Te Whatu Ora
Health New Zealand

Cardiovascular Disease and other Cardiovascular Related Diseases hospitalisations in New Zealand with a Northern Region focus, 2010/11 to 2020/21

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Key points:

Coronary Heart Disease

- Age standardised **coronary heart disease (CHD) hospitalisation rates** in New Zealand **have fallen 30% over the past 10 years** (Table 9) from 622 per 100,000 in 2010/11 to 438 in 2020/21 (after excluding inter-hospital transfers). The fall in overall CHD hospitalisation rates was predominately driven by the 41% (Figure 5) fall in age standardised 5-year CHD readmission rate in the same period from 246 per 100,000 in 2010/11 to 145 in 2020/21. This compares to a more modest fall of 22% (Figure 4) in age standardised first CHD hospitalisation rate (a proxy of incidence of CHD) from 376 per 100,000 in 2010/11 to 293 in 2020/21.
- The ethnic inequities in age standardised first CHD hospitalisation rates have widened further in New Zealand in recent years. Disconcertingly, for the six years from 2014/15 to 2020/21, the **first CHD hospitalisation rate increased by 9.4% for Pacific** people (Figure 4), while Māori had only a small fall (3.5%). This compares to a fall of 11.6% and 7.8% for Asian and European/Other ethnic groups respectively, over the same period.
- In 2020/21, the age standardised Māori CHD hospitalisation rate is 23% and 50% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific CHD hospitalisation rate is 53% and 86% higher than European/Other and Asian ethnic group respectively in New Zealand.
- In Northland, age standardised first CHD hospitalisation and 5-year readmission rates increased by 22% (Figure 1) and 7% (Figure 2) respectively from 2014/15 to 2020/21. In contrast, across New Zealand the first hospitalisation and 5-year readmission rates for CHD had fallen by 6% and 20% over the same period.
- The lack of local access to a cardiac catheterisation laboratory (cath lab) and Districts with multiple acute hospital sites are associated with high percentage of inter-hospital transfers for CHD hospitalisation (Table 8). The variations in the percentages of inter-hospital transfers for CHD in Districts without a local cath lab suggested there may be geographical variations with regard to access of invasive management of coronary heart disease.
- There has been a 32% increase in the number of inter-hospital transfers for CHD from 2010/11 to 2020/21 in the Northern region, e.g. from 735 in Waitemata to 838 (Table 7). The increase in inter-hospital transfers for CHD are likely to be related to access to invasive interventions for CHD.
- Inter-hospital transfers for CHD occur infrequently in people domiciled in Districts with tertiary hospital facilities such as Auckland, Capital and Coast and Canterbury (only accounting for 1 to 3% (Table 8) of all CHD events in these Districts). Understandably, the percentage of CHD events that were inter-hospital transfers much higher in Districts with sister hospitals (e.g. Waitemata at 27%) or Districts serving rural populations (e.g. Northland at 29%).
- Despite growing and ageing populations, and increases in the number of inter-hospital transfers, the absolute number of CHD hospitalisations in Auckland, and Counties Manukau Districts had fallen by 2%, and 8% respectively because of the fall in the CHD incidence and admission rate of people with existing CHD during the 10-year period (Table 5). The increase in the absolute number of CHD hospitalisations in Waitemata (5%) and Northland (26%) is partly related to the increase in number of inter-hospital transfers, by 14% and 68%, respectively (Table 7).

Stroke

- After adjustment for inter-hospital transfers, the age standardised **stroke hospitalisation rate in New Zealand remained relatively static with only a 1% increase in the ten years** from 2010/11 to 2020/11 (Figure 12). Correspondingly, both age-standardised first stroke hospitalisation rates and 5-year stroke readmission rates increased by 1% in the same period.
- **The absolute number of stroke hospitalisations increased by 36% in New Zealand** and by 37% (Table 10) in the Northern region over the same period, suggesting the growth in stroke hospitalisation is mostly related to the growing and ageing population and increasing number of inter-hospital transfers for stroke.
- In 2020/21, the age standardised Māori stroke hospitalisation rate is 39% and 74% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific stroke hospitalisation rate is 62% and 100% higher than European/Other and Asian ethnic group respectively in New Zealand.
- **Age standardised first stroke hospitalisation rates increased by 3% and 16% in Māori and Pacific people** respectively in New Zealand in the ten years from 2010/11 to 2020/11 (Figure 12). This implies a concerning increase in stroke incidence in those populations, and compares to a fall of 6% in Asian and a modest rise of 1% in the European/Other ethnic groups over the same period.
- Age standardised 5-year stroke readmission rates increased by 13% (Figure 13) in Māori but Pacific had an 8% decrease over the same period in New Zealand. However, 5-year stroke readmission rates in Pacific people were 131% higher compared to Asian and 65% higher than the European/Other ethnic group. Furthermore, a more recent 18% increase in the 5-year stroke readmission rates in Pacific people from 2014/15 to 2020/21 is of concern.

Peripheral Vascular Disease

- **The age standardised peripheral vascular disease (PVD) hospitalisation rate fell by 7%** (Figure 16) from 2010/11 to 2020/21 in New Zealand (after adjusted for inter-hospital transfers).
- Alarmingly, the corresponding **Māori and Pacific age standardised PVD hospitalisation rates had increased by 7% and 45%** (Figure 16) respectively over the same time period. This compares to a 26% and 10% fall in PVD hospitalisation rates for Asian and European/Other ethnic groups respectively.
- In 2020/21, the age standardised Māori PVD hospitalisation rate is 57% and 276% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific age standardised PVD hospitalisation rate is 34% and 222% higher than European/Other and Asian ethnic group respectively in New Zealand.
- The total absolute number of PVD hospitalisations has increased by 25% (Table 15) in New Zealand and by 18% in Northern region in the ten years from 2010/11 to 2020/21.
- Nationally, **age standardised first PVD hospitalisation rates fall by 11%** (Figure 17) from 2010/11 to 2020/21 in New Zealand. However, **Māori first PVD hospitalisation rates fall only by 2% with Pacific people had a 36% increase over the same time period.** Asian and European/Other ethnic group fall by 30% and 13% respectively.
- Age standardised 5-year PVD readmission rates fall by 2% (Figure 18) in New Zealand from 2010/11 to 2020/21. However, Māori and Pacific had a 28% and 67% increase in 5-year PVD readmission rates over the same time period.

Chest Pain

- A discharge diagnosis of chest pain is a diagnosis of exclusion (of other important causes of chest pain such as cardiovascular or respiratory disease) rather than total count of number of presentations with chest pain. Nevertheless, chest pain hospitalisation can be helpful proxy of demand of chest pain presentations.
- **The total age standardised chest pain hospitalisation rate increased by 9%** (Figure 19) in New Zealand from 2010/11 (637 per 100,000) to 2020/21 (697 per 100,000). Pacific people have the highest chest pain hospitalisation rate at 1,270 per 100,000 followed by Māori at 923 in 2020/21. Asian have the lowest chest pain hospitalisation rate at 552, while European/Other had 649 per 100,000.
- The absolute number of hospital discharges with a primary diagnosis of chest pain increased by 36% (Table 19) from 2010/11 to 29,068 in 2020/21 in New Zealand and by 42% in the Northern region to 11,537 in 2020/21.
- There were contrasting chest pain hospitalisation trends between Districts. While age standardised Counties Manukau chest pain hospitalisation rates fell by 3% (Table 20) from 2010/11 to 2020/21, Northland, Auckland and Waitemata chest pain hospitalisation rates rose 37%, 21%, and 9% respectively over the corresponding period.
- In 2020/21, the age standardised Māori chest pain hospitalisation rate is 42% and 67% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific age standardised chest pain hospitalisation rate is 94% and 129% higher than European/Other and Asian ethnic group respectively in New Zealand.

Atrial Fibrillation/ Flutter

- The age standardised **atrial fibrillation/ flutter (AF) hospitalisation rate increased by 13%** (Figure 20) from 265 per 100,000 in 2010/11 to 301 in 2020/21 in New Zealand (after adjustment for transfers). Correspondingly, Māori and Pacific people age standardised AF hospitalisation rates increased by 8% and 24% to 398 and 362 per 100,000 respectively in 2020/21. Asian increased by 11% to only 124 per 100,000 2020/21 and European/Other group increased by 16% to 301 per 100,000 in 2021/21.
- In 2020/21, the age standardised Māori AF hospitalisation rate is 30% and 218% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific AF hospitalisation rate is 18% and 190% higher than European/Other and Asian ethnic group respectively in New Zealand.
- **The absolute number of AF hospitalisations increased by 49%** and 46% (Table 21) **in New Zealand** and the Northern Region from 2010/11 to 2020/21. In 2020/21, there were 12,902 hospitalisations with a primary diagnosis code of AF in New Zealand. This compared to 31,603 all AF hospitalisations with either a primary (41%) or secondary diagnosis code (59%) of AF, suggesting AF is a common comorbidity of hospitalisation in patients of presenting with other causes.

Heart Failure

- **The absolute number of HF hospitalisation increased by 47% (Table 23) from 2010/11 to 2020/21 in New Zealand** and 51% in the Northern region.
- The age **standardised heart failure (HF) hospitalisation rate (after adjustment for transfers) increased by 11%** (Table 24) from 238 per 100,000 in 2010/11 to 264 in 2020/21 in New Zealand. Māori, Pacific and European/Other HF hospitalisation rate increased by 6%, 21%, and 7% to 625, 695, and 210 per 100,000 in 2020/21 respectively. However, Asian HF hospitalisation rate fall by 24% to 154 per 100,000 in 2020/21.
- In 2020/21, the age standardised Māori heart failure hospitalisation rate is 198% and 306% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific heart failure hospitalisation rate is 231% and 352% higher than European/Other and Asian ethnic group respectively in New Zealand.
- For people aged 15 to 44, HF hospitalisation rate increased by 73% (Table 25) from 12 per 100,000 in 2010/11 to 21 in 2020/21. This compares to a more moderate relatively increase in the 45 to 65 age group (37% increase) and over 65-year-olds (4% increase) over the same time period.
- The age standardised first HF hospitalisation rate increased by 7% (Figure 23) from 140 per 100,000 in 2010/11 to 149 in 2020/21 in New Zealand. This compares to 17% increase in 5-year HF readmission rates at 115 per 100,000 in 2020/21 (Figure 24).

High Degree Heart Block

- High degree heart block (HB) refers to sick sinus syndrome and 2nd degree HB or above: possible indications for a permanent pacemaker.
- HB is a common co-morbidity that is captured by secondary diagnosis codes (n=1,158) making up 39% of all HB hospitalisations inclusive of all primary and secondary codes (n=2955) in New Zealand in 2020/21.
- **The number of HB hospitalisations (including both primary and secondary diagnosis) increased by 61%** (Table 26) **in New Zealand** and by 50% in the Northern region in the 10 years from 2010/11 to 2020/21.
- The **age standardised HB hospitalisation rate** (after adjustment for transfers) **increased by 28%** (for primary diagnosis only/ Table 27) and by 19% (for all diagnoses/Table 28) in New Zealand from 2010/11 to 2020/21.
- There are contrasting HF hospitalisation trends by District (after adjusted for transfers). Waitemata HB hospitalisation rate increased by 54% (Table 27) from 2010/11 to 2020/21. This compares to a fall of 17% in Auckland, and 10% in Counties Manukau over the corresponding period.
- Pacific people have the highest HB hospitalisation (primary diagnosis) rate at 55 per 100,000 (Figure 25) in 2020/21 in New Zealand, followed by Māori at 38 per 100,000, European/ other at 35 per 100,000, Asian at 24 per 100,000.
- In 2020/21, the age standardised Māori HB hospitalisation rate is 9% and 58% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific HB hospitalisation rate is 57% and 129% higher than European/Other and Asian ethnic group respectively in New Zealand.

Supraventricular Tachycardia

- The total number of hospitalisations with supraventricular tachycardia (SVT) in New Zealand (primary diagnosis) increased by 30% from 2010/11 to 2020/21.
- The **age standardised SVT hospitalisation rate** (after adjusted for transfers) **increased by 6%** in New Zealand from 2010/11 from 40 per 100,000 (Figure 26) to 42 in 2020/21. Pacific people have the highest SVT hospitalisation rate at 82 per 100,000 followed by Māori at 55 per 100,000 in 2020/21. Asian have the lowest SVT hospitalisation rate at 25 per 100,000. This compares to European/Other at 41 per 100,000.
- SVT can be managed symptomatically by medication or potentially cured by ablation procedures particularly for patients with troublesome symptoms from recurrent events. In 2020/21, The age standardised 5-year SVT readmission rate at 14 per 100,000 (Figure 27) in New Zealand is lower than the first SVT hospitalisation rate in New Zealand at 28 per 100,000 (Figure 28).
- The age standardised SVT 5-year readmission rate increased by 10% in New Zealand overall from 2010/11 to 2020/21 (Figure 28). However, Māori and Pacific SVT 5-year readmission rates increased by 25% and 58% respectively over the same period, suggesting possible unmet need in accessing potentially curative treatment.
- In 2020/21, the age standardised Māori SVT hospitalisation rate is 34% and 120% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific SVT hospitalisation rate is 100% and 228% higher than European/Other and Asian ethnic group respectively in New Zealand.

Valvular Heart Disease

- **The age standardised valvular heart disease (VHD) hospitalisation rate** (after adjustment for transfers) **increased by 11%** (Table 36) in New Zealand from 2010/11 to 2020/21. The European/Other VHD hospitalisation rate rose by 15% (Figure 29). This compares to a rise of 1% in Māori, 6% increase in Asian and a fall of 7% in Pacific people over the same period.
- There are contrasting VHD hospitalisation trends by Districts and the variations in inter-hospital transfer rates that may merit further investigation in the difference in clinical treatment thresholds in the context of multimorbidity for valvular heart disease between Districts. For examples, Waitemata and Auckland had increases of 33% and 8% respectively in age standardised VHD hospitalisation rates from 2010/11 to 2020/21 (Table 36). This compares to an opposing trend in Counties Manukau and Northland having falls of 32% and 42% respectively. The variations in age specific VHD hospitalisation rates are more marked for people aged 65 and over, Waitemata and Auckland had 58% (Table 38) and 6% increase VHD hospitalisation rates from 2010/11 to 2020/21. In contrast, Northland and Counties Manukau fell by 41% and 34% respectively over the same period. Waitemata had the highest rate of inter-hospital transfers for VDR in the 65 and over age group (120 per 100,000) (Table 39) in 2020/21. This compared to only 31 per 100,000 in Counties Manukau and 28 per 100,000 in 2020/21.
- In 2020/21, the age standardised Māori VHD hospitalisation rate is 17% and 204% higher than European/Other and Asian ethnic group respectively in New Zealand. Pacific VHD hospitalisation rate is 46% and 278% higher than European/Other and Asian ethnic group respectively in New Zealand. Ethnic differences are more marked in the younger age groups. For examples, between 45 and 64 years, the specific Māori VHD hospitalisation rate is 165% and 324% higher than European/Other and Asian ethnic group respectively in New Zealand. Age specific Pacific VHD hospitalisation rate at 45 to 64 years is 205% and 388% higher than European/Other and Asian ethnic group respectively in New Zealand (Table 37).

