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Close-contact infectious diseases in New Zealand: Trends and ethnic inequalities in hospitalisations, 1989 to 2008 (2nd Edition)

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1. Executive Summary

Introduction

Infectious diseases are the most common cause of acute hospitalisation in New Zealand. Their incidence is known to have increased during the 1990s. Infectious diseases are also a major cause of health inequalities, with Māori and Pacific peoples' hospitalisation rates consistently higher than those for Europeans and others.

A conceptually useful category for analysis is close-contact infectious diseases (CCIDs), i.e. respiratory, skin and enteric (faecal-oral) infections spread by person-to-person contact in the community. There are several reasons for focusing on CCIDs:

- they account for most cases of infectious disease;
- their incidence appears to have been rising over the past two decades;
- they include the infectious diseases with pandemic potential (e.g. influenza and SARS);
- they contribute to ethnic and socio-economic health inequalities;
- they provide a potential indicator of population vulnerability to infectious disease because they are likely to be driven by health determinants such as household crowding levels;
- their modes of transmission (respiratory, oral, direct contact) frequently overlap;
- they may provide a focus for improved disease prevention and control effort; and
- they are measurable using coded hospitalisation and mortality data that are routinely collected in New Zealand (as presented in this report).

This report describes the epidemiology of infectious diseases and CCIDs for the 20-year period from 1989 to 2008, with a specific focus on ethnic inequalities relating to Māori and Pacific peoples.

It should be noted that this second edition of the report replaces and supersedes the first edition. Changes to ethnic classification, the use of two data sources to assign ethnicity to hospitalised cases, and changes to the strata used for age-standardisation, mean that some rates and ratios are substantially different from the first edition, though the trends and relativities between rates are largely unchanged.

Methods

We analysed acute overnight hospitalisations, filtered to exclude non-relevant health events, such as admissions for childbirth. All subsequent references to *hospitalisations* refer to this filtered subset. Hospitalisations were first categorised as infectious or non-infectious based on the ICD-9 or ICD-10 classification of their principal diagnosis. Infectious hospitalisations were those that were predominantly caused by an infectious agent, the late effects of an infection or from treatment for an infection. They were further separated into CCIDs and non-close-contact infectious diseases (non-CCIDs). CCIDs were those where:

- humans are the only or the most important source (i.e. excluding disease with zoonotic and environmental reservoirs);
- transmission is by direct physical contact, respiratory transmission or faecal-oral spread (i.e. excluding diseases transmitted from contaminated food, water and environments; blood borne, sexually transmitted, congenital and perinatal infections; endogenous infections; and those with multiple and unknown transmission modes); and

- infections are predominantly acquired in the community (i.e. excluding infections acquired overseas and in health-care settings).

Results have been reported for age groups, and by modified total ethnicity. Rates were generally age-standardised to the New Zealand 2006 Census population distribution. In addition, these rates were often expressed as a percentage of total hospitalisations to adjust for the large rise in total hospitalisation rates over the past 20 years.

Results

Infectious disease hospitalisations increased markedly over the 20-year period from 1989 to 2008, with a rise from an average annual rate of 1071.6 per 100,000 in the period 1989 to 1993, to 1806.5 per 100,000 in 2004 to 2008. Over the same period, their contribution rose from 17.9 percent of hospitalisations to 25.8 percent in 2004 to 2008. For children less than 5 years, the proportions were much higher again, with infectious diseases causing 60.5% of hospitalisations in the 2004 to 2008 period. There were marked ethnic differences in the distribution of infectious diseases. In the most recent 5-year period (2004 to 2008), infectious diseases accounted for 23.6 percent of hospitalisations for European/Other, 29.1 percent for Māori, and 32.9 percent for Pacific peoples. For children less than 5 years, the proportions were 54.9 percent for European/Other, 65.1 percent for Māori; and 68.9 percent for Pacific peoples.

The largest contributor to the rise in infectious diseases over the last 20 years was CCID. By 2004 to 2008, CCIDs accounted for 16.8 percent of hospitalisations for European/Other, 22.5 percent of Māori hospitalisations and 25.5 percent of Pacific hospitalisations.

There was evidence of significantly increasing ethnic inequalities in infectious diseases over the 20-year period 1989 to 2009. In the 1989 to 1993 period, the CCID age standardised rate ratio (SRR) for Māori was 2.22 and for Pacific peoples was 2.25 compared with European/Other. By 2004 to 2008, these SRRs had increased to 2.38 for Māori (an increase of 6.9 (95%CI 5.9-7.9) percent) and to 2.61 for Pacific peoples (an increase of 16.0 (95%CI 14.1-17.9) percent). Standardised rate differences (SRD) showed an even more marked increase, rising 84.7 (95%CI 78.9-90.7) percent for Māori and 111.3 (95%CI 99.9-123.7) percent for Pacific people.

CCID rates were highest in children less than 5 years with a rate of 4794.9 per 100,000 in the period from 2004 to 2008. The contribution of infectious diseases to hospitalisations also increased markedly in this age group from 40.1 percent of hospitalisations in the 1989 to 1993 period, to 52.7 percent of hospitalisations in 2004 to 2008. The next most vulnerable age group was adults aged 70+ with a CCID rate of 3295.2 per 100,000 in 2004 to 2008. CCIDs increased from 6.2 percent of hospitalisations in the 1989 to 1993 period to 13.7 percent in 2004 to 2008.

Respiratory hospitalisations made up roughly half of all CCIDs. The largest single category was lower respiratory tract infections (LRTIs), which include pneumonia, bronchiolitis and influenza. This category increased from 6.6 percent of all-cause hospitalisations in the period 1989 to 1993 to 9.8 percent in 2004 to 2008. Because rates rose markedly for Māori, Pacific and European/Other, ethnic inequalities changed little over that period (the SRR of 2.5 for Māori vs. European/Other in the 1989 to 1993 period increased slightly to 2.7 in 2004 to 2008; while the Pacific SRR increased from 2.6 to 3.0).

The main increase in close-contact skin infections between 1989 and 2008 came from bacterial skin infections, which doubled from 2.3 percent of hospitalisations in the 1989 to 1993 period to 4.6 percent in the 2004-2008 period. This increase affected all ethnic groups. SRRs in 2004-2008, at 2.6 for Māori and 2.7 for Pacific peoples, were not significantly different from their 1989-1993 levels of 2.8 and 2.7 respectively.

Within the enteric (faecal-oral) infection category, inequalities showed a significant increase in the late effects of enteric infections (e.g. peptic ulcers). An SRR of 2.0 was recorded for Māori vs. European/Other in the 1989 to 1993 period, increasing to 3.3 in the 2004 to 2008 period, while the Pacific SRR increased from 2.9 to 4.6 over the same period.

The greatest increase in ethnic inequalities was for post-streptococcal diseases, notably rheumatic fever. The SRR of 7.4 recorded for Māori vs. European/Other in the 1989 to 1993 period increased to 22.8 in the 2004 to 2008 period. The SRR for Pacific vs. European/Other increased from 10.8 to 30.5 over the same period.

Pertussis also showed an increase in inequalities between Māori and European/Other over this period. An SRR of 1.3 was recorded for Māori vs. European/Other in the 1989 to 1993 period, increasing to 2.8 in the 2004 to 2008 period.

Inequalities in bacterial meningitis incidence increased over the 1989 to 2003 period, but then levelled out; SRRs of 2.4 and 2.6 were recorded for Māori and Pacific respectively vs. European/Other in the 2004 to 2008 period.

CCID rates were associated with social deprivation. In the 2004 to 2008 period, they increased with each NZDep quintile, from 16.6 percent of all-cause hospitalisations in NZDep 1–2 to 21.0 percent in NZDep 9–10. By contrast, while non-CCID rates increased with increasing deprivation, they represented a lesser proportion of all-cause hospitalisations with increasing deprivation. The risk of CCID and non-CCID hospitalisation was independently associated with social deprivation and ethnicity, with little interaction effect between these determinants.

Discussion and conclusion

Infectious diseases, and particularly CCIDs, are making a large and increasing contribution to hospitalisations in New Zealand. They continue to be an important cause of health inequalities with markedly higher rates for Māori and Pacific people, compared with Europeans and others.

This large increase in infectious disease hospitalisations has important health and economic implications. The rise is equivalent to an additional 22,000 hospitalisations a year (compared with what would have been seen had the proportion of 17.9 percent of hospitalisations caused by infectious diseases in the 1989 to 1993 period continued to the present).

The findings of this report also support the validity of distinguishing CCIDs from infectious diseases more generally (i.e. non-CCIDs). The CCIDs were defined based on sharing common modes of transmission. As this report shows, they also appear to behave differently from non-CCIDs over time and across ethnic and deprivation groups. By contrast, non-CCIDs are a collection of infectious diseases with diverse modes of transmission, reservoirs and exposure settings so are likely to have complex relationships to ethnicity and socioeconomic determinants of health.

Prevention and control measures for CCIDs include the following broad approaches.

1. Determinant focussed – these are measures aimed at general determinants of inequalities in health (e.g. reducing household crowding to limit transmission of all CCIDs, ensuring adequate water supplies to support personal hygiene).
2. Transmission focused – these are measures aimed at reducing specific modes of transmission that will usually be common to several diseases (e.g. focus on reducing active and passive smoking and promoting cough etiquette to reduce rates of respiratory infection; focus on provision of adequate hand-washing facilities in schools and pre-schools to reduce enteric infections).

3. Disease-specific – these are measures focused on specific infectious diseases such as primary prevention of rheumatic fever, introduction and high coverage of vaccines for specific diseases (e.g. meningococcal disease and pneumococcal disease), and measures to improve access to specific treatment (e.g. for *Helicobacter pylori* infection to reduce peptic ulcer disease and gastric cancer).

The next stages of this project will describe patterns of household crowding across ethnic groups and assess the potential for reductions in household crowding to lower the burden of infectious diseases in New Zealand, including sub-analyses for both Māori and Pacific peoples.

2. Introduction

Infectious diseases are the most common cause of hospitalisation in New Zealand (among the broad disease categories such as cardiovascular disease and cancer, and excluding admissions related to childbirth).[1] They also remain an important cause of premature mortality that is showing no evidence of declining.[1] Rates of several infectious diseases are unusually high in New Zealand, notably acute rheumatic fever,[2-3] childhood pneumonia[4] and skin infections.[5]

New Zealand has experienced two meningococcal disease epidemics over the last 25 years: a serogroup A meningococcal disease epidemic from 1985 to 1988[6] and the recent serogroup B meningococcal disease epidemic from 1991 onwards.[7-8] These epidemics displayed significant ethnic and socio-economic inequalities. The serogroup B meningococcal disease epidemic was only brought under control in 2005 by use of an effective, but expensive (greater than $200 million, excluding costs of workforce), vaccination programme.[9] This pattern of successive meningococcal disease epidemics is highly unusual for a developed country.

Infectious diseases are also a major cause of health inequalities, notably for tuberculosis,[10] acute rheumatic fever[2], meningococcal disease[11] and skin infections.[5] More recently we have seen marked health inequalities with the 2009 H1N1 influenza pandemic where hospitalisation rates were 3.0 times higher for Māori and 6.7 times higher for Pacific people than for European/Other.[12]

Aims of this project

- To produce a detailed description of CCID hospitalisations for the 20-year period from 1989 to 2008, including sub-analyses for Māori and Pacific peoples, and analyses of ethnic and socio-economic inequalities.
- To produce a detailed description of household crowding across the 1991 to 2006 census period, including sub-analyses for Māori and Pacific peoples, and analyses of ethnic and socio-economic inequalities.
- To identify how improvement to housing conditions and reduced inequalities could contribute to a reduced burden of infectious diseases from housing conditions.

This report addresses the first of these aims.

This is the second edition of this report and replaces and supersedes the previous edition published in June 2010. This revised report now includes further sub-analyses for Pacific peoples. There have also been methodological changes from the first edition, including a move from using prioritised to total ethnicity; the use of two data sources to assign ethnicity to hospitalised cases (both hospitalisation and NHI ethnicity fields combined); and an additional age band (80+ years) for calculating age-standardised rates.

3. Methods

3.1. Classification of CCIDs

Measuring the burden of infectious disease using hospitalisation and mortality data requires 'recoding' to identify those conditions (ICD codes) with an infectious aetiology. This approach was initially developed by the US Centers for Disease Control and Prevention[13] and applied to distinguish infectious disease deaths,[13] hospitalisations,[14] and hospitalisations of American Indians and Alaskan Natives.[15-17] This coding scheme has been used successfully in New Zealand to describe the burden of disease attributed to infections.[1]

To investigate the potential effects of disease transmission in households and the impact of health determinants, we have further refined this ICD list by identifying a subset of CCIDs (see Table 12 in the appendix). These diseases include the traditional contagious diseases (from Latin *tangere*, meaning 'to touch'). These are diseases where:

- humans are the only or the most important reservoir (i.e. excluding disease with zoonotic and environmental reservoirs);
- transmission is by direct physical contact, inhaled airborne particles and droplets (respiratory), or faecal-oral spread (i.e. excluding diseases transmitted from contaminated food, water and environments; blood borne, sexually transmitted, congenital and perinatal infections; endogenous infections; and those with multiple and unknown transmission modes); and
- infections are predominantly acquired in the community (i.e. excluding infections acquired overseas and from health-care settings).

The CCIDs include: pertussis; meningitis; invasive streptococcal and staphylococcal infections; eye infections; ear infections; rheumatic fever and acute glomerulonephritis; upper and lower respiratory tract infections; skin infections; infections of bone, joint and connective tissue; and the late effects of these infections.

There are several reasons for focusing on CCIDs:

- they account for most cases of infectious disease (explored further in this report);
- their incidence appears to have been rising over the past two decades (explored further in this report);
- they include the infectious diseases with pandemic potential (e.g. influenza and SARS);
- they contribute to ethnic and socio-economic health inequalities in New Zealand (explored further in this report);
- they provide a potential indicator of population vulnerability to infectious disease (as they are likely to be driven by socio-economic determinants of health such as household crowding levels);
- their modes of transmission (respiratory, oral, direct contact) frequently overlap;
- they may provide a focus for improved disease prevention and control effort; and
- they are measurable using coded hospitalisation and mortality data that are routinely collected in NZ (as presented in this report).

These diseases were distinguished using ICD.9 and ICD.10 codes. Each code was classified according to whether it had an infectious cause, its dominant route of transmission, reservoir, and place of acquisition (community, overseas, hospital). This classification was refined at a workshop

at the University of Otago, Wellington, on 22 April 2009 attended by about 20 professional staff working in the infectious disease sector.

3.2. Obtaining hospitalisation records

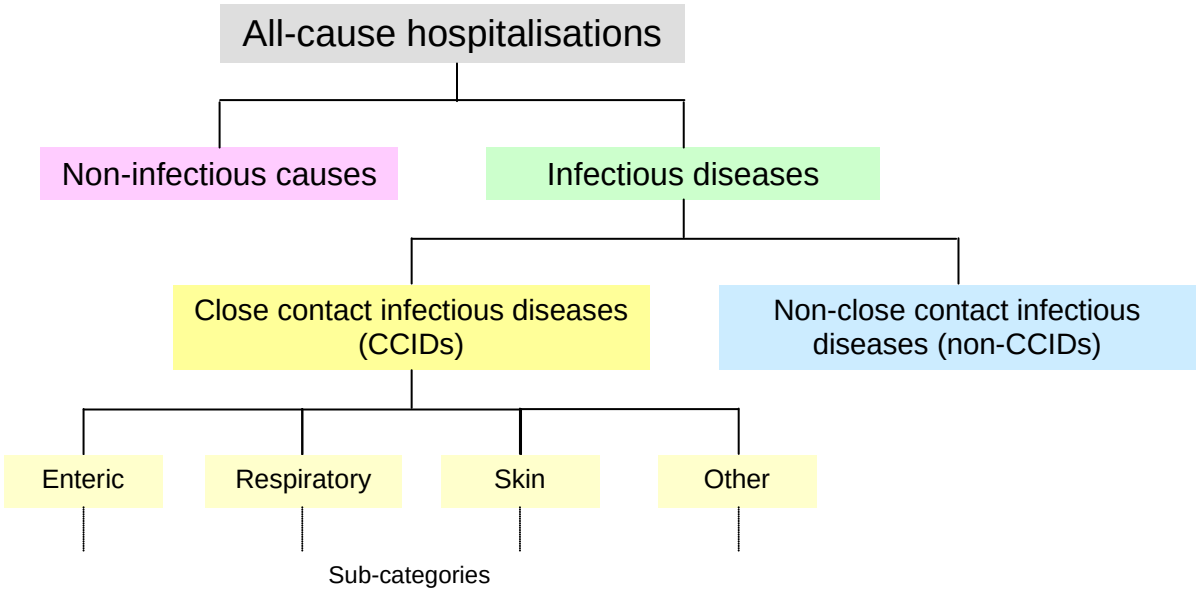
This research uses hospitalisation events recorded by the New Zealand Ministry of Health in the National Minimum Dataset (NMDS). The NMDS records coded data on all publicly funded hospital admissions in New Zealand. These data include a unique health sector identifier, the National Health Index (NHI) number, for all hospitalised individuals.

3.3. Analysis

Hospitalisation data were filtered to exclude health events that had little or no relationship to the research questions being investigated. The filtering steps and their rationale are shown in Table 1. This analysis used principal diagnoses (coded using ICD.9 or ICD.10) for conditions of interest. The standard filter excluded private hospital cases, overseas visitors, transfers, waiting list cases, day cases and readmissions within a month. A similar filtering approach has been used during the analysis of New Zealand injury hospitalisations.[18]

Hospitalisation categories included in this study are illustrated in Figure 1.

Figure 1. Major categories of hospitalisations used in this study



The incidence of hospitalisations has been presented in five main ways:

- counts of hospitalised cases;
- age-standardised hospitalisation rates;
- age-standardised hospitalisations rates as a percentage of all-cause hospitalisation rates;
- age-standardised hospitalisation rate ratios (SRR); and
- age-standardised hospitalisation rate differences (SRD).

CCID and non-CCID rates are also each presented along with non-infectious disease hospitalisation rates. This comparison is particularly necessary with CCID rates, as some of the increase in all-cause hospitalisations is due to the CCID rate increase. It was also necessary to investigate whether changes in CCID hospitalisation rates over the study period had mirrored changes in non-infectious disease rates.

Age-standardised rates are needed because of changes in population size and age structure over time and across different ethnic groups. Most rates were age standardised to the age structure of the New Zealand population at the time of the 2006 Census. Age bands were 0–4, 5–9, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69, 70–79 and 80+ years.

It should be noted that the first edition of this report had 70+ as the highest age band. As disease rates in the elderly are generally high, the finer stratification by age in this second edition has changed some rates and ratios, though the trends and relativities between rates are largely unchanged.

All-cause hospitalisation rates have risen markedly over the past 20 years, at least partly because of changes in medical and administrative practices. Consequently, there are advantages in expressing infectious disease hospitalisations as a percentage of all-cause hospitalisations (age-standardised rates expressed as a percentage of age-standardised all-cause hospitalisations). Such a measure is likely to give a better indication of shifts in disease burden than simply using absolute age-standardised hospitalisation rates. However, rates alone are also important. Year-by-year changes in Māori, Pacific and European/Other CCID rates are closely correlated to each other, and also to year-by-year changes in Māori and Pacific non-infectious disease hospitalisation rates. European/Other non-infectious disease hospitalisation rates, however, follow a distinct pattern. Adjusting rate ratios for all-cause hospitalisation rates would therefore hide some of the rise in Māori and Pacific CCID hospitalisation rates relative to European/Other.

For most of the analyses we split the 20-year period into four 5-year periods. Each was centred on a population census (i.e. the Censuses of 1991, 1996, 2001 or 2006), which provided the population denominator for rates calculation.

Ethnicity was classified using a modified version of total ethnicity, with four groups: Māori, Pacific peoples, Asian (results not included in this report) and 'European/Other'. The European/Other category was not a total ethnicity count, but instead included all those not included in one of the other three groups (i.e. non-Māori, non-Pacific, non-Asian). This approach prevents undercounting for Pacific peoples, while still providing an exclusive denominator for statistical calculations.

Pacific peoples were further classified by Statistics level 2 ethnicity. Results are shown for (in order of population size) Samoans, Cook Islanders, Tongans and Niueans. Results were not included for the residual "Other Pacific" group because the census population used to calculate rates was incompatible as a denominator (see Table 30).

Ethnicity was assigned using both the hospitalisation and NHI ethnicity fields combined; i.e. a hospitalisation would be counted as Māori (or Pacific, or e.g. Tongan) if their ethnicity was recorded as Māori (or Pacific, or Tongan) in *either* the NHI *or* their hospitalisation record. This approach will have helped reduce bias due to changes in ethnicity coding over the study period; while earlier hospitalisations will have less sophisticated ethnicity coding for their hospitalisation-record ethnicity, their NHI-record ethnicity is updated, and is therefore more likely to reflect current coding standards.

The analysis used well documented methods for calculating adjusted rates, rate ratios and confidence intervals.[19] All graphs show 95% confidence intervals for rates and proportions/percentages. Because these rates are often based on very large numbers, the confidence intervals are often so narrow that they are not visible as discrete bars.

Figure 2. Number of hospitalisations included and excluded according to category, by 5-year period, 1989 to 2008

[see Table 11 for data]

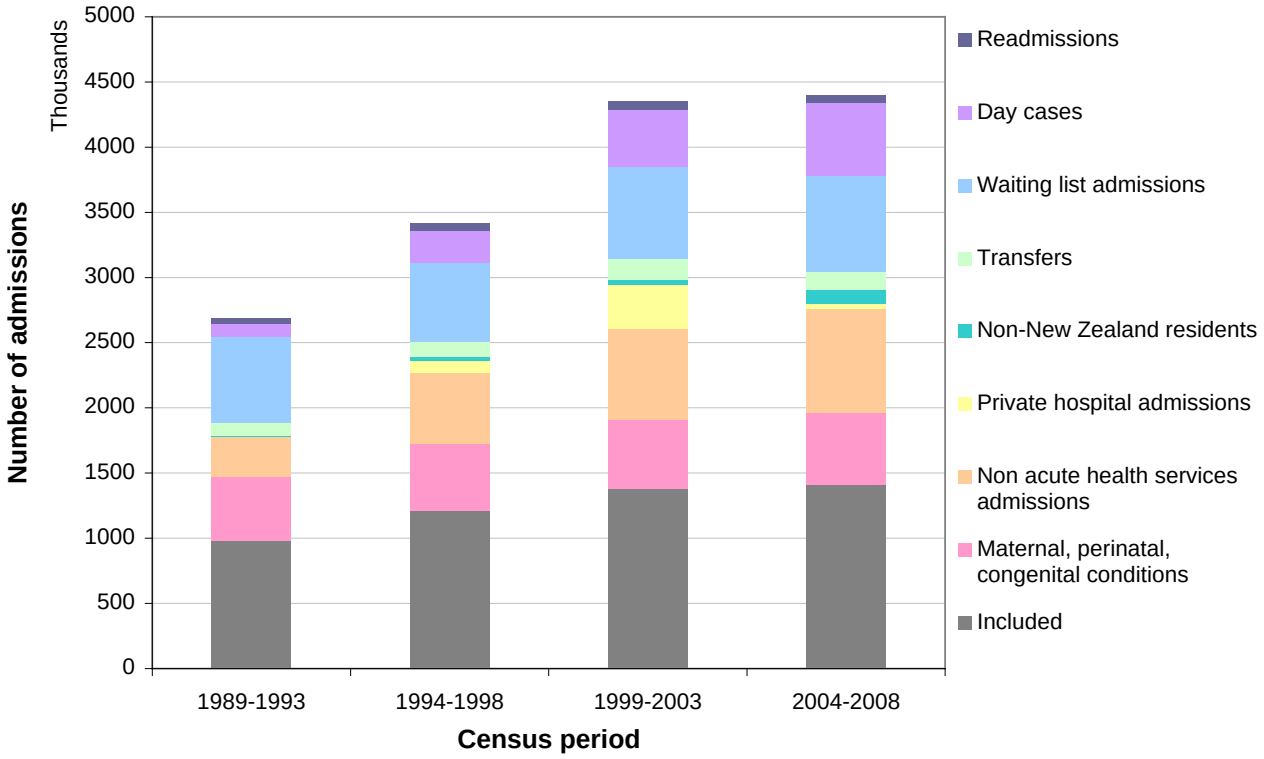


Table 1. Filters used in the analysis of hospitalisation data

Event removed	Rationale for removing event	Method for removing event
1. Diagnoses that are not relevant – Restrict to conditions of interest	All analyses begin by selecting the condition(s) of interest to the research question. Where the focus is on broad categories of events, such as all-cause hospitalisations, it is appropriate to remove events that may not represent illness or injury events, notably: • Maternal, perinatal, congenital conditions – strongly reflect demographic and reproductive patterns in the population. • Factors influencing health status and contact with health services – includes follow-up care, dialysis, rehabilitation, screening, immunizations, prosthetic fittings, normal deliveries, boarders and social factors which do not represent an acute health event.	Pregnancy, childbirth and the puerperium (O00-O99). Certain conditions originating in the perinatal period (P00-P96). Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99). Factors influencing health status and contact with health services (Z00-Z99).
2. **Additional diagnoses** – Restrict to principal diagnosis	Principal diagnosis is defined as: 'The diagnosis established after study to be chiefly responsible for causing the patient's episode of care in hospital'. Other relevant diagnosis (or additional diagnosis) is defined as: 'A condition or complaint either co-existing with the principal diagnosis or arising during the episode of care or attendance at a healthcare facility'. Most analyses are based on principal diagnosis, though it may be appropriate to include other diagnoses, particularly for distinct and serious illnesses to detect all cases.	Diagnosis type. Principal diagnosis (diagnosis type A). Other relevant diagnosis (diagnosis type B), up to 98 can be recorded.
3. **Private hospital admissions** – Restrict to publicly funded hospital discharges	The collection of privately funded hospital discharges is considerably delayed and less complete than publicly funded hospital data. In New Zealand this category includes only about 10% of hospitalisations and most (about 90%) are for elective surgery so are not generally relevant for the research questions being investigated in this study.	Purchaser code = '06'
4. **Overseas visitors** – Restrict to New Zealand residents	Rate calculations use the census population of resident New Zealanders as the denominator, which does not include overseas visitors.	NZ Resident Status = N
5. Transfers – Restrict to new admissions	Transfers between DHBs (and sometimes hospitals and services) may be recorded as separate admissions, even when part of the same episode of care.	Combine transfers with new admissions into single admission episodes.
6. Waiting list cases – Restrict to acute and arranged admissions	Waiting list cases (those admitted 7+ days after being first assessed) are strongly influenced by the availability of health-care services.	Admission type = restrict to AC and AA, exclude WN.
7. **Day cases** – Restrict to overnight hospital events (i.e. inpatients)	Day patients include less serious hospital attendances as well as conditions that result in multiple-day case admissions, notably: renal dialysis, chemotherapy, radiotherapy and blood transfusions. Recording is also very inconsistent across different health authorities (DHB) and time periods.	Length of stay = 0 days
8. **Readmissions** – Restrict to incident cases	Readmissions are strongly influenced by the nature and severity of the initial illness or injury, social and health service factors. Removing them helps to identify incident events, and the factors that contribute to them. Note that this filter does not exclude recurrences of the same illness or injury at a later date (greater than 30 days later).	Same encrypted NHI, same diagnostic code, admission date within 30 days of previous admission, or, injury event date is the same as previous admission.

4. Results

4.1. Acute overnight hospitalisations

The effects of the filtering steps used with hospitalisation events are shown in Figure 2 with numbers in Table 11. The hospitalisation events of interest to this study are acute overnight hospitalisations. These events increased from 984,515 in the 1989 to 1993 period, to 1,409,009 in the 2004 to 2008 period. As a proportion of total hospital discharges, they decreased from about 37 percent in the earlier period to 32 percent in the last 5 years. The largest drivers for this change in proportion were the marked increases in recorded day cases (from 98,165 to 565,547) and in 'factors influencing health status and contact with health services' (from 311,967 to 798,806). Many of these shifts reflect changes in the recording of hospitalisation events over time, and changes in how health care is administered in hospitals. They illustrate the importance of filtering out such admissions to leave a set of hospitalisation events sufficiently consistent to form the basis of analyses of changes in population health status over time, as used in this report.

As noted earlier, all references to "hospitalisations" in this report refer to the filtered subset of acute overnight hospitalisations, as distinct from hospitalisation events.

4.2. Incidence of hospitalisations and infectious diseases

Table 2 shows all-cause hospitalisations for 5-year periods from 1989 to 2008 along with the average annual rates for each period. These data show that hospitalisations increased from an average annual rate of 5992.9 per 100,000 (i.e. equivalent to about 6.0 percent of the population each year) to 6996.2 per 100,000 (i.e. about 7.0 percent) over this period.

Total infectious diseases increased more markedly, with a rise from 1071.6 per 100,000 in the 1989 to 1993 period, to 1806.5 per 100,000 in the 2004 to 2008 period. Their contribution rose from 17.9 percent of acute overnight hospitalisations in 1989 to 1993, to 25.8 percent in 2004 to 2008.

Table 2. All-cause hospitalisations, infectious diseases, non-CCIDs and CCIDs (and categories of CCIDs) hospitalisation numbers and average rates for 5-year periods, 1989 to 2008

Census period	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	No.	Age-std rate[†]	No.	Age-std rate[†]	No.	Age-std rate[†]	No.	Age-std Rate[†]
All-cause hospitalisations	984515	5992.9 (5980.9-6004.9)	1211925	6868.0 (6855.7-6880.3)	1378174	7421.6 (7409.2-7434.0)	1409009	6996.2 (6984.6-7007.7)
Total infectious diseases	187388	1071.6 (1066.7-1076.5)	253734	1378.1 (1372.7-1383.5)	327099	1734.7 (1728.7-1740.6)	363823	1806.5 (1800.6-1812.4)
Non-CCIDs	53285	313.8 (311.1-316.5)	69353	386.2 (383.3-389.1)	76735	411.4 (408.4-414.3)	96377	478.5 (475.5-481.6)
Total CCIDs	134103	757.8 (753.7-761.9)	184381	992.0 (987.4-996.5)	250364	1323.3 (1318.1-1328.5)	267446	1328.0 (1322.9-1333.0)
▪ Respiratory	74687	413.9 (410.9-416.9)	97195	519.8 (516.5-523.1)	132189	698.2 (694.5-702.0)	140668	698.5 (694.8-702.1)
▪ Enteric	18070	108.8 (107.2-110.4)	26223	143.2 (141.4-144.9)	30154	158.8 (157.1-160.6)	31874	158.3 (156.5-160.0)
▪ Skin	26863	155.7 (153.8-157.6)	40679	222.9 (220.7-225.1)	63748	339.7 (337.1-342.3)	72266	358.8 (356.2-361.4)
▪ Other CCID	14483	79.5 (78.2-80.8)	20284	106.1 (104.6-197.6)	24273	126.6 (125.0-128.2)	22638	112.4 (110.9-113.9)

[†] Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

Table 3. All-cause hospitalisations, infectious diseases, non-CCIDs and CCIDs (and categories of CCIDs), for 5-year periods, 1989 to 2008

	% of total hospitalisations (95% CI)								% increase in rate	
Census period	**1989 to 1993**		**1994 to 1998**		**1999 to 2003**		**2004 to 2008**		**1989-1993 to 2004-2008 (95% CI)**	
	%	95%CI	%	95%CI	%	95%CI	%	95%CI	%	95%CI
All-cause hospitalisations	100.0		100.0		100.0		100.0		17	(17-17)
Total infectious diseases	17.9	(17.8-18.0)	20.0	(20.0-20.1)	23.3	(23.3-23.5)	25.8	(25.7-25.9)	69	(68-69)
Non-CCIDs	5.2	(5.2-5.3)	5.6	(5.6-5.7)	5.5	(5.5-5.6)	6.8	(6.8-6.9)	53	(51-54)
Total CCIDs	12.6	(12.6-12.7)	14.4	(14.4-14.5)	17.8	(17.8-17.9)	19.0	(18.9-19.1)	75	(74-76)
▪Respiratory	6.9	(6.9-7.0)	7.6	(7.5-7.6)	9.4	(9.4-9.5)	10.0	(9.9-10.0)	69	(68-70)
▪Enteric	1.8	(1.8-1.8)	2.1	(2.1-2.1)	2.1	(2.1-2.2)	2.2	(2.2-2.3)	45	(43-48)
▪Skin	2.6	(2.6-2.6)	3.2	(3.2-3.3)	4.6	(4.5-4.6)	5.1	(5.1-5.2)	130	(128-133)
▪Other CCID	1.3	(1.3-1.3)	1.5	(1.5-1.6)	1.7	(1.7-1.7)	1.6	(1.6-1.6)	41	(39-44)

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

4.3. Incidence of CCIDs

Between the 1989 to 1993 and 2004 to 2008 time periods, the contribution of CCIDs rose from 12.6 percent of hospitalisations to 19.0 percent, a 50.1 (95% CI 49.3-50.9) percent increase. Non-CCIDs rose from 5.2 percent of hospitalisations to 6.8 percent, a 30.6 (95% CI 29.5 – 31.8) percent increase. Consequently, there was a moderate shift in the causes of infectious diseases, with CCIDs increasing their contribution from 70.7 (95% CI 70.3 – 71.1) percent to 73.5 (73.2 – 73.8) percent.

Admissions due to infections acquired by the respiratory route made the largest contribution to CCID hospitalisations, accounting for more than half of CCIDs over the study period. For this reason, rate ratios for total CCIDs mirror rate ratios for respiratory illness. Respiratory admissions also outnumber non-CCIDs.

The greatest increase in CCIDs was for skin infections, with rates 2.2 (95% CI 2.2-2.2) times higher in 1999 to 2003, and 2.3 (95% CI 2.3-2.3) times higher in 2004 to 2008 periods, than in the 1989 to 1993 period. Rates for respiratory infections were 1.7 (95% CI 1.7-1.7) times higher over the same periods, and for enteric infections 1.5 (95% CI 1.4-1.5) times higher. Only 'other' CCIDs have shown any sign of decrease; although rates in the 1999 to 2003 period were 1.6 (95% CI 1.6-1.6) times higher than those in the 1989 to 1993 period, the ratio slipped back to 1.4 (95% CI 1.4-1.4) in 2004 to 2008.

4.4. Trends in CCIDs by year

Age-standardised rates rose for both CCIDs and non-CCIDs over the study period, but the increase was greater for CCIDs (Figure 3).

Hospitalisations for CCIDs and non-CCIDs increased more than the overall increase in hospitalisations over the study period (Figure 4). As suggested by the age-standardised rates in Figure 3, CCIDs showed a greater increase than non-CCIDs as a percentage of all-cause hospitalisations.

