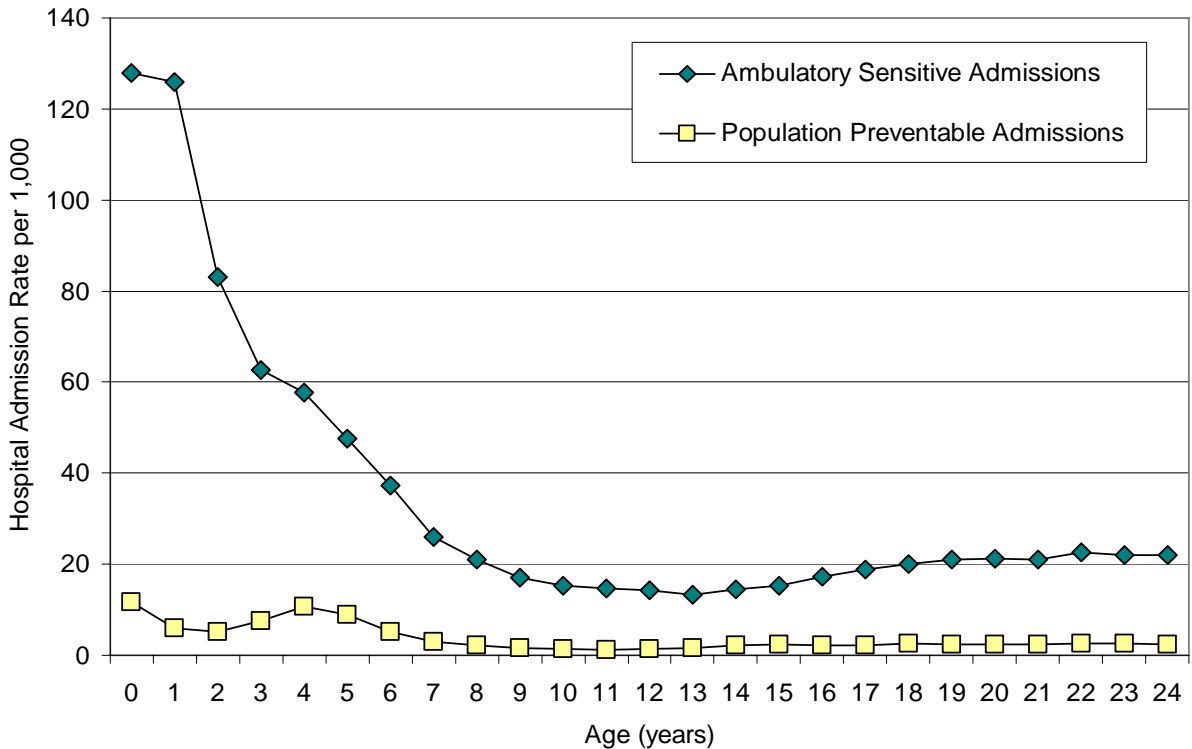


Figure 53. Ambulatory Sensitive and Population Preventable Hospital Admissions by Age, New Zealand Children and Young People, 2001-2005.



Potentially Avoidable Hospital Admissions in the Canterbury Region.

Figure 54. Ambulatory Sensitive Hospital Admissions Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.

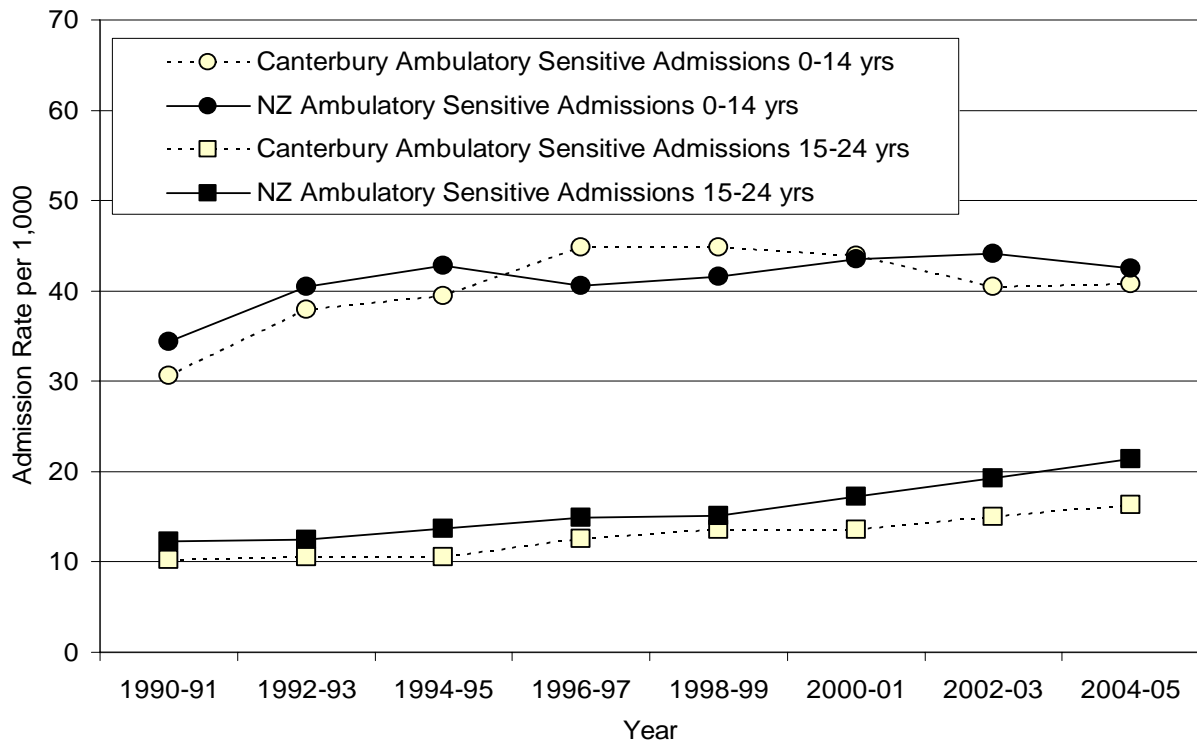
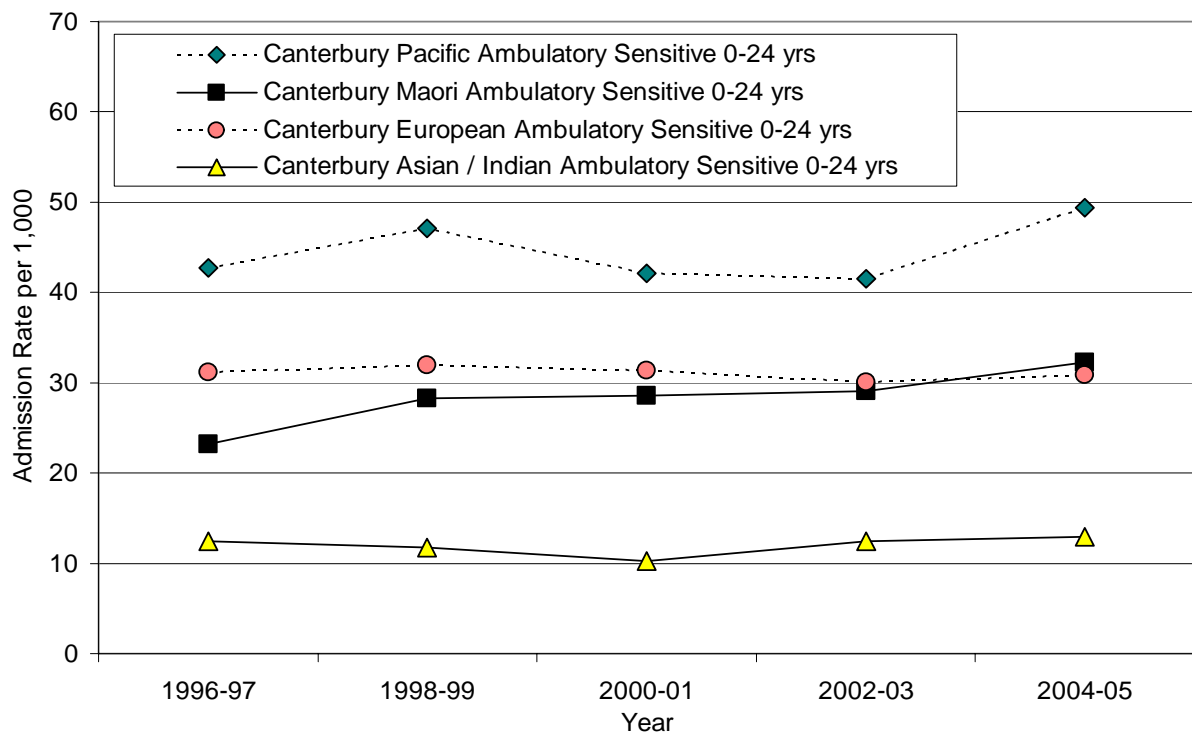


Figure 55. Ambulatory Sensitive Hospital Admissions by Ethnicity in Children and Young People 0-24 Years, Canterbury 1996-2005.



During 1990-2005, ambulatory sensitive admissions amongst Canterbury children and young people increased at a rate similar to the NZ average. While ambulatory sensitive admissions for Canterbury children were similar to the NZ average, admission rates for Canterbury young people were slightly lower (**Figure 54**). During 1996-2005 ambulatory sensitive admissions were higher amongst Canterbury Pacific > European and Māori > Asian / Indian children and young people (**Figure 55**).

In Summary

New Zealand's ambulatory sensitive and population preventable hospital admissions have gradually increased during the past 18 years. During 2001-05, ambulatory sensitive admissions were highest amongst children <6 years, Pacific and Māori children and young people and those living in the most deprived areas.

During 1990-05, ambulatory sensitive admissions amongst Canterbury children and young people increased at a rate similar to the NZ average. While ambulatory sensitive admissions for Canterbury children were similar to the NZ average, admissions for Canterbury young people were slightly lower. In addition, during 1996-05 ambulatory sensitive admissions were higher amongst Canterbury Pacific >European and Māori >Asian / Indian children and young people.

RHEUMATIC FEVER

Introduction

Acute rheumatic fever is a delayed inflammatory reaction which develops in response to an inadequately treated group A streptococcal throat infection. It usually occurs in school-age children and may affect the brain, heart, joints, skin or subcutaneous tissue [17]. 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 [17]. While NZ's rheumatic fever rates have declined significantly during the past 30 years, they still remain higher than those of many other developed countries. Risk factors include age (highest in school age children), ethnicity (Pacific>>Māori>>European), socioeconomic disadvantage and overcrowding [52]. 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 [52].

The following section reviews morbidity and mortality for acute rheumatic fever and rheumatic heart disease amongst children and young people (0-24 years) in New Zealand and the Canterbury region. It utilises information from 2 separate data sources: hospital admissions from the National Minimum Dataset and mortality data from the Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions 0-24 years with a primary diagnosis of acute rheumatic fever (ICD-9 390-392; ICD-10 I00-I02) or rheumatic heart disease (ICD-9 393-398; ICD-10 I05-I09) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to acute rheumatic fever or rheumatic heart disease occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of acute rheumatic fever or rheumatic heart disease in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of acute rheumatic fever admissions 0-24 years in each NZDep Index decile (see Appendix 7) by the number of those 0-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing acute rheumatic fever admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Rheumatic Fever in NZ: Trends and Risk Factors

Acute rheumatic fever and rheumatic heart disease admission rates have remained relatively static during the past 10 years, while deaths have averaged 1-3 per year during the same period (**Figure 56**). During 2001-2005 hospital admissions for acute rheumatic fever peaked in late childhood to early adolescence, while admissions for rheumatic heart disease were relatively constant (albeit at a low level) after 5 years of age. In contrast, deaths due to rheumatic fever and rheumatic heart disease were most frequent during the teenage years (**Figure 57**). During 2001-05, rates of acute rheumatic fever were higher amongst those living in the most deprived areas, Pacific and Māori children and young people, males and those living in urban areas (**Table 39**).

Figure 56. Hospital Admissions (1988-2005) & Deaths (1988-2003) due to Acute Rheumatic Fever & Rheumatic Heart Disease, NZ Children & Young People 0-24 Years.

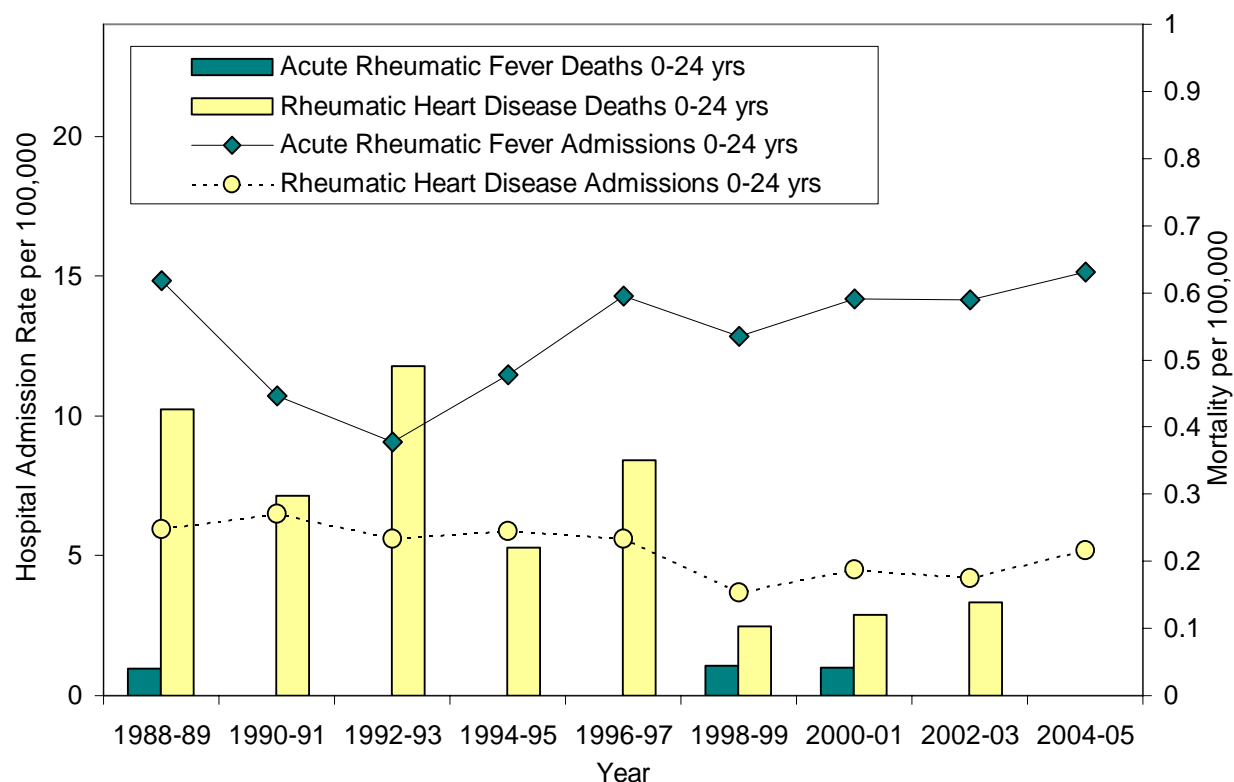
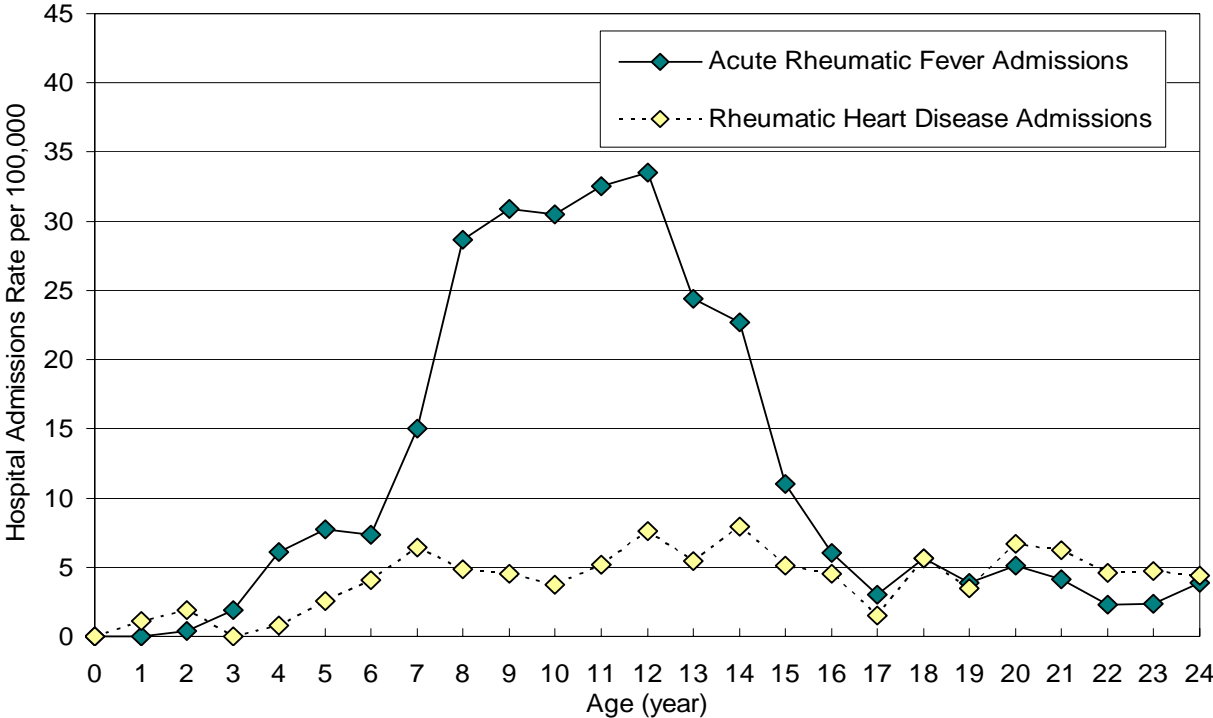


Table 39. Risk Factors for Hospital Admission due to Acute Rheumatic Fever, New Zealand Children and Young People 0-24 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	2.47	1.00		Māori	28.42	24.20	17.8-32.8
3-4	2.59	1.05	0.63-1.74	Pacific	64.07	54.58	40.1-74.2
5-6	7.73	3.13	2.07-4.74	European	1.17	1.00	
7-8	10.40	4.21	2.83-6.27	Asian / Indian	1.45	1.24	0.6-2.6
9-10	33.49	13.56	9.33-19.71				
Urban Rural				Gender			
Urban	14.0	1.00		Male	15.1	1.55	1.35-1.79
Rural	9.93	0.71	0.61-0.83	Female	9.73	1.00	

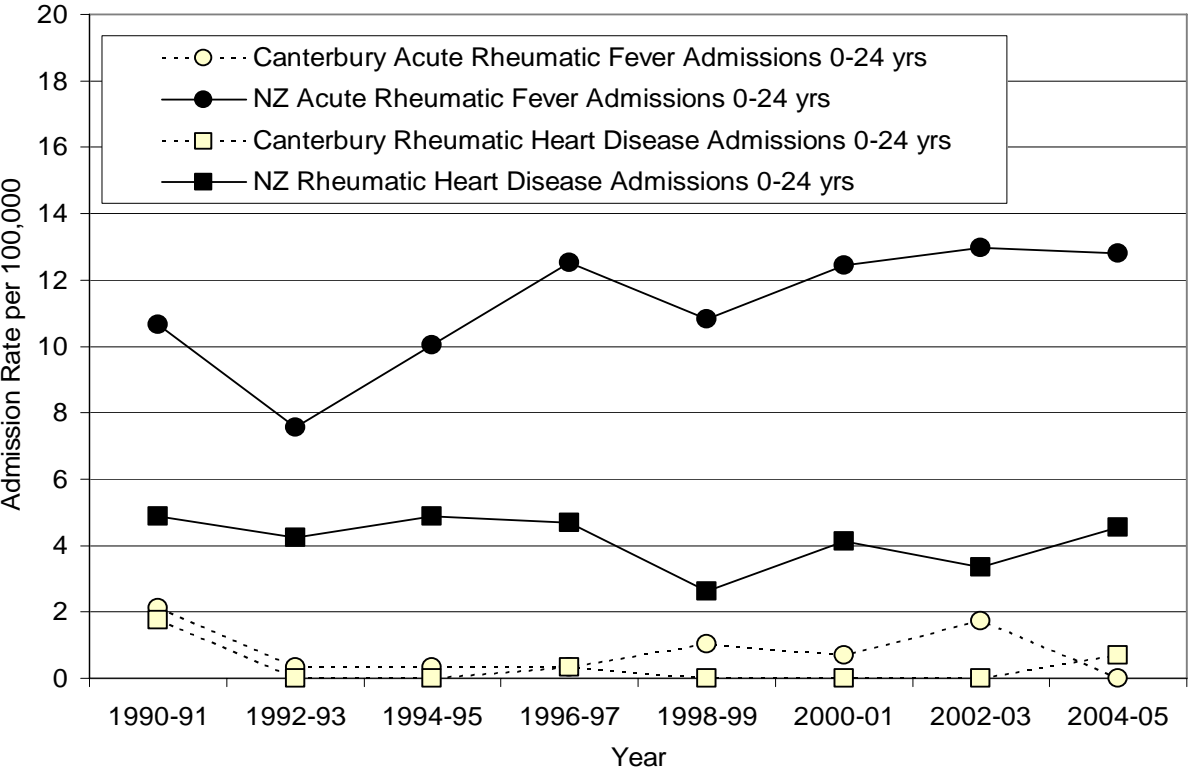
* rate per 100,000 per year, relative risks are unadjusted

Figure 57. Hospital Admissions due to Acute Rheumatic Fever & Rheumatic Heart Disease by Age, NZ Children & Young People 0-24 Years 2001-2005.



