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Health Status of Housing New Zealand Applicants and Tenants: Key Indicators for 2004-2008

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Associate Professor Michael Baker

Jane Zhang

Professor Philippa Howden-Chapman

He Kainga Oranga / Housing and Health Research Programme

University of Otago, Wellington

HE KAINGA ORANGA

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1. Executive Summary

Introduction

The *Social Housing Outcomes Worth* (SHOW) Study aims to investigate the relationship between housing conditions and hospitalisation rates in a large cohort of Housing New Zealand Corporation (HNZC) tenants and applicants. The aims of this report are to:

- Report on dynamic aspects of social housing use and throughput
- Report on the demographic composition of HNZC tenant and applicant households
- Report on housing conditions and exposures relevant to health
- Provide an indication of the health status of HNZC tenants and applicants based on a set of well accepted health indicators
- Report on a sub-set of health outcomes which are likely to be most sensitive to housing conditions and potentially preventable
- Compare the health status of HNZC tenants with housing applicants and the total NZ population to identify opportunities for health improvement
- Identify any trends of note in the above indicators.

This report adds 2008 data to the previous trend data for 2004-2007, giving a total of 5-years of follow-up time. It also slightly updates results for previous years because some applicants and tenants have changed their tenancy status or been successfully linked to their hospitalisation data (via their encrypted NHI number).

Methods

This study is based on data collected by HNZC as part of its routine business operations. Information on *housing applicants* is recorded on a Needs Assessment (NA) record form. Most *housing tenants* self-complete an annual Income Related Rent (IRR) application form (92.3% of tenancies were claiming an IRR in December 2009). The remaining 7.7% pay market rent and are effectively excluded from the study because their household details are not available. The HNZC applicant and tenant data were forwarded to the New Zealand Ministry of Health (MoH) for matching to their national health index number (NHI). The data were then anonymised (including encrypting the NHI) and passed to the researchers at University of Otago, Wellington for analysis.

Researchers then linked cases to their hospitalisation records using the encrypted NHI. The analysis was based entirely on principal diagnoses (coded using International Statistical Classification of Diseases and Related Health Problems Version 10, 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. Age-standardised rates were calculated to take account of the different age structures of *housing applicant* and *housing tenant* populations compared with the New Zealand population not in this cohort (*other NZ*). Analyses were repeated using age-ethnicity standardised rates to further adjust for the relatively high proportion of Māori and Pacific People in the cohort population. Rate ratios (RR) and 95 percent confidence intervals (95%CI) were calculated using standard methods for age-standardised and age-ethnicity standardised data.

The study commenced operation in May 2003. This report focuses on describing the characteristics of applicants and tenants and linked hospitalisation data for the 5-year period January 2004 to December 2008. Most analyses report results based on individuals and their time in HNZC houses

(eg, 21,320 applicants and 203,760 tenants in Dec 2008), but a few also describe results for households (eg, 9,830 applicant and 65,500 tenant households in Dec 2008)

Results

Data quality: Data completeness was high, as would be expected for a study based on information collected for management purposes.

- The voluntary smoking question was filled out by about 58.3% of adult tenants, though this proportion was increased to about 70.1% using results from subsequent IRR forms.
- Over 95.0% of housing applicants and tenants could be matched to their NHI numbers, allowing anonymous linkage to their hospitalisation records. Because not all denominator time could be accurately assigned to time spent as applicants and tenants some records were discarded, leaving 95.1% of tenant records and 92.2% of applicant records. Consequently, about 90.1% of total tenant records and 87.7% of total applicant records were available for subsequent analysis.

Housing use and throughput:

- There were, on average, 23,397 households (51,419people) assessed and placed on the waiting list each year from 2004 to 2008. About 24.7% of these households became tenants and 35.2% exited the waiting list without becoming tenants each year, with the rest (41.1%) remaining on the waiting list. Numbers in all of these housing applicant groups declined over the four years from 2004 to 2008. The median duration applicants stayed on the waiting list was about 130 days, with 59.7% spending less than 6 months, 20.8% between 6 months and 12 months, and 19.6% longer than a year.
- There were, on average, 70,100 households filling in an IRR form each year from 2004 to 2008. They included an average of 213,084 people. About 8.9% households exited HNZC tenancies (or in a few cases remained as tenants but ceased applying for an IRR) each year with most of the rest (90.1%) staying as tenants. Based on completed IRR forms entered onto RENTEL, the number of tenant households increased each year from 2004 to 2008. The median duration as tenants in HNZC houses was 3.5 years. There was a trend towards greater duration of tenancies over this period with the proportion of tenants living in HNZC houses 10+ years increasing from 11.9% in 2004 to 14.0% in 2008.

Demographic and socio-economic characteristics:

- These data show the very youthful nature of the HNZC applicant and tenant populations. The median age was 20 years, which was very much less than the NZ median of 35. The proportion of people over 65 years of age was about half the NZ average. The proportion of females was consistently higher than the NZ population for both tenants and applicants.
- Analysis of ethnicity is based on individuals listed on the Needs Assessment or IRR application form. Here we present results according to total response. These data confirm the high proportion of HNZC tenants who were Māori (37.6%) and Pacific people (36.3%) relative to the total NZ population. The applicant populations had a larger proportion that reported their ethnicity as European and other (37.6%) or Asian (9.4%) compared with the tenant population. There had been a slight increase in the proportion of Māori for both applicant and tenant populations, but no change in Pacific, European and other groups from 2004 to 2008. The proportion of applicants who identified as Asian was similar to the NZ Census. We would expect this group to become an increasing proportion of tenants over time as these applicants become housed.
- These data confirm the very low median equivalised household income of HNZC tenants ($231.4 weekly in 2008) and applicants ($263.7 weekly in 2008). Although the mean and

median incomes rose over this four-year period there was very little increase for the lower quintile.

- These data show that the largest proportion of HNZC customers were living in single parent households (42.2% for tenants and 46.8% for applicants), followed by couples with children (30.3% for tenants and 29.3% for applicants), then adults without children (27.5% for tenants and 23.9% for applicants). These proportions differed markedly from the wider NZ population where only about 12% of people lived in single parent households. Over the 2004 to 2008 period there was an increase in adults without children as applicants and a decline in couples with children.

Housing exposures and conditions:

- An average of 33.2% of tenants 18+ years of age who responded to the smoking questions reported being smokers (one or more a day). This was higher than the prevalence reported in the 2006 Census for New Zealanders as a whole (21% for those 15+ years). Over the 2004 to 2008 period there was no notable trend in the proportion of adult tenants who reported smoking. This stable result contrasts with a declining trend in smoking for New Zealanders generally. Living in a household where there were smokers was a relatively common exposure experienced by an average of 52.6% of tenants where smoking status information was reported. Over the 2004 to 2008 period there was a small increase in the proportion of tenants exposed to passive smoking.
- Household crowding (based on bedroom deficit calculated using the Canadian National Occupancy Standard) was a relatively common exposure for both housing applicant and tenant households compared with other New Zealanders. A bedroom deficit of one or more rooms was experienced by an average of 37.5% of tenants and 47.2% of applicants compared with 10.0% of New Zealanders at the time of the 2006 Census [1]. The difference was even more marked for 2+ bedroom deficits, which was experience by 13.6% of housing tenants and 24.0% of housing applicants compared with 3.5% of New Zealanders in 2006. Over the 2004 to 2008 period there was no notable trend in the proportion of applicants and tenants exposed to crowded households.

Hospitalisations and Mortality:

- The equivalent of 15.7% of HNZC tenants and 17.5% of HNZC applicants were admitted to hospital every year with acute (or relatively acute) illnesses or injuries, compared with 9.7% of other New Zealanders. After adjusting for age and ethnicity, hospitalisation rates were still 47.4% higher for tenants and 60.3% higher for applicants than for other New Zealanders. Compared with 2004, total hospitalisation rates for housing tenants and applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests an increasingly vulnerable population of housing applicants, and to a lesser extent tenants, over this period.
- The equivalent of 4.0% of HNZC tenants and 4.8% of HNZC applicants were admitted to hospital every year with Ambulatory Sensitive Hospitalisation (ASH) conditions. After adjusting for age and ethnicity, hospitalisation rates were still 53.8% higher for tenants and 65.7% higher for applicants than for other New Zealanders. Compared with 2004, ASH rates for housing applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests reduced access and utilisation of primary care services by the applicant population.
- The equivalent of 1.1% of HNZC tenants and applicants were admitted to hospital every year with Population Preventable Hospitalisation (PPH) conditions. After adjusting for age and

ethnicity, hospitalisation rates were still 100.5% higher for tenants and 130.4% higher for applicants than for other New Zealanders. Compared with 2004, PPH rates for housing tenants rose significantly in 2008 in relation to other New Zealanders suggesting reduced provision or effectiveness of population-based health strategies for this population.

- The equivalent of 2.5% of HNZC tenants and 3.3% of HNZC applicants were admitted to hospital every year with Housing Related Potentially Avoidable Hospitalisations (HR-PAH) illnesses. After adjusting for age and ethnicity, hospitalisation rates were still 50.8% higher for tenants and 72.8% higher for applicants than for other New Zealanders. Compared with 2004, HR-PAH rates for housing applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests reduced quality of housing conditions for housing applicants.
- Deaths were far less common than hospitalisations. An average of 0.6% of housing tenants and 0.3% of applicants died each year compared with 0.7% of the other NZ population. These rates strongly reflect the relatively younger age structure of tenants and particularly applicant households. After adjusting for age and ethnicity, the mortality rate remained slightly, but significantly, higher among tenants and lower among housing applicants. With only three years of mortality data available, it is not possible to draw conclusions about trends in mortality rates in this population.

Infectious diseases:

- Close-contact infectious diseases were a common cause of hospitalisation, with an equivalent of 2.4% of HNZC tenants and 3.0% of applicants admitted to hospital each year with these conditions. After adjusting for age and ethnicity, hospitalisations for close-contact infectious diseases were still 39.3% higher for tenants and 48.2% higher for applicants than for other New Zealanders. Compared with 2004, rates for housing tenants and applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders.
- Gastroenteritis was a relatively uncommon cause of hospitalisation, with an average of 0.1% of HNZC tenant children and 0.2% of applicant children admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for gastroenteritis were 27.1% higher for HNZC applicant children and 3.1% higher for HNZC tenants than for other New Zealanders. Gastroenteritis rates increased significantly in 2008 compared with 2004 for housing applicants in absolute terms and in relation to other New Zealanders.
- Respiratory bacteria infections (including meningococcal disease) were relatively uncommon in New Zealand, with an average of 0.01% of HNZC tenant children and 0.02% of applicant children admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for bacterial meningitis and septicaemia in children were still 44.3% higher for HNZC tenant children and 62.4% for HNZC applicant children than for other New Zealanders. Over the 2004 to 2008 period, hospitalisations rates declined markedly reflecting the decline in New Zealand's prolonged serogroup B meningococcal disease epidemic.
- Influenza and pneumonia were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for influenza and pneumonia were still 41.8% higher for tenants and 37.8% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates for influenza and pneumonia for housing tenants and applicants relative to other New Zealanders declined slightly from 2004-2007, but increased in 2008.

- Bronchiolitis was a common cause of hospitalisation in young children in New Zealand, with an average of 1.6% of HNZC tenant children and 3.0% of applicant children admitted to hospital each year with this diagnosis. After adjusting for ethnicity, hospitalisations for bronchiolitis in children <5 years were still 38.4% higher for applicants than for other New Zealanders, but significantly lower for tenants. Over the 2004 to 2008 period, hospitalisation rates rose for housing applicants but were fairly stable for tenants and other New Zealanders. The apparent low bronchiolitis rates in housing tenants was probably an artefact caused by the very small proportion of newborn children being recorded on the IRR.
- Bacterial skin infections were a relatively common cause of hospitalisation in NZ, with an average of 0.7% of HNZC tenants and applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for bacterial skin infections were still 59.8% higher for tenants and 41.6% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates rose for housing tenants and applicants as well as other New Zealanders.

Circulatory and respiratory diseases:

- Circulatory and respiratory diseases were a common cause of hospitalisation, with an average of 3.0% of HNZC tenants and 3.3% of applicants admitted to hospital each year with these conditions. After adjusting for age and ethnicity, hospitalisations for circulatory and respiratory diseases were still 46.6% higher for tenants and 58.1% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, rates for housing tenants and applicants were fairly constant.
- Excess winter mortality (EWM) and excess winter hospitalisations (EWH) for circulatory and respiratory diseases give an indication of the extent to which housing protects populations from winter climatic conditions. EWH were not significantly different at 50.6% for housing tenants and 56.8% for housing applicants compared with 54.5% for other New Zealanders. However, EWM was about 49.1% for housing tenants, which was significantly higher than the rate for other New Zealanders (30.8%). This finding was in the context of a generally lower overall mortality rate in the tenant population, which probably reflects their relatively low age (even after age-standardisation). Numbers of deaths in housing applicants were too small to calculate robust age-ethnicity standardised rates.
- Asthma was a relatively common cause of hospitalisation in NZ, with an average of 0.4% of HNZC tenants and 0.5% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for asthma were still 58.8% higher for tenants and 91.0% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates fell slightly for housing tenants. However, they fell more rapidly for other New Zealanders so the level of inequality increased significantly for tenants in 2008 compared with 2004. Over this period rates varied inconsistently for housing applicants.
- Chronic obstructive pulmonary disease (COPD) includes both chronic bronchitis and emphysema. It was a relatively common cause of hospitalisation in NZ adults, with an average of 0.8% of HNZC tenants and 0.6% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for COPD were still 154.0% higher for tenants and 159.3% higher for applicants than for other New Zealanders. Compared with 2004, hospitalisation rates increased significantly for adult housing tenants in 2008, in absolute terms and in relation to other New Zealanders, but showed a large drop for adult applicants in 2008.
- Ischaemic heart disease was a relatively common cause of hospitalisation in NZ adults, with an average of 0.7% of adult HNZC tenants and 0.6% of adult applicants admitted to hospital each

year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for ischaemic heart disease were still 42.0% higher for tenants and 42.4% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisation rates declined slightly for tenants and other New Zealanders, so the excess risk for tenants stayed fairly constant. Rates were not stable for applicant adults.

- Heart failure was a relatively common cause of hospitalisation in NZ adults, with an average of 0.4% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for heart failure were still 70.5% higher for tenants and 44.6% higher for applicants than for other New Zealanders. Age ethnicity adjusted hospitalisations for housing tenants and applicants increased during 2004 to 2007 and dropped in 2008.

Mental health conditions:

- Mental health conditions were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 1.0% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for mental health conditions were still 122.6% higher for tenants and 247.9% higher for applicants than for other New Zealanders. Compared with 2004, hospitalisation rates for housing tenants dropped, but not significantly, relative to other New Zealanders in 2008. By comparison, the rate rose markedly for applicants in 2006 and 2007, before dropping again in 2008.
- Depression was a relatively uncommon cause of hospitalisation in NZ adults, with an average of 0.06% of HNZC tenants and 0.1% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for depression were still 102.7% higher for tenants and 179.2% higher for applicants than for other New Zealanders. Compared with 2004, age ethnicity-adjusted hospitalisations for housing tenants showed a non-significant decline in 2008. Numbers for housing applicants were too small to make conclusions about patterns from one year to the next.
- Psychosis was a relatively common cause of hospitalisation in the HNZC adult population, with an average of 0.4% of HNZC tenants and 0.7% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, psychosis was still 127.4% higher for tenants and 289.8% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisation for housing tenants were fairly constant but rose markedly for housing applicants up until 2007, followed by a decline in 2008.
- Intentional self-harm was a relatively uncommon cause of hospitalisation in NZ with an average of 0.1% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, intentional self-harm was 109.7% higher for tenants and 240.7% higher of applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisations for housing tenants were fairly constant, but showed a (non-significant) decline for housing applicants relative to other New Zealanders.
- Assault in the home was not a common cause of hospital admission in New Zealand with an average of 0.04% of HNZC tenants and applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for assault were still 140.8% higher for tenants than for other New Zealanders. Numbers were too small to calculate a rate ratio of housing applicants.

Home injuries:

- Home injuries were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 0.6% of applicants admitted to hospital each year with these diagnoses. After

adjusting for age and ethnicity, hospitalisations for home injuries were still 63.4% higher for tenants and applicants than for other New Zealanders. Compared with 2004, hospitalisation rates for housing tenants and applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders.

- Falls were the most common type of injury in the home in NZ with an average of 0.2% of HNZC tenants and applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for falls in the home were still 49.1 % higher for tenants and 32.7% higher for applicants than for other New Zealanders. Compared with 2004, age-ethnicity standardised hospitalisation rates for falls increased (non-significantly) in 2008 for housing tenants.
- Accidental poisonings in the home were an important, but relatively uncommon cause of hospital admission for NZ children <5years, with an average of 0.1% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After restricting to those <5 years, and adjusting for ethnicity, hospitalisations for accidental poisonings in the home were still 75.2% higher for tenants and 101.8% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, ethnicity standardised hospitalisation rates for accidental poisonings in the home were not stable, being based on small numbers.
- Injury from exposure to smoke, fire and flames in the home was a relatively uncommon cause of hospital admission in NZ. After adjusting for age and ethnicity, hospitalisations for smoke, fire and flames in the home were still 61.2% higher for tenants than for other New Zealanders. Numbers were too small to make conclusions about patterns from one year to the next or to calculate adjusted rates for housing applicants.
- Injury from exposure to heat and hot substances in the home were markedly higher for children under 5 years. However it was a relatively uncommon cause of hospital admission in NZ. After adjusting for age and ethnicity, hospitalisations for exposure to heat and hot substances in the home were still 78.0% higher for tenants than for other New Zealanders. Numbers were too small to make conclusions about patterns from one year to the next.

Discussion and conclusion

This collaborative project provides a great deal of information on aspects of the housing and health status of HNZC housing applications and tenants. These findings have implications for understanding the vulnerability of this population, the potential to improve their health through better access to health services, and through housing improvements.

Vulnerability: The composition of the HNZC tenant and applicant populations indicates a population that is highly vulnerable to illness and injury. These characteristics include the high proportion of children, sole parent households, Māori and Pacific peoples, and those on low incomes. Hospitalisation data confirm this assessment with the markedly higher hospitalisation rates for applicants and tenants compared with other New Zealanders, even after adjusting for age and ethnicity. These data also confirm that this population includes a relatively high proportion of people suffering from chronic physical illnesses (eg heart failure and COPD) as well as mental illness (eg psychotic illness).

The vulnerability of tenants, and particularly applicant populations, appears to have increased over the 2004 to 2008 period. Compared 2004, housing applicants in particular have had a significant increase in hospitalisation rates in 2008 in relation to other New Zealanders.

Access to health services: New Zealand has two indicators for measuring the effects of health services on population health. Both indicate that there is unrealised potential to improve the health status of this population. Ambulatory Sensitive Hospitalisation (ASH) rates were 53.8% higher for tenants and 65.7% higher for applicants than for other New Zealanders, after adjusting for age and ethnicity. This pattern suggests that there is considerable potential to improve the health of this population, particularly housing applicants, by improving access and utilisation of primary care services. Population Preventable Hospitalisation (PPH) rates were 100.5% higher for tenants and 130.4% higher for applicants than for other New Zealanders after adjusting for age and ethnicity. This pattern suggests there is considerable potential to improve the health of HNZC tenants and applicants by considering programmes to increase their access to population health services (such smoke-free programmes, better road safety).

Improved housing conditions: One of the aims of this project has been to refine an indicator of housing related illness, the current version being Housing Related Potentially Avoidable Hospitalisations (HR-PAH). The intent of this composite indicator is to provide a single summary measure for assessing the health impact of housing and to evaluate the health impact of housing improvement. The components are listed in the appendix (11.2). HR-PAH were 50.8% higher for tenants and 72.8% higher for applicants than for other New Zealanders after adjusting for age and ethnicity. This pattern suggests that HNZC may be providing housing of a higher standard than the private rental housing used by housing applicants. The conditions included in the HR-PAH are markers of close-contact infectious diseases (such as cellulitis, gastroenteritis, and respiratory infections) or of the quality of the indoor air environment (asthma, COPD).

Another category of hospitalisation that is plausibly related to the home environment is injuries. Unlike illnesses, surveillance data can record the location of the event and therefore identify that specific injuries occurred at home. Compared with 2004, home injury hospitalisation rates for housing tenants rose significantly relative to other New Zealanders in 2008. This increase would be worthy of further investigation if it continues. There is a case for including home injuries in the HR-PAH indicator.

Limitations: This study is based on a prospective cohort design which reduces many of the potential biases and confounding factors that limit the validity of other study designs. In addition, by effectively using the entire population of New Zealand it achieves a high level of statistical precision.

However, these findings need to be interpreted with caution for a number of reasons:

- Limitations with the numerator – Hospitalisations will 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 therefore more susceptible to biases.
- Limitations with the denominator – Accurately assigning participants (and their person-time) to the study is prone to a number of sources of error. Some of these errors reflect the limitations of using administrative data, which is collected primarily for applicant and tenant management purposes.
- Confounding – The analysis of hospitalisation data uses age-ethnicity-standardised rates to manage confounding by age and ethnicity. However, there are other confounders that have not been considered in the analysis (notably the effects of socio-economic deprivation at a household and neighbourhood level).

- Study size – Some of the diseases and injuries reported here are still relatively uncommon so findings need to be interpreted with caution. This limitation will diminish with time as the cohort size increases.
- Causal inference – This analysis divided the population into three groups (housing applicants, housing tenants, and other New Zealanders). The finding that some diseases have higher rates in one or other of these populations does not necessarily imply a causal association. For some conditions 'reverse' causality is operating in that those with these chronic diseases seek and are prioritised to receive social housing (e.g. multiple sclerosis). Future analyses will utilise the longitudinal nature of this cohort study to try to answer questions about whether a change in housing status is associated with a change in health status. Such analyses have much greater potential to answer causal questions about the health impact of housing conditions.

Improvements to data quality: There are a number of improvements that could be made to enhance data quality and the value of this annual analysis:

- Review with HNZC staff the range of outcomes and health indicators used in this report and how they are presented.
- Review the value of the Housing Related Potentially Avoidable Hospitalisations (HR-PAH) indicator as a composite measure of the health impact of housing and its use for measuring the impact of Social Housing and the Healthy Housing Programme. This discussion could consider whether there are other hospitalisation events that should be included. Potential additions would include: home injuries and a wider range of close contact infectious diseases. Potential deletions would include bronchiolitis (unless a method for identifying infants can be developed, for example by encouraging households to record new babies on their IRR).
- Identify opportunities to include a greater range of housing environment measures in the analysis, notably insulation levels and home heating (eg households with heat pumps). Initial discussions have been held with HNZC about the feasibility of using the index of housing quality developed by *He Kainga Oranga* and BRANZ to provide a more robust basis for a comparative study of social and private rented housing. We have established that, with minor modification to the HNZC building assessments, this index could be collected.
- Identify opportunities to include some neighbourhood variables (e.g. household and ethnic diversity, as well as environmental measures such as air quality and distance to public transport), which can be coded to mesh-block level.
- Investigate whether it is possible to further reduce the relatively small proportion of records that are currently excluded from the study.
- Continue this cohort in order to monitor the impact of the economic cycle on the demand for HNZC tenancies and stability of tenure, i.e. compare the effect of low unemployment years covered in this report with the current higher unemployment years.

2. Introduction

This report came out of a need to provide Housing New Zealand Corporation (HNZC) with useful ongoing information on the health status of their housing tenants.

Aims of this report

- Report on dynamic aspects of social housing use and throughput
- Report on the demographic composition of HNZC tenant and applicant households
- Report on housing conditions and exposures relevant to health
- Provide an indication of the health status of HNZC tenants and applicants based on a set of well accepted health indicators
- Report on a sub-set of health outcomes which are likely to be most sensitive to housing conditions and potentially preventable
- Compare the health status of HNZC tenants with housing applicants and the total NZ population to identify opportunities for health improvement
- Identify any trends of note in the above indicators.

3. Methods

This prospective cohort study was established in collaboration with New Zealand's largest provider of social housing (Housing New Zealand Corporation), which provides housing for approximately 5% of the population and in the process collects detailed information on housing applicants and tenants. The method is described below, and includes obtaining housing applicant and tenant data from HNZC, using these data to construct the cohort, linking to hospitalisation records, and analysis of this combined dataset.

3.1. Obtaining housing and household data from HNZC

The study utilised the fact that HNZC obtains and stores detailed records on all applicants and existing tenants.

When applicants apply for a house, their housing need is assessed with a semi-structured Needs Assessment (NA) interview. When the tenant applies for an Income Related Rent (IRR), usually a year after the tenancy begins or a change of circumstance occurs, the Income Related Rent (IRR) application form is self-reported. Information on the NA and IRR forms is entered into the HNZC database (RENTEL) for HNZC routine business management. The RENTEL database also includes details about their housing stock, notably the number of bedrooms in each house.

The records related to updated NA and IRR in RENTEL are forwarded to the Ministry of Health (MoH) monthly for linking to their National Health Index (NHI) number. The MoH strips names from HNZC data after the NHI matching process, and then transfers the data files to the University of Otago, Wellington, for analysis. To protect privacy, the MoH only releases the encrypted NHI

with each record. Staff of *He Kainga Oranga*/Housing and Health Research Programme, then analyse these data. This process includes using the encrypted NHI number to link cohort members to their hospitalisation records. These collated data allow hospitalisation rates to be analysed in relation to exposure to housing condition, socio-economic and demographic factors.

The collected HNZC data record their circumstance changes for applicant or tenant households at several key points.

- Applicant Needs Assessment interview
- Applicant change of circumstances
- Applicant becomes a tenant
- Tenant annual Income Related Rent application
- Tenant change of circumstances
- Tenant property change.

The current applicant and tenant household number is presented by month in Figure 4.1. HNZC data also include 'observations' that record applicant and tenant exits. These data are used to identify the date applicants and tenants left HNZC:

- Applicant Needs Assessment preliminary interview
- Applicant exits the waiting list
- Tenant exits the HNZC tenancy

3.2. Construction of cohort

The cohort consisted of housing applicants and those tenants completing an income related rent (IRR) application. It was constructed using HNZC data collected from May 2003 to December 2008. HNZC data provide information at both a household and an individual level. The household reference number assigned by HNZC (irr_tnnt_ref, a unique reference number that HNZC assigns to each household within the four main regions comp_ref) was used to track the households over time. The encrypted NHI was used to tract individuals.

There were multiple records for most households in the HNZC data. Each record provided the household information for a particular effective period. This time was important to calculate the person time exposed to certain housing factors such as income, crowding. The effective date was assigned for each record. IRR records for tenants started from the IRR effective date and ended at next IRR record effective date. Since there was no effective date on NA records, the first NA record for each applicant households started from the applicant's registered date and ended at the next update date or the date housed.

In a relatively small proportion of households, individuals with the same reference number (Household reference number/NHI number) appeared in different applications or tenancies with overlapping time. The following rules and research assumptions were developed to remove overlapping time by assigning person time or in some cases excluding person time entirely.

- The person was recorded as a housing applicant, and then became a tenant, while still being recorded as an applicant. Time as a tenant retained, but time as an applicant removed while any overlap occurred.

- The person was recorded as a tenant, and then became a housing applicant, while still being recorded as a tenant. Time as a tenant retained, but time as an applicant removed while any overlap occurred.
- The person was included in two applications at the same time. Second application was assumed to supersede first, which was exited at the time the second application was made.
- A subset of these overlapping applications are those with the same start date. Because it was difficult to know which application to assign the person to, these subjects are **excluded**.
- The person was included in three or more applications at the same time. These subjects are **excluded** from the study because of the high level of uncertainty around which household to assign them to.
- The person was included in two tenancies at the same time. The second tenancy was assumed to supersede the first, which was exited at the time the second tenancy started.
- A subset of these overlapping tenancies are those with the same start and finish date. Because it was difficult to know which tenancy to assign the person to, these subjects are **excluded**.
- A further subset of these overlapping tenancies are those where one was included within the other i.e. the second one has a later start date and an earlier finish date than the other. Because it was difficult to know which tenancy to assign the person to, these subjects are **excluded**.
- The person was simultaneously included in three or more tenancies. These subjects are **excluded** from the study because of the high level of uncertainty around which household to assign them to.
- The person was simultaneously included in a mix of multiple applications and tenancies. These subjects are **excluded** from the study because of the high level of uncertainty around which household to assign them to.