Summary of Results

Table 1: Age standardised hospitalisation rates (adjusted for transfers) per 100,000 people in 2020/21- primary diagnosis only

Disease category	Māori	Pacific	Asian	European/ Other	Overall in New Zealand
CHD overall	517	642	345	420	438
First CHD hospitalisation	333	448	239	281	293
5-year CHD readmission	184	195	106	139	145
Stroke overall	443	519	260	320	338
First stroke hospitalisation	349	415	215	258	271
5-year stroke readmission	93	104	45	63	67
PVD overall	192	164	51	122	124
PVD first hospitalisation	117	105	35	70	73
5-year PVD readmission	74	59	17	52	52
Heart failure	625	696	154	210	264
HF first hospitalisation	319	354	90	124	149
5-year HF readmission	306	342	64	86	115
HF aged 15 to 44	64	83	6	8	21
High degree heart block	38	55	24	35	35
Supraventricular tachycardia	55	82	25	41	42
Valvular heart disease	82	102	27	70	72
Atrial fibrillation and flutter	398	362	125	306	301
Chest pain	916	1,256	549	646	693

Note: Boxes highlighted in red have the highest rates with green boxes with the lowest rates for the disease category of interest.

Table 2: Percentage change in age standardised hospitalisation rates (adjusted for transfers) in New Zealand from 2010/11 to 2020/21

Disease category	Māori	Pacific	Asian	European/ Other	Overall in New Zealand
CHD overall	-29%	-18%	-36%	-30%	-30%
First CHD hospitalisation	-23%	-8%	-32%	-23%	-22%
5 year CHD readmission	-38%	-35%	-43%	-42%	-41%
Stroke overall	5%	10%	-9%	0%	1%
First stroke hospitalisation	3%	16%	-6%	1%	1%
5 year stroke readmission	13%	-8%	-21%	-1%	1%
PVD overall	7%	45%	-26%	-10%	-7%
PVD first hospitalisation	-2%	36%	-30%	-13%	-11%
5 year PVD readmission	28%	67%	-17%	-5%	-2%
Heart failure	6%	21%	-24%	7%	11%
HF first hospitalisation	5%	15%	-20%	4%	7%
5 year HF readmission	8%	29%	-30%	12%	17%
HF aged 15 to 44	81%	69%	398%	35%	73%
High degree heart block	24%	29%	1%	30%	28%
Supraventricular tachycardia	9%	25%	22%	7%	6%
Valvular heart disease	1%	-7%	6%	15%	11%
Atrial fibrillation and flutter	8%	24%	11%	16%	13%
Chest pain	7%	16%	13%	10%	10%

Note: Boxes highlighted in red have the highest % change by ethnicity and green boxes with the lowest % change for the disease category of interest. The green coloured circles indicate the age standardised rates were falling from 2010/11 to 2020/21 by more than 10%, yellow circles indicate the rates are falling by less than 1% and red circles indicate the rates are increasing.

Table 3: Percentage increase in the number of total hospitalisations for selected disease categories in New Zealand from 2010/11 to 2020/21 (overall category unadjusted for transfers) aged 15 or above

Disease category	Māori	Pacific	Asian	European/ other	Overall in New Zealand
CHD overall	16%	29%	57%	-13%	-5%
First CHD hospitalisation	25%	41%	64%	-6%	2%
5-year CHD readmission	-1%	-1%	33%	-28%	-22%
Stroke overall	67%	88%	114%	26%	36%
First stroke hospitalisation	64%	83%	118%	24%	34%
5-year stroke hospitalisation	81%	73%	78%	24%	33%
PVD overall	81%	121%	89%	13%	25%
PVD first hospitalisation	63%	105%	79%	8%	18%
5-year PVD readmission	116%	159%	113%	18%	30%
Heart failure	82%	97%	80%	33%	47%
HF first hospitalisation	76%	86%	96%	29%	42%
5-year readmission	85%	113%	57%	40%	55%
HF aged 15 to 44	115%	102%	867%	30%	95%
High degree heart block	87%	117%	190%	67%	73%
Supraventricular tachycardia	47%	90%	88%	18%	30%
Valvular heart disease	59%	37%	127%	51%	53%
Atrial fibrillation and flutter	70%	96%	150%	41%	49%
Chest pain	52%	71%	126%	23%	36%

Change in absolute numbers is one of the sources of information to inform hospital workload.

Table 4: Hospitalisation rate ratios between selected ethnicities in New Zealand in 2020/21

Disease category	Māori compared to Asian	Māori compared to European/ other	Pacific compared to Asian ratio	Pacific compared to European/ other
CHD overall	1.5	1.2	1.9	1.5
First CHD hospitalisation	1.4	1.2	1.9	1.6
5 year CHD readmission	1.7	1.3	1.8	1.4
Stroke overall	1.7	1.4	2.0	1.6
First stroke hospitalisation	1.6	1.4	1.9	1.6
5 year stroke readmission	2.1	1.5	2.3	1.7
PVD overall	3.8	1.6	3.2	1.3
PVD first hospitalisation	3.3	1.7	3.0	1.5
5 year PVD readmission	4.4	1.4	3.5	1.1
Heart failure	4.1	3.0	4.5	3.3
HF first hospitalisation	3.5	2.6	3.9	2.9
5 year readmission	4.8	3.6	5.3	4.0
HF aged 15 to 44	10.7	8.0	13.8	10.4
High degree heart block	1.6	1.1	2.3	1.6
Supraventricular tachycardia	2.2	1.3	3.3	2.0
Valvular heart disease	3.0	1.2	3.8	1.5
Atrial fibrillation and flutter	3.2	1.3	2.9	1.2
Chest pain	1.7	1.4	2.3	1.9

For some conditions Māori and Pacific age standardised hospitalisation rates are several-fold higher than other groups. It is worth noting that the Asian subgroups are heterogenous in regard to health outcomes. For example, South Asians have a higher prevalence of coronary heart disease than other Asians.

Interpretations of findings

While there was a fall in the cardiovascular disease (CVD) hospitalisation rate in New Zealand from 2010/11 to 2020/21 predominantly driven by the fall in coronary heart disease rates, the widening of ethnic disparity in age standardised hospitalisation rates across all categories of cardiovascular disease between Māori/ Pacific people compared to other ethnic groups is of great concern.

In contrast to the consistent fall in first CHD hospitalisation rates (as a proxy of incidence of CHD) nationally from 2010/11 to 2020/21, Māori and Pacific people had a more modest decrease in first CHD hospitalisation rates compared to Asian or European and other groups (Table 2). In the more recent 6 years between 2014/15 and 2020/21, the first CHD hospitalisation rates in fact increased by 9.4% for Pacific people (Figure 4). Furthermore, the unfavourable Māori and Pacific trends (in some cases trending in the opposite direction compared other ethnic groups) in age standardised first stroke (Figure 12) and PVD (Figure 17) hospitalisation rates from 2010/11 to 2020/21 suggest more focus is needed on primary prevention for cardiovascular disease overall. The high prevalence of obesity and diabetes with persistently suboptimal glycaemic control in Pacific people are likely contributors to the increase in incidence of CVD events. Relative persistently high smoking prevalence in Māori in recent years should remain an area of focus. Indeed, tobacco control remain one of the core interventions to reduce CVD events for all ethnic groups.

Both Māori and Pacific populations have young age structures. Young populations with high prevalence of modifiable cardiovascular risk factors almost always have low short term (5 year) CVD risk associated with young age. Given the current CVD guidelines has a predominant focus of pharmaceutical management for people with CVD 5-year risk of 20% or over, young people with modifiable risk factors with low to moderate level of short term cardiovascular risk may inadvertently be offered infrequent review intervals as recommended by the current national CVD guidelines. Acknowledging one off advice and/or intervention often do not result in immediate behavioural change, focus needs to go beyond undertaking CVD risk assessment by providing ongoing behavioural change support to actively manage modifiable risk factors post CVD risk assessment.

The lack of active recommendation (that are aligned with international guidelines) for cardiovascular management (e.g. statin), in low to medium CVD risk group are also possible contributors to the adverse widening trends by ethnicity as providers and patients may mis-interpret the concept of shared decision making. In the absence of active recommendation for treatment for CVD risk factors at the optimal intensity aligned with international guidelines, the concept of shared decision making may lead to misinterpretation of active management of modifiable CVD risk factors in subgroups of (low to) moderate short term CVD risk as discretionary. Since many of the cardiovascular risk factors are asymptomatic until complications occur, it is not intuitive for people with modifiable risk factors to seek ongoing care especially in the context where New Zealand general population have a relatively poor health literacy standard. The need for both opportunistic behavioural change support and proactive recalls to ensure continued support for modifiable risk factors are not clearly spelt out in the current New Zealand CVD risk management guidelines.

Consistent with the international literature, the improved survival with coronary heart disease is associated with an increase in the burden of other cardiovascular conditions such as heart failure, and atrial fibrillation in recent years. The impact of population ageing on number of hospitalisations is greater in conditions more strongly associated with older age, such as heart

failure, heart block, atrial fibrillation, valvular heart disease and stroke having higher absolute increase in the number of hospitalisations (Table 3). The opposing trends in the number of hospitalisations across the cardiovascular conditions described in this report have implications for the workforce planning within cardiovascular services, such as appropriate credentialing to meet a broader range of service demand to provide best practice in the context of increasing prevalence of multi-morbidities, and effective management of long-term conditions.

There may be merit in investigating the reciprocal trends by Districts in age standardised valvular heart disease hospitalisation rates further. The differences in inter-hospital transfer (inpatient transfer) between Districts, and reciprocal age standardised trends for the same ethnic group may suggest there may be differences in interventional threshold on how invasive interventions are offered in the context of multi-morbidity. For example, management of aortic stenosis.

Furthermore, the reciprocal trends on age standardised chest pain hospitalisation rates by District, may also merit review in outpatient chest pain pathways to optimise the model of care in limiting unnecessarily inpatient work-up of chest pain.

Recommendations

1. Better focus on primary prevention of cardiovascular disease by refining national clinical guidelines that aim to optimise population health gain, highlight the need for people-centric care, and troubleshoot common clinical challenges in management by
    a. aligning active recommendation for statin use in primary prevention to international guidelines, at around 5% 5-year macrovascular risk to optimise population health gain that has shown to be highly cost effective.
    b. Setting the expectations that are needed to deliver people-centric care
        i. Every single health service contact is considered as an opportunity to support behavioural change. The health sector needs to approach cardiovascular risk assessment as a start of conversation but not an end point. The emphasis should be on ongoing behavioural change support at all health service contacts as appropriate to modify risk factors rather than directing the sector to focus on the CVD assessment events only
        ii. Modify multiple risk factors as a packaged care, including common metabolic risk factors and other associated long term conditions (e.g. gout)
        iii. Active consideration of both microvascular risk and macrovascular risk for an individual, e.g. low macro-CVD risk for a young person does not mean aggressive management of early onset diabetes nephropathy is not needed
        iv. Clarify the need for active recommendations aligned with international guidelines in the context of shared decision making.
    c. Troubleshooting common clinical challenges in management, e.g. collating clinical pearls on the management of CVD risk in a context of a range of common comorbidities. For examples, beta-blockers use in people with chronic obstructive pulmonary disease, nocebo effects with statins, refining treatment regimens to limit side effects, and dose titration.
2. Optimise gains from secondary CVD prevention
    a. Prescribing medicine at hospital discharge: better visibility of discharge medications post-stroke or PVD diagnosis as well as significant number of coronary heart disease

hospitalisations currently not recorded in the "All of New Zealand, Acute Coronary Syndrome – Quality Improvement" (ANZACSQI Registry) database.

   b. Continuity of management at optimal intensity, that includes dose titration, regimen escalation and behaviour change support in modifying risk factors.
   c. Clinical guidelines to support optimal care in the context of multi-morbidity.

3. Develop and refine infrastructure and processes to ensure continuity of care and management
   a. Long term condition population 'register' with clinically actionable alerts sourced from whole of system information that is accessible at various points of care along the entire person's health service journey.
   b. Proactive recalls and opportunistic care are part of the core components of services to ensure continuity of care. Flexibility on how and whom the proactive recalls and opportunistic care are provided as long as they are delivered in a co-ordinated way.
4. Better use of information technology to better support clinical workflow, and service improvement. (e.g. to limit the administrative burden of triaging, better identification process of people who need to be seen urgently in an outpatient setting).
5. Given the variations in hospitalisation trends, by different disease categories, workforce planning and credentialing and service development should consider alignment with the amenable burden of disease
6. Evaluate models of care with an aim to optimise service delivery, e.g. chest pain clinic.
7. Consider investigating the more rapid rise in HF hospitalisation rates in the younger age groups to understand the underlying drivers e.g. substance abuse/amphetamine-induced cardiomyopathy.
8. Investigate District-level variations in valvular heart disease intervention rates and consider standardising intervention threshold of valvular heart disease in the context of multi-morbidity, particularly in people with significant non-cardiovascular co-morbidity.
9. Rapidly implement the measures outlined in the Smokefree Environment Amendment Bill currently in the parliamentary process.
10. Actively develop and evaluate environmental policies in preventing and reducing the burden of diabetes, obesity and subsequent complications like cardiovascular disease as per recommendation in the prior diabetes report.[1]

[1] Chan WC, Lee M, Papaconstantinou D, (2020) Understanding the heterogeneity of the diabetes population in Metro Auckland in 2018. Auckland: Counties Manukau Health. https://www.countiesmanukau.health.nz/assets/About-CMH/Reports-and-planning/Diabetes/2020_Understanding_the_Heterogeneity_of_the_diabetes_pop.pdf

Socioeconomic deprivation has a strong association with diabetes prevalence in addition to the ethnic disparities. People living in the most socioeconomically deprived areas have a 3.6-fold higher age standardised diabetes prevalence (12.1%) compared to people living in the least deprived areas (3.4%) as defined by NZDep2013 quintiles. Within each ethnic group there is a socioeconomic gradient. Age standardised Māori diabetes prevalence for those living in the least and most deprived areas are 5.6% and 12.1% respectively. The substantial differences in diabetes prevalence by geographic areas suggest environmental policies have a significant potential in preventing and reducing the burden of diabetes and obesity.