Rheumatic Fever in the Canterbury Region

Figure 58. Hospital Admissions due to Rheumatic Fever & Rheumatic Heart Disease in Children and Young People 0-24 yrs, Canterbury vs. NZ 1990-2005.



During 1990-05 hospital admissions for acute rheumatic fever and rheumatic heart disease in Canterbury were consistently lower than the NZ average. There was however, one death attributed to rheumatic heart disease during this period, although none occurred during the past 10 years for which data was available (**Figure 58**). Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

In Summary

Acute rheumatic fever and rheumatic heart disease admissions have remained relatively static in NZ during the past 10 years, while deaths have averaged 1-3 per year during the same period. During 2001-05 hospital admissions for acute rheumatic fever peaked in late childhood to early adolescence, while admissions for rheumatic heart disease were relatively constant after 5 years of age. In contrast, deaths due to rheumatic fever and rheumatic heart disease were most frequent during the teenage years. During 2001-05, rates of acute rheumatic fever were higher amongst those living in the most deprived areas, Pacific and Māori children and young people, males and those living in urban areas

During 1990-05 hospital admissions for acute rheumatic fever and rheumatic heart disease in Canterbury were consistently lower than the NZ average. There was however, one death attributed to rheumatic heart disease during this period, although none occurred during the past 10 years for which data was available. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

SERIOUS SKIN INFECTIONS

Introduction

Bacterial skin infections are a common cause of hospitalisation in children, with the most frequently implicated organisms being *Staphylococcus aureus* and *Streptococcus pyogenes* [53]. Common clinical presentations include:

Cellulitis: A diffuse infection of the skin and subcutaneous tissue characterised by local heat, redness, pain, swelling and occasionally fever, malaise, chills and headache. Infection is more likely to develop in the presence of damaged skin and abscesses / tissue destruction may occur if antibiotics are not taken. [17].

Furuncles and Carbuncles: Commonly known as abscesses or boils, furuncles form tender, red, firm / fluctuant masses of walled off purulent material. They arise from infections of the hair follicle (usually involving *S. aureus*), which then enlarge and eventually open to the skin surface, allowing the purulent contents to drain. Carbuncles are an aggregate of infected hair follicles that form a broad, swollen, red and painful mass that usually opens and drains through multiple tracts. Associated symptoms may include fever and malaise [54].

NZ's hospital admission rates for childhood skin infection have increased in recent years and are currently double those of the USA and Australia [55]). Admissions are highest during summer and are twice as high for Māori and three times as high for Pacific children when compared to those of European / Other origins. Admission rates are also higher amongst those living in the most deprived areas [55]. In developing interventions to reduce childhood skin infections, issues such as overcrowding, access to washing machines & first aid kits, exposure to insect bites, the cleaning and covering wounds and access to primary health care may all need to be addressed simultaneously, if rates of childhood skin sepsis are to decline (see Hunt 2004 [55] for a range of possible options at a DHB level).

The following section reviews hospital admission and mortality rates for serious skin infection amongst children (0-14 years) and young people (15-24 years) in New Zealand and the Canterbury region, using information available from the National Minimum Dataset and the Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions with a primary diagnosis of skin infection (ICD-9 680-686; ICD-10 L00-L08) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) for children (0-14 years) and young people (15-25 years) as recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to skin infection occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of skin infection in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates for children (0-14 years) and young people (15-24 years) during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of children (0-14 years) and young people (15-24 years) admitted with skin infection in each NZDep Index decile (see Appendix 7) by the number of children and young people living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing skin infection admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Serious Skin Infections in NZ: Trends and Risk Factors

While one young person died of serious skin infection in New Zealand during the past 15 years, hospital admission rates amongst both children and young people have risen progressively, with the most rapid increases occurring during the mid-late 1990s (**Figure 59**). During 2001-05 hospital admissions due to serious skin infection had a bi-modal distribution, with the highest rates occurring amongst children <5 years of age, followed by young people in their late teens and early 20s (**Figure 60**). Rates were also higher amongst Māori and Pacific children and young people, males, those living in the most deprived areas and amongst children living in urban areas (**Table 40, Table 41**).

Table 40. Risk Factors for Hospital Admission due to Serious Skin Infection, New Zealand Children 0-14 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	1.74	1.00		1-2	1.69	1.00	
2	1.65	0.95	0.85-1.06	3-4	1.97	1.16	1.08-1.25
3	1.75	1.01	0.90-1.12	5-6	2.37	1.40	1.31-1.51
4	2.16	1.25	1.12-1.38	7-8	3.47	2.05	1.92-2.19
5	2.15	1.24	1.11-1.37	9-10	5.99	3.53	3.33-3.75
6	2.59	1.49	1.35-1.64	Ethnicity			
7	2.87	1.65	1.50-1.82	Māori	5.26	2.79	2.68-2.91
8	4.02	2.31	2.11-2.53	Pacific	8.49	4.49	4.29-4.70
9	4.96	2.84	2.60-3.11	European	1.88	1.00	
10	6.89	3.94	3.62-4.29	Asian / Indian	1.76	0.94	0.85-1.03
Urban Rural				Gender			
Urban	3.84	1.00		Male	3.44	1.14	1.11-1.18
Rural	2.31	0.60	0.58-0.63	Female	3.00	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Table 41. Risk Factors for Hospital Admission due to Serious Skin Infection, New Zealand Young People 15-24 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	2.82	1.00		1-2	2.87	1.00	
2	2.91	1.03	0.92-1.16	3-4	3.26	1.13	1.05-1.23
3	2.98	1.05	0.94-1.18	5-6	3.64	1.27	1.18-1.36
4	3.51	1.24	1.11-1.38	7-8	4.20	1.46	1.36-1.57
5	3.36	1.19	1.06-1.33	9-10	4.76	1.66	1.55-1.77
6	3.89	1.38	1.24-1.53	Ethnicity			
7	4.17	1.47	1.33-1.63	Māori	4.92	1.30	1.23-1.36
8	4.24	1.50	1.36-1.66	Pacific	4.72	1.25	1.16-1.34
9	4.27	1.51	1.37-1.67	European	3.79	1.00	
10	5.37	1.90	1.72-2.09	Asian / Indian	1.04	0.27	0.24-0.31
Urban Rural				Gender			
Urban	3.82	1.00		Male	4.89	1.79	1.71-1.86
Rural	3.87	1.01	0.97-1.06	Female	2.73	1.00	

* rate per 1,000 per year, relative risks are unadjusted

Figure 59. Hospital Admissions due to Serious Skin Infections, New Zealand Children and Young People 0-24 Years 1988-2005.

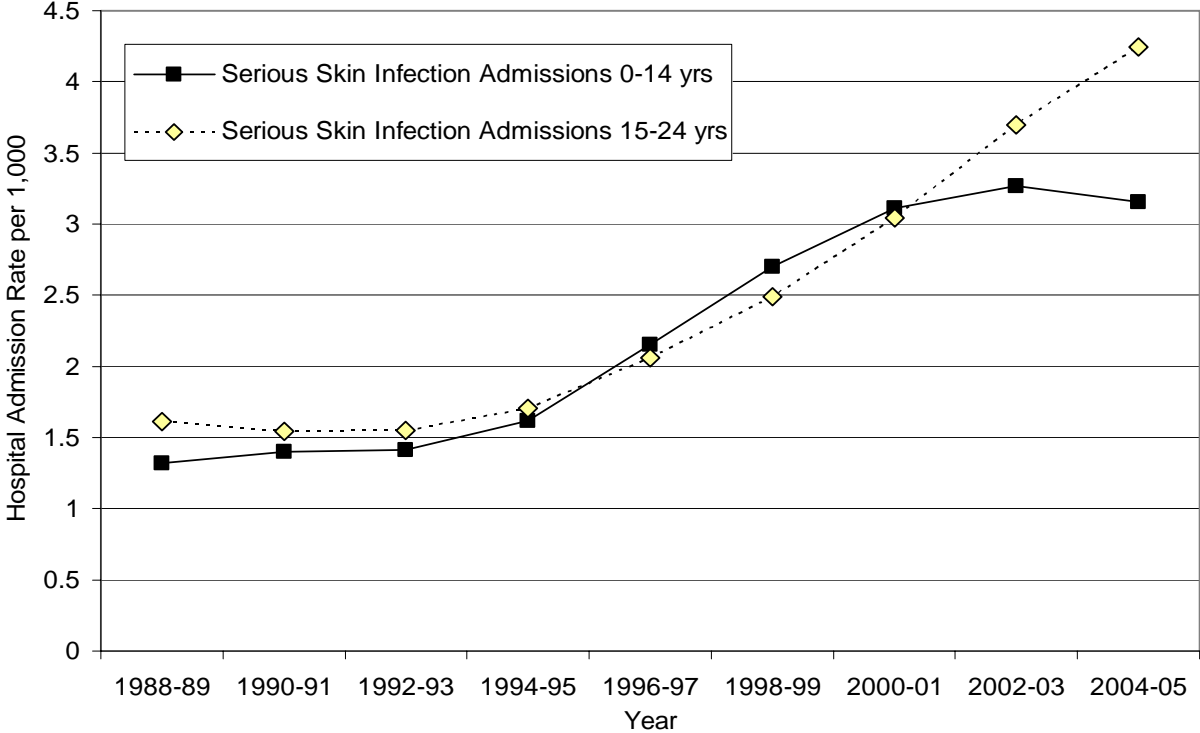
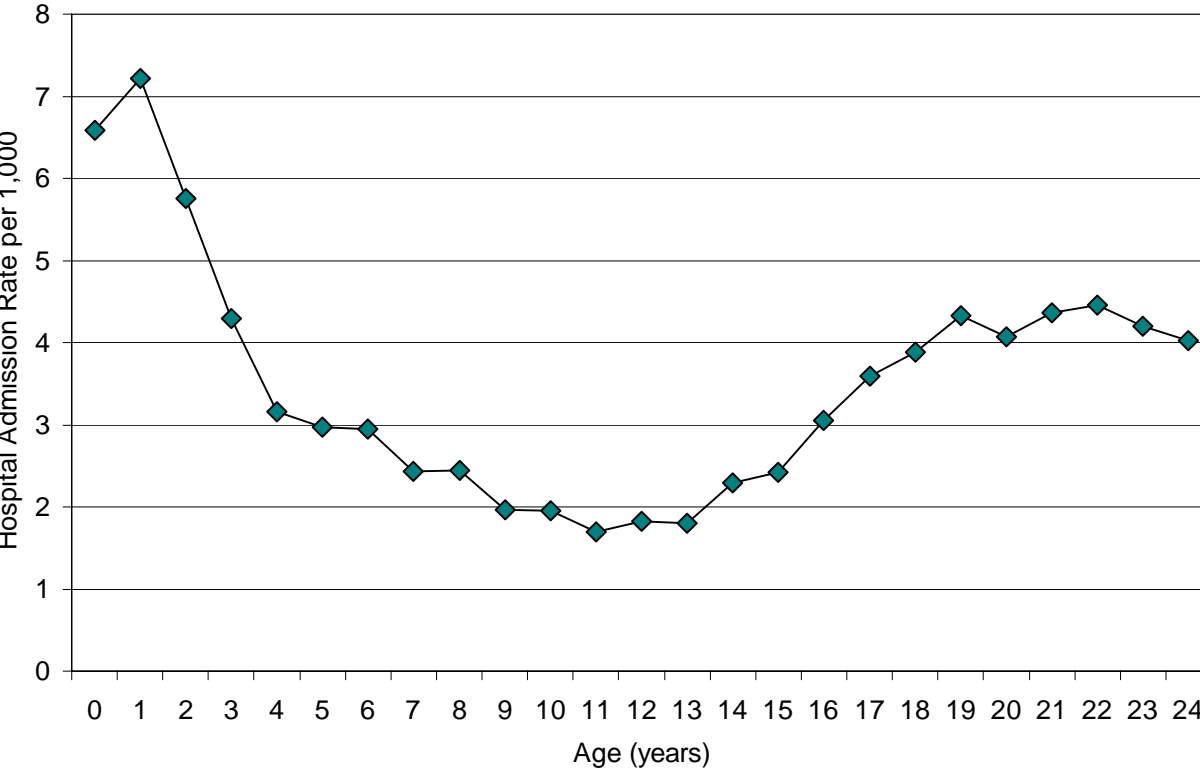


Figure 60. Hospital Admissions due to Serious Skin Infection by Age, New Zealand Children and Young People 0-24 Years, 2001-2005.



Serious Skin Infections in the Canterbury Region

Figure 61. Hospital Admissions due to Serious Skin Infection Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.

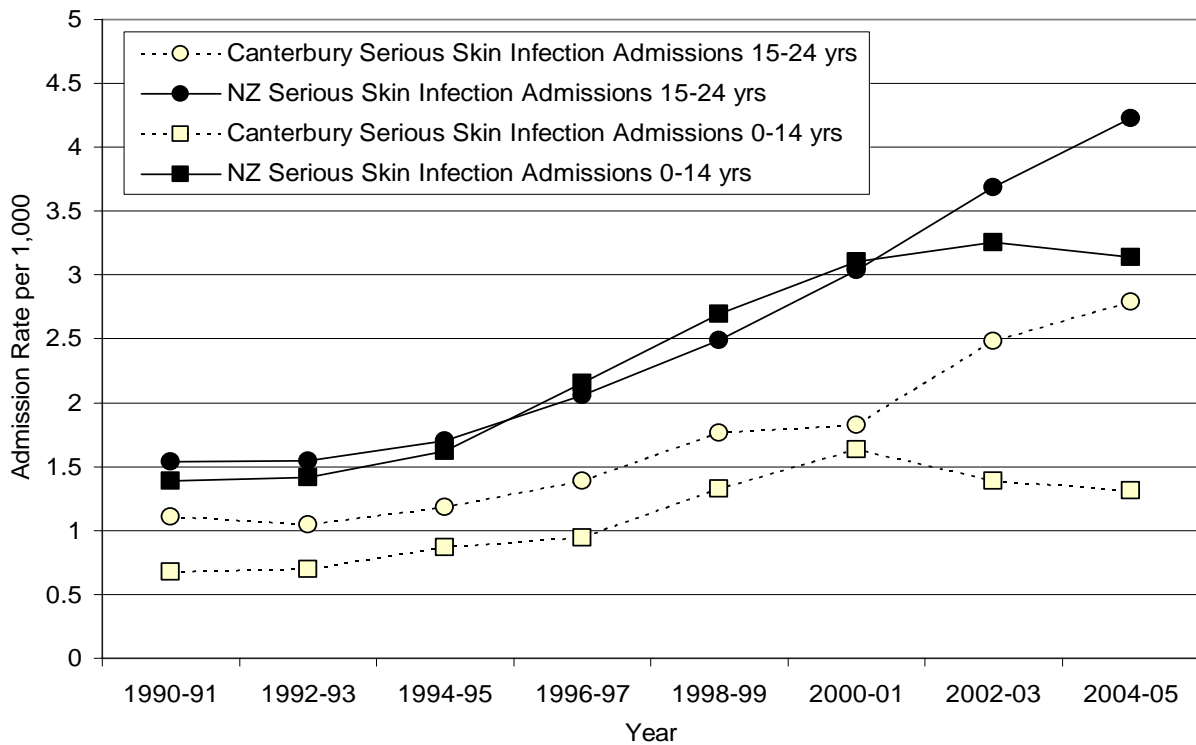
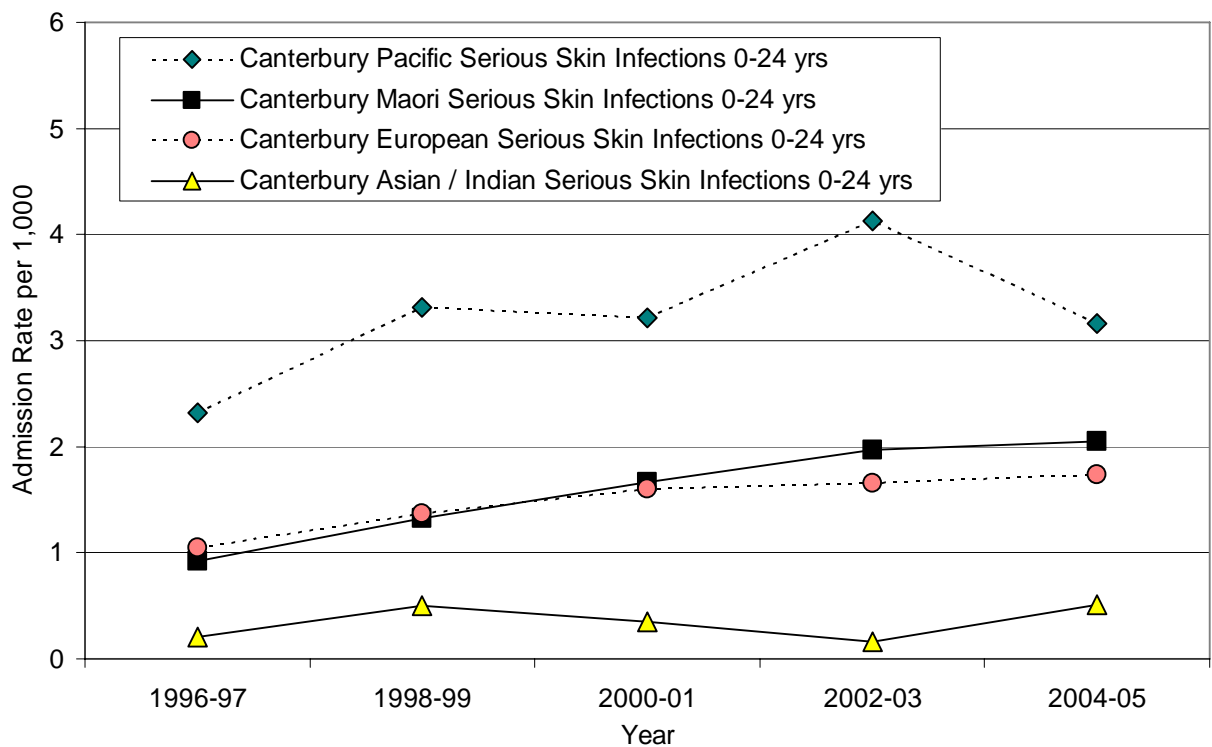


Figure 62. Hospital Admissions for Serious Skin Infections Amongst Children and Young People 0-24 Years by Ethnicity, Canterbury 1996-2005.



In Canterbury during 1990-05, while hospital admissions for serious skin infections increased for both children and young people, admission rates remained consistently below the NZ average (**Figure 61**). During 1996-05, admissions for serious skin infections were higher for Pacific > Māori and European > Asian / Indian children and young people (**Figure 62**). In addition, there were no deaths attributed to serious skin infections amongst Canterbury children and young people during 1990-2003.