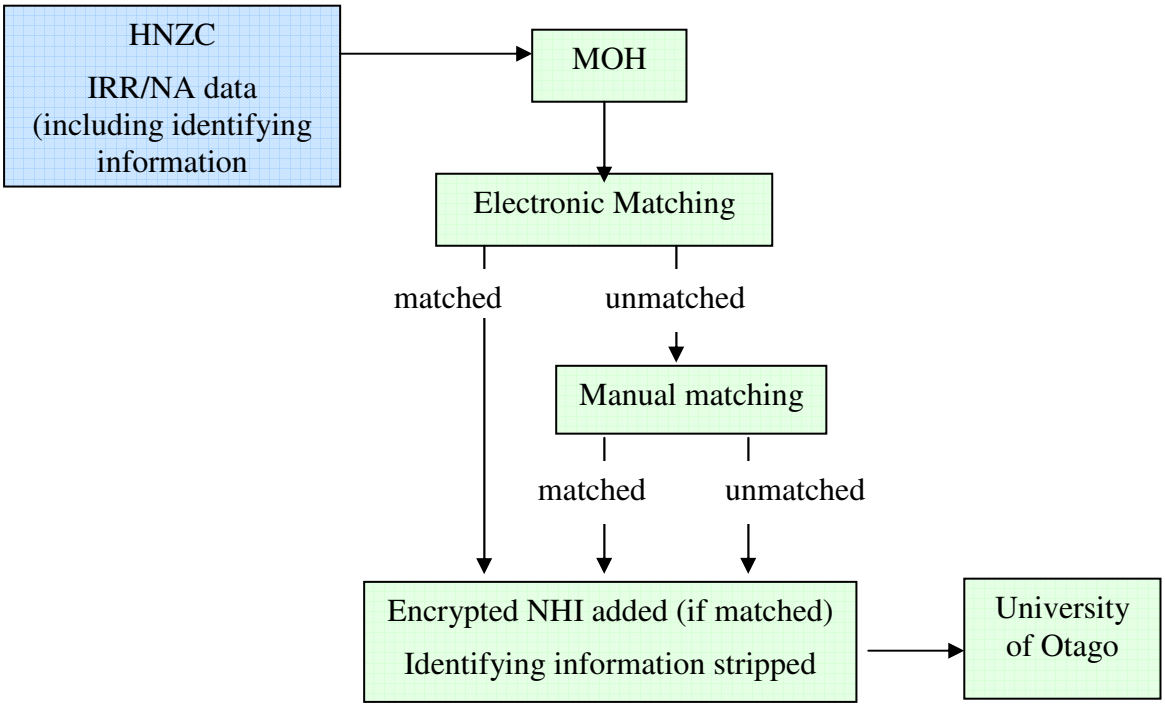
3.3. Linking to hospitalisations records

This research uses hospitalisations recorded by the New Zealand Ministry of Health (MoH). The MoH obtains coded data on all publicly funded hospital admissions in NZ. These data include a unique health sector identifier, the National Health Index (NHI) number for all hospitalised individuals.

HNZC applicant and tenant information collected each month is transferred to the MoH for matching to the National Health Index (NHI). These data arrive at The MoH in monthly batches of IRR and NA records for the preceding month and is in a series of linked tables that are mainly tenancy based.

This process of identifying the NHI number for applicants and tenants uses electronic followed by manual matching. Electronic matching is based on the following fields: family name, first name, date of birth, and sex. Manual matching is based on looking for close matches for each unmatched record. The confidentiality of study participants is fully protected. The MoH strips names from the file after the NHI matching process. The NHI is replaced by an 'encrypted NHI' making the data completely anonymous. This file of MoH data with attached encrypted NHI numbers is then transferred to the University of Otago, Wellington for analysis.

Figure 3.1 Steps involved in the transfer of housing tenant and applicant data from HNZC to WSM, including its linking to hospitalisation data by the MoH



Researchers at University of Otago, Wellington use this encrypted NHI to track members of the cohort and link them to hospitalisations that occurred during the study period. The MoH has separately supplied the researchers with a copy of National Minimum Dataset (NMDS). This dataset includes all hospital admissions reported by New Zealand's district health boards (DHB) with all entries including their encrypted NHI. The researchers use this file to identify hospitalisations in the cohort population that have occurred over the study period. They can also identify hospitalisations for those New Zealanders who are not in the cohort population, which allows the calculation of comparison rates.

3.4. Analysis

The major part of the analysis is to calculate hospitalisation rates in the cohort. This process includes several steps: selecting and filtering incidence hospitalisations, calculating person time as a denominator, calculating crude and standardised rates.

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 3.1. This analysis uses principal diagnoses (coded using International Statistical Classification of Diseases and Related Health Problems Version 10, ICD.10) for conditions of interest. The *standard filter* excluded private hospital cases, overseas visitors, hospital transfers, hospital waiting list cases, day cases, and readmissions within a month. A similar filtering approach has been used during the analysis of NZ injury hospitalisations [2].

The analysis reported in this paper describes the number and characteristics of the cohort study members and their health outcomes using standard methods for calculating crude and adjusted rates,

rate ratios and confidence intervals.[3] This present paper describes univariate results. Most rates have been age-standardised and age-ethnicity standardised to the age-ethnicity structure of HNZC tenants at cross section December 2006. Age bands are 0-4, 5-9, 10-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70+. Ethnicity was divided into 3 groups and used prioritised ethnicity: Māori, Pacific, and Other (European, Asian, MELAA, Other and Not stated).

Person time of the HNZC tenants and applicants is calculated from 2004 to 2008 as described above. Person time in the other NZ population (people who are not HNZC applicants or tenants) was estimated by subtracting HNZC person time from the estimated NZ population provided by Statistic NZ at 30 June from 2004 to 2008. As the estimated population only gave the population counter in single ages, rather than numbers in age-ethnicity groups used in our age-ethnicity structure, the numbers in each ethnicity group were estimated by multiplying the counter and proportion of prioritised ethnicities at each age band in Census 2006.

Because some of the health outcomes are fairly uncommon, it is not appropriate to attempt to calculate age and ethnicity-adjusted rates. Stable age-standardised and age-ethnicity standardised rate generally requires 5+ cases in all cells. This analysis uses 9 age bands and 3 ethnic groups so requires 27 cells for calculating age-ethnicity standardised rates. Consequently, rates will become unstable when there are fewer than 135 hospitalised cases (3*9 age-ethnic cells with an average of 5 cases in each). For rates restricted to children <18 years 45 cases are needed (3*3 age-ethnic cells), and 90 cases are needed for rates in adults 18+ years (3*6 age-ethnic cells). In these situations, rates are shown in *italics* in this report. If numbers are considerably smaller then they are not reported at all. We have set these numbers as 1+ cases per cell, giving a minimum requirement of 27 hospitalised cases where we are covering all age groups, 9 for children <18, and 18 in adults 18+. If numbers are less than this, then no age-ethnicity standardised rates are reported since some cells will have 0 cases.

Table 3.1 Filters used in the analysis of hospitalisation data for the SHOW study

Event that is 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 total 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 NZ 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. Hospital 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. Hospital 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 and 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 (>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

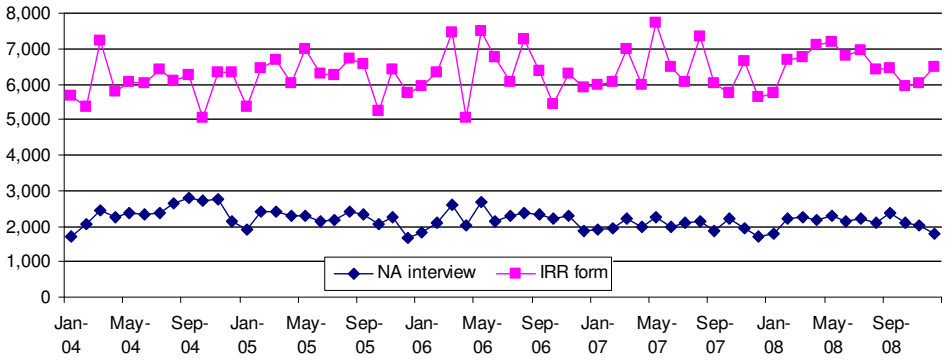
4. Data quality

This section presents information on key data quality indicators. These indicators are based on information reported though the IRR form and NA interview and recorded on RENTEL

4.1. Interview numbers

The collected HNZC data record circumstance changes for applicant or tenant households at several key points. There were, on average, around 2,190 NA interviews and 6,310 completed IRR forms entered each month. The applicant and tenant household number is presented monthly in Figure 4.1.

Figure 4.1 Household numbers of NA and IRR by month, 2004-08



4.2. Data completeness

a. Brief description of indicator

Scope of indicator: Based on completeness of key fields recorded on RENTEL, notably ethnicity and smoking. Ethnicity was collected from both tenants and applicants. The smoking question was collected via the IRR form from HNZC tenants older than 17 years. Unlike other information collected through the NA interview and IRR form it was specifically identified as a voluntary question. Missing valued appeared in both fields. To improve the completeness of these data, the missing values were filled in using information supplied by the same individuals when they completed subsequent IRR application forms (where available).

Rationale for indicator: Incomplete data limit the quality of the analysis that is possible.

b. Data completeness

Table 4.1 Data completeness for ethnicity and smoking, 2004-08

HNZC population	Ethnicity (%)	Ethnicity after replacement (%)	Smoking (%)	Smoking after replacement (%)
Tenants				
2004	85.6	94.9	55.8	72.1
2005	83.8	96.5	59.4	71.5
2006	89.1	97.8	59.3	69.1
2007	89.3	98.2	58.6	66.5
2008	89.5	98.4	58.0	63.9
Average	**87.0**	**97.0**	**58.2**	**69.2**
Applicants				
2004	90.2	99.0	–	–
2005	82.7	98.9	–	–
2006	86.0	99.1	–	–
2007	85.2	99.0	–	–
2008	86.0	99.1	–	–
Average	**86.0**	**99.0**	–	–

–: Data are not applicable

Figure 4.2 Responses to Ethnicity for applicants and tenants by month, 2004-2008

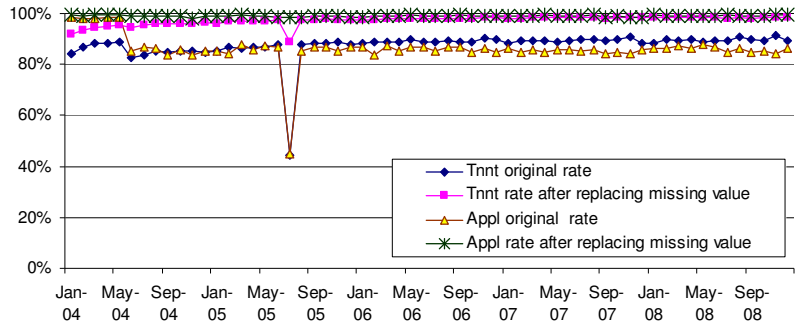
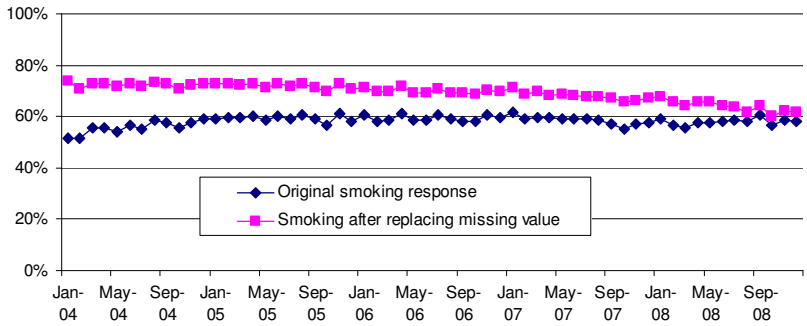


Figure 4.3 Response to smoking question on IRR form by month, 2004-2008



c. Key points

Figure 4.2 shows the ethnicity response rates for people in applicant and tenant households. Applicants and tenants have similar response rates at 87.0% and 86.0% respectively. One of four HNZC areas lost the ethnicity fields in July 2005, which accounts for the outlier value for that

month. The response rates increased to 97.0% for tenants and 99.0% for applicants after adding data provided by the same individuals when they completed subsequent IRR application forms (where available).

Figure 4.3 shows the monthly trend for response rates to the smoking question. The original smoking response rate increased during 2004 from 51.2% in January to 58.4% in December then flattens off in later years at around 58% to 60%. The smoking response rate was increased 11.0% up to 69.2% on average, after performing the missing value process. The early rates improved more since they are more likely to have subsequent records that can be drawn on to fill missing values.

4.3. Data matching

a. Brief description of indicator

Scope of indicator: Analysing hospitalisation outcomes in this population depends on being able to match cohort members to their encrypted NHI number. This quality indicator is the percent that could be matched.

Rationale for indicator: It is important to monitor and maximise the match proportion. Records that cannot be matched with an NHI number do not contribute to any of the subsequent analyses in this report (*Housing use and throughput*, *Demographic & socio-economic characteristics*, *Housing exposures and conditions*, and *Hospitalisations and mortality*).

b. Data matching

Table 4.2 Proportion of records matched to NHI, 2004-2008

Year	Tenants (%)	Applicants (%)
2004	94.0	93.8
2005	94.3	93.7
2006	94.7	95.5
2007	95.4	96.5
2008	94.7	96.2
Average	**94.7**	**95.1**

c. Key points

Table 4.2 show the proportion of applicants and tenants who could be matched to their NHI, from 2004 to 2008. When HZHIS matched new received data, it also updated the previous matched data with the same reference number. The match rate increased over time for all data. The average annual match rate for this period was 95.0% at end of 2008.

4.4. Denominator time

a. Brief description of indicator

Scope of indicator: Analysing hospitalisation outcomes in this population depends on being able to accurately assign 'person time' to applicants and tenants. This is the amount of time (days) that people spent as applicants, tenants or other (ie outside the cohort). This process depends on knowing when individuals change their status. For reasons described in the methods section, some

records needs to be excluded from the analysis because person time cannot be reliably assigned (usually because of complex application' and tenants' processes).

Rationale for indicator: It is important to monitor and maximise the proportion of records retained in the study. Records that cannot be assigned accurately as applicant and tenant time do not contribute to any of the subsequent analyses in this report (*Housing use and throughput*, *Demographic & socio-economic characteristics*, *Housing exposures and conditions*, and *Hospitalisations and mortality*).

b. Denominator time

Table 4.3 Proportion of records retained in the study, 2004-2008

Year	Tenants (%)	Applicants (%)
2004	97.0	93.3
2005	96.4	92.2
2006	93.7	91.8
2007	93.5	91.3
2008	93.4	91.1
Average	**95.1**	**92.2**

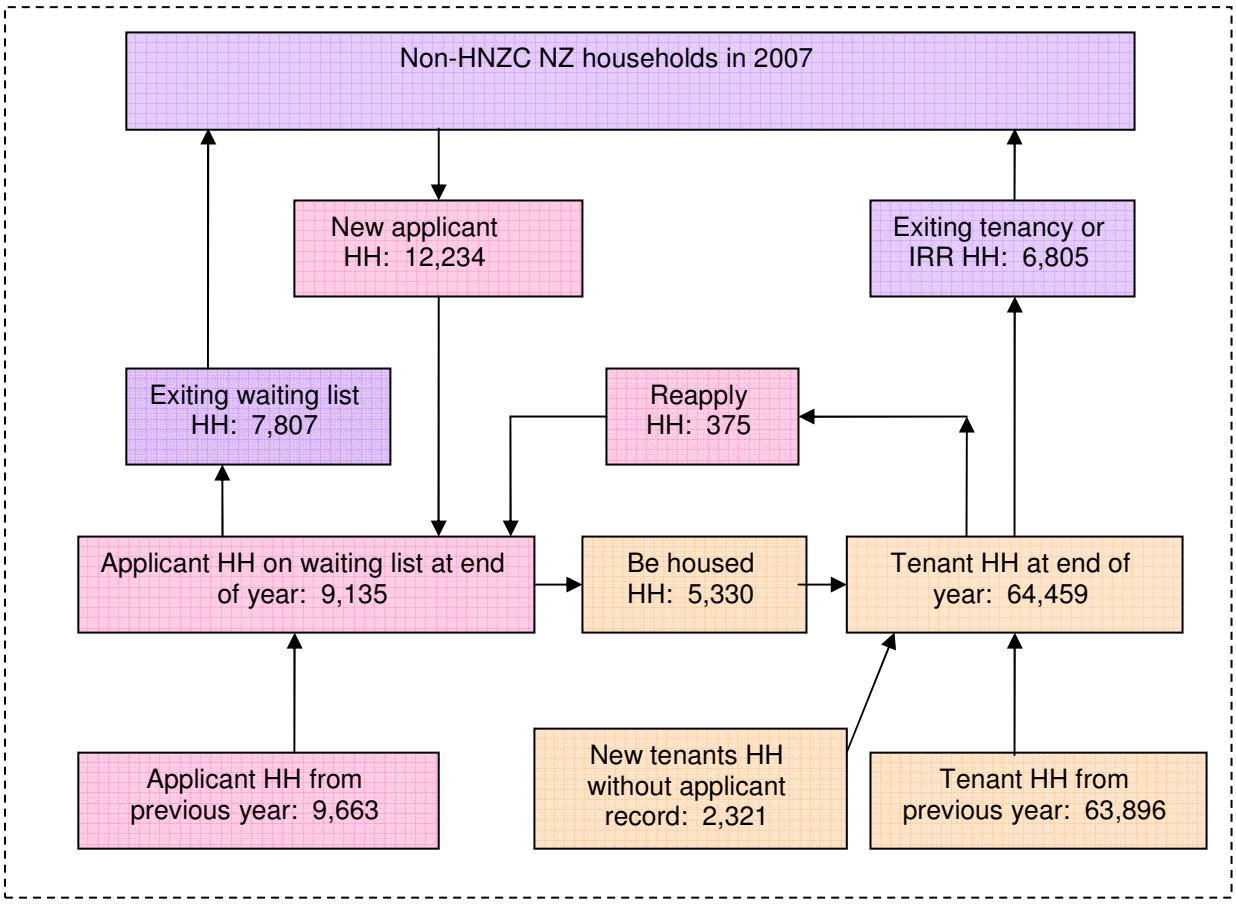
c. Key points

The monthly record retention is shown in Table 4.3**.** The proportion of records retained was higher for tenants as the tenant records were used if a person was recorded as an applicant and tenant simultaneously (based on the assumption that they were probably still a tenant while waiting for new house to become available). With the data collection time increasing, more records with overlapping time were identified and excluded. The proportion of records retained in the study decreased an average of 1% a year from 2004 to 2008.

5. Housing use and throughput

This section presents a range of measures of housing applicant and tenant occupancy and throughput. These indicators are based on information reported though the IRR form, NA interview, and HNZC management processes recorded on RENTEL. Many of these are dynamic indicators in that they record the number of people or households who move through a particular state over time (unlike the other indicators contained in this report, which present the situation at a particularly point in time, usually the end of a year). This report shows numbers in 2007 (because they are more stable than numbers in 2008, and will be updated after 2009).

Figure 5.1 Graphic representation of HNZC household (HH) flows between applicant and tenant states, and the New Zealand population in 2007. Note that households who move through the HNZC applicant-tenant flow-chart more than once are counted once only



The following tables are based on the above figure. If a household had multiple leases in a year, the first and the last lease were reviewed. The transfer leases between applicants or tenants in the middle were ignored. The apparent increase in tenants over time may be because more tenants are completing an IRR application. The household numbers are after lease time overlap adjustment (see Construction of cohort).

5.1. *Applicants entering and exiting waiting list*

a. Brief description of indicator

Scope of indicator: Based on RENTEL data from HNZC. Applicants assessed and placed on the waiting list can be measured as both households and people.

If applicants applied more than once, the last applicants were counted. The number of households was counted after removing the overlap in household lease time. The number of people was counted after removing the overlap in personal lease time and people without NHI numbers. It should be noted that some people had their lease date starting later or ending earlier than the dates recorded for the rest of their families, for example, newborn babies.

Rationale for indicator: The number of people placed on the waiting list is a key input that affects the size of this applicant population.

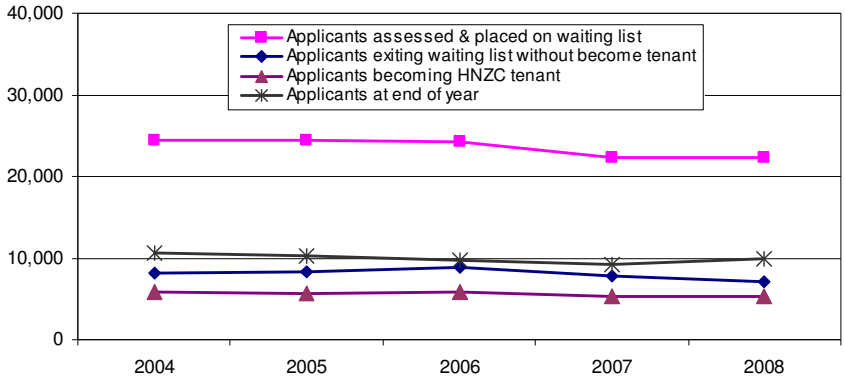
b. Applicant and tenant movements

Table 5.1 Applicant movements, 2004-2008

Year	Applicants assessed & placed on waiting list		Applicants exiting waiting list without become tenant		Applicants becoming HNZC tenants		Applicants at end of year	
	HH	People	HH	People	HH	People	HH	People
2004	24,455	55,781	8,096	17,146	5,758	15,189	10,601	23,390
2005	24,393	53,699	8,368	16,935	5,731	14,773	10,294	21,943
2006	24,262	53,053	8,812	17,989	5,787	14,494	9,663	20,511
2007	22,272	48,672	7,807	16,240	5,330	13,361	9,135	19,038
2008*	22,305	46,666	7,145	13,408	5,333	13,115	9,827	20,143
Average	**23,397**	**51,419**	**8,121**	**16,344**	**5,587**	**14,187**	**9,688**	**20,611**

* Numbers for the most recent year are not complete and will be updated when the next year is added

Figure 5.2 Number of applicant households entering and exiting each year, 2004-2008



c. Key points

There were, on average, 23,397 households assessed and placed on the waiting list each year from 2004 to 2008, as shown in Table 5.1. About 8,121 (34.4%) households exited from the waiting list without become tenants; about 5,586 (23.8%) households became tenants; and 9,688 (41.7%) households stayed on the waiting list. Numbers in all of these applicant groups declined over the four years from 2004 to 2008.

5.2. Tenants entering and exiting HNZC properties

a. Brief description of indicator

Scope of indicator: Based on RENTEL data from HNZC, tenant households can be measured as both households and people. Tenants were assumed to exit from their leases if they did not apply for an IRR for two years. Some of these tenants, who were deemed to have left, may have transferred to other tenancies and appeared as new tenants in a subsequent year. Or they may have exited by becoming a market renter.

Rationale for indicator: The number of people becoming HNZC tenants is the key input that affects the size of the tenant population.

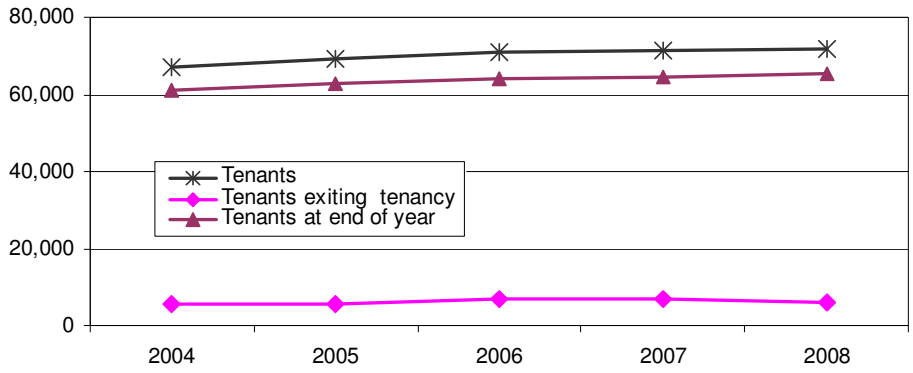
b. Number of new tenants

Table 5.2 Tenant movements, 2004-2008

Year	Tenants with IRR		Tenants who become applicants		Tenants exiting tenancy (or IRR)		Tenants at end of year	
	HH	People	HH	People	HH	People	HH	People
2004	67,085	200,947	316	1,604	5,656	18,389	61,113	180,750
2005	69,125	209,682	402	1,817	5,797	20,628	62,926	186,871
2006	71,162	216,392	439	2,112	6,826	23,331	63,897	190,918
2007	71,547	221,365	375	1,825	6,714	24,733	64,459	192,680
2008*	72,026	220,933	401	1,778	6,125	17,983	65,500	203,763
Average	**70,189**	**213,084**	**387**	**1,827**	**6,432**	**21,013**	**63,371**	**190,996**

* Numbers for the most recent year are not complete and will be updated when the next year is added

Figure 5.3 Number of tenant households entering and exiting each year, 2004-2008



c. Key points

There were, on average, 70,189 households filling in an IRR form each year from 2004 to 2008 as shown in Table 5.2. An average of 6,432 (8.8%) households exited HNZC tenancies each year; a few households (387, 0.5%) become applicants (transfers); and over 90.6% of households (an average of 63,371) stayed as tenants. Based on completed IRR forms entered onto RENTEL, the number of tenant households increased each year from 2004 to 2008.

5.3. *Duration as applicants*

a. Brief description of indicator

Scope of indicator: Based on RENTEL data from HNZC, which can be measured as both median and as proportions of applicants spending varying amounts of time as applicants. The current analysis was based on the duration of time people spent as applicants. It is based on the date people were first registered as applicants to the date they were either housed, or exited the waiting list. As HNZC uses households as their unit, the current analysis presented the duration of time on the waiting list for households.

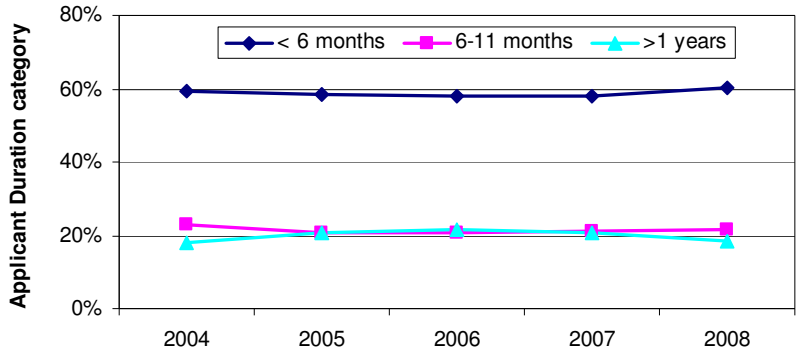
Rationale for indicator: The duration of time spent as an applicant on the waiting list for a HNZC house is an important management indicator for HNZC. It is also an important input for analysing risks associated with housing conditions and the health impact of social housing more generally.

b. Duration as applicant

Table 5.3 Duration as applicant households, 2004-2008

Applicants	Median duration (days)	0-5 months		6-11 months		1+ years	
		No.	%	No.	%	No.	%
2004	135	8,209	59.4	3,153	22.8	2,464	17.8
2005	135	8,256	58.7	2,921	20.8	2,899	20.6
2006	139	8,429	58.0	3,006	20.7	3,111	21.4
2007	136	7,626	58.2	2,764	21.1	2,714	20.7
2008	133	7,497	60.1	2,688	21.5	2,293	18.4
Average	**136**	**8,003**	**58.8**	**2,906**	**21.4**	**2,696**	**19.8**

Figure 5.4 Duration as applicant household, percentage in each time category, 2004-2008



c. Key points

As seen in Table 5.3, there has been almost no change in the duration of time that HNZC applicants spend on the waiting list in the period between 2004 and 2008. The median duration applicants stayed on the waiting list was about 136 days, with 58.8% spending less than 6 months, 21.2% between 6 months and 12 months, and 19.8% longer than a year.

5.4. Duration as tenants

a. Brief description of indicator

Scope of indicator: Based on RENTEL data from HNZC, this indicator can be measured either as the median or the proportion of time spent as tenants. This analysis was based on the duration of household tenancy. It is calculated from the start dates of the tenancy to the date of tenancy termination in the case of households that exited their tenancies during the year.

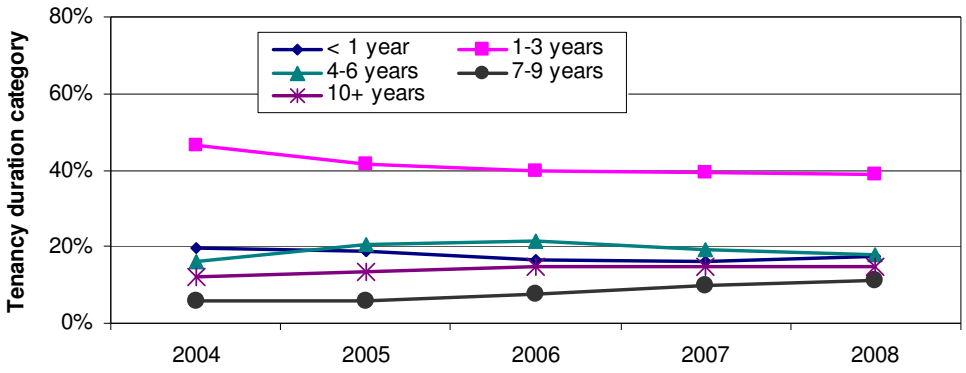
Rationale for indicator: The duration of time spent as a HNZC tenant is an important management indicator for HNZC. It is also an important input for analysing risks associated with housing conditions and the health impact of social housing more generally.

b. Duration as a tenant

Table 5.4 Duration of tenant households, 2004-2008

Tenancy	Median duration (days)	< 1 year		1-3 years		4-6 years		7-9 years		10+ years	
		No.	%	No.	%	No.	%	No.	%	No.	%
2004	957	1,117	19.8	2,634	46.6	909	16.1	321	5.7	675	11.9
2005	1,081	1,098	18.9	2,399	41.4	1,183	20.4	338	5.8	779	13.4
2006	1,219	1,135	16.6	2,719	39.8	1,461	21.4	504	7.4	1,008	14.8
2007	1,248	1,094	16.3	2,646	39.4	1,301	19.4	674	10.0	999	14.9
2008	1,264	1,055	17.2	2,386	39.0	1,092	17.8	688	11.2	904	14.8
Average	**1,174**	**1,100**	**17.7**	**2,557**	**41.1**	**1,189**	**19.1**	**505**	**8.1**	**873**	**14.0**

Figure 5.5 Duration of household tenancy, percentage in each time category, 2004-2008



c. Key points

As seen in Table 5.4 and Figure 5.5, the median duration of tenancies in HNZC houses was 1,174 days (3.5 years). The largest group of tenants (41.1%) had lived in HNZC houses for 1-3 years. There was a trend towards longer tenancies over this period, with the median tenancy increasing from 957 days in 2004 to 1,264 days in 2008.