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Methods

The hospitalisation data is sourced from the National Minimum Dataset (NMDS), Ministry of Health. This report examines publicly funded public and private hospital events. Privately funded hospital events are not included.

Analyses were stratified by Districts[2] of domicile with a focus on Northern region and Counties Manukau Districts, and prioritised ethnicity (Māori, Pacific, Asian and European/Other), for adults aged 15 years and above. Casemix restrictions are applied, and both acute and elective events are included.

Inter-hospital transfers are common for people with cardiovascular disease. Transfers refer to two or more continuous hospital events with the same disease category for the same patient in different hospital locations. Continuous hospital events can be defined as the same date of admission and date of discharge, and may include "transfer from" or "transfer to" codes, the earlier events are labelled as transfers. For example, first hospital primary diagnosis of I21 at discharge (CHD), and second continuous episode has a primary discharge code of I24 (the same CHD category) and if either episode has a transfer from and transfer to code then the first episode is labelled as a transfer. After adjustment for transfers, discharges are labelled as readmissions if the same person had a prior admission of the same cardiovascular disease subcategory in the past 5 years.

The numerator is the number of hospitalisations for adults (15+ years old) (based on primary diagnosis unless otherwise stated) and the denominator is the estimated resident population[3] residing in the relevant District. The direct method of age-standardisation is used, based on the age structure of the 2018 estimated resident population in New Zealand sourced from Statistics NZ. Age standardisation adjusts the rates of cardiovascular related disease to account for changes in the number of people and age structure in a population over time. It allows the comparison of rates from one year to another and fair comparisons between ethnicities.

This report includes a range of descriptive analyses, noting where the patterns of change can be explained by a range of underlying factors, i.e. changes in access to services. The observed trends may be useful to inform service planning and delivery. It is also important to note that while average changes over the 2010/11-2020/21 period are commented on, the changes from year to year were not necessarily linear, and may also be influenced by small numbers of cases for some conditions.

[2] Previously known as DHBs (District Health Boards) – the terminology 'District' is used to designate the people living in the geographic area formerly covered by the DHB

[3] Estimated resident population / population projections sourced from Stats NZ (MOH 2021 customised version) with retrospective realignment of prior population projections by Stats NZ

Cardiovascular disease (CVD) includes ischemic heart disease, stroke and peripheral vascular disease. They are often grouped together as the underlying risk factors are generally similar. Peripheral vascular disease has a stronger association with tobacco smoking. Atrial fibrillation and hypertension are more strongly associated with stroke. Other selected cardiovascular related disease examined in this report are listed as follows:

Definitions

Cardiovascular disease (CVD)	• Coronary heart disease ▪ Acute coronary syndrome • Stroke • Peripheral vascular disease
Other selected cardiovascular related disease	• Ischemic heart disease • Stroke • Peripheral vascular disease • Atrial fibrillation and flutter • Chest pain • Congestive heart failure • High degree heart block • Supraventricular tachycardia • Valvular heart disease

Appendix A lists the respective ICD diagnostic codes.

The report is laid out with each condition as a separate section. Volumes of hospitalisations in the Northern Region Districts are examined first, followed by age-standardised rates. For ethnicity comparisons all New Zealand rates are used to provide additional statistical stability. Where relevant analyses are carried out

1. to separate transfers from routine admissions
2. to separate first admissions from readmissions (using a 5-year window to define the readmission view). First admissions can be used as a proxy for incidence
3. to separate those with the condition listed as a principal diagnosis (as opposed to a comorbidity/secondary diagnosis).

Results

Coronary Heart Disease (CHD)

Table 5 shows the number of hospitalisations are the highest in Waitemata District, followed by Counties Manukau, Auckland, and lastly, Northland. Initially, the total CHD hospitalisations in Northland were lower than Auckland but surpassed Auckland in 2016. This is predominantly related to the increase in transfers in Northland as Table 6 shows the number of CHD hospitalisations after adjustment for transfers. From 2010/11 to 2020/21, the numbers increased by 36% and 5% (Table 5) for Northland and Waitemata, respectively. The numbers for Counties Manukau and Auckland decreased by -7% and -2% over the same time period.

Table 5 Total number of hospitalisations for CHD in adults (15+ years old) in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Total - Northern Region
2010/2011	1,182	2,977	1,280	1,980	7,419
2011/2012	1,209	3,156	1,253	2,044	7,662
2012/2013	1,233	3,167	1,333	1,839	7,572
2013/2014	1,193	3,119	1,203	1,896	7,411
2014/2015	1,059	2,842	1,104	1,730	6,735
2015/2016	1,218	3,041	1,106	1,769	7,134
2016/2017	1,421	3,130	1,142	1,719	7,412
2017/2018	1,384	3,091	1,255	1,765	7,495
2018/2019	1,544	2,925	1,227	1,886	7,582
2019/2020	1,448	2,858	1,147	1,915	7,368
2020/2021	1,602	3,119	1,253	1,841	7,815
2010/11-2020/21	36%	5%	-2%	-7%	5%

Table 6 Number of hospitalisations for CHD in adults (excluding inter-hospital transfers) for adults (15+ years old) in the Northern Region Districts, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	903	2,242	1,246	1,785
2011/2012	890	2,333	1,212	1,767
2012/2013	930	2,418	1,292	1,615
2013/2014	878	2,456	1,171	1,649
2014/2015	775	2,219	1,071	1,473
2015/2016	850	2,242	1,087	1,493
2016/2017	1,000	2,291	1,130	1,475
2017/2018	982	2,316	1,231	1,495
2018/2019	1,089	2,143	1,200	1,613
2019/2020	1,011	2,118	1,129	1,635
2020/2021	1,132	2,281	1,222	1,557
2010/11-2020/21	25%	2%	-2%	-13%

Table 7 shows the absolute number of transfers for CHD is the highest in Waitemata (n=838), followed by Northland (n=470), Counties Manukau (n=284) and lastly, the lowest in Auckland (n=31). In 2020/21, inter-hospital transfers accounted for 27% of total CHD hospitalisations in Waitemata District. This compares to 29% in Northland, 15% in Counties Manukau, and only 2% in Auckland (Table 8).

Specifically, the transfers increased by 68% in Northland, 46% in Counties Manukau, 14% in Waitemata and decreased by -9% in Auckland from 2010/11 to 2020/21. The number of transfers in Waitemata and Counties Manukau have remained constant in the last 5 to 6 years. This is compared to Northland on the rise since 2016 and Auckland remaining the same.

Table 7 Number of transfers for CHD in adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Totals excluding Auckland
2010/2011	279	735	34	195	1,209
2011/2012	319	823	41	277	1,419
2012/2013	303	749	41	224	1,276
2013/2014	315	663	32	247	1,225
2014/2015	284	623	33	257	1,164
2015/2016	368	799	19	276	1,443
2016/2017	421	839	12	244	1,504
2017/2018	402	775	24	270	1,447
2018/2019	455	782	27	273	1,510
2019/2020	437	740	18	280	1,457
2020/2021	470	838	31	284	1,592
2010/11 to 2020/21	68%	14%	-9%	46%	32%

Table 8 shows the proportion of CHD hospitalisation that were inter-hospital transfers for the whole country. The 3 main tertiary centres (Auckland, Wellington and Canterbury) have the lowest percentage of inter-hospital transfers for CHD hospitalisation. The Districts with the highest % of inter-hospital transfers either do not have a cardiac cath lab in their local hospital(s), and/or have a number of sister hospitals across number of sites. There are variations in the proportions of transfers in Districts where there is no local access to cardiac cath lab, suggesting there may be geocode variations in the invasive management of CHD or differences in model of care that may merit further exploration (e.g. Northland at 29% vs West Coast at 22%). Furthermore, there had been a gradual increase in the percentage of inter-hospital transfers in many Districts over the observed period. This is likely to be reflection of the preferred invasive management to acute coronary syndrome.

Table 8: % of total coronary heart disease hospitalisation that were inter-hospital transfers by District of domicile from 2011/12 to 2020/2021 (the number of transfers in brackets)

District	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021
Northland	24% (519)	26% (558)	25% (518)	26% (581)	27% (562)	30% (638)	30% (718)	29% (733)	29% (805)	30% (789)	29% (809)
Waitemata	25% (1,282)	26% (1,361)	24% (1,426)	21% (1,352)	22% (1,317)	26% (1,535)	27% (1,588)	25% (1,522)	27% (1,582)	26% (1,490)	27% (1,690)
Auckland	3% (110)	3% (138)	3% (116)	3% (103)	3% (100)	2% (97(	1% (84)	2% (88)	2% (106)	2% (90)	2% (103)
Counties Manukau	10% (387)	14% (529)	12% (461)	13% (522)	15% (497)	16% (530)	14% (589)	15% (636)	14% (679)	15% (672)	15% (642)
Waikato	7% (256)	9% (331)	7% (276)	8% (275)	8% (292)	8% (325)	7% (324)	9% (388)	8% (380)	7% (369)	7% (363)
Lakes	28% (355)	24% (304)	29% (384)	27% (356)	31% (326)	31% (392)	30% (427)	29% (413)	33% (418)	34% (410)	28% (377)
Bay of Plenty	22% (422)	21% (411)	17% (372)	18% (365)	17% (333)	19% (334)	16% (363)	15% (333)	16% (379)	15% (358)	13% (366)
Tairawhiti	26% (135)	25% (131)	26% (129)	25% (126)	24% (96)	28% (124)	28% (112)	27% (114)	29% (138)	25% (133)	27% (167)
Taranaki	14% (260)	11% (209)	16% (292)	16% (262)	19% (290)	18% (268)	23% (344)	23% (356)	26% (381)	22% (367)	20% (365)
Hawkes Bay	19% (304)	22% (389)	21% (320)	22% (339)	22% (351)	26% (365)	26% (365)	27% (404)	27% (466)	25% (398)	24% (382)
Mid-Central	18% (354)	15% (241)	19% (321)	18% (274)	19% (241)	22% (317)	22% (362)	23% (328)	25% (392)	20% (287)	22% (327)
Whanganui	16% (145)	19% (141)	21% (162)	23% (193)	20% (156)	23% (156)	22% (171)	26% (172)	25% (228)	24% (209)	23% (212)
Capital & Coast	4% (163)	3% (133)	3% (82)	3% (75)	3% (73)	3% (47)	2% (38)	2% (38)	3% (65)	2% (42)	1% (45)
Hutt Valley	29% (345)	28% (304)	33% (372)	28% (316)	30% (321)	33% (362)	35% (418)	35% (404)	34% (385)	32% (377)	32% (382)
Wairarapa	21% (109)	26% (128)	24% (119)	24% (111)	21% (95)	22% (117)	24% (122)	24% (130)	23% (90)	25% (119)	26% (138)
Nelson Marlborough	12% (210)	14% (249)	11% (202)	12% (160)	15% (264)	11% (188)	14% (224)	11% (180)	12% (169(	14% (220)	14% (258)
West Coast	18% (58)	22% (78)	25% (76)	23% (73)	22% (60)	22% (59)	21% (71)	21% (103)	22% (97)	22% (81)	22% (103)
Canterbury	2% (118)	3% (109)	3% (121)	3% (130)	3% (141)	2% (113)	3% (140)	3% (131)	3% (124)	3% (112)	3% (109)
South Canterbury	20% (163)	19% (172)	22% (182)	21% (163)	20% (151)	22% (179)	22% (152)	22% (136)	24% (187)	22% (161)	22% (169)
Southern	9% (204)	10% (232)	12% (291)	11% (297)	8% (218)	11% (287)	11% (310)	11% (258)	11% (257)	10% (263)	11% (310)
Total NZ	15% (5,910)	15% (6,248)	15% (6,222)	15% (6,073)	15% (5,884)	17% (6,433)	17% (6,922)	17% (6,867)	18% (7,328)	17% (6,947)	17% (7,318)

After adjusted for inter-hospital transfers for CHD, compared to other Districts in the Northern Region and NZ total, Counties Manukau experienced the largest decrease (-38%) in CHD hospitalisation rate from 2010/11 to 2020/21. Northland, Waitemata and Auckland decreased by -12%, -25%, and -24% respectively, over the same period.

Table 9 Age-standardised CHD hospitalisation rates (adjusted for transfers) per 100,000 adults (15+ years old) by District in the Northern Region and NZ, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand
2010/2011	662	619	465	639	622
2011/2012	625	625	438	606	603
2012/2013	634	622	458	540	576
2013/2014	584	613	402	537	542
2014/2015	496	537	360	461	495
2015/2016	527	530	358	451	492
2016/2017	592	529	363	431	496
2017/2018	563	518	387	422	471
2018/2019	599	468	371	439	459
2019/2020	546	447	339	431	437
2020/2021	581	464	354	395	438
2010/11 to 2020/21	-12%	-25%	-24%	-38%	-30%

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Overall, first CHD hospitalisation rates are decreasing for Counties Manukau, Waitemata and Auckland (Figure 1). Northland has been on the rise since 2015/16. While there has been an overall decrease in 5-year CHD readmission rates in the Northern region Districts (Figure 2), the flattening trend in CHD readmission since 2015/16 in Northland is different from the rest of the Districts in the Northern region.

The decrease in the longer term readmission rates may be attributable to more aggressive (and timely) invasive coronary interventions in recent years. The use of cardiovascular medication in both primary and secondary remained relatively static. The gradual fall in tobacco smoking prevalence would also contribute to the fall in both first and readmission of CHD.