In Summary

While one young person died of serious skin infection in New Zealand during the past 15 years, hospital admission rates amongst both children and young people have risen progressively, with the most rapid increases occurring during the mid-late 1990s. During 2001-05, hospital admissions due to serious skin infections had a bi-modal distribution, with the highest rates occurring amongst children <5 years of age, followed by young people in their late teens and early 20s. Rates were also higher amongst Māori and Pacific children and young people, males, those living in the most deprived areas and amongst children living in urban areas.

In Canterbury during 1990-05, while hospital admissions for serious skin infections increased for both children and young people, admission rates remained consistently below the NZ average. During 1996-05, admissions for serious skin infections were higher for Pacific > Māori and European > Asian / Indian children and young people. In addition, there were no deaths attributed to serious skin infections amongst Canterbury children and young people during 1990-03.

TUBERCULOSIS

Introduction

Tuberculosis is caused by *Mycobacterium tuberculosis*, an organism transmitted by the inhalation or ingestion of infected droplets. The disease usually affects the lungs, although infection of multiple organ systems can occur. Initial infection often goes unnoticed, with most infected individuals entering a latent phase. Progression to active TB occurs in about 5-15% of cases, with the risk of progression being influenced by the size of the infecting dose and the immunity of the individual exposed [56]. Persons with immunodeficiency e.g. those with HIV, may progress to disseminated forms of the disease, involving multiple organs such as the liver, lungs, spleen, bone marrow and lymph nodes [17].

NZ's TB rates fell progressively during the first half of last century, but reached a nadir of 295 cases in 1988, and thereafter have remained static at approximately 300-500 cases per year. Childhood TB has followed a similar pattern, with a clear resurgence in TB amongst children during 1992-2001 [57]. In one recent review, NZ's childhood TB rates were highest amongst those <5 years of age, those living in the most deprived areas and those of African>Pacific Island>Māori>Asian>European ethnic origins. Most cases were identified by contact tracing or immigrant screening and the majority were thought to originate either as part of a local outbreak, or as a consequence of migration from high risk countries [57]. From a public health perspective, the mainstays of controlling TB infection remain the vaccination (BCG) of high risk neonates, case finding and treatment of active and latent infections, contact tracing and the selective screening of high risk groups [56].

The following section reviews TB morbidity and mortality in NZ and the Canterbury region using two data sources; hospital admissions using the NMDS and death using the NZ Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of admissions 0-24 years with a primary diagnosis of TB (ICD-9 010-018; ICD-10 A15-A19) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset (Appendix 2), while denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Because of low numbers mortality was reported as the total number of deaths due to TB occurring in any one year. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of admissions with a primary diagnosis of TB in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic specific hospital admission rates during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of TB admissions 0-24 years in each NZDep Index decile (see Appendix 7) by the number of those 0-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing TB admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Tuberculosis in NZ: Trends and Risk Factors

In NZ during 1988-2005, hospital admissions for TB gradually increased, although data for the 2004-05 period suggests that this may be beginning to taper off. In addition, during 1988-2003, 3 NZ children and young people died as a result of TB (**Figure 63**). During 2001-2005, while there was a small peak amongst children <4 years of age, TB admission rates were highest amongst young people in their late teens and early twenties (**Figure 64**), those living

in the most deprived areas, those of non-European ethnic origin, females and those in urban areas (Table 42).

Figure 63. Hospital Admissions Due to Tuberculosis, New Zealand Children and Young People 0-24 Years, 1988-2005.

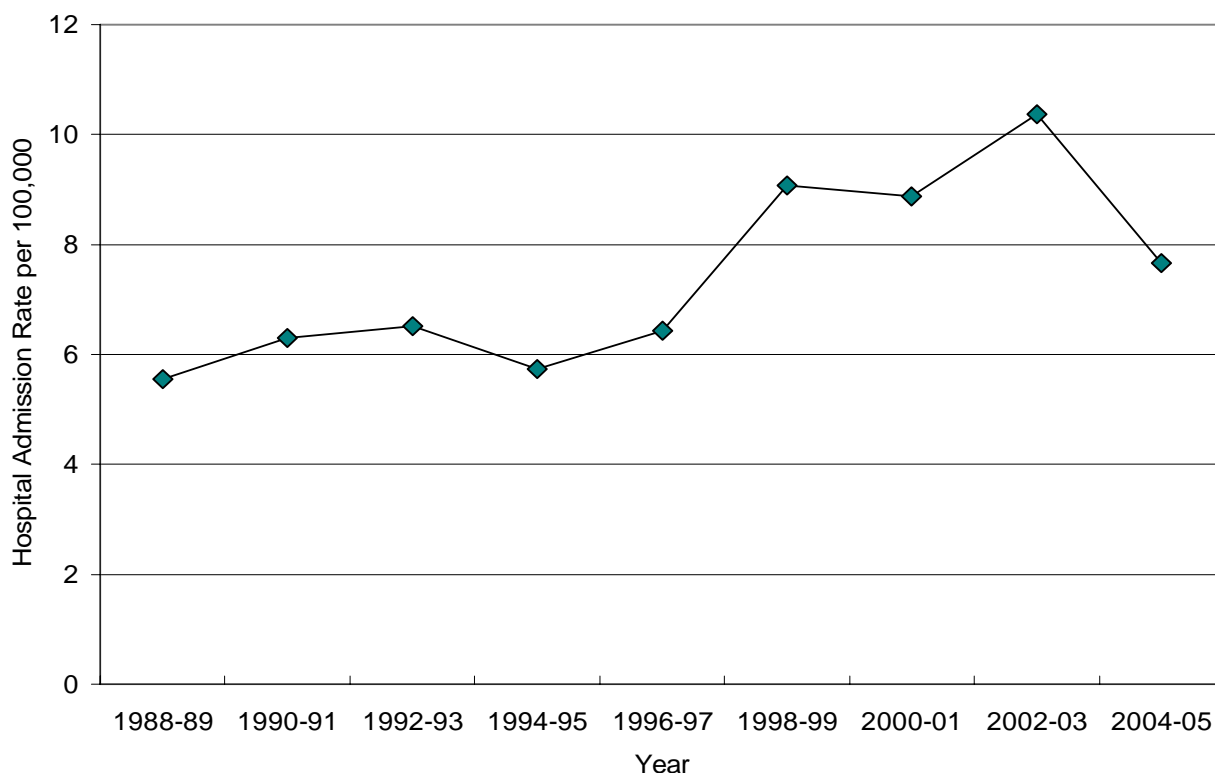
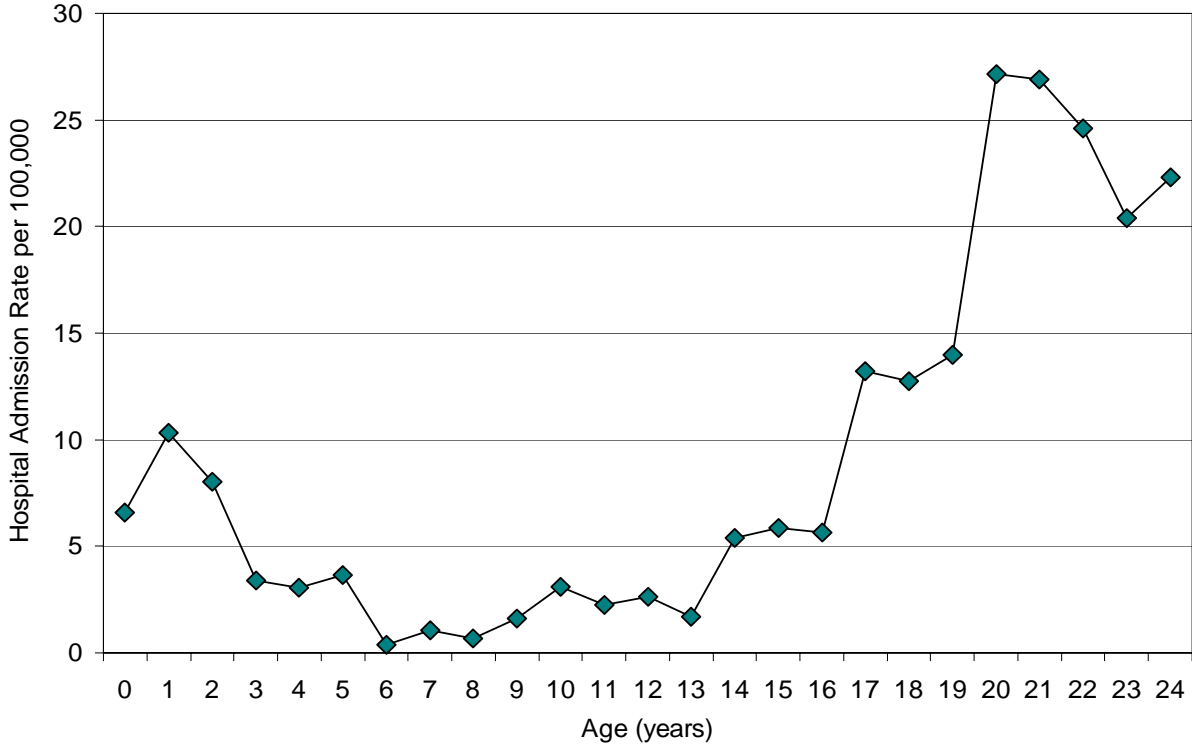


Table 42. Risk Factors for Hospital Admission due to TB, New Zealand Children and Young People 0-24 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	3.41	1.00		Māori	7.05	10.23	6.69-15.7
3-4	5.34	1.57	1.06-2.33	Pacific	29.75	43.16	28.7-64.9
5-6	7.02	2.06	1.42-2.99	European	0.69	1.00	
7-8	8.97	2.63	1.85-3.76	Asian / Indian	34.64	50.26	33.6-75.2
9-10	15.32	4.50	3.22-6.28				
Urban Rural				Gender			
Urban	11.1	1.00		Male	7.16	0.74	0.63-0.88
Rural	3.46	0.31	0.25-0.39	Female	9.64	1.00	

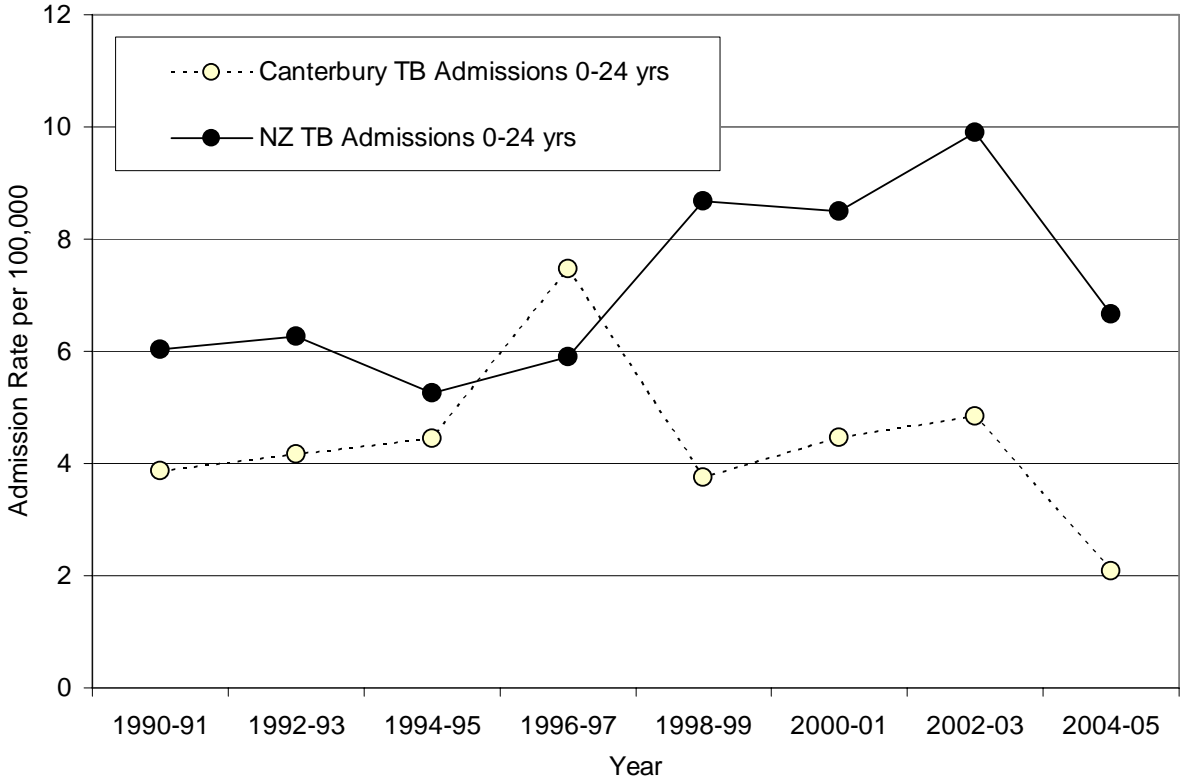
* rate per 100,000 per year, relative risks are unadjusted

Figure 64. Hospital Admission Rates for Tuberculosis by Age, New Zealand Children and Young People 0-24 Years, 2001-2005.



Tuberculosis in the Canterbury Region

Figure 65. Hospital Admissions due to TB Amongst Children and Young People 0-24 Years, Canterbury vs. New Zealand 1990-2005.



During 1990-2005, hospital admissions for TB in Canterbury were generally lower than the NZ average and during 1990-2003 there were no deaths attributed to TB in the region (**Figure 65**). Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

In Summary

In NZ during 1988-05, hospital admissions for TB gradually increased, although data for the 2004-05 period suggests that this may be beginning to taper off. In addition, during 1988-03, 3 NZ children and young people died as a result of TB. During 2001-05, while there was a small peak amongst children <4 years of age, TB admissions were highest amongst young people in their late teens and early twenties, those living in the most deprived areas, those of non-European ethnic origin, females and those in urban areas

During 1990-05, hospital admissions for TB in Canterbury were generally lower than the NZ average and during 1990-03 there were no deaths attributed to TB in the region. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

**THE HEALTH STATUS
OF YOUNG PEOPLE
15-24 YEARS**

INTRODUCTION

By Dr Simon Denny

Traditionally the teenage years are viewed as 'healthy'. A time of life when young people have outgrown or survived the childhood illnesses and yet still to face effects of illness from old age. However there is increasing recognition that the health of young people in New Zealand is poor. New Zealand's rate of teenage suicide, pregnancy and motor vehicles injuries are among the highest in the western world [58],[59], [60]. In addition, among all age groups in New Zealand, young people's mortality rates have improved the least over the last 40 years [61].

The World Health Organisation defines adolescence as the period of life spanning the ages between 10 and 19 years and young people defined as 10 to 24 years. In New Zealand young people aged 10 to 24 years make up 22% of the total population [62]. This section provides an overview of available data of the health outcomes of young people aged 15 - 25 years. This definition of young people reflects how secondary and tertiary health services have traditionally split youth between adult (15 years of age and older) and child (under 15 years of age) health services.

Historically there has been a lack of recognition of youth health by health planners, funders and services. There are very few youth specific health services and most health professionals have had little training in youth health. Many feel that their skills are deficient in dealing with this age group [63],[64]. Not surprisingly young people voice significant concerns about the health care they receive. Approximately 50% of high school students in New Zealand say that they have missed out on health care when they needed it and one of the main reasons given was that they didn't feel comfortable with their health care provider [65].

To improve the health and wellbeing of young people in New Zealand, the health sector need to focus on the needs of this population. This requires recognition of youth health issues; further training for health providers to meet the needs of young people; and policy and funding streams developed to support these efforts and youth specific services.

HOSPITAL ADMISSIONS & DEATHS: AN OVERVIEW

Introduction

Before presenting an analysis of individual youth health outcomes and their determinants at a population level, it is first necessary to provide a brief overview of most common reasons for hospital admission and mortality amongst young people in the region during the past 3 years. It is hoped that the brief summary tables presented below will provide the reader with an overall framework, within which to consider the relative importance of the various issues discussed in the sections which follow. In addition the reader is referred to sections in the earlier Child Health part of this report, which explore outcomes of relevance to young people 15-24 years. These include

- Cancer (carcinoma in situ of cervix)
- Potentially Avoidable Hospital Admissions
- Pneumonia
- Asthma
- Bronchiectasis
- Tuberculosis
- Serious Skin Infections
- Gastroenteritis
- Meningococcal Infection
- Rheumatic Fever

Notes on Data Sources and Statistical Methods

The hospital admission rates in this analysis were calculated by dividing the total number of hospital admissions for young people 15-24 years by census denominators for the period 2003-2005. Numerators were drawn from publicly funded hospital discharges (inpatient and day patient) in the 15-24 year age bracket, with the reason for admission being derived from the primary diagnosis (ICD-10 code) as recorded in the NMDS (Appendix 2). To maintain consistency with the injury and mental health sections that follow, injury and mental health inpatient admissions with an Emergency Medicine specialty code (M05-M08) on discharge were excluded from this analysis (see discussion in Appendix 2 for the rationale for this). Because admissions for pregnancy and childbirth varied in the way in which they were admitted as inpatient events (acute / arranged / waiting list), for the purposes of this analysis they were treated as a separate class of admission, although in the NMDS they appear variously under a number of different categories of admission.

Table 43. Mortality for Young People (15-24 yrs) in the Canterbury Region 2001-2003

Cause of Death	Number	Rate*	% of Deaths
Injury / Poisoning	55	31.6	42.6
Suicide	33	19.0	25.6
Cancer	11	6.3	8.5
Congenital Anomalies	6	3.5	4.7
Other Causes	24	13.8	18.6
Total	129	74.2	100.0

*Rates are per 100,000; Numbers are per 3 year period.

In Canterbury during 2001-03 injury / poisoning followed by suicide were the leading causes of death in young people, while during 2003-05 pregnancy and childbirth were the leading causes of hospital admission. In terms of other hospital admissions, injuries followed by

abdominal / pelvic pain were the leading causes of acute admissions, while mental health issues followed by immune disorders were the leading reasons for arranged admission. Surgery on the tonsils and adenoids followed by procedures on the skin and subcutaneous tissue were the leading causes of waiting list admissions for those 15-24 years.

Table 44. Hospital Admissions for Young People (15-24 yrs), Canterbury Region 2003-05.

Diagnosis	Number*	Rate*	% of Type	% of Total
Reproductive Admissions (by Diagnosis)				
Early Pregnancy Loss	594	7.1	9.5	2.8
Therapeutic Abortion*	479	5.7	7.7	2.2
Pregnancy & Delivery	5156	61.7	82.8	23.9
Total	6229	74.5	100.0	28.9
Acute Admissions (by Diagnosis)				
Injury / Poisoning*	1490	8.9	17.7	6.9
Abdominal / Pelvic Pain	762	4.6	9.1	3.5
Mental Health	752	4.5	8.9	3.5
Appendicitis	468	2.8	5.6	2.2
Skin Infections	382	2.3	4.5	1.8
Gastroenteritis	298	1.8	3.5	1.4
Asthma	243	1.5	2.9	1.1
Urinary Tract Infection	172	1.0	2.0	0.8
STI / Pelvic Inflammatory Disease	130	0.8	1.5	0.6
Other Causes	3715	22.2	44.2	17.2
Total	8412	50.3	100.0	39.0
Arranged Admissions (by Diagnosis)				
Mental Health	400	2.4	13.8	1.9
Immune Disorders	225	1.3	7.8	1.0
Cancer / Chemotherapy	191	1.1	6.6	0.9
Injury	66	0.4	2.3	0.3
Other Causes	2019	12.1	69.6	9.4
Total	2901	17.4	100.0	13.5
Waiting List Admissions (by Procedure)				
Tonsils and Adenoids	228	1.4	8.2	1.1
Skin / Subcutaneous Tissue	167	1.0	6.0	0.8
Removal Internal Fixation Device	138	0.8	5.0	0.6
Procedures on Nose	122	0.7	4.4	0.6
Dental Procedures	92	0.6	3.3	0.4
Diagnostic Procedure Intestine	64	0.4	2.3	0.3
Other Procedures	1865	11.2	67.2	8.7
No Procedure Listed	99	0.6	3.6	0.5
Total	2775	16.6	100.0	12.9
ACC Covered Admissions				
ACC Covered*	1225	7.3	100.0	5.7
Total	21542	128.9	100.0	100.0

*Rates are per 1,000; Numbers are per 3 year period. Note NMDS coverage of therapeutic abortions is partial, so figure may not accurately reflect the total number of terminations undertaken in the region during this period: Note large number of injury admissions also admitted under ACC Cover.