Figure 3. **Annual rate of all-cause hospitalisations, and total infectious diseases, CCID and non-CCID hospitalisations (age standardised to 2006 Census)**

[see Table 16 for data]

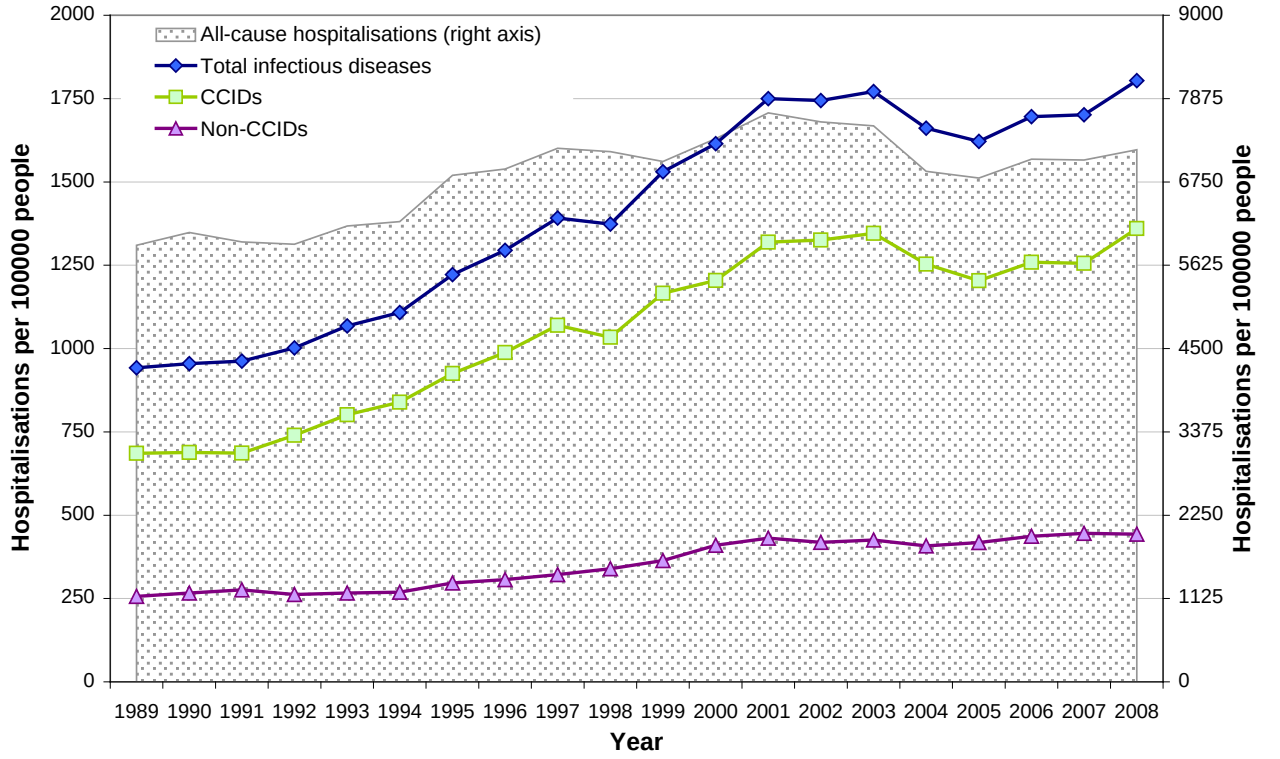


Figure 4. **Total infectious disease, CCID and non-CCID hospitalisations as a percentage of all-cause hospitalisations, by year (age standardised to 2006 Census).**

[see Table 17 for data]

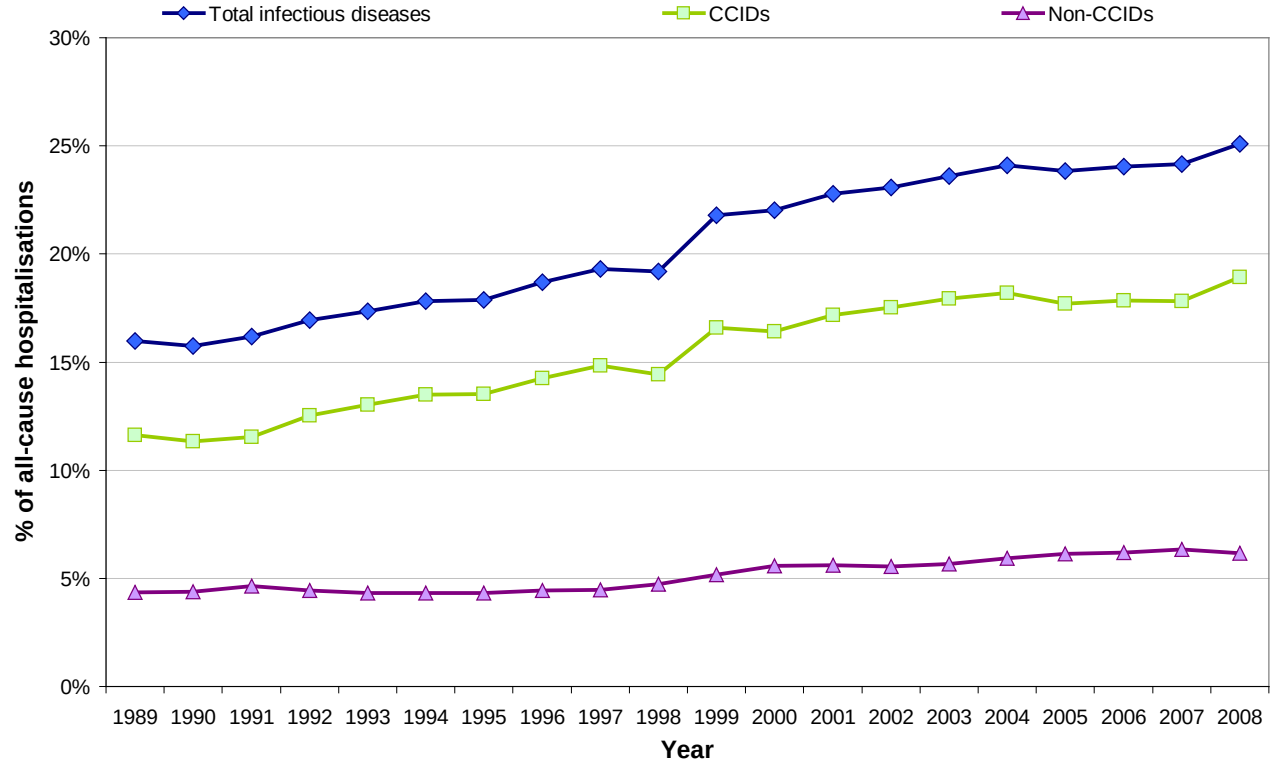


Figure 5. Annual hospitalisation rates for main categories of CCIDs (age standardised to 2006 Census)

[see Table 18 for data]

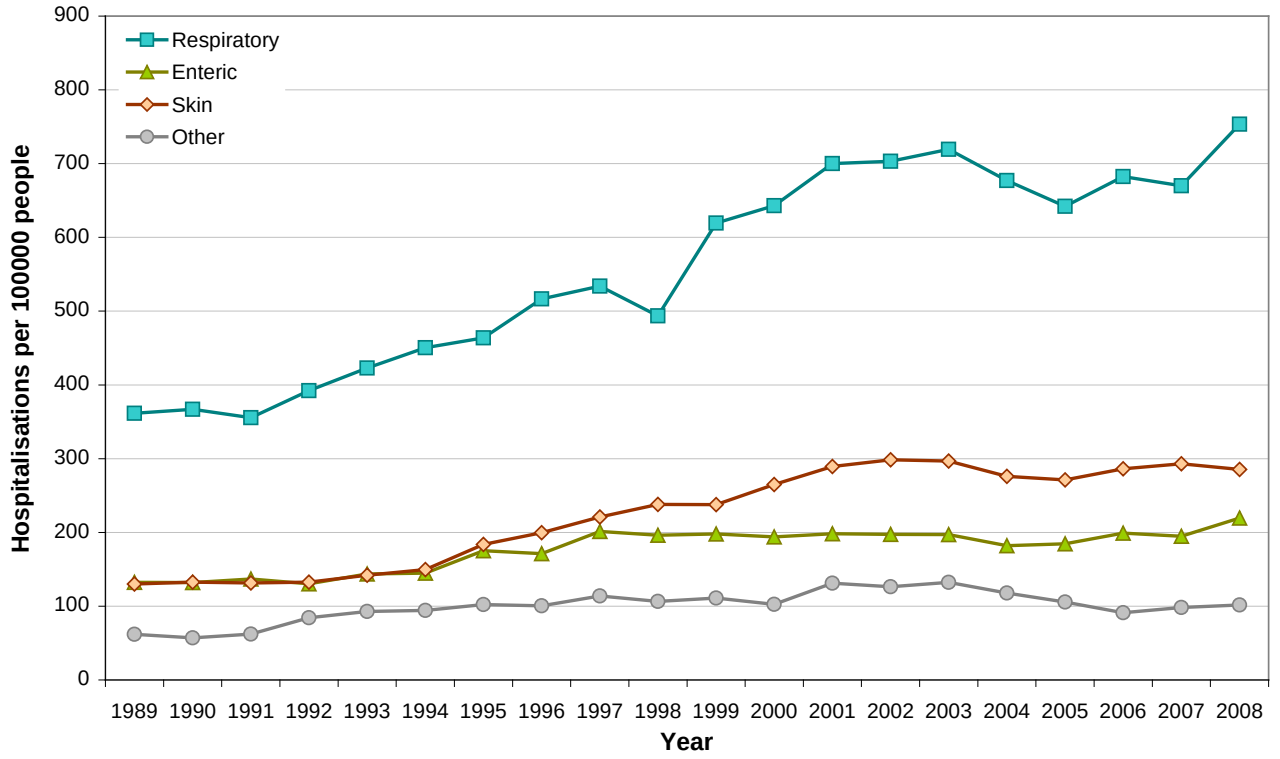


Figure 6. Hospitalisations for main categories of CCIDs, as a percentage of all-cause hospitalisations, by year (age standardised to 2006 Census)

[see Table 18 for data]

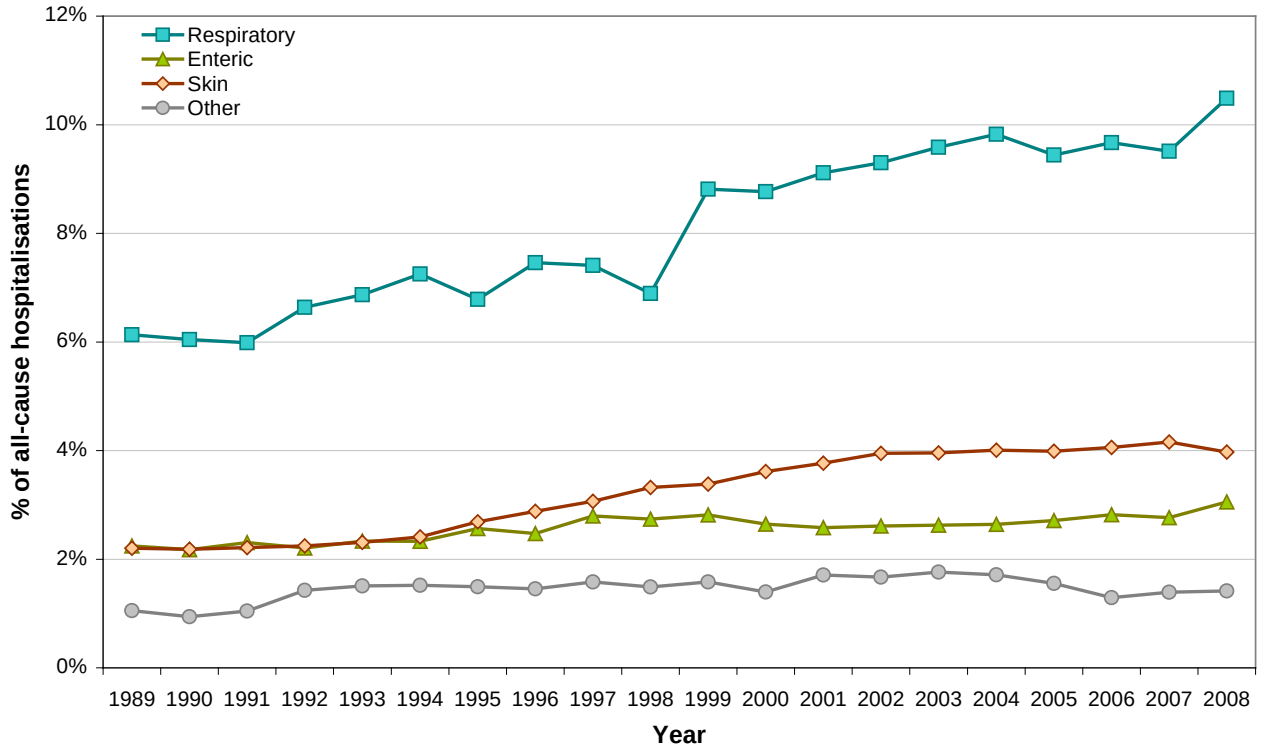


Figure 4 shows the importance of looking at rates as a percentage of hospitalisations rather than at rates in isolation. It would be easy to assume from Figure 3 that the increase in infectious diseases had reached a plateau in the 2000s. Instead, Figure 4 shows that the increase in infectious disease incidence relative to all-cause hospitalisation rates has been relatively steady over the study period.

Respiratory illness had the highest hospitalisation rate among CCIDs, followed by skin infections, then enteric infections, then other (Figure 5). All of these CCIDs increased as a percentage of all-cause hospitalisations (Figure 6), though the rate and steadiness of increase varied by category.

4.5. Age and sex distribution of CCIDs

There were minimal differences in CCID distribution by sex over the study period. Males had a marginally higher incidence of CCID, with their SRR compared to females reducing from 1.31 to 1.21 over the study period.

CCID rates were highest in children under 5 years, then in adults aged 70+ years. Rates increased in all age groups, though particularly in adults 70+ years of age (Figure 7).

However, the steep increase in CCID hospitalisation rates for adults 70+ reflects their increase in all-cause hospitalisation rates. Figure 8 shows CCID hospitalisation rates as a proportion of all-cause hospitalisations. While CCIDs have increased for all age groups, the absolute increase was greatest in children under 5 years, for whom CCIDs went from 44.1 (43.7-44.6) percent of hospitalisations in the 1989 to 1993 period, to 56.2 (55.8-56.6) percent of hospitalisations in the 2004 to 2008 period. For adults 70+ they increased from 8.0 (8.0-8.1) percent in the 1989 to 1993 period, to 14.6 (14.6-14.6) percent in 2004 to 2008.

Figure 7. Five-yearly CCID hospitalisation rates by age group

[see Table 19 for data]

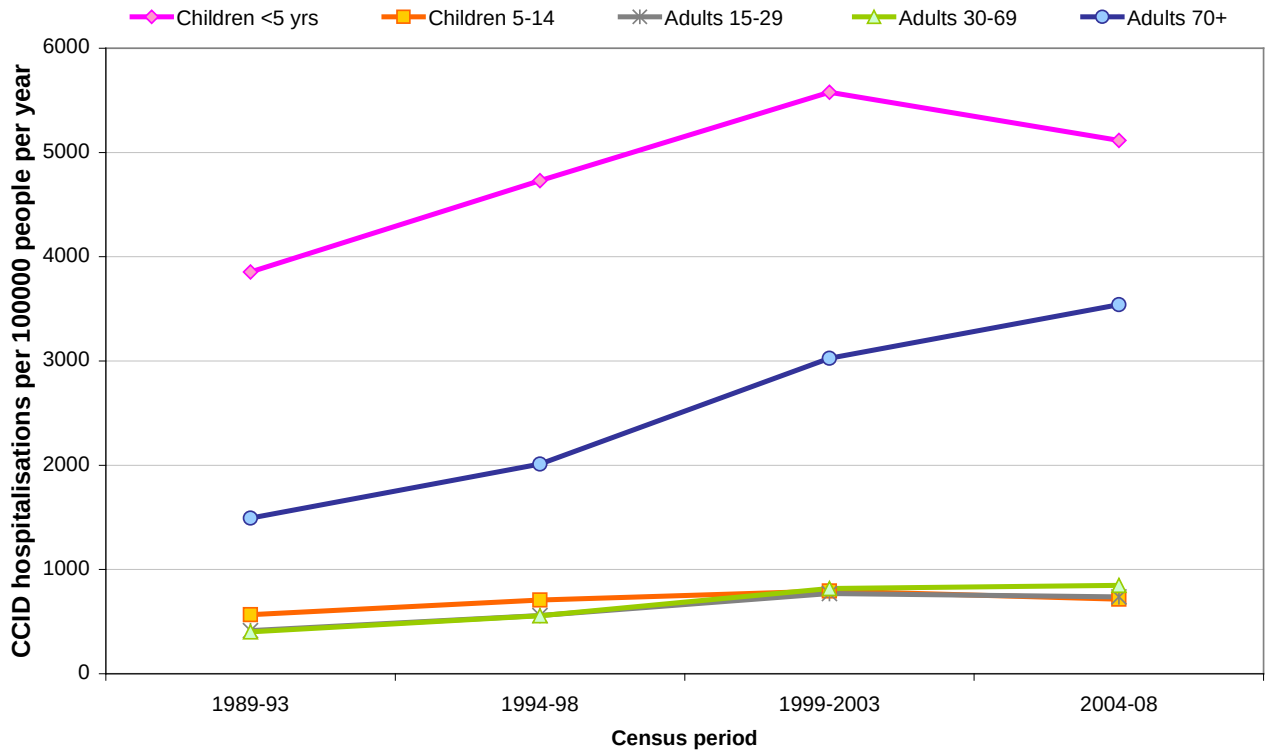


Figure 8. **CCIDs as a percentage of all-cause hospitalisations, by age group, for 5-year periods from 1989 to 2008**

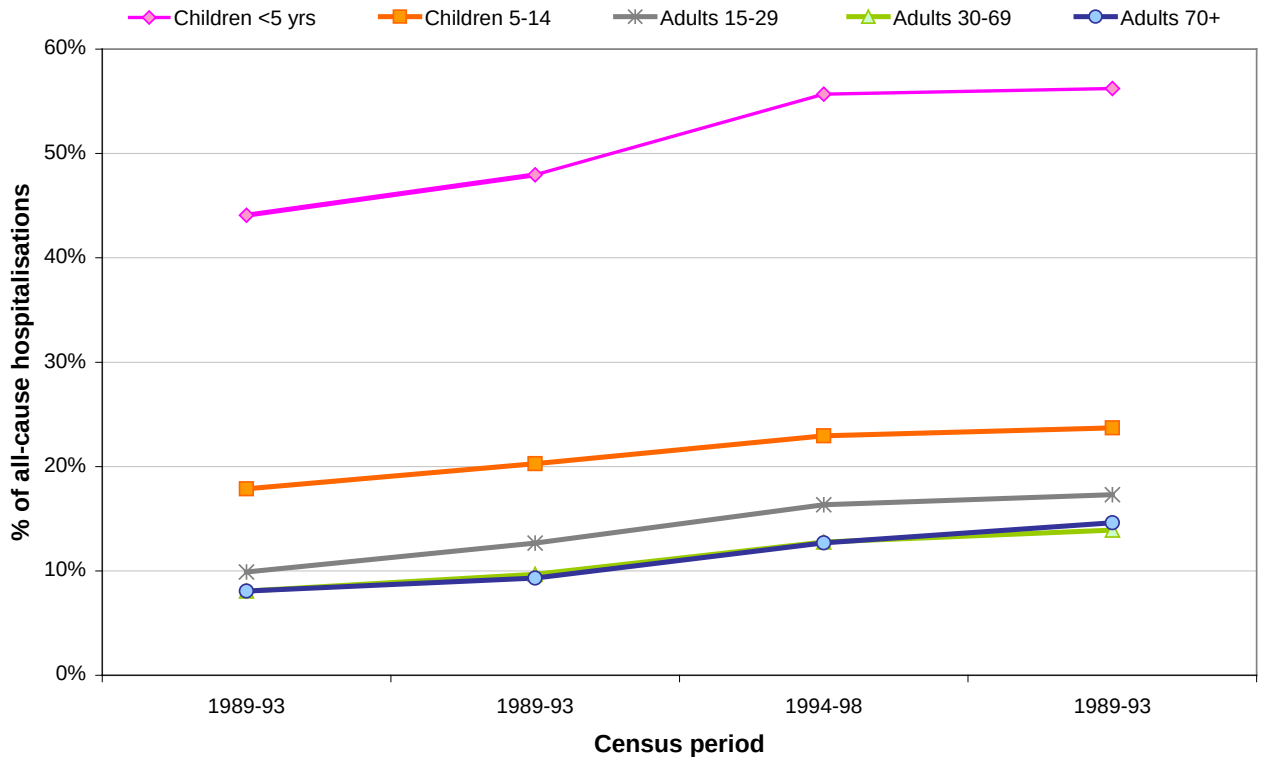
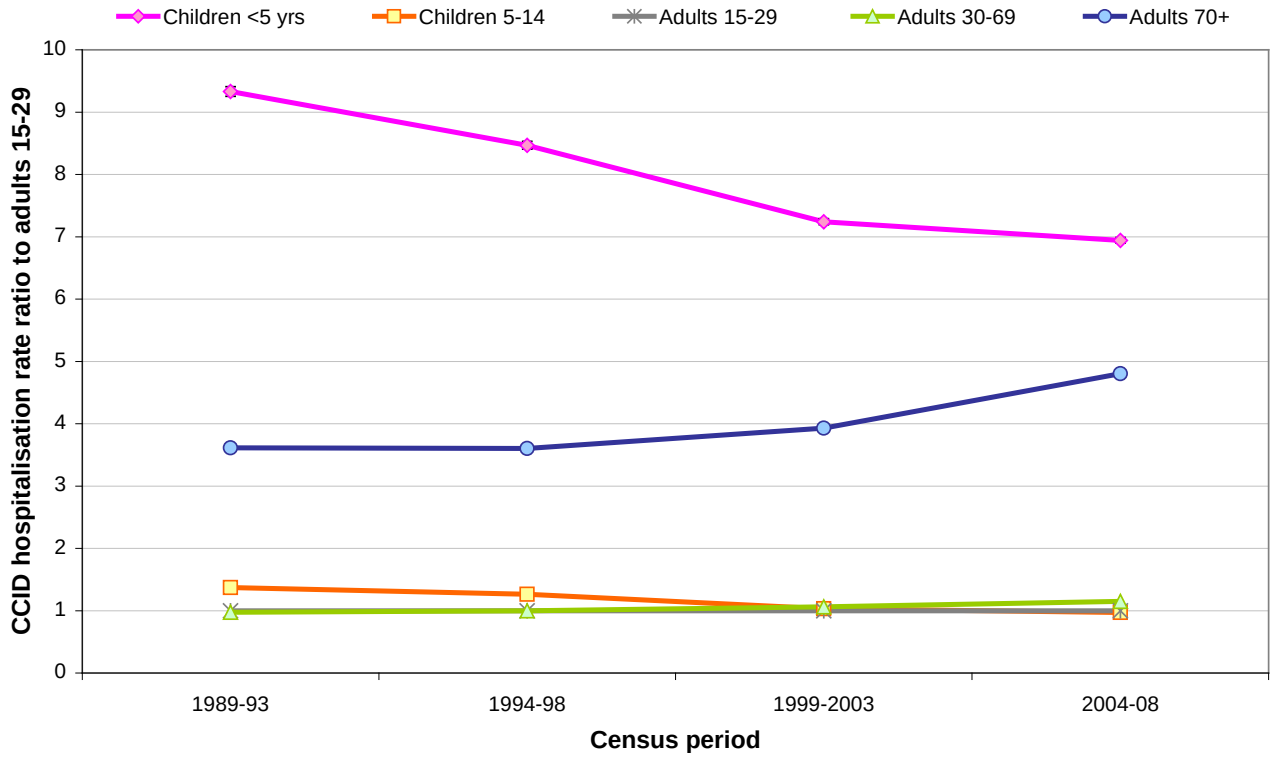


Figure 9. **Ratio of CCID hospitalisation rate by age group to CCID hospitalisation rates for adults 15-29, for 5-year periods from 1989 to 2008**

[see Table 20 for data]



Relative to the 15 to 29-year age group, the greatest increase in CCID rate ratios was for those aged 70+ (Figure 9), whose rate ratio increased by 32.9 (31.6-34.2) percent. Rate ratios for children less than 5 years were still highest in comparison to the 15 to 29-year reference group, but gradually became closer to the reference group rate.

Thus, the greatest concentration of CCID was found in the under-5 age group, but if current trends continue, their predominance will drop over coming decades, and may be overtaken by the 70+ age group.

4.6. Ethnic distribution of CCIDs

These results compare the rates of CCIDs in different ethnic groups. They investigate how the ethnic distribution of CCIDs, and infectious diseases more generally, differ from non-infectious-disease hospitalisations. This analysis also assesses how this distribution has changed over time, to see if CCIDs have become relatively more concentrated in any particular ethnic group.

4.6.1. Contribution of infectious diseases

Infectious disease rates and standardised rate ratios by ethnicity are shown in Table 4, with SRDs in Table 5. Between the first and last census periods, age-standardised infectious disease hospitalisation rates have increased by 56.6 (95% CI 55.8-57.5) percent for European/Other, 70.7 (95%CI 68.0-73.4) percent for Māori, and 84.3 (95%CI 79.1-89.6) percent for Pacific peoples. In the most recent period, infectious disease accounted for 23.6 percent of hospitalisations for European/Other, 29.1 percent for Māori and 32.9 percent for Pacific peoples.

Standardised rate differences (hospitalisations per 100,000 per year) for infectious disease have also increased over the study period. In 1989-1993, the Māori infectious disease hospitalisation rate was 955.8 higher than the European/Other rate. By 2004-2008 this difference had increased to 1765.2, an increase of 84.7 (95%CI 78.9-90.7) percent. For Pacific peoples, the rate difference from European/Other increased from 976.1 to 2014.1, an increase of 111.3 (95%CI 99.9-123.7) percent.

4.6.2. CCID hospitalisation rates and relative risks

Hospitalisation rates for CCIDs have increased markedly for all ethnic groupings over the 20 years from 1989 to 2008 (Figure 10). Age-standardised European/Other CCID hospitalisation rates per 100,000 people were 84.3 (95%CI 81.5-87.1) percent higher in 2008 than in 1989; Māori rates were 109.9 (95%CI 101.4-118.8) percent higher; and Pacific rates were 139.0 (95%CI 122.5-156.7) percent higher. By the 2004 to 2008 period, CCID accounted for 16.8 percent of hospitalisations for European/Other, 22.5 percent of Māori hospitalisations, and 25.5 percent of Pacific hospitalisations.

Five-yearly SRRs (Figure 14) suggest widening ethnic inequalities over the 20-year period 1989 to 2009. Despite some drops in the intervening years, the SRR for Maori CCID rates in relation to European/Other rose from 2.22 in 1989 to 1993, to 2.38 in 2004-2008, an increase of 6.9 (95%CI 5.9-7.9) percent; while the Pacific SRR rose from 2.25 to 2.61, an increase of 16.0 (95%CI 14.1-17.9) percent.

As CCIDs make up the majority of infectious disease hospitalisations, increases in SRRs for infectious disease are echoed in SRDs for CCIDs. The 1989-1993 CCID hospitalisation rate (hospitalisations per 100,000 per year) for Maori was 797.9 higher than the European/Other rate. By 2004-2008 this difference had increased to 1458.6, an increase of 82.8 (95%CI 76.9-89.0) percent. For Pacific peoples, the rate difference from European/Other increased from 812.8.1 to 1701.0, an increase of 109.3 (95%CI 97.4-122.3) percent.

Table 4. Average annual rate and SRRs of all-cause hospitalisations, total infectious diseases, CCIDs and non-CCIDs, by ethnic group, for 5-year periods from 1989 to 2008 (age standardised to 2006 Census). [Figure 13, Figure 14, Figure 15]

Census period	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008		% increase in rate	
	Age-std rate†	SRR (95% CI)	Age-std rate†	SRR (95% CI)	Age-std rate†	SRR (95% CI)	Age-std rate†	SRR (95% CI)	1989-1993 to 2004-2008 (95% CI)	
All-cause hospitalisations										
Euro/Other	5744.3	Ref	6629.1	Ref	6862.9	Ref	6317.1	Ref	10.0	(9.7-10.2)
Māori	8970.4	1.56 (1.56-1.57)	9220.8	1.39 (1.39-1.40)	11277.3	1.64 (1.64-1.65)	11210.2	1.77 (1.77-1.78)	25.0	(24.0-26.0)
Pacific	7142.7	1.24 (1.23-1.25)	8335.1	1.26 (1.25-1.26)	10989.6	1.60 (1.59-1.61)	10804.5	1.71 (1.70-1.72)	51.3	(49.0-53.7)
Total IDs										
Euro/Other	952.7	Ref	1247.8	Ref	1469.8	Ref	1491.9	Ref	56.6	(55.8-57.5)
Māori	1908.5	2.00 (1.99-2.02)	2127.4	1.70 (1.69-1.72)	3056.8	2.08 (2.07-2.09)	3257.2	2.18 (2.17-2.19)	70.7	(68.0-73.4)
Pacific	1928.8	2.02 (2.00-2.05)	2443.8	1.96 (1.94-1.98)	3540.0	2.41 (2.39-2.43)	3554.4	2.38 (2.37-2.40)	84.3	(79.1-89.6)
CCIDs										
Euro/Other	651.4	Ref	875.6	Ref	1089.6	Ref	1058.8	Ref	62.5	(61.5-63.6)
Māori	1449.2	2.22 (2.20-2.25)	1612.1	1.84 (1.83-1.86)	2431.2	2.23 (2.22-2.25)	2517.3	2.38 (2.36-2.39)	73.7	(70.6-76.9)
Pacific	1464.1	2.25 (2.21-2.28)	1873.2	2.14 (2.11-2.16)	2815.4	2.58 (2.56-2.61)	2759.8	2.61 (2.59-2.63)	88.5	(82.4-94.8)
Non-CCIDs										
Euro/Other	301.3	Ref	372.2	Ref	380.3	Ref	433.2	Ref	43.7	(42.4-45.1)
Māori	459.3	1.52 (1.50-1.55)	515.2	1.38 (1.37-1.40)	625.6	1.65 (1.63-1.66)	739.8	1.71 (1.69-1.73)	61.1	(56.0-66.3)
Pacific	464.6	1.54 (1.50-1.59)	570.6	1.53 (1.50-1.56)	724.6	1.91 (1.87-1.94)	794.6	1.83 (1.81-1.86)	71.0	(61.6-81.0)

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census
Ref=reference group

Table 5. Standardised rate differences for all-cause hospitalisations, total infectious diseases, and CCIDs, by ethnic group, for 5-year periods from 1989 to 2008 (age standardised to 2006 Census)

Time period	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	SRD†	95% CI	SRD†	95% CI	SRD†	95% CI	SRD†	95% CI
All-cause hospitalisations								
Euro/Other	Ref.		Ref.		Ref.		Ref.	
Māori	3226.1	(3155.1-3297.8)	2591.7	(2530.5-2653.3)	4414.3	(4348.3-4480.7)	4893.1	(4833.8-4952.6)
Pacific	1398.5	(1286.3-1512.4)	1706.0	(1609.6-1803.5)	4126.7	(4028.3-4225.9)	4487.4	(4399.9-4575.6)
Total IDs								
Euro/Other	Ref.		Ref.		Ref.		Ref.	
Māori	955.8	(925.6-986.5)	879.5	(852.1-907.3)	1587.0	(1554.2-1620.1)	1765.2	(1734.7-1796.0)
Pacific	976.1	(921.8-1031.9)	1195.9	(1147.1-1245.8)	2070.2	(2017.4-2123.8)	2062.5	(2014.1-2111.5)
CCIDs								
Euro/Other	Ref.				Ref.		Ref.	
Māori	797.9	(771.6-824.6)	736.5	(712.6-760.8)	1341.6	(1312.3-1371.2)	1458.6	(1431.7-1485.7)
Pacific	812.8	(765.3-861.8)	997.5	(954.6-1041.4)	1725.9	(1678.8-1773.8)	1701.0	(1658.5-1744.2)
Non-CCIDs								
Euro/Other	Ref.				Ref.		Ref.	
Māori	158.0	(143.3-173.1)	143.0	(129.8-156.6)	245.4	(230.71-260.34)	306.7	(292.2-321.4)
Pacific	163.3	(137.6-190.5)	198.4	(175.3-222.5)	344.3	(320.72-368.66)	361.4	(338.6-384.9)

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census
Ref=reference group

Within the context of all-cause hospitalisations, the pattern by ethnicity is more complex. All-cause hospitalisations have also been increasing (see Figure 10). Taking that rise into account, the increase in CCIDs, as a proportion of all-cause hospitalisations, has been broadly similar across ethnic groupings (Figure 11). For European/Other, CCIDs increased from 11.3 percent of all-cause hospitalisations in 1989 to 2003, to 16.8 percent in 2004 to 2008. For Māori, the corresponding increases were from 16.2 percent in 1989 to 2003, to 22.5 percent in 2004 to 2008, and for Pacific peoples, from 20.5 percent in 1989 to 2003, to 25.5 percent in 2004 to 2008. Here the differences in distribution of CCIDs across ethnic groups are influenced both by the overall rise in incidence of these diseases and by trends in the incidence of other causes of hospitalisation over that period. One striking ethnic difference is the much lower rise in non-infectious causes of hospitalisation for Europeans/Others over this period, relative to Māori and Pacific peoples. This change has also contributed to the increasing contribution of CCIDs to hospitalisations for Europeans/Others (when measured as a percentage of all-cause hospitalisations).

4.7. Ethnic distribution of non-CCIDs

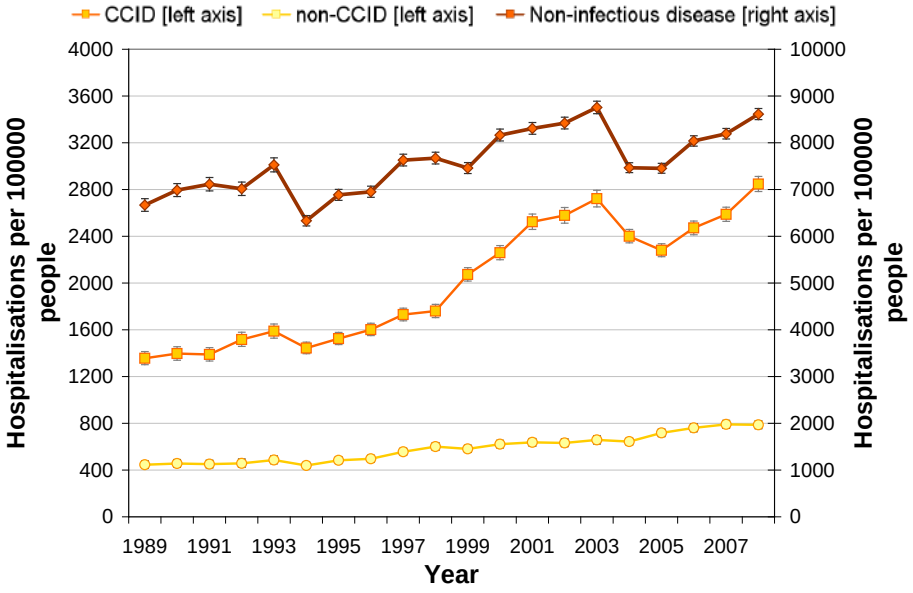
As with CCIDs, hospitalisation rates for non-CCIDs have increased between 1989 and 2008 for all ethnic groupings (Figure 10). However, the increase in non-CCIDs as a proportion of all-cause hospitalisations was not as similar across ethnic groupings as it was for CCIDs. Most notably, non-CCIDs as a proportion of all-cause hospitalisations (Figure 12) increased only a little for Pacific peoples, making up 6.8 percent of hospitalisations in 1989 and 7.5 percent in 2008. Māori and European/Other, both with proportions of 5.3 percent in 1989, have seen greater increases, taking them to 6.8 percent and 6.4 percent respectively in 2008, levels much closer to the Pacific rate.

SRRs for Māori and Pacific relative to European/Other non-CCID rates have followed different patterns (Figure 15), but started and ended at similar levels. SRRs were 1.52 and 1.54 respectively in the 1989 to 1993 period, and 1.71 and 1.83 in 2004 to 2008. This represented an increase of 12.1 (95%CI 10.3-13.9) percent for Maori, and 19.0 (95%CI 15.7-22.3) percent for Pacific peoples.

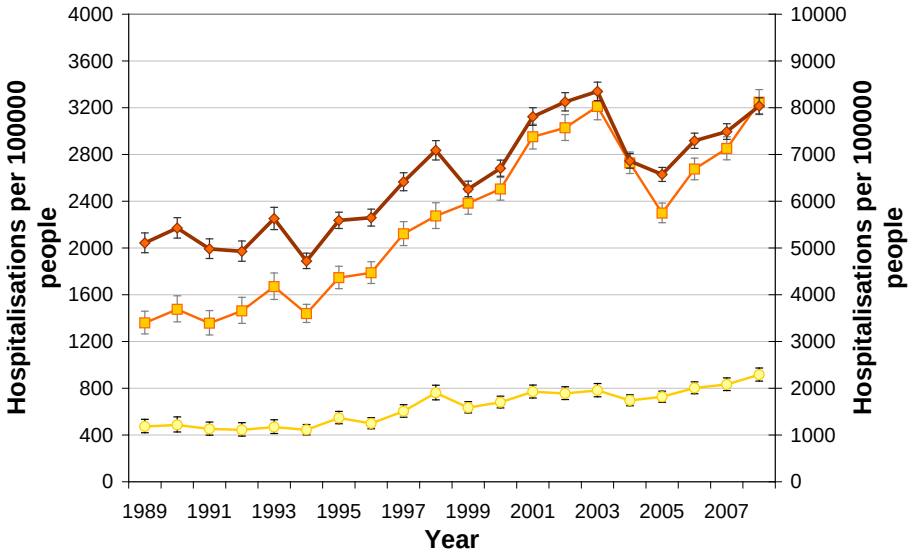
For Māori, the SRD (hospitalisations per 100,000 per year) from European/Other has almost doubled, from 158.0 to 306.7 (relative rate difference 1.94, 95%CI 1.77-2.14), while the Pacific SRD has more than doubled, from 163.3 to 361.4 (relative rate difference 2.21, 95%CI 1.90-2.63).

Figure 10. **Annual CCID, non-CCID and non-infectious disease hospitalisation rates, 1989-2008, by ethnic grouping (age standardised to 2006 Census).**

Māori



Pacific



European & Other

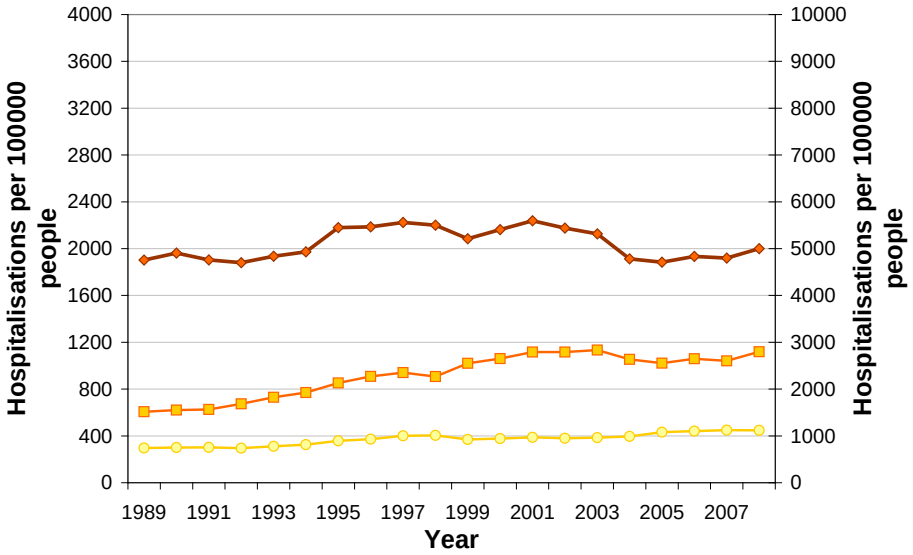


Figure 11. CCIDs as a percentage of all-cause hospitalisations, by ethnic grouping (age standardised to 2006 Census)

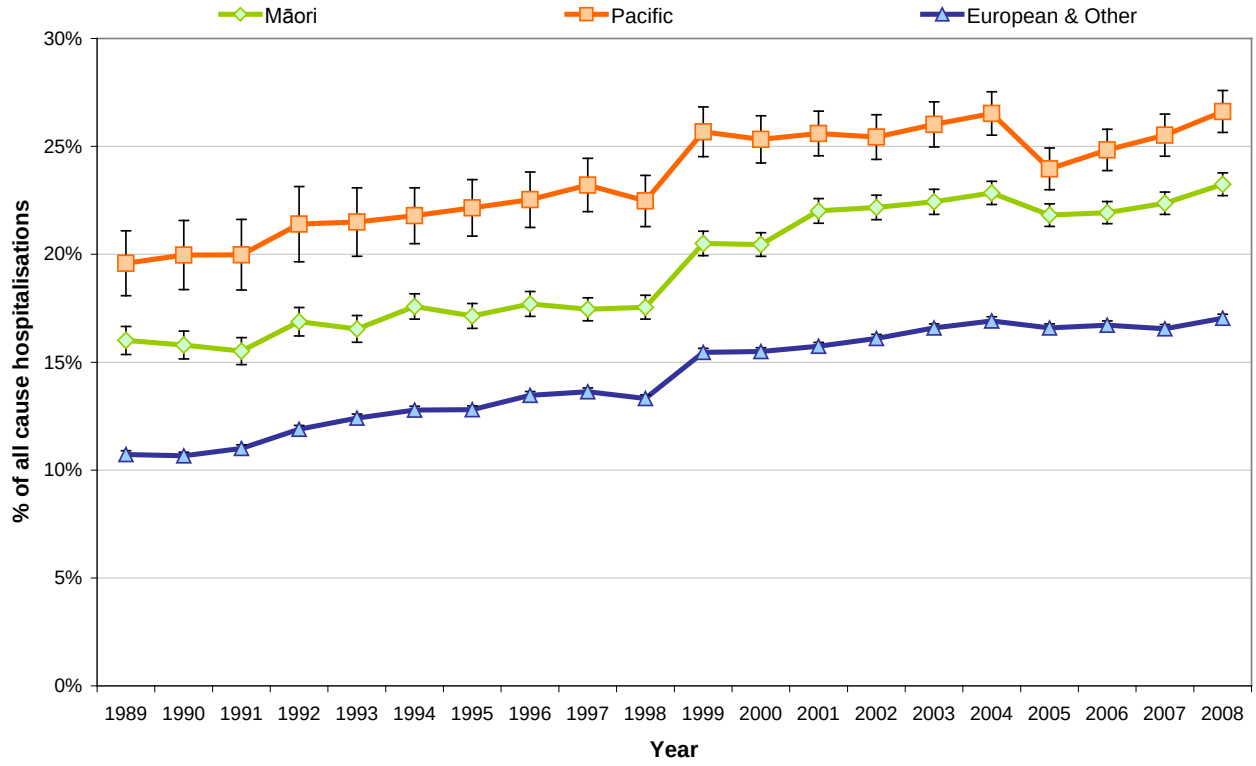


Figure 12. Non-CCIDs as a percentage of all-cause hospitalisations, by ethnic grouping (age standardised to 2006 Census)

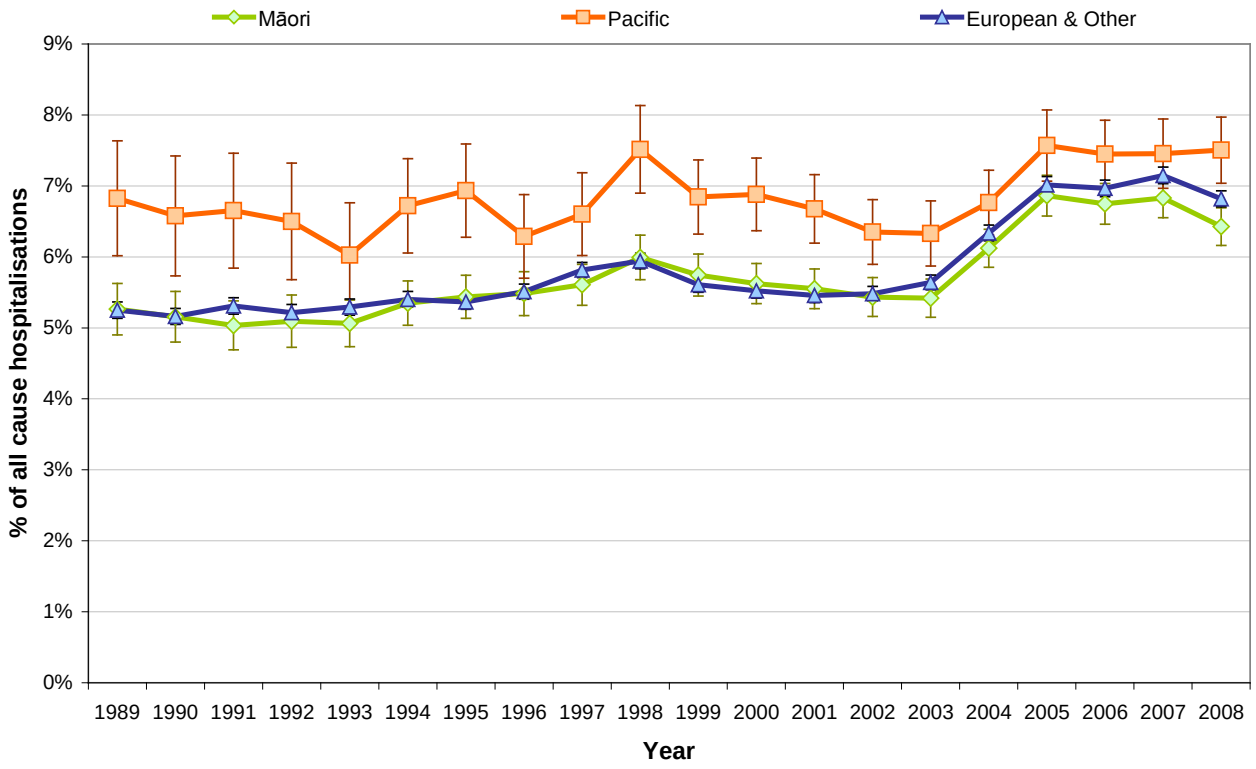


Figure 13. Ratio of Māori and Pacific ID hospitalisation rates to European/Other ID hospitalisation rates, for 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 4 for data]