Figure 1 Age-standardised first CHD hospitalisation rate per 100,000 adults (15+ years old) by Districts in the Northern Region, 2010/11 to 2020/21

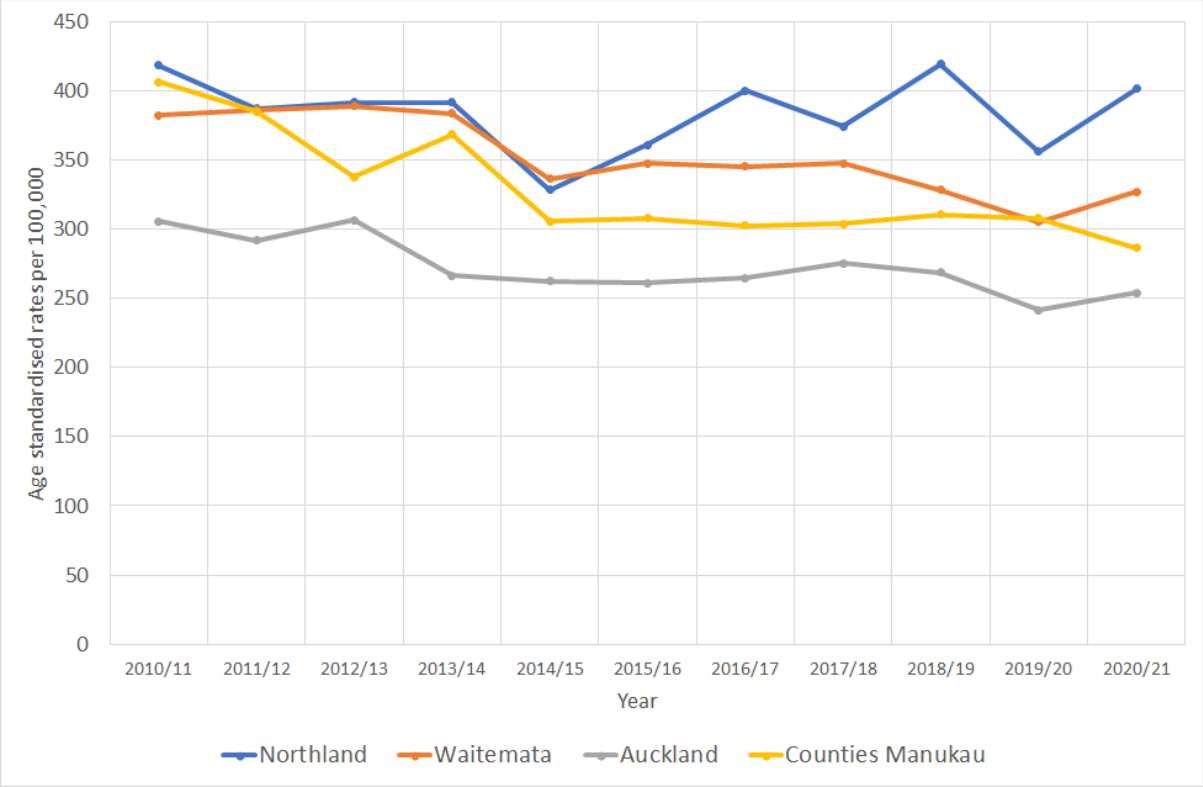
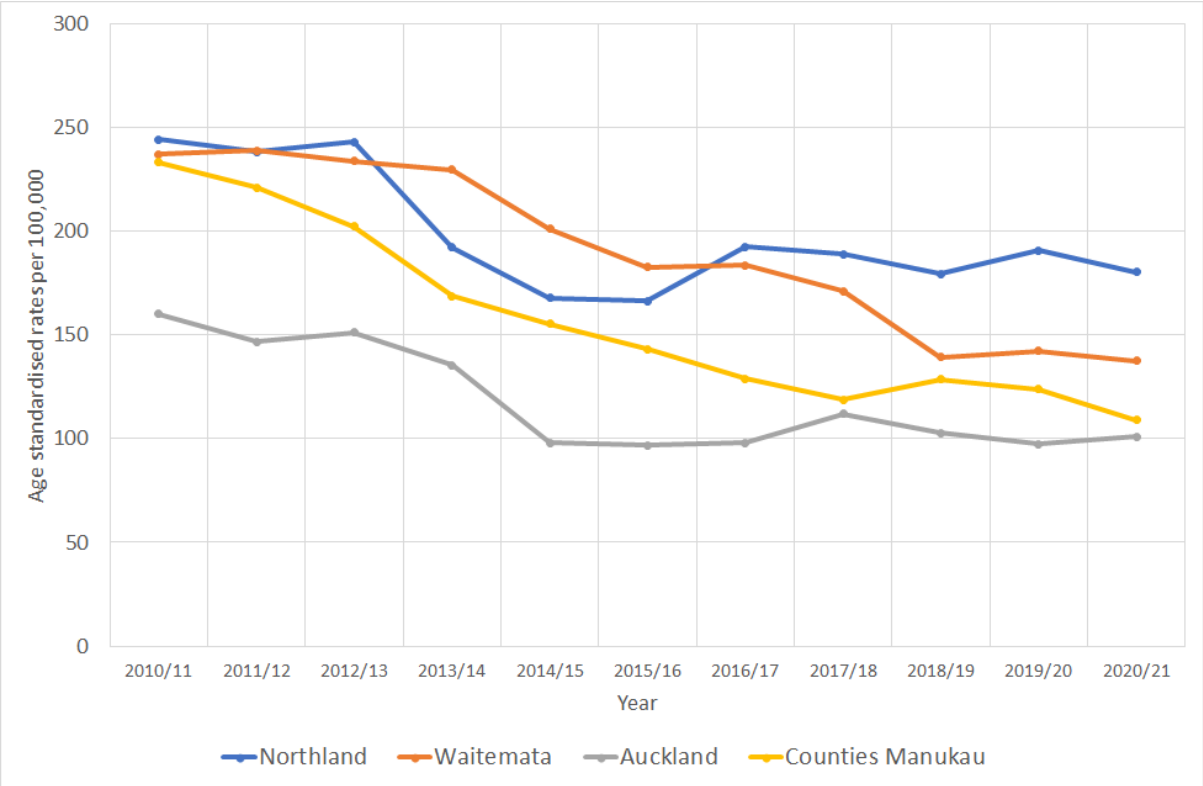


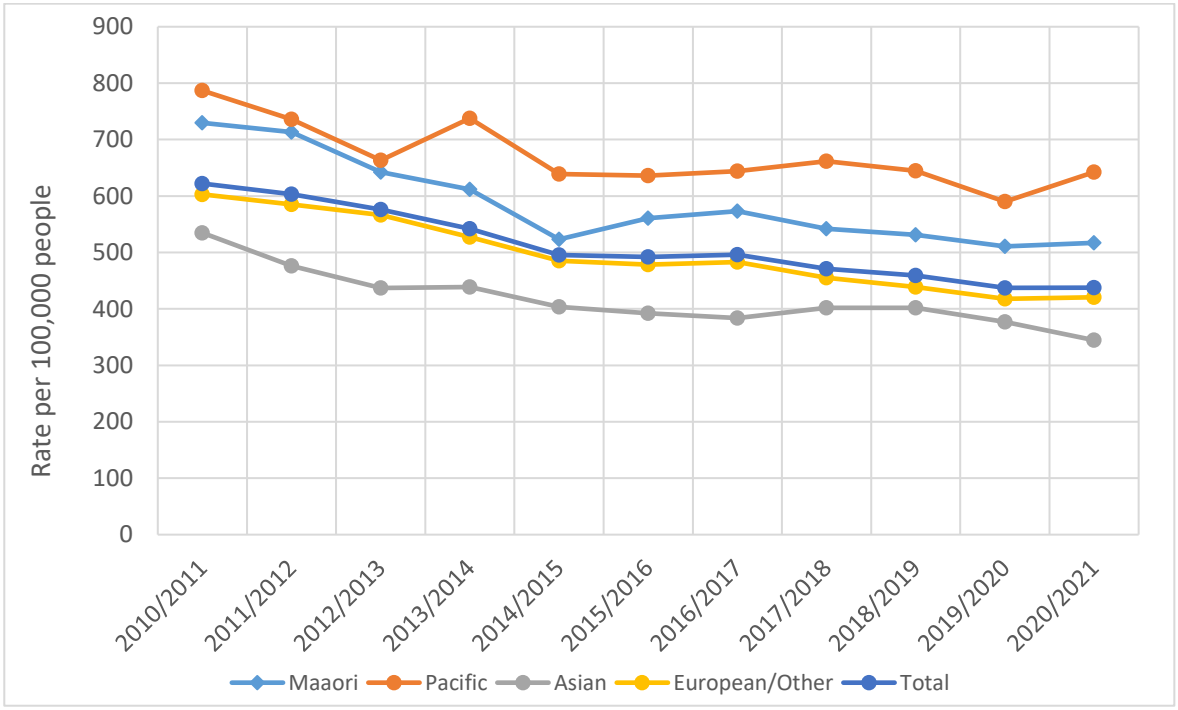
Figure 2 Age-standardised 5-year CHD readmission rate per 100,000 adults (15+ years old) by Districts in the Northern Region, 2010/11 to 2020/21



Age standardised CHD hospitalisation rates in New Zealand by ethnicity

The New Zealand age-standardised CHD hospitalisation rates are highest in Pacific, followed by Māori, European/Other and lastly Asian after adjusted for transfers (Figure 3).

Figure 3 Age-standardised CHD hospitalisation rates (adjusted for transfer) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Note: total refers to the New Zealand age standardised rates

Similar to the initial decrease in CHD hospitalisations, first CHD hospitalisation rates overall decreased from 2010/11 to 2014/15 but the rate of decrease had slowed since 2014/15 (Figure 4). It is of concern that the Pacific first CHD hospitalisation rates had trended upwards, by 9.4% from 2014/15 to 2020/21. This compares to a fall of 3.5%, 11.6% and 7.8% for Māori, Asian, and European/Other ethnic group in the same corresponding period.

Overall, age standardised 5-year CHD readmission rates had fallen by 41% in New Zealand, ranging from a fall of 35% for Pacific people, 38% in Māori, 42% in European/other, to 43% in Asian (Figure 5).

Figure 4 Age-standardised first CHD hospitalisation rate per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21

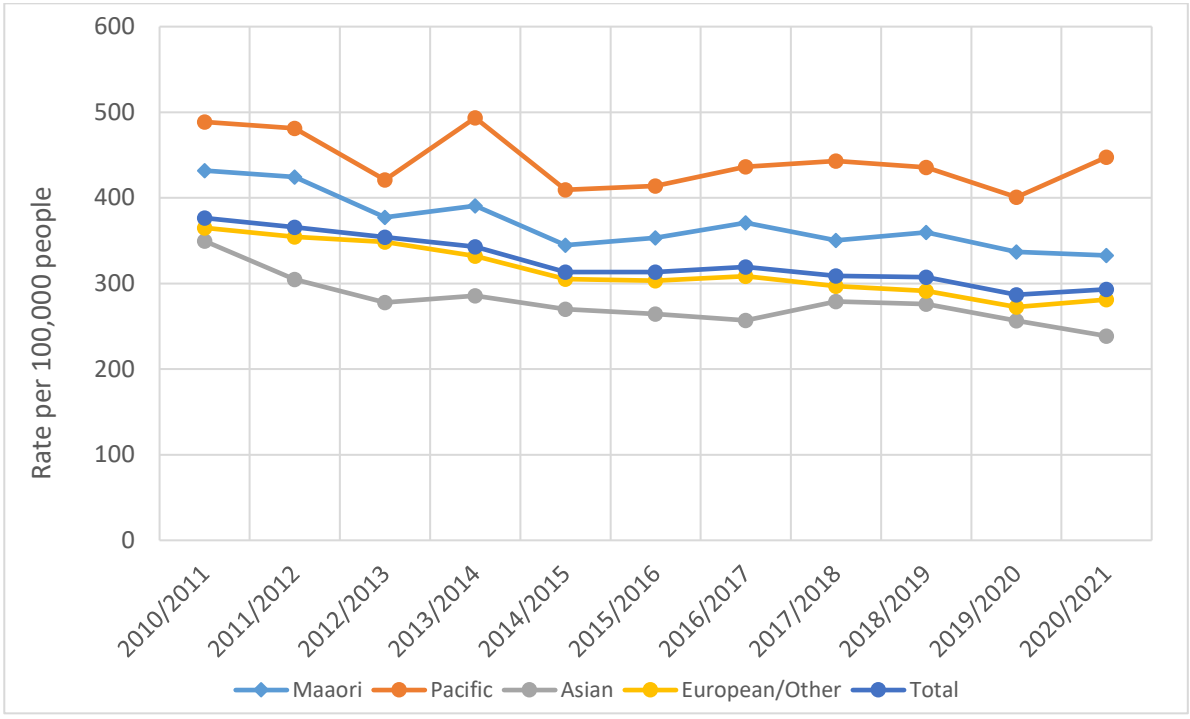
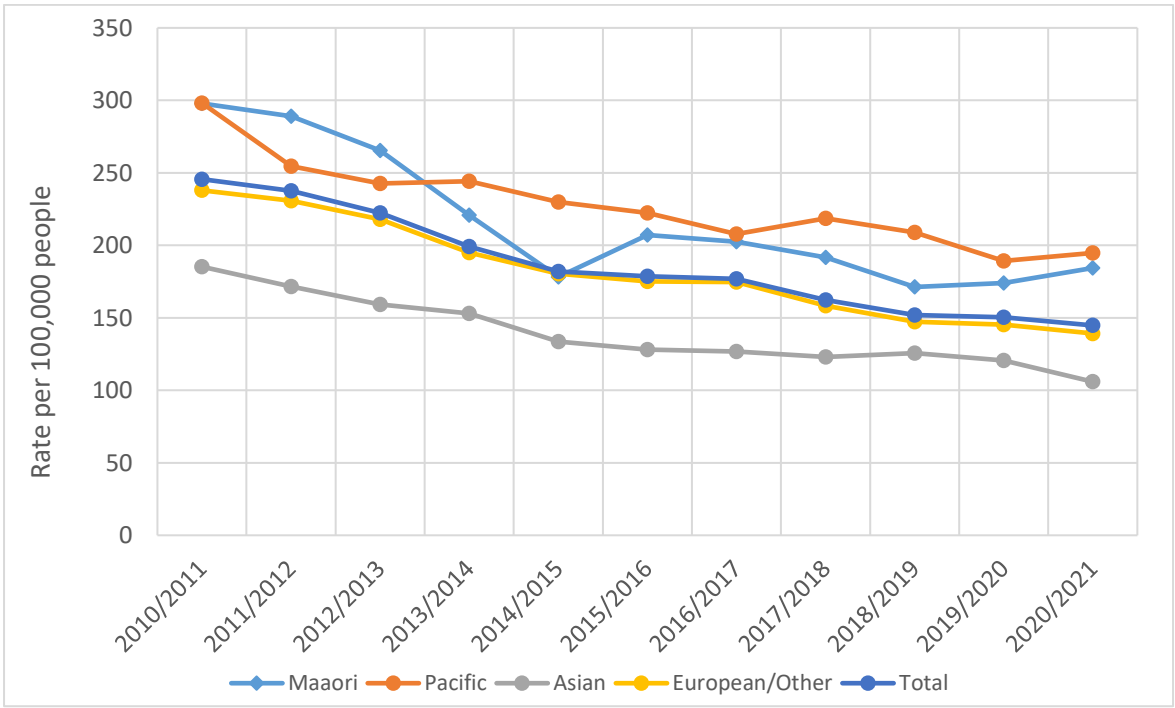


Figure 5 Age-standardised 5-year CHD readmission rate per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Age standardised acute coronary syndrome hospitalisation rates in New Zealand by ethnicity

Acute coronary syndrome (ACS) is an important subgroup of coronary heart disease that often requires urgent hospital treatment. Acute coronary syndrome accounted for 67% of total coronary heart disease hospitalisation (primary diagnosis) in New Zealand for people aged 15 and over in 2020/21. Over 76% of all (including both primary and secondary diagnoses) ACS hospitalisations were primary diagnosis. Trends of ACS by ethnicity are similar to that of CHD applying the same methods to define first hospitalisation and 5-year readmission rates. Māori and Pacific age-standardised first ACS hospitalisation rate have a flattening or rising trend in since 2014/15.