INJURIES IN YOUNG PEOPLE

Introduction

Injuries are the leading cause of hospital admission and death amongst young people 15-24 years, with motor vehicle accidents being the single most frequent cause in both categories [38, 66]. Non-accidental injuries also make a significant contribution, with self inflicted injuries and those arising from assault both being higher amongst young people than those 0-14 years [37-39, 66]. Risk factors for injury related deaths include gender, ethnicity and age, with rates being highest amongst males, Māori young people and those in their late teens and early 20's [67]. Injury related hospital admissions show a similar pattern, although admissions due to falls, sport injuries and non-road traffic injuries have been lower amongst Māori than non-Māori in recent years [67].

The following section reviews injury related morbidity and mortality for young people (15-24 years) using the National Minimum Dataset and the National Mortality Collection. The section begins by summarising the most frequent causes of hospital admission and death in NZ and the Canterbury Region, before selecting two injury categories (Transport Accidents and Assaults) for further review. Self inflicted injuries and deaths due to suicide are covered in a later section, which explores mental health issues for young people-24 years.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of injury related hospital admissions for young people 15-24 years, by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatient and day patient) with a primary diagnosis of injury (ICD9 800-995: ICD 10 S00-T79), excluding those with an external cause code ICD-9 E870-879: ICD-10 Y40-Y84 (complications of medical or surgical care), ICD-9 E930-949 (adverse effects of drugs in therapeutic use) and ICD-9 E929, E969, E959 (late effects (>1 year) of injury). Land Transport Accidents (ICD-9 E800-829, E846-848: ICD-10 V01-V89, V98-99) and injuries arising from Assault (ICD-9 E960-968: ICD-10 X85-Y09) were considered in more detail. In addition, as outlined in Appendix 2, to ensure comparability from region to region, all cases with an Emergency Department Specialty Code on discharge were also excluded from this analysis, as were cases who died whilst in hospital (to avoid double counting in both morbidity and mortality data). Cause of injury was assigned using the supplementary E code relating to each injury admission. Denominators were derived from the usual resident NZ and DHB populations as estimated at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Mortality rates were calculated by dividing the total number of injury related deaths (ICD-9 E800-995: ICD-10 V01-Y36) by census population denominators for the periods 1988-2003. Age-specific hospital admission (2001-2005) rates were calculated by dividing the (5 year) total number of Land Transport Accident and Assault admissions in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic and gender specific hospital admission rates for young people during 2001-2005. NZDep specific hospital admission rates were calculated by dividing the total number of young people admitted as a result of a Land Transport Accident or Assault in each NZDep Index decile (see Appendix 7) by the number of young people 15-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Injuries among Young People: Trends and Risk Factors

During the past 3 years for which data was available, injuries arising from mechanical forces (e.g. striking against an object or person), followed by falls were the leading causes of hospital admission amongst NZ young people. As a group however, transport accidents

accounted for 23.9% of all injury related admissions, with over half of these occurring while young people were the occupants of vehicles (**Table 45**). The leading cause of injury related death was transport accidents, with the majority of injuries again occurring while young people were the occupants of a vehicle. Suicide was the second leading cause of death, with deaths from assault being a distant third (**Table 46**). In Canterbury during this period the pattern was similar, with mechanical forces, followed by falls being the leading causes of hospital admission and transport accidents followed by suicide being the leading causes of death (**Table 47**).

Table 45. Most Frequent Causes of Injury Related Hospital Admission due to Young People (15-24 yrs) in New Zealand and the Canterbury Region during 2003-2005.

Injury Type	New Zealand		Canterbury		
	*Rate	%	*Number	*Rate	%
Mechanical Forces*	551.1	29.1	669	400.2	26.8
Falls	353.8	18.7	453	271.0	18.2
Transport Accident: Occupant	235.4	12.5	269	160.9	10.8
Transport Accident: Motorbike*	91.4	4.8	134	80.2	5.4
Transport Accident: Cyclist	43.2	2.3	78	46.7	3.1
Transport Accident: Pedestrian	24.4	1.3	38	22.7	1.5
Other Transport Accident	55.7	3.0	95	56.8	3.8
Assault	200.6	10.6	231	138.2	9.3
Intentional Self Harm	135.8	7.2	239	143.0	9.6
Accidental Poisoning	25.9	1.4	47	28.1	1.9
Electricity / Fire / Burns	30.5	1.6	27	16.2	1.1
Other Causes	142.0	7.5	214	128.0	8.6
Total	1889.8	100.0	2494	1491.9	100.0

*rates are per 100,000 per year; Number is per 3 year period; Mechanical forces includes being accidentally struck / crushed / injured by an object / implement / person / animal: Motorbike includes 3 wheeler.

Table 46. Causes of Injury Related Mortality for Young People (15-24 yrs), NZ 2001-2003.

Injury Type	New Zealand	
	*Rate	%
Transport Accident	26.3	45.9
Intentional Self Harm (Suicide)	20.0	34.9
Assault	3.2	5.6
Accidental Poisoning	1.7	2.9
Undetermined Intent	0.9	1.5
Drowning / Submersion	1.5	2.7
Other Causes	3.8	6.5
Total	57.4	100.0

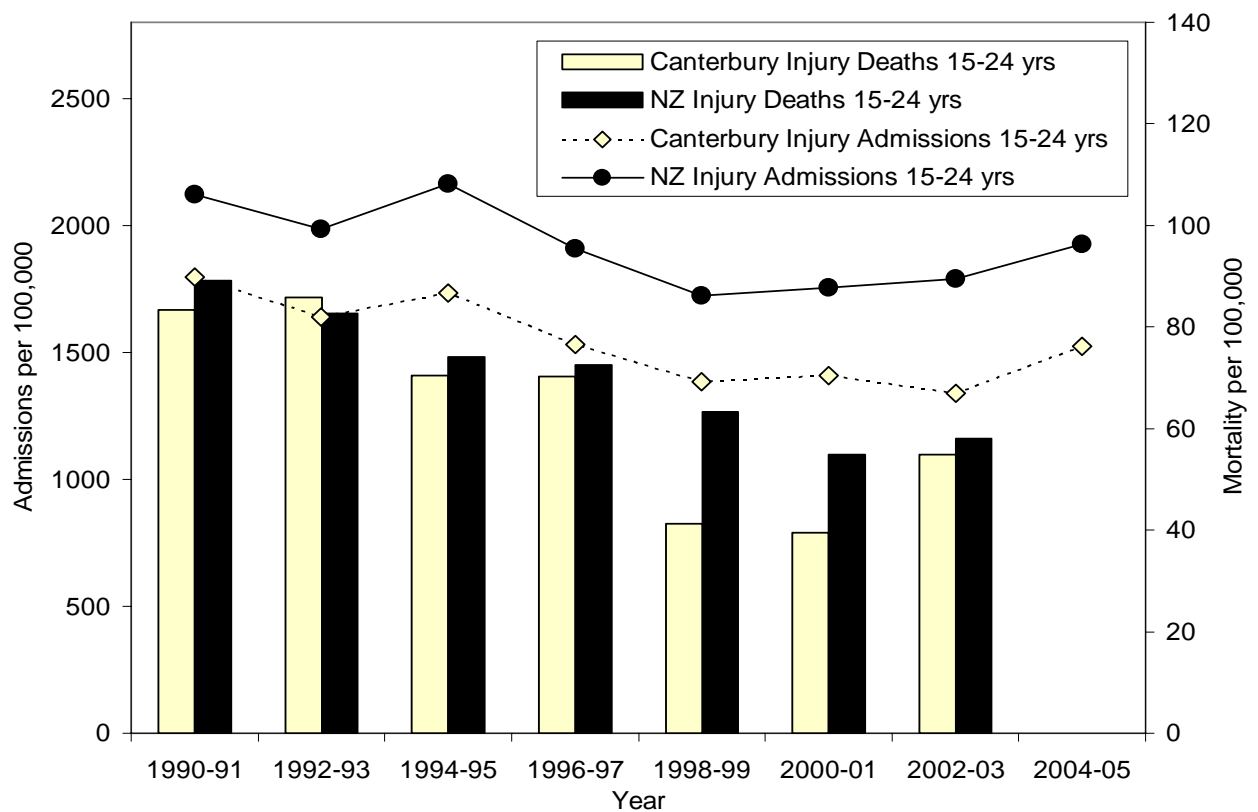
*rates are per 100,000 per year

Table 47. Injury Related Mortality for Young People 15-24 yrs, Canterbury 2001-03.

Injury Type	Canterbury		
	*Number	*Rate	%
Transport Accident	45	25.9	51.1
Intentional Self Harm (Suicide)	33	19.0	37.5
Accidental Poisoning	3	1.7	3.4
Falls	3	1.7	3.4
Other Causes	4	2.3	4.5
Total	88	50.6	100.0

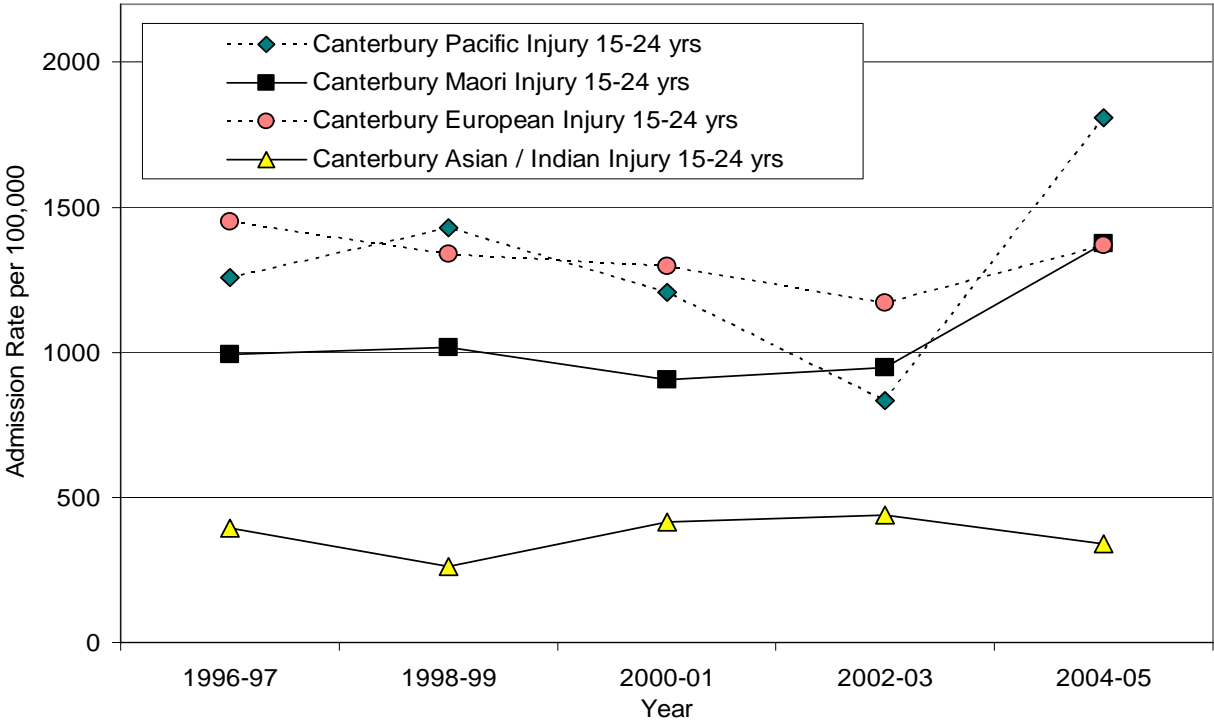
*rates are per 100,000 per year; Number is per 3 year period

Figure 66. Hospital Admissions (1990-2005) and Deaths (1990-2003) due to Injury in Young People 15-24 Years, the Canterbury Region vs. New Zealand.



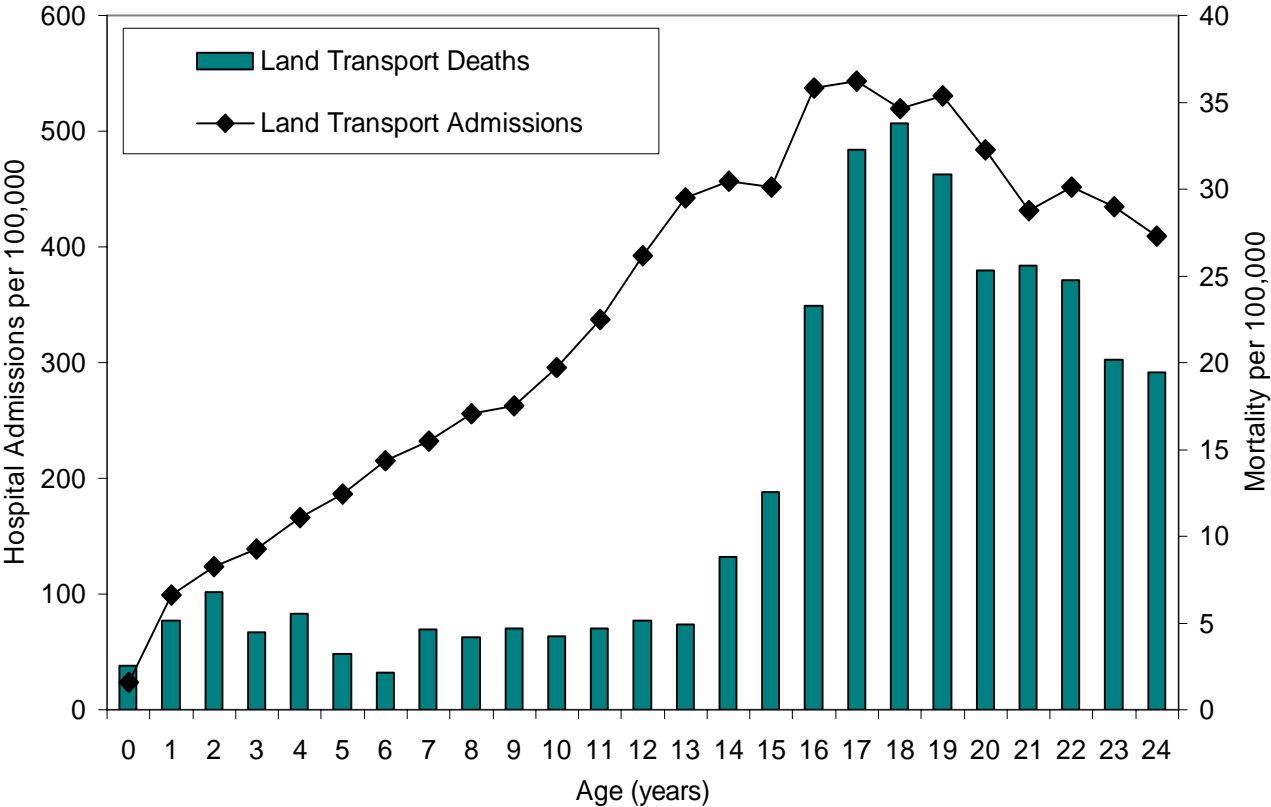
In Canterbury during 1990-2005, hospital admissions due to injury amongst young people were consistently lower than the NZ average, while injury mortality during 1990-2003 was either similar to or lower than the NZ average. Despite this, a total of 561 young people died as a result of injuries in Canterbury between 1990 and 2003 (Figure 66). During 1996-2005, injury related hospital admission rates in Canterbury were higher amongst European and Pacific > Māori > Asian / Indian young people (Figure 67).

Figure 67. Hospital Admissions due to Injury by Ethnicity in Young People 15-24 Years, the Canterbury Region 1996-2005.



Risk Factors for Land Transport Accidents in NZ

Figure 68. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Land Transport Accidents by Age, New Zealand Children and Young People 0-24 Years.



In NZ during 1988-05, hospital admissions and deaths due to land transport accidents (including vehicle occupant, motorcycle, bicycle, pedestrian and non-traffic vehicle accidents) declined amongst young people 15-24 years. Admissions and deaths however were not uniformly distributed by age, with both rising progressively during adolescence to reach a peak at 17-18 years of age (Figure 68). Admissions were also higher amongst Māori and European young people, those in the most deprived areas, males and in rural areas (Table 48).

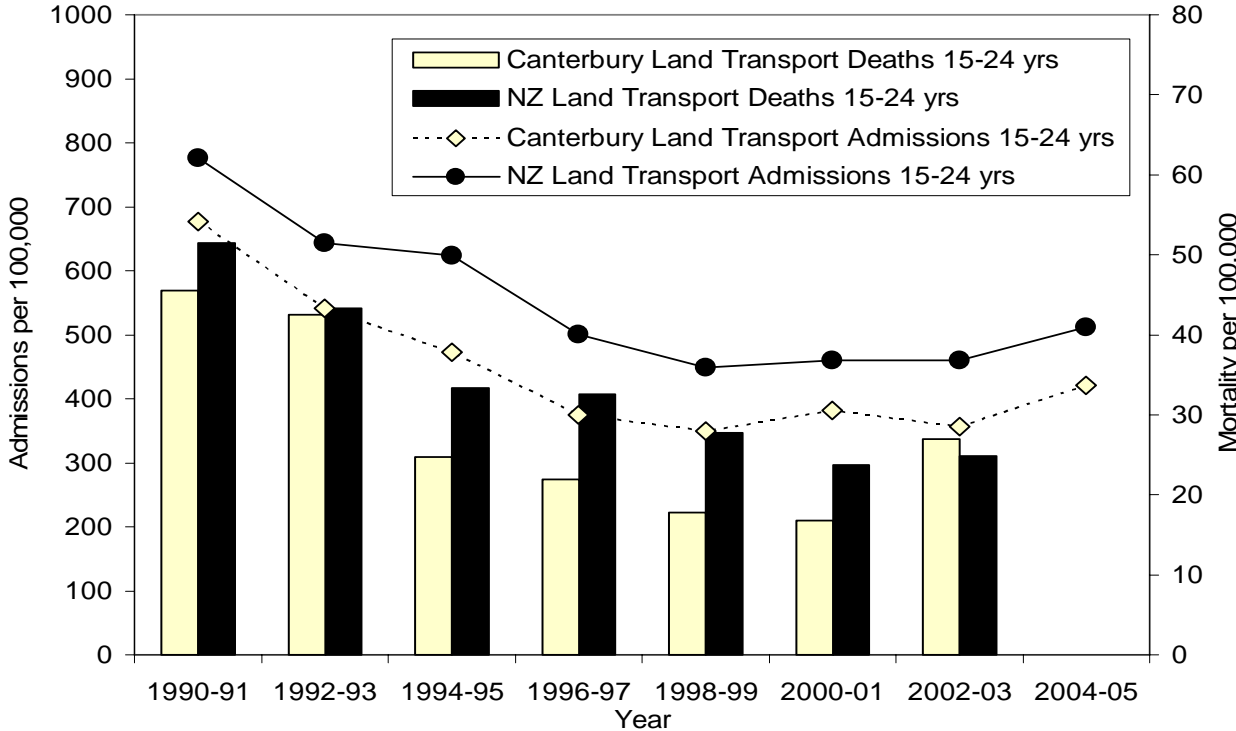
Table 48. Risk Factors for Hospital Admission due to Land Transport Accidents, New Zealand Young People 15-24 years, 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	333.4	1.00		1-2	357.0	1.00	
2	378.3	1.13	1.02-1.26	3-4	421.2	1.18	1.10-1.26
3	384.3	1.15	1.04-1.28	5-6	408.2	1.14	1.07-1.22
4	454.3	1.36	1.23-1.50	7-8	421.7	1.18	1.11-1.26
5	409.1	1.23	1.11-1.36	9-10	468.1	1.31	1.23-1.39
6	407.3	1.22	1.11-1.35	Ethnicity			
7	448.3	1.34	1.22-1.48	Māori	500.2	1.06	1.01-1.11
8	398.1	1.19	1.08-1.31	Pacific	231.8	0.49	0.45-0.54
9	439.8	1.32	1.20-1.44	European	473.2	1.00	
10	503.0	1.51	1.37-1.65	Asian / Indian	163.5	0.35	0.32-0.38
Urban Rural				Gender			
Urban	276.3	1.00		Male	601.4	2.27	2.18-2.37
Rural	614.7	2.22	2.13-2.31	Female	264.0	1.00	

* rate per 100,000 per year, relative risks are unadjusted

Land Transport Accidents in the Canterbury Region

Figure 69. Hospital Admissions (1990-2005) and Deaths (1990-2003) due to Land Transport Accidents in Young People 15-24 Years, Canterbury vs. New Zealand.