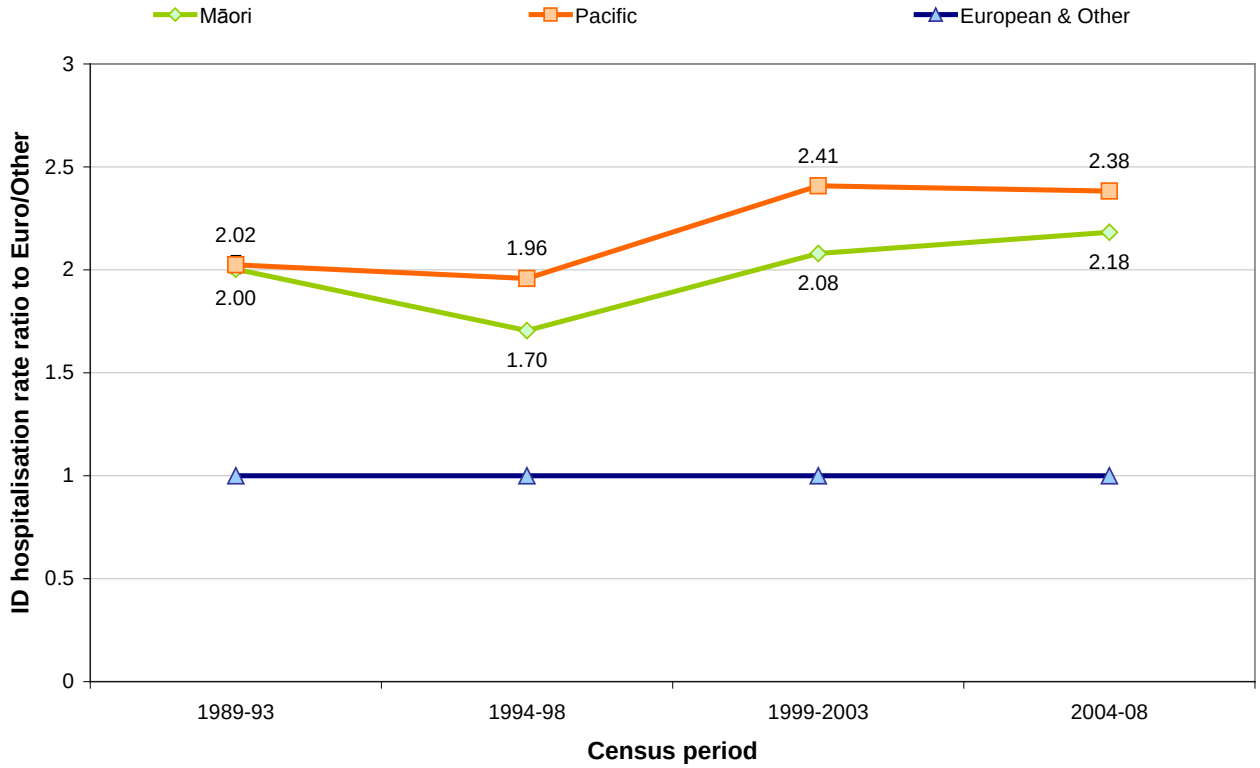


Figure 14. Ratio of Māori and Pacific CCID hospitalisation rates to European/Other CCID hospitalisation rates, for 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 4 for data]

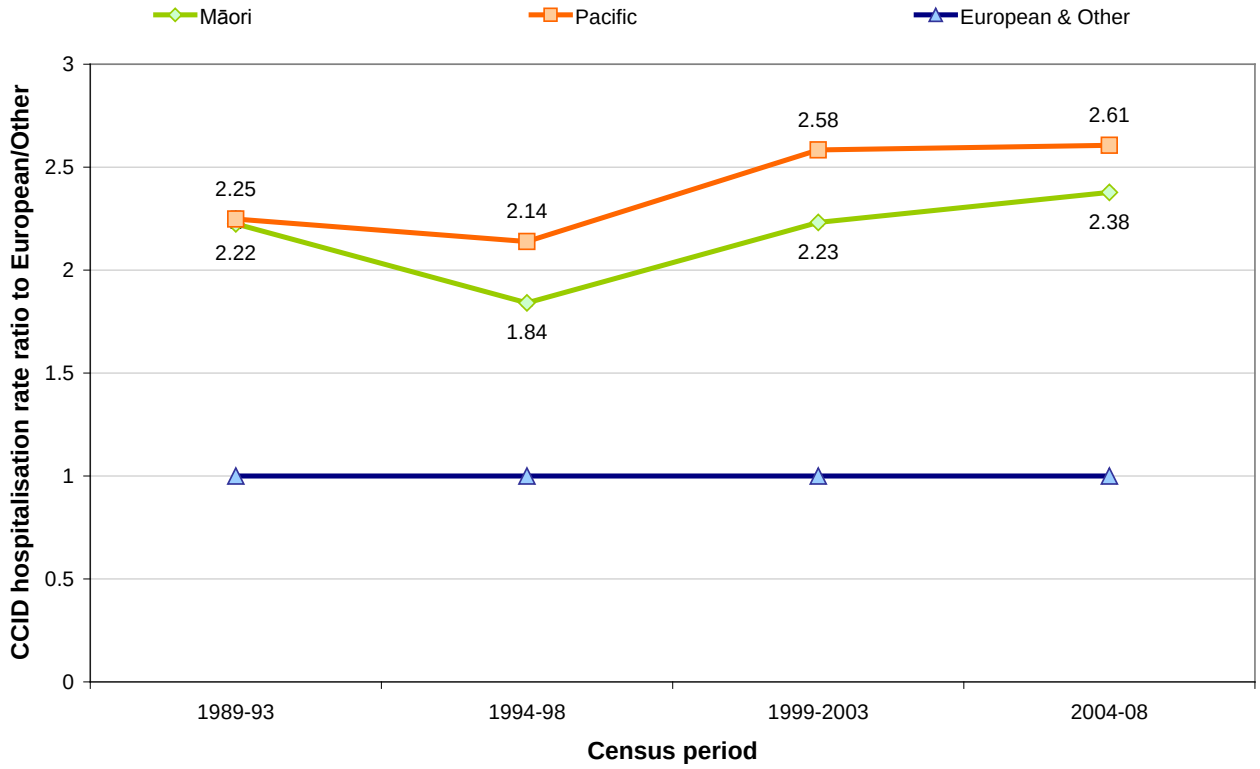
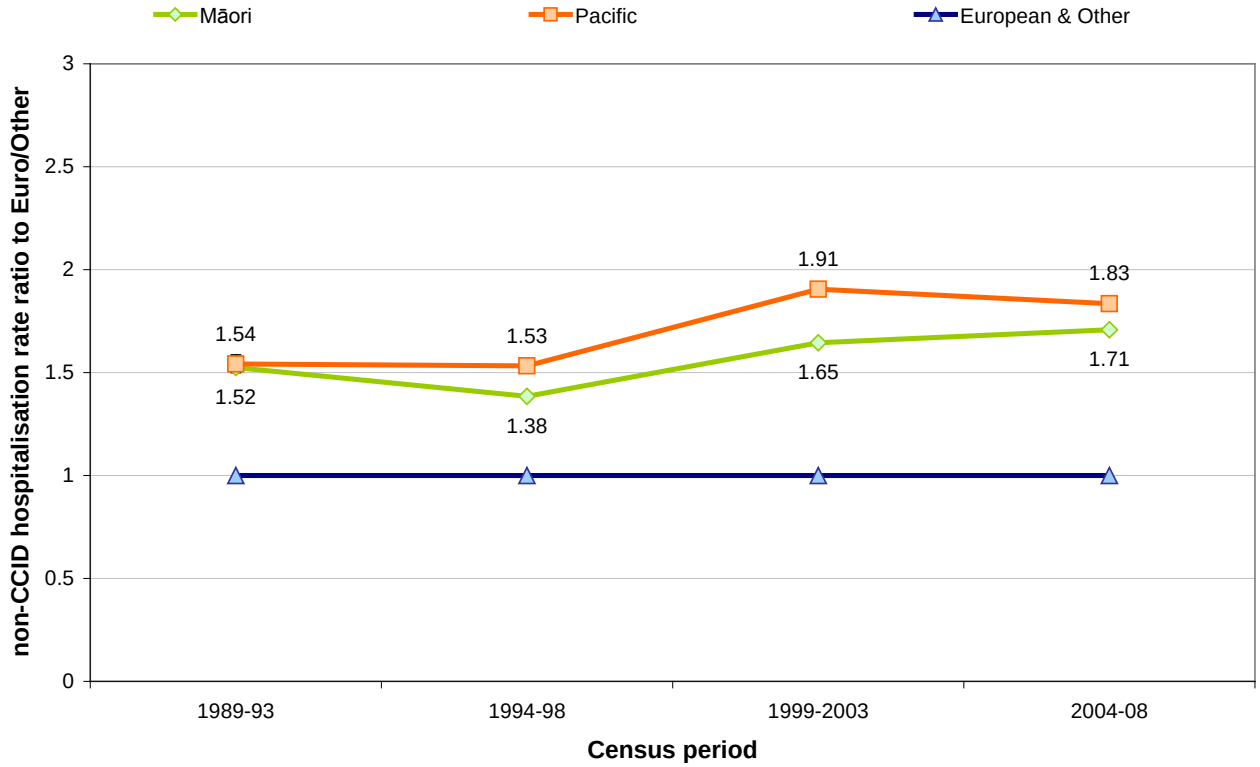


Figure 15. Ratio of Māori and Pacific non-CCID hospitalisation rates to European/Other non-CCID hospitalisation rates, for 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 4 for data]



4.8. Distribution of CCIDs and non-CCIDs by level 2 Pacific ethnicity

Overall, the distribution of Pacific CCID and non-CCID rates was driven by rates for the Samoan ethnic group, who constitute almost 50 percent of Pacific people in New Zealand. Year-by-year variation followed similar patterns for Tongans, Cook Islanders and Niueans, but showed greater volatility for Tongans, and lower overall rates for Cook Islanders and Niueans (Figure 16).

Inequalities in CCID hospitalisation rates in relation to the European/Other reference group were higher for Samoans and Tongans, and lower for Cook Islanders and Niueans, and these differences drove rate ratios for total infectious diseases.

Figure 16. Annual Pacific CCID, non-CCID and non-infectious disease hospitalisation rates, 1989-2008, by level 2 ethnic group (age standardised to 2006 Census).

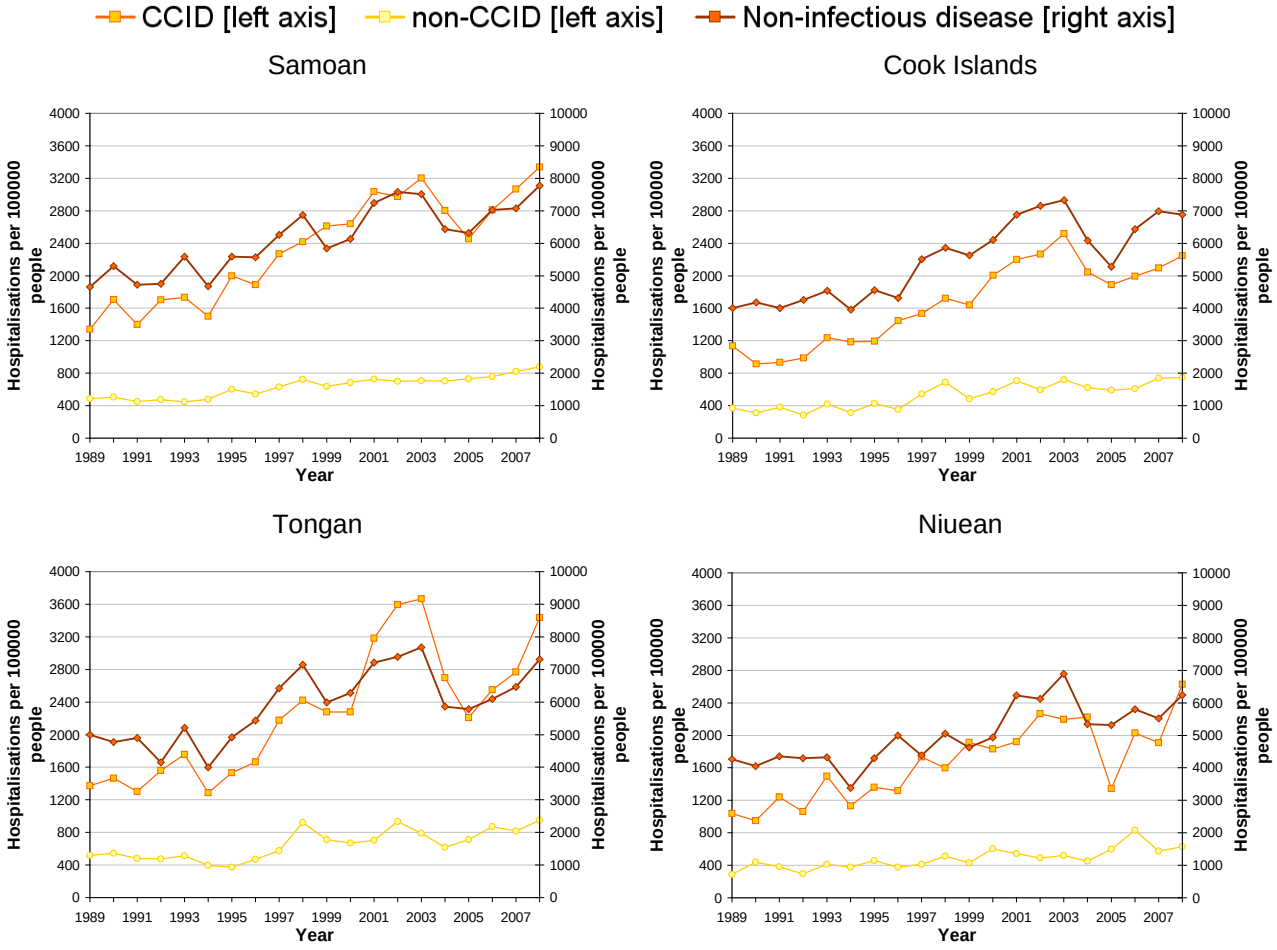


Figure 17. Ratio of Samoan, Cook Islands, Tongan and Niuean ID hospitalisation rates to European/Other ID hospitalisation rates, for 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 7 for data]

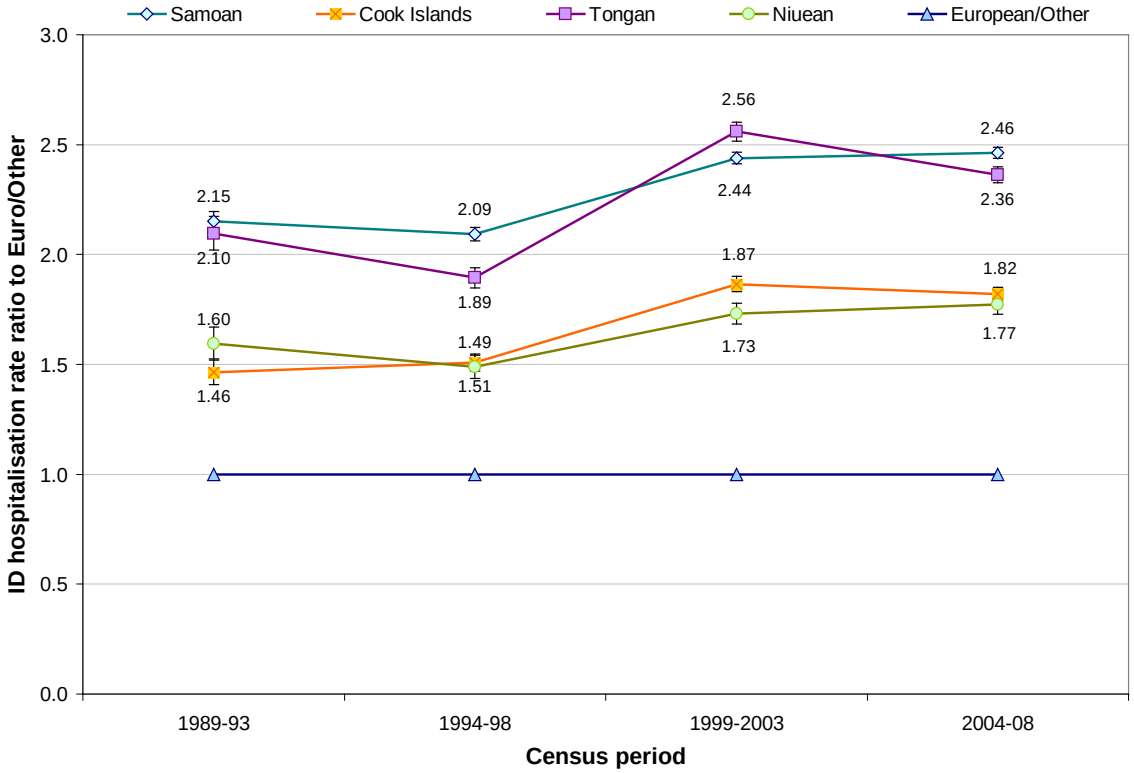


Figure 18. Ratio of Samoan, Cook Islands, Tongan and Niuean CCID hospitalisation rates to European/Other CCID hospitalisation rates, for 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 7 for data]

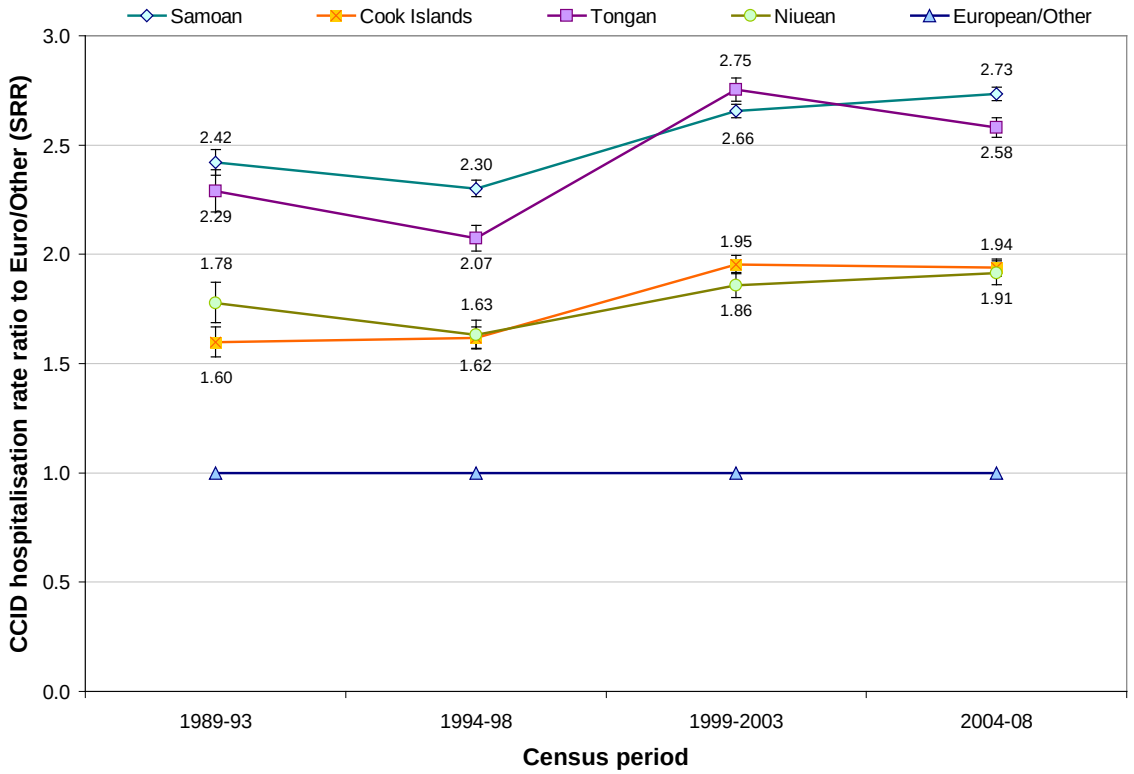


Figure 19. Ratio of Samoan, Cook Islands, Tongan and Niuean non-CCID hospitalisation rates to European/Other non-CCID hospitalisation rates, for 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 7 for data]

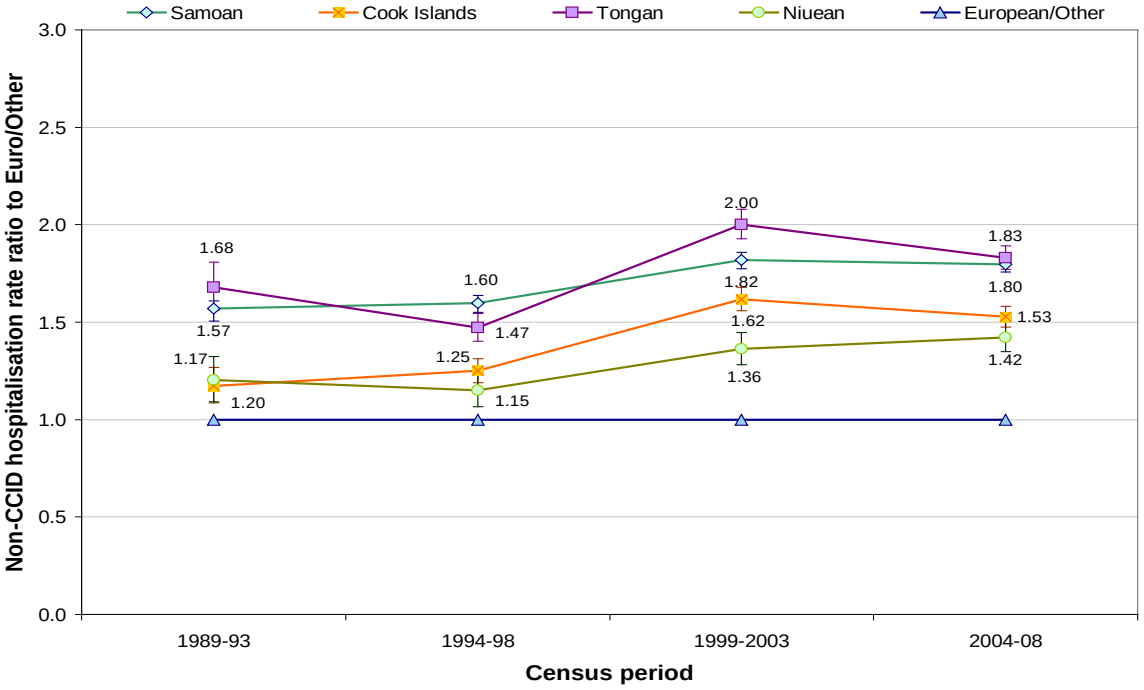


Table 6. Standardised rate differences for all-cause hospitalisations, total infectious diseases, and CCIDs, by ethnic group, for 5-year periods from 1989 to 2008 (age standardised to 2006 Census)

Census period	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	SRD†	95% CI	SRD†	95% CI	SRD†	95% CI	SRD†	95% CI
All-cause hospitalisations								
Euro/Other	Ref		Ref		Ref		Ref	
Samoan	1309.5	(1139.3-1483.9)	1773.7	(1630.5-1919.4)	3582.6	(3443.0-3724.1)	4278.3	(4149.3-4408.9)
Cook Islands	1057.2	(768.1-1359.2)	1317.3	(1080.7-1561.0)	3804.4	(3575.8-4038.0)	3508.3	(3322.6-3697.7)
Tongan	-153.8	(-375.0-76.4)	92.0	(-97.3-286.8)	2495.9	(2295.4-2700.8)	2729.6	(2547.3-2915.6)
Niuean	34.5	(-249.9-333.5)	-351.6	(-604.0--88.8)	1441.7	(1174.3-1718.0)	1971.5	(1723.3-2227.3)
Total infectious diseases								
Euro/Other	Ref		Ref		Ref		Ref	
Samoan	1096.3	(1008.9-1187.5)	1362.5	(1287.5-1439.8)	2115.3	(2037.2-2195.2)	2181.1	(2107.1-2256.7)
Cook Islands	1044.4	(899.4-1200.9)	1115.4	(999.0-1237.8)	2291.6	(2162.2-2425.5)	2031.9	(1924.5-2142.7)
Tongan	441.3	(337.5-553.5)	633.5	(536.0-736.3)	1272.5	(1169.4-1379.7)	1223.3	(1127.8-1322.3)
Niuean	567.2	(430.1-717.9)	608.6	(477.5-749.7)	1073.7	(934.6-1220.8)	1151.8	(1018.5-1292.2)
CCIDs								
Euro/Other	Ref		Ref		Ref		Ref	
Samoan	924.8	(847.4-1006.1)	1139.7	(1074.0-1207.6)	1803.8	(1733.7-1875.7)	1835.9	(1770.2-1903.1)
Cook Islands	839.7	(715.4-975.3)	940.0	(837.0-1049.1)	1910.5	(1795.6-2030.0)	1672.4	(1578.7-1769.4)
Tongan	389.2	(301.3-485.3)	540.3	(454.5-631.7)	1037.4	(945.7-1133.3)	994.9	(911.5-1081.9)
Niuean	506.2	(388.1-637.6)	552.7	(438.6-676.7)	936.1	(812.2-1068.1)	968.7	(853.6-1090.8)
Non-CCIDs								
Euro/Other	Ref		Ref		Ref		Ref	
Samoan	171.5	(132.2-214.4)	222.8	(187.3-260.6)	311.5	(277.7-347.0)	345.3	(311.7-380.2)
Cook Islands	204.7	(133.8-287.2)	175.4	(123.1-233.1)	381.0	(323.4-443.4)	359.5	(308.1-414.4)
Tongan	52.1	(-0.1-113.4)	93.1	(48.6-142.4)	235.1	(189.4-284.4)	228.4	(183.1-277.0)
Niuean	61.1	(-4.0-140.4)	55.9	(-5.2-127.2)	137.6	(77.3-205.7)	183.0	(118.4-255.3)

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census
Ref=reference group

Table 7. Average annual rate and SRRs of all-cause hospitalisations, total infectious diseases, and CCIDs, by Pacific level 2 ethnic group, for 5-year periods from 1989 to 2008 (age standardised to 2006 Census). [Figure 17, Figure 18, Figure 19]

Census period	1989-93		1994-98		1999-2003		2004-08	
	Age-std Rate†	Age-std RR (95%CI)	Age-std Rate†	Age-std RR (95%CI)	Age-std Rate†	Age-std RR (95%CI)	Age-std Rate†	Age-std RR (95%CI)
Total hospitalisations								
Euro/Other	5744.3	Ref	6629.1	Ref	6862.9	Ref	6317.1	Ref
Samoan	7053.8	1.23 (1.21 - 1.24)	8402.9	1.27 (1.26 - 1.28)	10445.5	1.52 (1.51 - 1.53)	10595.4	1.68 (1.67 - 1.69)
Cook Islands	5590.4	0.97 (0.95 - 0.99)	6721.2	1.01 (1.00 - 1.03)	9358.8	1.36 (1.35 - 1.38)	9046.7	1.43 (1.42 - 1.45)
Tongan	6801.5	1.18 (1.16 - 1.21)	7946.4	1.20 (1.18 - 1.22)	10667.3	1.55 (1.54 - 1.57)	9825.5	1.56 (1.54 - 1.57)
Niuean	5778.7	1.01 (0.98 - 1.03)	6277.5	0.95 (0.93 - 0.97)	8304.6	1.21 (1.19 - 1.23)	8288.6	1.31 (1.29 - 1.33)
Total IDs								
Euro/Other	952.7	Ref	1247.8	Ref	1469.8	Ref	1491.9	Ref
Samoan	2049.0	2.15 (2.11 - 2.20)	2610.4	2.09 (2.06 - 2.12)	3585.2	2.44 (2.41 - 2.47)	3673.1	2.46 (2.44 - 2.49)
Cook Islands	1394.0	1.46 (1.41 - 1.52)	1881.3	1.51 (1.47 - 1.55)	2742.3	1.87 (1.83 - 1.90)	2715.3	1.82 (1.79 - 1.85)
Tongan	1997.1	2.10 (2.02 - 2.17)	2363.2	1.89 (1.85 - 1.94)	3761.4	2.56 (2.52 - 2.60)	3523.8	2.36 (2.33 - 2.40)
Niuean	1519.9	1.60 (1.52 - 1.67)	1856.5	1.49 (1.44 - 1.54)	2543.5	1.73 (1.68 - 1.78)	2643.7	1.77 (1.73 - 1.82)
CCIDs								
Euro/Other	651.4	Ref	875.6	Ref	1089.6	Ref	1058.8	Ref
Samoan	1576.1	2.42 (2.36 - 2.48)	2015.3	2.30 (2.26 - 2.34)	2893.4	2.66 (2.62 - 2.69)	2894.7	2.73 (2.70 - 2.77)
Cook Islands	1040.6	1.60 (1.53 - 1.67)	1416.0	1.62 (1.57 - 1.67)	2127.0	1.95 (1.91 - 1.99)	2053.7	1.94 (1.90 - 1.98)
Tongan	1491.1	2.29 (2.19 - 2.39)	1815.6	2.07 (2.02 - 2.13)	3000.1	2.75 (2.70 - 2.81)	2731.2	2.58 (2.54 - 2.62)
Niuean	1157.5	1.78 (1.69 - 1.87)	1428.3	1.63 (1.57 - 1.70)	2025.7	1.86 (1.80 - 1.92)	2027.5	1.91 (1.86 - 1.97)
Non-CCIDs								
Euro/Other	301.3	Ref	372.2	Ref	380.3	Ref	433.2	Ref
Samoan	472.9	1.57 (1.50 - 1.64)	595.0	1.60 (1.55 - 1.65)	691.8	1.82 (1.78 - 1.86)	778.41	1.80 (1.76 - 1.84)
Cook Islands	353.5	1.17 (1.09 - 1.27)	465.3	1.25 (1.19 - 1.31)	615.3	1.62 (1.56 - 1.68)	661.59	1.53 (1.48 - 1.58)
Tongan	506.1	1.68 (1.56 - 1.81)	547.6	1.47 (1.40 - 1.54)	761.3	2.00 (1.93 - 2.08)	792.64	1.83 (1.77 - 1.89)
Niuean	362.4	1.20 (1.09 - 1.32)	428.1	1.15 (1.07 - 1.24)	517.8	1.36 (1.28 - 1.45)	616.21	1.42 (1.35 - 1.50)

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census
Ref=reference group

4.9. Ethnic distribution of CCIDs for children

The following section shows the distribution of infectious disease and CCIDs for the child population less than 5 years of age. This population has the highest rates of hospitalisation for infectious diseases, being equivalent to 5.5 percent of the population each year (Table 8). By 2004 to 2008 these diseases accounted for 60.5 percent of hospitalisations (Table 9) compared with 25.8 percent for the total population (Table 3). Infectious disease hospitalisations are largely CCIDs (92.8 percent) in the under 5 age group, which is a much higher proportion than in the total population (73.5 percent).

Over the 1989-93 to 2004-08 period, the rate of ID hospitalisations rose 33.6 percent for children under 5 years (Table 9), which was less than the 69 percent rise seen in the total population. The reason appears to be a much smaller rise in the incidence of respiratory infections over this period compared with the total population.

Inequalities in Infectious Disease hospitalisation rates in relation to the European/Other reference group were somewhat lower than for the population as a whole in earlier time periods (1989-93, 1994-98) but increased marked in the subsequent 10 years (Figure 20). By 2000-08, infectious diseases accounted for 54.9 percent of hospitalisations for European/Other children less than 5 years, 65.1 percent of hospitalisations for Māori children, and 68.9 percent of hospitalisations for Pacific children.

Table 8. All-cause hospitalisation, infectious disease, non-CCID and CCID (and categories of CCID) hospitalisation numbers and rates for under-5 year olds, in 5-year periods, 1989 to 2008

Census period	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	No.	Age-std rate[†]	No.	Age-std rate[†]	No.	Age-std rate[†]	No.	Age-std Rate[†]
All-cause hospitalisations	121153	8742.8	137860	9861.2	135646	10018.2	125161	9100.1
		(8693.7-8792.2)		(9809.3.7-9913.4)		(9965.1-10071.7)		(9049.8- 9150.7)
Total infectious diseases	57148	4124.0	71167	5090.6	81294	6004.0	75779	5509.7
		(4090.3-4257.9)		(5053.4 - 5128.2)		(5962.9 - 6045.4)		(5470.6 - 5549.0)
Non-CCIDs	3740	269.9	5050	361.2	5774	426.4	5412	393.5
		(261.4- 278.7)		(351.4 - 371.3)		(415.6 - 437.6)		(383.1 - 404.1)
Total CCIDs	53408	3854.1	66117	4729.4	75520	5577.6	70367	5116.2
		(3821.6-3886.9)		(4693.5-4765.6)		(5538.0 - 5617.5)		(5078.5 - 5154.1)
▪ Respiratory	38935	2809.7	43286	3096.3	47395	3500.4	43043	3129.5
		(2781.9-2837.7)		(3067.2-3125.6)		(3469.0-3532.1)		(3100.1-3159.2)
▪ Enteric	5652	407.9	10445	747.1	11828	873.6	10957	796.7
		(397.4-418.6)		(732.9 - 761.6)		(858.0 - 889.5)		(781.9 - 811.7)
▪ Skin	4216	304.2	5539	396.2	7749	572.3	8880	645.6
		(295.2 - 313.6)		(385.9 - 406.8)		(559.7 - 585.2)		(632.3 - 659.2)
▪ Other CCID	4605	332.3	6847	489.8	8548	631.3	7487	544.4
		(322.9-342.1)		(478.3 - 501.5)		(618.1 - 644.8)		(532.2 - 556.8)

[†] Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

Table 9. **All-cause hospitalisations, infectious diseases, non-CCIDs and CCIDs (and categories of CCIDs), for under-5 year olds, as a percentage of total hospitalisations, in 5-year periods, 1989 to 2008**

	% of total hospitalisations (95% CI)								% increase in rate	
Census period	**1989 to 1993**		**1994 to 1998**		**1999 to 2003**		**2004 to 2008**		**1989-1993 to 2004-2008 (95% CI)**	
All-cause hospitalisations	100.0		100.0		100.0		100.0		4.1	(3.5-4.7)
Total IDs	47.2	(46.8-47.6)	51.6	(51.2 -52.0)	59.9	(59.5-60.3)	60.5	(60.1-61.0)	33.6	(32.5-34.7)
Non-CCIDs	3.1	(3.0 - 3.2)	3.7	(3.6-3.8)	4.3	(4.1-4.4)	4.3	(4.2-4.4)	45.8	(41.2-50.5)
Total CCIDs	44.1	(43.7 - 44.5)	48.0	(47.6 -48.3)	55.7	(55.3-56.1)	56.2	(55.8-56.6)	32.7	(31.6-33.9)
▪ Respiratory	32.1	(31.8 -32.5)	31.4	(31.1-31.7)	34.9	(34.6-35.3)	34.4	(34.1-34.7)	11.4	(10.3-12.5)
▪ Enteric	4.7	(4.5 -4.8)	7.6	(7.4- 7.7)	8.7	(8.6-8.9)	8.8	(8.6-8.9z)	95.3	(90.3-100.5)
▪ Skin	3.5	(3.4 - 3.6)	4.0	(3.9-4.1)	5.7	(5.6-5.8)	7.1	(6.9-7.2)	112.2	(105.9-118.7)
▪ Other CCID	3.8	(3.7 - 3.9)	5.0	(4.9-5.1)	6.3	(6.2-6.4)	6.0	(5.8-6.1)	63.8	(59.1-68.6)

Figure 20. **Ratio of Māori and Pacific ID hospitalisation rates to European/Other ID hospitalisation rates, for under-5 year olds, in 5-year periods from 1989 to 2008 (age standardised to 2006 census).**

[see Table 21 for data]

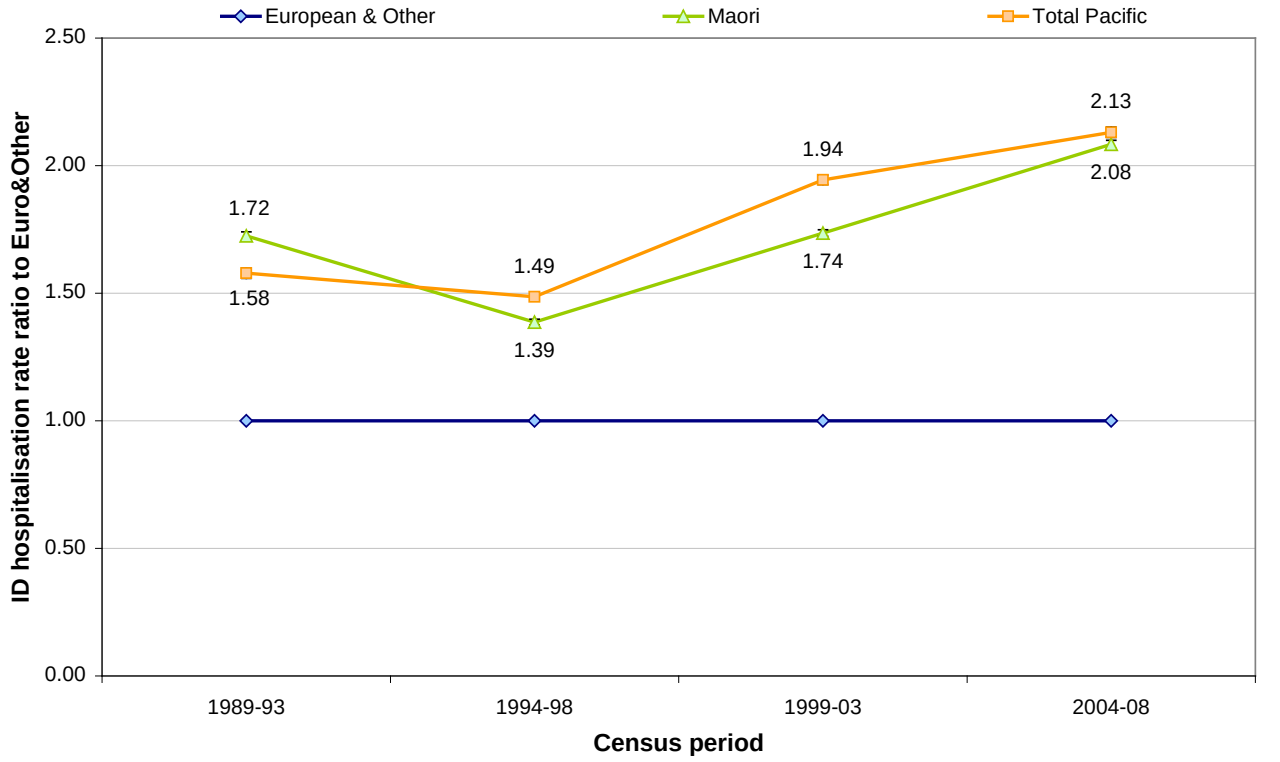


Figure 21. Ratio of Māori and Pacific CCID hospitalisation rates to European/Other CCID hospitalisation rates, for under-5 year olds, in 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 21 for data]

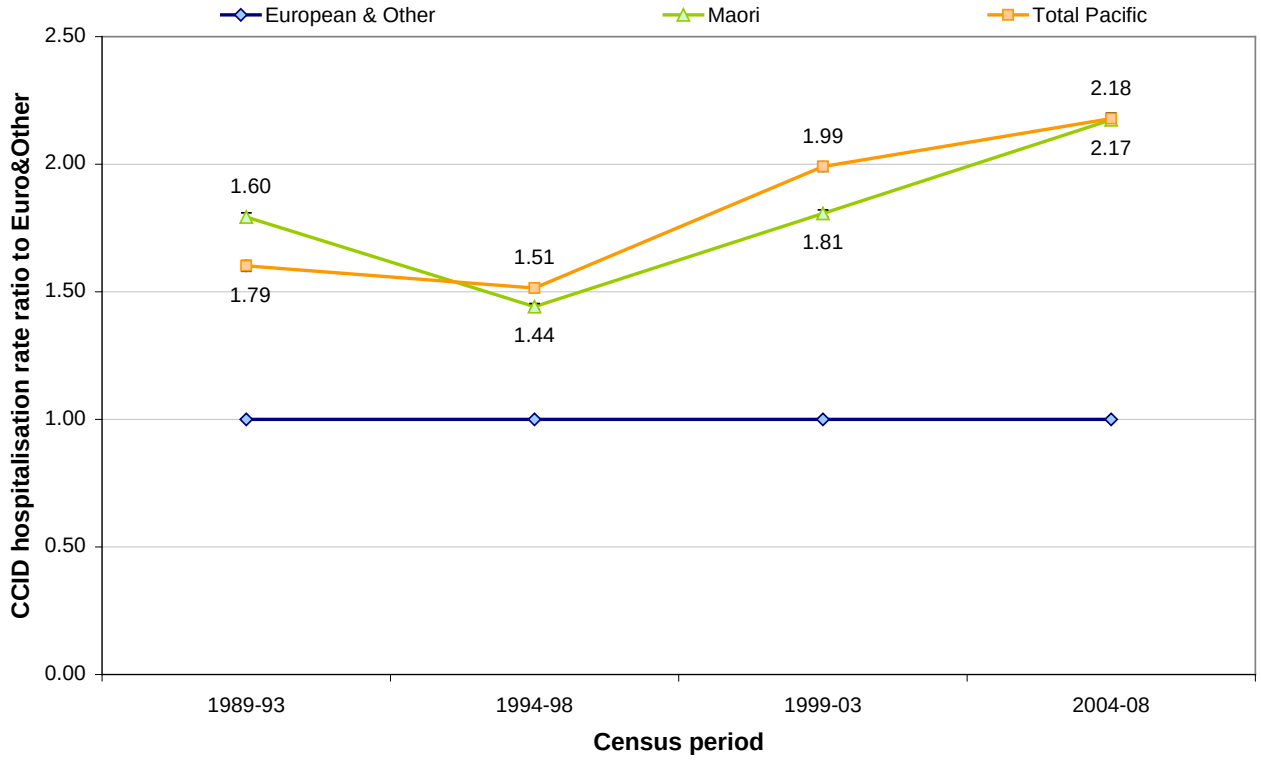
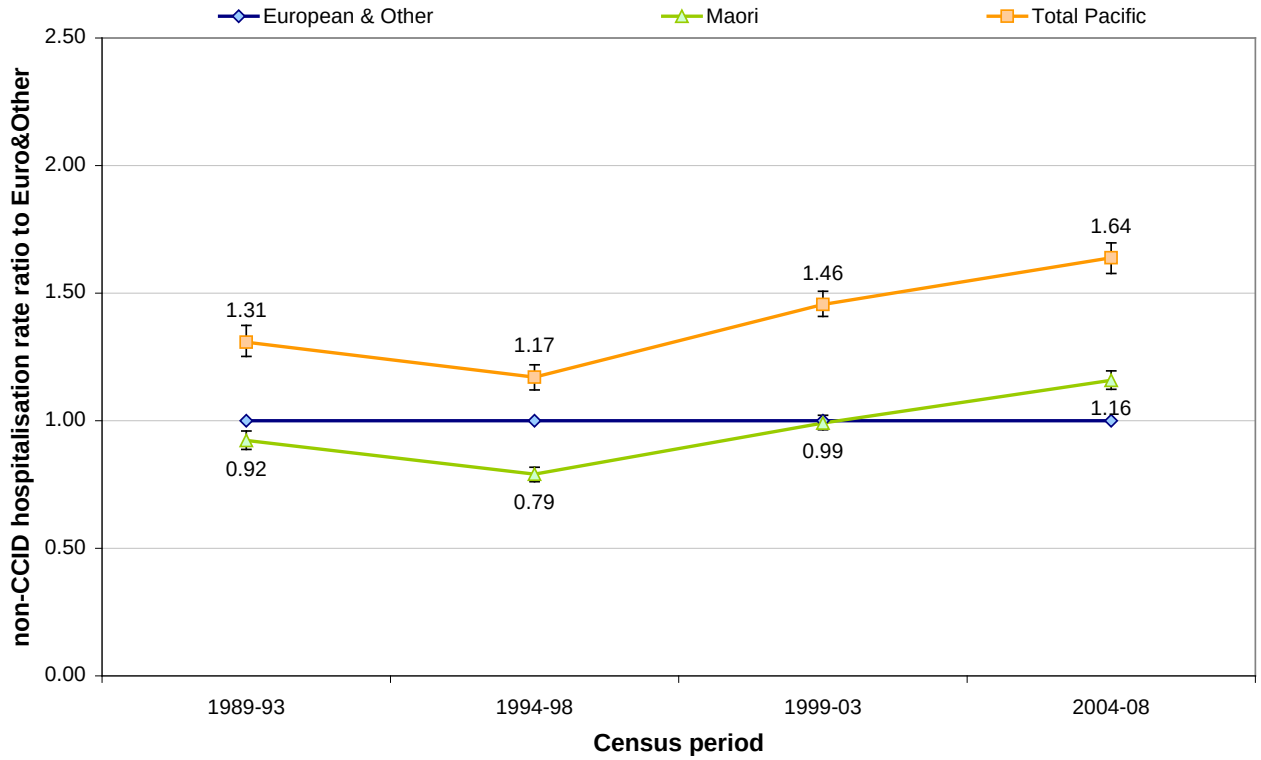


Figure 22. Ratio of Māori and Pacific non-CCID hospitalisation rates to European/Other non-CCID hospitalisation rates, for under-5 year olds, in 5-year periods from 1989 to 2008 (age standardised to 2006 census).