Figure 6 Age-standardised first ACS hospitalisation rate per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21 (primary diagnosis)

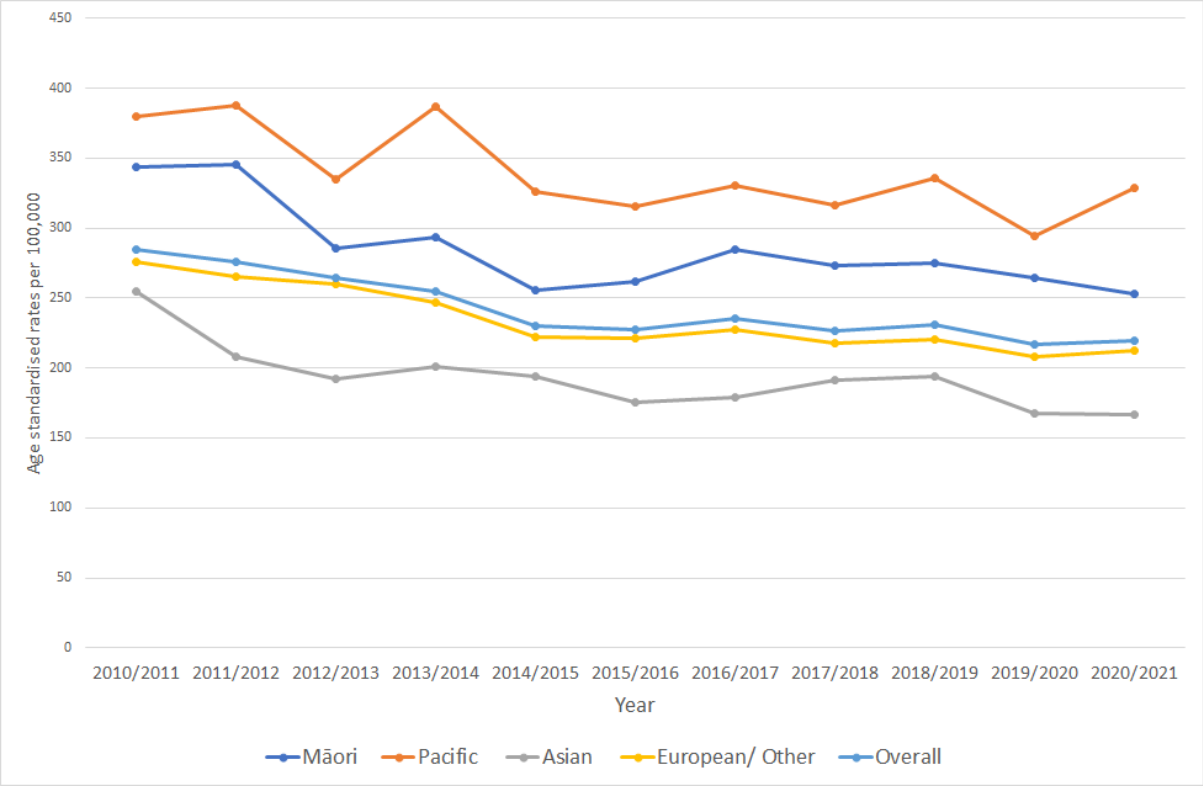


Figure 7 Age-standardised first ACS hospitalisation rate per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21 (primary and secondary diagnoses)

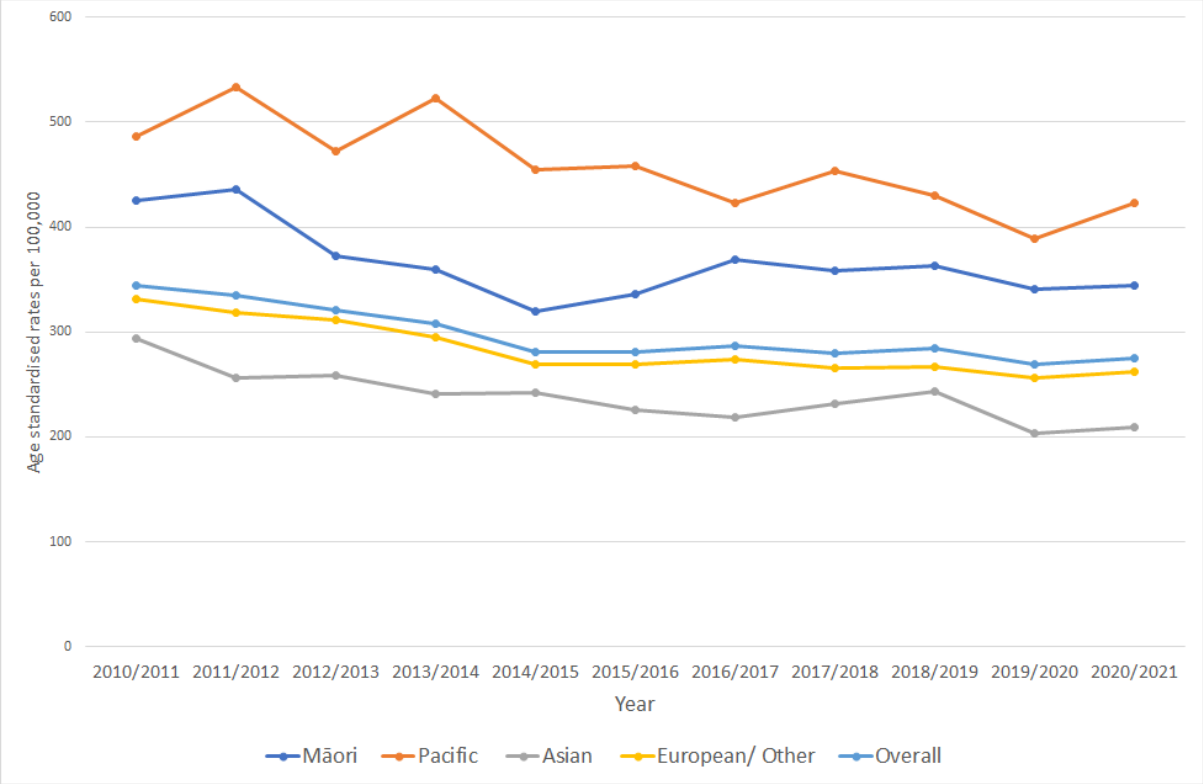


Figure 8: Age-standardised 5-year ACS readmission rate per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21 (primary diagnoses only)

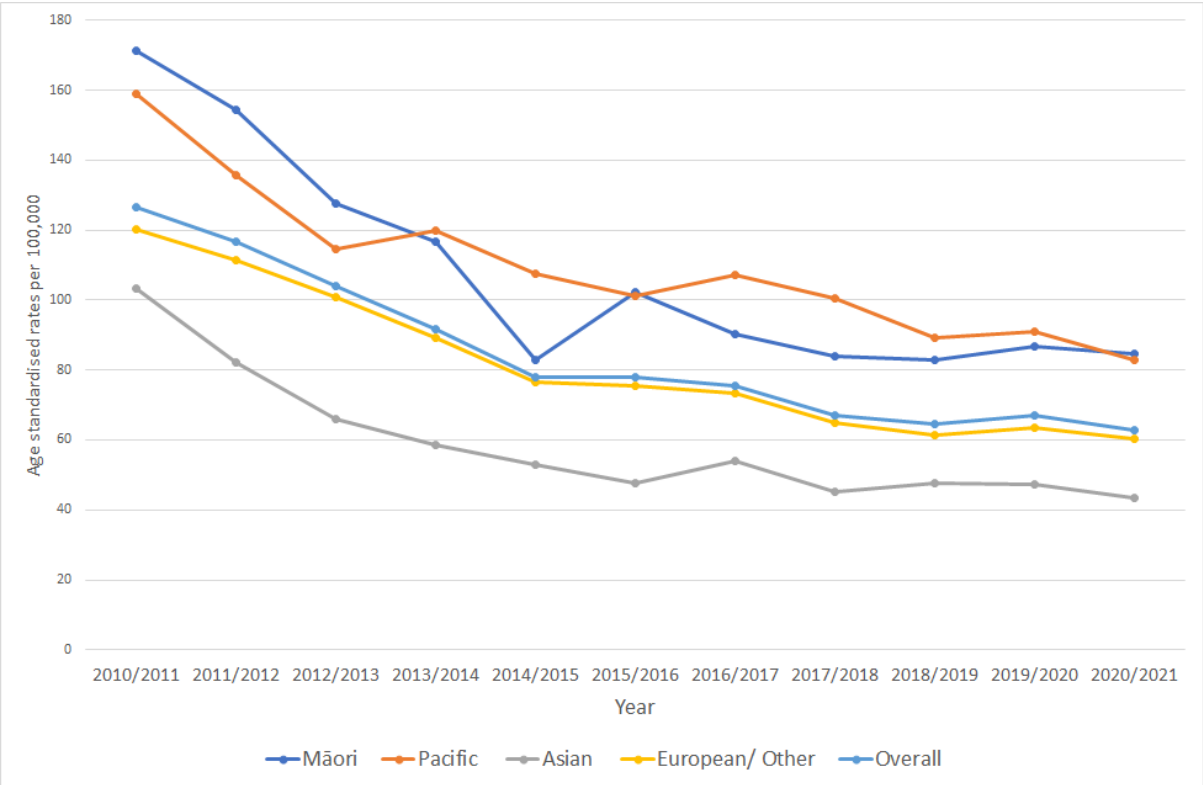
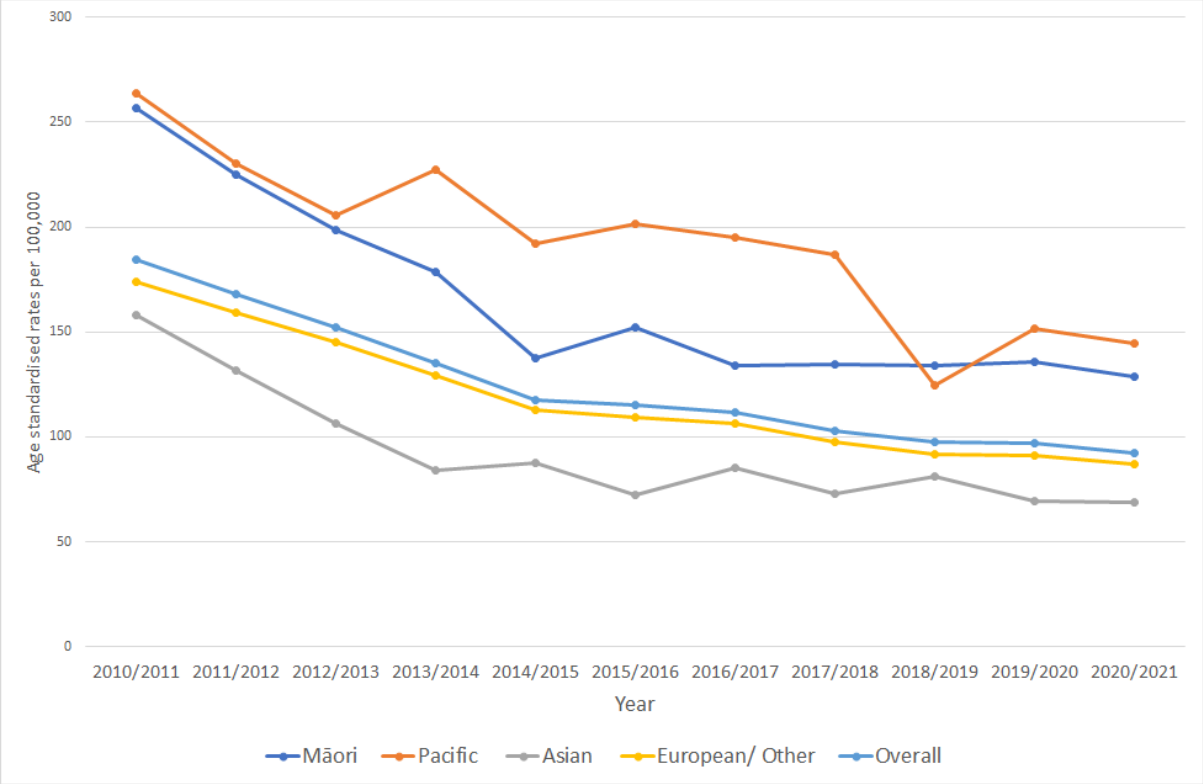


Figure 9 Age-standardised 5-year ACS readmission rate per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21 (primary and secondary diagnoses)



Stroke

Stroke includes both haemorrhagic and ischemic subtypes of stroke. Transient cerebral ischaemic attacks are included. From 2010/11 to 2020/21, the total numbers of stroke hospitalisations increased by 40%, 38%, 18% and 49% in Northland, Waitemata, Auckland and Counties Manukau, respectively (Table 10). The increases were mostly related to demographic changes (growing and ageing population), and increases in the number of inter-hospital transfers outside of Auckland District since 2016/17.