6. Demographic and socio-economic characteristics

This section presents key demographic and socio-economic characteristics of HNZC housing applicants and tenants. These indicators are based on information reported though the IRR form and NA interview and recorded on RENTEL

The population includes a cross-section of current applicants and tenants at the end of each year.

6.1. Age and sex

a. Brief description of indicator

Scope of indicator: Based on age and sex data from RENTEL. Age can be measured as median and as proportions in key age bands.

Rationale for indicator: The age-sex structure of the HNZC applicant and tenant populations is a critical input in understanding their health.

b. Age-sex composition

Table 6.1 Age and sex distribution of applicants and tenants, compared with NZ population, 2004-2008

Population & year	Median age	<18 years		18-64 years		65+ years		Female	Male	Total
		No.	%	No.	%	No.	%	%	%	No.
Tenants										
2004	20	81,870	45.3	84,930	47.0	12,946	7.2	55.0	45.0	180,750
2005	20	84,344	45.2	88,095	47.1	13,588	7.3	55.1	44.9	186,871
2006	20	85,780	45.0	90,389	47.3	14,057	7.4	55.1	44.9	190,918
2007	20	85,873	44.6	91,754	47.6	14,492	7.5	55.1	44.9	192,680
2008	20	88,007	43.3	99,852	49.0	15,423	7.6	54.7	45.3	203,763
Average	**20**	**85,175**	**44.6**	**91,004**	**47.6**	**14,101**	**7.4**	**55.0**	**45.0**	**190,996**
Applicants										
2004	20	10,937	46.7	11,202	47.9	1,224	5.2	57.2	42.8	23,390
2005	20	10,153	46.2	10,513	47.9	1,258	5.7	57.0	43.0	21,943
2006	21	9,268	45.2	9,895	48.2	1,333	6.5	56.0	44.0	20,511
2007	21	8,526	44.8	9,205	48.3	1,294	6.8	55.8	44.2	19,038
2008	21	8,961	44.5	9,738	48.3	1,433	7.1	55.5	44.6	20,143
Average	**21**	**9,569**	**45.6**	**10,111**	**48.1**	**1,308**	**6.2**	**56.4**	**43.6**	**21,005**

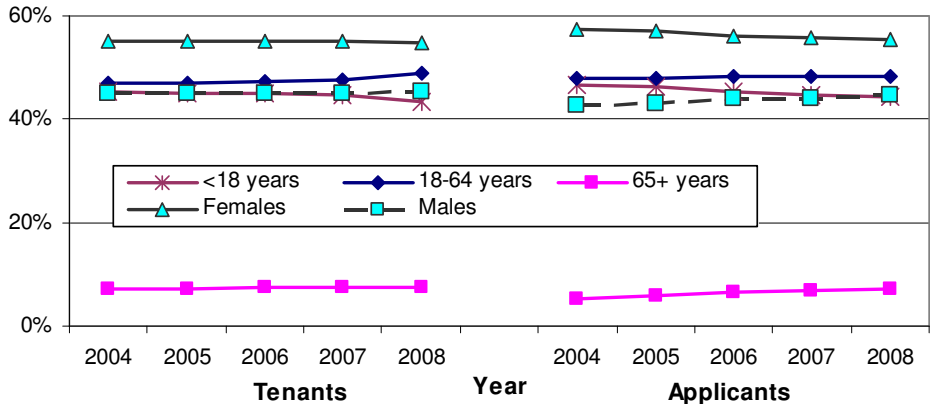
NZ Census										
2001	34.8	1,008,384	27.0	2,278,485	61.0	450,420	12.1	51.2	48.8	3,737,280
2006	35.9	1,111,740	27.6	2,420,610	60.1	495,606	12.3	51.2	48.8	4,027,947

c. Key points

These data show the very youthful nature of the HNZC applicant and tenant populations. The median age was 20 years, which was considerably younger than the NZ median of 35 years. The proportion of people 65+ years was about half the NZ average. The proportion of females was consistently higher than the NZ population for both tenants and applicants.

The age distribution of the applicant population changed slightly over the 2004-08 period with an increase in proportion of elders over 65 years of age and a decline in children <18 years.

Figure 6.1 Age and sex distribution of applicants and tenants, 2004-2008



6.2. Ethnicity

a. Brief description of indicator

Scope of indicator: Based on self-identified ethnicity data from RENTEL, which uses the standard Census question and allows multiple ethnicities. This analysis presents total and prioritised ethnicity.

Rationale for indicator: The ethnic mix of the HNZC applicant and tenant populations is a critical input in understanding their health.

This analysis used Census 2006 ethnicity coding and level one categories to code ethnicities of applicants and tenants. Data were analysed as prioritised ethnicity in the sequence: Māori, Pacific, Asian, European and Other (MELAA, Other), and Not Stated.

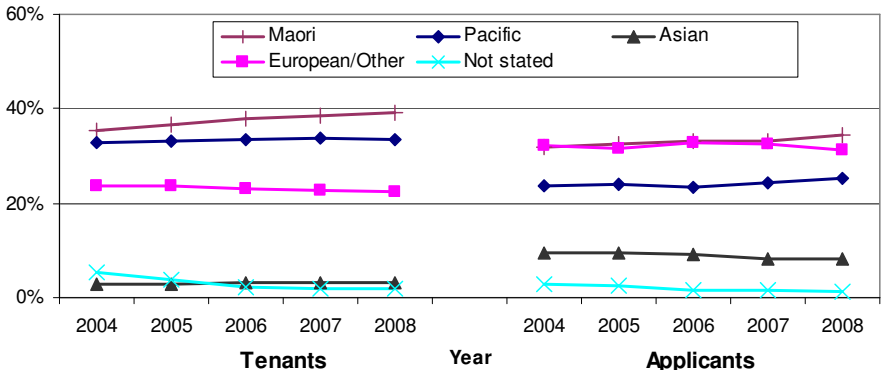
b. Ethnic composition

Table 6.2 Ethnicity of applicants and tenants, compared with NZ population, 2004-2008

Population & year	Māori		Pacific		Asian		European/ Other		Not stated	
	Prioritised[1] (%)	Total[2] (%)	Prioritised[1] (%)	Total[2] (%)	Prioritised[1] (%)	Total[2] (%)	Prioritised[1] (%)	Total[2] (%)	Prioritised[1] (%)	Total[2] (%)
Tenants										
2004	35.3	35.3	32.9	35.2	2.7	3.0	23.7	29.1	5.4	5.4
2005	36.7	36.7	33.0	35.8	2.9	3.3	23.6	30.1	3.8	3.8
2006	38.0	38.0	33.5	36.6	3.0	3.5	23.2	30.6	2.3	2.3
2007	38.6	38.6	33.6	37.0	3.2	3.7	22.7	30.7	1.9	1.9
2008	39.1	39.1	33.5	37.0	3.2	3.7	22.3	30.6	1.9	1.9
Average	**37.6**	**37.6**	**33.3**	**36.3**	**3.0**	**3.5**	**23.1**	**30.2**	**3.0**	**3.0**
Applicants										
2004	32.0	32.0	23.6	25.1	9.4	9.7	32.2	36.3	2.8	2.8
2005	32.6	32.6	23.9	25.6	9.6	10.0	31.5	36.9	2.5	2.5
2006	33.0	33.0	23.5	25.1	9.1	9.5	32.8	39.0	1.6	1.6
2007	33.2	33.2	24.4	26.3	8.2	8.9	32.4	38.8	1.7	1.7
2008	34.3	34.3	25.2	27.5	8.1	8.8	31.2	37.5	1.3	1.3
Average	**33.0**	**33.0**	**24.1**	**25.9**	**8.9**	**9.4**	**32.0**	**37.6**	**2.0**	**2.0**
NZ Census										
2001	14.1	14.1	5.3	6.2	6.1	-	70.5	-	4.0	4.0
2006	14.0	14.0	5.6	6.6	8.5	8.8	67.6	-	4.3	4.3

[1] Ethnic groups have been prioritised to level one in the following order: Māori, Pacific Peoples, Asian, European/Other
[2] Total ethnic groups include all of the people who stated each ethnic group, whether as their only ethnic group or as one of several ethnic groups.
- Data not available.

Figure 6.2 Prioritised ethnic group of applicants and tenants, 2004-2008



c. Key points

These data confirm the high proportion of HNZC tenants who were Māori and Pacific people relative to the total NZ population. The applicant population had a larger proportion that reported their ethnicity as European, Other or Asian, compared with the tenant population.

There was a slight increase in the proportion of Māori for both applicants and tenants, but no change in Pacific, European and other groups from 2004 to 2008. This apparent change may have been affected by the decline in people not stating their ethnicity (particularly if a high proportion was Māori). The proportion of applicants who identified as Asian was similar to the NZ Census. We

would expect this group to become an increasing proportion of tenants over time as these applicants become housed.

6.3. Household income

a. Brief description of indicator

Scope of indicator: Based on household income recorded on RENTEL, income can be expressed as a median as well as proportions in various income bands.

Rationale for indicator: Household income is a key determinant of health and well-being. Even within the low-income population that qualifies for social housing, there is still a range of household income levels.

We report the equivalised household income. The *sum of income* field measures total weekly household income that is relevant to the calculation of the income-related rent (IRR). Jensen equivalised income weights are used to adjust for household size and composition (adults and children)[4]. The household income is adjusted by dividing the weekly income by the appropriate weight from for the number of adults and children in a household.

b. Household equivalised income

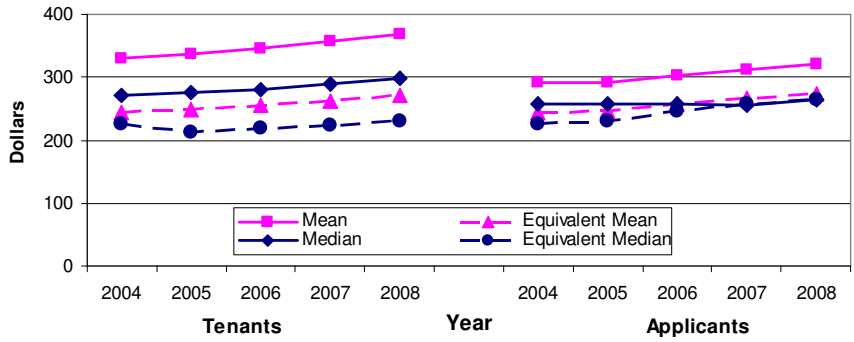
Table 6.3: Household weekly income for applicants and tenants, 2004-2008

Population & year	Income				Equivalised Income			
	Mean	Upper quintiles[1]	Median[1]	Lower quintiles[1]	Mean	Upper quintiles[1]	Median[1]	Lower quintiles[1]
Tenants								
2004	329.3	377.4	270.2	235.1	244.7	296.2	225.5	166.1
2005	336.4	393.6	276.8	241.5	249.4	307.9	211.9	162.4
2006	345.6	406.0	281.0	249.0	255.0	315.5	218.5	165.0
2007	357.2	426.2	289.8	255.7	263.3	327.0	224.3	169.9
2008	368.6	440.1	297.5	260.8	270.7	336.4	231.4	173.9
Average	**347.4**	**408.7**	**283.1**	**248.4**	**256.6**	**316.6**	**222.3**	**167.5**
Applicants								
2004	292.5	336.0	256.5	336.0	243.9	279.4	225.5	188.5
2005	291.3	335.3	256.5	241.5	246.7	286.5	231.6	180.2
2006	303.1	355.7	256.5	245.3	257.7	307.2	245.3	185.9
2007	311.4	370.2	255.7	249.1	267.6	322.1	257.1	190.8
2008	322.0	383.7	263.8	255.7	273.8	330.4	263.7	196.9
Average	**304.0**	**356.2**	**257.8**	**265.5**	**258.0**	**298.8**	**239.9**	**186.3**
Census 2006 (family income)	-	-	1,134	-	-	-	-	-

- Data not available.

[1] Quintiles divide the distribution into four even parts with the upper quintiles containing the quarter (or 25%) with the highest values, the median representing the middle (or 50th percentile), and the lower quintiles containing the quarter (or 25%) with the lowest values.

Figure 6.3 Household income per week of applicants and tenants, 2004-2008



c. Key points

These data confirm the very low median equivalised household income of HNZC tenants at $222.3 and applicants at $239.9. Although the mean and median incomes rose over this four-year period, there was very little increase for the lower quintile.

6.4. Household structure

a. Brief description of indicator

Scope of indicator: Based on household type recorded on RENTEL.

Rationale for indicator: Household type has important implications for the resources available to the family and therefore their health and well-being.

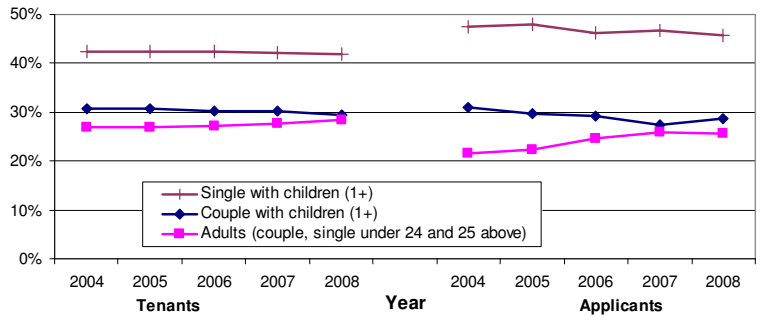
b. Household type

Table 6.4: Household type for applicants and tenants, 2004-2008

Population & year	Single with children (1+)		Couple with children (1+)		Adults (couple, single under 24 and 25 above)	
	Household (%)	Person (%)	Household (%)	Person (%)	Household (%)	Person (%)
Tenants						
2004	35.8	42.4	18.0	30.6	46.1	26.9
2005	35.7	42.3	18.1	30.8	46.2	26.9
2006	35.7	42.5	17.7	30.2	46.6	27.3
2007	35.4	42.2	17.6	30.3	47.0	27.6
2008	35.3	41.9	17.5	29.6	47.2	28.5
Average	**35.7**	**42.2**	**17.9**	**30.3**	**46.5**	**27.5**
Applicants						
2004	42.0	47.4	19.3	31.0	38.7	21.6
2005	41.8	47.9	18.0	29.6	40.2	22.4
2006	39.5	46.3	17.2	29.2	43.4	24.5
2007	38.7	46.6	15.7	27.5	45.6	25.8
2008	38.4	45.7	16.7	28.7	44.9	25.6
Average	**40.6**	**46.8**	**17.6**	**29.3**	**41.8**	**23.9**
NZ Census (households)						
2001 (1,344,240 dwelling)	12.4	-	29.6	-	58.1	-
2006 (1,454,175 total dwelling)	11.8	-	29.8	-	58.4	-

- Data not available.

Figure 6.4 Household category for applicants and tenants, 2004-2008



c. Key points

These data show that the largest proportion of HNZC clients were living in single parent households (42.2% for tenants and 46.8% for applicants), followed by couples with children (30.3% for tenants and 29.3% for applicants), then adults without children (27.5% for tenants and 24.9% for applicants). These proportions differed markedly from the wider NZ population where only about 12% of people lived in single parent households. If analysed by household rather than by individual, the proportions are different, with the most common household type being adults or adults with no children (46.5% for tenants and 41.8% for applicants), ahead of single parent households (35.7% for tenants and 40.6% for applicants) and couples with children (17.6% for tenants and 17.9% for applicants). Over the 2004 to 2008 period there was an increase in adults without children as applicants and a decline in couples with children.

7. Housing exposures and conditions

This section presents a range of measures of the environmental conditions experienced by HNZC tenants and applicants. These indicators are based on information reported though the IRR form and NA interview and recorded on RENTEL.

7.1. Active smoking

a. Brief description of indicator

Scope of indicator: Based on HNZC tenants reporting that they are active smokers (one or more cigarette per day). These data are not available for applicant households.

Rationale for indicator: Active smoking is an important risk factor for multiple diseases. It also presents a source for environmental tobacco smoke (ETS) exposure if carried out indoors.

Exclusions: No information is collected from children (<18 years) and housing applicants.

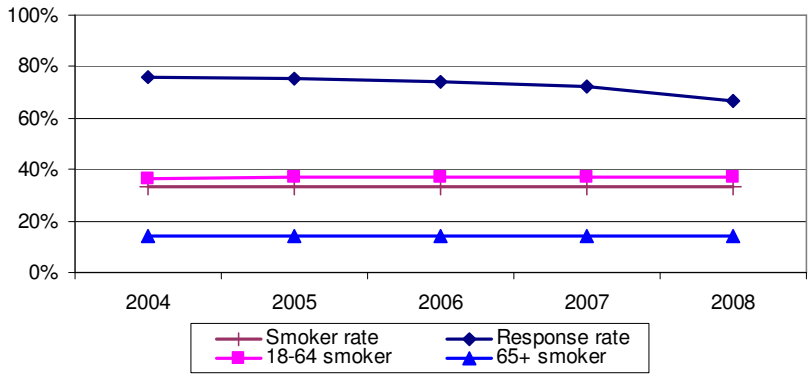
b. Prevalence of exposure and trends

Table 7.1: Active smoking for tenants (18+ years), 2004-2008

Population & year	No. of smokers	No. of tenants providing smoking information	Smokers %	Response to smoking question %
Tenants				
2004	24,571	74,263	33.1	75.9
2005	25,496	76,698	33.2	75.4
2006	25,866	77,478	33.4	74.2
2007	25,467	76,530	33.3	72.0
2008	25,377	76,734	33.1	66.6
Average	**25,355**	**76,341**	**33.2**	**72.6**
Tenants 2004-2008 average				
18-64 years	23,563	63,841	36.9	70.2
65+ years	1,793	12,499	14.3	88.6
Total New Zealand				
1996 Census (15+ years)	-	-	23.7	92.8
2006 Census (15+ years)	-	-	20.7	94.8

- Data not available.

Figure 7.1 Active smoking prevalence for tenants (18+ years), 2004-2008



c. Key points

An average of 33.2% of tenants 18 years of age or more who responded to the smoking questions reported being smokers (one or more a day). This was higher than the prevalence reported by the 2006 Census for New Zealanders as a whole (20.7% for those 15 years and over).

Over the 2004 to 2008 period, there was no notable trend in the proportion of adult tenants who reported smoking. This lack of change in smoking rates contrasts with a declining trend in smoking for New Zealanders generally.

7.2. Passive smoking

a. Brief description of indicator

Scope of indicator: Based on the percentage of tenant households that report an active smoker (one or more cigarette per day) in the same household.

Rationale for indicator: Passive smoking is a risk factor for several diseases.

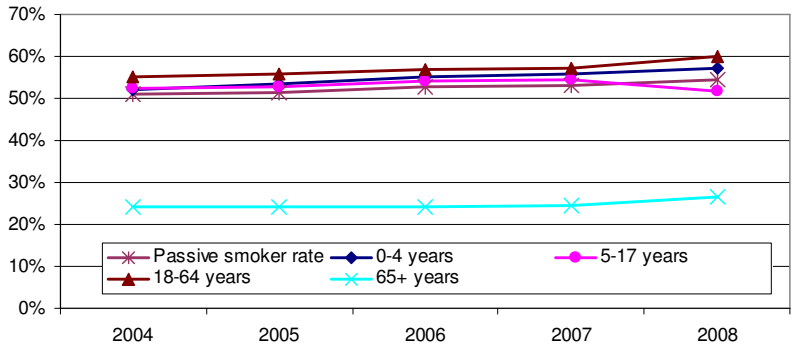
Exclusions: No information is collected from housing applicants.

b. Prevalence of exposure and trends

Table 7.2: Tenant households with passive smoking, 2004-2008

Population & year	No. of passive smokers	No. of tenants providing smoking information	Passive smokers %
Tenants			
2004	69,253	135,704	51.0
2005	71,835	139,461	51.5
2006	73,444	139,336	52.7
2007	72,199	135,858	53.1
2008	72,992	134,141	54.4
Average	**71,945**	**136,900**	**52.6**
Tenants 2004-2008, Average			
0-4 years	7,409	13,550	54.7
5-17 years	25,760	48,520	53.1
18-64 years	35,921	62,977	57.0
65+years	2,824	11,494	24.6

Figure 7.2 Passive smoking prevalence for tenants



c. Key points

Living in a household containing smokers was a relatively common exposure. When smoking status was reported, over half the tenants (52.6%) were potentially exposed to second-hand smoke. Over the 2004 to 2008 period there was a small increase in the proportion of tenants exposed to passive smoking.

7.3. Household crowding

a. Brief description of indicator

Scope of indicator: Based on the percentage of HNZC applicant and tenant households that have one or two or more shortages of bedroom in their households calculated using the Canadian National Occupancy Standard (CNOS). This standard can be expressed as a measure of households or people. The CNOS defines household crowding as a situation where one or more additional

bedrooms are required to meet the sleeping needs of the household.[5] Statistics New Zealand, HNZC and the Australian Bureau of Statistics have adopted this standard in recent reports.[6] [7]

Rationale for indicator: Household crowding is a risk factor for some infectious diseases and may contribute to poorer educational attainment and other negative outcomes if there is insufficient space in a house for some activities (eg quiet study at home).

Exclusions: None.

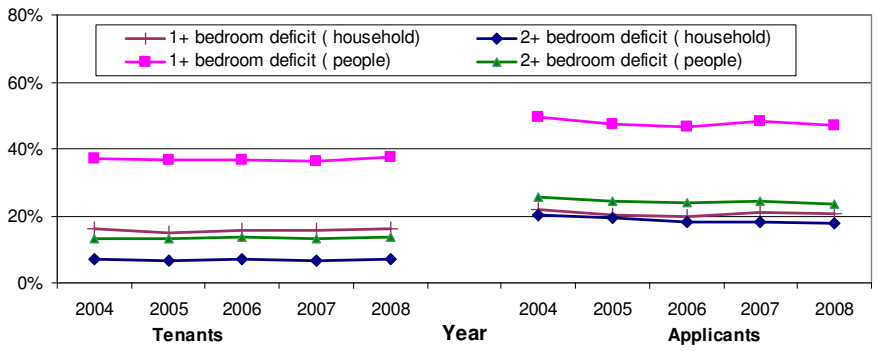
b. Prevalence of exposure

Table 7.3: Household crowding for applicants and tenants, 2004-2008

Population & year	No. of households	1+ bedroom deficit (% household)	2+ bedroom deficit (% households)	No. of people	1+ bedroom deficit (% people)	2+ bedroom deficit (% people)
Tenants						
2004	60,509	22.7	6.8	180,750	37.0	13.4
2005	61,856	21.3	6.4	186,871	36.5	13.1
2006	63,263	22.4	6.9	190,918	36.7	13.4
2007	63,841	22.0	6.5	192,680	36.3	13.0
2008	65,722	23.1	7.1	203,763	37.7	13.8
Average	**62,367**	**22.1**	**6.7**	**187,805**	**37.5**	**13.6**
Applicants						
2004	9,594	41.9	20.3	23,390	49.5	25.4
2005	9,183	39.5	19.3	21,943	47.4	24.2
2006	8,668	38.1	18.3	20,511	46.5	23.8
2007	8,214	38.8	18.1	19,038	48.1	24.3
2008	8,544	38.1	17.8	20,143	46.9	23.3
Average	**8,915**	**39.6**	**19.0**	**21,221**	**47.2**	**24.0**
Total New Zealand						
2001 (Census)	1,276,235	5.1	1.2	-	-	-
2006 (Census)	-	-	-	389,600	10.0	3.5

- data not available.

Figure 7.3 Crowding prevalence for applicants and tenants, 2004-2008



c. Key points

Household crowding was a relatively common exposure in the households of both housing tenants and applicants, compared with other New Zealanders. A bedroom deficit of one or more rooms was experienced by an average of 37.5% of tenants and 47.2% of applicants, compared with 10.0% of New Zealanders at the time of the 2006 Census [1]. The difference was even more marked for a two or more bedroom deficit, which was experience by 13.6% of housing tenants and 24.0% of housing applicants, compared with 3.5% of New Zealanders in 2006.

Over the 2004 to 2008 period, there was no notable trend in the proportion of applicants and tenants exposed to crowded households.

8. Hospitalisations and Mortality

This section presents a range of measures of the health status of HNZC tenants and applicants. Most of these indicators are based on hospitalisations data, though a few are mortality indicators.

Rates are adjusted for the age and age-ethnicity mix of housing applicants and tenants to allow for meaningful comparisons with the wider New Zealand population.

8.1. Total, Avoidable and Housing-related Hospitalisations

8.1.1. Total acute and arranged hospitalisations

a. Brief description of indicator

Scope of indicator: Uses International Statistical Classification of Diseases and Related Health Problems Version 10 (ICD.10) codes for total illness and injury admissions: A00-N99, R00-T98, Excludes pregnancy, childbirth and puerperium (O00-O99), certain conditions originating in perinatal period (P00-P96), congenital malformations, deformities and chromosomal abnormalities (Q00-Q99), and factors influencing health status and contact with health services (Z00-Z99).

Rationale for indicator: Indicator of overall level of ill-health and injury in population as well as use of hospital services.

Exclusions: Excludes private hospital cases, overseas visitors, transfers, and waiting list admissions, i.e. the same as standard filter, except that day cases and readmissions within a month are retained.

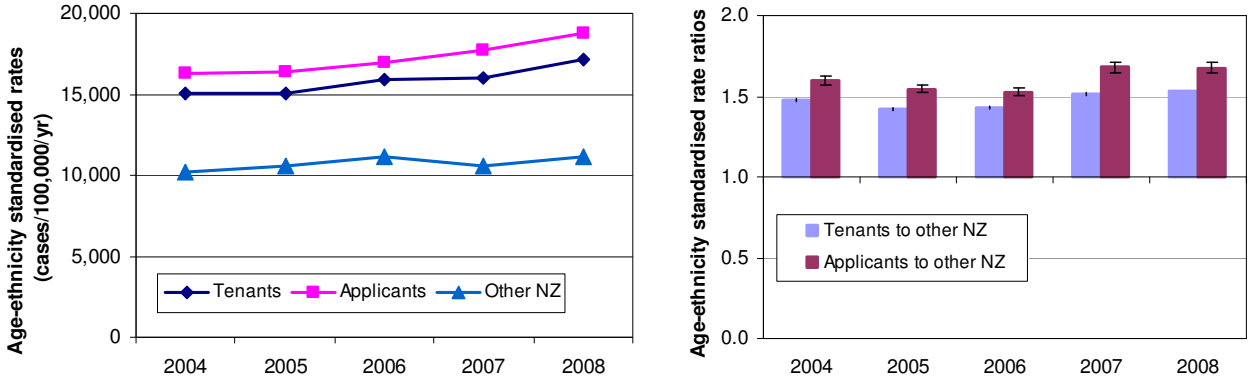
b. Incidence, rate ratio and trends

Table 8.1: Total acute and arranged hospital admission numbers and rates in applicants and tenants compared with the other NZ population, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	25,796	14,820.2	14,967.7	15,049.1	1.48	1.47	1.49
2005	26,829	14,811.5	14,981.2	15,009.4	1.42	1.41	1.43
2006	29,327	15,722.1	15,868.7	15,896.3	1.43	1.42	1.44
2007	30,173	15,893.9	15,947.7	15,980.4	1.51	1.50	1.52
2008	29,974	17,146.4	17,076.2	17,098.6	1.53	1.52	1.54
Total period	**142,099**	**15,677.6**	**15,771.4**	**15,795.5**	**1.47**	**1.47**	**1.48**
Applicants							
2004	3,972	15,944.5	16,042.4	16,274.7	1.60	1.57	1.63
2005	3,872	16,454.0	16,145.3	16,359.8	1.55	1.52	1.57
2006	4,000	17,789.8	17,181.4	16,998.9	1.53	1.50	1.55
2007	3,685	18,631.9	17,821.8	17,760.4	1.68	1.65	1.71
2008	3,564	19,688.1	18,828.6	18,717.9	1.68	1.65	1.71
Total period	**19,093**	**17,547.3**	**17,140.8**	**17,175.6**	**1.60**	**1.59**	**1.62**
Other NZ							
2004	371,339	9,549.5	8,379.2	10,180.3	1.00	-	-
2005	375,400	9,554.1	8,439.3	10,585.4	1.00	-	-
2006	391,827	9,855.9	8,611.8	11,134.6	1.00	-	-
2007	387,783	9,649.6	8,365.3	10,586.2	1.00	-	-
2008	370,985	9,972.2	8,575.8	11,161.7	1.00	-	-
Total period	**1,897,334**	**9,713.9**	**8,473.1**	**10,716.0**	**1.00**	**-**	**-**
Tenants 2004-2008							
0-4 years	17,740	22,081.3	-	-	-	-	-
5-17 years	22,634	7,126.3	-	-	-	-	-
18-64 years	72,408	16,506.6	-	-	-		-
65+ years	29,317	42,019.5	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.1 Trends of age-ethnicity standardised rates and rate ratios, for acute and arranged hospital admission, 2004-2008



c. Key points

The equivalent of 15.7% of HNZC tenants and 17.5% of HNZC applicants were admitted to hospital every year with acute (or relatively acute) illnesses or injuries, compared with 9.7% of other New Zealanders. After adjusting for age and ethnicity, hospitalisation rates were still 47.4% higher for tenants and 60.3% higher for applicants than for other New Zealanders.