[see Table 21 for data]



4.10. Distribution of specific disease groups

This section shows the distribution of specific disease groupings within the larger CCID category over time and across ethnic groups (specifically for Māori, Pacific, and European/Other).

Rates and all-cause hospitalisation-adjusted rates for the main categories of CCID are illustrated in Figure 5 and Figure 6.

CCIDs by category as a percentage of all-cause hospitalisations, for Māori, Pacific, and European/Other, are illustrated in Figure 23 below. All ethnic groupings experienced increases across all categories of CCID over the study period.

4.10.1. Enteric CCIDs

The increase in the total enteric category over the study period (Figure 6) was primarily the result of an increase in gastroenteritis hospitalisations (for faecal-oral human pathogens such as norovirus and rotavirus). Other enteric infections from human sources (such as hepatitis A and enterovirus) are rare and have increased only slightly, and late effects of enteric infections (notably peptic ulcer and stomach cancer) have decreased.

Figure 24 shows close contact enteric infections as a percentage of total hospitalisations, by ethnic group. Gastroenteritis CCID rates have been increasing as a percentage of total hospitalisations for all ethnic groups, but have increased most for European/Other, who also started at a higher point. For this sub-group of infectious diseases, inequalities may be said to have decreased, though this change does not imply any decrease in rates for any group.

Late effects of enteric infections show a different pattern. Rates have been decreasing as a percentage of total hospitalisations for all three ethnic groups. However, rates have decreased more for Pacific peoples than for Māori or European/Other. The largest absolute increases in relative inequalities within the enteric category were in the late effects of enteric infections. The SRR was 2.01 for Māori vs. European/Other in the 1989 to 1993 period, increasing to 3.29 in the 2004 to 2008 period). For Pacific peoples the SRR increased from 2.88 to 4.57 over the same period. However, both of these increases occurred because the rate of hospitalisation for this sub-category decreased more for European/Other than for Māori or Pacific, rather than because overall rates increased. Absolute inequalities increased only a little for Māori, from 53.3 to 60.6, and dropped a little for Pacific, from 98.6 to 94.7.

4.10.2. Respiratory CCIDs

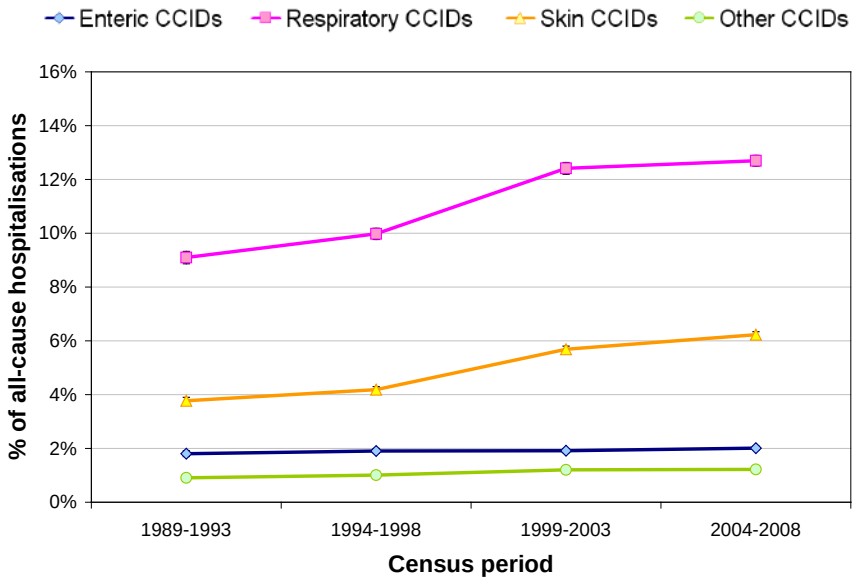
Respiratory hospitalisations make up roughly half of all CCIDs. The largest single category of respiratory hospitalisations is LRTIs, which include pneumonia, bronchiolitis and influenza. This category has increased from 6.6 percent to 9.8 percent of all-cause hospitalisations.

While respiratory hospitalisations have been increasing overall as a percentage of hospitalisations, this is a reflection of the increase in LRTIs; rates have been dropping as a percentage of all-cause hospitalisations for all other respiratory CCID sub-categories except bacterial meningitis.

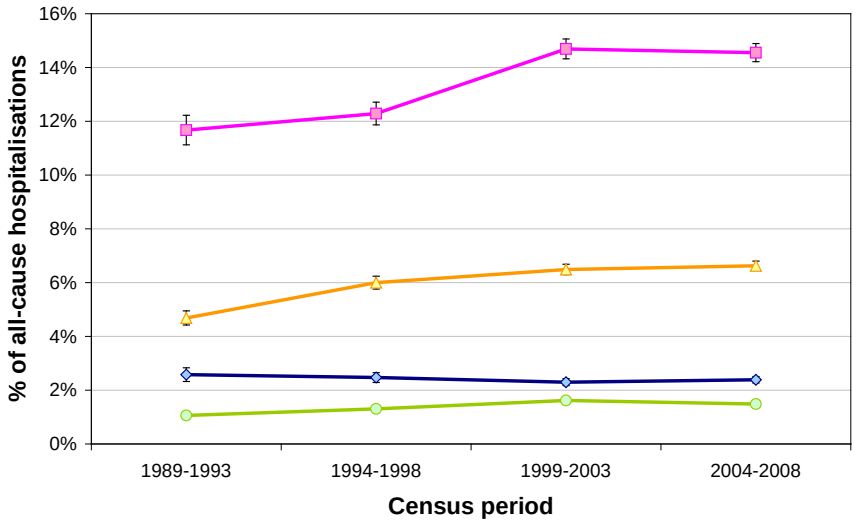
Figure 25 shows close contact respiratory infection rates as a percentage of total hospitalisations, by ethnic group. Overall, the difference between Māori and European/Other respiratory hospitalisation rates has fluctuated only a little over the study period, with the SRR beginning at 2.50 in the 1989 to

Figure 23. CCIDs as a percentage of all-cause hospitalisations, by CCID category and ethnic grouping (age standardised to 2006 Census).

Māori



Pacific



European & Other

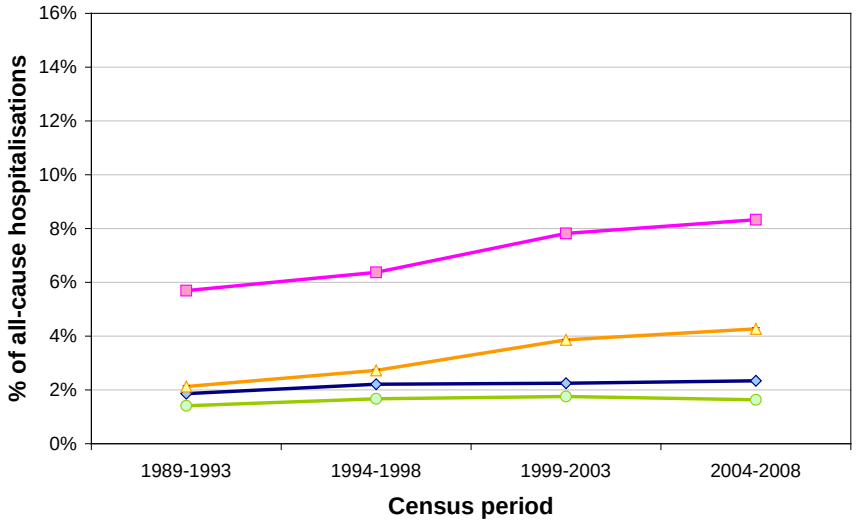
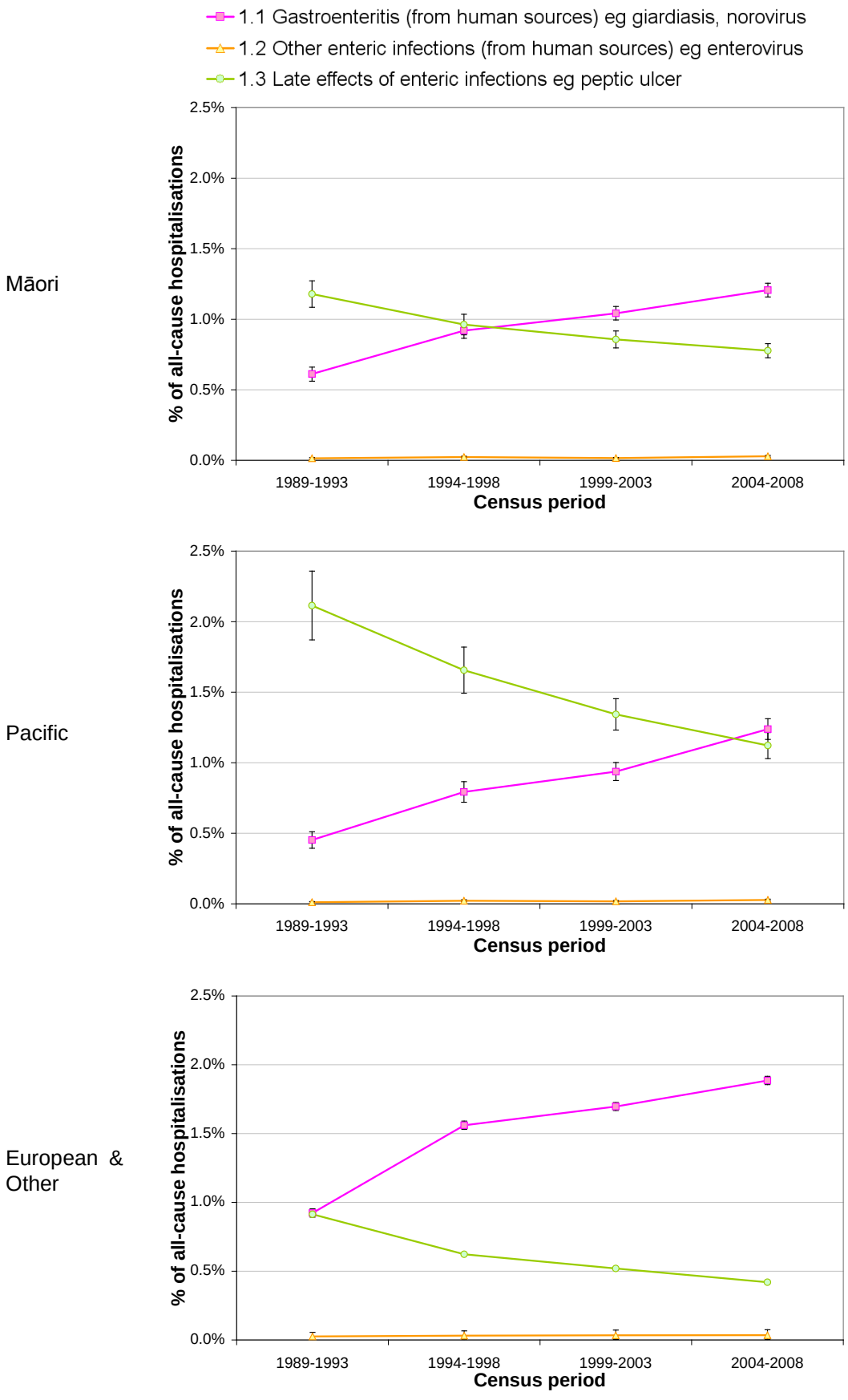


Figure 24. Close-contact enteric infections as a percentage of all-cause hospitalisations, by sub-category and ethnic grouping (age standardised to 2006 Census)



2003 period, and ending at 2.70 in the 2004 to 2008 period. The difference between Pacific and European/Other has seen a greater increase, with the SRR increasing from 2.55 to 2.99.

Within the respiratory category, the greatest increase in inequalities for both Māori and Pacific, and European/Other hospitalisations, was for post-streptococcal diseases (notably acute rheumatic fever) (Figure 25). In 1989 to 1993, Māori and Pacific age-standardised rates for post-streptococcal diseases were 13.1 and 19.1 hospitalisations per 1000 people per year respectively, making the Māori rate 7.4 times higher, and the Pacific rate 10.8 times higher than the European/Other rate of 1.8. By the 2004 to 2008 period, the European/Other rate had dropped to 0.4. The Māori and Pacific rates had only dropped to 9.9 and 13.2, giving SRRs of 22.8 and 30.5 respectively. The increase in acute rheumatic fever, and ethnic disparities in its occurrence, have been previously discussed by Jaine et al 2008.[2]

Pertussis also showed an increase in inequalities between Māori and European/Other. The SRR was 1.3 for Māori vs. European/Other in the 1989 to 1993 period, increasing to 2.8 in 2004 to 2008. Pertussis inequalities increased less for Pacific vs. European/Other, from an SRR of 1.7 in 1989 to 1993, to 1.9 in 2004 to 2008.

Inequalities in bacterial meningitis incidence also increased for Māori vs. European/Other, from 1.5 in 1989 to 1993, to 2.5 in the 2004 to 2008 period. Inequalities in this category for Pacific peoples changed little, with the SRR of 2.5 in 1989 to 1993, moving to 2.6 in 2004 to 2008.

The incidence of both post-streptococcal diseases and pertussis is higher in younger age groups, therefore the increases in inequalities in these CCID sub-categories are not due to the increasing age of the Māori population.

Inequalities in respiratory CCID hospitalisation rates, as a percentage of all-cause hospitalisations between Māori, and European/Other, have decreased for late effects of respiratory infections, and LRTIs. Respiratory virus inequalities initially reduced, but had returned to their 1989 to 1993 level by 2004 to 2008.

It is important to note that the late sequelae of respiratory infections (including rheumatic heart disease fever and lymphoma), reflects the results of infections several decades ago. This situation contrasts with other categories of infectious disease where the consequences of infection usually result in an acute disease.

4.10.3. Close-contact skin infections

The majority of the increase in close-contact skin infections between 1989 and 2008 came from bacterial skin infections, which doubled from 2.3 percent of hospitalisations in the 1989 to 1993 period, to 4.6 percent in the 2004 to 2008 period.

Figure 26 shows close-contact skin infections as a percentage of all-cause hospitalisations. Although inequalities between Māori and European/Other rates have declined over the 20-year study period, the decline occurred only between 1989 to 1993 and 1994 to 1998. SRRs increased over the last two periods, with Māori close-contact skin infection incidence 2.6 times higher than European/Other in 2004 to 2008.

For Pacific people, there has been no significant change in the SRR relative to European/Other, which was 2.7 at both the start and finish of the study period.

Absolute differences in hospitalisation rates for Māori and Pacific vs. European/Other have doubled across all categories of close contact skin infection.

Figure 25. Close-contact respiratory infections as a percentage of all-cause hospitalisations, by sub-category and ethnic grouping (age standardised to 2006 Census

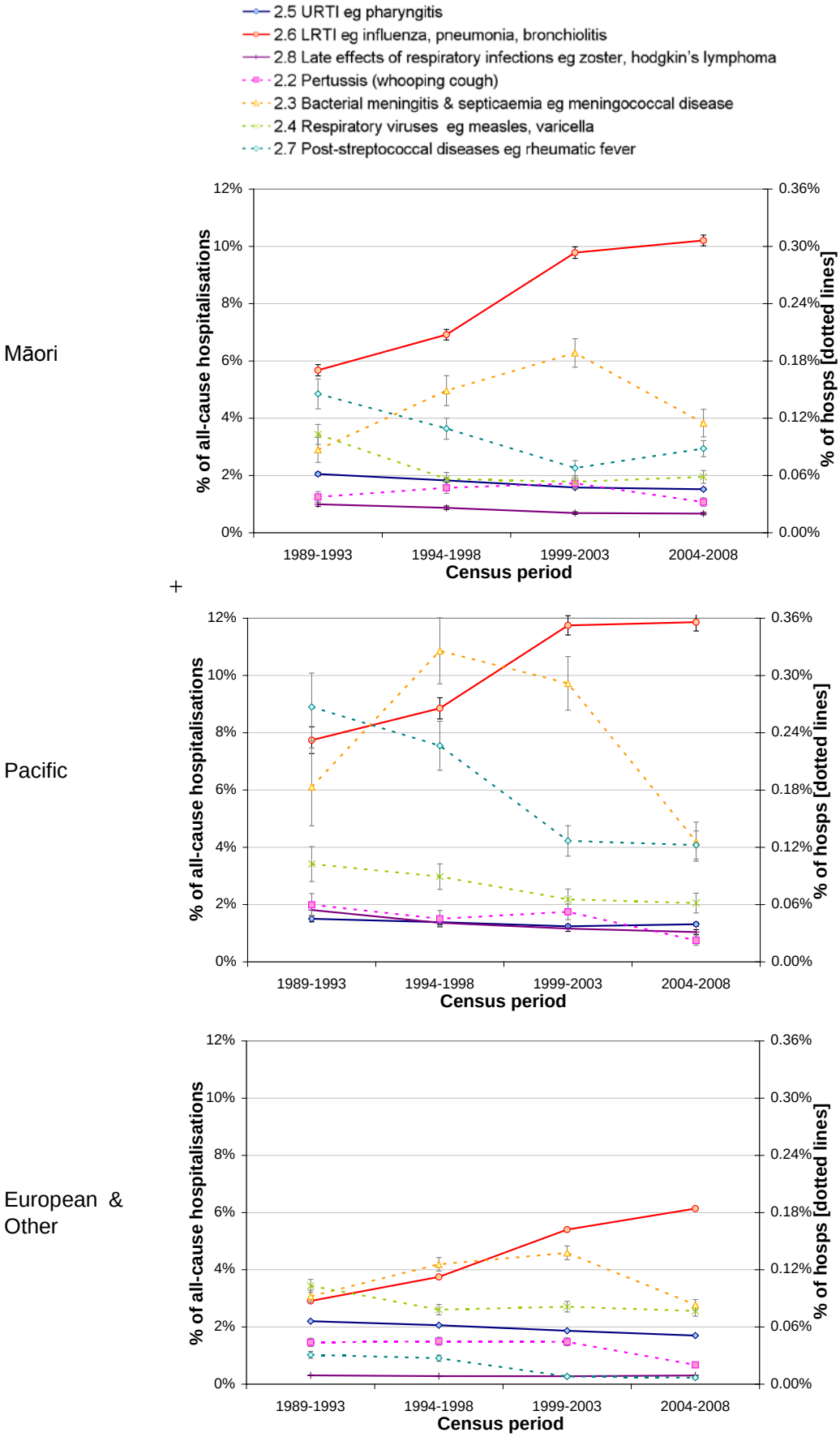


Figure 26. Close-contact skin infections as a percentage of all-cause hospitalisations, by sub-category and ethnic group (age standardised to 2006 Census)

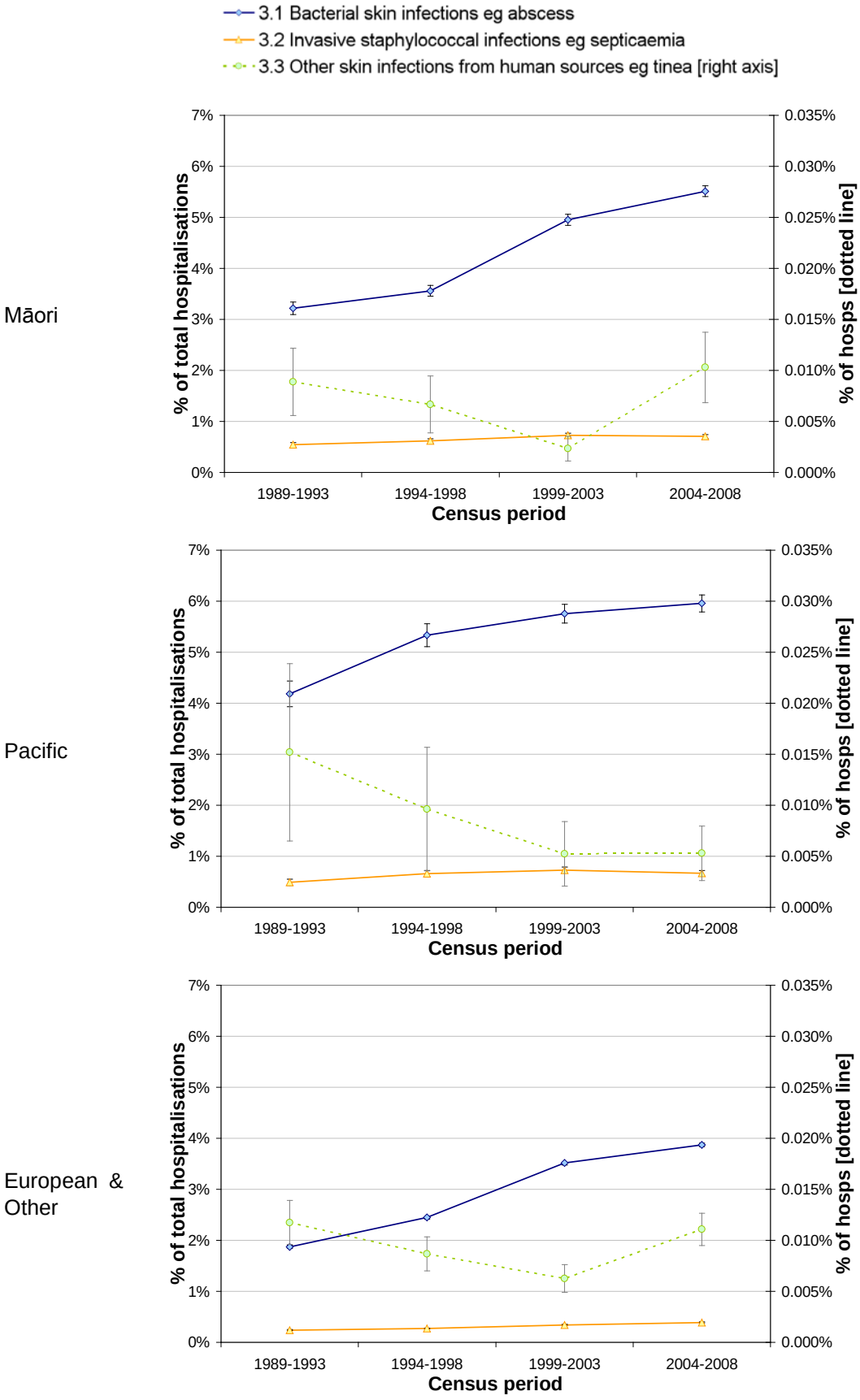
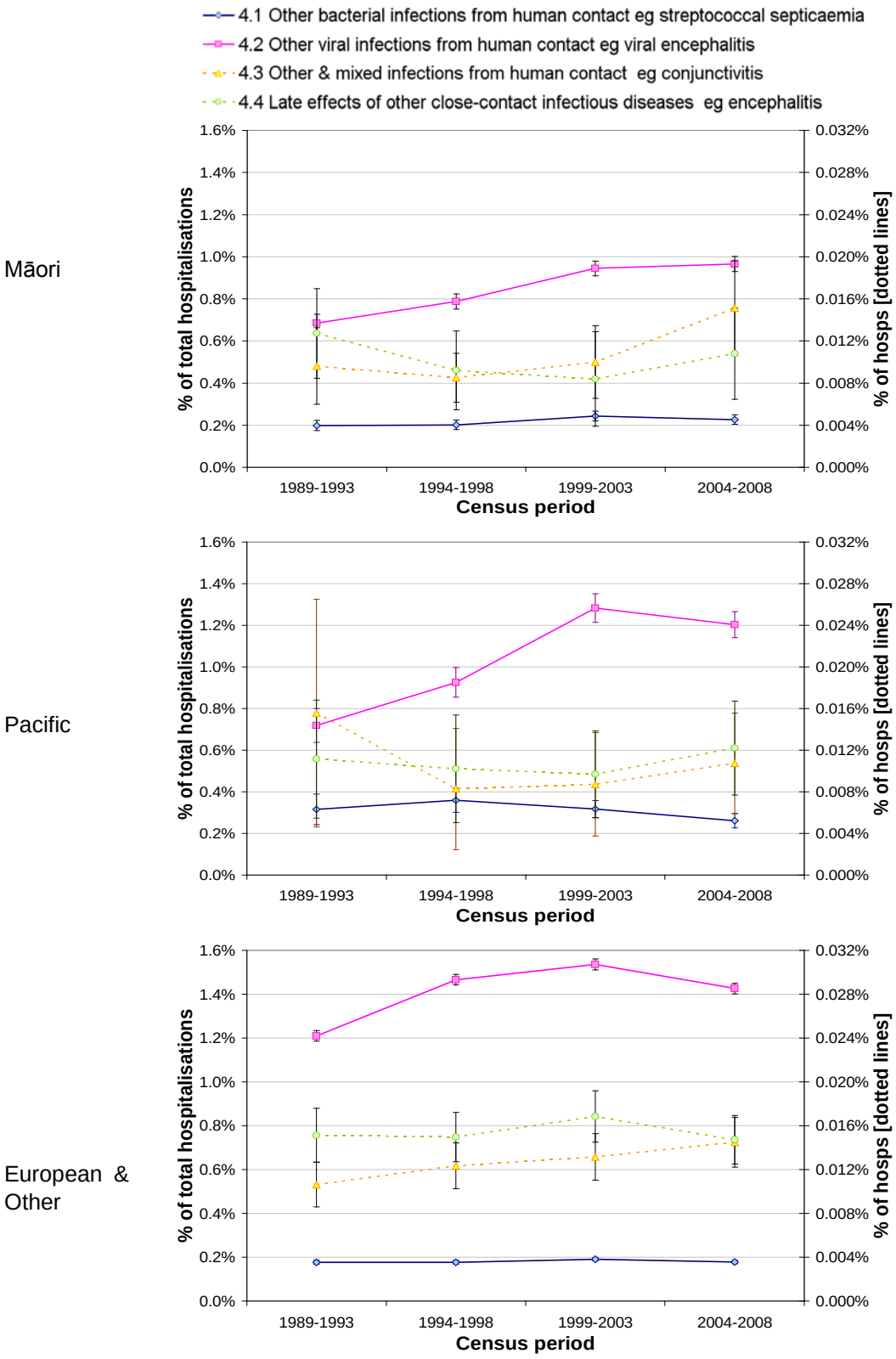


Figure 27. CCIDs with multiple or unknown transmission as a percentage of all-cause hospitalisations, by sub-category and ethnic grouping (age standardised to 2006 Census)



4.10.4. Other CCIDs

Rates of other CCIDs increased over the 1989 to 2003 study periods, but dropped back a little by 2004 to 2008. The largest sub-category, which also showed the greatest increase, was other viral infections from human contact, which increased from 1.1 percent of hospitalisations in 1989 to 1993, to 1.4 percent in 2004 to 2008 (reaching 1.5 percent in the 1999 to 2003 period).

Figure 27 shows rates of CCIDs with multiple or unknown transmission as a percentage of all-cause hospitalisations. Māori and Pacific experienced greater increases in CCIDs with multiple or unknown transmission than did European/Other. This effect was shared by the two largest sub-categories, other bacterial infections from human contact (e.g. streptococcal septicaemia) and other viral infections from human contact (e.g. viral encephalitis). Patterns for other and mixed infections from human contact (e.g. conjunctivitis) and late effects of other CCIDs (e.g. encephalitis) have less absolute effect, as these sub-categories make up less than 0.1 percent of all-cause hospitalisations.

4.11. Distribution by socio-economic status

For all four census periods, the rates of hospitalisation for an infectious disease rose significantly with increasing deprivation (Table 10). There was only a small trend across the first four NZDep quintiles; the largest inter-quintile increase was between NZDep deciles 7–8 and deciles 9–10.

At the same time, hospitalisation rates for infectious diseases rose across the four census periods for all NZDep quintiles (Figure 28). However, most of that increase occurred over the first three census periods; over the last two census periods rates have increased only for the two poorest quintiles (NZDep 7-8 and NZDep 9-10), remained the same for quintile NZDep 5-6, and decreasing for the two wealthiest quintiles. These disparate directions for rates were emphasised in CCIDs (Figure 29), but not apparent in non-CCIDs (Figure 30), where rates increased relatively continuously across all quintiles.

Infectious disease has also increased for all quintiles as a percentage of all-cause hospitalisations (Figure 31). This trend occurred in both CCIDs (Figure 32) and non-CCIDs (Figure 33). The distribution across deciles has changed little for either of these sub-categories between census periods. Most unusually, however, in all census periods non-CCIDs as a proportion of all-cause hospitalisations increased with *decreasing* deprivation (Figure 33).

Inequalities in infectious disease rates have widened over the four census periods (Figure 34), with the widening greatest between the poorest and the wealthiest quintile. The hospitalisation rate for NZDep 9-10 relative to NZDep 1-2 has continued to increase across the four study census periods. For other quintiles, however, changes have been more complex. Hospitalisation rates for quintile NZDep 3-4 and NZDep 5-6 have converged closer to rates for NZDep 1-2, though the convergence has only been continuous for NZDep 3-4. The rate for NZDep 7-8 relative to NZDep 1-2 also dropped for the first two inter-census periods, but rose over the last period.

The above description of changes in ID rate inequalities applies equally to both CCID (Figure 35) and non-CCID (Figure 36) hospitalisations.

Table 10. CCID and non-CCID hospitalisation rates, percentages and SRRs, by NZDep quintile and 5-year periods from 1999 to 2008

		1989 to 1993			1994 to 1998			1999 to 2003			2004 to 2008			Rate ratio 2004-08 vs. 1989-93
	NZDep quintile	Age-std hosp rate†	% of total hosps	SRR	Age-std hosp rate†	% of total hosps	SRR	Age-std hosp rate†	% of total hosps	SRR	Age-std hosp rate†	% of total hosps	SRR	
CCIDs	1-2	429.3	11.4%	Ref	575.0	13.3%	Ref	780.2	15.9%	Ref	733.0	16.6%	Ref	1.71
	3-4	610.0	11.9%	1.42	775.9	13.6%	1.35	1019.6	16.4%	1.28	856.2	17.1%	1.16	1.40
	5-6	734.9	12.0%	1.71	884.7	13.9%	1.54	1202.6	16.7%	1.55	1163.2	17.7%	1.54	1.58
	7-8	915.8	12.4%	2.13	1170.2	13.6%	2.04	1544.8	17.2%	1.95	1641.4	18.7%	2.25	1.79
	9-10	1112.5	13.6%	2.59	1584.4	15.6%	2.76	2234.9	19.8%	2.84	2281.1	21.0%	3.14	2.05
Non-CCIDs	1-2	202.7	5.4%	Ref	255.9	5.9%	Ref	287.7	5.9%	Ref	326.4	7.4%	Ref	1.61
	3-4	276.8	5.4%	1.37	329.8	5.8%	1.29	349.0	5.6%	1.18	358.2	7.2%	1.09	1.29
	5-6	325.8	5.3%	1.61	359.2	5.6%	1.40	401.8	5.6%	1.40	446.0	6.8%	1.33	1.37
	7-8	375.6	5.1%	1.85	477.8	5.5%	1.87	475.5	5.3%	1.63	577.4	6.6%	1.77	1.54
	9-10	418.1	5.1%	2.06	562.3	5.5%	2.20	622.1	5.5%	2.14	720.8	6.6%	2.22	1.72

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

Figure 28. Five-yearly ID hospitalisation rates by NZDep quintile (age standardised to 2006 Census).

[See Table 22 for data]

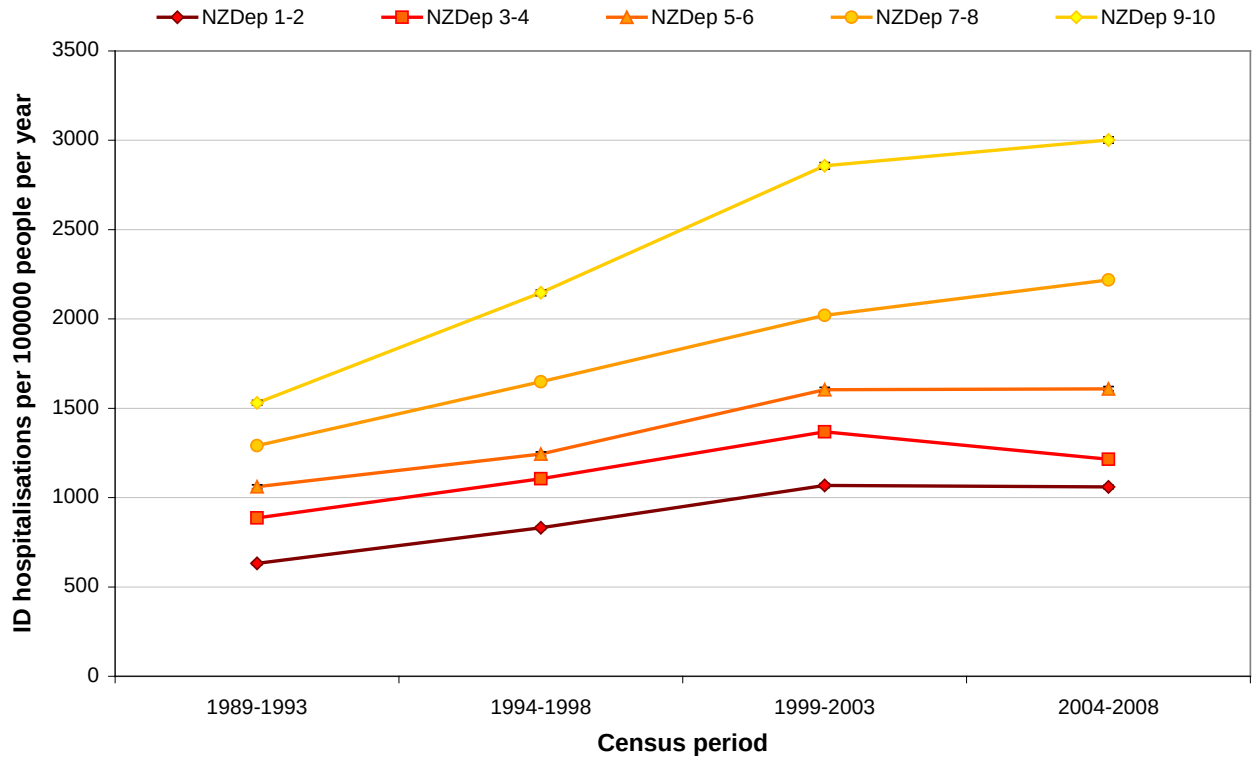


Figure 29. Five-yearly CCID hospitalisation rates by NZDep quintile (age standardised to 2006 Census).