Since 2016/17, the increase in the number of inter-hospital transfers accounted for 16%, 24%, 4% and 13% of the overall increase in Northland, Waitemata, Auckland and Counties Manukau respectively. After adjusting for inter-hospital transfers and demographic changes, the age standardised stroke hospitalisation rates from 2010/11 to 2020/21 increased by 1% in Northland, but decreased by 3% in Waitemata, 9% in Auckland, and 1% in Counties Manukau respectively (Table 14).

Table 10 Total number of hospitalisations for stroke in adults (15+ years old) by Districts in the Northern Region and New Zealand, 2010/11 to 2020/21 (primary diagnosis)

	Northland	Waitemata	Auckland	Counties Manukau	Total - Northern Region	New Zealand
2010/2011	514	1,399	869	1,059	3,841	11,302
2011/2012	637	1,427	877	1,151	4,092	11,937
2012/2013	545	1,436	876	1,195	4,052	11,986
2013/2014	575	1,470	924	1,238	4,207	12,183
2014/2015	608	1,399	843	1,207	4,057	12,156
2015/2016	653	1,528	918	1,205	4,304	12,275
2016/2017	643	1,605	930	1,362	4,540	13,113
2017/2018	763	1,679	1,019	1,418	4,879	13,925
2018/2019	700	1,772	956	1,525	4,953	14,302
2019/2020	748	1,711	879	1,461	4,799	14,124
2020/2021	720	1,925	1,027	1,581	5,253	15,376
2010/11-2020/21	40%	38%	18%	49%	37%	36%

Table 11 shows the number of transfers across the Northern Region increasing significantly for Waitemata (99% from 2010/11 to 2020/21) and Counties Manukau (240%). In Counties Manukau, the hospitalisations increased sharply in 2017 and continued to increase gradually, whereas Waitemata has a gradual increase of transfers. One of the treatments for stroke is clot retrieval. This service is provided in Auckland City Hospital, hence, a number of transfers from Counties Manukau and Waitemata to Auckland City Hospital. Thus, Auckland District residents have the lowest number of transfers as well as a relatively small increase in transfers of 13% over the same time period.

Interhospital transfers account for 11%, 12%, 2.5% and 9.7% of overall stroke hospitalisations in Northland, Waitemata, Auckland and Counties Manukau respectively in 2020/21.

Table 11 Total number of transfers for stroke in adults (15+ years old) in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	66	116	23	45
2011/2012	74	125	25	79
2012/2013	64	132	14	71
2013/2014	67	144	20	100
2014/2015	91	107	17	59
2015/2016	78	133	26	51
2016/2017	67	154	22	125
2017/2018	96	189	20	144
2018/2019	89	203	33	164
2019/2020	101	193	21	179
2020/2021	79	231	26	153
2010/11 - 2020/21	20%	99%	13%	240%

Across the Northern Region, the age standardised stroke hospitalisation rates have remained relatively flat except for Counties Manukau increasing by 5% (driven mostly by transfers) and Auckland decreasing by -8% from 2010/11 to 2020/21 (Table 12).

Table 12 Age-standardised stroke hospitalisation rate per 100,000 adults (15+ years old) in the Northern Region, 2010/11 to 2020/21 (including transfers)

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	379	387	329	389
2011/2012	454	384	323	404
2012/2013	380	372	312	408
2013/2014	385	369	322	409
2014/2015	395	344	286	387
2015/2016	410	364	306	373
2016/2017	388	373	300	404
2017/2018	444	378	324	413
2018/2019	391	389	299	427
2019/2020	406	363	268	392
2020/2021	376	392	301	409
2010/11 - 2020/21	-1%	1%	-8%	5%

Specifically, Table 13 shows an upwards trend in the absolute number of non-transfer hospitalisations across the Northern Region Districts and Table 14 shows the age standardised stroke hospitalisation rate (after adjusted for transfers) falling in Waitemata (-3%), Auckland (-9%) and Counties Manukau (-1%). This indicates the overall increase (Table 12) for Waitemata and Counties Manukau is in part due to an increase in transfers. Additionally, the growth in absolute numbers was expected from demographic growth.

Table 13 Total number of stroke hospitalisations (excluding transfers) in adults (15+ years old) in the Northern Region Districts, 2010/11 to 2020/21

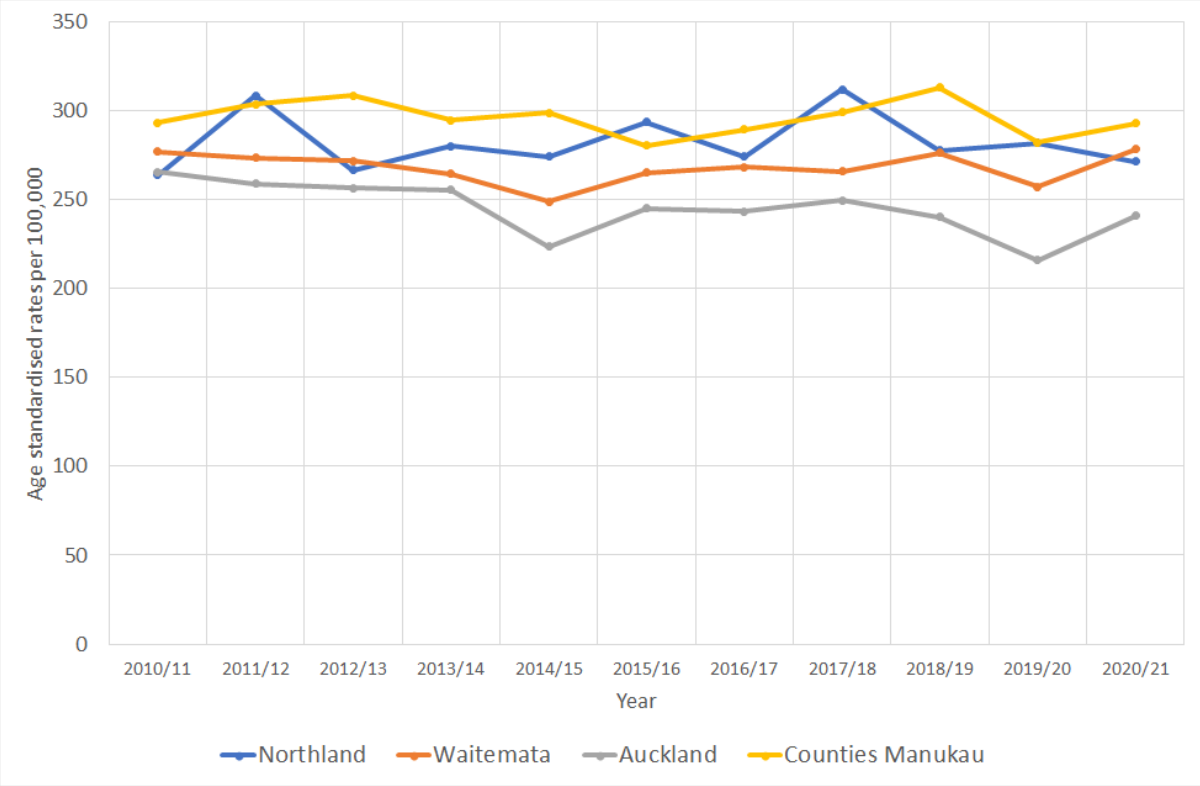
	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	448	1,283	846	1,014
2011/2012	563	1,302	852	1,072
2012/2013	481	1,304	862	1,124
2013/2014	508	1,326	904	1,138
2014/2015	517	1,292	826	1,148
2015/2016	575	1,395	892	1,154
2016/2017	576	1,451	908	1,237
2017/2018	667	1,490	999	1,274
2018/2019	611	1,569	923	1,361
2019/2020	647	1,518	858	1,282
2020/2021	641	1,694	1,001	1,428
2010/11 - 2020/21	43%	32%	18%	41%

Table 14 Age-standardised stroke hospitalisation rate (excluding transfers) for adults (15+ years old) in the Northern Region Districts, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	331	357	321	375
2011/2012	402	352	314	379
2012/2013	336	340	307	387
2013/2014	340	334	315	378
2014/2015	335	318	281	370
2015/2016	360	333	298	359
2016/2017	347	337	294	370
2017/2018	387	336	317	372
2018/2019	341	345	289	383
2019/2020	352	322	262	347
2020/2021	335	345	293	371
2010/11 to 2020/21	1%	-3%	-9%	-1%

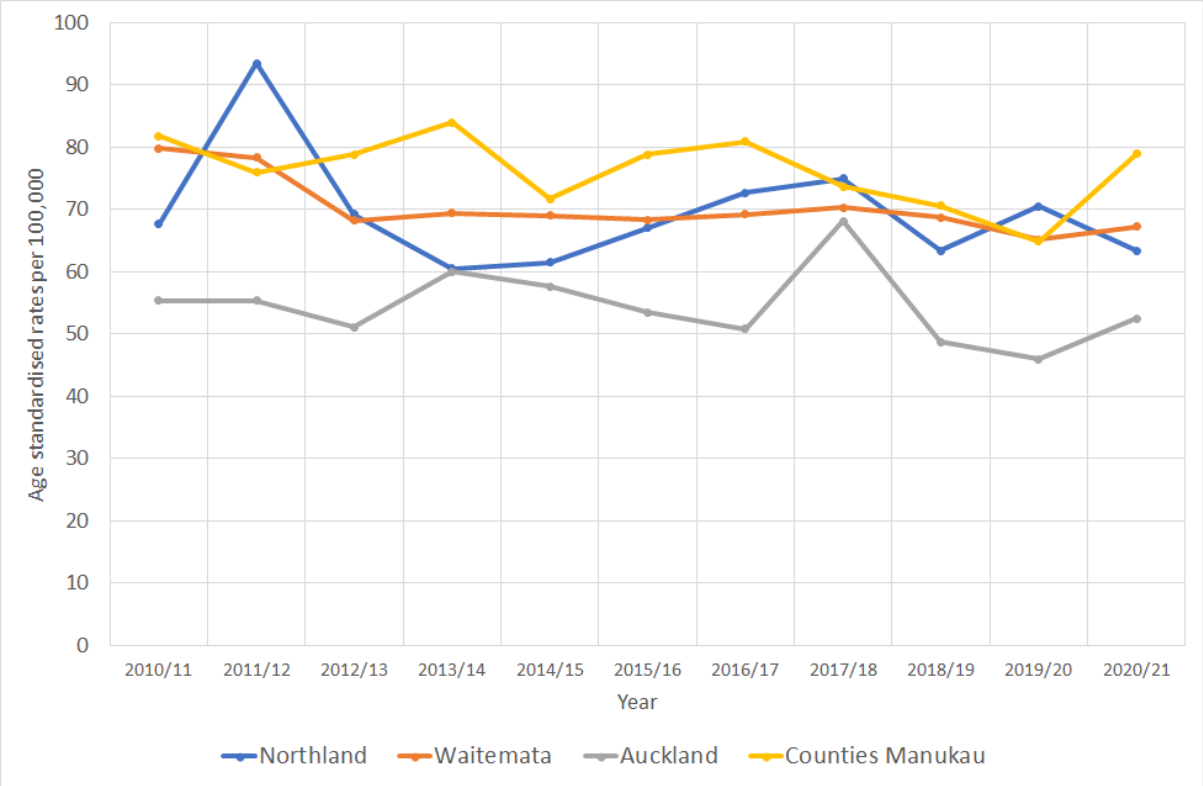
Figure 10 shows the first stroke hospitalisation rate in the Northern Region Districts is mostly unchanged except for Auckland decreasing by -9% from 2010/11 to 2020/21.

Figure 10 Age-standardised first stroke hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21



However, there is some evidence of reduction in 5-year stroke readmission rates as Northland, Waitemata, Auckland and Counties Manukau decreased by -6%, -16%, -5% and -3%, respectively from 2010/11 to 2020/21 (Figure 11). Similar to the absolute number of first hospitalisations, the 5-year stroke readmission rates are highest in Counties Manukau, followed by Northland, Waitemata and Auckland. Specifically, the difference between Auckland and Counties Manukau has increased.

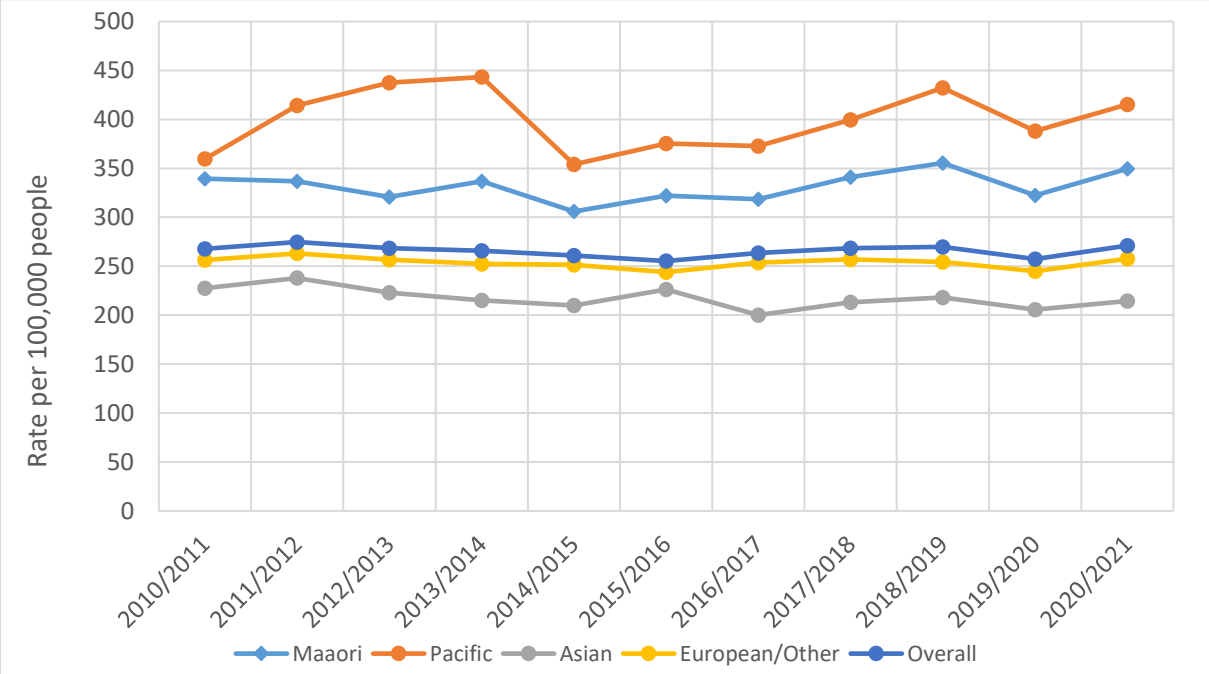
Figure 11: Age-standardised 5-year stroke readmission rate (excluding transfers) per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21



Age standardised stroke hospitalisation rates in New Zealand by ethnicity

The overall age-standardised first stroke hospitalisation rate in NZ had increased by 1% from 2010/11 to 2020/21 (Figure 12). However, the first stroke hospitalisation rate is highest in Pacific and on the rise, increasing by 16% over the same time period. Māori have the second highest rate and has been on the rise since 2016, increasing by 3% from 2010/11 to 2020/21. European/Other increased by 1%. Asian have the lowest rate of hospitalisation for stroke and importantly trending downwards as the rate decreased by 6% over the same time period. This has resulted the increasing differences in rates between Pacific and Māori and European/Other/Asian. In 2020/21, Māori and Pacific age standardised first stroke hospitalisation rates are 62% and 93% higher than Asian respectively (the ethnic group with the lowest rate).