Compared with 2004, total hospitalisation rates for housing applicants and tenants were significantly in 2008, in absolute terms and in relation to other New Zealanders. The rise was greatest for housing applicants. This pattern suggests an increasingly vulnerable population of housing applicants, and to a lesser extent tenants, over this period.

8.1.2. Potentially avoidable hospitalisations – Ambulatory sensitive

a. Brief description of indicator

Scope of indicator: Uses a Ministry of Health (MOH) set of ICD.10 codes for conditions considered to be Ambulatory Sensitive Hospitalisations (ASH). These are a subset of Potential Avoidable Hospitalisations (PAH) (See Appendix 11.2). This approach has been used in NZ to identify avoidable mortality [8] and avoidable hospitalisations [9]. The list of such conditions has been extensively reviewed and revised to ICD.10 for use across NZ and Australia [10].

Rationale for indicator: Ambulatory Sensitive Hospitalisations (ASH) are those resulting from diseases sensitive to prophylactic or therapeutic interventions deliverable in a primary health care setting (e.g. vaccine-preventable diseases, mammography for early breast cancer, effective glycaemic control in diabetics). They are considered a good indicator of access to primary health care health services.

Exclusions: Filtering follows conventions used by the MoH for calculating the ASH component of PAH. Apart from the standard filter used in this report, i.e. excluding private hospital cases, overseas visitors, transfers, waiting list except day cases not in ED and readmissions within a month, it also filters out neonates age <29 days, and older people age >74 years, and restricts some diseases to cases in adults or children (see Appendix 11.2), and excludes admissions from some primary rural facilities (see Appendix 11.2).

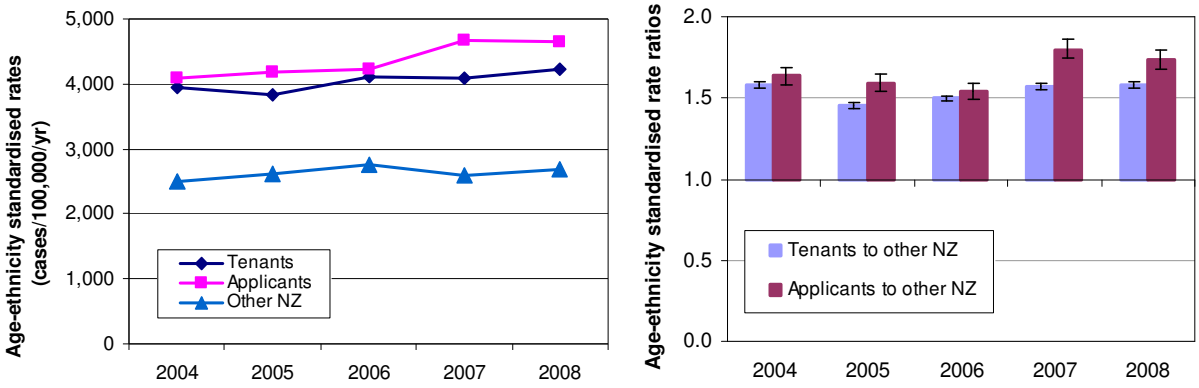
b. Incidence, rate ratio and trends

Table 8.2: Ambulatory sensitive hospital admission numbers and rates in applicants and tenants compared with other NZ population, 2004-2008

Population & year	No. of hospitalisations.	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	6,699	3,848.4	3,903.6	3,955.3	1.58	1.56	1.60
2005	6,768	3,736.4	3,810.5	3,821.4	1.46	1.44	1.48
2006	7,552	4,048.6	4,124.7	4,123.0	1.50	1.48	1.52
2007	7,679	4,045.0	4,102.5	4,093.0	1.57	1.56	1.60
2008	7,358	4,209.1	4,255.0	4,237.2	1.58	1.56	1.60
Total period	**36,056**	**3,978.0**	**4,039.4**	**4,040.6**	**1.54**	**1.53**	**1.55**
Applicants							
2004	1,104	4,429.7	3,933.0	4,091.0	1.63	1.58	1.69
2005	1,070	4,544.8	3,989.5	4,178.5	1.59	1.54	1.65
2006	1,079	4,798.8	4,105.2	4,238.5	1.54	1.49	1.59
2007	1,034	5,228.1	4,552.9	4,676.6	1.80	1.74	1.86
2008	956	5,281.1	4,536.8	4,651.1	1.74	1.68	1.80
Total period	**5,242**	**4,817.6**	**4,203.1**	**4,351.7**	**1.66**	**1.63**	**1.68**
Other NZ							
2004	62,383	1,604.3	1,679.6	2,502.5	1.00	-	-
2005	63,541	1,617.1	1,715.8	2,621.5	1.00	-	-
2006	65,977	1,659.6	1,750.7	2,752.7	1.00	-	-
2007	64,591	1,607.3	1,688.9	2,598.8	1.00	-	-
2008	60,164	1,617.2	1,684.7	2,677.5	1.00	-	-
Total period	**316,655**	**1,621.2**	**1,703.7**	**2,626.6**	**1.00**	**-**	**-**
Tenants 2004-2008							
0-4 years	9,498	11,822.3	-	-	-	-	-
5-17 years	6,696	2,108.1	-	-	-	-	-
18-64 years	15,813	3,604.7	-	-	-	-	-
65+ years	4,050	5,804.1	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.2 Trends of age-ethnicity standardised rates and rate ratios, for Ambulatory Sensitive Hospitalisation, 2004-2008



c. Key points

The equivalent of 4.0% of HNZC tenants and 4.8% of HNZC applicants were admitted to hospital every year with ASH conditions. After adjusting for age and ethnicity, hospitalisation rates were still 53.8% higher for tenants and 65.7% higher for applicants than for other New Zealanders.

Compared with 2004, ASH rates for housing applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. There was no significant change in the pattern for tenants over this period. This pattern suggests reduced access and utilisation of primary care services by the applicant population.

8.1.3. Potentially avoidable hospitalisations – Population preventable

a. Brief description of indicator

Scope of indicator: Uses a Ministry of Health set of ICD.10 codes for conditions considered to be Population Preventable Hospitalisations (PPH). These are a subset of Potentially Avoidable Hospitalisations (PAH) (See Appendix 11.2).

Rationale for indicator: Population Preventable Hospitalisations (PPH) are those resulting from diseases preventable through population-based strategies (e.g. smoke-free laws, housing improvements, better road safety). PPH provide an indication of the extent that this population is being reached by public health programmes.

Exclusions: Filtering follows conventions used by The MoH for calculating the PPH component of PAH. These are the same as ASH (above) except that there is no exclusion of neonates (aged < 29 days).

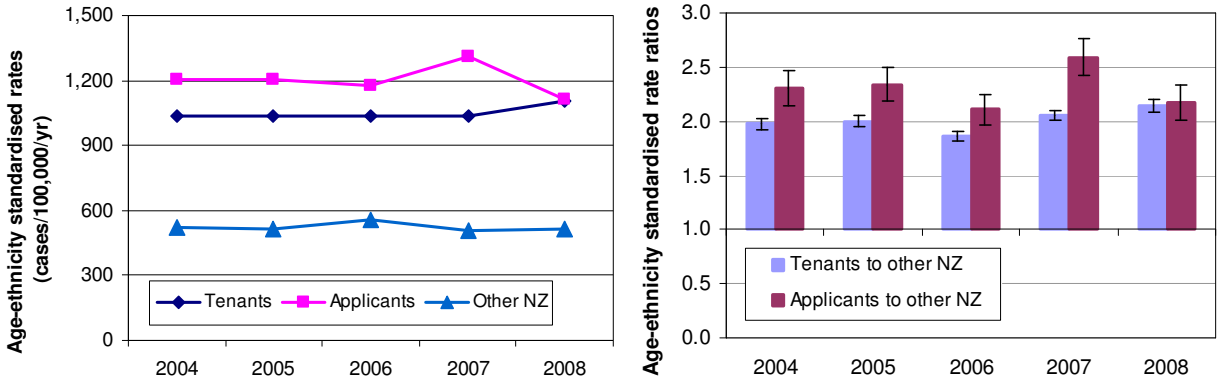
b. Incidence, rate ratio and trends

Table 8.3: Population Preventable Hospitalisations numbers and rates in applicants and tenants compared with other NZ population, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	1,770	1,016.6	1,025.9	1,031.8	1.97	1.92	2.03
2005	1,856	1,024.6	1,032.0	1,035.9	2.00	1.95	2.05
2006	1,935	1,037.3	1,036.4	1,038.0	1.86	1.82	1.91
2007	1,991	1,048.8	1,035.7	1,035.3	2.05	2.00	2.10
2008	1,983	1,134.4	1,104.5	1,103.2	2.14	2.09	2.20
Total period	**9,535**	**1,051.9**	**1,046.6**	**1,048.3**	**2.01**	**1.98**	**2.03**
Applicants							
2004	250	1,001.6	1,186.1	1,201.9	2.30	2.15	2.46
2005	253	1,073.0	1,163.6	1,206.0	2.33	2.18	2.49
2006	249	1,107.4	1,173.9	1,173.0	2.11	1.97	2.25
2007	253	1,279.2	1,340.8	1,306.5	2.59	2.43	2.76
2008	196	1,082.7	1,098.0	1,115.6	2.17	2.01	2.33
Total period	**1,200**	**1,102.9**	**1,194.0**	**1,204.5**	**2.30**	**2.24**	**2.37**
Other NZ							
2004	19,962	513.3	376.4	522.5	1.00	-	-
2005	19,569	498.0	364.9	517.3	1.00	-	-
2006	20,621	518.7	377.8	557.0	1.00	-	-
2007	19,655	489.1	348.5	504.3	1.00	-	-
2008	18,289	491.6	346.7	515.1	1.00	-	-
Total period	**98,095**	**502.2**	**362.8**	**522.8**	**1.00**	**-**	**-**
Tenants 2004-2008							
0-4 years	228	283.8	-	-	-	-	-
5-17 years	269	84.5	-	-	-	-	-
18-64 years	6,306	1,437.4	-	-	-	-	-
65+ years	2,733	3,916.4	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.3 Trends of age-ethnicity standardised rates and rate ratios for Population Preventable Hospitalisations, 2004-2008



c. Key points

The equivalent of 1.1% of HNZC tenants and 1.1% of HNZC applicants were admitted to hospital every year with PPH conditions. After adjusting for age and ethnicity, hospitalisation rates were still 100.5% higher for tenants and 130.4% higher for applicants than for other New Zealanders.

Compared with 2004, the PPH hospitalisation rate for housing tenants increased significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests reduced provision or effectiveness of population-based strategies for this population. There was no significant change in the pattern for applicants over this period.

8.1.4. Potentially Avoidable Hospitalisations – housing related

a. Brief description of indicator

Scope of indicator: Uses a set of ICD.10 codes for conditions considered to be related to housing conditions and therefore potential avoidable (See Appendix 11.2).

Rationale for indicator: This is a subset of PAH that overlaps with conditions sensitive to housing conditions (HR-PAH). It therefore has the potential to provide a single indicator of the health impact of housing conditions.

Exclusions: Filtering follows conventions used by the MoH for PAH to ensure comparability with MoH estimates.

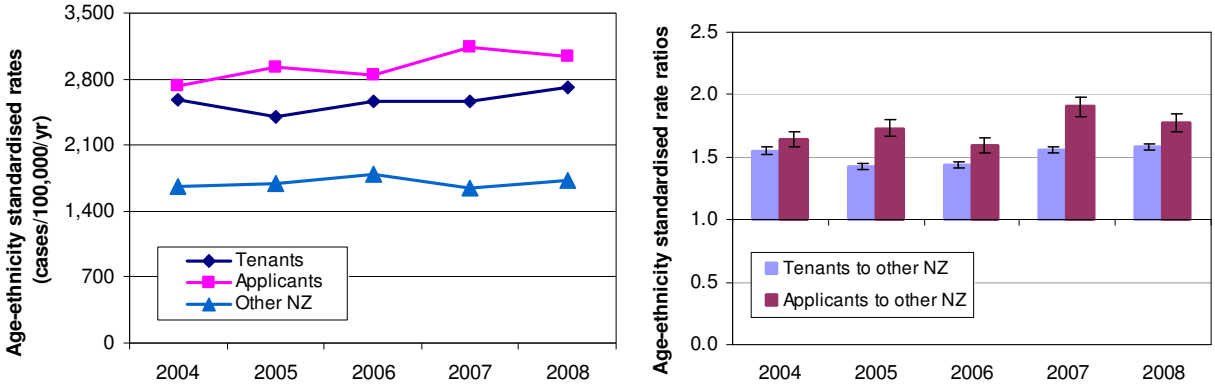
b. Incidence, rate ratio and trends

Table 8.4: Housing-related Potentially Avoidable Hospitalisation numbers and rates in applicants and tenants compared with other NZ population, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	4,326	2,485.4	2,536.4	2,580.2	1.55	1.52	1.58
2005	4,206	2,322.0	2,387.1	2,395.6	1.42	1.40	1.44
2006	4,667	2,502.0	2,570.4	2,569.4	1.44	1.42	1.46
2007	4,774	2,514.8	2,563.9	2,556.5	1.55	1.53	1.58
2008	4,716	2,697.7	2,733.3	2,715.0	1.58	1.56	1.61
Total period	**22,689**	**2,503.3**	**2,557.9**	**2,558.8**	**1.51**	**1.50**	**1.52**
Applicants							
2004	758	3,042.8	2,558.6	2,731.0	1.64	1.58	1.71
2005	767	3,259.3	2,693.9	2,917.2	1.73	1.66	1.80
2006	750	3,335.6	2,696.4	2,843.8	1.59	1.53	1.66
2007	705	3,564.6	2,971.8	3,132.2	1.90	1.83	1.98
2008	646	3,568.6	2,876.1	3,046.2	1.77	1.70	1.85
Total period	**3,626**	**3,332.5**	**2,752.2**	**2,931.9**	**1.73**	**1.70**	**1.76**
Other NZ							
2004	37,448	963.0	1,062.3	1,664.4	1.00	-	-
2005	37,009	941.9	1,062.3	1,686.5	1.00	-	-
2006	38,190	960.6	1,074.4	1,783.7	1.00	-	-
2007	36,955	919.6	1,019.3	1,645.8	1.00	-	-
2008	34,860	937.0	1,018.9	1,717.6	1.00		-
Total period	**184,462**	**944.4**	**1,047.5**	**1,697.0**	**1.00**	**-**	**-**
Tenants 2004-2008							
0-4 years	7,523	9,364.0	-	-	-	-	-
5-17 years	3,487	1,097.9	-	-	-	-	-
18-64 years	8,947	2,039.6	-	-	-	-	-
65+ years	2,732	3,915.7	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.4 Trends of age-ethnicity standardised rates and rate ratios, for Housing-related Potentially Avoidable Hospitalisation, 2004-2008



c. Key points

The equivalent of 2.5% of HNZC tenants and 3.3% of HNZC applicants were admitted to hospital every year with HR-PAH illnesses. After adjusting for age and ethnicity, hospitalisation rates were still 50.8% higher for tenants and 72.8% higher for applicants than for other New Zealanders.

Compared with 2004, HR-PAH rates for housing applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests reduced quality of housing conditions for housing applicants. There was no significant change in the pattern for tenants.

8.2. Mortality

8.2.1. Total mortality

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for total illness and injury mortality: A00-N99, R00-T98. Does not include underlying cause of death from pregnancy, childbirth and puerperium (O00-O99), certain conditions originating in perinatal period (P00-P96), and congenital malformations, deformities and chromosomal abnormalities (Q00-Q99), and factors influencing health status and contact with health services (Z00-Z99). (see Table 3.1 for rationale).

Mortality data are collected through a separate system and lag about two years behind hospitalisation data.

Rationale for indicator: Indicator of overall level of ill-health and injury in population.

Exclusions: None. The exclusions applied to filtering hospitalisation data do not apply to mortality data.

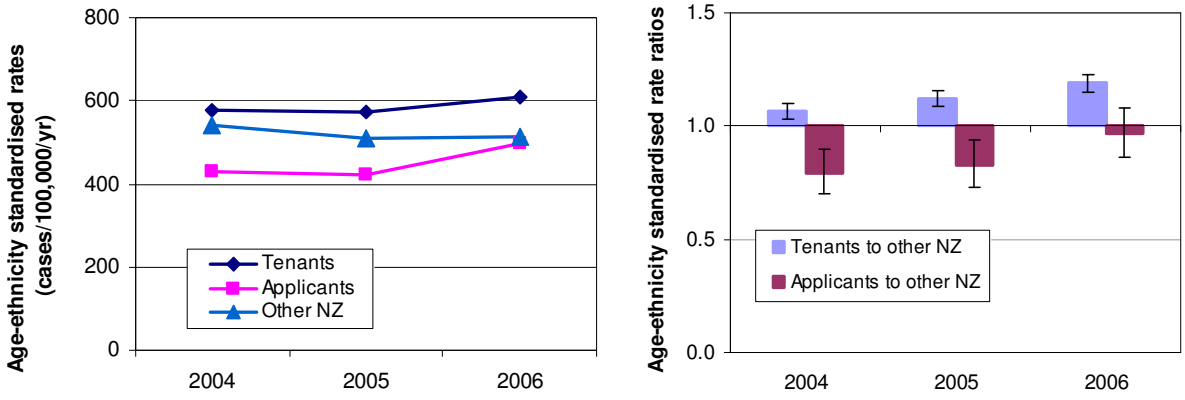
b. Incidence, rate ratio and trends

Table 8.5: Mortality numbers and rates in applicants and tenants compared with other NZ population, 2004-2006

Population & year	No. of deaths	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	985	566.7	566.9	576.7	1.06	1.03	1.10
2005	1,012	562.1	566.5	572.1	1.12	1.09	1.16
2006	1,114	605.3	608.4	610.1	1.19	1.15	1.23
Total period	**3,111**	**578.4**	**581.0**	**586.7**	**1.12**	**1.10**	**1.14**
Applicants							
2004	*72*	290.6	395.3	*431.1**	*0.79**	*0.70**	*0.90**
2005	*65*	278.8	342.8	*423.3**	*0.83**	*0.73**	*0.94**
2006	*82*	372.2	452.6	*495.5**	*0.97**	*0.86**	*1.08**
Total period	**219**	**312.3**	**397.4**	**449.4**	**0.86**	**0.80**	**0.92**
Other NZ							
2004	27,230	707.4	456.4	542.6	1.00	-	-
2005	25,903	666.0	427.5	510.7	1.00	-	-
2006	25,912	658.6	417.2	513.2	1.00	-	-
Total period	**79,045**	**677.1**	**433.5**	**521.9**	**1.00**	-	-
Tenants-2004-2006							
0-4	36	66.9	-	-	-	-	-
5-17	63	33.3	-	-	-	-	-
18-64	1,285	507.7	-	-	-	-	-
65+	1,727	4,107.8	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.5 Mortality trends of age-ethnicity standardised rates and rate ratios, 2004-2006



c. Key points

Deaths were far less common than hospitalisations. An average of 0.58% of housing tenants and 0.31% of applicants died each year compared with 0.68% of the other NZ population. These rates strongly reflect the relatively younger age structure of tenants and particularly applicant households. After adjusting for age and ethnicity, the mortality rate remained slightly, but significantly, higher among tenants and lower among housing applicants.

With only three years of mortality data available, it is not possible to draw conclusions about trends in mortality rates in this population.

8.3. Infectious diseases

8.3.1. Close contact infectious disease

a. Brief description of indicator

Scope of indicator: Uses a set of ICD.10 codes for close-contact infectious diseases. This indicator is restricted to the infections themselves rather than their late effects (see Appendix 11.3).

Rationale for indicator: This approach was based on a set of ICD.9 codes initially developed by the US Centers for Disease Control and Prevention for identifying (and recoding) diseases with an infectious aetiology.[11] This approach has been applied in the US to distinguish infectious disease deaths[11] and hospitalisations.[12] [13] This coding scheme has also been used in NZ to describe the burden of disease attributed to infection.[14] We further refined this ICD list by identifying a subset of *close-contact infectious diseases*. These are those where (i) humans are the only or the most important source, (ii) where transmission is by direct physical contact, respiratory transmission, or faecal-oral spread, and (iii) illness is an acute rather than chronic effect of infection. They therefore provide an indicator of the potential effects of household crowding and poor access to washing facilities

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

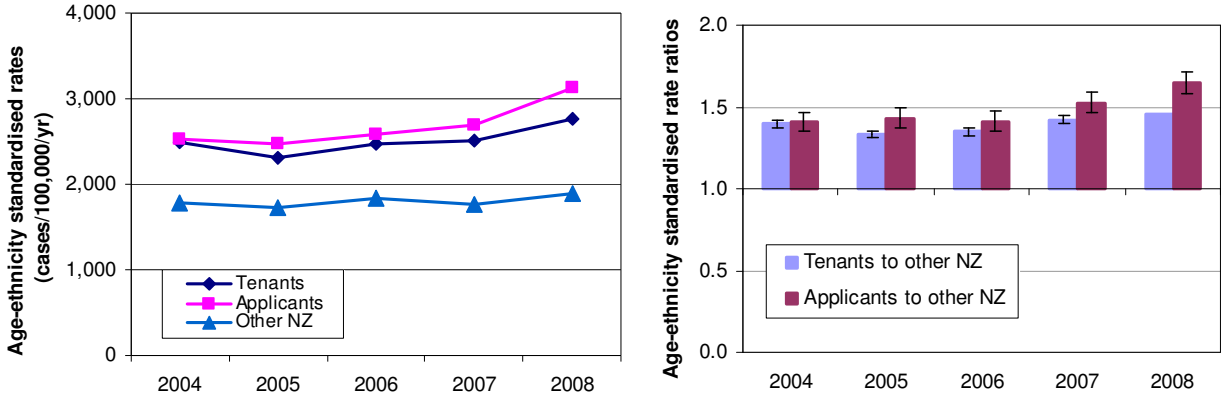
b. Incidence, rate ratio and trends

Table 8.6: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for close contact infectious diseases, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	4,192	2,408.4	2,454.8	2,491.8	1.40	1.37	1.42
2005	4,069	2,246.4	2,305.0	2,311.9	1.33	1.31	1.36
2006	4,497	2,410.8	2,471.2	2,466.4	1.35	1.33	1.37
2007	4,693	2,472.1	2,518.4	2,508.4	1.42	1.40	1.45
2008	4,824	2,759.5	2,790.2	2,767.8	1.46	1.44	1.48
Total period	**22,275**	**2,457.6**	**2,507.3**	**2,506.2**	**1.39**	**1.38**	**1.40**
Applicants							
2004	696	2,793.9	2,416.3	2,518.4	1.41	1.35	1.47
2005	639	2,715.4	2,308.3	2,479.9	1.43	1.37	1.49
2006	658	2,926.4	2,467.9	2,583.0	1.41	1.36	1.47
2007	606	3,064.0	2,560.8	2,692.4	1.53	1.46	1.59
2008	650	3,590.7	2,963.8	3,119.2	1.65	1.58	1.71
Total period	**3,249**	**2,986.0**	**2,530.8**	**2,665.5**	**1.48**	**1.45**	**1.51**
Other NZ							
2004	44,784	1,151.7	1,178.1	1,785.2	1.00	-	-
2005	42,676	1,086.1	1,128.7	1,734.2	1.00	-	-
2006	44,666	1,123.5	1,145.0	1,827.5	1.00	-	-
2007	44,605	1,109.9	1,127.6	1,761.8	1.00	-	-
2008	44,410	1,193.8	1,185.5	1,895.7	1.00	-	-
Total period	**221,141**	**1,132.2**	**1,152.6**	**1,798.9**	**1.00**	-	-
Tenants 2004-2008							
0-4 years	6,351	7,905.2	-	-	-	-	-
5-17 years	3,917	1,233.3	-	-	-	-	-
18-64 years	8,331	1,899.2	-	-	-	-	-
65+ years	3,676	5,268.7	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.6 Trends of age-ethnicity standardised rates and rate ratios, for close contact infectious diseases, 2004-2008



c. Key points

Close-contact infectious diseases were a common cause of hospitalisation, with an equivalent of 2.5% of HNZC tenants and 3.0% of applicants admitted to hospital each year with these conditions. After adjusting for age and ethnicity, hospitalisations for close-contact infectious diseases were still 39.3% higher for tenants and 48.2% higher for applicants than for other New Zealanders.

Compared with 2004, rates for housing tenants and applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders.

8.3.2. Gastroenteritis in children

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for intestinal infectious diseases and exclude those considered largely food-borne, transmitted from zoonotic sources, imported and hospital acquired. This leaves diseases that are largely transmitted by person-to-person contact, notably shigellosis (A03), giardiasis (A071), viral gastroenteritis eg rotavirus, norovirus (A08), and diarrhoea of presumed infectious origin (A09), nausea and vomiting (R11).

Rationale for indicator: Gastrointestinal infections are plausibly linked to household crowding, based on faecal-oral mode of transmission and evidence from some enteric infections (hepatitis A and *Helicobacter pylori*).

Exclusions: Restricted to children <18 years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

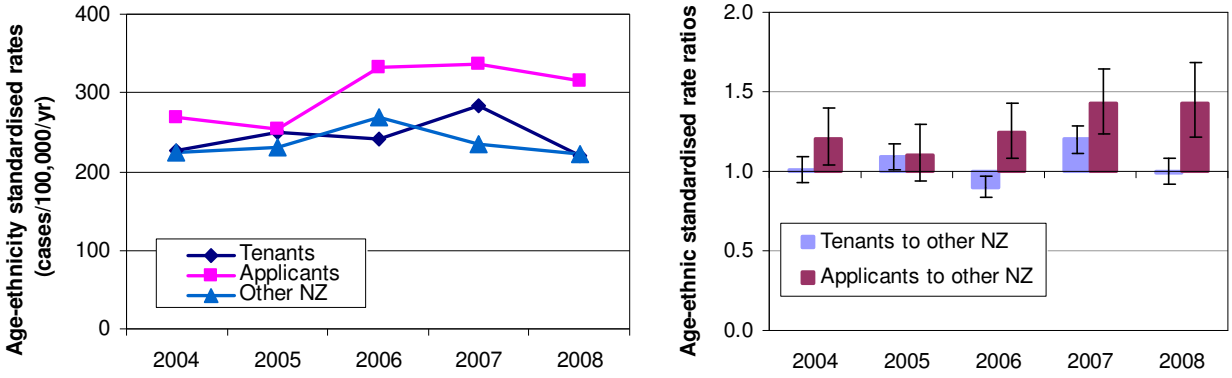
b. Incidence, rate ratio and trends

Table 8.7: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for gastroenteritis in children (<18 years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	173	99.4	228.0	225.7	1.01	0.93	1.09
2005	194	107.1	252.5	250.7	1.09	1.01	1.18
2006	190	101.9	240.2	241.2	0.90	0.83	0.97
2007	226	119.0	279.7	282.7	1.20	1.12	1.29
2008	161	92.1	216.3	220.1	0.99	0.91	1.08
Total period	**944**	**104.2**	**243.9**	**242.9**	**1.03**	**1.00**	**1.07**
Applicants							
2004	48	192.7	289.9	269.5	1.21	1.04	1.40
2005	41	174.2	263.9	253.9	1.10	0.94	1.29
2006	54	240.2	349.4	333.3	1.24	1.08	1.43
2007	49	247.8	358.0	335.8	1.42	1.23	1.65
2008	39	215.4	317.1	316.4	1.43	1.21	1.69
Total period	**231**	**212.3**	**313.5**	**299.6**	**1.27**	**1.19**	**1.36**
Other NZ							
2004	2,360	60.7	201.0	223.3	1.00	-	-
2005	2,384	60.7	202.7	230.1	1.00	-	-
2006	2,867	72.1	242.3	268.6	1.00	-	-
2007	2,526	62.9	210.0	235.8	1.00	-	-
2008	1,968	52.9	176.1	221.4	1.00	-	-
Total period	**12,105**	**62.0**	**206.7**	**235.7**	**1.00**	-	-
Tenants (2004-2008)							
0-4 years	715	890.0	-	-	-	-	-
5-17 years	229	72.1	-	-	-	-	-
18-64 years	409	93.2	-	-	-	-	-
65+ years	173	248.0	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.7 Trends of age-ethnicity standardised rates and rate ratios, for gastroenteritis in children (<18 years), 2004-2008



c. Key points

Gastroenteritis was a relatively uncommon cause of hospitalisation, with an average of 0.1% of HNZC tenant children and 0.2% of applicant children admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for gastroenteritis were 27.1% higher for HNZC applicant children and 3.1% higher for HNZC tenants than for other New Zealanders.