In Canterbury during 1990-2005 hospital admissions due to land transport accidents were consistently lower than the NZ average, while mortality rates during 1990-2003 were either similar to or lower than the NZ average. Despite this, during 1990-2003 a total of 247 young people died as a result of land transport accidents in Canterbury (Figure 69).

Assault in NZ

Figure 70. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Assault by Age and Gender, New Zealand Young People 15-24 Years.

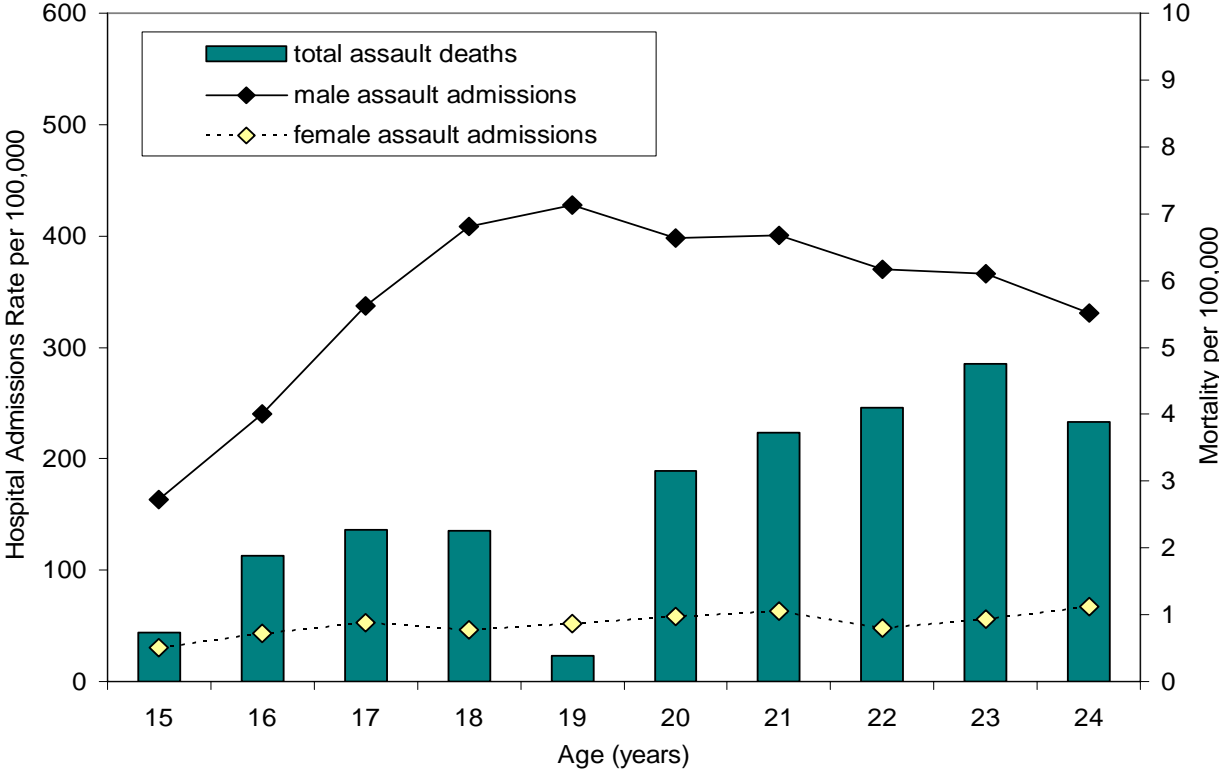


Table 49. Risk Factors for Hospital Admission due to Assault, New Zealand Young People 15-24 Years, 2001-2005.

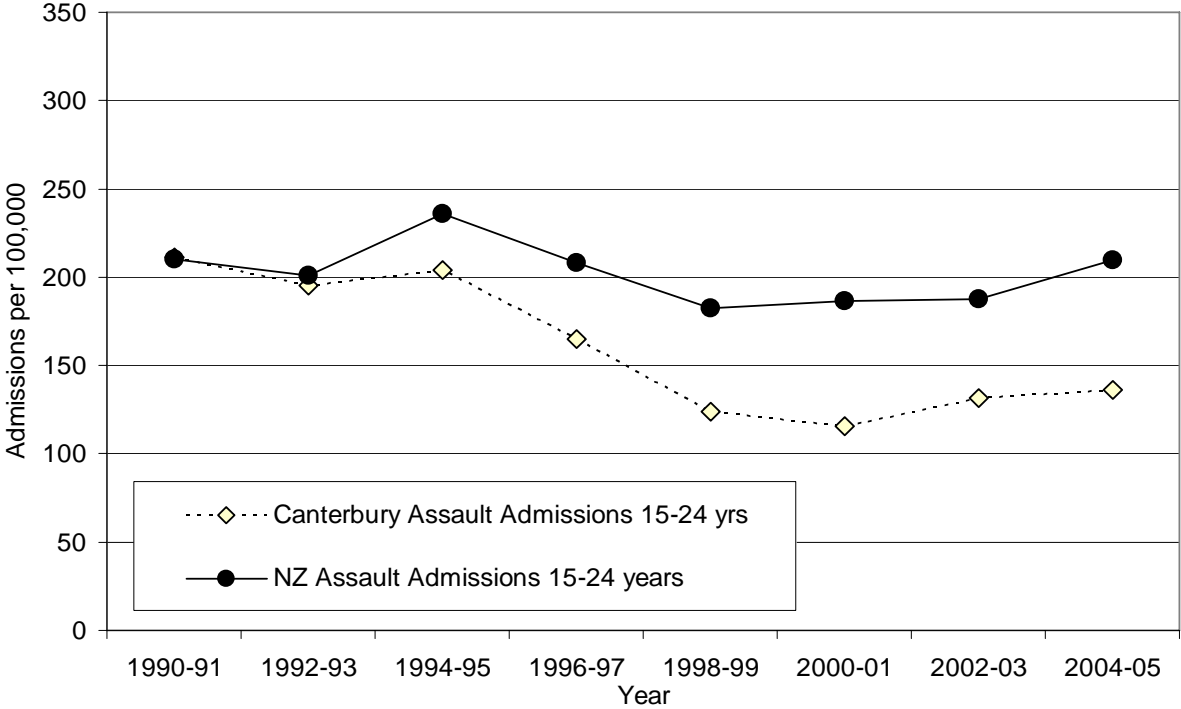
Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	117.4	1.00		1-2	115.2	1.00	
2	113.3	0.97	0.81-1.16	3-4	138.4	1.20	1.06-1.35
3	118.8	1.01	0.85-1.21	5-6	157.9	1.37	1.22-1.54
4	156.0	1.33	1.13-1.57	7-8	223.7	1.94	1.74-2.16
5	143.4	1.22	1.03-1.45	9-10	293.2	2.54	2.30-2.81
6	170.2	1.45	1.24-1.70	Ethnicity			
7	208.0	1.77	1.52-2.07	Māori	370.9	2.38	2.23-2.53
8	237.7	2.02	1.74-2.35	Pacific	297.2	1.91	1.74-2.09
9	233.0	1.98	1.71-2.30	European	155.7	1.00	
10	367.6	3.12	2.71-3.60	Asian / Indian	49.7	0.32	0.27-0.38
Urban Rural				Gender			
Urban	168.9	1.00		Male	342.8	6.66	6.12-7.24
Rural	187.2	1.11	1.04-1.18	Female	51.3	1.00	

* rate per 100,000 per year, relative risks are unadjusted

In contrast to falling land transport accident rates, hospital admissions due to assault in NZ changed little during 1988-05. Mortality trends however were more difficult to interpret due to the smaller number of cases involved. During 2001-05, assault admissions were higher for young men, Māori and Pacific young people, those living in the most deprived areas and those in rural areas (Table 49).

Assault in the Canterbury Region

Figure 71. Hospital Admissions due to Assault in Young People 15-24 Years, Canterbury vs. New Zealand 1990-2005.



In Canterbury during 1990-05, admission rates for assault amongst young people declined, with rates being consistently lower than the NZ average during the last 12 years for which data was available. Despite this, a total of 15 young people died as a result of an assault in Canterbury during 1990-2003 (Figure 71).

In Summary

During the past 3 years for which data was available, injuries arising from mechanical forces, followed by falls were the leading causes of hospital admission amongst NZ young people. As a group however, transport accidents accounted for 23.9% of all injury related admissions, with over half of these occurring while young people were the occupants of vehicles. The leading cause of injury related death was transport accidents, with the majority of injuries again occurring while young people were the occupants of a vehicle. Suicide was the second leading cause of death, with deaths from assault being a distant third. In Canterbury during this period the pattern was similar, with mechanical forces, followed by falls being the leading causes of hospital admission and transport accidents followed by suicide being the leading causes of death. In comparative terms, during 1990-05 hospital admissions due to injury amongst Canterbury young people were consistently lower than the NZ average, while injury mortality during 1990-03 was either similar to or lower than the NZ average. Despite this, a total of 561 young people died as a result of injuries in Canterbury between 1990 and 2003.

During 1996-05, injury related hospital admissions in Canterbury were higher amongst European and Pacific > Māori > Asian / Indian young people

In NZ during 1988-05, hospital admissions and deaths from land transport accidents declined amongst young people 15-24 years. Land transport accidents however were not uniformly distributed by age, with both hospital admissions and deaths rising progressively during adolescence to a peak at 17-18 years of age. Hospital admissions were also higher amongst European and Māori young people, those living in the most deprived areas, males and those in rural areas. In Canterbury during 1990-05 hospital admissions due to land transport accidents were consistently lower than the NZ average, while mortality during 1990-03 was either similar to or lower than the NZ average. Despite this, during 1990-03 a total of 247 young people died as a result of land transport accidents in Canterbury

In contrast to falling land transport accident rates, hospital admissions due to assault in NZ changed little during 1988-05. Mortality trends however were more difficult to interpret due to the smaller number of cases involved. While admissions due to assault were much higher for young men, gender differences in mortality were much less marked, particularly during the teenage years. During 2001-05, assault admissions were also higher for Māori and Pacific young people, those living in the most deprived areas and those in rural areas. In Canterbury during 1990-05, admission rates for assault amongst young people declined, with rates being consistently lower than the NZ average during the last 12 years for which data was available. Despite this, a total of 15 young people died as a result of an assault in Canterbury during 1990-03.

MENTAL HEALTH ISSUES IN YOUNG PEOPLE

Introduction

Mental health problems become more common as young people move through adolescence, with the Dunedin Multidisciplinary Health and Development Study suggesting that the prevalence of mental health problems increases from about 17.6% at age 11, to 22% at age 15, to 36.6% at 18 years of age [68]. Mental health conditions commonly diagnosed amongst this age group include anxiety disorders, depression, conduct disorders and alcohol and substance use disorders. In addition suicide rates amongst NZ young people (see next section) remain high by international standards [67].

The type of mental health problem diagnosed varies by age and gender, with males tending to have higher rates of conduct disorder and alcohol and substance use and females higher rates of anxiety and depression. More limited information also suggests that mental health problems vary with ethnicity, with higher rates of admission and readmission to psychiatric hospitals amongst Māori males 15-19 years [67]. In terms of risk factors for mental health problems, multiple disadvantages during childhood appears to place young people at higher risk of poorer mental health outcomes. Known resiliency / protective factors include intelligence and problem solving abilities; interests outside the home; a caring relationship with an adult outside the family; warm, nurturing and supportive relationships with at least one parent; easy temperament; positive peer relationships; low levels of novelty seeking [67].

The following section explores mental health issues from two different perspectives. The first utilises information from the Youthline Helpline Service and describes the most common reasons for presentation in a self-referral context. The second utilises information from the National Minimum Dataset and explores risk factors for mental health admissions amongst young people during 2001-2005 (the change over from the ICD-9 to ICD-10 coding system during 1999 make precise comparisons with earlier years difficult).

Notes on Data Sources and Statistical Methods

Youthline's Youth Help Line Service

The information presented in this section was collected by Youthline telephone counsellors at the time of client contact. The anonymous nature of the service means that while it is usually possible to obtain relatively complete information on the nature of the presenting issue, it is not always appropriate to collect additional information (e.g. age, ethnicity, area of residence) and thus in many cases information of this nature is incomplete. Thus further analysis by age, ethnicity and NZDep Index decile was not possible using Youthline Helpline data.

Hospital Admissions for Mental Health Issues

Mental health admission rates in this analysis were calculated by dividing the total number hospital admissions (15-24 years) with a primary diagnosis of Mental or Behavioural Disorder (ICD-10 F00-F99), by census denominators for the period 2001-2005. Numerators included all publicly funded hospital discharges with a mental health diagnosis (F00-F99), with the exception of those discharged with an Emergency Department Subspecialty Code (these were excluded to provide consistency from region to region (Appendix 2)). Risk factors for admission with schizophrenia (ICD-10 F20), depression (ICD-10 F32-F33) and bipolar affective disorder (F31) were then explored in more detail. Age-specific admission rates were calculated by dividing the (5 year) total number of cause specific mental health admissions in each 1-year age bracket, by the extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic and gender specific admission rates. NZDep specific admission rates were calculated by dividing the total number of young people admitted with a particular mental health condition in each NZDep Index decile (see Appendix 7) by the number of young people 15-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing admission rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group), while confidence intervals were calculated using the Epi Info statistical software program.

Calls to the Youthline’s Youth Help Line Service

Youthline is a charitable organisation, established in 1970 to provide a first point of contact for young people requiring confidential support and counselling. It provides a number of clinical services including family therapy, email counselling, pregnancy counselling and crisis support, as well as an on-site school, youth information including the inter-departmental on-line initiative Urge/Whakamanawa, (www.urge.co.nz), community facilities and youth development programmes. While the range of face to face services varies from region to region, its Youth Help Line counselling service is available nationwide, with approximately 24,000 calls annually being received by its 0800 free-call number.

While the later parts of this section consider mental health issues requiring psychiatric inpatient care (e.g. schizophrenia, bipolar affective disorder, depression, self harm), it is likely that restricting the focus of this section solely to these relatively uncommon events would significantly underestimate both the nature and the prevalence of mental health issues experienced by young people in New Zealand. Thus the following section reviews the most common reasons for calling the Youthline Help Line counselling service during the past year, in an attempt to provide some additional insights into the nature of mental health issues experienced by young people in this country.

Calls to Youthline’s Youth Help Line Service during 2005-06.

As **Table 51** suggests, the issues experienced by young people who contact Youthline’s Youth Help Line Service are diverse and include concerns about interpersonal relationships, difficulties in the employment setting, issues relating to pregnancy, miscarriage and sexuality, eating disorders, family problems and substance abuse. While a regional breakdown of the reasons for calling Youthline’s Help Line Service by cause was not available **Table 50** summarises the number of young people contacting the Youth Help Line Service in the Canterbury Region during Sept 2005- Aug 2006.

Table 50. The Number of Calls to Youthline's Youth Help Line Service in the Canterbury Region during 2005-2006.

Month	Sept. 05	Oct. 05	Nov. 05	Dec. 05	Jan. 06	Feb. 06	Mar. 06	Apr. 06	May. 06	Jun. 06	Jul. 06	Aug. 06	Total
Number	158	188	304	294	253	136	275	241	349	359	172	302	3031

Table 51. The Main Reasons for Calling Youthline's Youth Help Line in New Zealand between Sept 2005 and Sept 2006.

Main Issue Related to Call	Number	Percent of Calls
Abusive Caller	1008	2.9
Accommodation	267	0.8
Anger	1443	4.1
Anxiety	991	2.8
Bullying	362	1.0
Child Prostitution	8	0.0
Contact/Isolation	10157	29.0
Couple issues	275	0.8
Custody/Access issues	97	0.3
Depression	2688	7.7
Eating Disorder	155	0.4
Emotional abuse	92	0.3
Emotional Support	2788	8.0
Employment relations/issues	165	0.5
Family Violence	180	0.5
Family/Children	1186	3.4
Family/Parents	1073	3.1
Financial stress/Unemployment	215	0.6
Gambling	27	0.1
Grief	644	1.8
Health/Sexual issues	1038	3.0
Incest	27	0.1
Loneliness	1053	3.0
Mental Illness	574	1.6
Miscarriage Support	212	0.6
Pregnancy	499	1.4
Psychological abuse	42	0.1
Referral	876	2.5
Relationships	3727	10.7
School	127	0.4
Self Harm	349	1.0
Sexual abuse (rape)	417	1.2
Sexual Orientation	255	0.7
Stress	542	1.5
Substance abuse/Addiction	404	1.2
Suicide	804	2.3
Supervision	22	0.1
Violence/Physical abuse	192	0.5
Total	34981	100.0

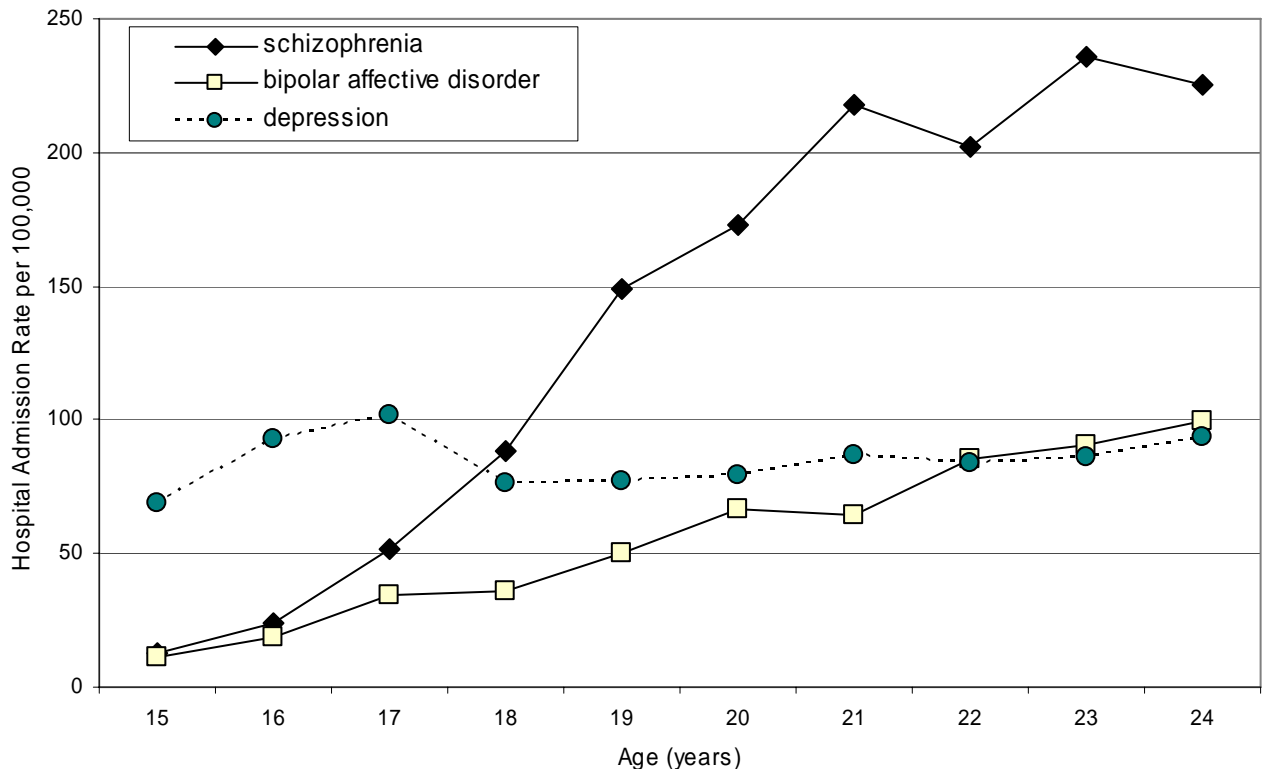
Youth Mental Health Admissions 2001-2004.

Table 52. The Most Frequent Reasons for Hospital Admission for Mental Health Issues in Young People (15-24 yrs), New Zealand and the Canterbury Region, 2000-2004.