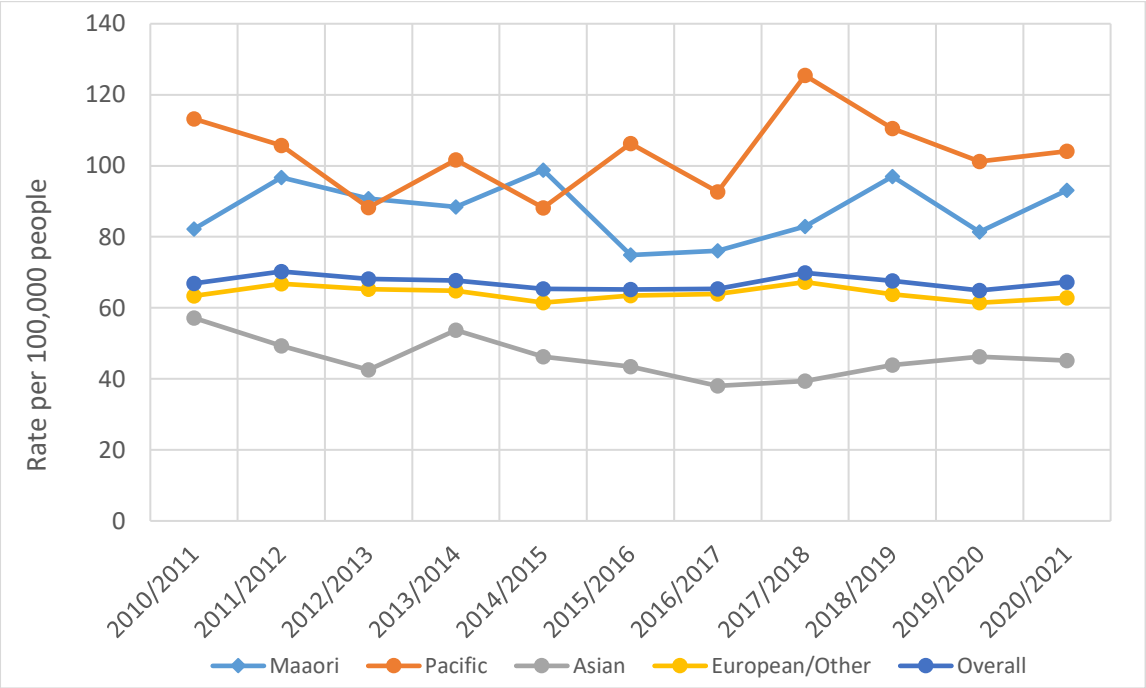
Figure 12 Age-standardised first stroke hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Overall, the age-standardised 5-year stroke readmission rate had also increased by 1% from 2010/11 to 2020/21. The corresponding changes by ethnicity over the same period are as follows: Māori had an increase by 13%, Pacific fall by 8%, Asian fall by 21% and a modest fall of 1% with European/Other.

Notably, the 5-year stroke readmission rates for Māori and Pacific had remained considerably higher than other ethnic groups, namely rates for Pacific people were 131% higher compared to Asian and 65% than the European/Other ethnic group. Similarly, Māori 5-year stroke readmission rates were 107% higher than Asian and 48% higher than European/Other. Furthermore, a more recent 18% increase in the 5-year stroke readmission rates in Pacific people from 2014/15 to 2020/21 is of concern.

Figure 13 Age-standardised 5-year stroke readmission rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in NZ, 2010/11 to 2020/21



Peripheral Vascular Disease (PVD)

The number of hospitalisations for PVD are the highest in Waitemata, followed by Counties Manukau, Auckland and Northland (Table 15). The long-term trajectory is upwards with Northland, Waitemata and Auckland increasing by 59%, 16% and 23%, respectively from 2010/11 to 2020/21. Counties Manukau had a similar a trajectory until 2016 but falling since 2017, decreasing by -3% from 2010/11 to 2020/21 overall. This compares to a 25% increase in the number of PVD hospitalisation in New Zealand overall over the same period.

Table 15 Total number of hospitalisations for PVD in adults (15+ years old) by District in the Northern Region and NZ overall, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Total - Northern Region	New Zealand overall
2010/2011	223	473	310	457	1,463	4,515
2011/2012	215	512	312	455	1,494	4,635
2012/2013	256	441	301	429	1,427	4,448
2013/2014	253	516	318	440	1,527	4,650
2014/2015	271	511	323	512	1,617	5,041
2015/2016	277	528	369	470	1,644	5,130
2016/2017	271	555	317	534	1,677	5,234
2017/2018	289	562	314	516	1,681	5,442
2018/2019	313	554	346	445	1,658	5,365
2019/2020	302	502	340	408	1,552	5,185
2020/2021	355	549	382	444	1,730	5,622
2010/11 to 2020/21	59%	16%	23%	-3%	18%	25%

Table 16 Age-standardised PVD hospitalisation rate per 100,000 adults (including transfers) (15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	163	132	118	169
2011/2012	152	138	116	160
2012/2013	175	116	110	149
2013/2014	166	131	111	148
2014/2015	174	125	109	165
2015/2016	174	126	124	145
2016/2017	161	129	102	159
2017/2018	166	127	100	151
2018/2019	174	121	106	126
2019/2020	162	107	103	111
2020/2021	180	112	111	115
2010/11 to 2020/21	11%	-15%	-6%	-32%

Northland has the highest proportions of inter-hospital transfer related to PVD hospitalisation (Table 17). Auckland being the main vascular centre would mostly receive back its own domicile patients who happened to be out of area at the time of presentation. The proportions and number of interhospital transfers for PVD are relatively less compared for CHD and for stroke.

Table 17 Total number of transfers (proportion of total PVD) for PVD in adults (aged 15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	40 (18%)	46 (10%)	6 (2%)	5 (1%)
2011/2012	28 (13%)	58 (11%)	4 (1%)	16 (3%)
2012/2013	34 (13%)	39 (9%)	2 (1%)	11 (3%)
2013/2014	40 (16%)	46 (9%)	0	12 (3%)
2014/2015	41 (15%)	41 (8%)	2(1%)	14 (3%)
2015/2016	36 (13%)	38 (7%)	0	7 (1%)
2016/2017	34 (13%)	29 (5%)	2 (1%)	11 (2%)
2017/2018	38 (13%)	47 (8%)	1 (0%)	21 (4%)
2018/2019	46 (15%)	59 (11%)	1 (0%)	15 (3%)
2019/2020	46 (15%)	59 (13%)	5 (1%)	18 (4%)
2020/2021	57 (16%)	52 (9%)	2 (1%)	16 (4%)

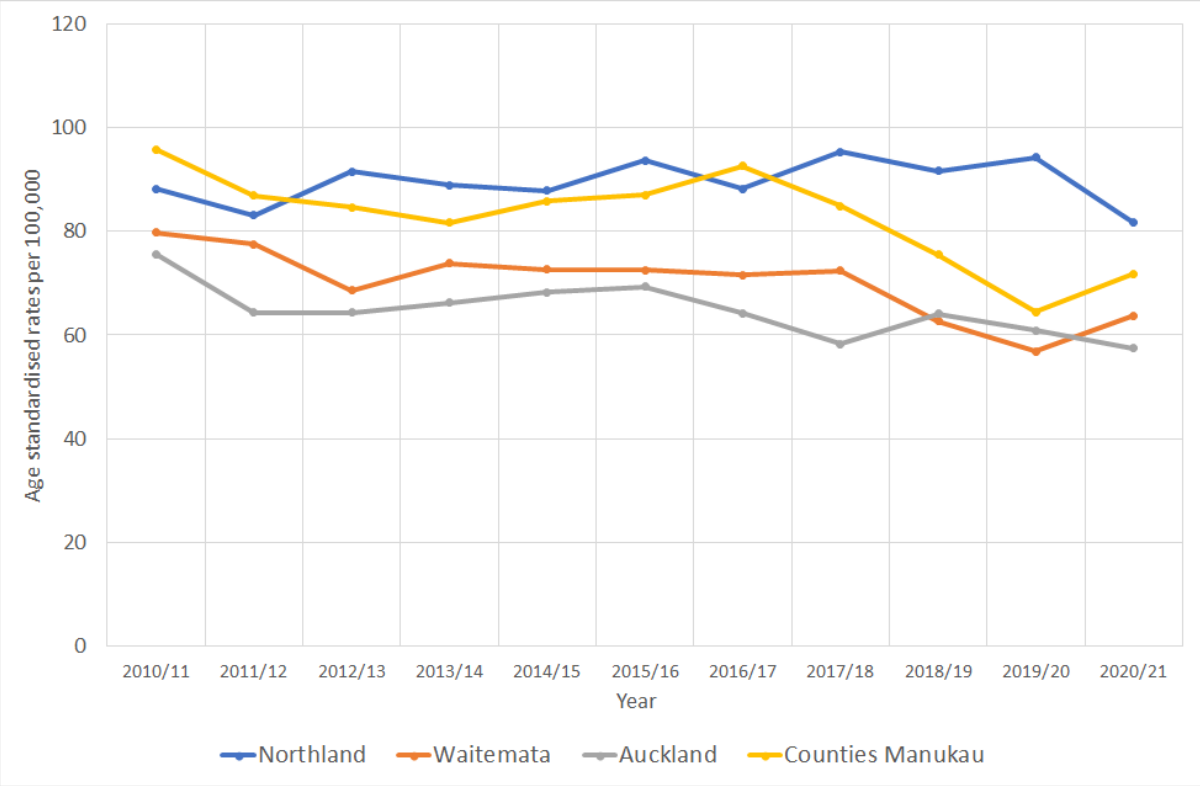
After adjusted for interhospital transfers, age standardised PVD hospitalisation rates are similar across the Districts in metro Auckland in 2020/21 (Table 18).

Table 18 Age-standardised rate of hospitalisation for PVD (excluding transfers) per 100,000 adults (aged 15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	134	119	116	167
2011/2012	132	122	115	154
2012/2013	152	106	109	145
2013/2014	140	120	111	144
2014/2015	147	115	109	161
2015/2016	152	117	124	143
2016/2017	141	122	101	156
2017/2018	144	116	100	145
2018/2019	148	108	106	122
2019/2020	137	94	101	106
2020/2021	152	101	111	110
2010/11 to 2020/21	14%	-15%	-4%	-34%

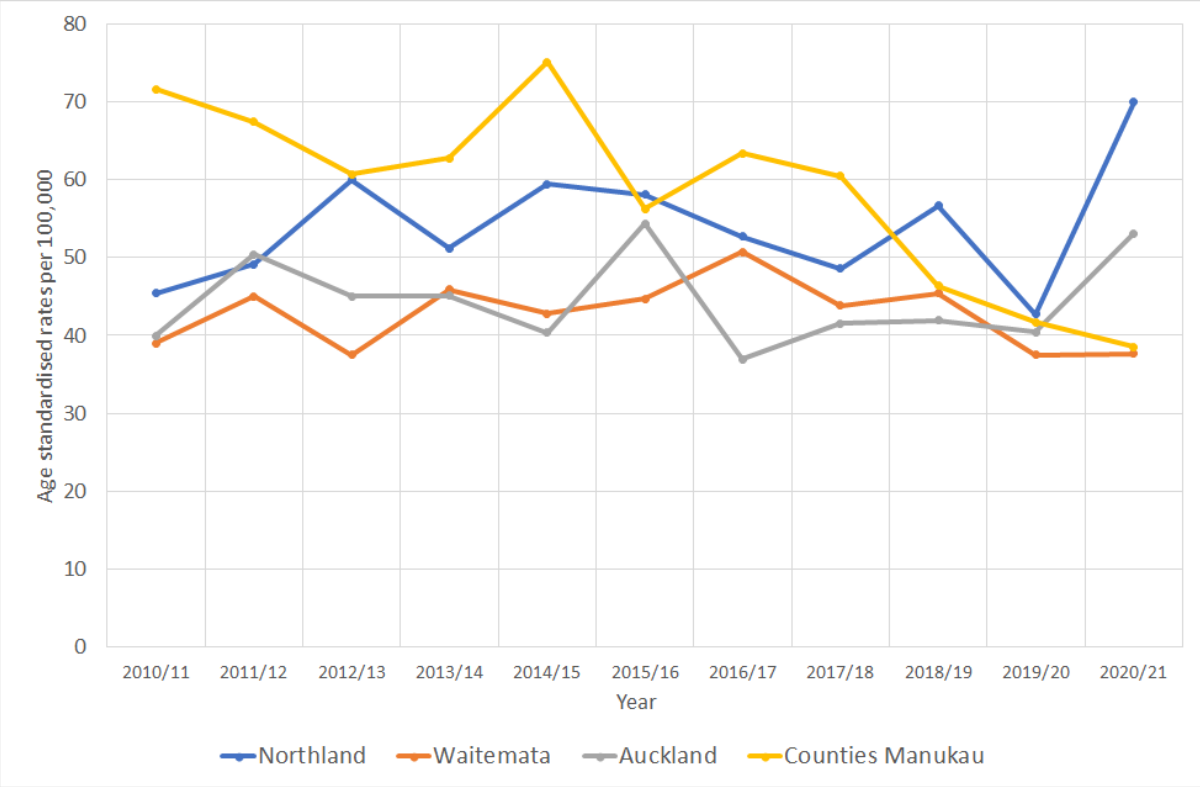
Consistent with the significant drop reported in Table 18, the first PVD hospitalisation rate and 5-year PVD readmission in Counties Manukau decreased by -25% and -46% respectively from 2010/11 to 2020/21 (Figure 14 and Figure 15). In 2010/11, Counties Manukau had the highest rate of first hospitalisation for PVD but has become comparable to Auckland and Waitemata in the last few years. The rates of first admission in Northland, Waitemata and Auckland decreased by -7%, -20% and -24%, respectively from 2010/11 to 2020/21.