[See Table 22 for data]

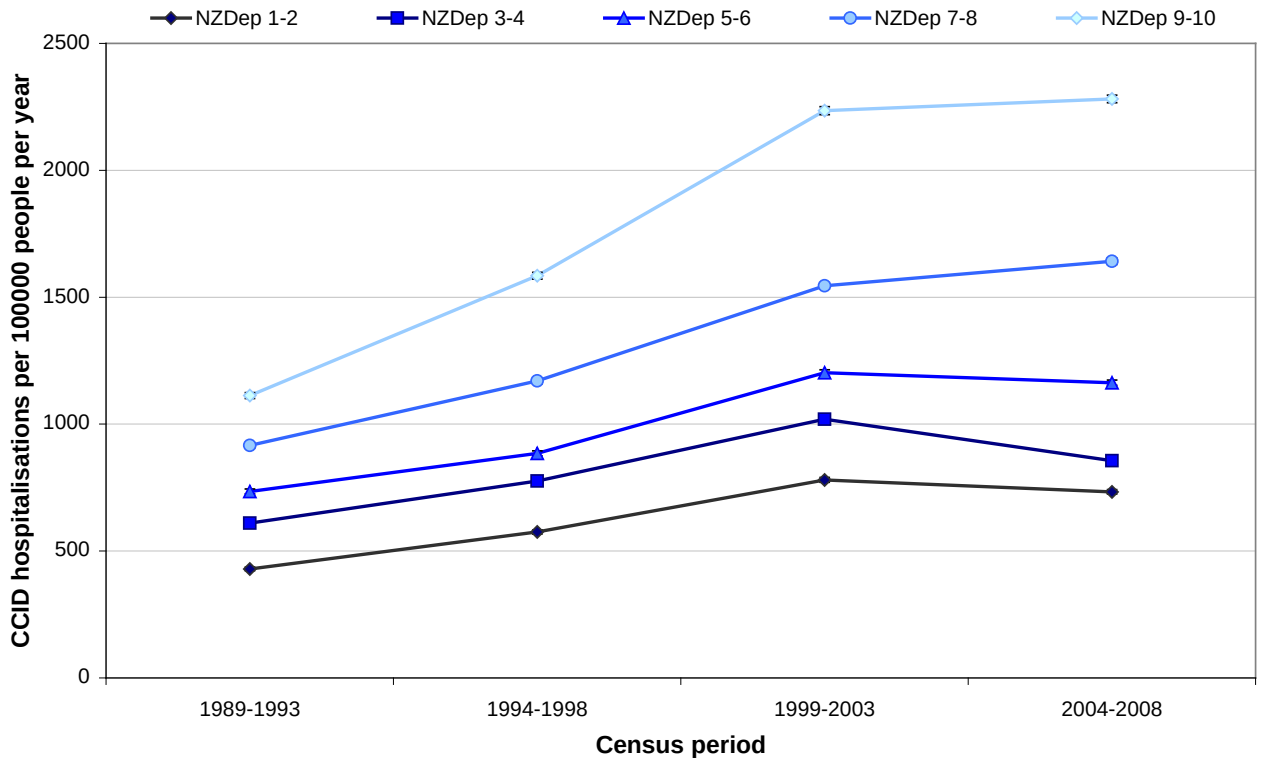


Figure 30. Five-yearly non-CCID hospitalisation rates by NZDep quintile (age standardised to 2006 Census).

[See Table 22 for data]

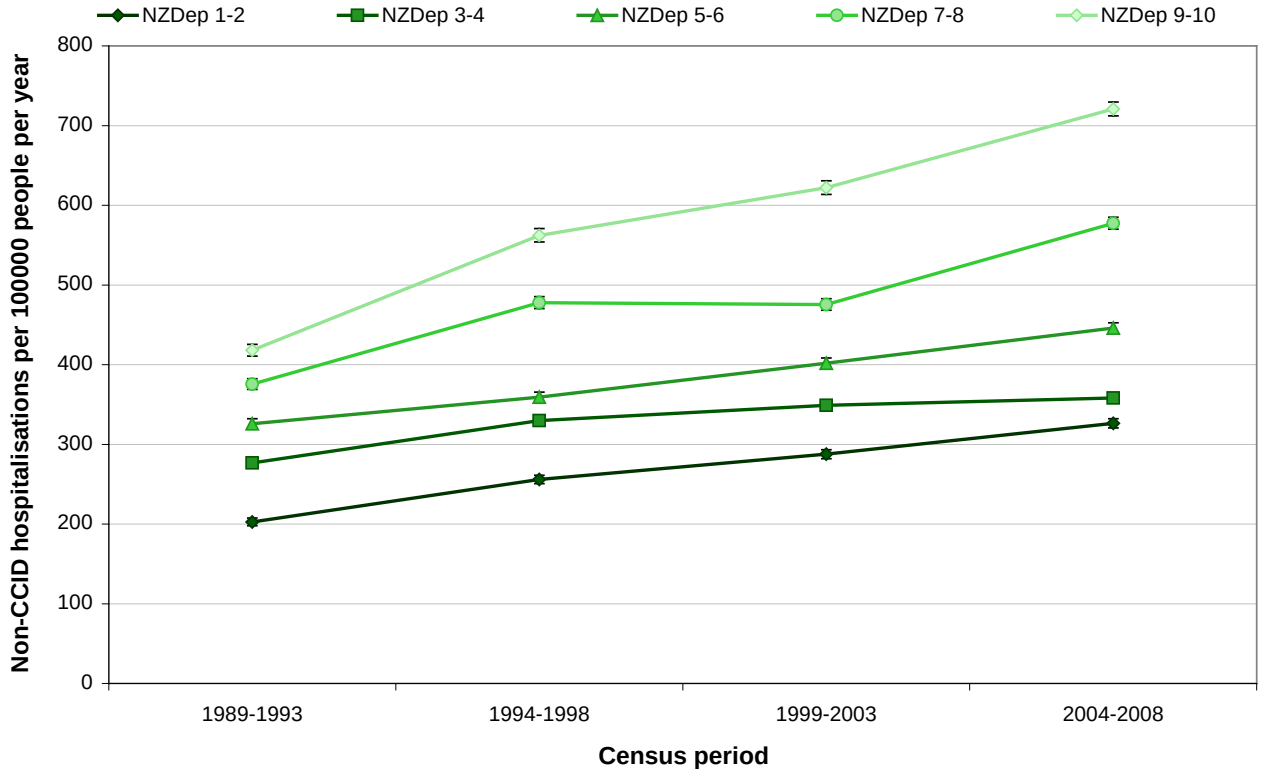


Figure 31. IDs as a percentage of all-cause hospitalisations, by NZDep quintile (age standardised to 2006 Census)

[See Table 23 for data]

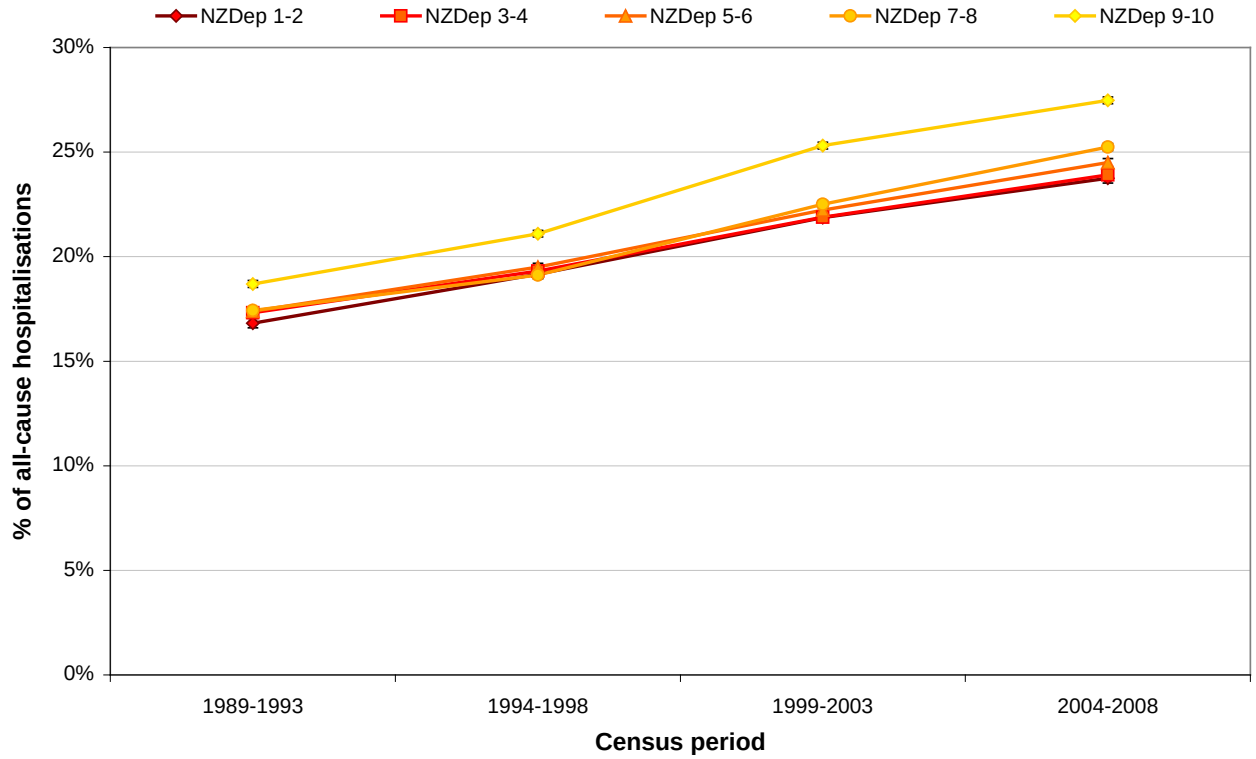


Figure 32. CCIDs as a percentage of all-cause hospitalisations, by NZDep quintile (age standardised to 2006 Census)

[See Table 23 for data]

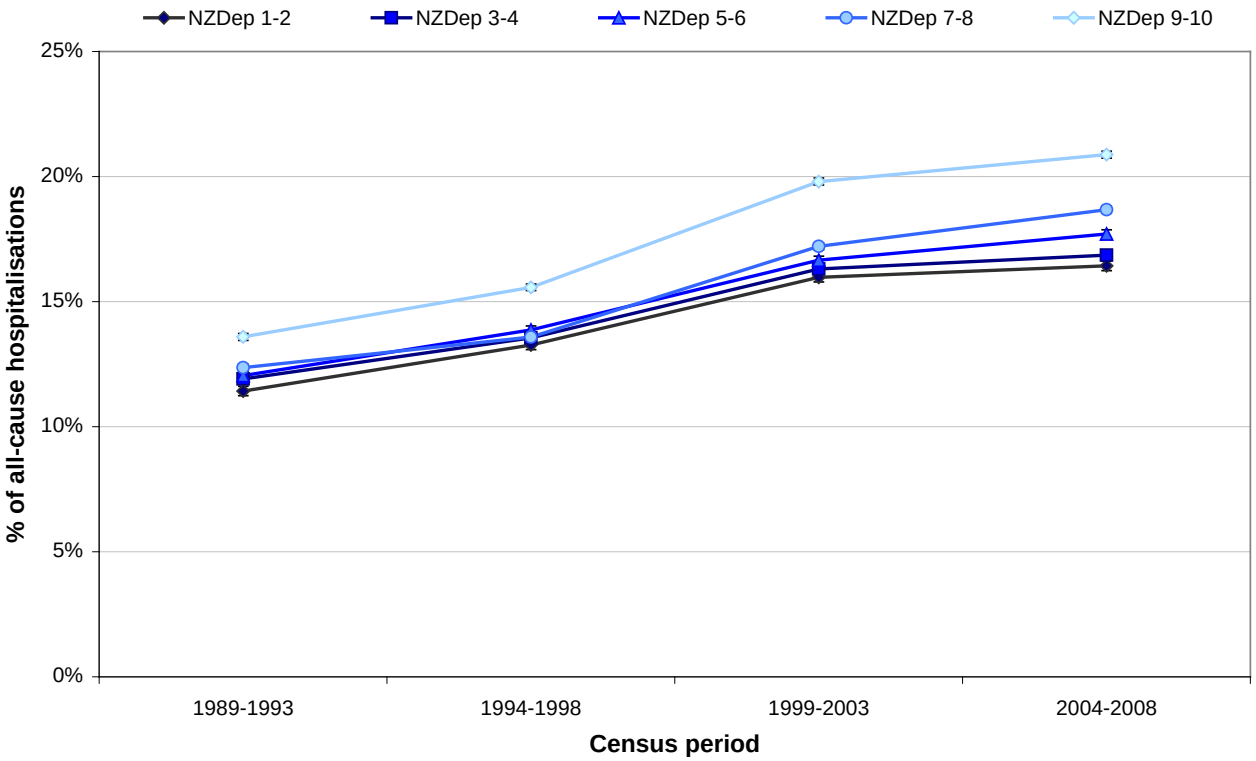


Figure 33. Non-CCIDs as a percentage of all-cause hospitalisations, by NZDep quintile (age standardised to 2006 Census)

[See Table 23 for data]

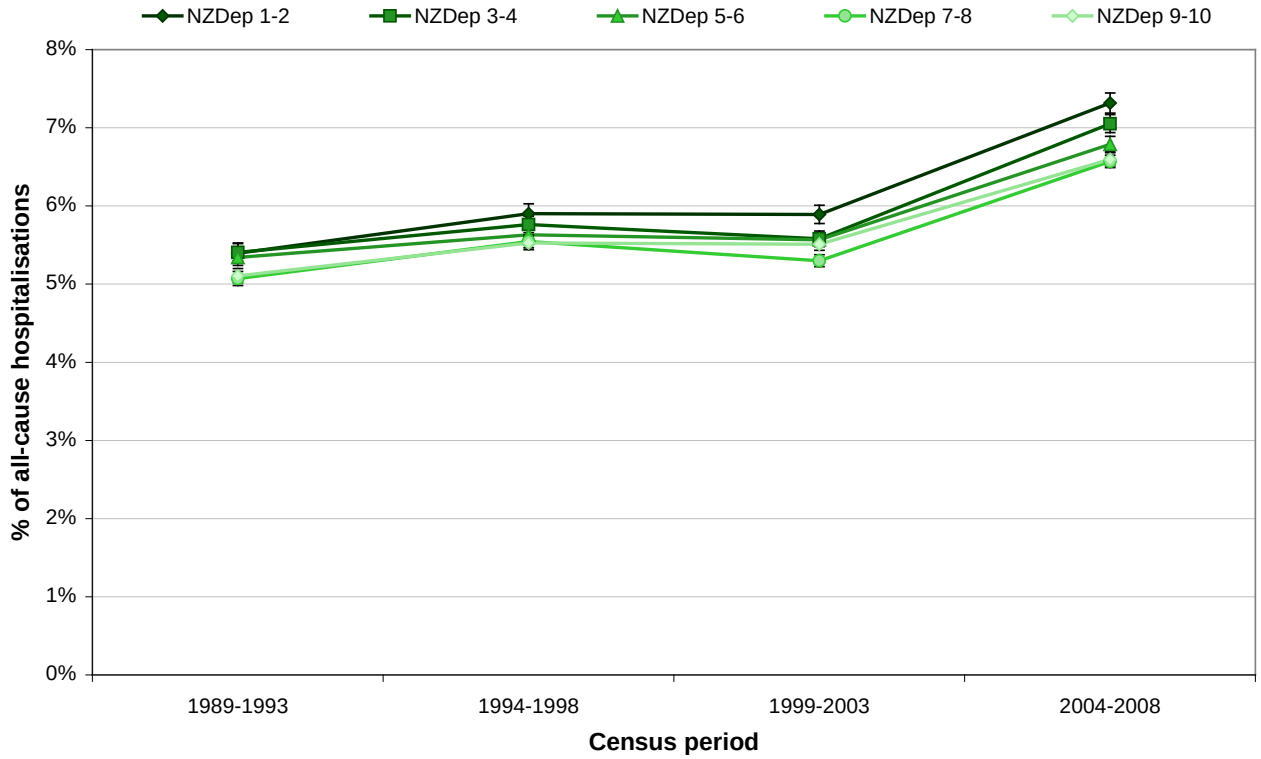


Figure 34. Ratio of NZDep quintile ID hospitalisation rates to NZDep 1-2 (age standardised to 2006 Census).

[See Table 24 for data]

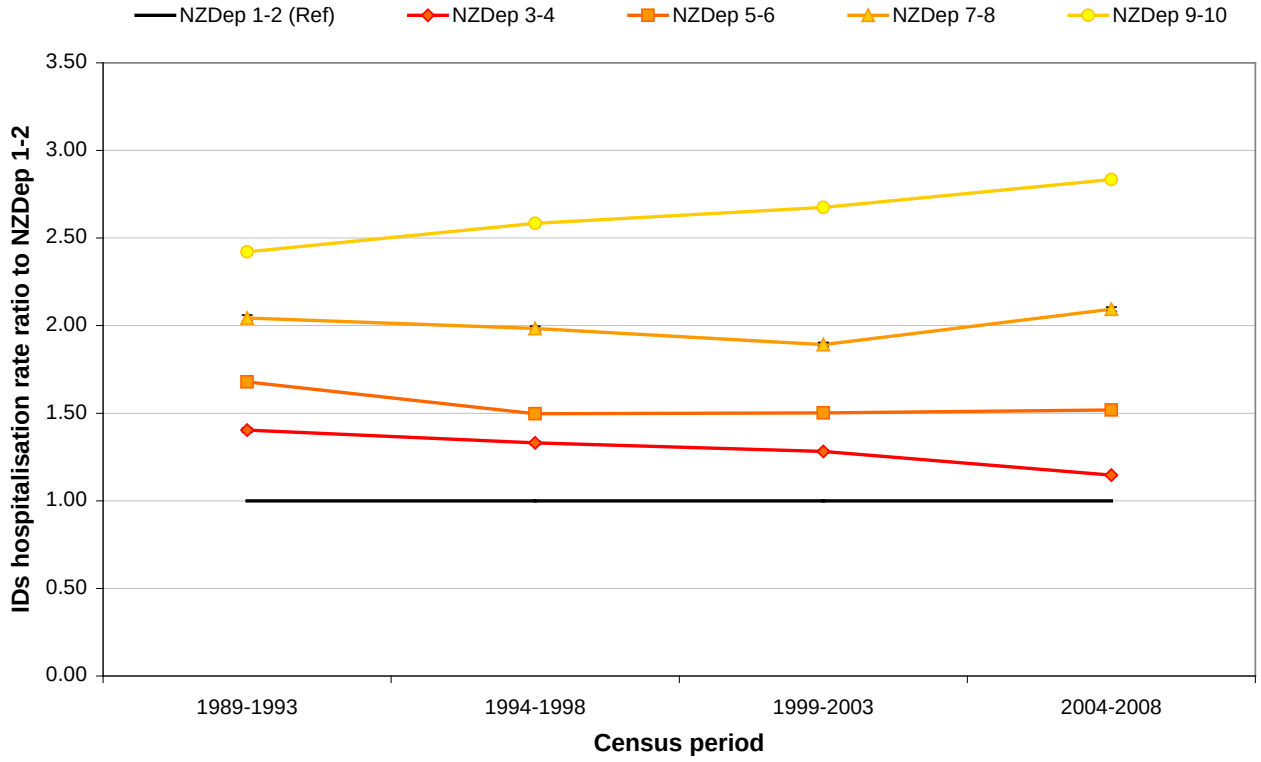


Figure 35. Ratio of NZDep quintile CCID hospitalisation rates to NZDep 1-2 (age standardised to 2006 Census).

[See Table 24 for data]

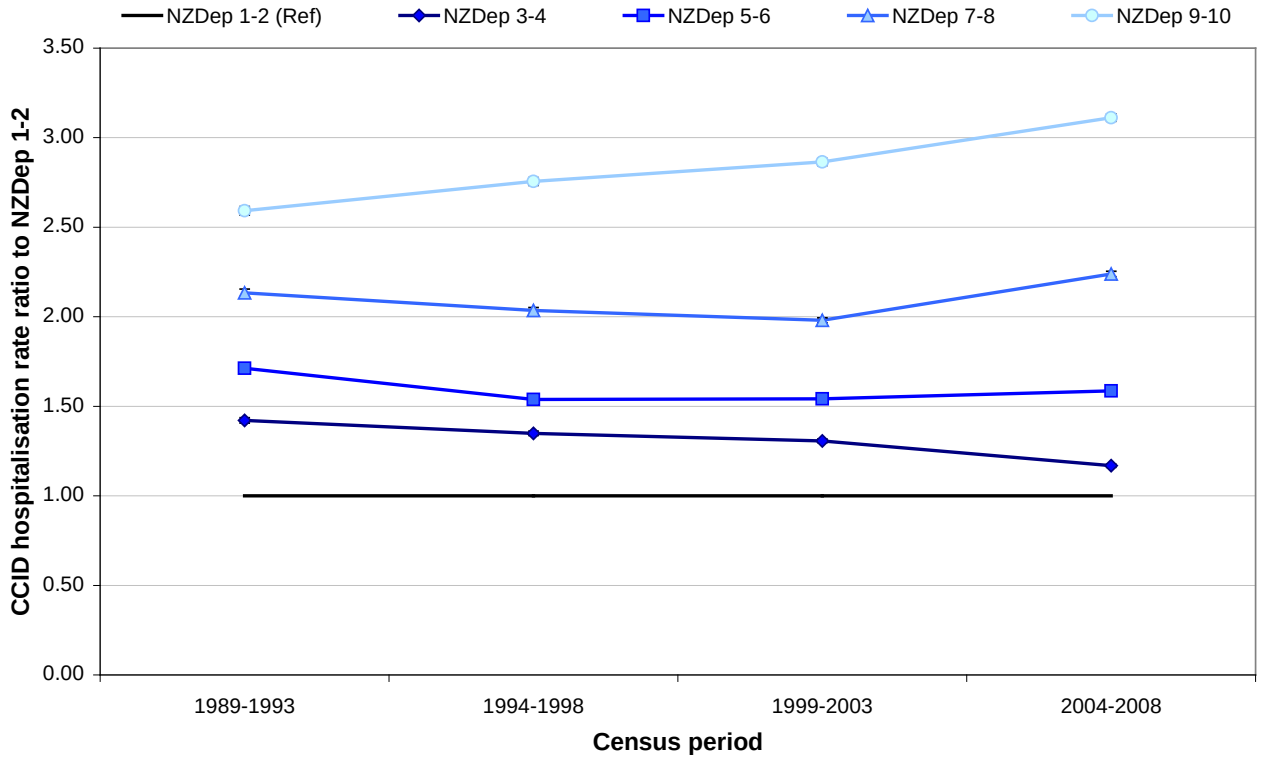
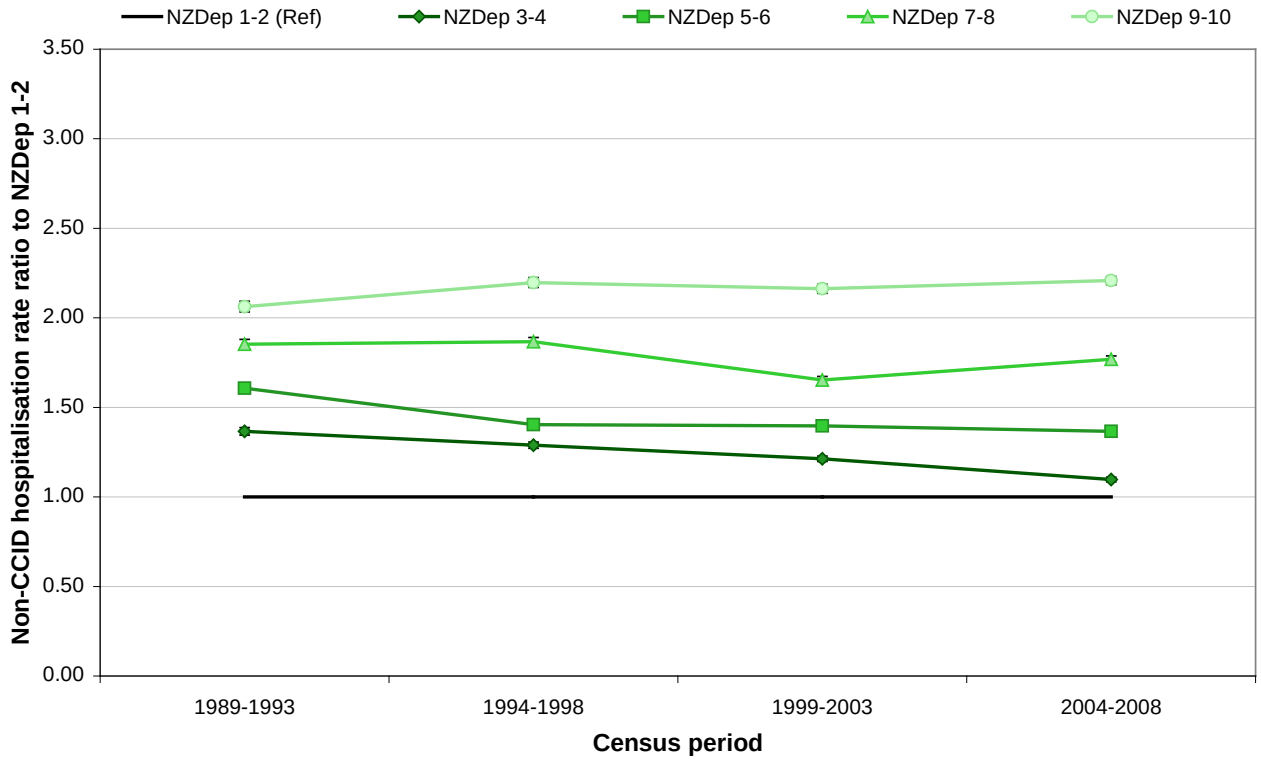


Figure 36. Ratio of NZDep quintile non-CCID hospitalisation rates to NZDep 1-2 (age standardised to 2006 Census).

[See Table 24 for data]



4.12. Distribution by socio-economic status and ethnicity

Ethnicity and socio-economic status were each independent risk factors for both CCID and non-CCID hospitalisations. This point is illustrated by the fact that for each strata of deprivation, hospitalisation rates are significantly higher for Māori and Pacific peoples compared to European/Other (Figure 37, Figure 38 and Figure 39). Changes in hospitalisation rates within NZDep quintiles were similar across the two infectious disease sub-categories (Figure 38 and Figure 39). However, infectious disease distribution across NZDep quintiles changed in different ways across the three main ethnic groupings considered in this report.

4.12.1. Infectious disease and socio-economic status among Māori

Inequalities in infectious disease hospitalisations by socio-economic status within the Māori population have increased over the study period. Māori NZDep 1-2 hospitalisation increased little between 1989 to 1993 and 2004 to 2008. Rates for Māori in NZDep 9-10, however, have continued to increase across the entire study period. Rates for the three middle quintiles, which were clumped together in the first three census periods, have now diverged. The end result of these changes was that Māori infectious disease rates in the 2004-2008 period exhibited a strong gradient by NZDep quintile, where such a gradient had been much smaller in 1989 to 1993.

Overall, however, Māori inter-quintile infectious disease rates relative to European and Other have become more similar over the study period (Figure 40), indicating that while overall Māori rates remain higher than European and Other rates, the distribution of disease over socio-economic groups is becoming more similar.

4.12.2. Infectious disease and socio-economic status among Pacific peoples

Pacific peoples have experienced a reversal in the distribution of infectious disease hospitalisation by socio-economic status, in both CCIDs and non-CCIDs (Figure 37, Figure 38 and Figure 39). In 1989 to 1993, hospitalisation rates increased with decreasing deprivation. Between then and 2004-2008 that gradient has inverted, and now displays the more familiar gradient of increasing rates with increasing deprivation.[i]

Pacific inter-quintile infectious disease rates relative to European and Other have also converged (Figure 41).

4.12.3. Infectious disease and socio-economic status among European and Other

European and Other CCID and non-CCID hospitalisation rates have increased for all NZDep quintiles. However, patterns between the two categories show more variation than in the other ethnic groupings. As for the total population, differences in CCID and non-CCID rates between the wealthiest and poorest quintiles appear to have become more polarised over the last two periods, with rates becoming more similar for NZDep 1-2 and NZDep 3-4; and for NZDep 7-8 and NZDep 9-10. However, unlike the total population, CCID rates for NZDep 9-10 decreased between the last two census periods.

[i] It is possible that rates for the first census period reflect a data issue. However, we cannot identify any problem with either our numerator or our denominator, so can only conclude that this is a real effect. It may, however, reflect a change in access to hospital services or a migration effect rather than a change in disease incidence.

4.12.4. Comparison of socio-economic and ethnic group differences

Changes in infectious disease rates by socio-economic status have been distinct across the three ethnic groups included in this study. Intra-ethnic group inequalities have increased most markedly for Māori and Pacific peoples. The ratio of Māori CCID rates in the poorest NZDep quintile 9-10, relative to European and Other rates in the wealthiest quintile NZDep 1-2, increased slightly from 4.1 (95% CI 4.0-4.2) in the 1989 to 1993 period, to 4.8 (95% CI 4.7-4.8) in the 2004 to 2008 period; while the same ratio for Pacific CCID rates rose from 3.4 (95% CI 3.2-3.6) to 4.5 (95% CI 4.4-4.6)

Overall, Māori and Pacific ethnicity was associated with an approximate doubling in risk of CCID hospitalisation for all levels of social deprivation, at least in the three most recent Census periods (Figure 42 and Figure 43). Certainly for Māori, there appeared to be little interaction between ethnicity and deprivation (Figure 42); in the most recent 2004-2008 period, the ratio between Māori CCID rates relative to European and Other CCID rates were not significantly different across deprivation strata, ranging from 1.74 (95% CI 1.72-1.76) to 1.78 (95% CI 1.73-1.84) for NZDep 1-2 to NZDep 7-8, with NZDep 9-10 only slightly higher at 2.01 (95%CI 1.99-2.03).

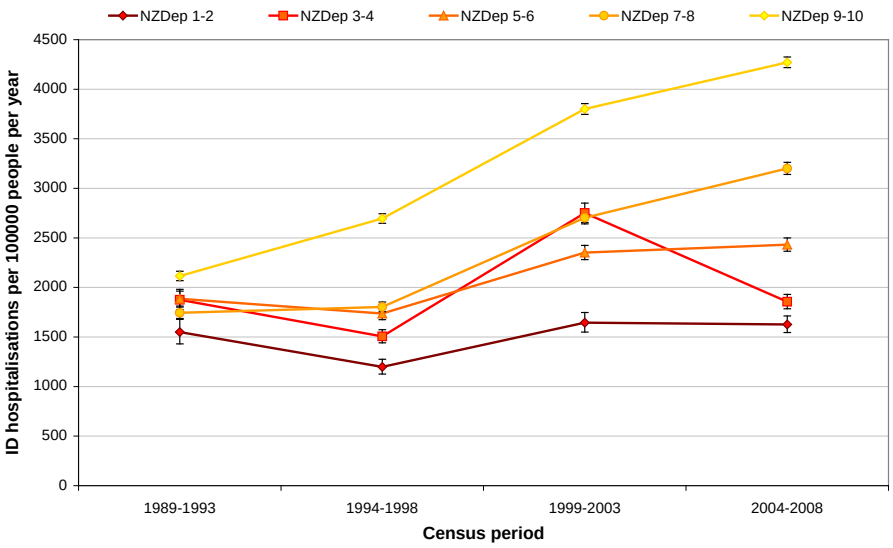
For Pacific peoples, the pattern was broadly similar, but there was some interaction between ethnicity and deprivation (Figure 43). In the most recent 2004-2008 period, Pacific peoples living in the most deprived NZDep 9-10 quintile had an increased CCID hospitalisation risk of 1.90 (95% CI 1.88-1.92) . By contrast, the risk increased for those in less deprived quintiles, reaching 2.62 (95% CI 2.49-2.74) for NZDep 1-2. This negative gradient in interaction between ethnicity and NZDep for Pacific people was most pronounced in the first census period, and has decreasing since.

These effects were repeated, but at lower ratios, in non-CCIDs (Figure 44, Figure 45).

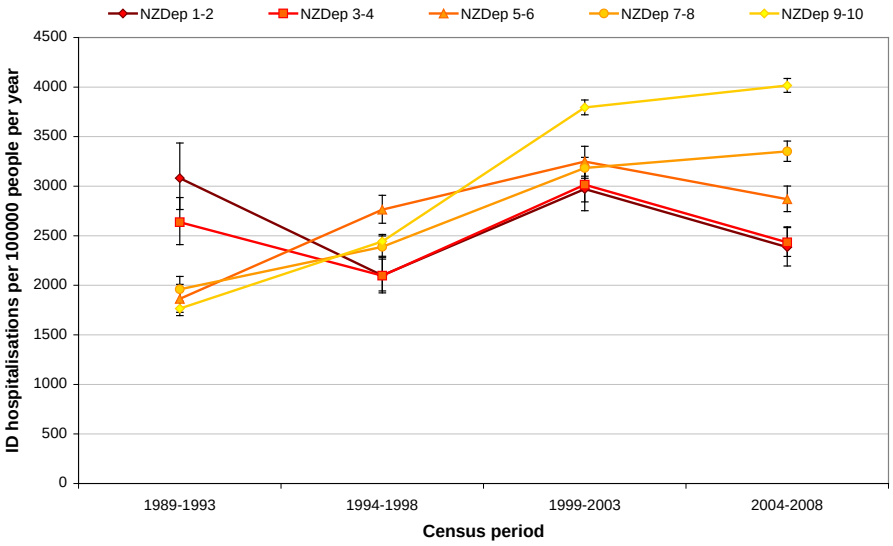
Figure 37. ID hospitalisation rates per 100000 people, by ethnicity and NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 25 for data]

Māori



Pacific



European & Other

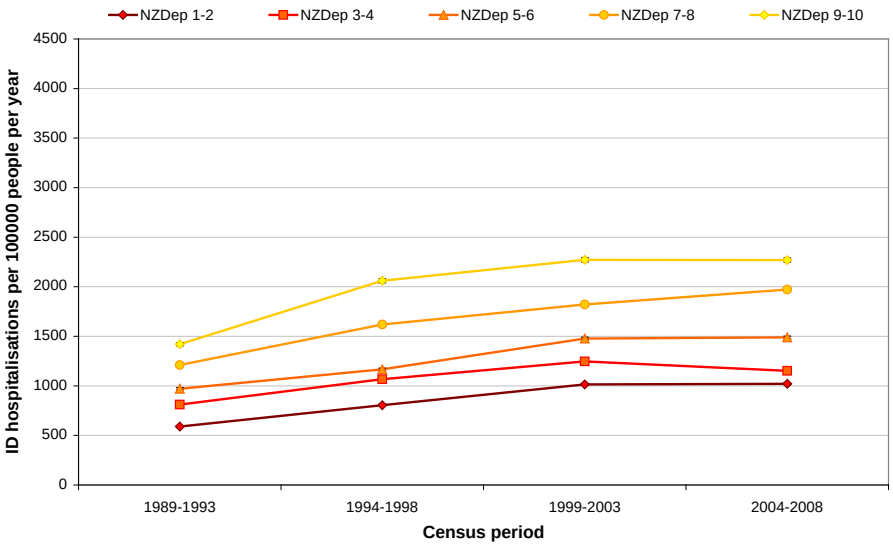
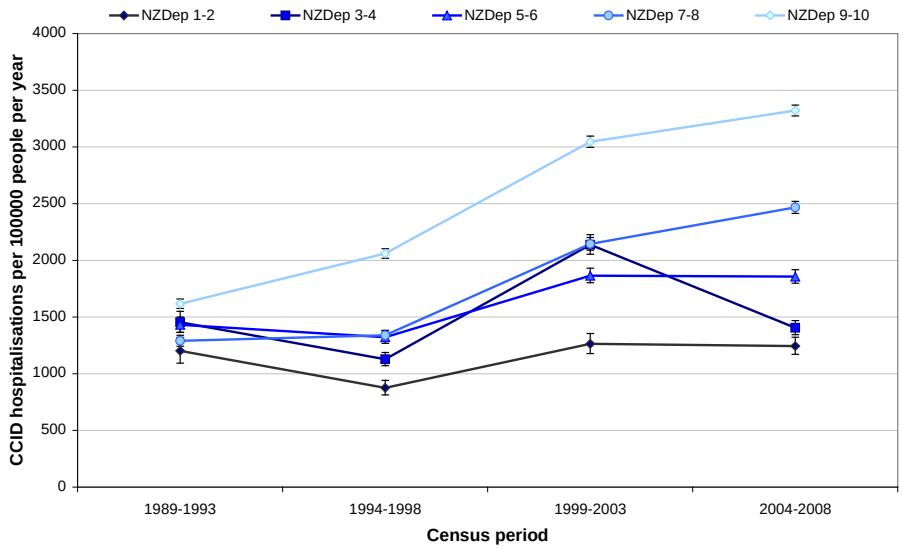


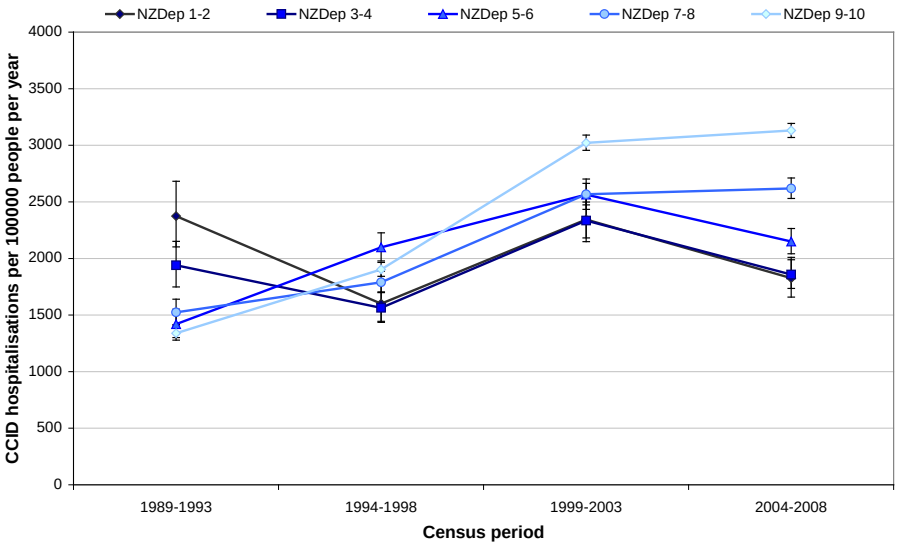
Figure 38. CCID hospitalisation rates per 100000 people, by ethnicity and NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 26 for data]

Māori



Pacific



European & Other

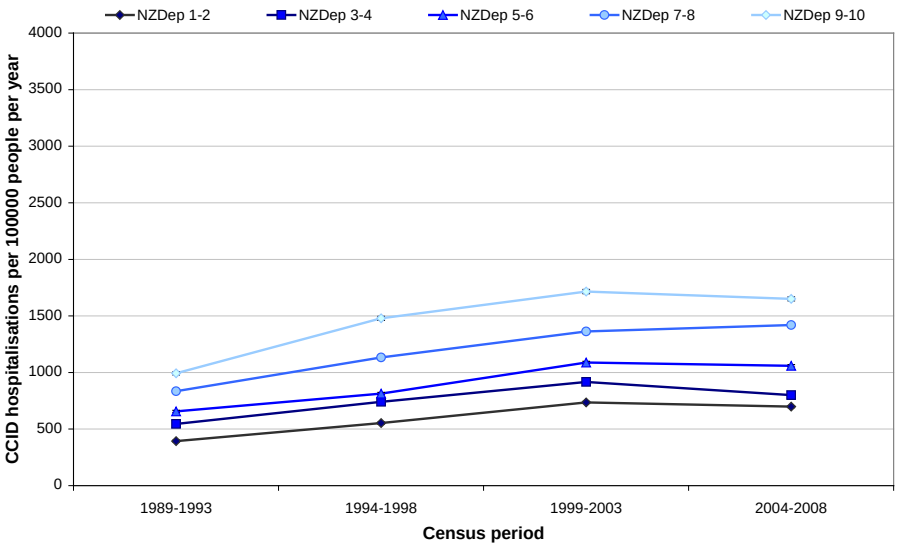
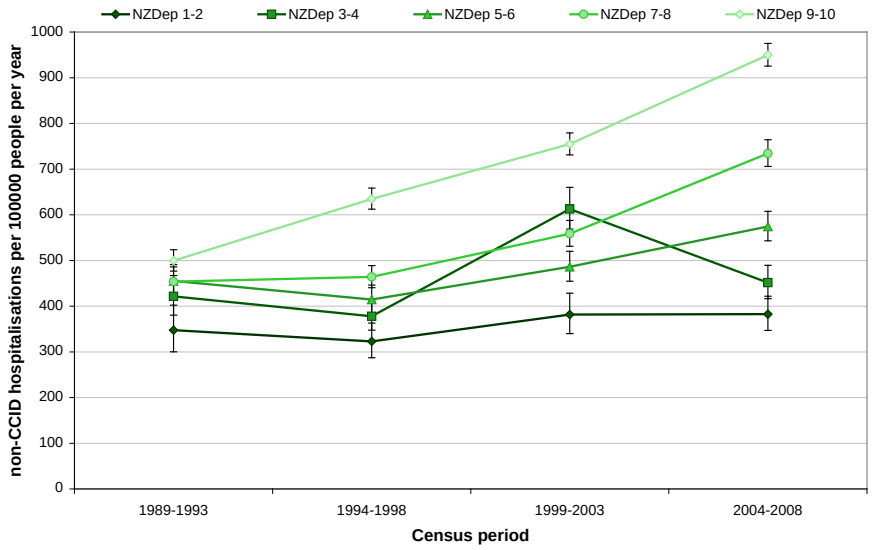