Diagnosis	New Zealand		Canterbury		
	Rate*	%	Number*	Rate*	%
Schizophrenia	132.3	22.7	266	91.8	11.1
Schizotypal & delusional disorders	75.2	12.9	181	62.5	7.5
Depression	84.6	14.5	472	163.0	19.7
Alcohol & Drug Mental Health Effects	74.5	12.8	235	81.1	9.8
Bipolar Affective Disorder	53.5	9.2	326	112.5	13.6
Stress Reaction / Adjustment Disorder	43.3	7.4	159	54.9	6.6
Personality Disorders	39.9	6.8	378	130.5	15.7
Other Mental Health Issues	80.1	13.7	384	132.6	16.0
Total	583.4	100.0	2401	828.9	100.0

*Rate per 100,000 per year, Number is per 5 year period.

Figure 72. Hospital Admission Rates for Mental Health Issues by Age and Diagnosis, New Zealand Young People (15-24 yrs), 2000-2004.



During 2000-2004 the most common reason for hospital admission with a mental health issue for NZ young people (15-24 years) was schizophrenia, followed by depression and bipolar affective disorder. Composite categories including schizotypal & delusional disorders and drug and alcohol related conditions also made a significant contribution (Table 52). While admission rates tended to increase with age for the majority of mental health issues, this trend was most marked with those admitted with schizophrenia (Figure 72). In Canterbury during 2000-2004, the most common reason for an inpatient admission with a mental health issue

was depression, followed by bipolar affective disorder. While rates for a number of these admission categories appear to be higher than the NZ average, such figures are difficult to interpret, as many mental health services in NZ are offered on an outpatient basis, and thus access to inpatient mental health services may fail to accurately reflect the true burden of disease, or access to such services in an ambulatory care setting.

Table 53. Ethnicity, NZDep Index Decile and Risk of Hospital Admission for Schizophrenia, NZ Young People 15-24 Years, 2000-2004.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	57.4	1.00		1-2	61.6	1.00	
2	65.4	1.14	0.89-1.46	3-4	75.0	1.22	1.03-1.43
3	56.5	0.98	0.76-1.27	5-6	98.7	1.60	1.38-1.86
4	91.3	1.59	1.27-2.00	7-8	155.3	2.52	2.19-2.90
5	90.3	1.57	1.25-1.98	9-10	215.3	3.49	3.06-3.99
6	106.0	1.84	1.48-2.30	Ethnicity			
7	139.0	2.42	1.96-2.99	Māori	379.2	5.42	5.02-5.85
8	170.1	2.96	2.41-3.63	Pacific	143.9	2.06	1.80-2.36
9	156.5	2.72	2.22-3.34	European	70.0	1.00	
10	287.1	5.00	4.11-6.08	Asian / Indian	35.5	0.51	0.41-0.63
Gender							
Female	59.0	1.00					
Male	204.9	3.47	3.20-3.77				

*rate per 100,000 per year, relative risks are unadjusted

Table 54. Ethnicity, NZDep Index Decile and Risk of Hospital Admission for Depression, NZ Young People 15-24 Years, 2000-2004.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	72.7	1.00		1-2	79.6	1.00	
2	85.8	1.18	0.95-1.47	3-4	74.1	0.93	0.80-1.08
3	70.0	0.96	0.76-1.21	5-6	72.7	0.91	0.79-1.06
4	77.6	1.07	0.86-1.33	7-8	107.4	1.35	1.18-1.54
5	78.2	1.08	0.86-1.34	9-10	79.8	1.00	0.87-1.15
6	67.9	0.93	0.75-1.17	Ethnicity			
7	127.9	1.76	1.45-2.14	Māori	62.6	0.59	0.52-0.67
8	88.8	1.22	1.00-1.50	Pacific	33.3	0.31	0.31-0.41
9	85.7	1.18	0.97-1.44	European	106.0	1.00	
10	72.6	1.00	0.81-1.24	Asian / Indian	18.9	0.18	0.13-0.24
Gender							
Female	109.9	1.85	1.69-2.02				
Male	59.5	1.00					

* rate per 100,000 per year, relative risks are unadjusted

Table 55. Ethnicity, NZDep Index Decile and Risk of Hospital Admission for Bipolar Affective Disorder, NZ Young People 15-24 Years, 2000-2004.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	45.2	1.00		1-2	38.6	1.00	
2	32.7	0.72	0.53-0.99	3-4	43.4	1.12	0.91-1.39
3	40.6	0.90	0.67-1.21	5-6	53.2	1.38	1.13-1.68
4	45.9	1.01	0.77-1.34	7-8	58.9	1.52	1.26-1.84
5	66.6	1.47	1.13-1.91	9-10	62.4	1.62	1.34-1.94
6	41.5	0.92	0.69-1.22	Ethnicity			
7	59.4	1.31	1.01-1.70	Māori	84.8	1.68	1.49-1.90
8	58.4	1.29	1.00-1.67	Pacific	30.6	0.61	0.46-0.80
9	72.2	1.60	1.25-2.03	European	50.5	1.00	
10	50.4	1.11	0.85-1.45	Asian / Indian	18.9	0.37	0.28-0.50
Gender							
Female	51.8	1.00					
Male	55.2	1.07	0.96-1.19				

* rate per 100,000 per year, relative risks are unadjusted

During 2000-2004 the risk factor profiles of the 3 most common mental health diagnoses varied markedly, with hospital admissions for schizophrenia being more frequent amongst males, Māori and Pacific young people and those living in the most deprived areas (**Table 53**). In contrast, for depression hospital admissions were more frequent amongst females and European young people, with few differences being seen by NZDep decile (**Table 54**). Finally, risk of bipolar affective disorder was inconsistently elevated amongst those in the more deprived areas and there was no association with gender, although rates were higher amongst Māori young people (**Table 55**).

In Summary

The reasons why young people sought help from Youthline's Helpline Service in 2005-06 suggest that the mental health issues facing young people are diverse and include concerns about interpersonal relationships, difficulties with employment, issues relating to pregnancy, miscarriage and sexuality, eating disorders, family problems and substance abuse. In contrast, the most common reasons for mental health admissions amongst NZ young people 15-24 years during 2000-04 were schizophrenia, followed by depression and bipolar affective disorder. While admission rates tended to increase with age for the majority of mental health issues, this trend was most marked with those admitted with schizophrenia. In addition, the risk factors for these 3 conditions varied markedly, with hospital admissions for schizophrenia being more frequent amongst males, Māori and Pacific young people and those living in the most deprived areas. In contrast, for depression hospital admissions were more frequent amongst females and European young people, with few differences being seen by NZDep decile. Finally, risk of bipolar affective disorder was inconsistently elevated amongst those in the more deprived areas and there was no association with gender, although rates were higher amongst Māori young people.

In Canterbury during 2000-04, the most common reason for an inpatient admission with a mental health issue was depression, followed by bipolar affective disorder. While rates for a number of these admission categories appear to be higher than the NZ average, such figures are difficult to interpret, as many mental health services in NZ are offered on an outpatient basis, and thus access to inpatient mental health services may fail to accurately reflect the true burden of disease, or access to such services in an ambulatory care setting.

SUICIDE & SELF-HARM

Introduction

While NZ's youth suicide rates have been increasing steadily since the early 1970s, it was not until the late 1980s / early 1990s that the most dramatic increases began to occur. Youth suicide rates reached a peak in 1996 and since then have begun to decline. Risk factors for suicide include male gender, age (while much recent interest has focused on teenage suicides, recent data would suggest that the majority of youth deaths actually occur amongst those aged 19-24 years) and ethnicity (Māori males >non-Māori males >Māori females >non-Māori females) [69]. In terms of prevention, in 1998 the NZ Government launched a Youth Suicide Prevention Strategy, to provide a framework for understanding suicide prevention and indicating steps government agencies, communities, services, hapu and iwi could take to reduce suicide rates in the 15-24 year age group [70].

The following section reviews youth suicide and self harm in New Zealand and the Canterbury region using two data sources: hospital admissions for self-inflicted injury from the National Minimum Dataset and Suicide Deaths from the National Mortality Collection.

Notes on Data Sources and Statistical Methods

Hospital admission rates in this analysis were calculated by dividing the total number of young people (15-24 years admitted with a primary diagnosis of injury (ICD-9 800-995; ICD-10 S00-T79) and an external cause code of intentional self harm (ICD-9 E950-E958 or ICD-10 X60-X84) by census denominators for the period 1988-2005. Numerators included all publicly funded hospital discharges (inpatients & day patients) recorded in the National Minimum Dataset, although as outlined in Appendix 2, those with an Emergency Department Specialty Code on discharge were excluded, as were those who died while still in hospital (to avoid their double counting in admission and mortality statistics). Denominators were derived from the usual resident populations at the 1986, 1991, 1996 and 2001 censuses, with linear extrapolation being used to estimate population numbers between censuses. Suicide mortality rates were calculated by dividing the total number of deaths (15-24 years) attributed to intentional self harm (ICD-9 950-958; ICD-10 X60-X84) by the same census denominators. Age-specific hospital admission (2001-2005) and mortality (1999-2003) rates were calculated by dividing the (5 year) total number of admissions / deaths with a primary diagnosis of intentional self harm in each 1-year age bracket, by the total extrapolated census populations for the same 5 year period. Similar procedures were used to estimate ethnic and gender specific youth suicide rates during 1999-2003. NZDep specific youth suicide rates were calculated by dividing the total number of suicide deaths 15-24 years in each NZDep Index decile (see Appendix 7) by the number of those 15-24 years living in these areas at the 2001 census (Census 2001 figures x5 to provide denominators for this 5-year period). Relative risks were calculated by dividing youth suicide rates in each category of interest by those of the reference category (NZDep decile 1; NZDep Quintile 1-2: European ethnic group, female), while confidence intervals were calculated using the Epi Info statistical software program.

Youth Suicide and Self Harm in NZ: Trends and Risk Factors

New Zealand's youth (15-24 yrs) suicide rates increased rapidly during the early 1990s, reached a peak in 1996 and thereafter began to decline. While a similar phenomenon occurred for self-inflicted injury hospitalisations during the early-mid 1990s, during the last 8 years for which data was available, admissions for self-inflicted injuries have remained relatively static (**Figure 73**). While suicide rates during 1999-2003 were highest amongst young men in their early 20s, hospital admissions for self-inflicted injury (2001-2005) were highest amongst young women in their mid to late teens (**Figure 74**). During 2001-05, suicide rates were also higher amongst Māori young people and those living in rural areas (**Table 56**).

Figure 73. Hospital Admissions (1988-2005) and Deaths (1988-2003) due to Self Inflicted Injury, New Zealand Young People 15-24 Years.

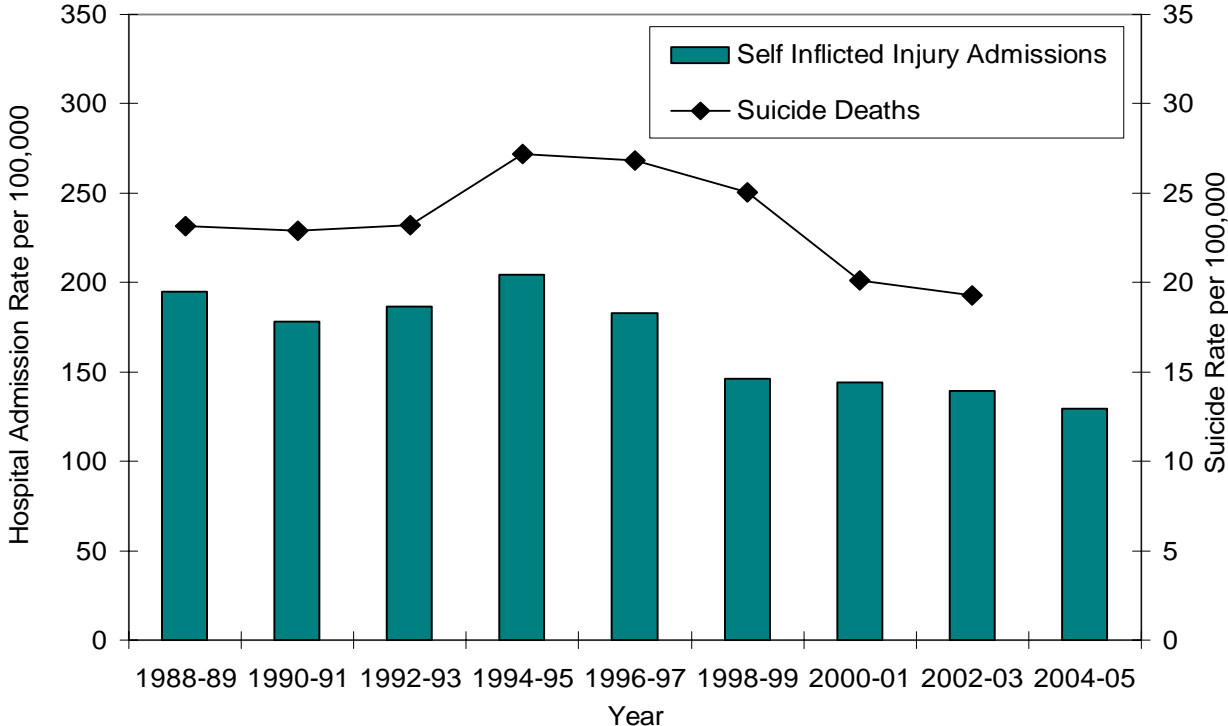


Figure 74. Hospital Admissions (2001-2005) and Deaths (1999-2003) due to Self Inflicted Injury by Age and Gender, New Zealand Young People 15-24 Years.

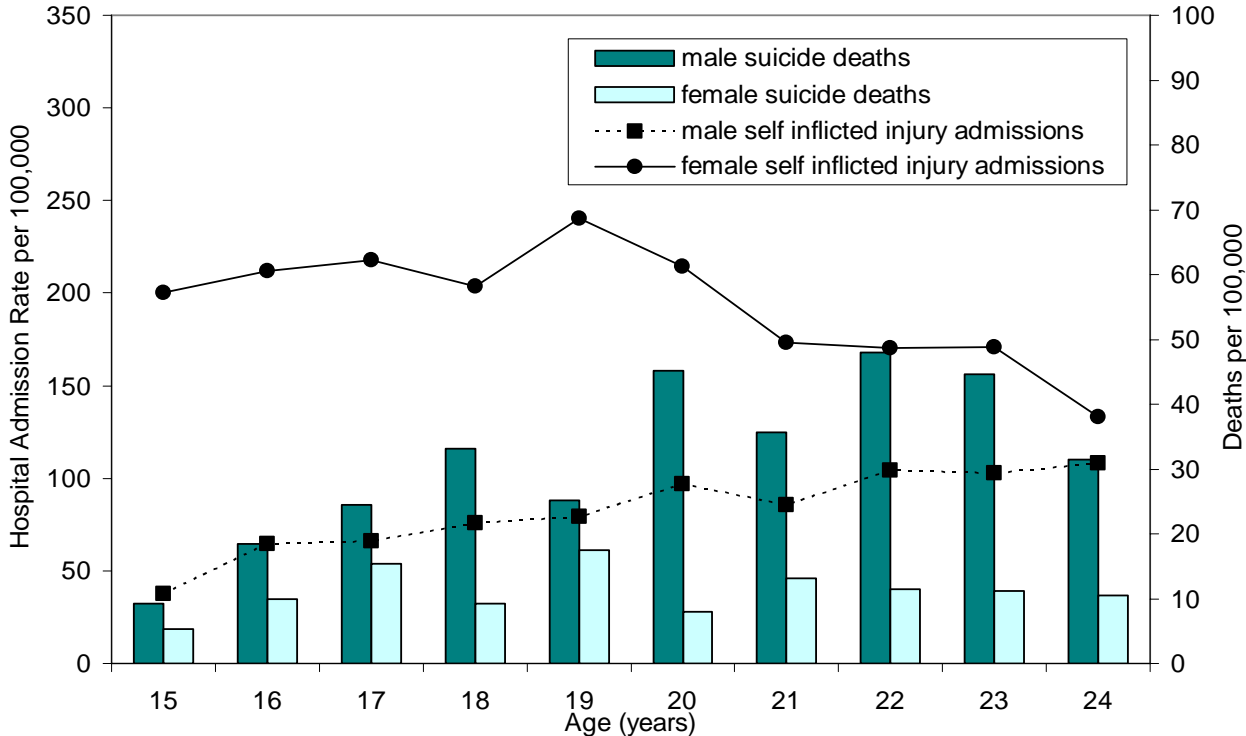


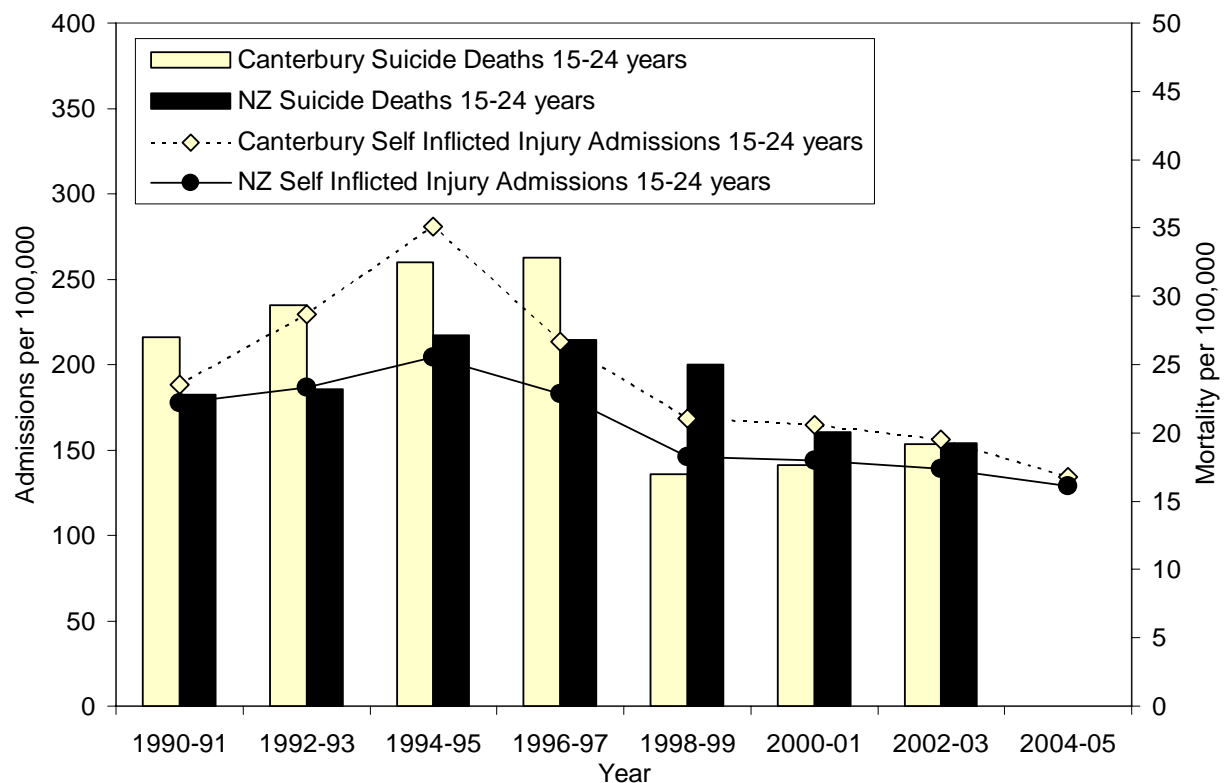
Table 56. Risk Factors for Suicide, NZ Young People 15-24 Years, 1999-2003.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Quintile				Ethnicity			
1-2	16.1	1.00		Māori	33.9	1.83	1.50-2.22
3-4	17.0	1.06	0.76-1.47	Pacific	22.6	1.22	0.87-1.69
5-6	22.2	1.38	1.01-1.88	European	18.6	1.00	
7-8	23.6	1.47	1.09-1.97	Asian / Indian	13.9	0.75	0.52-1.07
9-10	20.8	1.29	0.96-1.74				
Urban Rural				Gender			
Urban	17.4	0.72	0.60-0.87	Male	29.9	2.76	2.27-3.36
Rural	24.2	1.00		Female	10.9	1.00	

* rate per 100,000 per year, relative risks are unadjusted

Youth Suicide and Self Harm in the Canterbury Region

Figure 75. Hospital Admission Rates for Self Harm (1990-2005) and Deaths due to Suicide (1990-2003) Amongst Young People 15-24 Years, Canterbury vs. New Zealand.