Compared with 2004, gastroenteritis rates for tenants and applicants showed non-significant increases in 2008, in absolute terms and in relation to other New Zealanders.

8.3.3. Bacterial meningitis & septicaemia in children

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for bacterial meningitis, septicaemia and arthritis caused by meningococcal disease, pneumococcal disease and *Haemophilus influenza* (see Appendix 11.3).

Rationale for indicator: These infections are transmitted between people and are therefore linked to household crowding. There is good evidence in the case of bacterial meningitis.

Exclusions: Restricted to children <18years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

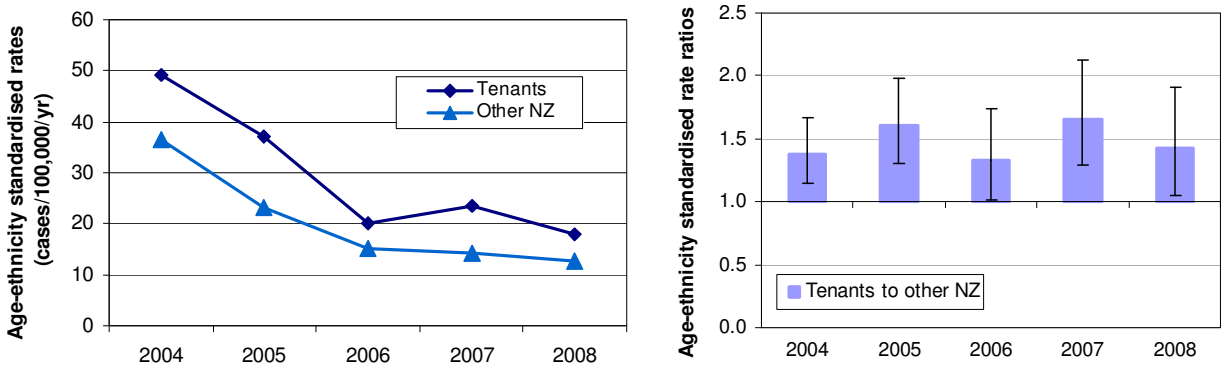
b. Incidence, rate ratio and trends

Table 8.8: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for bacterial meningitis and septicaemia in children (<18 years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[1]	CI (95%CI)	
Tenants							
2004	37	21.3	47.7	49.1	1.38	1.15	1.66
2005	30	16.6	37.3	37.1	1.60	1.30	1.98
2006	16	8.6	20.2	20.2	1.33	1.01	1.74
2007	20	10.5	23.6	23.4	1.66	1.29	2.13
2008	14	8.0	18.0	17.9	1.42	1.06	1.91
Total period	**117**	**12.9**	**29.3**	**29.2**	**1.44**	**1.30**	**1.60**
Applicants							
2004	8	32.1	*	*	*	*	*
2005	2	8.5	*	*	*	*	*
2006	1	4.4	*	*	*	*	*
2007	4	20.2	*	*	*	*	*
2008	5	27.6	*	*	*	*	*
Total period	**20**	**18.4**	**30.8**	**32.9**	**1.62**	**1.29**	**2.05**
Other NZ							
2004	230	5.9	20.1	36.4	1.00	-	-
2005	157	4.0	13.4	23.1	1.00	-	-
2006	107	2.7	9.0	15.2	1.00	-	-
2007	111	2.8	9.2	14.1	1.00	-	-
2008	87	2.3	7.9	12.6	1.00	-	-
Total period	**692**	**3.5**	**11.9**	**20.3**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	65	80.9	-	-	-	-	-
5-17 years	52	16.4	-	-	-	-	-
18-64 years	23	5.2	-	-	-	-	-
65+ years	10	14.3	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.8 Trends of age-ethnicity standardised rates and rate ratios, for bacterial meningitis and septicaemia in children (<18 years), 2004-2008



c. Key points

These respiratory bacteria infections were relatively uncommon in New Zealand, with an average of 0.01% of HNZC tenants and 0.02% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for bacterial meningitis and septicaemia in children were still 44.3% higher for HNZC tenant children and 62.4% for HNZC applicant children than for other New Zealanders.

Over 2004 to 2008 period, hospitalisations rates declined markedly reflecting the decline in New Zealand's prolonged serogroup B meningococcal disease epidemic.

8.3.4. Influenza and Pneumonia

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for Influenza (J10, J11) and Pneumonia (J12-J18).

Rationale for indicator: Linked to household crowding, based on some evidence for bacterial pneumonia.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

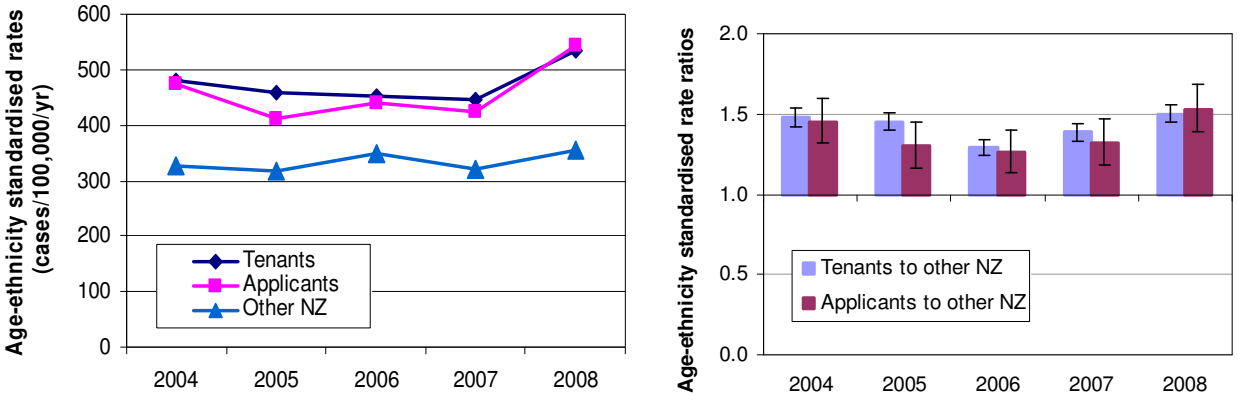
b. Incidence, rate ratio and trends

Table 8.9: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for influenza and pneumonia, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	804	461.9	474.2	481.8	1.48	1.42	1.53
2005	805	444.4	459.0	459.3	1.45	1.40	1.51
2006	821	440.1	454.2	451.8	1.29	1.24	1.34
2007	837	440.9	449.6	445.7	1.39	1.33	1.44
2008	936	535.4	541.3	533.8	1.50	1.45	1.55
Total period	**4,203**	**463.7**	**474.9**	**473.0**	**1.42**	**1.39**	**1.44**
Applicants							
2004	128	513.8	431.8	474.2	1.45	1.32	1.60
2005	98	416.4	360.6	411.3	1.30	1.16	1.45
2006	104	462.5	399.2	440.7	1.26	1.13	1.40
2007	90	455.1	381.6	423.2	1.32	1.18	1.47
2008	109	602.1	511.1	544.6	1.53	1.39	1.69
Total period	**529**	**486.2**	**418.5**	**459.5**	**1.38**	**1.32**	**1.44**
Other NZ							
2004	8,605	221.3	192.9	326.4	1.00	-	-
2005	8,518	216.8	200.3	316.7	1.00	-	-
2006	8,971	225.7	201.4	350.1	1.00	-	-
2007	8,571	213.3	186.0	321.5	1.00	-	-
2008	9,011	242.2	208.6	355.9	1.00		-
Total period	**43,676**	**223.6**	**197.7**	**333.5**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	1,260	1,568.3	-	-	-	-	-
5-17 years	520	163.7	-	-	-	-	-
18-64 years	1,410	321.4	-	-	-	-	-
65+ years	1,013	1,451.9	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.9 Trends of age-ethnicity standardised rates and rate ratios, for influenza and pneumonia, 2004-2008



c. Key points

Influenza and pneumonia were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for influenza and pneumonia were still 41.8% higher for tenants and 37.8% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, hospitalisation rates for influenza and pneumonia for housing tenants and applicants relative to other New Zealanders declined slightly from 2004-2007, but increased significantly in 2008.

8.3.5. Acute bronchiolitis in young children

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for acute bronchiolitis (J21)

Rationale for indicator: Linked to household crowding, based on good evidence for acute bronchiolitis.

Exclusions: Restricted to children <5 year. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

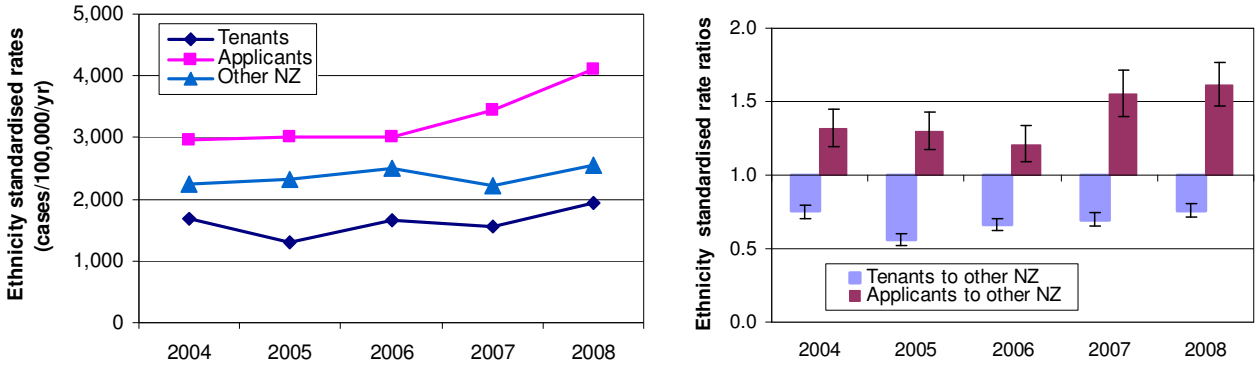
b. Incidence, rate ratio and trends

Table 8.10: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for acute bronchiolitis in children (<5 years), 2004-2008

Population(<5 years) & year	No. of hospitalisations	Crude rate per 100,000	Ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants						
2004	256	1,623.1	1,689.5	0.75	0.70	0.80
2005	206	1,289.6	1,296.8	0.56	0.52	0.60
2006	272	1,665.1	1,658.8	0.67	0.63	0.71
2007	262	1,559.5	1,551.8	0.70	0.65	0.74
2008	300	1,940.9	1,930.9	0.76	0.71	0.80
Total period	**1,296**	**1,613.2**	**1,620.5**	**0.68**	**0.67**	**0.70**
Applicants						
2004	105	2,717.5	2,965.0	1.32	1.20	1.45
2005	101	2,790.9	3,019.7	1.30	1.17	1.43
2006	97	2,843.4	3,010.9	1.21	1.09	1.34
2007	96	3,123.1	3,449.1	1.55	1.40	1.71
2008	112	3,782.8	4,101.8	1.61	1.47	1.77
Total period	**511**	**3,018.6**	**3,275.3**	**1.38**	**1.33**	**1.45**
Other NZ						
2004	2,902	1,095.0	2,251.1	1.00	-	-
2005	2,795	1,055.8	2,328.5	1.00	-	-
2006	2,876	1,080.2	2,492.4	1.00	-	-
2007	2,940	1,078.8	2,226.0	1.00	-	-
2008	3,201	1,247.4	2,549.0	1.00	-	-
Total period	**14,714**	**1,110.4**	**2,365.9**	**1.00**	**-**	**-**
Tenants (2004-2008)						
0-4 years	1,296	1,613.2	-	-	-	-
5-17 years	2	0.6	-	-	-	-
18-64 years	2	0.5	-	-	-	-
65+ years	4	5.7	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.10 Trends of age-ethnicity standardised rates and rate ratios, for acute bronchiolitis in children (<5 years), 2004-2008



c. Key points

Bronchiolitis was a common cause of hospitalisation in young children in New Zealand, with an average of 1.6% of HNZC tenant children and 3.0% of applicant children admitted to hospital each year with this diagnosis. After adjusting for ethnicity, hospitalisations for bronchiolitis in children <5 years were still 38.4% higher for applicants than for other New Zealanders, but significantly lower for tenants.

Compared with 2004, hospitalisation rates rose significantly for housing applicants in 2008, in absolute terms and in relation to other New Zealanders, but were fairly stable for tenants..

The apparent low bronchiolitis rates in housing tenants is probably an artefact caused by the data collection process. Most cases of bronchiolitis occur in the first year of life. Because the IRR form is only completely once a year by many households, there may be a delay in recording newborn babies. As a result, these babies may have short amount of person time recorded as tenants.

8.3.6. Bacterial skin infections

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for skin infections of typical sites, skin infections of atypical sites, skin infections secondary to primary skin disease and to external trauma (see Bacterial skin infections in the table of Close contact infectious diseases in Appendix 12.3).

Rationale for indicator: Linked to household crowding, based on transmission from direct person to person contact and some evidence for bacterial skin infections.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

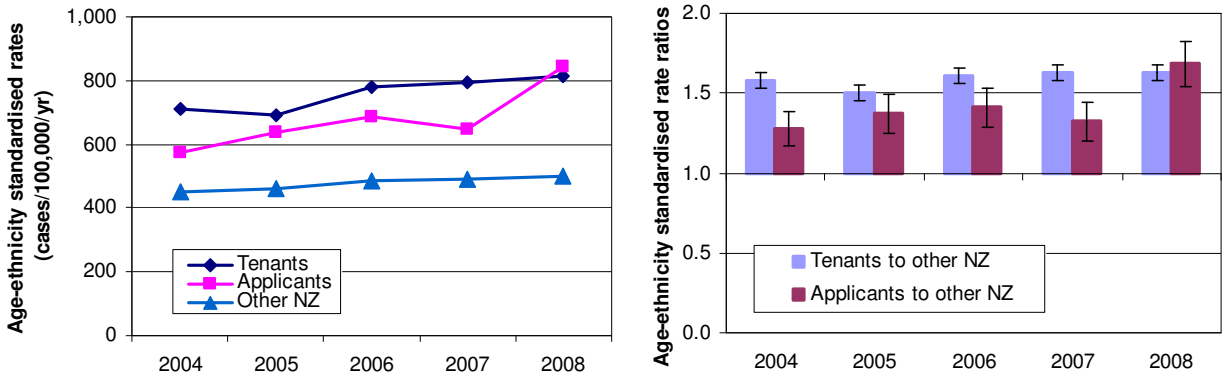
b. Incidence, rate ratio and trends

Table 8.11: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for bacterial skin infections, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	1,215	698.0	702.1	713.1	1.58	1.54	1.64
2005	1,236	682.4	690.2	693.1	1.50	1.45	1.55
2006	1,440	772.0	780.1	779.7	1.61	1.57	1.66
2007	1,503	791.7	800.1	795.7	1.63	1.58	1.68
2008	1,427	816.3	822.8	814.6	1.63	1.58	1.68
Total period	**6,821**	**752.6**	**759.4**	**760.8**	**1.60**	**1.58**	**1.62**
Applicants							
2004	157	630.2	552.9	575.5	1.28	1.18	1.39
2005	146	620.4	579.2	635.1	1.38	1.26	1.50
2006	156	693.8	652.5	683.9	1.41	1.30	1.54
2007	131	662.4	621.5	648.9	1.33	1.21	1.45
2008	158	872.8	791.9	844.7	1.69	1.56	1.84
Total period	**748**	**687.4**	**634.2**	**674.2**	**1.42**	**1.36**	**1.47**
Other NZ							
2004	11,249	289.3	280.4	450.1	1.0	-	-
2005	10,991	279.7	270.9	461.8	1.0	-	-
2006	11,455	288.1	279.7	483.6	1.0	-	-
2007	11,806	293.8	289.8	488.6	1.0	-	-
2008	10,615	285.3	281.5	499.2	1.0	-	-
Total period	**56,116**	**287.3**	**280.4**	**476.0**	**1.0**	**-**	**-**
Tenants (2004-2008)							
0-4 years	1,319	1,641.8	-	-	-	-	-
5-17 years	1,659	522.3	-	-	-	-	-
18-64 years	3,269	745.2	-	-	-	-	-
65+ years	574	822.7	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.11 Trends of age-ethnicity standardised rates and rate ratios, for bacterial skin infections, 2004-2008



c. Key points

Bacterial skin infections were a relatively common cause of hospitalisation in NZ, with an average of 0.8% of HNZC tenants and 0.7% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for bacterial skin infections were still 59.8% higher for tenants and 41.6% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, hospitalisation rates rose for housing tenants and applicants as well as other New Zealanders. Compared with 2004, there was a significant rise in the rates for housing applicants in 2008 relative to other New Zealanders.

8.4. Respiratory and cardiovascular diseases

8.4.1. Total respiratory and circulatory diseases

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for circulatory and respiratory diseases: I00-I99, J00-99

Rationale for indicator: These conditions are related to exposure to indoor cold, damp and mould.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

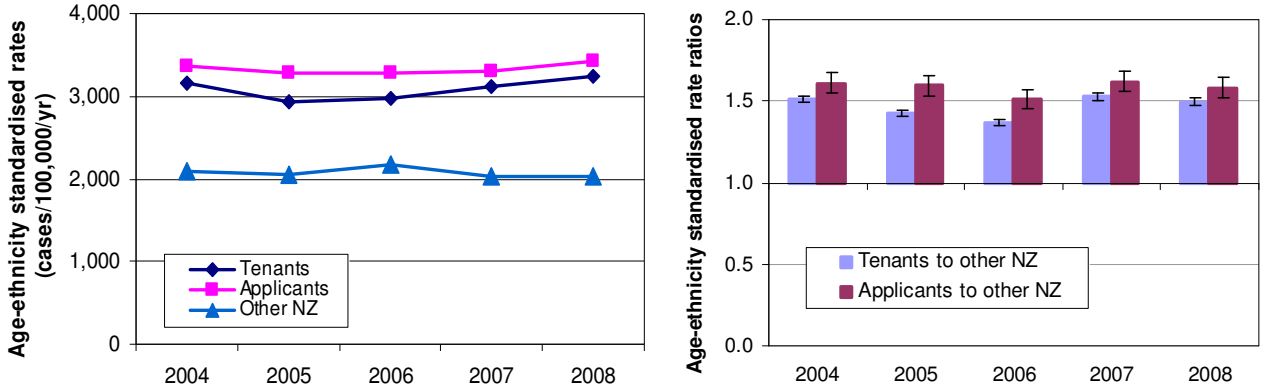
b. Incidence, rate ratio and trends

Table 8.12: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for circulatory and respiratory diseases, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	5,313	3,052.4	3,124.7	3,167.2	1.51	1.49	1.53
2005	5,159	2,848.1	2,925.6	2,933.7	1.43	1.41	1.45
2006	5,444	2,918.5	2,981.4	2,976.4	1.37	1.35	1.39
2007	5,873	3,093.7	3,121.7	3,108.1	1.53	1.51	1.55
2008	5,706	3,264.1	3,256.9	3,234.8	1.50	1.48	1.52
Total period	**27,495**	**3,033.5**	**3,080.8**	**3,079.5**	**1.47**	**1.46**	**1.48**
Applicants							
2004	773	3,103.0	3,149.1	3,366.6	1.61	1.55	1.67
2005	740	3,144.6	3,016.2	3,279.5	1.59	1.53	1.66
2006	740	3,291.1	3,061.1	3,280.7	1.51	1.45	1.57
2007	691	3,493.8	3,199.0	3,293.7	1.62	1.56	1.68
2008	653	3,607.3	3,264.4	3,417.6	1.58	1.52	1.65
Total period	**3,597**	**3,305.8**	**3,130.2**	**3,320.7**	**1.58**	**1.55**	**1.61**
Other NZ							
2004	70,898	1,823.2	1,468.7	2,094.4	1.00	-	-
2005	69,098	1,758.6	1,433.0	2,056.5	1.00	-	-
2006	71,567	1,800.2	1,436.4	2,169.2	1.00	-	-
2007	69,934	1,740.2	1,372.2	2,034.9	1.00	-	-
2008	68,346	1,837.2	1,443.5	2,035.5	1.00	-	-
Total period	**349,843**	**1,791.1**	**1,430.1**	**2,100.6**	**1.00**	-	-
Tenants (2004-2008)							
0-4 years	5,092	6,338.1	-	-	-	-	-
5-17 years	2,356	741.8	-	-	-	-	-
18-64 years	10,976	2,502.2	-	-	-	-	-
65+ years	9,071	13,001.3	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.12 Trends of age-ethnicity standardised rates and rate ratios, for circulatory and respiratory diseases, 2004-2008



c. Key points

Circulatory and respiratory diseases were a common cause of hospitalisation, with an average of 3.0% of HNZC tenants and 3.3% of applicants admitted to hospital each year with these conditions. After adjusting for age and ethnicity, hospitalisations for circulatory and respiratory diseases were still 46.6% higher for tenants and 58.1% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, rates for housing tenants and applicants were fairly constant.

8.4.2. Excess winter hospitalisations (circulatory and respiratory)

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for circulatory (I00-I99) and respiratory (J00-J99) conditions which account for the bulk of excess winter hospitalisations (EWH). Calculated as the ratio of rates over winter (June to Sept.) compared with the other 8 months of the year.

Rationale for indicator: EWH is considered related to exposure to indoor cold and damp over winter

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

b. Incidence, rate ratio and trends

Table 8.13: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for excess winter hospitalisation, 2004-2008

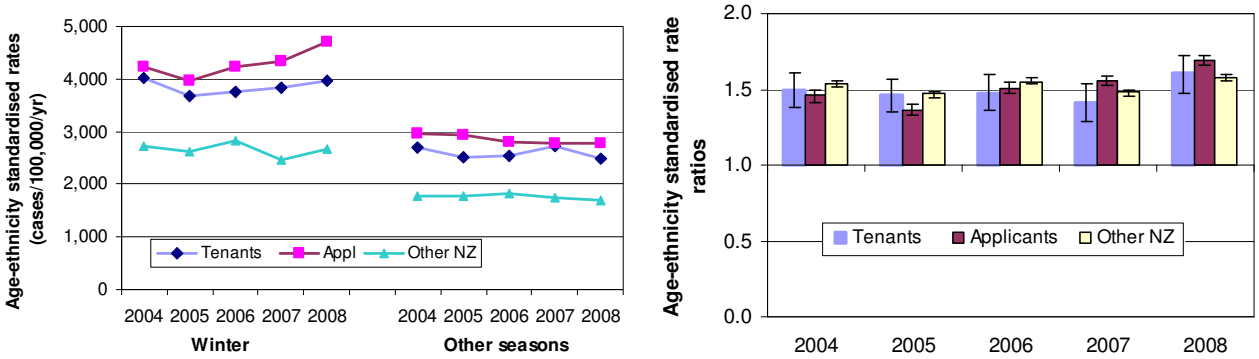
Population & year	Hospitalisation No. in Winter	Crude rate per 100,000	Age-ethnicity standardised rate per 100,000[1]	Hosp. No. in other seasons	Crude rate per 100,000	Age-ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants									
2004	2,292	3,905.6	4,015.4	3,021	2,593.0	2,687.2	1.49	1.46	1.53
2005	2,194	3,592.6	3,665.6	2,965	2,450.7	2,519.2	1.46	1.42	1.49
2006	2,326	3,704.0	3,746.8	3,118	2,504.4	2,529.8	1.47	1.43	1.51
2007	2,452	3,843.8	3,828.1	3,421	2,700.5	2,714.1	1.41	1.38	1.45
2008	2,651	4,056.0	3,968.5	3,055	2,408.2	2,485.2	1.61	1.58	1.64
Total period	**11,915**	**3,841.9**	**3,862.4**	**15,580**	**2,531.1**	**2,565.3**	**1.51**	**1.49**	**1.52**
Applicants									
2004	347	4,097.9	4,242.0	426	2,586.2	2,960.3	1.46	1.35	1.57
2005	320	4,104.2	3,971.4	420	2,665.6	2,930.8	1.36	1.25	1.47
2006	340	4,433.4	4,224.3	400	2,697.0	2,796.8	1.51	1.40	1.63
2007	304	4,686.1	4,344.2	387	2,909.1	2,786.5	1.56	1.44	1.69
2008	351	5,049.2	4,716.5	302	2,575.4	2,790.7	1.69	1.58	1.81
Total period	**1,662**	**4,478.9**	**4,288.5**	**1,935**	**2,647.9**	**2,876.4**	**1.56**	**1.51**	**1.61**
Other NZ									
2004	29,130	2,247.4	2,733.5	41,768	1,611.2	1,774.9	1.54	1.52	1.56
2005	27,445	2,095.5	2,618.4	41,653	1,590.1	1,775.5	1.47	1.45	1.50
2006	28,868	2,178.4	2,838.6	42,699	1,611.1	1,834.5	1.55	1.53	1.57
2007	27,709	2,598.6	2,469.9	42,225	1,576.1	1,753.9	1.48	1.46	1.50
2008	30,435	2,454.3	2,684.5	37,911	1,528.6	1,700.3	1.58	1.56	1.60
Total period	**143,587**	**2,205.4**	**2,669.4**	**206,256**	**1,584.0**	**1,766.2**	**1.54**	**1.53**	**1.55**
Tenants (2004-2008)									
0-4 years	2,113	6,763.9	-	2,120	3,512.7	-	1.93	-	
5-17 years	661	837.6	-	888	567.1	-	1.48	-	
18-64 years	3,427	2,995.5	-	5,067	2,222.7	-	1.35	-	
65+ years	3,195	16,883.3	-	4,461	11,770.5	-	1.43	-	

[1] Age and ethnicity standardised to tenant population in 2006

[2] Rate ratios between age-ethnicity standardised rate in winter and in other seasons

- Not applicable

Figure 8.13 Trends of age-ethnicity standardised rates and rate ratios, for excess winter hospitalisation, 2004-2008



c. Key points

Housing tenants, and particularly applicants, have markedly higher rates of hospitalisation for circulatory and respiratory conditions compared with other New Zealanders. However, their Excess Winter Hospitalisations (EWH) are not significantly different at 59.1% for housing tenants, 56.2% for housing applicants compared with 54.4% for other New Zealanders.

8.4.3. Excess winter mortality (circulatory and respiratory)

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for circulatory (I00-I99) and respiratory (J00-J99) conditions (underlying cause of death) which account for the bulk of excess winter mortality (EWM). Calculated as the ratio of rates over winter (June to Sept.) compared with the other 8 months of the year.

Rationale for indicator: EWM is considered related to exposure to indoor cold and damp over winter.

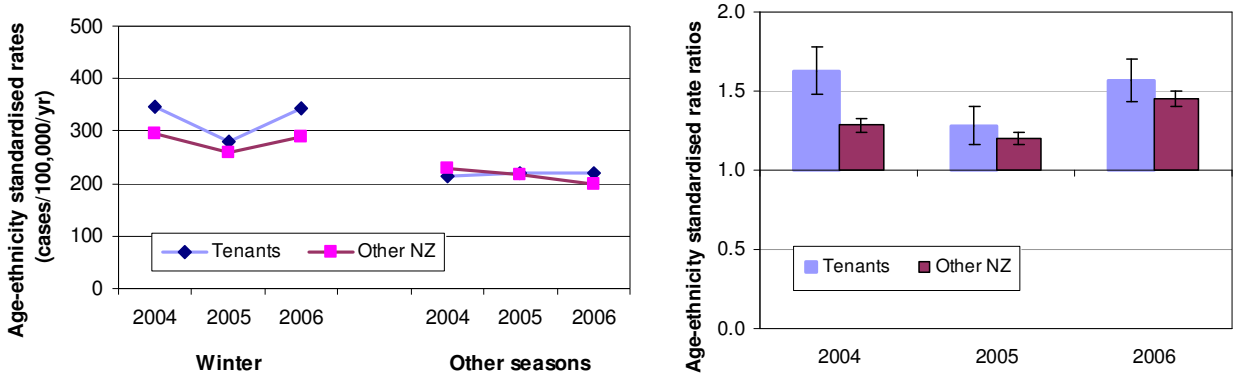
b. Incidence, rate ratio and trends

Table 8.14: Excess winter mortality numbers and rates in applicants and tenants compared with other NZ population, 2004-2006

Population & year	No. of deaths in Winter	Crude rate per 100,000	Age-ethnicity standardised rate per 100,000[1]	No. of deaths in other seasons	Crude rate per 100,000	Age-ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants									
2004	200	343.6	345.6	241	208.5	213.0	1.62	1.48	1.78
2005	166	274.9	621.2	258	215.6	218.7	1.28	1.16	1.41
2006	208	337.4	712.9	267	218.2	219.3	1.56	1.43	1.71
Total period	**574**	**318.5**	**671.8**	**766**	**214.2**	**216.7**	**1.49**	**1.41**	**1.57**
Applicants									
2004	10	118.8	*	17	103.9	*	*	*	*
2005	8	103.6	*	22	141.0	*	*	*	*
2006	11	146.7	*	12	82.6	*	*	*	*
Total period	**29**	**122.7**	*	**51**	**109.7**	*	*	*	*
Other NZ									
2004	5,349	416.9	295.8	7,906	308.1	230.3	1.28	1.24	1.32
2005	4,587	353.8	260.3	7,604	293.3	216.3	1.20	1.16	1.24
2006	5,052	385.2	289.3	7,176	273.6	199.5	1.45	1.40	1.50
Total period	**14,988**	**385.2**	**281.6**	**22,686**	**291.5**	**215.3**	**1.31**	**1.28**	**1.33**
Tenants (2004-2006)									
0-4 years	0	*	-	5	11.1	-	*	-	-
5-17 years	*2*	*3.4**	-	*2*	*1.7**	-	*1.98*	-	-
18-64 years	178	210.5	-	245	145.4	-	1.45	-	-
65+ years	394	2,816.3	-	514	1,832.4	-	1.54	-	-

[1] Age and ethnicity to tenant population in 2006
[2] Rate ratios between age-ethnicity standardised rate in winter and in other seasons
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.14 Trends of age-ethnicity standardised rates and rate ratios, for excess winter mortality, 2004-2006



c. Key points

Excess winter mortality (EWM) for circulatory and respiratory diseases was about 49.1% for housing tenants, which is significantly higher than the rate for other New Zealanders (30.8%). Numbers of deaths in housing applicants were too small to calculate robust age-ethnicity standardised rates.