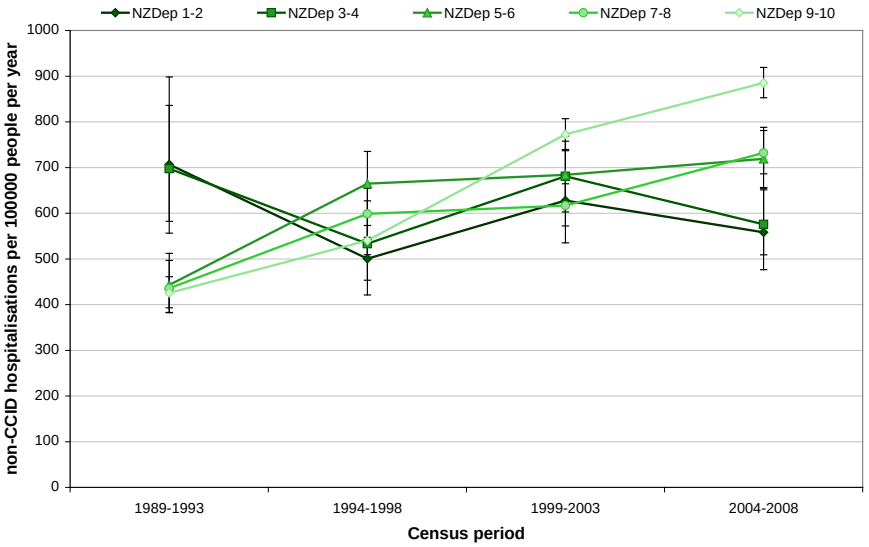
Figure 39. Non-CCID hospitalisation rates per 100000 people, by ethnicity and NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 27 for data]

Māori



Pacific



European & Other

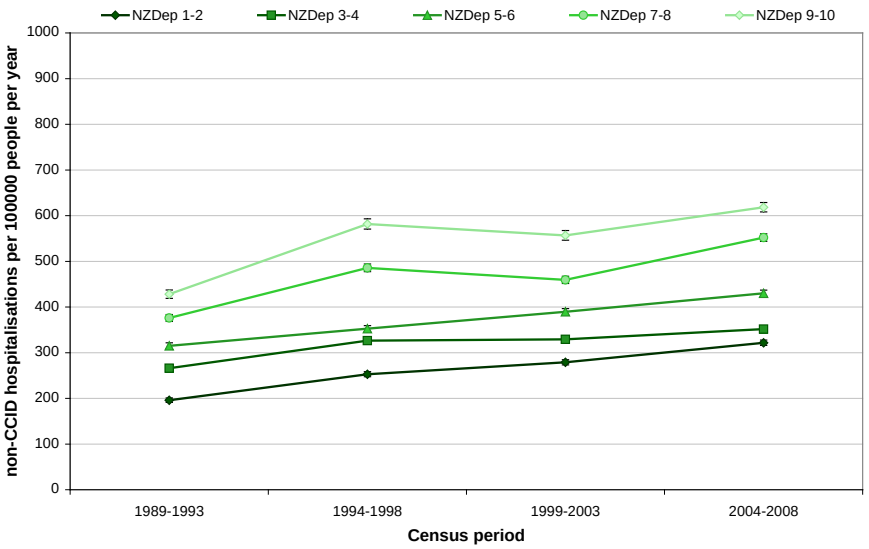


Figure 40. Ratio of Māori ID hospitalisation rate to European & Other, by NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 28 for data]

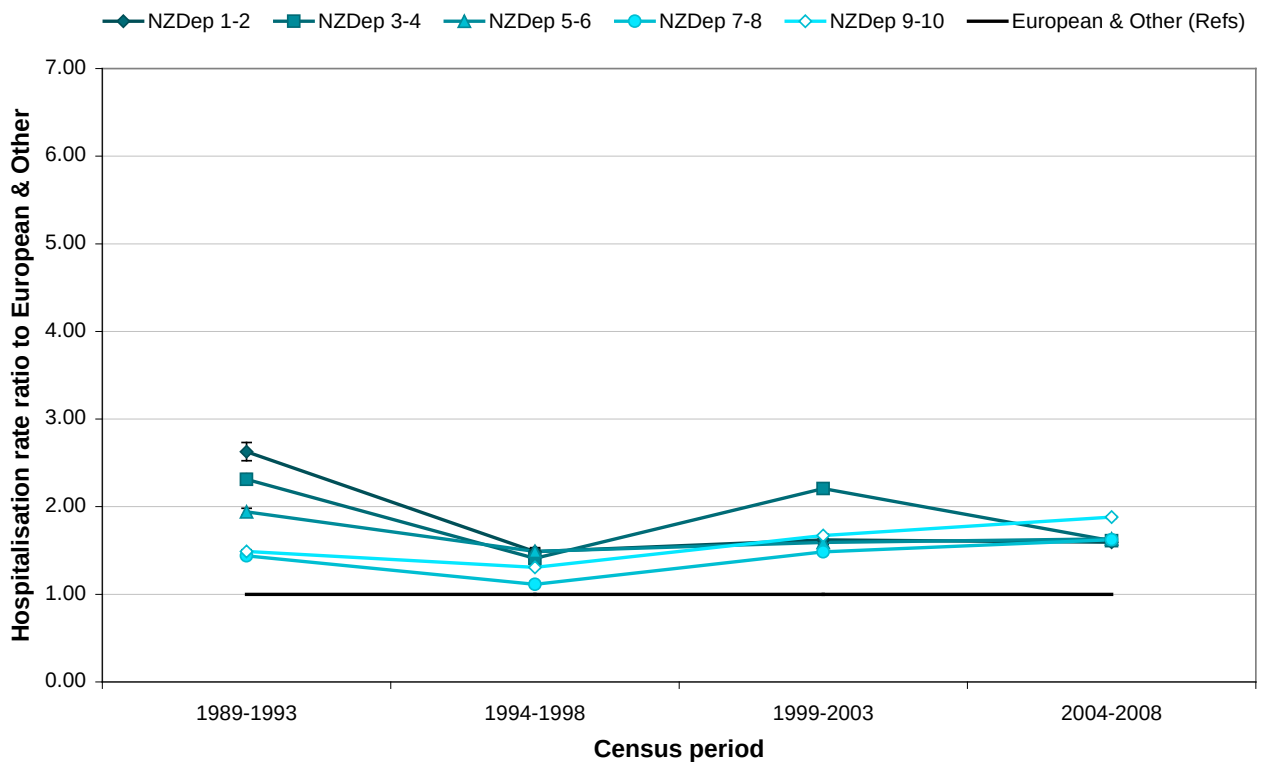


Figure 41. Ratio of Pacific ID hospitalisation rate to European & Other, by NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 29 for data]

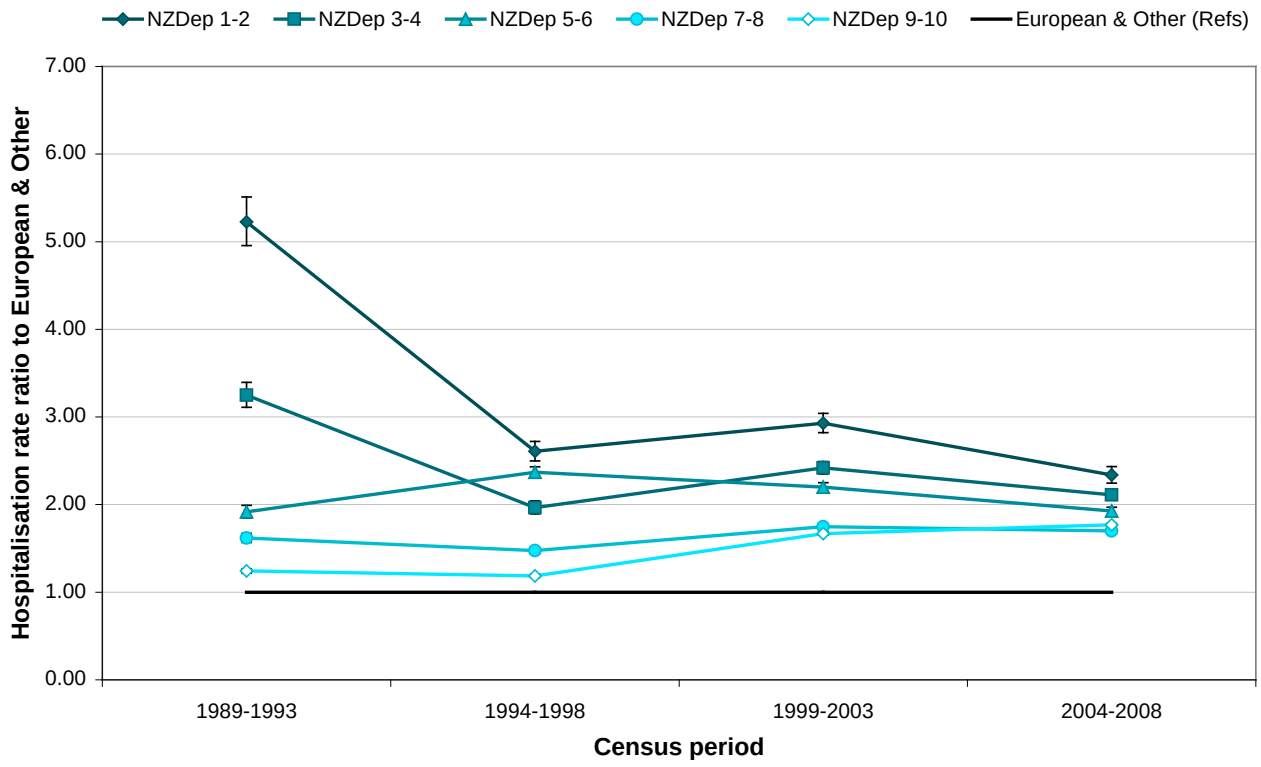


Figure 42. Ratio of Māori CCID hospitalisation rate to European & Other, by NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 28 for data]

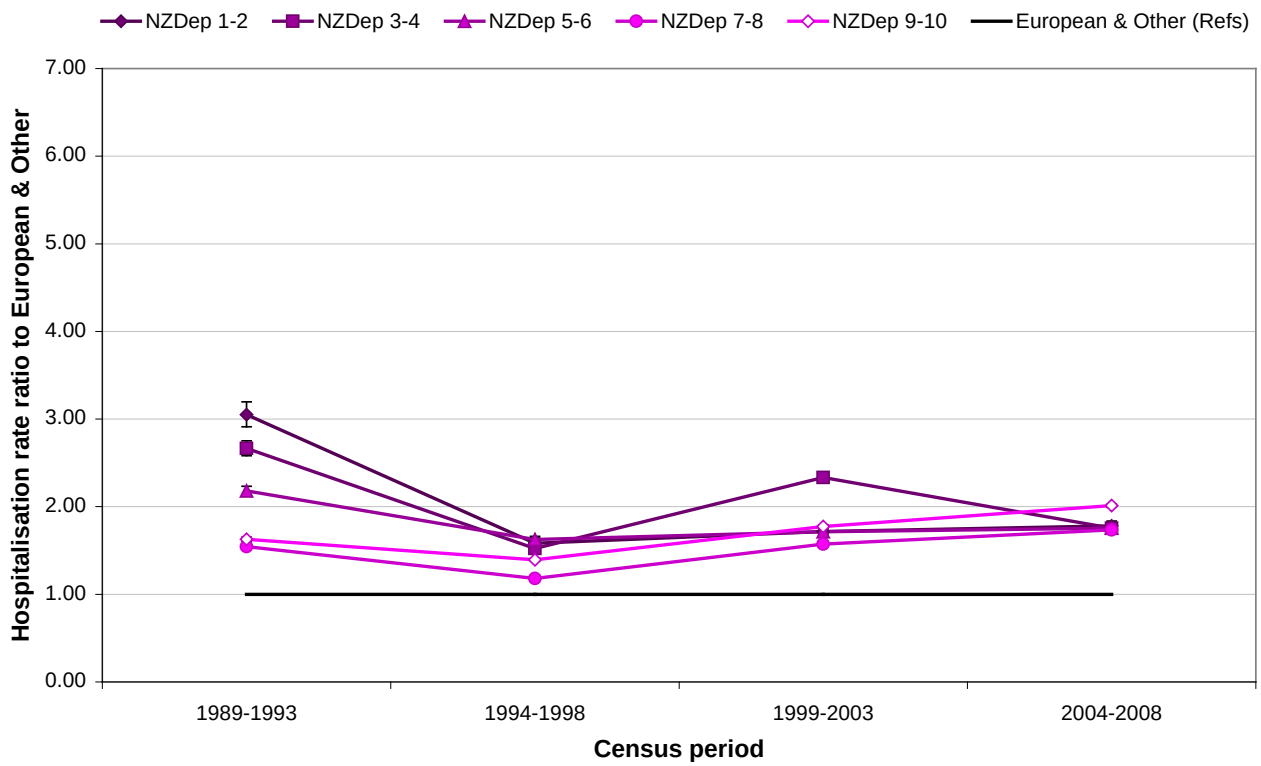


Figure 43. Ratio of Pacific CCID hospitalisation rate to European & Other, by NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 29 for data]

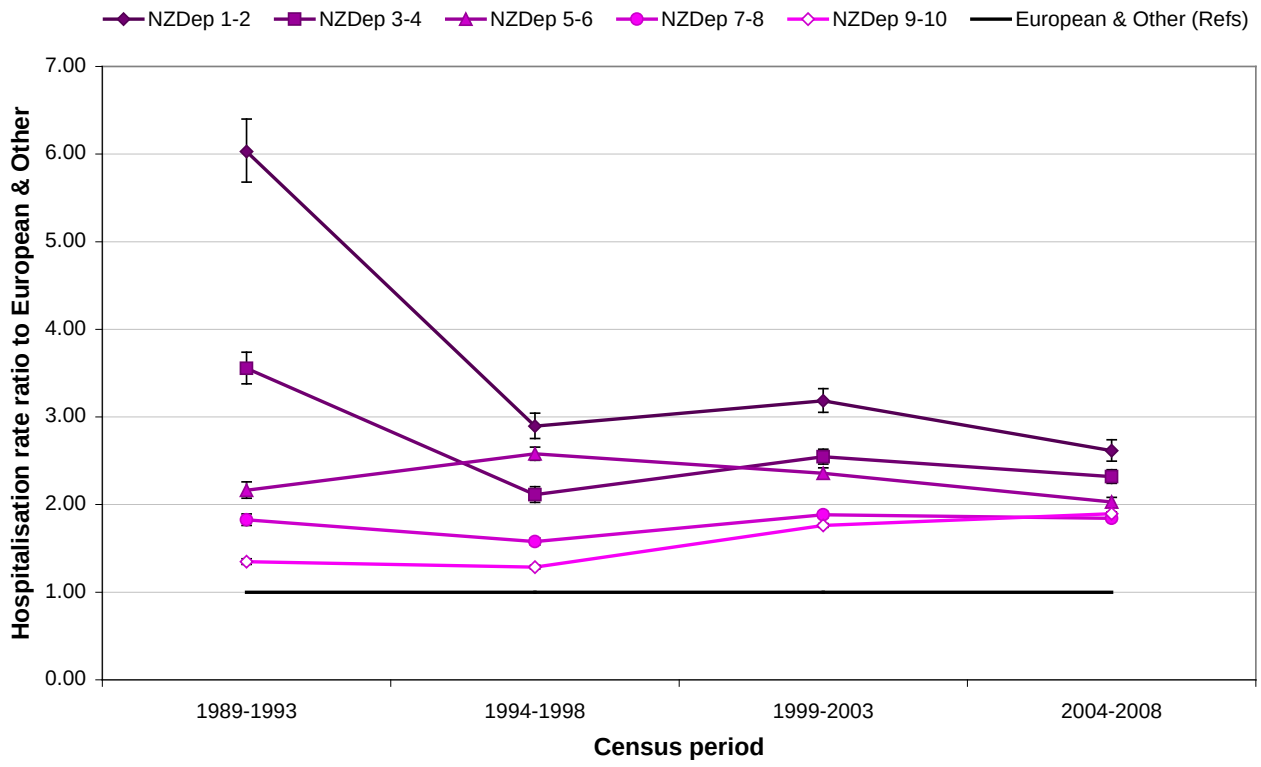


Figure 44. Ratio of Māori non-CCID hospitalisation rate to European & Other, by NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 28 for data]

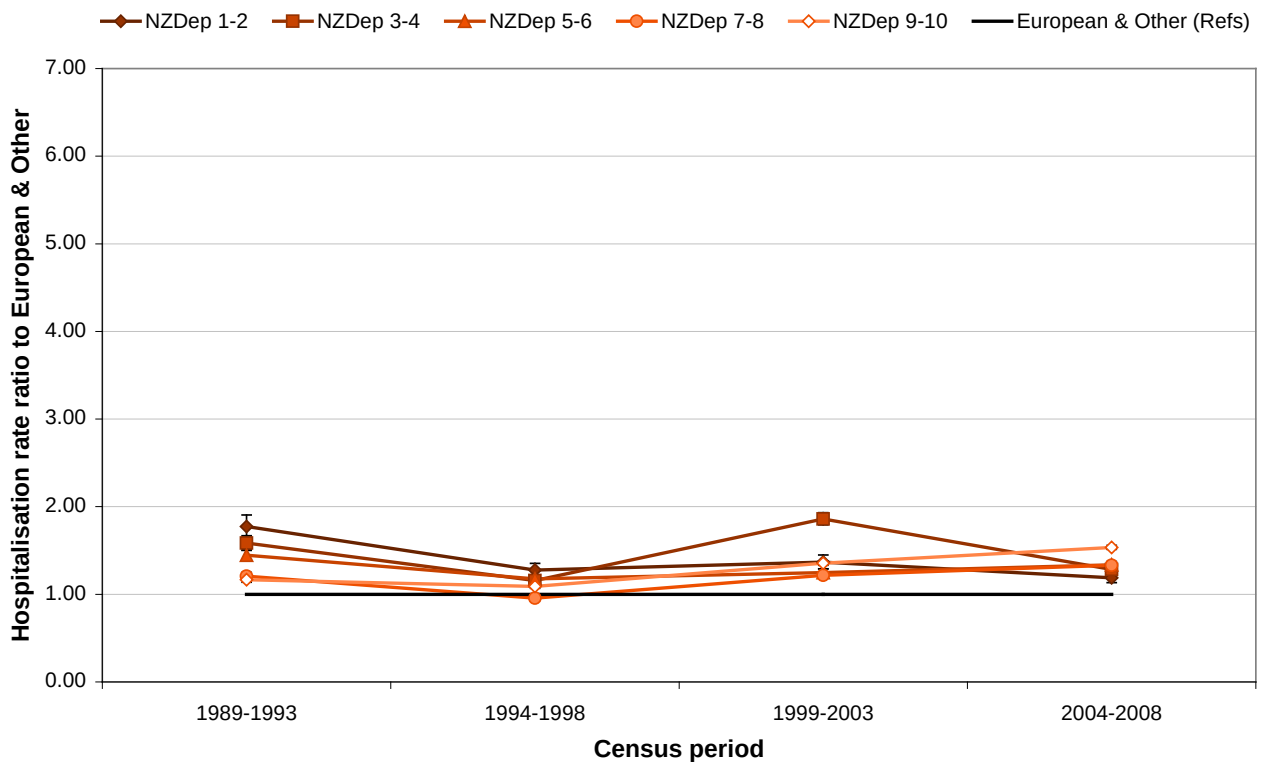
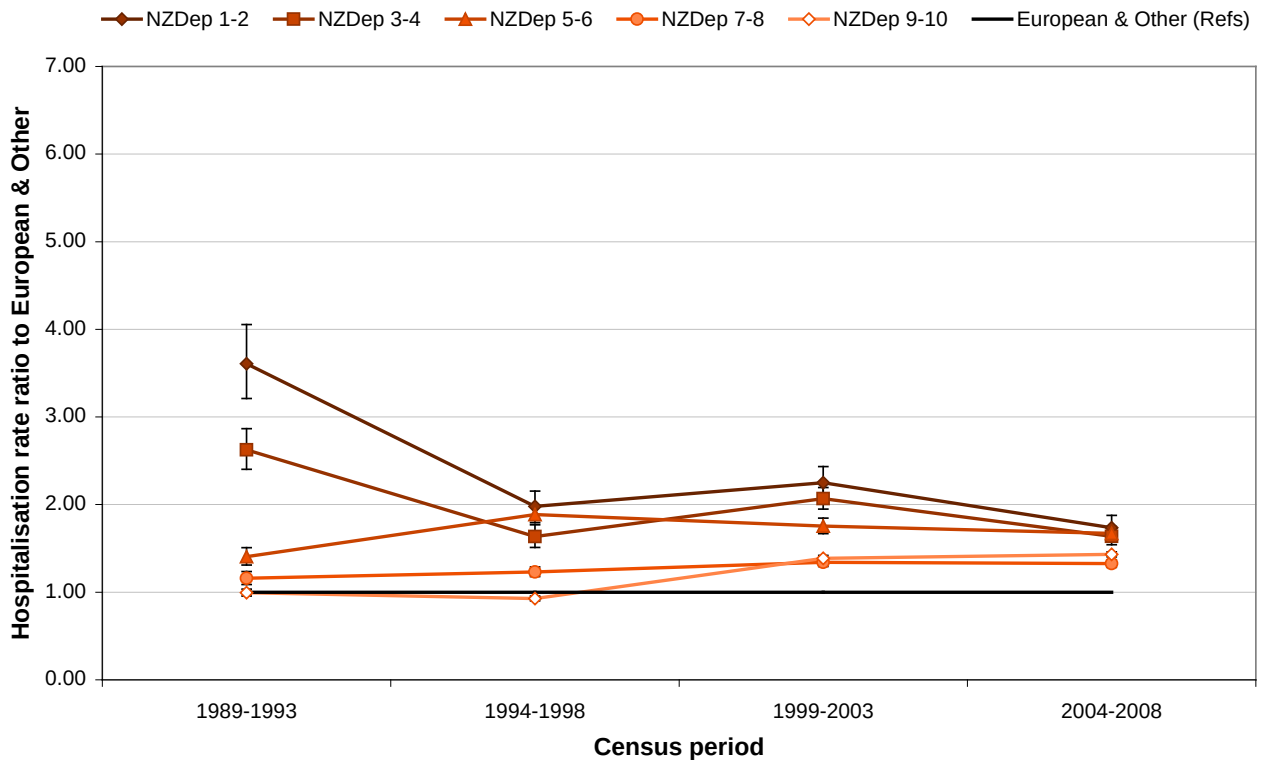


Figure 45. Ratio of Pacific non-CCID hospitalisation rate to European & Other, by NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census).

[See Table 29 for data]



5. Discussion and conclusions

5.1. Key findings

Infectious diseases make a large contribution to all-cause hospitalisations, accounting for 17.9 percent of hospitalisations in 1989 to 1993, increasing to 25.8 percent of hospitalisations in 2004 to 2008. This large increase in infectious disease hospitalisations has important health and economic implications. The increase is equivalent to an additional 22,000 hospitalisations a year (compared with what would have been seen had the proportion of 17.9 percent of hospitalisations caused by infectious diseases in 1989 to 1993 continued to the present).

CCID hospitalisations have also increased, both in total rates and as a proportion of all-cause hospitalisations. Their contribution to infectious diseases increased significantly from 70.7 percent to 73.5 percent over this period. They now make up nearly a fifth of all hospitalisations.

Both Māori and Pacific CCID rates were consistently higher than European/Other rates. In addition, there were widening ethnic inequalities in infectious disease over the 20-year observation period. In the 1989 to 1993 period the SRR for Māori was 2.22 and for Pacific peoples was 2.25 compared with European/Other. By 2004 to 2008, these SRRs had increased to 2.38 for Māori (7% increase) and to 2.61 for Pacific peoples (16% increase). The pattern was more varied for specific CCID sub-categories; in some instances increasing inequalities were the result of rates dropping less quickly among Māori or Pacific than among European/Other, rather than increasing more quickly.

CCID rate differences (hospitalisations per 100,000 per year) from European/Other rates have also increased over the study period, with an 82.8 percent increase from 797.9 to 1458.6 for Maori, and a 109.3 percent increase from 812.1 to 1701.0 for Pacific peoples.

The analysis of CCID hospitalisations for specific Pacific populations (using Statistics NZ level 2 ethnicity grouping) showed higher levels of inequality for Samoans and Tongans in relation to the European/Other reference group, and somewhat lower inequalities for Cook Islanders and Niueans. In other respects, the patterns for these ethnic groups largely followed that seen for the Pacific population in total.

CCID incidence was higher among groups living in more socio-economically deprived areas, and increased more in these groups over the study period, both in total, and as a percentage of all-cause hospitalisations. Otherwise, inequalities by NZDep were only slightly more pronounced for CCIDs than for other hospitalisations, and less pronounced in non-CCIDs.

Both ethnicity and socioeconomic deprivation had strong independent effects on infectious disease hospitalisation risk, particularly for CCID, with little interaction between them. The consequence is that Māori and Pacific peoples are particularly vulnerable to CCID. Firstly, because the risk of infection with these diseases is strongly association with deprivation and Māori and Pacific peoples make up a disproportionate share of the most deprived populations;[20] and secondly, because Māori and Pacific peoples have approximately twice the risk of CCID hospitalisation across all levels of deprivation.

Respiratory illness made the largest contribution to the increase in CCIDs over the study period. Inequalities for both Māori and Pacific rates of respiratory CCID vs. European/Other have reduced slightly in relation to all-cause hospitalisations.

The findings of this report also support the validity of distinguishing CCIDs from infectious diseases more generally (i.e. non-CCIDs) – not only are they different in mode of transmission, but they also behave differently over time and across ethnic groups and levels of small-area socio-

economic deprivation. In particular, the distinct behaviour of CCIDs and non-CCIDs by NZDep over the 10 years from 1999 to 2008, in relation to all-cause hospitalisations, suggests the two categories should be considered differently.

5.2. Implications

Because CCIDs are making a large and increasing contribution to hospitalisations and to health inequalities, they are an important area for public health intervention.

Prevention and control measures for CCIDs require further development, but can be classified into three broad groups:

1. Determinant focussed – these are measures aimed at general determinants of inequalities in health (e.g. reducing household crowding to limit transmission of all CCIDs, ensuring adequate water supplies to support personal hygiene).
2. Transmission focused – these are measures aimed at reducing specific modes of transmission that will usually be common to several diseases (e.g. focus on reducing active and passive smoking and promoting cough etiquette to reduce rates of respiratory infection; focus on provision of adequate hand-washing facilities in schools and pre-schools to reduce enteric infections).
3. Disease-specific – these are measures focused on specific infectious diseases such as primary prevention of rheumatic fever, introduction and high coverage of vaccines for specific diseases (e.g. meningococcal disease and pneumococcal disease), and measures to improve access to specific treatment (e.g. for *Helicobacter pylori* infection to reduce peptic ulcer disease and gastric cancer).

The disease sub-categories with the greatest potential for intervention are those which make a relatively large contribution to the disease burden, and which have been rising most rapidly. By these criteria, the prime candidates for intervention are lower respiratory tract infections and bacterial skin infections, which made up 7.4 percent and 4.6 percent respectively of all-cause hospitalisations in the 2004 to 2008 period, having increased from 3.6 percent and 2.3 percent respectively in the 1989 and 1993 period.

The large, and increasing, health inequalities for acute rheumatic fever mean that prevention and control of this disease deserves particular attention. The need to halt or reverse increasing health inequalities would also support a particular focus on pertussis and improved access to *Helicobacter pylori* treatment.

Whatever interventions are introduced, it is particularly important that they include strategies to ensure high coverage for Māori and Pacific populations. An example where a worthwhile intervention did not achieve uniformly high coverage was vaccination against New Zealand's serogroup B meningococcal disease epidemic over the 2004-06 period. Coverage was high in Pacific populations and Europeans but somewhat lower in Māori.[21] The programme contributed to a highly significant drop in disease risk for all ethnic groups. However, difference in vaccine uptake probably contributed to a relative widening of inequalities for Māori relative to European/Other, whereas inequalities for Pacific stayed the same (though still unacceptably wide). The analysis in this report has also identified differences in infectious disease risk for the main Pacific ethnic groups in New Zealand suggesting that targeted ethnic specific approach may be needed.

5.3. Limitations

Findings from this study need to be interpreted with caution for a number of reasons.

- Limitations with the infectious disease classification system – the definition of diseases as predominantly infectious and predominantly CCID is based on expert judgement. This classification is built on previous international and New Zealand work. The system has been further refined by the project team and peer-reviewed by a highly qualified external reference group. However, there will inevitably be some errors remaining in this classification.
- Limitations with the numerator – hospitalisations only capture a proportion of all diseases cases. For severe diseases, such as meningococcal disease, this proportion will be high, but for less severe diseases, such as mumps, this proportion will be low and possibly not representative of disease distribution in the total population. There are a range of issues with using hospitalisation data, such as use of principal diagnosis, which inevitably under-counts some disease groups.
- Limitations with the denominator – rate calculations have used denominator populations from the New Zealand census. There are potential problems when matching to an appropriate numerator, particularly for analyses by ethnic group. These potential problems have been highlighted in this present analysis when considering hospitalisation rates for some Pacific populations, as shown by the discordance between NHI and census counts for the *Other Pacific* category.
- Limitations of ethnicity coding – ethnicity data routinely collected in health data sets, such as hospitalisations, has been shown to undercount Māori.[22] It is possible that this degree of undercount has decreased over time. If that is the case, then this effect would have tended to decrease the observed level of inequality in historic data compared with the 'true' effect and also compared with what is observed in more recent data. To minimise this potential effect, we assigned ethnicity using both the hospitalisation and NHI ethnicity fields combined. i.e. a hospitalisation would be counted as Māori or Pacific if their ethnicity was recorded as Māori or Pacific in either the NHI or their hospitalisation record.
- Study size and precision – by effectively using the entire population of New Zealand this analysis achieves a high level of statistical precision. However, some of the diseases reported here are still relatively uncommon so findings need to be interpreted with caution.
- Geographical variation – this study does not distinguish between different geographical areas of New Zealand. Infectious disease incidence may not be homogenous across the country.
- Limitations in methods for measuring inequalities – this report has used relatively simple methods for presenting ethnic inequalities in infectious disease rates. Inequalities have generally been expressed as SRR, with some also expressed as SRD. Additional methods could be used in future analyses.[23]

5.4. Further work

This is the first stage of a larger project. The next stage will produce a detailed description of household crowding across the 1991 to 2006 period (based on four censuses), with a specific focus on household crowding levels and ethnic inequalities. The goal is to identify how improvement to housing conditions and reduced inequalities in the determinants of health could contribute to lowering rates of infectious diseases.

This analysis by its very nature has looked at large disease groupings. All of the categories described here would benefit from more detailed analysis.

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7. Appendices

7.1. Filters

Table 11. Hospitalisations excluded and remaining by filter method

	1989 to 1993			1994 to 1998			1999 to 2003			2004 to 2008		
Method for removing event	**No. of hosps excluded**	**No. of hosps remaining**	**% of total**	**No. of hosps excluded**	**No. of hosps remaining**	**% of total**	**No. of hosps excluded**	**No. of hosps remaining**	**% of total**	**No. of hosps excluded**	**No. of hosps remaining**	**% of total**
		2687289			3418927			4347784			4403379	
Pregnancy, childbirth and the puerperium (O00-O99).	394078	2293211	85.34	397611	3021316	88.37	406012	3941772	90.66	430905	3972474	90.21
Certain conditions originating in the perinatal period (P00-P96).	56163	2237048	83.25	75920	2945396	86.15	86425	3855347	88.67	83730	3888744	88.31
Congenital malformations, deformations and chromosomal abnormalities (Q00-Q99).	33915	2203133	81.98	35481	2909915	85.11	38440	3816907	87.79	38578	3850166	87.44
Factors influencing health status and contact with health services (Z00-Z99).	311967	1891166	70.37	552287	2357628	68.96	700134	3116773	71.69	798806	3051360	69.30
Diagnosis type (no hospitalisations excluded).												
Purchaser code = '06'	69	1891097	70.37	86819	2270809	66.42	340455	2776318	63.86	35699	3015661	68.49
NZ Resident Status = N	8898	1882199	70.04	32192	2238617	65.48	32177	2744141	63.12	107666	2907995	66.04
Combine transfers with new admissions into single admission episodes.	99993	1782206	66.32	116184	2122433	62.08	163497	2580644	59.36	138857	2769138	62.89
Admission type = restrict to AC and AA, exclude WN	655116	1127090	41.94	605307	1517126	44.37	703491	1877153	43.17	734706	2034432	46.20
Length of stay = 0 days	98165	1028925	38.29	245286	1271840	37.20	436849	1440304	33.13	565547	1468885	33.36
Same encrypted NHI, same diagnostic code, admission date within 30 days of previous admission, or, injury event date is the same as previous admission.	44410	984515	36.64	59915	1211925	35.45	62130	1378174	31.70	59876	1409009	32.00

7.2. Close-contact infectious diseases (CCIDs) conditions

Table 12. Conditions included as CCIDs

CCIDs	ICD10 code
1 Close-contact enteric infections	
1.1 Gastroenteritis (from human sources)	
Shigellosis	A03
Giardiasis	A071
Rotavirus enteritis	A080
Norovirus gastroenteritis	A081
Adenovirus enteritis	A082
Other viral enteritis	A083
Viral intestinal infection, unspecified	A084
Other specified intestinal infections	A085
Diarrhoea of presumed infectious origin	A09
Nausea and vomiting	R11
1.2 Other enteric infections (from human sources)	
Acute poliomyelitis	A80
Enteroviral encephalitis	A850
Enteroviral meningitis	A870
Acute hepatitis A	B15
Epidemic myalgia (Bornholm disease)	B330
Enterovirus infection, unspecified	B341
Enterobiasis (pinworm)	B80
1.3 Late effects of enteric infections	
Sequelae of Poliomyelitis	B91
Osteopathy after poliomyelitis	M896
Malignant neoplasm of stomach and carcinoma in situ of stomach	C16, D002
Peptic ulcer	K25-K28
2 Close-contact infectious disease with respiratory transmission	
2.1 Tuberculosis	
Tuberculosis (respiratory, CNS, other organs, □ilitary)	A15-A19
Tuberculosis of cervix, causing PID	N740, N741
Pneumoconiosis associated with TB	J65
Tuberculous oesophagitis	K230
Tuberculous arthritis	M011
Tuberculosis complicating pregnancy, childbirth and puerperium	O980
Observation for suspected tuberculosis	Z030
Tuberculosis disorders of intestines, peritoneum and mesenteric glands	K930
2.2 Pertussis	
Whooping cough	A37
2.3 Bacterial meningitis and septicaemia	
Meningococcal disease	A39
Meningococcal arthritis	M010
Septicaemia due to *Streptococcus pneumoniae*	A403
Pneumococcal meningitis	G001
Pneumococcal arthritis and polyarthritis	M001
Haemophilus influenzae septicaemia	A413
Haemophilus influenzae infection, unspecified	A492
Haemophilus meningitis	G000
2.4 Respiratory viruses	
Varicella	B010, B011, B012, B019
Measles	B05

Rubella	B06
Rubella arthritis	M014
Exanthema subitum (sixth disease)	B082
Erythema infectiosum (fifths disease)	B083
Hand, foot and mouth/enteroviral vesicular stomatitis with exanthem	B084
Enteroviral vesicular pharyngitis herpangina	B085
Other viral exanthemata with skin and mucous membrane lesions	B088, B09
Mumps	B26
Coronavirus infection, unspecified	B342
Parvovirus infection, unspecified	B343
2.5 URTI	
Suppurative otitis media	H660, H661, H662, H663, H664
Mastoiditis	H700, H701, H702, H708
Acute myringitis	H730
Acute nasopharyngitis	J00
Acute sinusitis	J01
Acute streptococcal pharyngitis	J020, J030
Acute pharyngitis	J028, J029
Acute tonsillitis	J038, J039,
Acute laryngitis and tracheitis	J04
Acute obstructive laryngitis (croup) and epiglottitis	J05
Acute upper respiratory infections of multiple and unspecified sites	J06
Chronic sinusitis	J32
Peritonsillar abscess	J36
Retro/pharyngeal abscesses	J390, J391
2.6 LRTI	
Influenza	J10, J11
Viral pneumonia not elsewhere classified	J12
Pneumonia due to *Streptococcus pneumoniae*	J13
Pneumonia due to *Haemophilus influenzae*	J14
Pneumonia due to other organisms not elsewhere classified	J16
Pneumonia organism, unspecified	J18
Acute bronchitis	J20
Acute bronchiolitis	J21
Unspecified acute lower respiratory infection	J22
Infective exacerbation of COPD	J440
Abscess of lung and mediastinum, pyothorax	J85, J86
2.7 Post-streptococcal diseases	
Rheumatic fever	I00, I01, I02
Acute nephritic syndrome	N003, N004
2.8 Late effects of respiratory infections	
Zoster	B02
Sequelae of Tuberculosis	B90
Malignant neoplasm of the nasopharynx	C11
Kaposi's sarcoma	C46
Hodgkin's lymphoma	C81
Burkitt's tumour	C837
Chronic rheumatic heart disease	I05, I06, I07, I08, I09
Bronchiectasis	J47
Nephrotic Syndrome – diffuse mesangial proliferative	N043
Nephrotic Syndrome – diffuse endocapillary proliferative	N044

3 Close-contact skin infections	
3.1 Bacterial skin infections	
Impetigo	L01
Cutaneous abscess, furuncle and carbuncle	L02
Cellulitis	L03
Acute lymphadenitis	L04
Pilonidal cyst with abscess	L050
Other local infections of skin	L08
Erysipelas	A46
Hordeolum (abscess, stye)	H000
Acute inflammation of orbit (including abscess, cellulitis)	H050
Abscess and cellulitis of external ear	H600, H601
Otitis externa	H602, H603, H608, H609
Abscess, furuncle and carbuncle of nose	J340
Other inflammatory disorders of penis	N482
Inflammatory disorder of scrotum	N492
Inflammatory disorder of unspecified male genital organ	N499
Anal abscess	K610
Abscess of vulva	N764
Varicella with other complications (infection)	B018
Scabies	B86
Other dermatitis (infective dermatitis)	L303, L308, L309
Insect/spider bite	S1013, S1083, S1093, S2013, S2033, S2043, S2083, S3083, S3093, S4083, S5083, S6083, S7083, S8083, S9083, T009, T0903, T1108, T1303, T1403, T633, T634
Post-traumatic wound infection NEC	T793
Open wound with foreign body (with or without infection)	T8901
Open wound with infection	T8902
3.2 Invasive staphylococcal infections	
Staphylococcus aureus septicaemia	A410
Staphylococcal septicaemia	A411, A412
Staphylococcal meningitis	G003
Staphylococcal arthritis and polyarthritis	M000
Osteomyelitis	M86
Inflammatory disorders of breast (abscess, carbuncle, mastitis)	N61
Staphylococcal infection, unspecified	A490
3.3 Other skin infections from human sources	
Viral warts	B07
Molluscum contagiosum	B081
Dermatophytosis (tinea)	B35
Other superficial mycosis	B36
4 Close-contact disease with multiple or unknown transmission	
4.1 Other bacterial infections from human contact	
Scarlet fever	A38
Septicaemia due to group A streptococcus	A400
Streptococcal infection, unspecified	A491
Streptococcal meningitis	G002
Other streptococcal arthritis and polyarthritis	M002
Pyogenic arthritis due to other bacteria and unspecified	M008, M009
Other bacterial meningitis	G008, G009,
Non pyogenic meningitis (non-bacterial)	G030
Chronic meningitis, benign recurrent meningitis (Mollaret)	G031, G032
Meningitis unspecified	G038, G039

Bacterial meningoencephalitis and meningomyelitis NEC	G042
4.2 Other viral infections from human contact	
Unspecified viral encephalitis	A86
Adenoviral meningitis	A871
Other and unspecified viral meningitis	A878, A879
Other and unspecific viral infections of CNS	A888, A89
Herpes simplex virus infection	B00
Cytomegalovirus	B25
Infectious mononucleosis (gammaherpesviral mononucleosis)	B270
Cytomegaloviral mononucleosis	B271
Infectious mononucleosis	B278, B279
Viral conjunctivitis	B30
Viral Carditis	B332
Adenoviral and other specified viral encephalitis	A851, A858
Adenovirus infection, unspec	B340
Papovavirus infection (including BKV and JCV), unspecified	B344
Other viral infections of unspecified site	B348
Viral infection, unspec (including viremia NOS)	B349
4.3 Other and mixed infections from human contact	
Conjunctivitis	H100, H102, H103, H104, H105, H108, H109
Pediculosis and phthiriasis	B85
4.4 Late effects of other close-contact infectious diseases	
Acute disseminated encephalitis	G040
Other encephalitis, myelitis and encephalomyelitis (post-infectious)	G048
Encephalitis, myelitis and encephalomyelitis, unspecified	G049

*CCID indicator excludes late effects of these diseases.