During 1990-2005, hospital admissions for self inflicted injury in the Canterbury were generally higher than the NZ average. While suicide rates were higher than the NZ average during the early-mid 1990s, rates were more similar to the NZ average during the past 6 years for which data was available. Despite this, during 1990-03 there were a total of 221 suicide deaths amongst young people in the Canterbury region (**Figure 75**). Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

In Summary

NZ's youth suicide rates increased rapidly during the early 1990s, reached a peak in 1996 and thereafter began to decline. While a similar phenomenon occurred for self-inflicted injury hospitalisations during the early-mid 1990s, during the last 8 years for which data was available, admissions for self-inflicted injuries have remained relatively static. While NZ's suicide rates during 1999-03 were highest amongst young men in their early 20s, hospital admissions for self-inflicted injury were highest amongst young women in their mid to late teens. During 2001-05, suicide rates were also higher amongst Māori young people and those living in rural areas.

During 1990-05, hospital admissions for self inflicted injury in the Canterbury were generally higher than the NZ average. While suicide rates were higher than the NZ average during the early-mid 1990s, rates were more similar to the NZ average during the past 6 years for which data was available. Despite this, during 1990-03 there were a total of 221 suicide deaths amongst young people in the Canterbury region. Small numbers precluded a more detailed analysis of ethnic specific hospital admission rates, and thus regional estimates need to be extrapolated from national figures.

SEXUALLY TRANSMITTED INFECTIONS

Introduction

Research would indicate that 10-30% of NZ young people have had sexual intercourse by the time they reach 15 years of age, with the figure increasing to over 50% by 16-17 years [67]. Factors associated with early sexual intercourse include female gender, Māori ethnicity, a background of socioeconomic disadvantage, sexual abuse in childhood and alcohol misuse in early adolescence [67]. Sexually transmitted infections (STI) are relatively common amongst those 15-24 years, with chlamydia being the most frequently diagnosed STI, followed by genital warts, non specific urethritis, genital herpes and gonorrhoea [71]. While chlamydia and gonorrhoea are more common amongst Māori and Pacific groups, viral conditions such as genital warts and genital herpes are more common amongst Europeans [67].

While changes in STI surveillance in recent years make precise time series analysis difficult, rates of both chlamydia and gonorrhoea appear to have increased during the past 5 years [71]. This is of concern, as STIs can lead to the development of serious sequelae such as pelvic inflammatory disease, ectopic pregnancy and infertility, as well as facilitating the transmission of HIV [71]. The following section briefly describes the characteristics of the commonest of the STIs occurring in the 15-24 age group, before reviewing their distribution at a regional and national level.

Chlamydia: STI caused by the organism *Chlamydia trachomatis*. Infection may be asymptomatic in 70% of females and 50% of males. Untreated, chlamydia can lead to pelvic inflammatory disease (PID), ectopic pregnancy and infertility in females and urethritis, epididymoorchitis, arthritis and infertility in males. Infection can also be transmitted to infants at the time of birth, leading to conjunctivitis and pneumonia [72].

Gonorrhoea: STI caused by the organism *Neisseria gonorrhoea*. Infection may be asymptomatic in 50% of females and 10% of males. Untreated, gonorrhoea can lead to PID in females, epididymoorchitis in males and severe conjunctivitis in neonates [72].

Genital Herpes: STI caused by *Herpes simplex* virus (HSV) Type 1 or 2. Infections are associated with painful vesicular eruptions / ulcerations of the skin / mucus membranes of the genitalia, which may become recurrent. Vaginal delivery in pregnant women with active infections may lead to infection of the newborn, resulting in severe systemic disease [72].

Genital Warts: STI caused by infection with the human papillomavirus (HPV), which leads to the formation of small, soft, pink growths on the genitals which may become pedunculated. Warts may be solitary or cauliflower like and are generally painless [17]. Infection may be with types 6 and 11, or with the more high risk types 16 and 18, which are associated with a higher risk of cervical cancer [72].

Data Sources and Statistical Methods

The information on sexually transmitted infections (STIs) in this analysis was obtained from the ESR (Appendix 4) and is based on information from their clinic and laboratory based surveillance systems. While a number of sexual health and family planning clinics report voluntarily to ESR regarding the numbers of STIs seen, a lack of a clearly defined denominator means that it is impossible to estimate population prevalence from the information provided. In addition, because other practitioners within the primary care setting also treat young people for STIs, the figures given cannot be taken as representative of the total population. Nevertheless the information provided by sexual health clinics is of value in providing information on the relative proportions of the STIs treated within the primary care setting.

Sexual Health / Family Planning Clinic Data

Table 57 summarises sexual health and family planning clinic data for young people <25 years in the Canterbury during 2001-05. While the number of clinics reporting to ESR varied from year to year, and not all young people with sexual health issues accessed these particular clinics, the table nevertheless provides some indication as to the relative contributions chlamydia, gonorrhoea, genital warts and genital herpes make to the burden of sexually transmitted infections experienced by the Canterbury youth population.

In Summary

While no rate data was able to be extrapolated from Sexual Health and Family Planning Clinic data, clinic based surveillance suggests that chlamydia, gonorrhoea, genital warts and genital herpes were all relatively common infections amongst Canterbury young people during 2001-05.

Table 57. Sexual Health and Family Planning Clinic Notifications of Sexually Transmitted Infections in Young People <25 Years, Canterbury 2001-2005*.

Clinic	Year	Chlamydia*	Gonorrhoea*	Genital Herpes*	Genital Warts*
Ashburton Sexual Health Clinic	2001	6	0	0	9
	2002	7	0	3	8
	2003	9	0	0	9
	2004	7	0	0	7
	2005	3	0	0	6
Ashburton Family Planning Clinic	2001	11	0	2	1
	2002	7	2	2	4
	2003	19	2	1	4
	2004	11	3	0	3
	2005	22	1	0	3
Canterbury University	2001	13	1	4	7
	2002	10	0	4	10
	2003	11	0	3	7
	2004	36	0	4	21
	2005	44	2	4	9
Christchurch Sexual Health Clinic	2001	95	9	26	157
	2002	115	13	21	174
	2003	139	15	35	222
	2004	190	16	25	211
	2005	193	21	32	237
Christchurch FPA	2001	74	26	13	37
	2002	114	23	9	31
	2003	144	17	14	42
	2004	129	6	8	36
	2005	203	7	7	56
Christchurch Polytechnic Institute of Technology	2001	0	0	1	2
	2002	4	0	2	0
	2003	9	0	1	1
	2004	20	0	0	3
	2005	12	1	0	1
Christchurch Youth Health	2001	109	3	7	13
	2002	146	1	7	4
	2003	84	0	2	4
	2004	67	0	0	4
	2005	113	7	3	4
Rangiora Family Planning Clinic	2001	6	0	2	1
	2002	3	0	1	1
	2003	20	1	0	3
	2004	47	2	3	8
	2005	26	8	3	4

* Source: ESR. Note Chlamydia and Gonorrhoea cases are probable or confirmed, Genital Herpes and Genital Wart are for first presentations only.

TEENAGE PREGNANCY

Introduction

Teenage pregnancy, as described in this section, encompasses three distinct outcomes: births, terminations of pregnancy and spontaneous miscarriages amongst women <20 years of age. While NZ's teenage birth rates have declined in recent years, the number of therapeutic abortions has increased steadily, resulting in a small overall increase in teenage pregnancy rates. Teenage birth rates are highest amongst Māori>Pacific>European women, and although abortion rates are slightly higher amongst Māori, Māori women who do become pregnant in their teenage years are less likely to seek a therapeutic abortion [59].

High teenage pregnancy rates are a cause for concern, as young maternal age has been associated with a number of adverse birth outcomes [73]. In NZ, teenage pregnancy increases the risk of both preterm birth and small for gestational age [2]. There is currently debate however, as to whether it is the social or biological factors that play the greatest role, with risk of preterm birth amongst teens disappearing in a number of different studies, once the effects of socioeconomic disadvantage had been taken into account [73]. In addition to its biological effects, teenage pregnancy may also have a detrimental impact on the educational attainment, not only of young women themselves, but also the aspirations and opportunities available to their children [74]. The following section reviews New Zealand's teenage pregnancy rates during the past two decades, as well as the distribution of teenage births at a regional level.

Notes on Data Sources and Statistical Methods

Teenage pregnancy rates are made up of three components: births, terminations and miscarriages. In this analysis each component has been sourced from a different national dataset: (1) Information on **Teenage Births** was sourced from the Birth Registration Dataset (Appendix 1) and included all women <20 years who gave birth to a baby 20+ weeks gestation during 1980-2005; (2) Information on **Terminations of Pregnancy** was sourced from the Abortion Supervisory Committee. While information on the age and ethnicity of women undergoing abortion was available, information on usual area of residence was not, precluding analysis of terminations by DHB or NZDep Index decile; (3) Rates of **Spontaneous Miscarriage** were estimated as being 10% of induced abortions and 20% of live births [59].

The population denominators utilised in this analysis were derived from census data for the years 1981, 1986, 1991, 1996 and 2001 with population estimates between census years being derived by linear extrapolation. Teenage birth rates were calculated by dividing the number of births to women <20 years, by the number of women in the 15-19 year age bracket [59]. Similarly abortion rates were calculated by dividing the number of induced abortions for women <20 years by the number of women in the 15-19 age bracket [59]. Miscarriage rates were calculated as specified above. Denominators for the 2001-2005 period (social / ethnic gradients and maternal age / ethnicity graphs) were based on 2001 census data, multiplied by 5 to give a 5 year average.

Teenage Pregnancy in NZ: Trends and Risk Factors

While NZ's teenage birth rates declined during 1980-2004, teenage pregnancies did not, with a gradual increase in the number of teenagers seeking therapeutic abortion. Thus by 2004, for every woman giving birth in her teenage years, there was one corresponding therapeutic abortion (**Figure 76**).

During 2001-05, teenage birth rates in NZ were highest amongst Māori and Pacific women, those living in the most deprived areas and those living in rural areas (**Table 58**). Higher teenage birth rates amongst Māori and Pacific women resulted from both a shift to the left in the maternal age distribution (i.e. towards birth at a younger age), as well as from higher overall fertility rates amongst Māori and Pacific women (**Figure 77**).

Figure 76. Teenage Pregnancy Rates for New Zealand Women, 1980-2004.

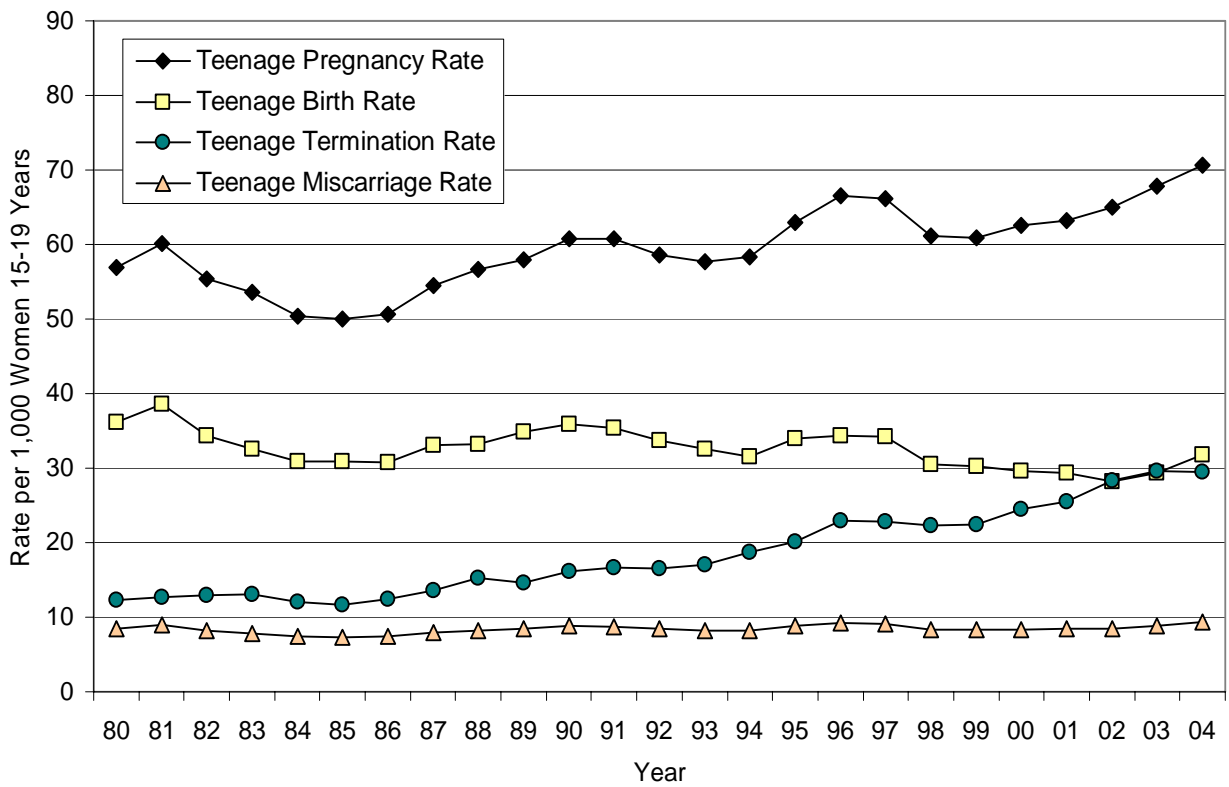


Figure 77. Birth Rates by Maternal Age and Ethnicity, New Zealand 2001-2005

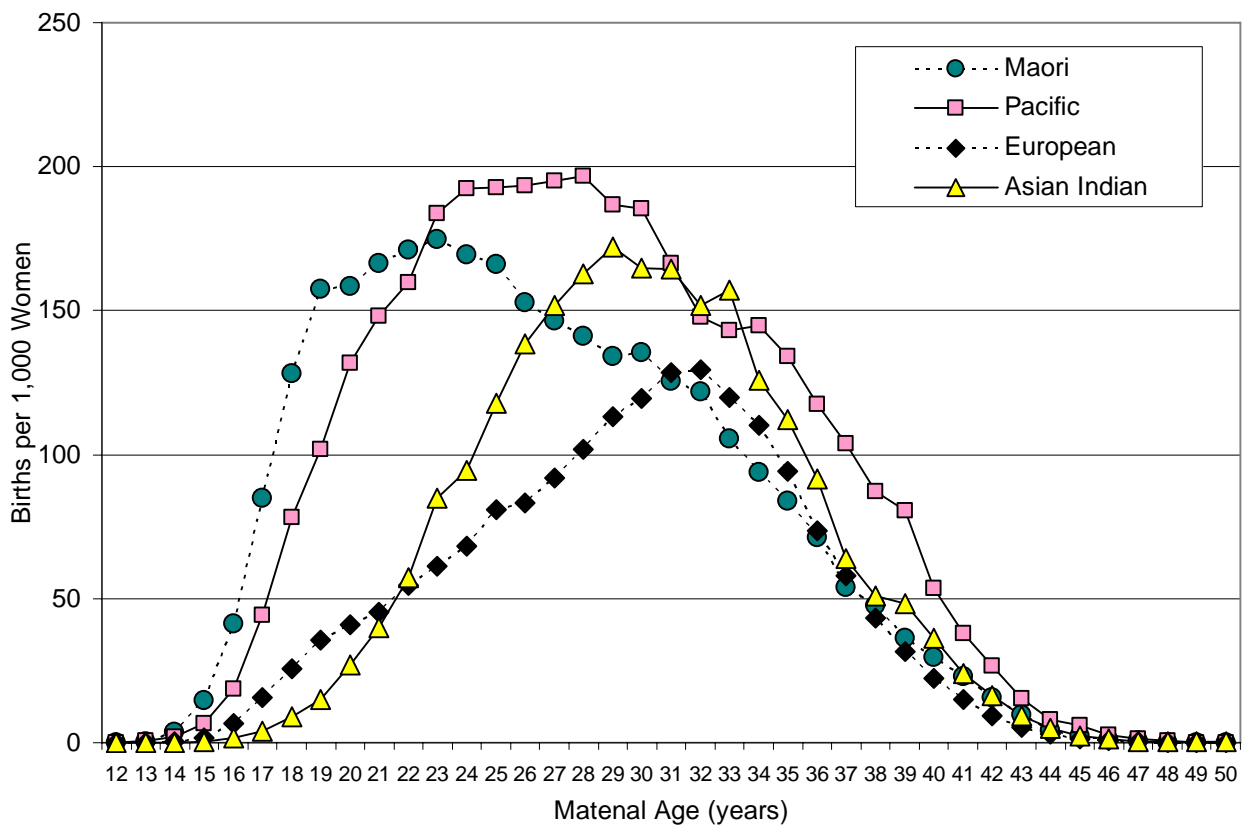


Table 58. Teenage Birth Rates (Excluding Terminations & Miscarriages) by Ethnicity and NZ Deprivation Index Decile, New Zealand 2001-2005.

Variable	Rate*	RR	95% CI	Variable	Rate*	RR	95% CI
NZDep Index Decile				NZDep Index Quintile			
1	7.16	1.00		1-2	8.72	1.00	
2	10.23	1.42	1.25-1.61	3-4	16.83	1.91	1.77-2.06
3	14.84	2.06	1.83-2.32	5-6	26.00	2.93	2.73-3.15
4	18.68	2.58	2.30-2.89	7-8	38.37	4.27	3.99-4.57
5	22.81	3.14	2.81-3.51	9-10	59.57	6.50	6.09-6.93
6	28.86	3.94	3.54-4.39	Ethnicity			
7	34.91	4.74	4.27-5.26	Māori	93.40	5.08	4.93-5.24
8	41.73	5.63	5.08-6.24	Pacific	52.59	2.97	2.84-3.11
9	45.22	6.08	5.49-6.73	European	17.11	1.00	
10	76.73	10.02	9.07-11.08	Asian / Indian	6.11	0.36	0.33-0.40
Urban Rural							
Urban	29.30	1.00					
Rural	35.89	1.22	1.19-1.26				

* rate per 1,000 per year, relative risks are unadjusted

Teenage Birth Rates in the Canterbury Region

Figure 78. Teenage Birth Rates, Canterbury vs. New Zealand 1990-2005.