With only three yeas of mortality data available, it is not possible to draw conclusions about trends in EWM in this population.

8.4.4. Asthma

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for asthma (J45, J46).

Rationale for indicator: Linked to the indoor air environment, including cold, damp, mould, house dust mites (HDM), combustion products, formaldehyde, volatile organic compounds and evidence from good quality studies.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

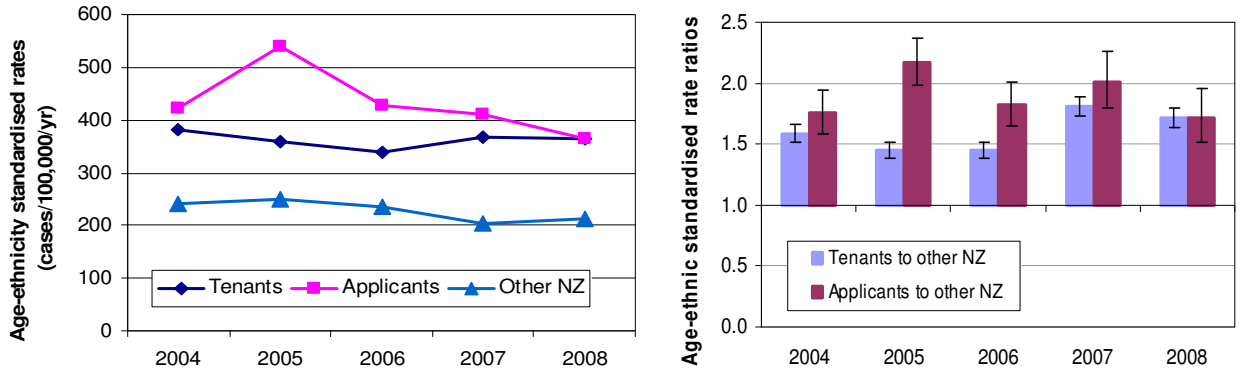
b. Incidence, rate ratio and trends

Table 8.15: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for asthma, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	641	368.3	374.1	383.2	1.59	1.52	1.66
2005	630	347.8	358.2	359.6	1.44	1.38	1.51
2006	613	328.6	339.2	339.3	1.45	1.38	1.51
2007	685	360.8	370.0	368.7	1.80	1.73	1.88
2008	622	355.8	365.4	363.6	1.72	1.64	1.80
Total period	**3,191**	**352.1**	**361.2**	**361.6**	**1.59**	**1.56**	**1.62**
Applicants							
2004	115	461.6	390.2	423.0	1.75	1.59	1.94
2005	141	599.2	485.0	539.6	2.17	1.98	2.37
2006	110	489.2	385.6	426.7	1.82	1.64	2.01
2007	89	450.0	390.8	411.7	2.01	1.80	2.25
2008	67	370.1	336.0	363.8	1.72	1.51	1.95
Total period	**522**	**479.7**	**398.7**	**435.0**	**1.91**	**1.82**	**2.00**
Other NZ							
2004	4,797	123.4	150.5	241.4	1.00	-	-
2005	4,618	117.5	149.0	248.9	1.00	-	-
2006	4,337	109.1	135.8	234.6	1.00	-	-
2007	3,976	98.9	123.0	204.4	1.00	-	-
2008	3,838	103.2	127.3	212.0	1.00	-	-
Total period	**21,566**	**110.4**	**137.1**	**227.7**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	1,232	1,533.5	-	-	-	-	-
5-17 years	687	216.3	-	-	-	-	-
18-64 years	1,147	261.5	-	-	-	-	-
65+ years	125	179.2	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.15 Trends of age-ethnicity standardised rates and rate ratios, for asthma, 2004-2008



c. Key points

Asthma was a relatively common cause of hospitalisation in NZ, with an average of 0.4% of HNZC tenants and 0.5% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for asthma were still 58.8% higher for tenants and 91.0% higher for applicants than for other New Zealanders.

Compared with 2004, hospitalisation rates for housing tenants relative to other New Zealanders rates rose significantly in 2008, but varied inconsistently for housing applicants.

8.4.5. Chronic Obstructive Pulmonary Disease in adults

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for Chronic Obstructive Pulmonary Disease (COPD J40-J44).

Rationale for indicator: Linked to the indoor air environment, including cold, damp, mould, combustion products based on evidence from some studies.

Exclusions: Restricted to adults 18+ years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

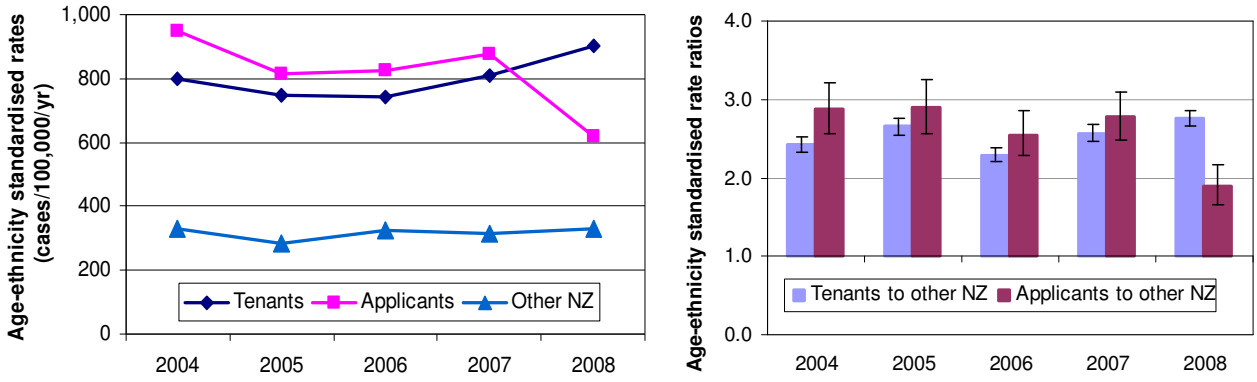
b. Incidence, rate ratio and trends

Table 8.16: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for chronic obstructive pulmonary disease in adults, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	743	768.1	794.1	800.9	2.43	2.33	2.53
2005	731	725.7	746.1	749.3	2.66	2.55	2.77
2006	759	727.9	742.1	741.6	2.29	2.20	2.38
2007	860	803.9	812.2	811.6	2.57	2.47	2.67
2008	908	910.7	911.3	903.4	2.75	2.65	2.86
Total period	**4,001**	**786.9**	**801.3**	**801.5**	**2.54**	**2.50**	**2.58**
Applicants							
2004	84	630.7	888.9	948.8	2.87	2.56	3.22
2005	75	591.4	696.4	814.2	2.89	2.56	3.25
2006	84	681.7	775.1	826.2	2.55	2.28	2.85
2007	86	779.9	851.5	875.3	2.77	2.48	3.09
2008	54	536.4	578.3	619.6	1.89	1.65	2.16
Total period	**383**	**644.6**	**755.2**	**818.5**	**2.59**	**2.46**	**2.73**
Other NZ							
2004	7,489	258.0	223.1	330.2	1.00	-	-
2005	6,690	227.3	195.3	282.0	1.00	-	-
2006	7,286	243.9	208.0	324.1	1.00	-	-
2007	7,069	233.6	196.3	315.8	1.00	-	-
2008	7,037	250.4	207.3	328.0	1.00	-	-
Total period	**35,571**	**242.5**	**205.8**	**315.6**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	10	12.4	-	-	-	-	-
5-17 years	33	10.4	-	-	-	-	-
18-64 years	1,704	388.5	-	-	-	-	-
65+ years	2,297	3,292.2	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.16 Trends of age-ethnicity standardised rates and rate ratios, for chronic obstructive pulmonary disease in adults, 2004-2008



c. Key points

COPD was a relatively common cause of hospitalisation in NZ adults, with an average of 0.8% of HNZC tenants and 0.6% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for COPD were still 154.0% higher for tenants and 159.3% higher for applicants than for other New Zealanders.

Compared with 2004, hospitalisation rates increased significantly for adult housing tenants in 2008, but showed a large and significant drop for adult applicants.

8.4.6. Ischaemic heart disease in adults

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for ischaemic heart disease (IHD I20-I25).

Rationale for indicator: Linked to the indoor air environment including cold, and noise exposure, based on largely ecological studies and biological plausibility.

Exclusions: Restricted to adults 18+ years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

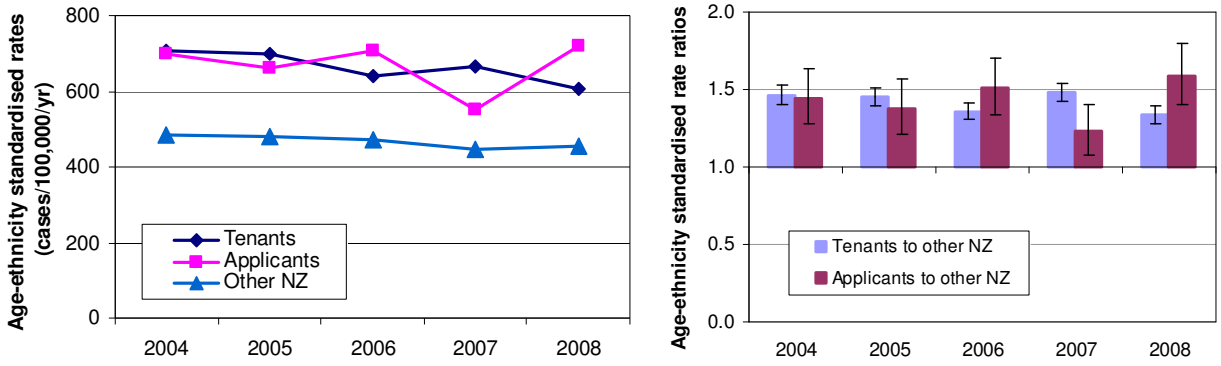
b. Incidence, rate ratio and trends

Table 8.17: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for ischaemic heart disease in adults (18+ years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	669	691.6	711.2	708.7	1.47	1.41	1.52
2005	684	679.0	697.3	699.3	1.45	1.40	1.51
2006	652	625.3	637.0	638.6	1.36	1.31	1.42
2007	700	654.3	661.2	663.8	1.48	1.42	1.54
2008	600	601.8	602.6	606.3	1.33	1.28	1.39
Total period	**3,305**	**650.0**	**660.6**	**663.1**	**1.42**	**1.39**	**1.45**
Applicants							
2004	70	525.6	707.4	699.3	1.45	1.28	1.64
2005	67	528.3	664.3	662.1	1.38	1.21	1.56
2006	70	568.1	665.4	707.6	1.51	1.33	1.70
2007	62	562.3	615.1	551.4	1.23	1.08	1.40
2008	65	645.7	728.1	721.1	1.59	1.40	1.80
Total period	**334**	**562.1**	**673.8**	**665.3**	**1.42**	**1.35**	**1.51**
Other NZ							
2004	14,597	502.9	438.5	483.7	1.00	-	-
2005	14,485	492.2	426.5	480.9	1.00	-	-
2006	14,312	479.2	412.0	469.6	1.00	-	-
2007	13,715	453.1	385.2	448.2	1.00	-	-
2008	12,571	447.4	375.7	454.7	1.00	-	-
Total period	**69,680**	**475.0**	**407.3**	**467.1**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	0	*	-	-	-	-	-
5-17 years	1	0.3	-	-	-	-	-
18-64 years	1,615	368.2	-	-	-	-	-
65+ years	1,690	2,422.2	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.17 Trends of age-ethnicity standardised rates and rate ratios, for ischaemic heart disease in adults (18+ years), 2004-2008



c. Key points

IHD was a relatively common cause of hospitalisation in NZ adults, with an average of 0.7% of adult HNZC tenants and 0.6% of adult applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for IHD were still 42.0% higher for tenants and 42.4% for applicants than for other New Zealanders.

Over the 2004 to 2008 period, age ethnicity adjusted hospitalisation rates declined slightly for tenants and other New Zealanders. However, compared with 2004, hospitalisation rate for tenants declined significantly in relation to other New Zealand in 2008. Rates were not stable for applicant adults.

8.4.7. Heart Failure in adults

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for heart failure (I50).

Rationale for indicator: Linked to the indoor air environment including cold, based on largely ecological studies and biological plausibility.

Exclusions: Restricted to adults 18+ years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

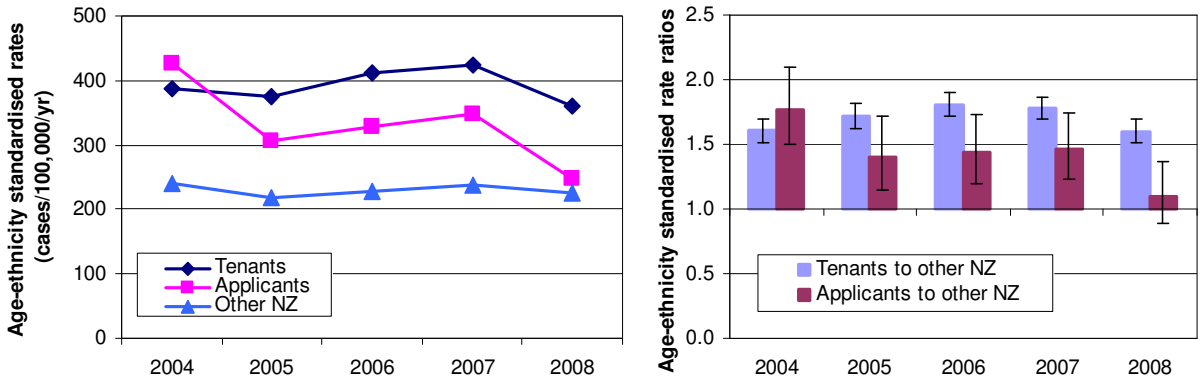
b. Incidence, rate ratio and trends

Table 8.18: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for heart failure in adults (18+ years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	356	368.0	379.4	386.0	1.60	1.52	1.70
2005	365	362.3	372.2	374.1	1.72	1.63	1.82
2006	423	405.7	413.8	411.3	1.81	1.72	1.90
2007	455	425.3	431.4	423.0	1.78	1.69	1.87
2008	362	363.1	364.5	360.3	1.60	1.51	1.69
Total period	**1,961**	**385.7**	**393.0**	**391.4**	**1.71**	**1.66**	**1.75**
Applicants							
2004	37	277.8	372.3	426.5	1.77	1.50	2.09
2005	24	189.2	259.4	306.4	1.41	1.15	1.72
2006	29	235.3	279.8	327.6	1.44	1.20	1.73
2007	33	299.3	334.2	348.4	1.46	1.23	1.74
2008	22	218.5	232.1	248.1	1.10	0.89	1.36
Total period	**145**	**244.0**	**294.8**	**331.8**	**1.45**	**1.33**	**1.57**
Other NZ							
2004	5,105	175.9	149.7	240.6	1.0	-	-
2005	4,896	166.4	140.9	217.8	1.0	-	-
2006	5,058	169.3	142.5	227.6	1.0	-	-
2007	5,158	170.4	142.3	238.0	1.0	-	-
2008	4,765	169.6	139.6	225.2	1.0	-	-
Total period	**24,982**	**170.3**	**142.9**	**229.5**	**1.0**	**-**	**-**
Tenants (2004-2008)							
0-4 years	9	11.2	-	-	-	-	-
5-17 years	8	2.5	-	-	-	-	-
18-64 years	860	196.1	-	-	-	-	-
65+ years	1,101	1,578.0	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.18 Trends of age-ethnicity standardised rates and rate ratios, for heart failure in adults (18+ years), 2004-2008



c. Key points

Heart failure was a relatively common cause of hospitalisation in NZ adults, with an average of 0.4% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for heart failure were still 70.5% higher for tenants and 44.6% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, age ethnicity adjusted hospitalisations for housing tenants increased from 2004-2007, but dropped markedly in 2008. The numbers for housing applicants were too small to draw comparative conclusions about patterns from one year to the next.

8.5. Mental health conditions

8.5.1. Total mental health hospitalisations

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for mental and behavioural disorders: F00-F99.

Rationale for indicator: These conditions are considered potentially related to housing conditions.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

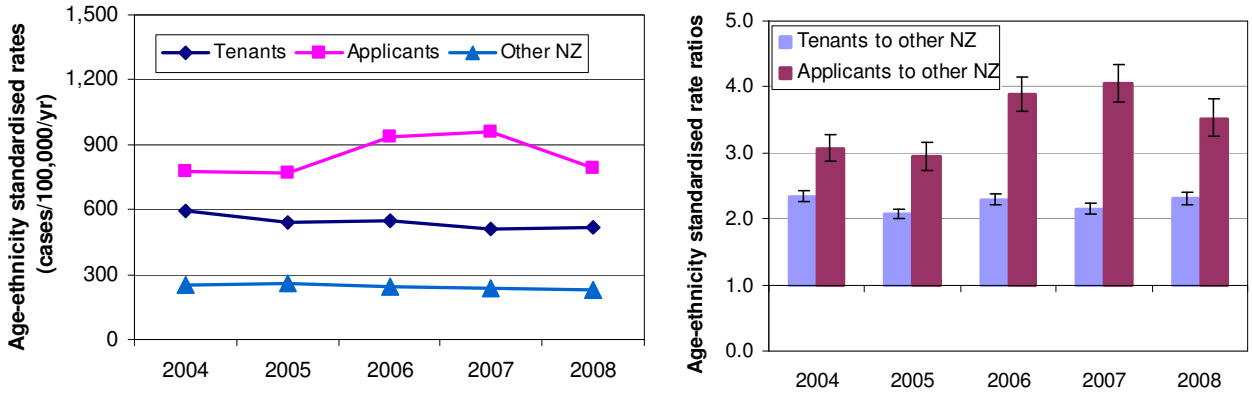
b. Incidence, rate ratio and trends

Table 8.19: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for mental health conditions, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	1,055	606.1	596.6	593.8	2.34	2.26	2.42
2005	986	544.3	537.6	539.8	2.06	1.99	2.14
2006	1,024	549.0	543.5	551.6	2.29	2.22	2.37
2007	952	501.5	497.0	508.5	2.15	2.08	2.23
2008	900	514.8	510.7	519.4	2.31	2.23	2.40
Total period	**4,917**	**542.5**	**535.9**	**542.1**	**2.23**	**2.19**	**2.26**
Applicants							
2004	237	951.4	906.6	779.5	3.07	2.87	3.29
2005	212	900.9	885.8	768.4	2.94	2.73	3.16
2006	250	1,111.9	1,092.4	933.3	3.88	3.63	4.14
2007	210	1,061.8	1,049.8	956.3	4.05	3.77	4.35
2007	156	861.8	860.0	792.5	3.53	3.25	3.83
Total period	**1,065**	**978.8**	**961.8**	**847.0**	**3.48**	**3.37**	**3.59**
Other NZ							
2004	11,505	295.9	237.2	253.8	1.00	-	-
2005	10,830	275.6	223.4	261.5	1.00	-	-
2006	10,192	256.4	203.6	240.5	1.00	-	-
2007	10,067	250.5	200.6	236.3	1.00	-	-
2008	8,773	235.8	189.5	224.8	1.00	-	-
Total period	**51,367**	**263.0**	**211.1**	**243.5**	**1.00**	-	-
Tenants 2004-2008							
0-4 years	7	9.6	-	-	-	-	-
5-17 years	197	77.4	-	-	-	-	-
18-64 years	3,219	940.2	-	-	-	-	-
65+ years	320	563.1	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.19 Trends of age-ethnicity standardised rates and rate ratios, for mental health conditions, 2004-2008



c. Key points

Mental health conditions were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 1.0% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for mental health conditions were still 122.6% higher for tenants and 247.9% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, hospitalisation rates for housing tenants dropped slightly relative to other New Zealanders. However, the rate rose markedly for applicants in 2006 and 2007, before dropping in 2008.

8.5.2. Depressive episode in adults

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for depressive episode (F32).

Rationale for indicator: Potentially linked to poor housing conditions including cold, damp, mould, crowding.

Exclusions: Restricted to adults 18+ years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

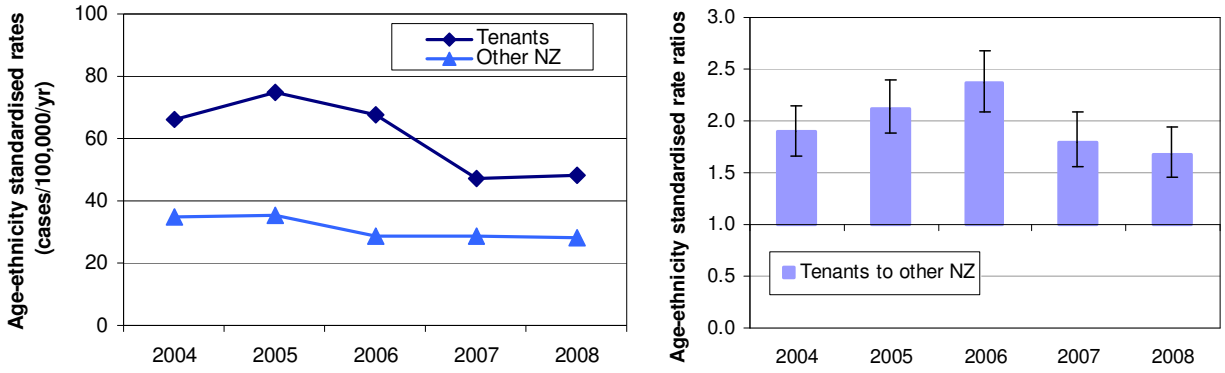
b. Incidence, rate ratio and trends

Table 8.20: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for depressive episode in adults (18+ years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	66	68.2	*67.7**	65.9	1.89	1.66	2.15
2005	76	75.4	*74.7**	74.6	2.12	1.88	2.39
2006	69	66.2	*66.3**	67.5	2.36	2.08	2.68
2007	50	46.7	*47.2**	47.4	1.80	1.55	2.09
2008	56	56.2	*57.1**	48.2	1.68	1.45	1.94
Total period	**317**	**62.3**	**62.5**	**63.2**	**2.03**	**1.91**	**2.15**
Applicants							
2004	13	*97.6**	*99.5**	*	*	*	*
2005	20	*157.7**	*147.6**	*	*	*	*
2006	13	*105.5**	*100.2**	*	*	*	*
2007	11	*99.8**	*97.4**	*	*	*	*
2008	10	*99.3**	*95.3**	*	*	*	*
Total period	**67**	**112.8**	**107.9**	***87.0****	***2.79****	***2.46****	***3.16****
Other NZ							
2004	1,169	40.3	40.0	34.9	1.00	-	-
2005	1,195	40.6	40.5	35.2	1.00	-	-
2006	1,042	34.9	34.5	28.6	1.00	-	-
2007	1,003	33.1	33.7	28.7	1.00	-	-
2008	864	30.7	31.3	28.3	1.00	-	-
Total period	**5,273**	**35.9**	**36.0**	**31.2**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	2	2.5	-	-	-	-	-
5-17 years	27	8.5	-	-	-	-	-
18-64 years	281	64.1	-	-	-	-	-
65+ years	36	51.6	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.20 Trends of age-ethnicity standardised rates and rate ratios, for depressive episode in adults (18+ years), 2004-2008



c. Key points

Depression was a relatively uncommon cause of hospitalisation in NZ adults, with an average of 0.06% of HNZC tenants and 0.1% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for depression were still 102.7% higher for tenants and 179.2% higher for applicants than for other New Zealanders.

Compared with 2004, age ethnicity adjusted hospitalisation for housing tenants showed a (non-significant) decline in 2008 in relation to the other New Zealanders. Numbers for housing applicants were too small to make conclusions about patterns from one year to the next.

8.5.3. Psychosis in adults

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for psychosis (F20-F29).

Rationale for indicator: Exacerbations potentially linked to generally poor housing conditions, including cold, damp, mould, crowding.

Exclusions: Restricted to adults 18+ years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

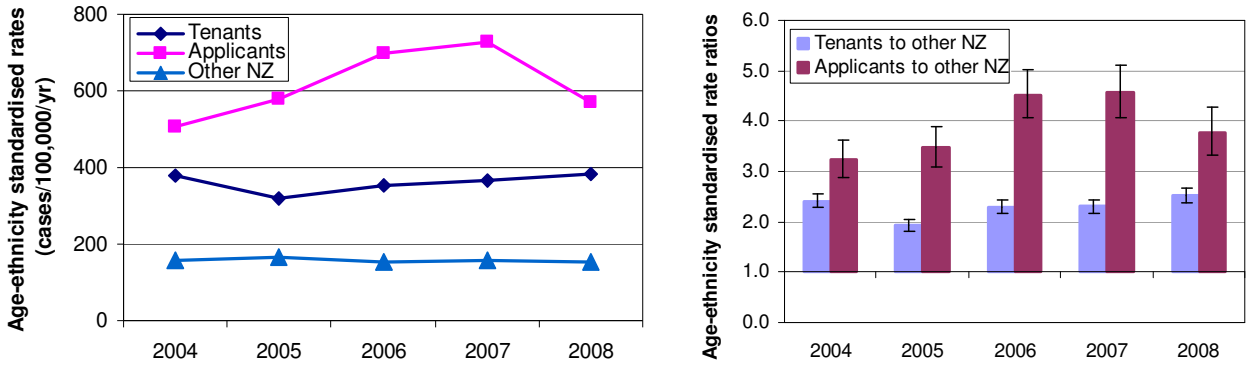
b. Incidence, rate ratio and trends

Table 8.21: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for psychosis in adults (18+ years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	366	378.4	346.2	379.5	2.42	2.29	2.56
2005	320	317.7	292.4	318.4	1.92	1.81	2.04
2006	365	350.0	319.8	352.6	2.29	2.16	2.42
2007	345	331.5	332.2	367.1	2.31	2.18	2.44
2008	385	359.9	360.3	382.7	2.52	2.38	2.67
Total period	**1,808**	**355.6**	**324.2**	**358.5**	**2.27**	**2.22**	**2.33**
Applicants							
2004	82	615.7	498.1	507.5	3.23	2.88	3.64
2005	85	670.2	576.8	577.7	3.48	3.10	3.90
2006	100	811.5	730.2	696.4	4.52	4.08	5.02
2007	87	789.0	667.8	727.0	4.57	4.08	5.11
2008	63	625.8	596.2	572.1	3.77	3.31	4.29
Total period	**417**	**701.8**	**597.7**	**614.4**	**3.90**	**3.70**	**4.10**
Other NZ							
2004	2,917	100.5	88.3	156.9	1.00	-	-
2005	2,970	100.9	90.2	165.9	1.00	-	-
2006	2,660	89.1	78.4	154.0	1.00	-	-
2007	2,808	92.8	81.2	159.2	1.00	-	-
2008	2,348	83.6	87.1	151.8	1.00	-	-
Total period	**13,703**	**93.4**	**84.7**	**157.6**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	0	*	-	-	-	-	-
5-17 years	68	21.4	-	-	-	-	-
18-64 years	1,751	399.2	-	-	-	-	-
65+ years	57	81.7	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.21 Trends of age-ethnicity standardised rates and rate ratios, for psychosis in adults (18+ years), 2004-2008



c. Key points

Psychosis was a relatively common cause of hospitalisation in the HNZC client population, with an average of 0.4% of HNZC tenants and 0.7% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, psychosis hospitalisations were still 127.4% higher for tenants and 289.8% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, age ethnicity adjusted hospitalisation for housing tenants were fairly constant but rose markedly for housing applicants (up until 2007, followed by a decline in 2008).

8.5.4. Intentional self harm

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for any injury which includes an external code for intentional self harm (X60-X84).