7.3. Detailed results tables for CCIDs

Table 13. Distribution of CCIDs by disease group, and time period

Close-contact infectious diseases (CCIDs)	1989 to 1993														
	Maori					Pacific					Euro/Other				
	No	Rate				No	Rate				No	Rate			
		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)
1. Close-contact enteric infections	**2440**	**112.2**	**161.9**	**152.3**	**172.2**	**882**	**105.6**	**184.1**	**166.2**	**204.0**	**14826**	**106.4**	**107.0**	**105.2**	**108.7**
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	1556	71.6	54.9	50.4	59.9	440	52.7	32.3	28.2	37.0	7441	53.4	53.0	51.8	54.2
1.2 Other enteric infections (from human sources) e.g. enterovirus	30	1.4	1.3	0.8	2.1	11	1.3	0.8	0.4	1.5	207	1.5	1.5	1.3	1.7
1.3 Late effects of enteric infections e.g. peptic ulcer	854	39.3	105.7	97.4	114.8	431	51.6	151.0	133.8	170.5	7178	51.5	52.5	51.3	53.7
2. Close-contact infectious disease with respiratory transmission	**19802**	**910.8**	**815.9**	**796.4**	**835.9**	**7157**	**856.8**	**833.8**	**796.7**	**872.7**	**45572**	**327.1**	**326.9**	**323.9**	**330.0**
2.1 Tuberculosis (not counted)	0	0.0	0.0	.	.	0	0.0	0.0	.	.	0	0.0	0.0	.	.
2.2 Pertussis (whooping cough)	150	6.9	3.4	2.9	4.0	80	9.6	4.3	3.4	5.3	352	2.5	2.5	2.3	2.8
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	264	12.1	7.8	6.6	9.2	140	16.8	13.1	10.2	16.8	749	5.4	5.3	4.9	5.7
2.4 Respiratory viruses e.g. measles, varicella	364	16.7	9.2	8.3	10.3	115	13.8	7.3	6.0	8.9	830	6.0	5.9	5.5	6.3
2.5 URTI e.g. pharyngitis	6888	316.8	184.2	178.6	189.9	1564	187.2	107.6	100.0	115.8	17854	128.2	126.6	124.8	128.5
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	10676	491.0	509.1	491.9	527.0	4538	543.2	553.0	520.7	587.2	23108	165.9	167.2	165.0	169.3
2.7 Post-streptococcal diseases e.g. rheumatic fever	401	18.4	13.1	11.7	14.6	226	27.1	19.1	16.5	22.0	241	1.7	1.8	1.6	2.0
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	1059	48.7	89.2	82.7	96.1	494	59.1	129.5	114.6	146.4	2438	17.5	17.7	17.0	18.4
3. Close-contact skin infections	**7028**	**323.2**	**338.1**	**326.9**	**349.7**	**2926**	**350.3**	**334.8**	**316.7**	**353.8**	**17135**	**123.0**	**122.1**	**120.3**	**124.0**
3.1 Bacterial skin infections e.g. abscess	6012	276.5	288.6	278.2	299.5	2583	309.2	298.7	281.3	317.2	15101	108.4	107.6	105.9	109.4
3.2 Invasive staphylococcal infections e.g. septicaemia	994	45.7	48.7	44.9	52.9	334	40.0	35.0	30.6	40.0	1940	13.9	13.8	13.2	14.4
3.3 Other skin infections from human sources e.g. tinea	22	1.0	0.8	0.5	1.3	9	1.1	1.1	0.5	2.5	94	0.7	0.7	0.6	0.8
4. Close-contact disease with multiple or unknown transmission	**2346**	**107.9**	**81.2**	**76.7**	**85.9**	**758**	**90.7**	**75.8**	**67.6**	**85.0**	**11458**	**82.2**	**81.2**	**79.7**	**82.7**
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	400	18.4	17.8	15.7	20.3	166	19.9	22.5	17.3	29.4	1415	10.2	10.2	9.7	10.7
4.2 Other viral infections from human contact e.g. viral encephalitis	1889	86.9	61.3	57.5	65.4	573	68.6	51.3	45.6	57.8	9836	70.6	69.5	68.1	70.9
4.3 Other and mixed infections from human contact e.g. conjunctivitis	26	1.2	0.9	0.5	1.4	9	1.1	1.1	0.3	3.7	84	0.6	0.6	0.5	0.8
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	31	1.4	1.1	0.8	1.7	10	1.2	0.8	0.4	1.6	123	0.9	0.9	0.7	1.0

Close-contact infectious diseases (CCIDs)	1994 to 1998														
	Maori					Pacific					Euro/Other				
	No	Rate				No	Rate				No	Rate			
		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)
1. Close-contact enteric infections	**3788**	**144.8**	**175.7**	**167.2**	**184.5**	**1525**	**150.8**	**206.0**	**190.9**	**222.2**	**21102**	**144.4**	**146.8**	**144.8**	**148.8**
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	2817	107.6	84.8	79.8	90.0	977	96.6	66.1	60.1	72.7	14568	99.7	103.4	101.8	105.1
1.2 Other enteric infections (from human sources) e.g. enterovirus	66	2.5	2.2	1.6	2.8	27	2.7	1.8	1.2	2.7	304	2.1	2.1	1.8	2.3
1.3 Late effects of enteric infections e.g. peptic ulcer	905	34.6	88.7	82.1	96.0	521	51.5	138.0	124.5	153.1	6230	42.6	41.3	40.3	42.3
2. Close-contact infectious disease with respiratory transmission	**24297**	**928.5**	**920.0**	**901.6**	**938.8**	**10333**	**1021.9**	**1024.2**	**991.0**	**1058.5**	**60590**	**414.8**	**422.3**	**418.9**	**425.7**
2.1 Tuberculosis (not counted)	0	0.0	0.0	.	.	0	0.0	0.0	.	.	0	0.0	0.0	.	.
2.2 Pertussis (whooping cough)	225	8.6	4.3	3.8	4.9	84	8.3	3.8	3.0	4.7	405	2.8	3.0	2.7	3.3
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	544	20.8	13.7	12.3	15.3	464	45.9	27.2	24.3	30.4	1160	7.9	8.3	7.9	8.8
2.4 Respiratory viruses e.g. measles, varicella	248	9.5	5.2	4.6	5.9	153	15.1	7.4	6.3	8.8	731	5.0	5.2	4.8	5.6
2.5 URTI e.g. pharyngitis	6845	261.6	168.6	163.7	173.7	1741	172.2	115.4	107.7	123.7	19125	130.9	136.8	134.8	138.7
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	14967	571.9	637.7	621.2	654.7	7030	695.2	737.9	708.2	768.8	36145	247.4	248.5	246.0	251.1
2.7 Post-streptococcal diseases e.g. rheumatic fever	378	14.4	10.1	9.0	11.2	290	28.7	18.9	16.7	21.3	247	1.7	1.8	1.6	2.0
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	1090	41.7	80.3	74.7	86.4	571	56.5	113.6	102.5	126.0	2777	19.0	18.6	18.0	19.3
3. Close-contact skin infections	**9666**	**369.4**	**386.0**	**376.0**	**396.3**	**4951**	**489.6**	**500.2**	**481.2**	**519.9**	**26577**	**181.9**	**180.9**	**178.7**	**183.1**
3.1 Bacterial skin infections e.g. abscess	8258	315.6	328.3	319.0	337.8	4386	433.8	444.5	426.5	463.4	23870	163.4	162.3	160.3	164.4
3.2 Invasive staphylococcal infections e.g. septicaemia	1391	53.2	57.1	53.6	60.9	560	55.4	54.8	49.4	60.9	2622	17.9	18.0	17.3	18.7
3.3 Other skin infections from human sources e.g. tinea	17	0.6	0.6	0.4	1.1	5	0.5	0.8	0.3	2.2	85	0.6	0.6	0.5	0.7
4. Close-contact disease with multiple or unknown transmission	**3289**	**125.7**	**92.8**	**88.9**	**97.0**	**1392**	**137.7**	**108.6**	**100.9**	**117.0**	**15773**	**108.0**	**110.7**	**109.0**	**112.5**
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	516	19.7	18.6	16.5	20.9	290	28.7	29.9	25.1	35.6	1700	11.6	11.7	11.2	12.3
4.2 Other viral infections from human contact e.g. viral encephalitis	2710	103.6	72.7	69.4	76.1	1086	107.4	77.2	71.4	83.4	13814	94.6	97.2	95.6	98.8
4.3 Other and mixed infections from human contact e.g. conjunctivitis	39	1.5	0.8	0.6	1.1	7	0.7	0.7	0.2	2.3	113	0.8	0.8	0.7	1.0
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	24	0.9	0.8	0.5	1.4	9	0.9	0.9	0.4	1.7	146	1.0	1.0	0.8	1.2

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

Close-contact infectious diseases (CCIDs)	1999 to 2003														
	Maori					Pacific					Euro/Other				
	No	Rate				No	Rate				No	Rate			
		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)
1. Close-contact enteric infections	**5031**	**191.2**	**216.1**	**207.4**	**225.0**	**2400**	**207.1**	**252.6**	**238.4**	**267.6**	**22848**	**151.8**	**154.4**	**152.4**	**156.4**
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	3875	147.3	117.6	112.3	123.1	1665	143.7	103.0	96.1	110.5	16577	110.1	116.4	114.7	118.2
1.2 Other enteric infections (from human sources) e.g. enterovirus	62	2.4	1.8	1.4	2.4	35	3.0	2.0	1.4	2.8	330	2.2	2.3	2.1	2.6
1.3 Late effects of enteric infections e.g. peptic ulcer	1094	41.6	96.7	90.0	103.9	700	60.4	147.6	135.4	160.8	5941	39.5	35.7	34.8	36.6
2. Close-contact infectious disease with respiratory transmission	**31892**	**1212.0**	**1399.6**	**1376.4**	**1423.2**	**16339**	**1409.7**	**1614.6**	**1576.9**	**1653.1**	**81673**	**542.5**	**536.6**	**532.9**	**540.3**
2.1 Tuberculosis (not counted)	0	0.0	0.0	.	.	0	0.0	0.0	.	.	0	0.0	0.0	.	.
2.2 Pertussis (whooping cough)	286	10.9	5.8	5.2	6.6	136	11.7	5.8	4.9	6.8	405	2.7	3.0	2.8	3.4
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	837	31.8	21.2	19.6	23.1	586	50.6	32.1	29.0	35.5	1322	8.8	9.5	9.0	10.0
2.4 Respiratory viruses e.g. measles, varicella	270	10.3	6.0	5.3	6.8	144	12.4	7.2	6.0	8.6	768	5.1	5.6	5.2	6.0
2.5 URTI e.g. pharyngitis	6704	254.8	178.3	173.1	183.6	2196	189.5	136.4	129.3	143.8	17823	118.4	128.1	126.2	130.0
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	22293	847.2	1103.1	1081.3	1125.3	12239	1056.0	1291.4	1256.3	1327.4	58216	386.7	370.9	367.9	373.9
2.7 Post-streptococcal diseases e.g. rheumatic fever	282	10.7	7.6	6.8	8.7	227	19.6	13.9	12.2	15.9	79	0.5	0.6	0.4	0.7
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	1220	46.4	77.5	72.3	83.1	811	70.0	127.9	117.4	139.3	3060	20.3	19.0	18.3	19.7
3. Close-contact skin infections	**15765**	**599.1**	**641.1**	**628.1**	**654.4**	**7836**	**676.1**	**713.3**	**693.0**	**734.1**	**40443**	**268.7**	**265.0**	**262.4**	**267.6**
3.1 Bacterial skin infections e.g. abscess	13793	524.2	558.5	546.3	571.0	6952	599.8	632.4	613.3	652.1	36825	244.6	241.2	238.7	243.6
3.2 Invasive staphylococcal infections e.g. septicaemia	1964	74.6	82.3	77.8	87.1	877	75.7	80.3	73.8	87.3	3554	23.6	23.4	22.7	24.2
3.3 Other skin infections from human sources e.g. tinea	8	0.3	0.3	0.1	0.5	7	0.6	0.6	0.2	1.5	64	0.4	0.4	0.3	0.5
4. Close-contact disease with multiple or unknown transmission	**4736**	**180.0**	**136.0**	**131.3**	**141.0**	**2556**	**220.5**	**177.8**	**168.9**	**187.2**	**17115**	**113.7**	**120.5**	**118.7**	**122.3**
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	771	29.3	27.5	24.9	30.3	407	35.1	34.8	30.3	40.1	1945	12.9	13.1	12.5	13.7
4.2 Other viral infections from human contact e.g. viral encephalitis	3907	148.5	106.5	102.7	110.5	2124	183.3	141.0	133.5	148.8	14874	98.8	105.4	103.7	107.1
4.3 Other and mixed infections from human contact e.g. conjunctivitis	39	1.5	1.1	0.7	1.7	10	0.9	1.0	0.4	2.2	125	0.8	0.9	0.8	1.1
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	19	0.7	0.9	0.4	2.0	15	1.3	1.1	0.6	1.9	171	1.1	1.2	1.0	1.3

[1] Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

Close-contact infectious diseases (CCIDs)	2004 to 2008														
	Maori					Pacific					Euro/Other				
	No	Rate				No	Rate				No	Rate			
		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)		Crude	Age-std	Low (CI)	Up (CI)
1. Close-contact enteric infections	**5636**	**199.4**	**225.6**	**217.8**	**233.8**	**2804**	**210.8**	**258.0**	**245.2**	**271.5**	**23584**	**145.7**	**147.8**	**145.9**	**149.8**
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	4310	152.5	135.3	129.9	140.9	2047	153.9	133.8	125.9	142.2	18404	113.7	119.1	117.4	120.9
1.2 Other enteric infections (from human sources) e.g. enterovirus	119	4.2	3.2	2.6	4.1	59	4.4	2.9	2.3	3.8	324	2.0	2.2	2.0	2.5
1.3 Late effects of enteric infections e.g. peptic ulcer	1207	42.7	87.1	81.5	93.1	698	52.5	121.2	111.3	132.0	4856	30.0	26.5	25.8	27.3
											23584				
2. Close-contact infectious disease with respiratory transmission	**33347**	**1179.8**	**1422.9**	**1401.7**	**1444.5**	**16814**	**1264.3**	**1572.5**	**1538.4**	**1607.4**	**88028**	**544.0**	**526.2**	**522.7**	**529.7**
2.1 Tuberculosis (not counted)	0	0.0	0.0	.	.	0	0.0	0.0	.	.	0	0.0	0.0	.	.
2.2 Pertussis (whooping cough)	172	6.1	3.6	3.1	4.2	61	4.6	2.4	1.9	3.1	180	1.1	1.3	1.1	1.5
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	409	14.5	12.9	11.3	14.7	220	16.5	13.6	11.4	16.3	810	5.0	5.3	4.9	5.6
2.4 Respiratory viruses e.g. measles, varicella	288	10.2	6.6	5.8	7.4	140	10.5	6.7	5.5	8.0	701	4.3	4.9	4.5	5.2
2.5 URTI e.g. pharyngitis	6503	230.1	170.5	165.8	175.3	2393	179.9	142.2	135.2	149.5	15790	97.6	107.3	105.6	109.0
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	24202	856.2	1144.4	1124.4	1164.8	12830	964.7	1281.8	1249.9	1314.5	67055	414.4	387.9	384.9	390.9
2.7 Post-streptococcal diseases e.g. rheumatic fever	401	14.2	9.9	8.9	10.9	257	19.3	13.2	11.6	15.0	65	0.4	0.4	0.3	0.6
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	1372	48.5	75.1	70.3	80.2	913	68.7	112.6	103.8	122.1	3427	21.2	19.2	18.5	19.8
3. Close-contact skin infections	**18829**	**666.1**	**698.0**	**686.0**	**710.3**	**9038**	**679.6**	**716.0**	**697.9**	**734.6**	**44527**	**275.2**	**269.8**	**267.3**	**272.3**
3.1 Bacterial skin infections e.g. abscess	16782	593.7	617.9	606.6	629.4	8203	616.8	643.6	626.4	661.2	40411	249.7	244.7	242.3	247.1
3.2 Invasive staphylococcal infections e.g. septicaemia	2018	71.4	79.0	75.1	83.2	826	62.1	71.9	66.1	78.2	4050	25.0	24.7	23.9	25.5
3.3 Other skin infections from human sources e.g. tinea	29	1.0	1.2	0.8	1.7	9	0.7	0.6	0.3	1.2	66	0.4	0.4	0.3	0.5
4. Close-contact disease with multiple or unknown transmission	**4654**	**164.6**	**136.5**	**131.7**	**141.4**	**2465**	**185.4**	**160.6**	**152.8**	**168.9**	**15618**	**96.5**	**103.2**	**101.6**	**104.8**
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	619	21.9	25.4	22.9	28.2	327	24.6	28.2	24.4	32.5	1828	11.3	11.3	10.8	11.8
4.2 Other viral infections from human contact e.g. viral encephalitis	3939	139.4	108.2	104.3	112.3	2098	157.8	129.9	123.2	137.0	13509	83.5	90.1	88.6	91.6
4.3 Other and mixed infections from human contact e.g. conjunctivitis	65	2.3	1.7	1.2	2.4	18	1.4	1.2	0.6	2.1	136	0.8	0.9	0.8	1.1
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	31	1.1	1.2	0.7	2.0	22	1.7	1.3	0.8	2.1	145	0.9	0.9	0.8	1.1

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census

Table 14. CCIDs disease group hospitalisation rate ratios to European/Other, by ethnic group and time period

	1989-1993						1994-1998					
	Maori RR to Euro/Other			Pacific RR to Euro/Other			Maori RR to Euro/Other			Pacific RR to Euro/Other		
	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)
1. Close-contact enteric infections	**1.51**	**1.47**	**1.56**	**1.72**	**1.64**	**1.81**	**1.20**	**1.17**	**1.23**	**1.40**	**1.35**	**1.46**
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	1.04	0.99	1.08	0.61	0.57	0.65	0.82	0.80	0.84	0.64	0.61	0.67
1.2 Other enteric infections (from human sources) e.g. enterovirus	0.86	0.67	1.10	0.54	0.40	0.73	1.05	0.91	1.20	0.89	0.73	1.08
1.3 Late effects of enteric infections e.g. peptic ulcer	2.02	1.93	2.10	2.88	2.71	3.06	2.15	2.07	2.24	3.34	3.18	3.52
2. Close-contact infectious disease with respiratory transmission	**2.50**	**2.46**	**2.53**	**2.55**	**2.49**	**2.61**	**2.18**	**2.16**	**2.20**	**2.43**	**2.39**	**2.47**
2.1 Tuberculosis (not counted)	.	.	.	.	.	.	.	.	.	.	.	.
2.2 Pertussis (whooping cough)	1.34	1.22	1.47	1.70	1.51	1.91	1.45	1.34	1.57	1.26	1.13	1.41
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	1.47	1.35	1.61	2.47	2.18	2.81	1.65	1.55	1.75	3.26	3.06	3.46
2.4 Respiratory viruses e.g. measles, varicella	1.56	1.47	1.66	1.24	1.12	1.37	1.00	0.93	1.08	1.44	1.32	1.57
2.5 URTI e.g. pharyngitis	1.45	1.43	1.48	0.85	0.82	0.88	1.23	1.21	1.25	0.84	0.82	0.87
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	3.05	2.99	3.10	3.31	3.21	3.41	2.57	2.53	2.60	2.97	2.91	3.03
2.7 Post-streptococcal diseases e.g. rheumatic fever	7.39	6.80	8.02	10.79	9.84	11.83	5.57	5.14	6.04	10.45	9.61	11.37
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	5.04	4.84	5.25	7.32	6.88	7.80	4.31	4.14	4.48	6.10	5.78	6.43
3. Close-contact skin infections	**2.77**	**2.72**	**2.82**	**2.74**	**2.67**	**2.82**	**2.13**	**2.10**	**2.16**	**2.77**	**2.71**	**2.82**
3.1 Bacterial skin infections e.g. abscess	2.68	2.63	2.73	2.78	2.69	2.86	2.02	1.99	2.05	2.74	2.68	2.80
3.2 Invasive staphylococcal infections e.g. septicaemia	3.53	3.37	3.69	2.53	2.36	2.71	3.18	3.06	3.29	3.05	2.89	3.22
3.3 Other skin infections from human sources e.g. tinea	1.18	0.92	1.51	1.61	1.06	2.46	1.07	0.80	1.41	1.39	0.85	2.28
4. Close-contact disease with multiple or unknown transmission	**1.00**	**0.97**	**1.03**	**0.93**	**0.88**	**0.99**	**0.84**	**0.82**	**0.86**	**0.98**	**0.95**	**1.02**
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	1.75	1.64	1.87	2.22	1.94	2.53	1.58	1.49	1.68	2.55	2.33	2.78
4.2 Other viral infections from human contact e.g. viral encephalitis	0.88	0.85	0.91	0.74	0.70	0.78	0.75	0.73	0.77	0.79	0.76	0.83
4.3 Other and mixed infections from human contact e.g. conjunctivitis	1.41	1.10	1.82	1.82	1.00	3.30	0.96	0.80	1.15	0.84	0.46	1.53
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	1.31	1.06	1.63	0.92	0.64	1.31	0.86	0.66	1.12	0.86	0.60	1.22

	1999-2003						2004-2008					
	Maori RR to Euro/Other			Pacific RR to Euro/Other			Maori RR to Euro/Other			Pacific RR to Euro/Other		
	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)
1. Close-contact enteric infections	**1.40**	**1.37**	**1.43**	**1.64**	**1.59**	**1.68**	**1.53**	**1.50**	**1.55**	**1.75**	**1.70**	**1.79**
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	1.01	0.99	1.03	0.89	0.85	0.92	1.14	1.11	1.16	1.12	1.09	1.16
1.2 Other enteric infections (from human sources) e.g. enterovirus	0.79	0.69	0.92	0.85	0.72	1.01	1.46	1.29	1.65	1.33	1.16	1.53
1.3 Late effects of enteric infections e.g. peptic ulcer	2.71	2.61	2.81	4.14	3.96	4.32	3.29	3.17	3.40	4.57	4.38	4.78
2. Close-contact infectious disease with respiratory transmission	**2.61**	**2.59**	**2.63**	**3.01**	**2.97**	**3.04**	**2.70**	**2.68**	**2.73**	**2.99**	**2.96**	**3.02**
2.1 Tuberculosis (not counted)	.	.	.	.	.	.	.	.	.	.	.	.
2.2 Pertussis (whooping cough)	1.91	1.78	2.06	1.89	1.72	2.07	2.82	2.55	3.12	1.89	1.64	2.18
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	2.25	2.14	2.36	3.39	3.21	3.58	2.45	2.28	2.64	2.59	2.36	2.84
2.4 Respiratory viruses e.g. measles, varicella	1.08	1.01	1.16	1.29	1.17	1.42	1.35	1.26	1.45	1.37	1.25	1.51
2.5 URTI e.g. pharyngitis	1.39	1.37	1.41	1.06	1.04	1.09	1.59	1.56	1.61	1.33	1.29	1.36
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	2.97	2.94	3.01	3.48	3.43	3.53	2.95	2.92	2.98	3.30	3.26	3.35
2.7 Post-streptococcal diseases e.g. rheumatic fever	13.69	12.11	15.48	24.97	22.03	28.30	22.79	20.06	25.90	30.49	26.67	34.86
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	4.08	3.93	4.24	6.74	6.44	7.05	3.92	3.78	4.06	5.88	5.63	6.13
3. Close-contact skin infections	**2.42**	**2.39**	**2.45**	**2.69**	**2.65**	**2.73**	**2.59**	**2.56**	**2.61**	**2.65**	**2.62**	**2.69**
3.1 Bacterial skin infections e.g. abscess	2.32	2.29	2.34	2.62	2.58	2.66	2.53	2.50	2.55	2.63	2.59	2.67
3.2 Invasive staphylococcal infections e.g. septicaemia	3.51	3.40	3.63	3.43	3.28	3.58	3.20	3.11	3.29	2.91	2.79	3.04
3.3 Other skin infections from human sources e.g. tinea	0.61	0.42	0.88	1.34	0.84	2.13	2.77	2.20	3.48	1.37	0.96	1.97
4. Close-contact disease with multiple or unknown transmission	**1.13**	**1.11**	**1.15**	**1.48**	**1.44**	**1.51**	**1.32**	**1.30**	**1.35**	**1.56**	**1.52**	**1.60**
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	2.10	1.99	2.21	2.66	2.48	2.86	2.25	2.13	2.38	2.50	2.32	2.69
4.2 Other viral infections from human contact e.g. viral encephalitis	1.01	0.99	1.03	1.34	1.30	1.37	1.20	1.18	1.23	1.44	1.40	1.48
4.3 Other and mixed infections from human contact e.g. conjunctivitis	1.24	1.00	1.55	1.06	0.70	1.61	1.86	1.54	2.25	1.27	0.94	1.72
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	0.82	0.56	1.20	0.92	0.69	1.22	1.31	1.01	1.70	1.43	1.13	1.81

Table 15. Changes in distribution of CCIDs by disease group and ethnic grouping

Close-contact infectious diseases (CCIDs)	1989 to 1993 vs 2004-2008								
	Māori			Pacific			European/Other		
	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)	RR	Low (CI)	Up (CI)
1. Close-contact enteric infections	1.39	1.31	1.48	1.40	1.26	1.55	1.38	1.36	1.40
1.1 Gastroenteritis (from human sources) e.g. giardiasis, norovirus	2.46	2.26	2.69	4.14	3.61	4.75	5.27	2.20	2.30
1.2 Other enteric infections (from human sources) e.g. enterovirus	2.54	1.56	4.12	3.69	2.00	6.80	5.18	1.30	1.72
1.3 Late effects of enteric infections e.g. peptic ulcer	0.82	0.76	0.89	0.80	0.71	0.91	1.66	0.49	0.52
2. Close-contact infectious disease with respiratory transmission	1.74	1.70	1.79	1.89	1.80	1.97	2.52	1.59	1.62
2.1 Tuberculosis (not counted)									
2.2 Pertussis (whooping cough)	1.07	0.91	1.26	0.57	0.45	0.70	0.84	0.46	0.56
2.3 Bacterial meningitis and septicaemia e.g. meningococcal disease	1.65	1.40	1.95	1.04	0.81	1.34	1.66	0.92	1.07
2.4 Respiratory viruses e.g. measles, varicella	0.71	0.64	0.79	0.91	0.75	1.11	1.28	0.77	0.88
2.5 URTI e.g. pharyngitis	0.93	0.90	0.95	1.32	1.23	1.42	1.74	0.84	0.86
2.6 LRTI e.g. influenza, pneumonia, bronchiolitis	2.25	2.17	2.33	2.32	2.18	2.46	2.99	2.29	2.35
2.7 Post-streptococcal diseases e.g. rheumatic fever	0.76	0.68	0.85	0.69	0.60	0.80	1.20	0.22	0.28
2.8 Late effects of respiratory infections e.g. zoster, Hodgkin's lymphoma	0.84	0.78	0.91	0.87	0.77	0.98	1.88	1.04	1.13
3. Close-contact skin infections	2.06	2.00	2.14	2.14	2.02	2.26	3.30	2.18	2.24
3.1 Bacterial skin infections e.g. abscess	2.14	2.06	2.22	2.15	2.03	2.29	3.40	2.24	2.31
3.2 Invasive staphylococcal infections e.g. septicaemia	1.62	1.49	1.76	2.06	1.80	2.35	2.63	1.71	1.87
3.3 Other skin infections from human sources e.g. tinea	1.45	0.91	2.30	0.53	0.23	1.23	1.13	0.50	0.76
4. Close-contact disease with multiple or unknown transmission	1.68	1.59	1.78	2.12	1.89	2.38	3.64	1.25	1.30
4.1 Other bacterial infections from human contact e.g. streptococcal septicaemia	1.43	1.25	1.62	1.25	0.96	1.63	2.15	1.05	1.17
4.2 Other viral infections from human contact e.g. viral encephalitis	1.76	1.65	1.88	2.53	2.25	2.85	4.15	1.27	1.32
4.3 Other and mixed infections from human contact e.g. conjunctivitis	1.96	1.22	3.16	1.04	0.31	3.50	2.25	1.20	1.85
4.4 Late effects of other close-contact infectious diseases e.g. encephalitis	1.06	0.70	1.59	1.66	0.81	3.37	2.20	0.89	1.27

7.4. Further tables for figures

Table 16 All-cause, CCID and non-CCID hospitalisation numbers, crude and age-standardised rates by year, 1989-2008 (age-standardised to 2006 census) [Figure 3]

Year	All-cause hosps				CCIDs				Non-CCIDs			
		Rate per 100000 years				Rate per 100000 years				Rate per 100000 years		
	No	Crude	Age-std (95% CI)		No	Crude	Age-std (95% CI)		No	Crude	Age-std (95% CI)	
1989	194376	5761.1	5895.1	(5868.5-5921.7)	24560	727.9	685.9	(677.3-694.7)	8366	248.0	256.3	(250.8-261.9)
1990	199689	5918.6	6067.8	(6040.8-6094.8)	24593	728.9	688.5	(679.8-697.3)	8688	257.5	266.3	(260.7-272.1)
1991	194951	5778.2	5939.2	(5912.6-5966.0)	24536	727.2	686.2	(677.5-694.9)	9069	268.8	275.8	(270.1-281.6)
1992	193731	5742.0	5908.5	(5881.9-5935.2)	26387	782.1	739.7	(730.7-748.8)	8591	254.6	261.9	(256.3-267.5)
1993	201768	5980.2	6153.8	(6126.7-6181.1)	28560	846.5	801.3	(791.9-810.7)	8707	258.1	266.6	(260.9-272.3)
1994	220544	6095.2	6213.9	(6187.9-6240.1)	31544	871.8	839.4	(830.1-848.7)	9524	263.2	268.8	(263.4-274.3)
1995	241815	6683.1	6838.7	(6811.3-6866.2)	34541	954.6	925.2	(915.5-935.1)	10528	291.0	296.4	(290.7-302.1)
1996	244177	6748.4	6924.8	(6897.2-6952.5)	36659	1013.2	988.0	(977.9-998.2)	10888	300.9	306.7	(301.0-312.6)
1997	253699	7011.5	7203.2	(7175.1-7231.5)	39771	1099.2	1069.9	(1059.3-1080.5)	11388	314.7	321.6	(315.7-327.6)
1998	251690	6956.0	7159.2	(7131.0-7187.4)	38428	1062.0	1034.1	(1023.7-1044.6)	12014	332.0	339.3	(333.3-345.5)
1999	261248	6990.3	7026.3	(6999.4-7053.3)	44221	1183.2	1166.1	(1155.3-1177.1)	13546	362.5	364.1	(358.0-370.2)
2000	272428	7289.5	7333.8	(7306.3-7361.5)	45601	1220.2	1204.5	(1193.5-1215.6)	15260	408.3	410.0	(403.5-416.6)
2001	285307	7634.1	7681.0	(7652.8-7709.3)	49958	1336.7	1319.1	(1307.6-1330.8)	16042	429.2	430.9	(424.3-437.6)
2002	280689	7510.5	7561.2	(7533.3-7589.3)	50154	1342.0	1325.3	(1313.8-1337.0)	15552	416.1	418.8	(412.3-425.4)
2003	278502	7452.0	7505.8	(7477.9-7533.8)	50831	1360.1	1345.9	(1334.2-1357.7)	15784	422.3	425.4	(418.8-432.1)
2004	277585	6891.5	6891.5	(6865.9-6917.2)	50480	1253.2	1253.2	(1242.4-1264.2)	16441	408.2	408.2	(402.0-414.5)
2005	274005	6802.6	6802.6	(6777.2-6828.1)	48482	1203.6	1203.6	(1193.0-1214.4)	16847	418.3	418.3	(412.0-424.6)
2006	284240	7056.7	7056.7	(7030.8-7082.7)	50703	1258.8	1258.8	(1247.9-1269.8)	17593	436.8	436.8	(430.4-443.3)
2007	283787	7045.4	7045.4	(7019.6-7071.4)	50595	1256.1	1256.1	(1245.2-1267.1)	17949	445.6	445.6	(439.1-452.2)
2008	289392	7184.6	7184.6	(7158.5-7210.8)	54793	1360.3	1360.3	(1349.0-1371.8)	17861	443.4	443.4	(437.0-450.0)

Table 17 ID, CCID and non-CCID rates as a percentage of all-cause hospitalisation rates (age standardised to 2006 census) [Figure 4]

	% of all-cause hospitalisations		
	IDs	CCIDs	Non-CCIDs
Year	% (95% CI)	% (95% CI)	% (95% CI)
1989	16.0 (15.6-16.5)	11.6 (11.5-11.8)	4.3 (4.3-4.4)
1990	15.7 (15.3-16.2)	11.3 (11.2-11.5)	4.4 (4.3-4.5)
1991	16.2 (15.8-16.7)	11.6 (11.4-11.7)	4.6 (4.5-4.7)
1992	17.0 (16.5-17.4)	12.5 (12.4-12.7)	4.4 (4.3-4.5)
1993	17.4 (17.0-17.8)	13.0 (12.9-13.2)	4.3 (4.2-4.4)
1994	17.8 (17.5-18.3)	13.5 (13.4-13.7)	4.3 (4.2-4.4)
1995	17.9 (17.5-18.3)	13.5 (13.4-13.7)	4.3 (4.3-4.4)
1996	18.7 (18.3-19.1)	14.3 (14.1-14.4)	4.4 (4.3-4.5)
1997	19.3 (19.0-19.7)	14.9 (14.7-15.0)	4.5 (4.4-4.5)
1998	19.2 (18.8-19.6)	14.4 (14.3-14.6)	4.7 (4.7-4.8)
1999	21.8 (21.4-22.2)	16.6 (16.4-16.8)	5.2 (5.1-5.3)
2000	22.0 (21.7-22.4)	16.4 (16.3-16.6)	5.6 (5.5-5.7)
2001	22.8 (22.5-23.2)	17.2 (17.0-17.3)	5.6 (5.5-5.7)
2002	23.1 (22.7-23.5)	17.5 (17.4-17.7)	5.5 (5.5-5.6)
2003	23.6 (23.3-24.0)	17.9 (17.8-18.1)	5.7 (5.6-5.8)
2004	24.1 (23.8-24.5)	18.2 (18.0-18.3)	5.9 (5.8-6.0)
2005	23.8 (23.5-24.2)	17.7 (17.5-17.9)	6.1 (6.1-6.2)
2006	24.0 (23.7-24.4)	17.8 (17.7-18.0)	6.2 (6.1-6.3)
2007	24.2 (23.8-24.6)	17.8 (17.7-18.0)	6.3 (6.2-6.4)
2008	25.1 (24.8-25.5)	18.9 (18.8-19.1)	6.2 (6.1-6.3)

Table 18 Respiratory, Enteric, Skin and Other CCID hospitalisation numbers, crude and age-standardised rates, and rates as a percentage of all-cause hospitalisations by year, 1989-2008 (age-standardised to 2006 census) [Figure 5, Figure 6]

Year	Respiratory					Enteric				
		Rate per 100,000 years		% of hosps			Rate per 100,000 years		% of hosps	
	No	Crude	Age-std (95% CI)	%	95% CI	No	Crude	Age-std (95% CI)	%	95% CI
1989	13021	385.9	361.6 (355.4-368.0)	6.1	(6.1-6.2)	4832	143.2	132.3 (128.6-136.1)	2.2	(2.2-2.3)
1990	13206	391.4	366.8 (360.5-373.2)	6.0	(6.0-6.2)	4810	142.6	132.1 (128.3-135.9)	2.2	(2.1-2.2)
1991	12802	379.4	355.6 (349.4-361.9)	6.0	(6.0-6.1)	4995	148.0	136.9 (133.1-140.8)	2.3	(2.2-2.4)
1992	14074	417.1	392.3 (385.8-398.9)	6.6	(6.6-6.8)	4733	140.3	130.5 (126.8-134.3)	2.2	(2.1-2.3)
1993	15143	448.8	422.7 (416.0-429.6)	6.9	(6.9-7.0)	5205	154.3	143.6 (139.7-147.6)	2.3	(2.3-2.4)
1994	17039	470.9	450.5 (443.8-457.4)	7.2	(7.2-7.4)	5478	151.4	144.8 (141.0-148.7)	2.3	(2.3-2.4)
1995	17292	477.9	463.9 (457.0-470.9)	6.8	(6.8-6.9)	6710	185.4	175.4 (171.2-179.6)	2.6	(2.5-2.6)
1996	19114	528.3	516.6 (509.3-524.1)	7.5	(7.5-7.6)	6476	179.0	171.1 (167.0-175.4)	2.5	(2.4-2.5)
1997	19769	546.4	533.9 (526.4-541.4)	7.4	(7.4-7.5)	7647	211.3	201.3 (196.8-205.9)	2.8	(2.7-2.9)
1998	18337	506.8	493.5 (486.3-500.7)	6.9	(6.9-7.0)	7392	204.3	196.1 (191.7-200.7)	2.7	(2.7-2.8)
1999	23490	628.5	619.3 (611.4-627.3)	8.8	(8.8-8.9)	7548	202.0	197.8 (193.4-202.3)	2.8	(2.8-2.9)
2000	24352	651.6	643.0 (634.9-651.1)	8.8	(8.8-8.9)	7399	198.0	194.0 (189.7-198.5)	2.6	(2.6-2.7)
2001	26481	708.6	700.2 (691.8-708.7)	9.1	(9.1-9.2)	7575	202.7	198.3 (193.9-202.8)	2.6	(2.5-2.6)
2002	26591	711.5	703.1 (694.7-711.6)	9.3	(9.3-9.4)	7535	201.6	197.4 (193.0-201.9)	2.6	(2.6-2.7)
2003	27140	726.2	719.5 (711.0-728.1)	9.6	(9.6-9.7)	7506	200.8	197.1 (192.7-201.6)	2.6	(2.6-2.7)
2004	27274	677.1	677.1 (669.1-685.2)	9.8	(9.8-9.9)	7331	182.0	182.0 (177.9-186.2)	2.6	(2.6-2.7)
2005	25869	642.2	642.2 (634.5-650.1)	9.4	(9.4-9.6)	7434	184.6	184.6 (180.4-188.8)	2.7	(2.7-2.8)
2006	27484	682.3	682.3 (674.3-690.4)	9.7	(9.7-9.8)	8016	199.0	199.0 (194.7-203.4)	2.8	(2.8-2.9)
2007	26991	670.1	670.1 (662.1-678.1)	9.5	(9.5-9.6)	7845	194.8	194.8 (190.5-199.1)	2.8	(2.7-2.8)
2008	30354	753.6	753.6 (745.2-762.1)	10.5	(10.5-10.6)	8845	219.6	219.6 (215.1-224.2)	3.1	(3.0-3.1)