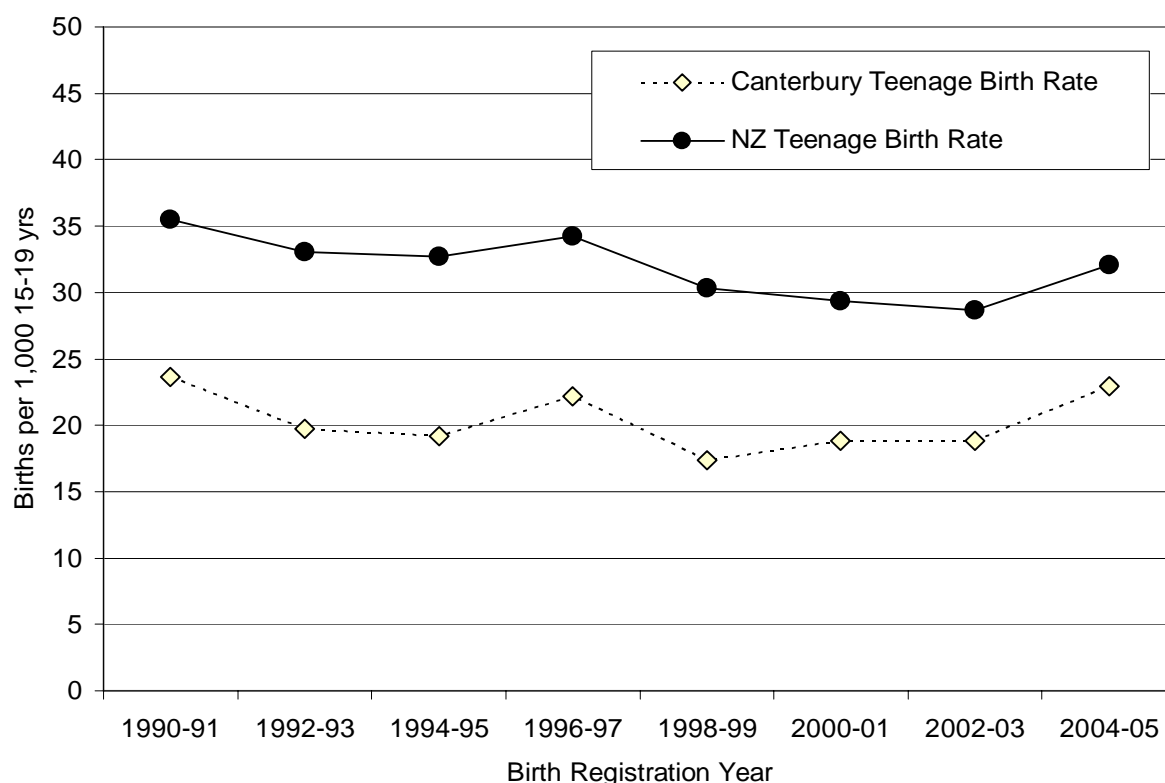
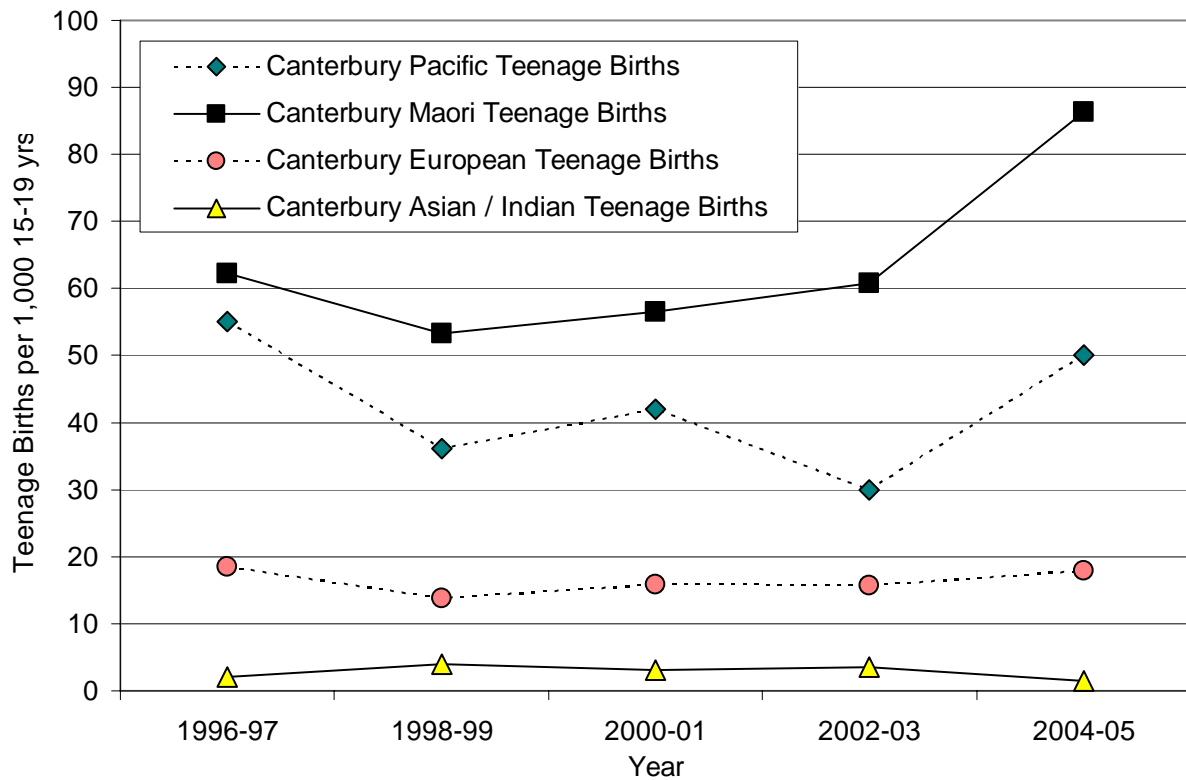


Figure 79. Teenage Birth Rates by Maternal Ethnic Group, Canterbury 1996-2005.



During 1990-2005, Canterbury's teenage birth rates were consistently lower than the NZ average (Figure 77). During 1996-05, teenage birth rates in Canterbury were highest amongst Māori > Pacific > European > Asian / Indian women (Figure 78).

In Summary

While NZ's teenage birth rates declined during 1980-04, teenage pregnancies did not, with a gradual increase in the number of teenagers seeking therapeutic abortion. Thus by 2004, for every woman giving birth in her teenage years, there was one corresponding therapeutic abortion. During 2001-05, teenage birth rates in NZ were highest amongst Māori and Pacific women, those living in the most deprived areas and those living in rural areas. Higher teenage birth rates amongst Māori and Pacific women resulted from both a shift to the left in the maternal age distribution (i.e. towards birth at a younger age), as well as from higher overall fertility rates amongst Māori and Pacific women.

During 1990-05, Canterbury's teenage birth rates were consistently lower than the NZ average. During 1996-05, teenage birth rates in Canterbury were highest amongst Māori > Pacific > European > Asian / Indian women.

APPENDICES

APPENDIX 1: THE BIRTH REGISTRATION DATASET

Mode of Data Collection

Since 1995 all NZ hospitals / delivering midwives have been required to notify Internal Affairs (within 5 working day of delivery), of the birth of a live / stillborn baby 20+ weeks gestation or weighting >400g. Prior to 1995, only stillborn babies reaching 28+ weeks of gestation required birth notification. Information on the hospital's notification form includes maternal age, ethnicity, multiple birth status, and baby's sex, birth weight and gestational age. In addition parents must complete a Birth Registration Form within 2 years of delivery, duplicating the above information, with the exception of birth weight and gestational age, which are supplied only on hospital notification forms. Once both forms are received by Internal Affairs, the information is merged into a single entry. This 2-stage process it is thought to capture 99.9% of births occurring in New Zealand and cross checking at the receipting stage allows for the verification of birth detail [1].

Issues that should be Taken into Account When Interpreting Information Derived from the Birth Registration Dataset

Because of the 2-stage birth registration process, the majority of variables contained within the birth registration dataset are >98% complete, and cross checking at the receipting stage (with the exception of birth weight and gestational age) allows for the verification of birth details. In addition, the way in which ethnicity is collected in this dataset confers a number of advantages, with maternal ethnicity being derived from the information supplied by parents on their baby's birth registration form. This has the advantage of avoiding some of the ambiguities associated with hospital and mortality data, which at times have been reported by third parties. Changes in the way ethnicity was defined in 1995 however make information collected prior to this date incomparable with that collected afterwards. For births prior to 1995, maternal ethnicity was defined by ancestry, with those having half or more Māori or Pacific blood meeting ethnic group criteria, resulting in three ethnic groups, Māori, Pacific and non-Māori non-Pacific. For births after 1995 maternal ethnicity was self identified, with an expanded number of ethnic categories being available and parents being asked to tick as many options as required to show which ethnic group(s) they belonged to. For those reporting multiple ethnic affiliations a priority rating system was introduced, as discussed Appendix 6 of this report.

Because this dataset captures 99.9% of births occurring in NZ, is >98% complete for most variables, collects self reported ethnicity in a standard manner and is collated and coded by a single agency, information derived from this dataset is likely to be of higher quality than that derived from many of NZ's other data sources. Limitations however include the relatively restricted number of variables contained within the dataset (e.g. it lacks information on maternal smoking, BMI or obstetric interventions) and the lack of cross checking for birth weight and gestational age (which is supplied only on the hospital notification form). The change over in ethnicity definition during 1995 also prohibits time series analysis by ethnicity over the medium to long term. Each of these factors must thus be taken into account when interpreting information in this report that has been derived from the Birth Registration Dataset.

APPENDIX 2: 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 New Zealand Health Information Service (NZHIS). 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 [75]. 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 & 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 6).

The following sections discuss the first two of these issues, while the third is discussed in Appendix 6, 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 [76].

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 [76]. NZHIS provided feedback which rectified this anomaly and since January 1995 the correct procedure has been used (these additional cases were coded using medical & 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 [77].

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 [77]. 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, 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 $\frac{1}{4}$ 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 $>1/3$ of NMDS emergency department discharges for those 0-24 years were due to injury, with another $1/3$ were 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 1/3 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 findings occurred despite Auckland having a similar proportion of children living in the most deprived 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 these Reports

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 over estimate 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)

Change Over from ICD-9 to ICD-10 Coding

From 1988 until June 1999, clinical information in the NMDS was coded using variants 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 classification system has been used, although for time series analysis, back and forward mapping between the two classification systems is possible fusing pre-defined algorithms [75].

The introduction of ICD-10 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 as compared to 5,000 in ICD-9). While for most conditions there is a reasonable 1:1 correspondence between ICD-9 and ICD-10 codes, for some this may lead to some irregularities in time series analysis [78]. 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 NZHIS 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 [79]. 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 6 for a discussion of this issue.

In 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 3: THE MORTALITY COLLECTION

Mode of Data Collection

The Mortality Collection is a dataset managed by the New Zealand Health Information Service (NZHIS), which classifies the underlying cause, for all deaths registered in NZ since 1988. Fetal and infant data is a subset of the Mortality Collection and contains extra information on factors such as birth weight and gestational age [80].

Each month Births, Deaths and Marriages send NZHIS 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-9 and ICD-10) is assigned by NZHIS staff according to the World Health Organisation's rules and guidelines for mortality coding [80].

Data Quality Issues Relating to the Mortality Collection

Unlike the NMDS, where information on the principal diagnosis is coded at the hospital level and then forwarded electronically to the NZHIS, for the Mortality Collection each of the approximately 28,000 deaths occurring in NZ each year is coded manually within NZHIS. 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 [81]. 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 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 6 of this report.

APPENDIX 4: ESR SEXUAL HEALTH DATA

Mode of Data Collection

Under the Health Act 1956 and the Tuberculosis Act 1948, health professionals are required to notify their local Medical Officer of Health of any notifiable disease that they suspect or diagnose. Notification data are recorded on a computerised database (EpiSurv) and forwarded weekly to the Institute of Environmental Science and Research (ESR) where the information is collated and analysed on behalf of the Ministry of Health [20].

While Sexually Transmitted Infections (STIs) are not notifiable diseases in New Zealand, data on STIs of public importance (chlamydia, gonorrhoea, genital herpes, genital warts, syphilis, non-specific urethritis) are submitted voluntarily to ESR by a number of sexual health clinics, family planning clinics and student and youth health clinics. In addition, laboratory based surveillance data is submitted by laboratories in Auckland, Waikato, and the Bay of Plenty (chlamydia & gonorrhoea) [20].

Data Quality and Completeness: Sexual Health Data

Currently, surveillance of sexually transmitted infections (STIs) in NZ is voluntary, with information provided by a number of Sexual Health Clinics (SHCs), Family Planning Clinics (FPCs) and Student Youth Health Clinics (SYHCs) nationally, as well as by laboratories in the Auckland, Waikato and Bay of Plenty Regions.

In general, clinic based surveillance systems tend to underestimate the overall burden of STIs in NZ, as a large percentage of these infections are diagnosed by other practitioners in the primary care setting. Laboratories however tend to receive specimens from all providers, making them a useful complimentary source of information in areas where laboratory based surveillance is operating (notification however is limited to chlamydia and gonorrhoea). In areas where both SHC and laboratory surveillance data is available, estimates suggest that the real rates of chlamydia are 3x higher and rates of gonorrhoea 2x higher than notifications by SHCs would suggest.

In terms of the information contained in this report, SHC data is probably most useful for highlighting the relative proportions of different types of STI in the primary care setting, as lacking a geographically defined population denominator SHC data is reported as the number of cases per 100 clinic attendees. In contrast, laboratory based surveillance data, which tends to have a more clearly defined geographic denominator, is of greater utility in estimating the overall burden of disease. Because of the patchy coverage however, neither surveillance system is able to provide a reliable estimates of the national burden of disease in this country [72].

Note: While parts of this material are based on data and information provided by the Institute of Environmental Science and Research Ltd on behalf of the Ministry of Health, the analyses, conclusions, opinions and statements expressed herein are those of the authors and not necessarily those of the Institute of Environmental Science & Research Ltd or the Ministry of Health.

APPENDIX 5: THE NZ CANCER REGISTRY

Mode of Data Collection

The NZ Cancer Registry (NZCR) is a population based register established in 1948 to collect information on all primary malignant diseases diagnosed in NZ. The term “primary” refers to tumours which originate in a primary site and are thus neither extensions nor recurrences of pre-existing tumours. Cancers are registered once, in the year of their first known diagnosis and only one tumour is recognised per organ / pair, unless the second tumour is of a different histology. Incidence thus reflects the number of primary tumours diagnosed, rather than the number of individuals with cancer in any one year. (Squamous cell and basal cell skin cancers have traditionally been excluded from the Register, as have in-situ cancers since 1985) [82].

When the register was set up in 1948, it primarily used information sent by public hospitals to the National Minimum Dataset (NMDS). With the introduction of the Cancer Registration Act and the Cancer Registry Regulations during 1993 / 1994 however, it became a legal requirement for all NZ laboratories to report newly diagnosed cancers to the New Zealand Health Information Service (NZHIS) for inclusion in the NZCR. Notification data is then supplemented with that contained in the NZ death certificate and hospital admission databases. To ensure a high standard of data quality, NZCR staff screen all records when adding them to the Register and cancer deaths are reconciled to cancer registrations as they occur [78]. Since the advent of laboratory based reporting, the quality and the completeness of the data have improved significantly, meaning that data collected since 1995 cannot be directly compared with that collected in previous years [82].

In the NZCR, ethnicity is based on the concept of self-identification and utilises the same classification system employed in the 1996 census, with the Statistics NZ prioritisation system being employed for those reporting multiple ethnic affiliations (see Appendix 6). The ethnicity recorded in the Register is taken from hospital discharge information, the National Health Index (NHI) database or the mortality collection. Because an increasing number of registrations are now based on laboratory reports, where ethnicity is not always specified, there has been an increase in the number of cases for which ethnicity is unknown. Because these cases tend to be by default allocated to the non-Māori category, there remains the potential for undercounting of Māori in this situation.

Since November 2001 all cancer registrations have been coded using ICD-10-AM for the topographical site of the cancer and the International Classification of Diseases for Oncology (ICD-O-2) for the morphological type of the tumour. Prior to this date ICD-9-CM-A was used as far back as 1995 [78]. Data in the Cancer Registry is subject to small changes over time as late reports about cancer registrations are received. Thus information reported at an earlier time may differ slightly from that reported later [82].

APPENDIX 6: THE MEASUREMENT OF ETHNICITY

All of the rates calculated in these reports have relied on the division of numerators (e.g. hospital admissions, mortality data) by Statistics New Zealand Census denominators, both at a national and a regional level. 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 denominator datasets. 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 80s and then discusses the implications of this for the information contained in these reports.

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 Māori, Full Pacific) or if of more than one origin, what fraction of that ethnic group they identified with (e.g. 7/8 European + 1/8 Māori). When prioritisation was required, those with >50% of Māori or Pacific blood were deemed to meet the ethnic group criteria of the time [83]. A similar approach was used to recording ethnicity in health sector statistics, with birth and death registration forms asking the degree of Māori or Pacific blood of the parents of a newborn baby / deceased individual. For hospital admissions, ancestry based definitions were also used during the early 80s, with admission officers often assuming ethnicity, or leaving the question blank [84].

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(s) 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 (the “sole Māori” population was used as a denominator to calculate health statistics between 1986 and 1995) [83]. 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 [84].

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 [84].

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

1. The NZ Māori category was moved to the top of the ethnic categories
2. The 1996 question made it more explicit that people could tick more than 1 box.
3. There was a new “Other European” category with 6 sub groups

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 [83]. Within the health sector however, the period 1995-95 saw a much larger change 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 Māori and Pacific 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 [84].

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 [83]. The health sector also continued to use self-identified definitions of ethnicity, with the recently released Ethnicity Data Protocols for the Health and Disability Sector providing guidelines to ensure that the information collected across the sector is consistent with the wording of the 2001 Census. 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 “change over”, 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.

Current Mode of Collecting & Recording Ethnicity in the Health Sector

The current protocol for ethnicity data collection for the health and disability sector recommends the use of the 2001 Census question “Which ethnic groups do you belong to (Mark the space or spaces that apply to you). Only 3 ethnic groups are currently stored electronically in the NMDS and Mortality Collections, with a Statistics NZ’s prioritisation algorithms being used if more than 3 ethnic groups are identified [75].

National datasets currently use Statistics NZ’s Ethnicity Classification, a hierarchical structure with 4 levels, each adding greater detail:

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

For those reporting multiple ethnic affiliations, information may be prioritised according to Statistics NZ protocols, with Māori ethnicity taking precedence over Pacific>Asian>Other>European ethnic groups [85]. This ensures that each individual is counted only once and that the sum of the ethnic group sub-populations equals the total NZ population [84].

Ethnicity Classifications Utilised in this Report & 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. The information thus reflects self-identified concepts of ethnicity, with Statistics NZ's Level 1 Ethnicity Classification being used, which recognise 5 ethnic groups: European, Māori, Pacific Island, Asian (including Indian) and Other Ethnic Groups. In order to ensure that each health event is only counted once, prioritised ethnic group has been used throughout.

Caution however must be taken when interpreting the ethnic specific information contained in these reports, as while the quality of information available since 1996 has been much greater than that previously, there remains some concern as to the way in which ethnicity information is collected within the health sector. Recent analysis of post 1996 data has suggested that hospitals continue to undercount multiple ethnic identifications and as a result, recent admission rates may continue to undercount Māori and Pacific peoples [84]. Similarly a linked analysis of the ethnicity information provided on census forms and death certificates suggests that during the 1996-1999 period, death certificate data tended to undercount Māori by about 7% [86]. Thus the ethnic specific rates presented in this report must be interpreted with these cautions in mind.

APPENDIX 7: THE NZ DEPRIVATION INDEX

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 indexes 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 [87]. 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 using 1996 and 2001 census data. The NZDep2001 combines 9 variables from the 2001 census which reflect 8 dimensions of deprivation (**Table 59**). Each variable represents a standardized 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 (approx 1-2,000 people). Individual area scores are then ranked and placed on an ordinal scale from 1 to 10, with decile 1 representing the least deprived 10% of small areas and decile 10 representing the most deprived 10% of small areas [88].

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 indexes 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 [87]. Despite these limitations however, the NZDep has been shown to be predictive of mortality and morbidity from a number of diseases in NZ.

Table 59. Variables used in the NZDep2001 Index of Deprivation [88].

No.	Factor	Variable in Order of Decreasing Weight in the Index
1	Income	People aged 18-59 receiving means tested benefit
2	Employment	People aged 18-59 unemployed
3	Income	People living in households with income below an income threshold
4	Communication	People with no access to a telephone
5	Transport	People with no access to a car
6	Support	People aged <60 living in a single parent family
7	Qualifications	People aged 18-59 without any qualifications
8	Owned Home	People not living in own home
9	Living Space	People living in households below a bedroom occupancy threshold

APPENDIX 8. AVOIDABLE HOSPITAL ADMISSIONS

Table 60. Conditions Considered to be Ambulatory Sensitive and Population Preventable by Ministry of Health in 2004 [51]

Condition	Population Preventable Hospitalisations Weighting	Ambulatory Sensitive Hospitalisations Weighting
Tuberculosis	0.5	0.5
HIV / AIDS	1	0
Skin Cancers	0.5	0.5
Oral Cancers	1	0
Colo-rectal Cancer	0.7	0.3
Lung Cancer	1	0
Breast Cancer	0.3	0.7
Nutrition	1	0
Alcohol-Related Conditions	1	0
Ischemic Heart Disease	1	0
Gastroenteritis	0.2	0.8
Other Infections	0.2	0.8
Immunisation-Preventable	0	1
Hepatitis / Liver Cancer	0	1
Sexually Transmitted Disease	0	1
Cervical Cancer	0	1
Thyroid Disease	0	1
Diabetes	0.2	0.8
Dehydration	0	1
Epilepsy	0	1
ENT Infections	0	1
Rheumatic Fever / Heart Disease	0	1
Hypertensive Disease	0.3	0.7
Angina	0	1
Congestive Heart Failure	0	1
Stroke	0.5	0.5
Respiratory Infections	0	1
CORD	0.6	0.4
Asthma	0	1
Dental Conditions	0.4	0.6
Peptic Ulcer	0	1
Ruptured Appendix	0	1
Obstructed Hernia	0	1
Kidney / Urinary Infection	0	1
Cellulitis	0	1
Failure to Thrive	0	1
Gangrene	0	1

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