Rationale for indicator: Potentially linked to depression and generally poor housing conditions, including cold, damp, mould, crowding.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

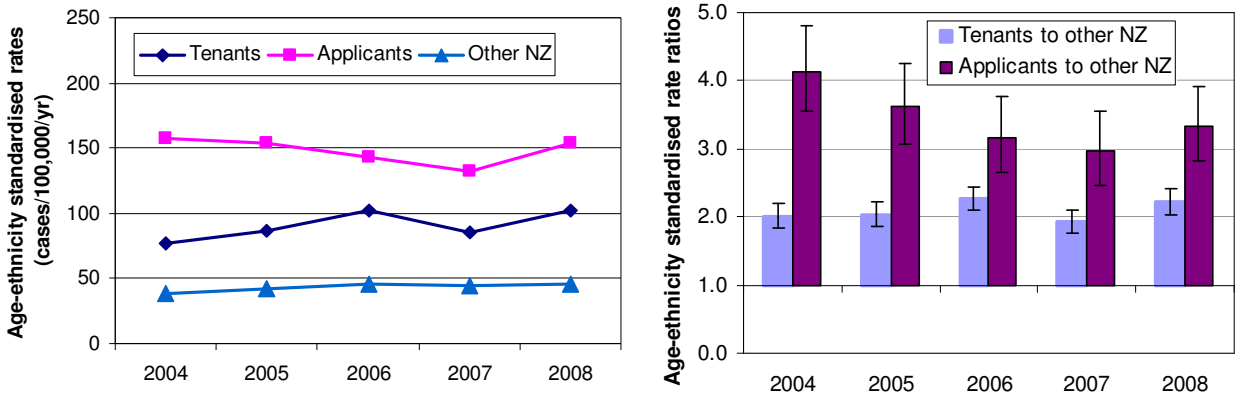
b. Incidence, rate ratio and trends

Table 8.22: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for intentional self harm, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	139	79.9	78.6	76.9	2.02	1.84	2.21
2005	160	88.3	86.9	86.9	2.04	1.87	2.22
2006	191	102.4	101.1	102.5	2.26	2.09	2.45
2007	160	84.3	83.5	85.5	1.92	1.76	2.10
2008	175	100.1	99.0	102.6	2.22	2.04	2.42
Total period	**825**	**91.0**	**89.9**	**90.8**	**2.10**	**2.02**	**2.18**
Applicants							
2004	48	192.7	193.9	*	*	*	*
2005	42	*178.5**	*187.1**	*	*	*	*
2006	37	*164.6**	*159.8**	*	*	*	*
2007	33	*166.9**	*172.0**	*	*	*	*
2008	38	*209.9**	*204.3**	*	*	*	*
Total period	**198**	**182.0**	**183.0**	**147.5**	**3.41**	**3.16**	**3.67**
Other NZ							
2004	1,925	49.5	47.7	38.2	1.00	-	-
2005	1,837	46.8	45.6	42.6	1.00	-	-
2006	2,088	52.5	51.9	45.3	1.00	-	-
2007	2,021	50.3	48.9	44.5	1.00	-	-
2008	1,810	48.7	47.1	46.2	1.00	-	-
Total period	**9,681**	**49.6**	**48.3**	**43.3**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	0	*	-	-	-	-	-
5-17 years	134	42.2	-	-	-	-	-
18-64 years	669	152.5	-	-	-	-	-
65+ years	22	31.5	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.22 Trends of age-ethnicity standardised rates and rate ratios, for intentional self harm, 2004-2008



c. Key points

Intentional self-harm was a relatively uncommon cause of hospitalisation in NZ with an average of 0.1% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, intentional self-harm was 109.7% higher for tenants and 240.7% higher of applicants than for other New Zealanders.

Over the 2004 to 2008 period, age ethnicity adjusted hospitalisations for housing tenants were fairly constant, but showed a (non-significant) decline for housing applicants relative to other New Zealanders.

8.5.5. Assault in the home

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for any injury (S00-T99) with an external code for assault (X85-Y09). Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3)

Rationale for indicator: Potentially linked to generally poor housing conditions, including cold, damp, mould, crowding and to poor home security.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

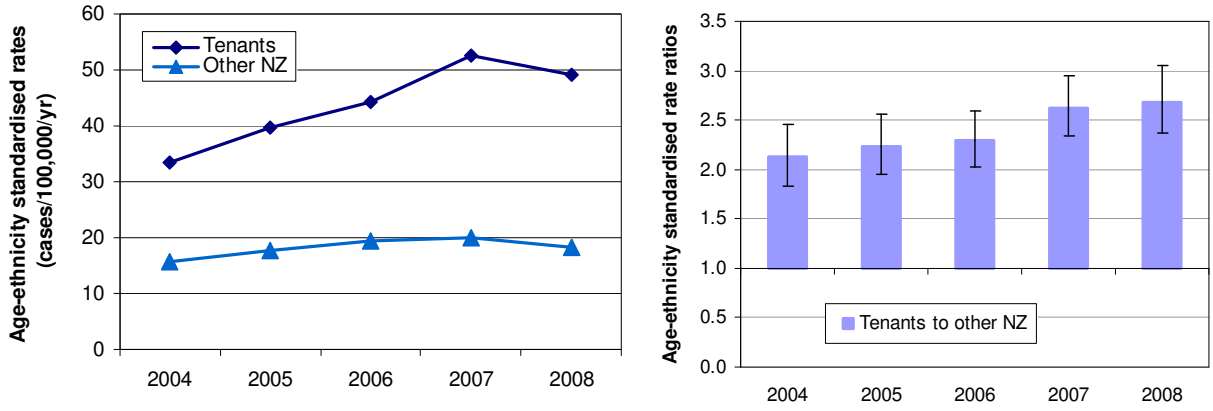
b. Incidence, rate ratio and trends

Table 8.23: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for assault in the home, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	57	32.7	32.2	33.5	2.12	1.83	2.46
2005	72	39.7	39.3	39.7	2.23	1.95	2.56
2006	83	44.5	44.1	44.3	2.29	2.03	2.59
2007	100	52.7	52.7	52.7	2.63	2.34	2.95
2008	87	49.8	49.6	49.0	2.68	2.36	3.05
Total period	**399**	**44.0**	**43.7**	**43.9**	**2.41**	**2.27**	**2.55**
Applicants							
2004	*9*	*36.1**	*34.2**	*	*	*	*
2005	*6*	*25.5**	*25.4**	*	*	*	*
2006	*9*	*40.0**	*42.3**	*	*	*	*
2007	*7*	*35.4**	*32.6**	*	*	*	*
2008	*9*	*49.7**	*43.4**	*	*	*	*
Total period	**40**	**36.8**	**34.9**	*	*	*	*
Other NZ							
2004	355	9.1	8.4	15.8	1.00	-	-
2005	369	9.4	8.9	17.8	1.00	-	-
2006	433	10.9	10.1	19.3	1.00	-	-
2007	418	10.4	9.7	20.1	1.00	-	-
2008	366	9.8	9.1	18.3	1.00	-	-
Total period	**1,941**	**9.9**	**9.2**	**18.3**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	21	26.1	-	-	-	-	-
5-17 years	56	17.6	-	-	-	-	-
18-64 years	315	71.8	-	-	-	-	-
65+ years	7	10.0	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.23 Trends of age-ethnicity standardised rates and rate ratios, for assault in the home, 2004-2008



c. Key points

Assault in the home was an uncommon cause of hospital admission in New Zealand with an average of 0.04% of HNZC tenants and 0.03% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for assault were still 140.8% higher for tenants than for other New Zealanders. Numbers were too small to calculate a rate ratio of housing applicants.

Compared with 2004, age-ethnicity standardised hospitalisation rates for assault in the home showed a non-significant increase for housing tenants in 2008, in relation to other New Zealanders (based on small numbers).

8.6. Injuries

8.6.1. Total home injury hospitalisations

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for home injury hospitalisations (S00-T99). Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3).

Rationale for indicator: These conditions are considered related to physical hazards in the home.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

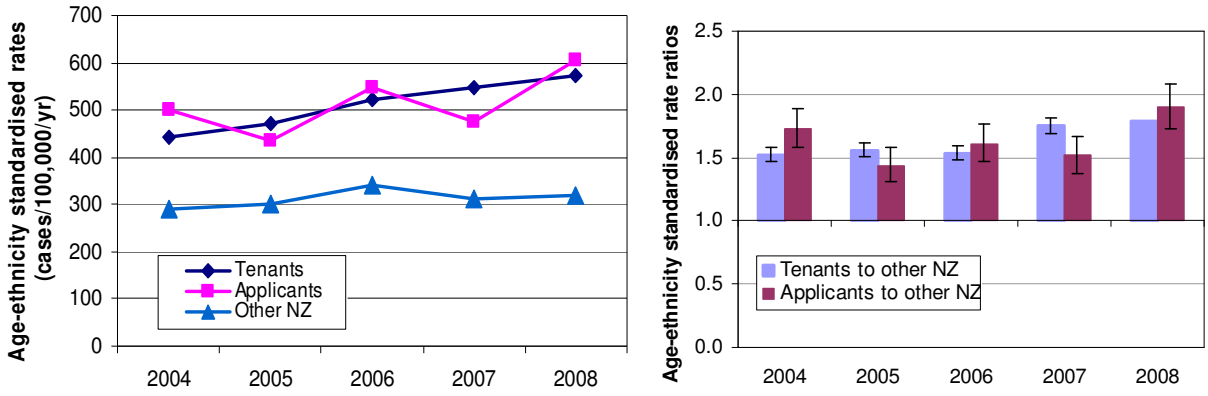
b. Incidence, rate ratio and trends

Table 8.24: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for home injury, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	759	436.1	438.8	442.2	1.52	1.47	1.58
2005	841	464.3	470.5	472.7	1.56	1.50	1.62
2006	956	512.5	518.6	521.5	1.54	1.48	1.59
2007	1,015	534.7	541.8	546.6	1.75	1.69	1.81
2008	978	559.5	564.0	571.7	1.79	1.72	1.85
Total period	**4,549**	**501.9**	**507.5**	**510.5**	**1.63**	**1.61**	**1.66**
Applicants							
2004	144	578.0	535.0	500.4	1.73	1.58	1.88
2005	123	522.7	476.6	434.8	1.44	1.31	1.58
2006	131	582.6	563.5	546.3	1.61	1.47	1.77
2007	116	586.5	528.0	474.0	1.52	1.38	1.67
2008	126	696.0	653.7	606.2	1.89	1.73	2.08
Total period	**640**	**588.2**	**547.9**	**510.6**	**1.63**	**1.57**	**1.70**
Other NZ							
2004	10,918	280.8	273.6	290.1	1.00	-	-
2005	10,727	273.0	268.0	302.8	1.00	-	-
2006	11,599	291.8	282.6	339.3	1.00	-	-
2007	11,673	290.5	278.8	312.6	1.00	-	-
2008	10,680	287.1	272.2	320.0	1.00	-	-
Total period	**55,597**	**284.6**	**275.2**	**312.5**	**1.00**	**-**	**-**
Tenants 2004-2008							
0-4 years	893	1,111.5	-	-	-	-	-
5-17 years	1,038	326.8	-	-	-	-	-
18-64 years	2,072	472.3	-	-	-	-	-
65+ years	546	782.6	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable

Figure 8.24 Trends of age-ethnicity standardised rates and rate ratios, for home injury, 2004-2008



c. Key points

Home injuries were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 0.6% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for home injuries were still 63.3% higher for tenants and applicants than for other New Zealanders.

Compared with 2004, hospitalisation rates for housing tenants and applicants rose significantly relative to other New Zealanders in 2008.

8.6.2. Falls at home

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for any injury (S00-T99) with an external code for fall (W00-W19). Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3).

Rationale for indicator: Linked to unsafe home environments containing trip and fall hazards and lack of hand rails and other safety devices.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

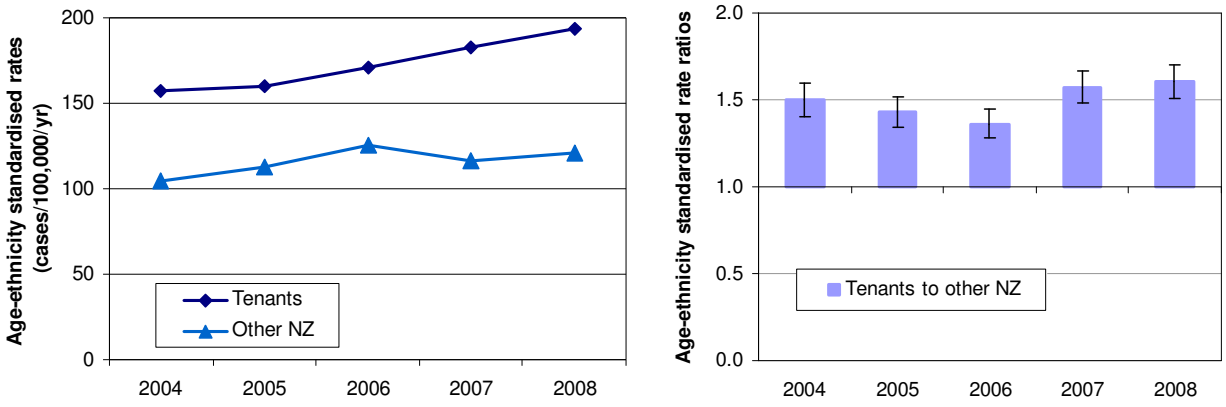
b. Incidence, rate ratio and trends

Table 8.25: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for fall at the home, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	266	152.8	155.0	156.8	1.50	1.41	1.60
2005	283	156.2	159.2	160.3	1.43	1.34	1.52
2006	311	166.7	169.9	170.8	1.36	1.28	1.45
2007	339	178.6	180.6	182.5	1.57	1.48	1.67
2008	330	188.8	189.5	193.2	1.60	1.51	1.70
Total period	**1,529**	**168.7**	**171.2**	**172.4**	**1.49**	**1.45**	**1.53**
Applicants							
2004	34	136.5	*146.6**	*	*	*	*
2005	41	174.2	*149.6**	*	*	*	*
2006	34	151.2	*158.5**	*	*	*	*
2007	28	141.6	*121.0**	*	*	*	*
2008	35	193.3	*195.7**	*	*	*	*
Total period	**172**	**158.1**	**152.4**	**153.5**	**1.33**	**1.22**	**1.44**
Other NZ							
2004	4,750	122.2	109.4	104.6	1.00	-	-
2005	4,816	122.6	109.5	112.4	1.00	-	-
2006	5,152	129.6	114.0	125.6	1.00	-	-
2007	5,324	132.5	115.3	116.1	1.00	-	-
2008	4,913	132.1	111.6	120.5	1.00	-	-
Total period	**24,955**	**127.8**	**112.0**	**128.3**	**1.00**	**-**	**-**
Tenants (2004-2008)							
0-4 years	264	328.6	-	-	-	-	-
5-17 years	308	97.0	-	-	-	-	-
18-64 years	533	121.5	-	-	-	-	-
65+ years	424	607.7	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

Figure 8.25 Trends of age-ethnicity standardised rates and rate ratios, for fall at the home, 2004-2008



c. Key points

Falls were the most common type of injury in the home in NZ with an average of 0.2% of HNZC tenants and applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for falls in the home were still 49.1 % higher for tenants and 32.7% higher for applicants than for other New Zealanders.

Compared with 2004, age-ethnicity standardised hospitalisation rates for falls showed a non-significant increase for housing tenants in relation to other New Zealanders in 2008. The numbers for applicants were too small to make conclusions.

8.6.3. Accidental poisonings in young children at home

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for any injury (S00-T99) with an external code for accidental poisoning (X40-X49). Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3)

Rationale for indicator: Linked to unsafe storage of poisons in the home and lack of secure storage areas which are inaccessible to children.

Exclusions: Restricted to children <5 years. Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

b. Incidence, rate ratio and trends

Table 8.26: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for accidental poisonings in children at home (<5 years), 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants						
2004	18	114.1	111.7	1.77	1.37	2.29
2005	26	162.8	159.5	2.42	1.95	3.00
2006	23	140.8	141.0	1.36	1.09	1.71
2007	24	142.9	142.3	2.03	1.63	2.53
2008	19	122.9	121.9	1.37	1.07	1.74
Total period	**110**	**136.9**	**136.6**	**1.75**	**1.58**	**1.94**
Applicants						
2004	7	181.2	*	*	*	*
2005	3	*82.9**	*	*	*	*
2006	5	146.6	*	*	*	*
2007	6	195.2	*	*	*	*
2008	7	236.4	*	*	*	*
Total period	**28**	**165.4**	**157.2**	**2.02**	**1.67**	**2.44**
Other NZ						
2004	194	73.2	63.0	1.00	-	-
2005	202	76.3	65.9	1.00	-	-
2006	223	83.8	103.3	1.00	-	-
2007	212	77.8	70.1	1.00	-	-
2008	210	81.8	89.3	1.00	-	-
Total period	**1,041**	**78.6**	**77.9**	**1.00**	**-**	**-**
Tenants (2004-2008)						
0-4 years	110	136.9	-	-	-	-
5-17 years	30	9.4	-	-	-	-
18-64 years	100	22.8	-	-	-	-
65+ years	9	12.9	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

c. Key points

Accidental poisonings in the home are a relatively uncommon cause of hospital admission for NZ children <5years, with an average of 0.1% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After restricting to those <5 years, and adjusting for ethnicity, hospitalisations for accidental poisonings in the home were still 75.2% higher for tenants and 101.8% higher for applicants than for other New Zealanders.

Over the 2004 to 2008 period, ethnicity standardised hospitalisation rates for accidental poisonings in the home were not stable, being based on small numbers.

8.6.4. Injury from exposure to smoke and flames at home

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for any injury (S00-T99) with an external code for exposure to smoke, fire and flames (X00-X09). Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3).

Rationale for indicator: Linked to fire hazards and lack of fire protection such as no working smoke detectors.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

b. Incidence, rate ratio and trends

Table 8.27: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for injury from exposure to smoke and flames at home, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	8	4.6	*	*	*	*	*
2005	6	3.3	*	*	*	*	*
2006	14	7.5	*	*	*	*	*
2007	17	9.0	*	*	*	*	*
2008	13	7.4	*	*	*	*	*
Total period	**58**	**6.4**	**6.5**	**6.5**	**1.61**	**1.40**	**1.86**
Applicants							
2004	*2*	8.0	*	*	*	*	*
2005	*1*	4.2	*	*	*	*	*
2006	*6*	26.7	*	*	*	*	*
2007	*4*	20.2	*	*	*	*	*
2008	*1*	5.5	*	*	*	*	*
Total period	**14**	**12.9**	*	*	*	*	*
Other NZ							
2004	130	3.3	3.5	*	*	*	*
2005	111	2.8	3.1	*	*	*	*
2006	145	3.6	3.8	*	*	*	*
2007	135	3.4	3.4	*	*	*	*
2008	99	2.7	2.9	*	*	*	*
Total period	**620**	**3.2**	**3.3**	**4.0**	**1.0**	**-**	
Tenants (2004-2008)							
0-4 years	11	13.7	-	-	-	-	-
5-17 years	20	6.3	-	-	-	-	-
18-64 years	25	5.7	-	-	-	-	-
65+ years	2	2.9	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

c. Key points

Injury from exposure to smoke, fire and flames in the home affect all age groups but was a relatively uncommon cause of hospital admission in NZ. After adjusting for age and ethnicity, hospitalisations for smoke, fire and flames in the home were still 61.2% higher for tenants than for other New Zealanders. Numbers were too small to make conclusions about patterns from one year to the next or to calculate adjusted rates for housing applicants.

8.6.5. Burns and scalds at home

a. Brief description of indicator

Scope of indicator: Uses ICD.10 codes for any injury (S00-T99) with an external code for exposure to heat and hot substances (X10-X19). Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3).

Rationale for indicator: Linked to specific hazards in home such as poorly protected heaters, insufficient bench-space and crowding.

Exclusions: Hospitalisations for housing applicants and tenants are filtered using the standard filter (excludes private hospital cases, overseas visitors, transfers, waiting list cases, day cases, and readmissions within a month).

b. Incidence, rate ratio and trends

Table 8.28: Hospital admission numbers and rates in applicants and tenants compared with other NZ population, for injury from burns and scalds at home, 2004-2008

Population & year	No. of hospitalisations	Crude rate per 100,000	Age standardised rate per 100,000[1]	Age ethnicity standardised rate per 100,000[1]	Rate ratio[2]	CI (95%CI)	
Tenants							
2004	33	19.0	*19.5**	*	*	*	*
2005	34	18.8	*19.7**	*	*	*	*
2006	44	23.6	*24.9**	*	*	*	*
2007	52	27.4	*28.8**	*	*	*	*
2008	37	21.2	*22.2**	*	*	*	*
Total period	**200**	**22.1**	**23.1**	**23.1**	**1.78**	**1.64**	**1.93**
Applicants							
2004	8	32.1	*	*	*	*	*
2005	6	25.5	*	*	*	*	*
2006	2	8.9	*	*	*	*	*
2007	4	20.2	*	*	*	*	*
2008	4	22.1	*	*	*	*	*
Total period	**24**	**22.1**	***15.3****	*	*	*	*
Other NZ							
2004	280	7.2	8.8	13.0	1.0	-	-
2005	256	6.5	8.5	14.0	1.0	-	-
2006	226	5.7	7.3	13.4	1.0	-	-
2007	240	6.0	7.5	12.2	1.0	-	-
2008	233	6.3	8.0	12.5	1.0	-	-
Total period	**1,235**	**6.3**	**8.0**	**13.0**	**1.0**	**-**	**-**
Tenants (2004-2008)							
0-4 years	120	149.4	-	-	-	-	-
5-17 years	28	8.8	-	-	-	-	-
18-64 years	46	10.5	-	-	-	-	-
65+ years	6	8.6	-	-	-	-	-

[1] Age and ethnicity standardised to tenant population in 2006
[2] Relative to the other NZ population (people who are not HNZC applicants or tenants) in that year
- Not applicable
* Low numbers so rates may be unstable or unreportable (see methods section)

c. Key points

Injury from exposure to heat and hot substances in the home affect all age groups, but rates are markedly higher for children under 5 years. However it was a relatively uncommon cause of hospital admission in NZ. After adjusting for age and ethnicity, hospitalisations for exposure to heat and hot substances in the home were still 78.0% higher for tenants than for other New Zealanders. Numbers were too small to make conclusions about patterns from one year to the next.

9. Discussion and conclusions

9.1. Key findings

This collaborative project between Housing New Zealand Corporation and *He Kainga Oranga* / Housing and Health Research Programme, University of Otago, Wellington provides a robust method for measuring health outcomes (hospitalisations) in both HNZC housing tenants and applicants. This analysis confirms that this population is relatively vulnerable and experiences significantly higher rates of disease and injury compared with other New Zealanders, with similar age and ethnicity. Much of this excess health burden appears preventable.

Data quality: Data completeness was high, as would be expected for a study based on information collected for management purposes. The voluntary smoking question was filled out by about 58.3% of adult tenants, and this proportion can be increased to about 70.1% using results from subsequent IRR forms.

By 2008, we could match over 95.0% of housing applicants and tenants to their NHI numbers, allowing anonymous linkage to their hospitalisation records. Because not all denominator time could be accurately assigned to time spent as applicants and tenants, some records were discarded, leaving about 95.1% of tenant records and 92.2% of applicant records. Consequently, about 90.1% of total tenant records and 87.7% of total applicant records were available for subsequent analysis.

Housing use and throughput: There were, on average, 23,397 households assessed and placed on the waiting list each year from 2004 to 2008. On average, about 24.7% of these households became tenants, 35.2% came off the waiting list *without* becoming tenants, while the remainder (41.1%) remained on the wailing list. During this five-year period of economic growth, unemployment dropped rapidly and the number of applicants in all groups declined. The median time applicants stayed on the waiting list was about 130 days, with 59.7% spending less than 6 months, 20.8% spending between 6 months and 12 months, and 19.6% spending longer than a year.

Between 2004 and 2008, on average, 70,100 households filled in an IRR form each year. About 8.9% of households stopped being HNZC tenants annually, but most of the rest (90.1%) remained as tenants. While applicant numbers declined over this period, there was an increase in HNZC housing stock, and consequently in an increased number of tenant households each year over this period. The median duration as tenants in HNZC houses was 3.5 years and over this period there was a trend towards longer tenancies, with the proportion of tenants living in HNZC houses longer than 10 years increasing from 11.9% in 2004 to 14.0% in 2008.

Demographic and socio-economic characteristics: These data show the very youthful nature of both HNZC applicants and tenants. Their median age was 20 years, which was very much less than the NZ median of 35 years. The proportion of people 65+ years was about half the NZ average. The proportion of females was higher than the NZ population for both tenants and applicants.

A high proportion of HNZC tenants were Māori (37.6%) and Pacific people (33.3%) relative to the total NZ population. There were differences between the applicant and tenant populations; a larger proportion of applicants reported their ethnicity as European and other (37.6%) or Asian (9.4%) compared with the tenant population. There has been a slight increase in the proportion of Māori for both applicants and tenant populations, but no change in Pacific, European and other groups from 2004 to 2008. The proportion of applicants who identified as Asian was similar to the NZ Census. We would expect this group to become an increasing proportion of tenants over time as these applicants become housed.

These data confirm the very low median equivalised household income of HNZC tenants ($231.4 weekly in 2008) and applicants ($263.7 weekly in 2008). Although the mean and median incomes rose over this four-year period, there was very little increase for the lower quintile of households.

The largest proportion of HNZC clients were living in single-parent households (42.2% for tenants and 46.8% for applicants), followed by households containing couples with children (30.3% for tenants and 29.3% for applicants), then households with adults without children (27.5% for tenants and 23.9% for applicants). These proportions differed markedly from the wider NZ population, where only about 12% of people lived in single-parent households. Over the 2004 to 2008 period, there was an increase in applicants who were adults without children and a decline in couples with children.

Housing exposures and conditions: On average a third of adult tenants (18 years and over), responded to the smoking questions, and reported smoking one or more cigarettes a day. This was higher than the prevalence reported in the 2006 Census for New Zealanders (21% for those 15 years and over). Over the 2004 to 2008 period, there was no notable trend in the proportion of adult tenants who reported smoking. This stable result contrasts with a declining trend in smoking for New Zealanders generally. Moreover, being exposed to second-hand smoke, through living in a household containing smokers, was a relatively common potential exposure (an average of 52.6% for tenants who reported their smoking status). Indeed, over the 2004 to 2008, period there was a small increase in the proportion of tenants potentially exposed to passive smoking.

Household crowding, a significant health risk for infectious diseases, was also a relatively common exposure for both applicant and tenant households, compared with other New Zealanders. Almost a half of applicants (47.2%) and over a third of tenants (37.5%) were short of at least one bedroom, compared with 10.0% of New Zealanders at the time of the 2006 Census [1]. The difference was even more marked for households that were two or more bedrooms short (24.0% of housing applicants and 13.6% of HNZC tenants, compared with 3.5% of New Zealander households). Over the 2004 to 2008 period, there was no notable trend in the proportion of applicants and tenants exposed to crowded households, which suggests that there was still an under-supply of suitably sized houses for households to rent, particularly in the private rental market, but also in the existing HNZC stock. Alternatively, there was an undersupply of affordable houses and therefore people were moving into crowded situations so as to afford the rent.

Housing sensitive health outcomes: There was a high level of hospitalisations among HNZC tenants, but even higher rates among applicants; 15.7% of HNZC tenants and 17.5% of HNZC applicants were admitted to hospital every year with acute (or relatively acute) illnesses or injuries, compared with 9.7% of the rest of New Zealanders. After adjusting for age and ethnicity, hospitalisation rates were still 47.4% higher for tenants and 60.3% higher for applicants than for other New Zealanders. Compared with 2004, total hospitalisation rates for housing tenants and applicants rose significantly, in absolute terms and in relation to other New Zealanders. This pattern suggests an increasingly vulnerable population of housing applicants, and to a less extent tenants, over this period.

Using a measure of Ambulatory Sensitive Hospitalisation (ASH) conditions, 4.0% of HNZC tenants and 4.8% of HNZC applicants were admitted to hospital each year. After adjusting for age and ethnicity, hospitalisation rates were still 53.8% higher for tenants and 65.7% higher for applicants than for other New Zealanders. Compared with 2004, ASH rates for housing applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests reduced access to, or under-utilisation of, primary care services by the applicant population.

Population Preventable Hospitalisation (PPH) conditions showed a similar pattern with 1.1% of HNZC tenants and 1.1% of HNZC applicants admitted to hospital every year with these conditions. After adjusting for age and ethnicity, hospitalisation rates were still 100.5% higher for tenants and 130.4% higher for applicants than for other New Zealanders. Compared with 2004, PPH rates for housing tenants rose significantly in 2008 in relation to other New Zealanders suggesting reduced provision or effectiveness of population-based strategies for this population.

Health outcomes related to housing conditions (Housing Related Potentially Avoidable Hospitalisations - HR-PAH) reinforced these differential patterns. The equivalent of 2.5% of HNZC tenants and 3.3% of HNZC applicants were admitted to hospital every year with HR-PAH. After adjusting for age and ethnicity, hospitalisation rates were still 50.8% higher for tenants and 72.8% higher for applicants than for other New Zealanders. Compared with 2004, HR-PAH rates for housing applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders. This pattern suggests reduced quality of housing conditions for housing applicants.

Deaths are far less common than hospitalisations, so the patterns are harder to interpret with certainty. An average of 0.6% of housing tenants and 0.3% of applicants died each year compared with 0.7% of the other NZ population. These rates strongly reflect the relatively younger age structure of tenants and particularly applicant households. After adjusting for age and ethnicity, the mortality rate remained slightly, but significantly, higher among tenants and lower among housing applicants. With only three years of mortality data available, it is not possible to draw conclusions about trends in mortality rates in this population.