Year	Skin					Other				
		Rate per 100,000 years		% of hosps			Rate per 100,000 years		% of hosps	
	No	Crude	Age-std (95% CI)	%	95% CI	No	Crude	Age-std (95% CI)	%	95% CI
1989	4471	132.5	129.9 (126.1-133.9)	2.2	(2.1-2.3)	2236	66.3	62.0 (59.5-64.7)	1.1	(1.0-1.1)
1990	4507	133.6	132.6 (128.7-136.6)	2.2	(2.1-2.3)	2070	61.4	57.1 (54.6-59.6)	0.9	(0.9-1.0)
1991	4486	133.0	131.6 (127.7-135.6)	2.2	(2.2-2.3)	2253	66.8	62.1 (59.6-64.8)	1.0	(1.0-1.1)
1992	4500	133.4	132.7 (128.8-136.7)	2.2	(2.2-2.3)	3080	91.3	84.2 (81.3-87.3)	1.4	(1.4-1.5)
1993	4803	142.4	142.1 (138.1-146.2)	2.3	(2.2-2.4)	3409	101.0	92.8 (89.7-96.0)	1.5	(1.5-1.6)
1994	5419	149.8	149.7 (145.7-153.8)	2.4	(2.3-2.5)	3608	99.7	94.4 (91.3-97.5)	1.5	(1.5-1.6)
1995	6633	183.3	183.8 (179.4-188.3)	2.7	(2.6-2.8)	3906	108.0	102.2 (99.0-105.5)	1.5	(1.4-1.5)
1996	7231	199.8	199.6 (195.1-204.3)	2.9	(2.8-3.0)	3838	106.1	100.6 (97.4-103.8)	1.5	(1.4-1.5)
1997	7987	220.7	220.9 (216.1-225.9)	3.1	(3.0-3.1)	4368	120.7	113.8 (110.4-117.2)	1.6	(1.5-1.6)
1998	8619	238.2	237.9 (232.9-243.0)	3.3	(3.3-3.4)	4080	112.8	106.6 (103.4-110.0)	1.5	(1.4-1.5)
1999	8920	238.7	237.8 (232.9-242.8)	3.4	(3.3-3.5)	4263	114.1	111.2 (107.9-114.6)	1.6	(1.5-1.6)
2000	9921	265.5	265.0 (259.8-270.3)	3.6	(3.5-3.7)	3929	105.1	102.5 (99.3-105.7)	1.4	(1.4-1.4)
2001	10854	290.4	289.5 (284.1-295.0)	3.8	(3.7-3.8)	5048	135.1	131.2 (127.6-134.8)	1.7	(1.7-1.8)
2002	11170	298.9	298.5 (293.0-304.1)	3.9	(3.9-4.0)	4858	130.0	126.3 (122.8-129.9)	1.7	(1.6-1.7)
2003	11101	297.0	296.9 (291.4-302.5)	4.0	(3.9-4.0)	5084	136.0	132.4 (128.8-136.1)	1.8	(1.7-1.8)
2004	11123	276.1	276.1 (271.1-281.3)	4.0	(3.9-4.1)	4752	118.0	118.0 (114.7-121.4)	1.7	(1.7-1.8)
2005	10924	271.2	271.2 (266.2-276.3)	4.0	(3.9-4.1)	4255	105.6	105.6 (102.5-108.9)	1.6	(1.5-1.6)
2006	11530	286.2	286.2 (281.1-291.5)	4.1	(4.0-4.1)	3673	91.2	91.2 (88.3-94.2)	1.3	(1.3-1.3)
2007	11803	293.0	293.0 (287.8-298.4)	4.2	(4.1-4.2)	3956	98.2	98.2 (95.2-101.3)	1.4	(1.4-1.4)
2008	11498	285.5	285.5 (280.3-290.7)	4.0	(3.9-4.0)	4096	101.7	101.7 (98.6-104.9)	1.4	(1.4-1.5)

Table 19 Five-yearly hospitalisation rates for all-cause hospitalisations, IDs, CCIDs and non-CCIDs by sex and by age group [Figure 7]

Time period	1989-93	1994-98	1999-2003	2004-08
	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)	Rate (95% CI)
Total hosps				
Males (age-std)	6779.3 (6760.1-6798.6)	7609.6 (7590.3-7629.0)	8178.1 (8158.8-8197.4)	7651.3 (7633.6-7669.1)
Females (age-std)	5411.4 (5395.6-5427.1)	6321.7 (6305.4-6338.1)	6839.4 (6823.0-6855.8)	6510.6 (6495.3-6526.0)
Children <5 yrs	8742.8 (8729.6-8756.0)	9861.1 (9847.3-9875.15)	10018.1(10003.8-10032.73)	9100.1 (9086.5-9113.70)
Children 5-14	3172.0 (3167.7-3176.4)	3484.5 (3480.4-3488.73)	3458.0 (3454.0-3462.00)	3020.7 (3017.1-3024.38)
Adults 15-29	4177.9 (4174.9-4181.0)	4410.3 (4407.1-4413.57)	4713.4 (4709.8-4716.94)	4258.3 (4255.1-4261.40)
Adults 30-69	4982.2 (4980.3-4984.0)	5764.7 (5763.0-5766.49)	6402.4 (6400.7-6404.14)	6095.4 (6093.9-6096.94)
Adults 70+	18505.8(18484.2-18526.4)	21604.9(21584.8-21624.61)	23845.5(23827.2-23864.71)	24238.9(24221.3-24256.45)
Total IDs				
Males (age-std)	1177.7 (1170.1-1185.4)	1483.5 (1475.3-1491.8)	1874.0 (1865.0-1883.1)	1922.2 (1913.4-1931.1)
Females (age-std)	994.1 (987.5-1000.8)	1304.3 (1297.0-1311.7)	1631.0 (1623.0-1639.1)	1714.2 (1706.2-1722.1)
Children <5 yrs	4124.0 (4114.9-4133.1)	5090.6 (5080.6-5100.63)	6004.0 (5992.8-6015.25)	5509.7 (5499.1-5520.26)
Children 5-14	804.8 (802.6-807.0)	976.7 (974.5-978.90)	1066.5 (1064.3-1068.71)	967.4 (965.3-969.42)
Adults 15-29	800.5 (799.1-801.8)	984.9 (983.3-986.37)	1224.4 (1222.5-1226.18)	1208.7 (1207.0-1210.35)
Adults 30-69	663.7 (663.1-664.4)	884.5 (883.8-885.23)	1161.3 (1160.6-1162.03)	1271.9 (1271.2-1272.58)
Adults 70+	2104.9 (2097.7-2111.9)	2838.9 (2831.7-2846.13)	3945.0 (3937.4-3952.68)	4802.0 (4794.2-4809.83)
CCIDs				
Males (age-std)	856.7 (850.2-863.2)	1099.0 (1092.0-1106.1)	1467.7 (1459.7-1475.7)	1453.4 (1445.7-1461.0)
Females (age-std)	681.2 (675.8-686.7)	909.5 (903.4-915.6)	1208.5 (1201.6-1215.4)	1222.9 (1216.2-1229.7)
Children <5 yrs	3854.1 (3845.3-3862.88)	4729.3 (4719.8-4739.04)	5577.5 (5566.8-5588.40)	5116.2 (5106.0-5126.38)
Children 5-14	566.4 (564.6-568.29)	706.6 (704.7-708.45)	793.6 (791.7-795.55)	716.3 (714.5-718.03)
Adults 15-29	413.1 (412.1-414.05)	558.5 (557.3-559.61)	770.2 (768.7-771.64)	737.1 (735.7-738.36)
Adults 30-69	402.3 (401.8-402.83)	557.3 (556.7-557.82)	817.6 (817.0-818.24)	847.4 (846.8-847.94)
Adults 70+	1493.1 (1487.0-1499.01)	2011.5 (2005.4-2017.56)	3025.6 (3019.0-3032.37)	3540.6 (3533.9-3547.31)
NonCCIDs				
Males (age-std)	321.0 (317.0-325.1)	384.5 (380.3-388.8)	406.4 (402.1-410.6)	468.9 (464.5-473.3)
Females (age-std)	312.9 (309.2-316.7)	394.8 (390.7-398.9)	422.5 (418.4-426.6)	491.2 (487.0-495.5)
Children <5 yrs	269.9 (267.6-272.21)	361.2 (358.6-363.89)	426.4 (423.5-429.43)	393.5 (390.7-396.32)
Children 5-14	238.4 (237.2-239.58)	270.1 (269.0-271.29)	272.9 (271.7-273.98)	251.1 (250.1-252.16)
Adults 15-29	387.4 (386.4-388.29)	426.4 (425.4-427.39)	454.2 (453.1-455.28)	471.6 (470.6-472.67)
Adults 30-69	261.4 (261.0-261.85)	327.3 (326.8-327.68)	343.7 (343.3-344.07)	424.5 (424.1-424.92)
Adults 70+	611.8 (608.0-615.65)	827.4 (823.5-831.31)	919.3 (915.7-923.05)	1261.4 (1257.4-1265.43)

Table 20 Five-yearly rate ratios for all-cause hospitalisations, IDs, CCIDs and non-CCIDs by sex and by age group [Figure 9]

Time period	1989-93	1994-98	1999-2003	2004-08
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Total hospitalisations				
Males (age-std)	1.25 (1.25-1.26)	1.20 (1.20-1.21)	1.20 (1.19-1.20)	1.18 (1.17-1.18)
Females (age-std)	Ref	Ref	Ref	Ref
Children <5 yrs	2.09 (2.09-2.10)	2.24 (2.23-2.24)	2.13 (2.12-2.13)	2.14 (2.13-2.14)
Children 5-14	0.76 (0.76-0.76)	0.79 (0.79-0.79)	0.73 (0.73-0.74)	0.71 (0.71-0.71)
Adults 15-29	Ref	Ref	Ref	Ref
Adults 30-69	1.19 (1.19-1.20)	1.31 (1.30-1.31)	1.36 (1.35-1.36)	1.43 (1.43-1.44)
Adults 70+	4.43 (4.42-4.44)	4.90 (4.88-4.91)	5.06 (5.05-5.07)	5.69 (5.68-5.71)
Total IDs				
Males (age-std)	1.18 (1.18-1.19)	1.14 (1.13-1.14)	1.15 (1.15-1.15)	1.12 (1.12-1.12)
Females (age-std)	Ref	Ref	Ref	Ref
Children <5 yrs	5.15 (5.12-5.19)	5.17 (5.14-5.20)	4.90 (4.88-4.93)	4.56 (4.53-4.58)
Children 5-14	Ref (0.99-1.01)	0.99 (0.98-Ref)	0.87 (0.86-0.88)	0.80 (0.79-0.81)
Adults 15-29	Ref	Ref	Ref	Ref
Adults 30-69	0.83 (0.82-0.83)	0.90 (0.89-0.90)	0.95 (0.94-0.95)	1.05 (1.05-1.06)
Adults 70+	2.63 (2.61-2.65)	2.88 (2.86-2.90)	3.22 (3.20-3.24)	3.97 (3.95-3.99)
CCIDs				
Males (age-std)	1.26 (1.25-1.26)	1.21 (1.20-1.21)	1.21 (1.21-1.22)	1.19 (1.18-1.19)
Females (age-std)	Ref	Ref	Ref	Ref
Children <5 yrs	9.33 (9.25-9.41)	8.47 (8.41-8.53)	7.24 (7.19-7.29)	6.94 (6.90-6.99)
Children 5-14	1.37 (1.36-1.39)	1.27 (1.25-1.28)	1.03 (1.02-1.04)	0.97 (0.96-0.98)
Adults 15-29	Ref	Ref	Ref	Ref
Adults 30-69	0.97 (0.97-0.98)	Ref (0.99-1.01)	1.06 (1.05-1.07)	1.15 (1.14-1.16)
Adults 70+	3.61 (3.58-3.65)	3.60 (3.57-3.63)	3.93 (3.90-3.96)	4.80 (4.77-4.84)
NonCCIDs				
Males (age-std)	1.03 (1.02-1.03)	0.97 (0.97-0.98)	0.96 (0.96-0.97)	0.95 (0.95-0.96)
Females (age-std)	Ref	Ref	Ref	Ref
Children <5 yrs	0.70 (0.68-0.71)	0.85 (0.83-0.86)	0.94 (0.93-0.95)	0.83 (0.82-0.85)
Children 5-14	0.62 (0.61-0.62)	0.63 (0.63-0.64)	0.60 (0.59-0.61)	0.53 (0.53-0.54)
Adults 15-29	Ref	Ref	Ref	Ref
Adults 30-69	0.67 (0.67-0.68)	0.77 (0.76-0.77)	0.76 (0.75-0.76)	0.90 (0.89-0.91)
Adults 70+	1.58 (1.56-1.60)	1.94 (1.92-1.96)	2.02 (2.00-2.05)	2.67 (2.65-2.70)

Table 21. Average annual rate and SRRs of all-cause hospitalisations, total infectious diseases, CCIDs and non-CCIDs, for under-5 year olds, by ethnic group, for 5-year periods from 1989 to 2008 (age standardised to 2006 Census). [Figure 20, Figure 21, Figure 22]

Census period	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)	RR	(95% CI)
All-cause hospitalisations								
Euro/Other	Ref		Ref		Ref		Ref	
Māori	1.46	(1.45 - 1.46)	1.20	(1.19 - 1.21)	1.48	(1.47 - 1.49)	1.76	(1.75 - 1.77)
Pacific	1.20	(1.19 - 1.21)	1.16	(1.15 - 1.17)	1.53	(1.52 - 1.55)	1.70	(1.69 - 1.71)
Total IDs								
Euro/Other	Ref		Ref		Ref		Ref	
Māori	1.72	(1.71 - 1.74)	1.39	(1.38 - 1.4)	1.74	(1.72 - 1.75)	2.08	(2.07 - 2.1)
Pacific	1.58	(1.56 - 1.6)	1.49	(1.47 - 1.5)	1.94	(1.93 - 1.96)	2.13	(2.11 - 2.15)
CCIDs								
Euro/Other	Ref		Ref		Ref		Ref	
Māori	1.79	(1.78 - 1.81)	1.44	(1.43 - 1.45)	1.81	(1.79 - 1.82)	2.17	(2.16 - 2.19)
Pacific	1.60	(1.58 - 1.62)	1.51	(1.5 - 1.53)	1.99	(1.97 - 2.01)	2.18	(2.16 - 2.2)
Non-CCIDs								
Euro/Other	Ref		Ref		Ref		Ref	
Māori	0.92	(0.89 - 0.96)	0.79	(0.76 - 0.82)	0.99	(0.96 - 1.02)	1.16	(1.12 - 1.2)
Pacific	1.31	(1.25 - 1.37)	1.17	(1.12 - 1.22)	1.46	(1.41 - 1.51)	1.64	(1.58 - 1.7)

† Average annual rate per 100,000, age standardised to distribution of New Zealand population in 2006 Census
Ref=reference group

Table 22 Five-yearly hospitalisation rates by disease category and NZDep quintile (age-standardised to 2006 Census)

	Rate per 100,000 person years							
	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Total IDs								
NZDep 1-2	631.9	(623.4 - 640.6)	830.9	(821.4 - 840.6)	1067.9	(1057 - 1078.8)	1059.4	(1049.1 - 1069.8)
NZDep 3-4	886.8	(876.6 - 897.1)	1105.7	(1094.7 - 1116.8)	1368.6	(1356.6 - 1380.7)	1214.5	(1203.7 - 1225.3)
NZDep 5-6	1060.7	(1049.5 - 1072)	1243.9	(1232.3 - 1255.6)	1604.4	(1591.4 - 1617.4)	1609.2	(1596.8 - 1621.7)
NZDep 7-8	1291.5	(1279.2 - 1303.8)	1648.0	(1634.6 - 1661.6)	2020.3	(2005.8 – 2035.0)	2218.8	(2204.2 - 2233.4)
NZDep 9-10	1530.6	(1517.1 - 1544.1)	2146.7	(2131.0 - 2162.5)	2857.0	(2839.2 – 2875.0)	3001.9	(2984.6 - 3019.3)
CCIDs								
NZDep 1-2	429.3	(422.2 - 436.4)	575.0	(567.1 - 583.1)	780.2	(770.9 - 789.6)	733.0	(724.5 - 741.7)
NZDep 3-4	610.0	(601.5 - 618.5)	775.9	(766.7 - 785.2)	1019.6	(1009.3 - 1030.1)	856.2	(847.2 - 865.4)
NZDep 5-6	734.9	(725.6 - 744.3)	884.7	(875 - 894.6)	1202.6	(1191.4 - 1213.9)	1163.2	(1152.6 - 1173.8)
NZDep 7-8	915.8	(905.6 - 926.2)	1170.2	(1158.9 - 1181.6)	1544.8	(1532.1 - 1557.6)	1641.4	(1628.9 - 1654)
NZDep 9-10	1112.5	(1101.2 - 1123.8)	1584.4	(1571.1 - 1597.8)	2234.9	(2219.3 - 2250.7)	2281.1	(2266.1 - 2296.2)
Non-CCIDs								
NZDep 1-2	202.7	(197.9 - 207.6)	255.9	(250.7 - 261.3)	287.7	(282.1 - 293.4)	326.4	(320.7 - 332.2)
NZDep 3-4	276.8	(271.1 - 282.6)	329.8	(323.8 - 335.9)	349.0	(343 - 355.1)	358.2	(352.4 - 364.1)
NZDep 5-6	325.8	(319.6 - 332.1)	359.2	(352.9 - 365.6)	401.8	(395.3 - 408.4)	446.0	(439.5 - 452.6)
NZDep 7-8	375.6	(368.9 - 382.5)	477.8	(470.5 - 485.3)	475.5	(468.4 - 482.7)	577.4	(570 - 584.9)
NZDep 9-10	418.1	(410.8 - 425.5)	562.3	(553.9 - 570.7)	622.1	(613.6 - 630.7)	720.8	(712.2 - 729.5)

Table 23 Five-yearly hospitalisation rates as a percentage of total hospitalisations, by disease category and NZDep quintile (age-standardised to 2006 Census)

	Rate per 100,000 person years			
	1989 to 1993	1994 to 1998	1999 to 2003	2004 to 2008
	Rate 95% CI	Rate 95% CI	Rate 95% CI	Rate 95% CI
Total IDs				
NZDep 1-2	16.8% (16.6% - 17.1%)	19.2% (18.9% - 19.4%)	21.9% (21.6% - 22.1%)	23.7% (23.5% - 24.0%)
NZDep 3-4	17.3% (17.1% - 17.5%)	19.3% (19.1% - 19.5%)	21.9% (21.7% - 22.1%)	23.9% (23.7% - 24.1%)
NZDep 5-6	17.4% (17.2% - 17.6%)	19.5% (19.3% - 19.7%)	22.2% (22.0% - 22.4%)	24.5% (24.3% - 24.7%)
NZDep 7-8	17.4% (17.3% - 17.6%)	19.1% (19.0% - 19.3%)	22.5% (22.3% - 22.7%)	25.2% (25.1% - 25.4%)
NZDep 9-10	18.7% (18.5% - 18.9%)	21.1% (20.9% - 21.3%)	25.3% (25.2% - 25.5%)	27.5% (27.3% - 27.6%)
CCIDs				
NZDep 1-2	11.4% (11.2% - 11.6%)	13.3% (13.1% - 13.4%)	16.0% (15.8% - 16.2%)	16.4% (16.2% - 16.6%)
NZDep 3-4	11.9% (11.7% - 12.1%)	13.6% (13.4% - 13.7%)	16.3% (16.1% - 16.5%)	16.9% (16.7% - 17.0%)
NZDep 5-6	12.0% (11.9% - 12.2%)	13.9% (13.7% - 14.0%)	16.7% (16.5% - 16.8%)	17.7% (17.5% - 17.9%)
NZDep 7-8	12.4% (12.2% - 12.5%)	13.6% (13.5% - 13.7%)	17.2% (17.1% - 17.4%)	18.7% (18.5% - 18.8%)
NZDep 9-10	13.6% (13.5% - 13.7%)	15.6% (15.4% - 15.7%)	19.8% (19.7% - 19.9%)	20.9% (20.7% - 21%)
Non-CCIDs				
NZDep 1-2	5.4% (5.3% - 5.6%)	5.9% (5.8% - 6.0%)	6.7% (5.8% - 6.0%)	7.3% (7.2% - 7.4%)
NZDep 3-4	5.4% (5.3% - 5.5%)	5.8% (5.7% - 5.9%)	6.1% (5.5% - 5.7%)	7.1% (6.9% - 7.2%)
NZDep 5-6	5.3% (5.2% - 5.5%)	5.6% (5.5% - 5.7%)	6.3% (5.5% - 5.7%)	6.8% (6.7% - 6.9%)
NZDep 7-8	5.1% (5.0% - 5.2%)	5.5% (5.5% - 5.6%)	5.5% (5.2% - 5.4%)	6.6% (6.5% - 6.7%)
NZDep 9-10	5.1% (5.0% - 5.2%)	5.5% (5.4% - 5.6%)	6.1% (5.4% - 5.6%)	6.6% (6.5% - 6.7%)

Table 24 Ratio of NZDep quintile ID hospitalisation rates to NZDep 1-2, by disease category and census period (age-standardised to 2006 Census)

	Rate per 100,000 person years			
	1989 to 1993	1994 to 1998	1999 to 2003	2004 to 2008
	Rate 95% CI	Rate 95% CI	Rate 95% CI	Rate 95% CI
Total IDs				
NZDep 1-2	1 Ref	1 Ref	1 Ref	1 Ref
NZDep 3-4	1.36 (1.36 - 1.37)	1.33 (1.32 - 1.34)	1.28 (1.27 - 1.29)	1.15 (1.14 - 1.15)
NZDep 5-6	1.62 (1.62 - 1.63)	1.50 (1.49 - 1.51)	1.50 (1.49 - 1.51)	1.52 (1.51 - 1.53)
NZDep 7-8	1.97 (1.97 - 1.98)	1.98 (1.97 - 2)	1.89 (1.88 - 1.9)	2.09 (2.08 - 2.11)
NZDep 9-10	2.18 (2.17 - 2.19)	2.58 (2.57 - 2.6)	2.68 (2.66 - 2.69)	2.83 (2.82 - 2.85)
CCIDs				
NZDep 1-2	1 Ref	1 Ref	1 Ref	1 Ref
NZDep 3-4	1.42 (1.41 - 1.44)	1.35 (1.34 - 1.36)	1.31 (1.3 - 1.32)	1.17 (1.16 - 1.18)
NZDep 5-6	1.71 (1.69 - 1.73)	1.54 (1.53 - 1.55)	1.54 (1.53 - 1.55)	1.59 (1.58 - 1.6)
NZDep 7-8	2.13 (2.11 - 2.15)	2.04 (2.02 - 2.05)	1.98 (1.97 - 1.99)	2.24 (2.22 - 2.25)
NZDep 9-10	2.59 (2.57 - 2.62)	2.76 (2.73 - 2.78)	2.86 (2.85 - 2.88)	3.11 (3.09 - 3.13)
Non-CCIDs				
NZDep 1-2	1 Ref	1 Ref	1 Ref	1 Ref
NZDep 3-4	1.37 (1.34 - 1.39)	1.29 (1.27 - 1.31)	1.21 (1.2 - 1.23)	1.10 (1.08 - 1.11)
NZDep 5-6	1.61 (1.58 - 1.63)	1.40 (1.39 - 1.42)	1.40 (1.38 - 1.41)	1.37 (1.35 - 1.38)
NZDep 7-8	1.85 (1.83 - 1.88)	1.87 (1.84 - 1.89)	1.65 (1.63 - 1.67)	1.77 (1.75 - 1.79)
NZDep 9-10	2.06 (2.03 - 2.09)	2.20 (2.17 - 2.22)	2.16 (2.14 - 2.19)	2.21 (2.19 - 2.23)

Table 25 ID hospitalisation rates per 100,000 people, by ethnicity and NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census)

	Rate per 100,000 person years							
	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Maori								
NZDep 1-2	1549.4	(1430.2 - 1678.6)	1198.1	(1125.7 - 1275.0)	1645.1	(1549.4 - 1746.6)	1626.7	(1544.6 - 1713.3)
NZDep 3-4	1875.9	(1776.0 - 1981.5)	1505.7	(1441.1 - 1573.3)	2751.2	(2655.4 - 2850.5)	1856.4	(1785.5 - 1930.2)
NZDep 5-6	1886.4	(1812.6 - 1963.2)	1736.9	(1674.6 - 1801.5)	2351.6	(2280.9 - 2424.5)	2431.6	(2365.1 - 2499.9)
NZDep 7-8	1743.5	(1686.8 - 1802.1)	1803.1	(1754.6 - 1853.0)	2702.9	(2641.0 - 2766.3)	3200.8	(3140.7 - 3262.1)
NZDep 9-10	2115.6	(2068.4 - 2163.8)	2694.9	(2647.1 - 2743.5)	3800.2	(3746.2 – 3855.0)	4271.2	(4218.1 – 4325.0)
Pacific								
NZDep 1-2	3081.9	(2764.2 - 3436.0)	2100.3	(1923.8 - 2292.9)	2971.6	(2752.9 - 3207.7)	2384.5	(2195.6 - 2589.6)
NZDep 3-4	2637.1	(2410.2 - 2885.2)	2097.4	(1943.2 - 2263.7)	3015.7	(2842.2 - 3199.9)	2433.2	(2292.1 - 2582.9)
NZDep 5-6	1863.1	(1727.3 - 2009.6)	2763.3	(2625.6 - 2908.3)	3248.3	(3100.6 - 3403.0)	2869.5	(2743.2 - 3001.6)
NZDep 7-8	1959.5	(1838.1 - 2088.9)	2388.0	(2282.9 - 2498.0)	3183.9	(3080.1 - 3291.2)	3351.3	(3250.8 - 3455.0)
NZDep 9-10	1765.2	(1695.0 - 1838.3)	2442.8	(2374.1 - 2513.4)	3794.4	(3719.9 - 3870.4)	4015.9	(3946.4 - 4086.6)
European & Other								
NZDep 1-2	589.7	(581.3 - 598.3)	805.6	(795.9 - 815.4)	1014.8	(1003.9 - 1025.8)	1020.0	(1009.5 - 1030.5)
NZDep 3-4	811.5	(801.3 - 821.7)	1066.8	(1055.4 - 1078.3)	1246.2	(1234.2 - 1258.3)	1152.4	(1141.4 - 1163.6)
NZDep 5-6	971.4	(960.0 – 983.0)	1166.1	(1153.9 - 1178.5)	1477.2	(1463.8 - 1490.8)	1489.1	(1476.2 - 1502.1)
NZDep 7-8	1210.6	(1197.3 - 1224.1)	1619.3	(1604.0 - 1634.7)	1821.8	(1806.1 - 1837.7)	1972.1	(1956.4 - 1987.9)
NZDep 9-10	1420.6	(1404.0 - 1437.4)	2060.4	(2039.6 - 2081.5)	2272.5	(2251.4 - 2293.9)	2269.2	(2249.3 - 2289.4)

Table 26 CCID hospitalisation rates per 100,000 people, by ethnicity and NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census)

	Rate per 100,000 person years							
	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Maori								
NZDep 1-2	1201.8	(1093.8 - 1320.5)	875.2	(813.1 - 942.0)	1263.4	(1178.3 - 1354.6)	1244.2	(1170.8 - 1322.1)
NZDep 3-4	1454.4	(1364.1 - 1550.6)	1128.0	(1071.3 - 1187.6)	2138.6	(2054.1 - 2226.5)	1405.0	(1343.9 - 1468.8)
NZDep 5-6	1431.1	(1365.6 - 1499.7)	1322.4	(1267.8 - 1379.3)	1865.3	(1802.4 - 1930.4)	1857.2	(1798.8 - 1917.4)
NZDep 7-8	1289.7	(1242.0 - 1339.1)	1339.1	(1296.9 - 1382.7)	2144.4	(2089.2 - 2201.0)	2466.4	(2413.8 - 2520.2)
NZDep 9-10	1615.9	(1574.8 - 1658)	2059.9	(2018.1 - 2102.7)	3045.5	(2997 - 3094.8)	3321.3	(3274.3 - 3369)
Pacific								
NZDep 1-2	1201.8	(1093.8 - 1320.5)	875.2	(813.1 - 942.0)	1263.4	(1178.3 - 1354.6)	1244.2	(1170.8 - 1322.1)
NZDep 3-4	1454.4	(1364.1 - 1550.6)	1128.0	(1071.3 - 1187.6)	2138.6	(2054.1 - 2226.5)	1405.0	(1343.9 - 1468.8)
NZDep 5-6	1431.1	(1365.6 - 1499.7)	1322.4	(1267.8 - 1379.3)	1865.3	(1802.4 - 1930.4)	1857.2	(1798.8 - 1917.4)
NZDep 7-8	1289.7	(1242.0 - 1339.1)	1339.1	(1296.9 - 1382.7)	2144.4	(2089.2 - 2201.0)	2466.4	(2413.8 - 2520.2)
NZDep 9-10	1615.9	(1574.8 - 1658)	2059.9	(2018.1 - 2102.7)	3045.5	(2997 - 3094.8)	3321.3	(3274.3 - 3369.0)
European & Other								
NZDep 1-2	393.9	(386.9 - 400.9)	552.7	(544.7 - 560.9)	735.8	(726.5 - 745.2)	698.3	(689.6 - 707.1)
NZDep 3-4	545.6	(537.3 - 554.0)	740.5	(731.0 - 750.1)	916.9	(906.6 - 927.3)	800.8	(791.5 - 810.1)
NZDep 5-6	656.3	(647.0 - 665.9)	813.6	(803.4 - 823.9)	1087.5	(1076 - 1099.2)	1059.0	(1048.1 - 1070.1)
NZDep 7-8	834.6	(823.6 - 845.8)	1133.6	(1120.7 - 1146.5)	1362.5	(1348.8 - 1376.3)	1420.2	(1406.8 - 1433.6)
NZDep 9-10	992.6	(978.9 - 1006.6)	1478.6	(1461.0 - 1496.5)	1715.8	(1697.3 - 1734.4)	1650.8	(1633.8 - 1668.1)

Table 27 Non-CCID hospitalisation rates per 100,000 people, by ethnicity and NZDep quintile, in 5-year periods from 1989 to 2008 (age standardised to 2006 Census)

	Rate per 100,000 person years							
	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Maori								
NZDep 1-2	347.6	(300.3 - 402.3)	322.9	(287.3 - 362.9)	381.6	(340 - 428.4)	382.5	(347 - 421.7)
NZDep 3-4	421.5	(380.4 - 467.1)	377.8	(347.6 - 410.5)	612.7	(568.8 - 660)	451.5	(416.4 - 489.5)
NZDep 5-6	455.3	(422.2 - 491.1)	414.5	(385.3 - 446)	486.3	(454.8 - 520)	574.4	(543.1 - 607.5)
NZDep 7-8	453.8	(423.8 - 486)	464.0	(440.6 - 488.8)	558.5	(531 - 587.5)	734.4	(705.8 - 764.2)
NZDep 9-10	499.7	(476.8 - 523.6)	634.9	(612.2 - 658.5)	754.7	(731.2 - 779)	949.9	(925.4 - 975)
Pacific								
NZDep 1-2	347.6	(300.3 - 402.3)	322.9	(287.3 - 362.9)	381.6	(340 - 428.4)	382.5	(347 - 421.7)
NZDep 3-4	421.5	(380.4 - 467.1)	377.8	(347.6 - 410.5)	612.7	(568.8 - 660)	451.5	(416.4 - 489.5)
NZDep 5-6	455.3	(422.2 - 491.1)	414.5	(385.3 - 446)	486.3	(454.8 - 520)	574.4	(543.1 - 607.5)
NZDep 7-8	453.8	(423.8 - 486)	464.0	(440.6 - 488.8)	558.5	(531 - 587.5)	734.4	(705.8 - 764.2)
NZDep 9-10	499.7	(476.8 - 523.6)	634.9	(612.2 - 658.5)	754.7	(731.2 - 779)	949.9	(925.4 - 975)
European & Other								
NZDep 1-2	195.9	(191.1 - 200.8)	252.8	(247.5 - 258.3)	279.0	(273.4 - 284.8)	321.7	(315.9 - 327.6)
NZDep 3-4	265.9	(260.2 - 271.8)	326.3	(320.1 - 332.7)	329.3	(323.2 - 335.5)	351.6	(345.6 - 357.7)
NZDep 5-6	315.1	(308.6 - 321.7)	352.6	(345.9 - 359.4)	389.7	(382.9 - 396.6)	430.1	(423.3 - 437)
NZDep 7-8	376.0	(368.6 - 383.6)	485.7	(477.4 - 494.2)	459.4	(451.5 - 467.3)	552.0	(543.8 - 560.3)
NZDep 9-10	428.0	(418.8 - 437.4)	581.8	(570.7 - 593.1)	556.8	(546.4 - 567.4)	618.4	(608.2 - 628.8)

Table 28 Ratio of Māori hospitalisation rates to European & Other, by NZDep quintile, census period and disease category (age-standardised to 2006 Census)

	Rate per 100,000 person years							
	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Total IDs								
NZDep 1-2	2.63	(2.53 - 2.73)	1.49	(1.44 - 1.53)	1.62	(1.57 - 1.67)	1.59	(1.55 - 1.64)
NZDep 3-4	2.31	(2.25 - 2.38)	1.41	(1.38 - 1.44)	2.21	(2.17 - 2.25)	1.61	(1.58 - 1.64)
NZDep 5-6	1.94	(1.9 - 1.98)	1.49	(1.46 - 1.52)	1.59	(1.57 - 1.62)	1.63	(1.61 - 1.66)
NZDep 7-8	1.44	(1.42 - 1.46)	1.11	(1.1 - 1.13)	1.48	(1.47 - 1.5)	1.62	(1.61 - 1.64)
NZDep 9-10	1.49	(1.47 - 1.51)	1.31	(1.29 - 1.32)	1.67	(1.66 - 1.69)	1.88	(1.87 - 1.9)
CCIDs								
NZDep 1-2	3.05	(2.91 - 3.2)	1.58	(1.53 - 1.64)	1.72	(1.66 - 1.78)	1.78	(1.73 - 1.84)
NZDep 3-4	2.67	(2.58 - 2.75)	1.52	(1.48 - 1.56)	2.33	(2.29 - 2.38)	1.75	(1.72 - 1.79)
NZDep 5-6	2.18	(2.13 - 2.23)	1.63	(1.59 - 1.66)	1.72	(1.69 - 1.75)	1.75	(1.73 - 1.78)
NZDep 7-8	1.55	(1.52 - 1.58)	1.18	(1.16 - 1.2)	1.57	(1.55 - 1.6)	1.74	(1.72 - 1.76)
NZDep 9-10	1.63	(1.6 - 1.65)	1.39	(1.38 - 1.41)	1.78	(1.76 - 1.79)	2.01	(1.99 - 2.03)
Non-CCIDs								
NZDep 1-2	1.77	(1.65 - 1.91)	1.28	(1.21 - 1.35)	1.37	(1.29 - 1.45)	1.19	(1.13 - 1.25)
NZDep 3-4	1.59	(1.51 - 1.67)	1.16	(1.11 - 1.21)	1.86	(1.79 - 1.93)	1.28	(1.23 - 1.34)
NZDep 5-6	1.45	(1.39 - 1.5)	1.18	(1.13 - 1.22)	1.25	(1.21 - 1.29)	1.34	(1.3 - 1.37)
NZDep 7-8	1.21	(1.17 - 1.25)	0.96	(0.93 - 0.98)	1.22	(1.18 - 1.25)	1.33	(1.3 - 1.36)
NZDep 9-10	1.17	(1.14 - 1.2)	1.09	(1.07 - 1.11)	1.36	(1.33 - 1.38)	1.54	(1.51 - 1.56)

Table 29 Ratio of Pacific hospitalisation rates to European & Other, by NZDep quintile, census period and disease category (age-standardised to 2006 Census)

	Rate per 100,000 person years							
	1989 to 1993		1994 to 1998		1999 to 2003		2004 to 2008	
	Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
Total IDs								
NZDep 1-2	5.23	(4.96 - 5.51)	2.61	(2.5 - 2.72)	2.93	(2.82 - 3.04)	2.34	(2.25 - 2.43)
NZDep 3-4	3.25	(3.11 - 3.4)	1.97	(1.89 - 2.04)	2.42	(2.35 - 2.49)	2.11	(2.05 - 2.17)
NZDep 5-6	1.92	(1.85 - 1.99)	2.37	(2.31 - 2.43)	2.20	(2.15 - 2.25)	1.93	(1.88 - 1.97)
NZDep 7-8	1.62	(1.57 - 1.67)	1.47	(1.44 - 1.51)	1.75	(1.72 - 1.78)	1.70	(1.67 - 1.73)
NZDep 9-10	1.24	(1.22 - 1.27)	1.19	(1.17 - 1.2)	1.67	(1.65 - 1.69)	1.77	(1.75 - 1.79)
CCIDs								
NZDep 1-2	6.03	(5.68 - 6.4)	2.89	(2.75 - 3.04)	3.19	(3.05 - 3.32)	2.62	(2.49 - 2.74)
NZDep 3-4	3.55	(3.38 - 3.74)	2.11	(2.02 - 2.2)	2.55	(2.46 - 2.63)	2.32	(2.24 - 2.4)
NZDep 5-6	2.16	(2.07 - 2.26)	2.58	(2.5 - 2.66)	2.36	(2.3 - 2.42)	2.03	(1.98 - 2.08)
NZDep 7-8	1.83	(1.76 - 1.89)	1.58	(1.54 - 1.62)	1.88	(1.85 - 1.92)	1.84	(1.81 - 1.88)
NZDep 9-10	1.35	(1.32 - 1.38)	1.29	(1.27 - 1.31)	1.76	(1.74 - 1.78)	1.90	(1.88 - 1.92)
Non-CCIDs								
NZDep 1-2	3.61	(3.21 - 4.06)	1.98	(1.82 - 2.15)	2.25	(2.08 - 2.43)	1.74	(1.61 - 1.88)
NZDep 3-4	2.62	(2.4 - 2.87)	1.63	(1.51 - 1.77)	2.07	(1.95 - 2.19)	1.64	(1.54 - 1.74)
NZDep 5-6	1.41	(1.31 - 1.51)	1.89	(1.79 - 1.98)	1.76	(1.67 - 1.85)	1.67	(1.6 - 1.75)
NZDep 7-8	1.16	(1.09 - 1.24)	1.23	(1.18 - 1.29)	1.34	(1.29 - 1.39)	1.33	(1.28 - 1.37)
NZDep 9-10	0.99	(0.96 - 1.04)	0.93	(0.9 - 0.96)	1.39	(1.36 - 1.42)	1.43	(1.4 - 1.46)

7.5. Pacific populations, comparison of NHI and Census

Table 30 NHI and Census 2006 populations for level 2 Pacific ethnicities.

	NHI population	Census population	Difference (% of NHI pop)
Samoan	156,837	131,100	25,737 (16%)
Cook Islands	59,750	58,008	1,742 (3%)
Tongan	51,125	50,478	647 (1%)
Niuean	18,148	22,476	-4,328 (-24%)
Other Pacific	53,211	25,158	28,053 (53%)
Total Pacific	339,071	287,220	51,851 (15%)

For Samoan, Cook Islands, Tongan and Niuean ethnic groups, the 2006 census population roughly approximated the NHI population on 6 March 2006. However, the residual "Other Pacific" population in the NHI was double the census population. Using the census population as a denominator for hospitalisation rates would therefore have severely over-estimated the hospitalisation rate for "Other Pacific" peoples. The direction of this undercount was also unknown over time. Therefore, reliable "Other Pacific" hospitalisation rates were unavailable for this report.

7.6. R2 matrix for non-infectious hospitalisations vs. CCID hospitalisations, by ethnicity

Table 31 R^2 values for regressions of year by year age-adjusted CCID and all-cause hospitalisation rates by ethnicity

		Māori	Pacific		Euro/Other	
		Non-ID*	CCID*	Non-ID *	CCID*	Non-ID
Māori	CCID	0.7973	0.9539	0.9675	0.8451	0.0221 (p=0.532)
	Non-ID		0.8400	0.8837	0.6494	0.1165 (p=0.141)
Pacific	CCID			0.9506	0.8921	0.1015 (p=0.171)
	Non-ID				0.7968	0.1413 (p=0.102)
Euro/Other	CCID					0.1865 (p=0.057)

*p-values all <0.001

These R^2 values show that Māori, Pacific, and European/Other CCID rates, and Māori and Pacific non-infectious disease hospitalisation rates, are all correlated; but that European/Other non-infectious disease hospitalisation rates are not correlated to any of the other hospitalisation categories.