Infectious disease hospitalisations: Close-contact infectious diseases were a common cause of hospitalisation, with 2.4% of HNZC tenants and 3.0% of applicants admitted to hospital each year with these conditions. After adjusting for age and ethnicity, hospitalisations for close-contact infectious diseases were still 39.3% higher for tenants and 48.2% higher for applicants than for other New Zealanders. Compared with 2004, rates for housing tenants and applicants rose significantly in 2008, in absolute terms and in relation to other New Zealanders.

Gastroenteritis was a relatively uncommon cause of hospitalisation, with an average of 0.1% of HNZC tenant children and 0.2% of applicant children admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for gastroenteritis were 27.1% higher for HNZC applicant children and 3.1% higher for HNZC tenants than for other New Zealanders. Gastroenteritis rates increased significantly in 2008 compared with 2004 for housing applicants, in absolute terms and in relation to other New Zealanders.

Respiratory bacteria infections (including meningococcal disease) were relatively uncommon in New Zealand, with an average of 0.01% of HNZC tenants and 0.02% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for bacterial meningitis and septicaemia in children were still 44.3% higher for HNZC tenant children and 62.4% for HNZC applicant children than for other New Zealanders. Over the 2004 to 2008 period, hospitalisations rates declined markedly reflecting the decline in New Zealand's prolonged serogroup B meningococcal disease epidemic.

Influenza and pneumonia were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 0.5% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for influenza and pneumonia were still 41.8% higher for tenants and 37.8% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates for housing tenants and applicants relative to other New Zealanders declined non significant from 2004 to 2007, but increased in 2008.

Bronchiolitis was a common cause of hospitalisation in young children in New Zealand, with an average of 1.6% of HNZC tenant children and 3.0% of applicant children admitted to hospital each

year with this diagnosis. After adjusting for ethnicity, hospitalisations for bronchiolitis in children less than 5 years of age were double the rate in applicants than tenants and were 38.4% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates rose for housing applicants relative to other New Zealanders, but were fairly stable for tenants. The apparent low bronchiolitis rates in housing tenants compared to the general population were probably an artefact caused by the data collection process. Most cases of bronchiolitis occur in the first year of life. Newborn babies tend not be recorded on the IRR form (See analysis in the companion report *The Health Impact of Social Housing*).

Bacterial skin infections were a relatively common cause of hospitalisation in NZ, with an average of 0.7% of HNZC tenants and 0.7% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for bacterial skin infections were still 59.8% higher for tenants and 41.6% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates rose for housing tenants and applicants as well as other New Zealanders and there was no significant change in the rates for housing tenants and applicants relative to other New Zealanders.

Circulatory and respiratory disease hospitalisations: Circulatory and respiratory diseases were a common cause of hospitalisation, with an average of 3.0% of HNZC tenants and 3.3% of applicants admitted to hospital each year with these conditions. After adjusting for age and ethnicity, hospitalisations for circulatory and respiratory diseases were still 46.6% higher for tenants and 58.1% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, rates for housing tenants and applicants were fairly constant.

Excess winter mortality (EWM) and excess winter hospitalisations (EWH) for circulatory and respiratory diseases give an indication of the extent to which housing protects populations from winter climatic conditions. EWH were not significantly different at 50.6% for housing tenants and 56.8% for housing applicants compared with 54.5% for other New Zealanders. However, EWM was about 49.1% for housing tenants, which was significantly higher than the rate for other New Zealanders (30.8%). Numbers of deaths in housing applicants were too small to calculate robust age-ethnicity standardised rates.

Asthma was a relatively common cause of hospitalisation in NZ, with an average of 0.4% of HNZC tenants and 0.5% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for asthma were still 58.8% higher for tenants and 91.0% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, hospitalisation rates fell slightly for housing tenants. However, they fell more rapidly for other New Zealanders so the level of inequality increased significantly for tenants in 2008 compared with 2004. Over this period rates varied inconsistently for housing applicants.

Chronic obstructive pulmonary disease (COPD) was a relatively common cause of hospitalisation in NZ adults, with an average of 0.8% of HNZC tenants and 0.6% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for COPD were still 154.0% higher for tenants and 159.3% higher for applicants than for other New Zealanders. Compared with 2004, hospitalisation rates increased significantly for adult housing tenants in 2008, but showed a large drop for adult applicants in 2008.

Ischaemic heart disease was a relatively common cause of hospitalisation in NZ adults, with an average of 0.7% of adult HNZC tenants and 0.6% of adult applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for ischaemic heart disease were still 42.0% higher for tenants and 42.4% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisation rates declined

slightly for tenants and other New Zealanders, so the excess risk for tenants stayed fairly constant. Rates were not stable for applicant adults.

Heart failure was a relatively common cause of hospitalisation in NZ adults, with an average of 0.4% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for heart failure were still 70.5% higher for tenants and 44.6% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisations for housing tenants and applicants increasing from 2004 to 2007, but dropped in 2008.

Mental health hospitalisations: Mental health conditions were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 1.0% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for mental health conditions were still 123.1% higher for tenants and 247.9% higher for applicants than for other New Zealanders. Compared with 2004, hospitalisation rates for housing tenants dropped significantly relative to other New Zealanders in 2008, but rose markedly for applicants.

Depression was a relatively uncommon cause of hospitalisation in NZ adults, with an average of 0.06% of HNZC tenants and 0.11% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for depression were still 102.7% higher for tenants and 179.2% higher for applicants than for other New Zealanders. Compared with 2004, age ethnicity adjusted hospitalisations for housing tenants showed a significant decline in 2008. Numbers for housing applicants were too small to make conclusions about patterns from one year to the next.

Psychosis was a relatively common cause of hospitalisation in the HNZC client population, with an average of 0.4% of HNZC tenants and 0.7% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, psychosis were still 127.4% higher for tenants and 289.8% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisation for housing tenants were fairly constant but rose markedly for housing applicants up until 2007, followed by a decline in 2008.

Intentional self-harm was a relatively uncommon cause of hospitalisation in NZ with an average of 0.1% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, intentional self-harm was 109.7% higher for tenants and 240.7% higher of applicants than for other New Zealanders. Over the 2004 to 2008 period, age ethnicity adjusted hospitalisations for housing tenants were fairly constant, but showed a (non-significant) decline for housing applicants relative to other New Zealanders.

Assault in the home was not a common cause of hospital admission in New Zealand with an average of 0.04% of HNZC tenants and 0.03% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for assault were still 140.8% higher for tenants than for other New Zealanders. Numbers were too small to calculate a rate ratio of housing applicants.

Home injury hospitalisations: Home injuries were a common cause of hospitalisation, with an average of 0.5% of HNZC tenants and 0.6% of applicants admitted to hospital each year with these diagnoses. After adjusting for age and ethnicity, hospitalisations for home injuries were still 63.4% higher for tenants and 63.2% higher for applicants than for other New Zealanders. Compared with 2004, hospitalisation rates for housing tenants and applicants rose significantly in 2008 relative to other New Zealanders.

Injuries from falls were the most common type of injury in the home in NZ with an average of 0.2% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After adjusting for age and ethnicity, hospitalisations for falls in the home were still 49.1% higher for

tenants and 32.7% higher for applicants than for other New Zealanders. Compared with 2004, age-ethnicity standardised hospitalisation rates for falls increased (non-significantly) in 2008 for housing tenants.

Accidental poisonings in the home were a relatively uncommon cause of hospital admission for NZ children under 5 years of age, with an average of 0.1% of HNZC tenants and 0.2% of applicants admitted to hospital each year with this diagnosis. After restricting the analysis to those less than 5 years, and adjusting for ethnicity, hospitalisations for accidental poisonings in the home were still 75.2% higher for tenants and 101.8% higher for applicants than for other New Zealanders. Over the 2004 to 2008 period, ethnicity standardised hospitalisation rates for accidental poisonings in the home were not stable for housing tenants and increased for housing applicants (except in 2005) (based on small numbers).

Injury from exposure to smoke, fire and flames in the home was a relatively uncommon cause of hospital admission in NZ. After adjusting for age and ethnicity, hospitalisations for smoke, fire and flames in the home were still 61.2% higher for tenants than for other New Zealanders. Numbers were too small to make conclusions about patterns from one year to the next or to calculate adjusted rates for housing applicants.

Injury from exposure to heat and hot substances in the home was markedly higher for children under 5 years. However it was a relatively uncommon cause of hospital admission in NZ. After adjusting for age and ethnicity, hospitalisations for exposure to heat and hot substances in the home were still 78.0% higher for tenants than for other New Zealanders. Numbers were too small to make conclusions about patterns from one year to the next.

9.2. Implications

This collaborative project provides a great deal of information on aspects of the housing and health status of HNZC housing applications and tenants. These findings have implications for understanding the vulnerability of this population, the potential to improve their health through improved access to health services, and through housing improvements. In most diagnostic categories the rates of illness in the tenant population in HNZC houses were markedly less than those of applicants.

Vulnerability: The composition of the HNZC tenant and applicant populations indicates a population which is highly vulnerable to illness and injury. These characteristics include the high proportion of children, sole-parent households, Māori and Pacific peoples, and those on very low income. Hospitalisation data confirm this assessment with the markedly higher hospitalisation rates for applicants and tenants compared with other New Zealanders, even after adjusting for age and ethnicity. These data also confirm that this population includes a relatively high proportion of people suffering from chronic physical illnesses (eg heart failure and COPD) as well as mental illness (eg psychotic illness). To some extent these outcomes are explainable by the social and income allocation formulae operated by HNZC which aims to provide housing for those with the greatest need.

The characteristics of the tenant population remained relatively stable over the 2004 to 2008 period. However, the applicant population appeared to become increasingly vulnerable with a significant increase in hospitalisation rates compared with other New Zealanders at the end of this period. This effect was not uniform across health outcomes with applicant hospitalisation rates for some conditions declining in 2008 (COPD, heart failure, and psychosis).

Access to health services: New Zealand has two indicators for measuring the effects of health services on population health. Both indicate that there is unrealised potential to improve the health

status of this population. Ambulatory Sensitive Hospitalisation (ASH) rates were 53.8% higher for tenants and 65.7% higher for applicants than for other New Zealanders, after adjusting for age and ethnicity. This pattern suggests that there is considerable potential to improve the health of this population, particularly housing applicants, by improving access and utilisation of primary care services (such as programmes to improve management of diabetes and high blood pressure and early treatment for acute and chronic infections). Population Preventable Hospitalisation (PPH) rates were 100.5% higher for tenants and 130.4% higher for applicants than for other New Zealanders after adjusting for age and ethnicity. This pattern suggests there is considerable potential to improve the health of HNZC tenants and applicants by considering programmes to increase their access to population health services (such as programmes to reduce the uptake of smoking, limit excessive alcohol use, and improve nutrition) in the locations where there are concentrations of HNZC houses.

Improved housing conditions: One of the aims of this project has been to refine an indicator of housing related illness, current termed Housing Related Potentially Avoidable Hospitalisations (HR-PAH). The intent of this composite indicator is to provide a single summary measure for assessing the health impact of housing and to evaluate the health impact of housing improvement. The components of HR-PAH are listed in the appendix (11.2). HR-PAH were 50.8% higher for tenants and 72.8% higher for applicants than for other New Zealanders after adjusting for age and ethnicity. This pattern suggests that HNZC may be providing housing of a higher standard than the private rental housing used by housing applicants. The conditions included in the HR-PAH are markers of close-contact infectious diseases (such as cellulitis, gastroenteritis, and respiratory infections) and of the quality of the indoor air environment (asthma, COPD).

Another category of hospitalisation that is plausibly related to the home environment is injuries. Unlike illnesses, surveillance data can record the location of the event and therefore identify that specific injuries occurred at home. Compared with 2004, injury hospitalisation rates for housing tenants rose significantly in 2008 relative to other New Zealanders. This would be worthy of further investigation if it continues. There is a case for including home injuries in the HR-PAH indicator.

9.3. Limitations

This study is based on a prospective cohort design which reduces many of the potential biases and confounding factors that limit the validity of other study designs. In addition, by effectively using the entire population of New Zealand it achieves a high level of statistical precision.

However, these findings need to be interpreted with caution for a number of reasons:

- Exclusions from the study – Some social housing applicants and tenants are excluded from the study. These include tenants not applying for an IRR. In addition, a small proportion of applicants and tenants are excluded because their person time cannot be accurately assigned to applicant and tenant states, or because they cannot be linked to their encrypted NHI. They are likely to have some systematic differences from other housing applicants and tenants which limits generalisability of findings to all applicants and tenants.
- Limitations with the numerator – Hospitalisations will 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 biased.
- Limitations with the denominator – Accurately assigning participants (and their person-time) to the study is prone to a number of sources of error. Some of these errors reflect the limitations of using administrative data which is collected for applicant and tenant management purposes.

- Confounding – The analysis of hospitalisation data uses age-ethnicity-standardised rates to manage confounding by age and ethnicity. However, there are other confounders that have not been considered in the analysis (notably the effects of socio-economic deprivation and possible neighbourhood effects that flow from high concentration of economically deprived households that have fewer resources to build up social capital in the area).
- Study size – Some of the diseases reported here are still relatively uncommon so findings need to be interpreted with caution. This limitation will diminish with time as the cohort size increases.
- Causal inference – This analysis divided the population into three groups (housing applicants, housing tenants, and other New Zealanders). The finding that some diseases have higher rates in one or other of these populations does not necessarily imply a causal association. For some conditions 'reverse' causality is operating in that those with some chronic diseases seek and are prioritised to receive social housing (e.g. multiple sclerosis). Future analyses will utilise the longitudinal nature of this cohort study to try to answer questions about whether a change in housing status is associated with a change in health status. Such analyses have much greater potential to answer such causal questions and will be the key analyses of this study.

9.4. Further work to improve data quality

There are a number of improvements that could be made to enhance data quality and the value of this annual analysis:

- Review with HNZC staff the range of outcomes and health indicators used in this report and how they are presented.
- Review the value of the Housing Related Potentially Avoidable Hospitalisations (HR-PAH) indicator as a composite measure of the health impact of housing and its use for measuring the impact of Social Housing and the Healthy Housing Programme. This discussion could consider whether there are other hospitalisation events that should be included. Potential additions would include: home injuries and a wider range of close contact infectious diseases. Potential deletions would include bronchiolitis (unless a method for identifying such cases in the first year of life can be developed).
- Identify opportunities to include a greater range of housing environment measures in the analysis, notably insulation levels and home heating (eg households with heat pumps). Initial discussions have been held with HNZC about the feasibility of using the index of housing quality developed by *He Kainga Oranga* and BRANZ to establish a clearer framework for a comparative study of social and private rented housing. We have established that with minor modification to the HNZC building assessments this index could be collected.
- Identify opportunities to include some neighbourhood variables (e.g. household and ethnic diversity, as well as environmental measures such as air quality and distance to public transport) which can be coded to mesh-block level.
- Investigate whether it is possible to reduce the relatively small proportion of records that are currently excluded from the study.
- Continue this cohort in order to monitor the impact of the economic cycle on the demand for HNZC tenancies and stability of tenure, i.e. compare the effect of low unemployment years covered in this report with the current higher employment years.

10. References

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11. Appendices

11.1. Summary of indicators

Indicator	ICD.10 codes	Age group
Data quality	**-**	**-**
Interview numbers	NA	All
Data completeness	NA	All
Data matching	NA	All
Denominator time	NA	All
Housing use and throughput	**-**	**-**
Applicants entering and exiting waiting list	NA	All
Tenants entering and exiting HNZC properties	NA	All
Duration as applicants	NA	All
Duration as tenants	NA	All
Demographic & socio-economic characteristics	**-**	**-**
Age and sex	NA	All
Ethnicity	NA	All
Household income	NA	All
Household structure	NA	All
Housing exposures and conditions	**-**	**-**
Active smoking	NA	Adults >17 years
Passive smoking	NA	All
Household crowding	NA	All
Hospitalisations	-	-
Hospitalisations – Total, Avoidable & Housing related	See appendix 12.2	All
Total acute and arranged hospital admissions	A00- T99	All
Potentially avoidable hospitalisations – Ambulatory sensitive	See appendix 12.2	All
Potentially avoidable hospitalisations – Population preventable	See appendix 12.2	All
Potentially avoidable hospitalisations – Housing related	See appendix 12.2	All
Mortality	-	-
Total mortality		All
Infectious diseases	-	**-**
Close contact infectious diseases	See appendix 12.3	All
Gastroenteritis	See ICD.10 codes in appendix 12.3	Child <18 years
Meningitis & septicaemia	See ICD.10 codes in appendix 12.3	Child <18 years
Influenza and Pneumonia	J10-J18	All
Bronchiolitis	J21	Child <5year
Skin infections	See ICD.10 codes in appendix 12.3	All
Respiratory and cardiovascular diseases	-	**-**
Circulatory and respiratory disease hospitalisations	I00-I99, J00-J99	All
Excess winter hospitalisations (circulatory & respiratory)	I00-I99, J00-J99	All
Excess winter mortality (circulatory & respiratory)	I00-I99, J00-J99	All
Asthma	J45, J46	All
Chronic Obstructive Pulmonary Diseases	J40-J44	Adults>17years
Ischaemic heart disease	I20-I25	Adults>17years
Heart Failure	I50	Adults>17years
Mental health conditions	-	**-**
Mental health hospitalisations	F00-F99	All
Depressive episode	F32	Adults>17years

Psychosis	F20-F29	Adults>17years
Intentional self harm	S00-T99 + E-code for intentional self harm (X60-X84)*	All
Assault in the home	S00-T99 + E-code for assault (X85-Y09)*	All
Home injuries	-	**-**
Home injury hospitalisations	S00-T99 *	All
Falls at home	S00-T99 + E-code for fall (W00-W19)*	All
Accidental poisonings at home	S00-T99 + E-code for accidental poisoning (X40-X49)*	Child <5 years
Injury from exposure to smoke and flames and home	S00-T99 + E-code for exposure to smoke, fire and flames (X00-X09)*	All
Burns and scalds at home	S00-T99 + E-code for exposure to heat and hot substances (X10-X19)*	All

* Occurrence at home identified by additional code (4th digital is 0 in ICD.10 v1, or Y920 in ICD.10 V2&3).

11.2. Potentially avoidable hospitalisations and mortality

Potentially avoidable hospitalisations (including ASH and PPH)

Current list supplied by Ministry of Health, August 2008 (with additional column added for HR-PAH)

Condition	Principal Diagnosis Codes	Age if limited	PPH Weight	ASH Weight	HR-PAH[1]
Alcohol related conditions	F10, I426, K290, K70	A	1	0	
Angina and chest pain	I20, R072-R074	A	0.5	0.5	
Asthma	J45-J46		0	1	1
Bronchiectasis	J47	C	0	1	
Cellulitis	H000, H010, J340, L01-L04, L08, L980		0	1	1
Cervical cancer	C53	A	0	1	
Congestive heart failure	I50, J81	A	0	1	
Constipation	K590		0	1	
CORD	J40-J44, J47	A	1	0	1
Dental conditions	K02, K04, K05		0	1	
Dermatitis & eczema	L20-L30		0	1	
Diabetes	E10-E14, E162	A	0	1	
Epilepsy	G40-G41, O15, R560, R568	A	0	1	
Gastroenteritis/dehydration	A02-A09, R11		0	1	1
GORD (Gastro-oesophageal reflux disease)	K21		0	1	
HIV AIDS	B20-B24		1	0	
Hypertensive disease	I10-I15, I674	A	0	1	
Kidney/urinary infection	N10, N12, N136, N309, N390	A	0	1	
Lung cancer	C33-C34	A	1	0	
Myocardial infarction	I21-I23;I241	A	0.5	0.5	
Non-B Hepatitis and liver cancer	B15,B17-B19, C220, C221, C229, P353	A	1	0	
Nutrition Deficiency and Anaemia	D50-D53, E40-E46, E50-E64, M833*		0	1	
Obstructed hernia	K400, K401, K403, K404, K410, K411, K413, K414, K420, K421, K430, K431, K440, K441, K450, K451, K460, K461		1	0	
Oral cancers	C01-C06, C09, C10	A	1	0	

Other ischaemic heart disease	I240, I248,I249, I25	A	0.5	0.5	
Pelvic inflammatory disease	N70-N77	A	1	0	
Peptic ulcer	K25-K28	A	0	1	
Respiratory infections - Acute bronchiolitis	J21	C	0	1	1
Respiratory Infections - influenza, viral pneumonia, acute bronchitis	J10-J12, J20		1	0	1
Respiratory infections - Pneumonia	J13-J16, J18		0	1	1
Rheumatic fever/heart disease	I00-I02,I05-I09		0	1	
Ruptured appendix	K350, K351	A	1	0	
Sexually transmitted Infections	A50-A59,A60, A63, A64, I980, M023, M031, M730, M731, N290, N341		0	1	
Stroke	I61, I63-I66	A	0.5	0.5	
Tuberculosis	A150-A199,B900-B909, M011, P370		1	0	1
Upper respiratory tract and ENT infections, Sinusitis, Tonsillitis	J00-J04, J06, H65-H67, J01-J03 J00-J03, J040, J06		0	1	1
Vaccine-preventable disease - HIB, Meningitis, Meningococcal disease, Whooping Cough, Hep B, Pneumococcal disease, Other	A33-A37, A403, A80, B16, B18	6mth+	0	1	1[2]
Vaccine-preventable disease - MMR	B05, B06,B26, M014, P350	15 mth+	0	1	

[1] Housing related PAH (HR-PAH) – Subset of PAH that are also included on the list of housing sensitive health outcomes.

[2] Only meningococcal disease (A39) in this category is included in the HR-PAH.

11.3. Close-contact infectious diseases

Close contact infectious diseases (CCID)	CCID to include in indicator*	ICD10 code
1 Close contact enteric infections		
1.1 Gastroenteritis (from human sources)		
Shigellosis	1	A03
Giardiasis	1	A071
Rotavirus enteritis	1	A080
Norovirus gastroenteritis	1	A081
Adenovirus enteritis	1	A082
Other viral enteritis	1	A083
Viral intestinal infection, unspecified	1	A084
Other specified intestinal infections	1	A085
Diarrhoea of presumed infectious origin	1	A09
Nausea and vomiting	1	R11
1.2 Other enteric infections (from human sources)		
Acute poliomyelitis	1	A80
Enteroviral encephalitis	1	A850
Enteroviral meningitis	1	A870
Acute hepatitis A	1	B15
Epidemic myalgia (Bornholm disease)	1	B330
Enterovirus infection, unspec	1	B341
Enterobiasis (pinworm)	1	B80
1.3 Late effects of enteric infections		
Sequelae of Poliomyelitis		B91
Osteopathy after poliomyelitis		M896
Malignant neoplasm of stomach & 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, miliary)	1	A15-A19
Tuberculosis of cervix, causing PID	1	N740, N741
Pneumoconiosis associated with TB	1	J65
Tuberculous oesophagitis	1	K230
Tuberculous arthritis	1	M011
Tuberculosis complicating pregnancy, childbirth and puerperium	1	O980
Observation for suspected tuberculosis	1	Z030
Tuberculosis disorders of intestines, peritoneum and mesenteric glands	1	K930
2.2 Pertussis		
Whooping cough	1	A37
2.3 Bacterial meningitis & septicaemia		
Meningococcal disease	1	A39
Meningococcal arthritis	1	M010
Septicaemia due to *Streptococcus pneumoniae*	1	A403

Pneumococcal meningitis	1	G001
Pneumococcal arthritis and polyarthritis	1	M001
Haemophilus influenzae septicaemia	1	A413
Haemophilus influenzae infection unspec	1	A492
Haemophilus meningitis	1	G000
2.4 Respiratory viruses		
Varicella	1	B010, B011, B012, B019
Measles	1	B05
Rubella	1	B06
Rubella arthritis	1	M014
Exanthema subitum (sixth disease)	1	B082
Erythema infectiosum (fifths disease)	1	B083
Hand foot and mouth / enteroviral vesicular stomatitis with exanthem	1	B084
Enteroviral vesicular pharyngitis Herpangina	1	B085
Other viral exanthemata with skin and mucous membrane lesions	1	B088, B09
Mumps	1	B26
Coronavirus infection, unspec	1	B342
Parvovirus infection, unspec	1	B343
2.5 URTI		
Suppurative otitis media	1	H660, H661, H662, H663, H664
Mastoiditis	1	H700, H701, H702, H708
Acute myringitis	1	H730
Acute nasopharyngitis	1	J00
Acute sinusitis	1	J01
Acute streptococcal pharyngitis	1	J020, J030
Acute pharyngitis	1	J028, J029
Acute tonsillitis	1	J038, J039,
Acute laryngitis and tracheitis	1	J04
Acute obstructive laryngitis (croup) and epiglottitis	1	J05
Acute upper respiratory infections of multiple and unspecified sites	1	J06
Chronic sinusitis	1	J32
Peritonsillar abscess	1	J36
Retro/pharyngeal abscesses	1	J390, J391
2.6 LRTI		
Influenza	1	J10, J11
Viral pneumonia not elsewhere classified	1	J12
Pneumonia due to *Streptococcus pneumoniae*	1	J13
Pneumonia due to *Haemophilus influenzae*	1	J14
Pneumonia due to other organisms not elsewhere classified	1	J16
Pneumonia organism unspecified	1	J18
Acute bronchitis	1	J20
Acute bronchiolitis	1	J21
Unspecified acute lower respiratory infection	1	J22
Infective exacerbation of COPD	1	J440
Abscess of lung and mediastinum, pyothorax	1	J85, J86

2.7 Post-streptococcal diseases		
Rheumatic fever	1	I00, I01, I02
Acute nephritic syndrome	1	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	1	
Impetigo	1	L01
Cutaneous abscess, furuncle and carbuncle	1	L02
Cellulitis	1	L03
Acute lymphadenitis	1	L04
Pilonidal cyst with abscess	1	L050
Other local infections of skin	1	L08
Erysipelas	1	A46
Hordeolum (abscess, stye)	1	H000
Acute inflammation of orbit (incl. abscess, cellulitis)	1	H050
Abscess and cellulitis of external ear	1	H600, H601
Otitis externa	1	H602, H603, H608, H609
Abscess, furuncle and carbuncle of nose	1	J340
Other inflammatory disorders of penis	1	N482
Inflammatory disorder of scrotum	1	N492
Inflammatory disorder of unspecified male genital organ	1	N499
Anal abscess	1	K610
Abscess of vulva	1	N764
Varicella with other complications (infection)	1	B018
Scabies	1	B86
Other dermatitis (Infective dermatitis)	1	L303, L308, L309
Insect/spider bite	1	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	1	T793
Open wound with foreign body (with or without infection)	1	T8901
Open wound with infection	1	T8902
3.2 Invasive staphylococcal infections		
Staphylococcus aureus septicaemia	1	A410
Staphylococcal septicaemia	1	A411, A412
Staphylococcal meningitis	1	G003
Staphylococcal arthritis & polyarthritis	1	M000
Osteomyelitis	1	M86
Inflammatory disorders of breast (abscess, carbuncle, mastitis)	1	N61
Staphylococcal infection unspecified	1	A490
3.3 Other skin infections from human sources		
Viral warts	1	B07
Molluscum contagiosum	1	B081
Dermatophytosis (tinea)	1	B35
Other superficial mycosis	1	B36
4 Close-contact disease with multiple or unknown transmission		
4.1 Other bacterial infections from human contact		
Scarlet fever	1	A38
Septicaemia due to group A streptococcus	1	A400
Streptococcal infection unspecified	1	A491
Streptococcal meningitis	1	G002
Other Streptococcal arthritis & polyarthritis	1	M002
Pyogenic arthritis due to other bacteria & unspecified	1	M008, M009
Other bacterial meningitis	1	G008, G009,
Non pyogenic meningitis (non bacterial)	1	G030
Chronic meningitis, benign recurrent meningitis (Mollaret)	1	G031, G032
Meningitis unspecified	1	G038, G039
Bacterial meningoencephalitis & meningomyelitis NEC	1	G042
4.2 Other viral infections from human contact		
Unspecified viral encephalitis	1	A86
Adenoviral meningitis	1	A871
Other & unspecified viral meningitis	1	A878, A879
Other & unspecific viral infections of CNS	1	A888, A89
Herpes Simplex Virus infection	1	B00
Cytomegalovirus	1	B25
Infectious Mononucleosis (gammaherpesviral mononucleosis)	1	B270
Cytomegaloviral mononucleosis	1	B271
Infectious Mononucleosis	1	B278, B279
Viral conjunctivitis	1	B30
Viral Carditis	1	B332
Adenoviral and other specified viral encephalitis	1	A851, A858
Adenovirus infection, unspec	1	B340
Papovavirus infection (incl. BKV & JCV), unspec	1	B344
Other viral infections of unspecified site	1	B348
Viral infection, unspec (incl. viremia NOS)	1	B349

4.3 Other & mixed infections from human contact		
Conjunctivitis	1	H100, H102, H103, H104, H105, H108, H109
Pediculosis & phthiriasis	1	B85
4.4 Late effects of other close-contact infectious diseases		
Acute disseminated encephalitis		G040
Other encephalitis, myelitis and encephalomyelitis (postinfectious)		G048
Encephalitis, myelitis and encephalomyelitis, unspecified		G049

*CCID indicator excludes late effects of these diseases