Figure 14 Age-standardised first PVD hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21



For 5-year stroke readmission rates, the difference between Auckland-metro Districts has reduced but the difference between Northland and Auckland-metro Districts has increased slightly.

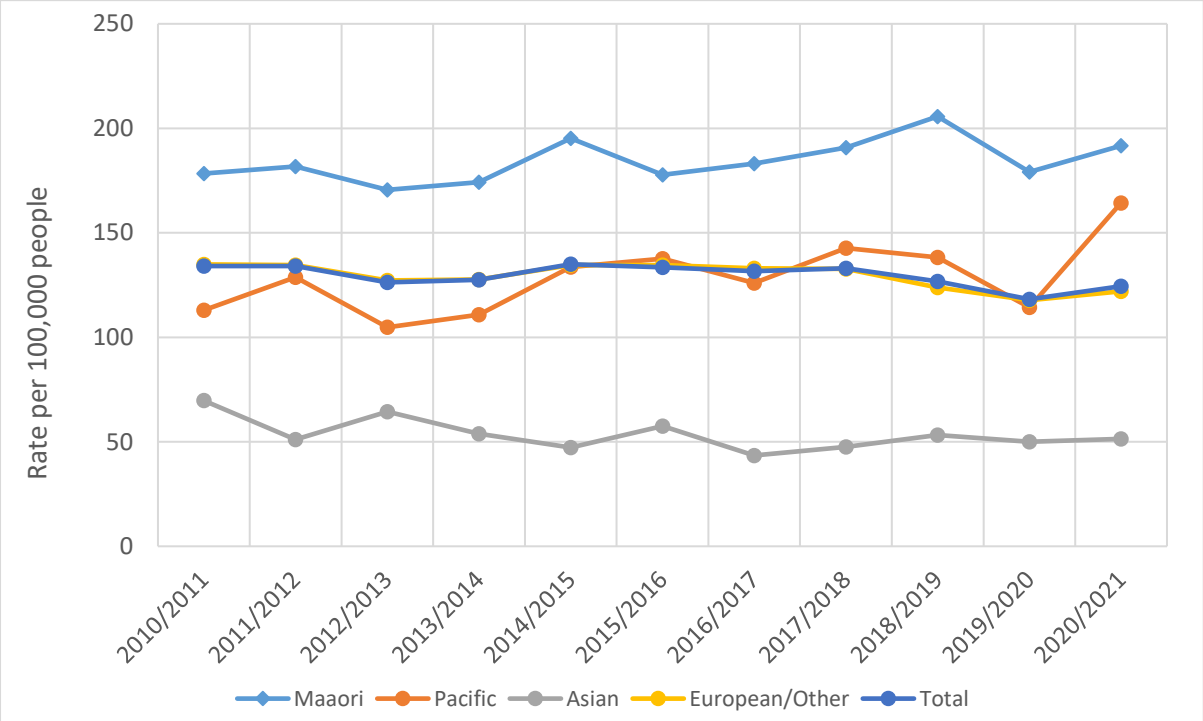
Figure 15 Age-standardised 5-year PVD readmission rate (excluding transfers) per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21



Age-standardised PVD hospitalisation rates in New Zealand by ethnicity

After adjusted for inter-hospital transfers, the age standardised peripheral vascular disease (PVD) hospitalisation rate fell by 7% from 2010/11 to 2020/21 in New Zealand (Figure 16). Alarmingly, the corresponding Māori and Pacific age standardised PVD hospitalisation rates had increased by 7% and 45% respectively over the same time period (Figure 16). This compares to a 26% and 10% fall in PVD hospitalisation rates for Asian and European/Other ethnic groups respectively. The Māori peripheral vascular disease (PVD) hospitalisation rate is 57% and 276% higher than European/Other and Asian ethnic groups in New Zealand respectively in 2020/21.

Figure 16 Age-standardised PVD hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in NZ, 2010/11 to 2020/21



Nationally, age standardised first PVD hospitalisation rates fell by 11% from 2010/11 to 2020/21 in New Zealand (Figure 17). However, Māori first PVD hospitalisation rates fell only by 2%, while Pacific people had a 36% increase over the same time period. Asian and European/Other ethnic group fall by 30% and 13% respectively.

Age standardised 5-year PVD readmission rates fall by 2% in New Zealand from 2010/11 to 2020/21 (Figure 18). However, Māori and Pacific had a 28% and 67% increase in 5-year PVD readmission rates over the same time period.

PVD is strongly associated with tobacco smoking (and to a lesser extent diabetes) which may partially explain the higher rates of PVD observed in Māori and Pacific population. This emphasizes the potential wider benefits of a smoke-free society.

Figure 17 Age-standardised first hospitalisation PVD rate per 100,000 adults (15+ years old) by ethnicity in NZ, 2010/11 to 2020/21

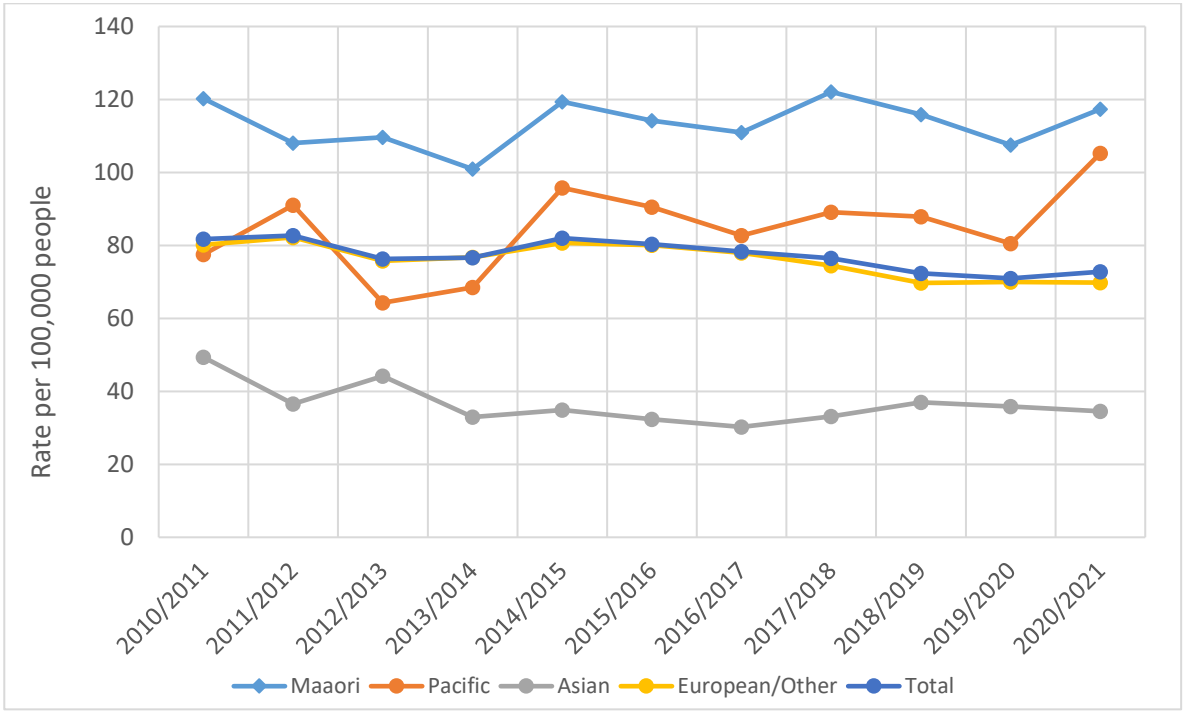
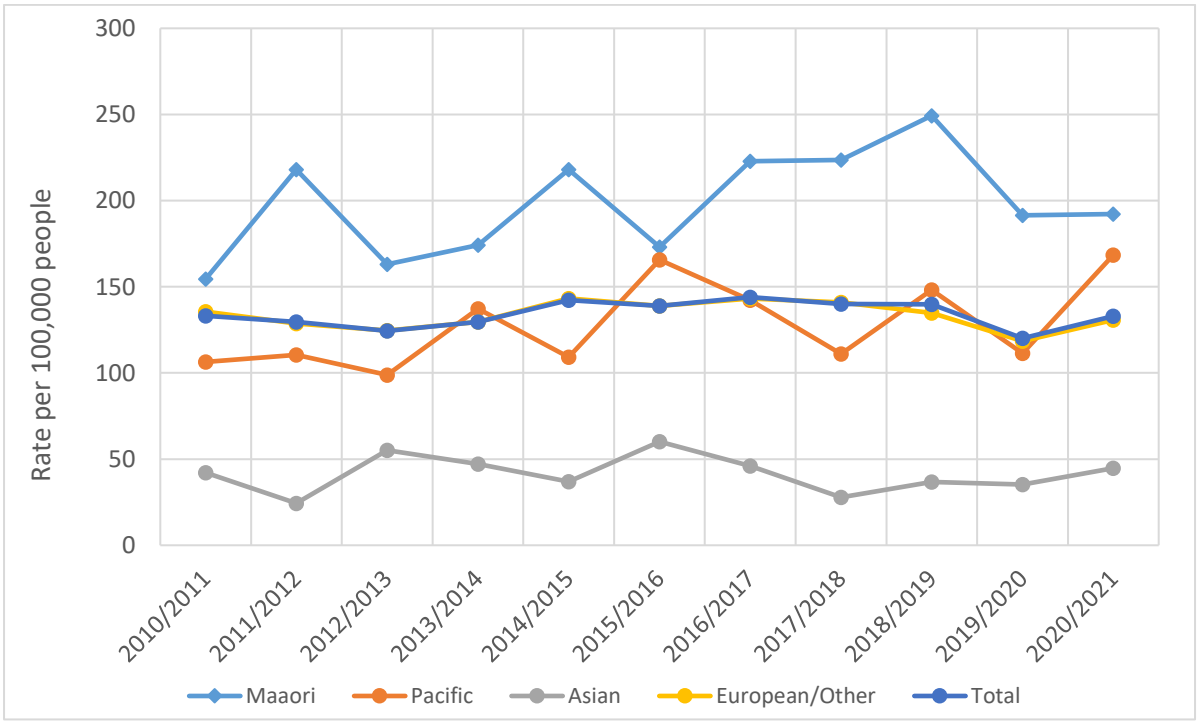


Figure 18 Age-standardised 5-year PVD readmission rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in NZ, 2010/11 to 2020/21



Chest Pain

A discharge diagnosis of chest pain is a diagnosis of exclusion - if a cause for the chest pain such as cardiovascular or respiratory disease is found then that is what is recorded instead. Nevertheless, chest pain hospitalisation can be helpful proxy of demand of chest pain presentations.

From 2010/11 to 2020/21, chest pain hospitalisations increased by 81%, 52%, 38% and 27% in Northland, Auckland, Waitemata and Counties Manukau, respectively (Table 19). Specifically, the hospitalisations in Waitemata were on the rise before gradually declining from 2017. Other important changes include the significant increase in hospitalisations between 2019/20 and 2020/21, Northland increased by 17%, followed by Waitemata (15%), Auckland (11%) and lastly, Counties Manukau (9%).

Table 19 Total number of hospitalisations for chest pain in adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Northern Region	New Zealand
2010/2011	842	2,996	1,773	2,495	8,106	21,296
2011/2012	830	3,310	1,821	2,568	8,529	22,247
2012/2013	875	3,475	1,994	2,674	9,018	23,534
2013/2014	924	3,838	2,036	2,787	9,585	25,584
2014/2015	1,053	3,937	2,068	2,769	9,827	25,012
2015/2016	1,041	4,278	2,164	2,856	10,339	26,657
2016/2017	1,111	4,237	2,249	2,937	10,534	27,812
2017/2018	1,154	4,128	2,433	2,949	10,664	27,449
2018/2019	1,230	3,863	2,525	2,803	10,421	27,842
2019/2020	1,306	3,603	2,425	2,909	10,243	26,878
2020/2021	1,525	4,144	2,695	3,173	11,537	29,068
2010/11 - 2020/21	81%	38%	52%	27%	42%	36%

After adjusted for the growing and ageing population, the age standardised chest pain hospitalisation rate increased by 37% in Northland, 9% in Waitemata and 21% in Auckland from 2010/11 to 2020/21 (Table 20). However, the Counties Manukau rate decreased by -3% suggesting the model of care in the management of chest pain in the outpatient setting in CM may have a role in truncating inpatient demand.

In 2010/11, Northland had the second lowest chest pain hospitalisation rate in the Northern Region, increasing to the highest rate in 2021. Similarly, rates of hospitalisation increased in Waitemata before gradually decreasing in from 2016 to 2020. Chest pain hospitalisation rates in Counties Manukau were 1.3 times the Auckland rate in 2010/11 but the difference reduced over time and is now comparable with Counties Manukau sitting just above Auckland District.

Given the opposing trends in chest pain hospitalisation rates by Districts, there may be merit in reviewing the different model of care to managing chest pain by looking at chest pain clinic volumes and timeliness, what are the optimal clinical pathway in managing people presenting with chest pain (e.g. optimal mix of investigation). Figure 19 shows the age-standardised rate of chest pain for Pacific in New Zealand on the rise.

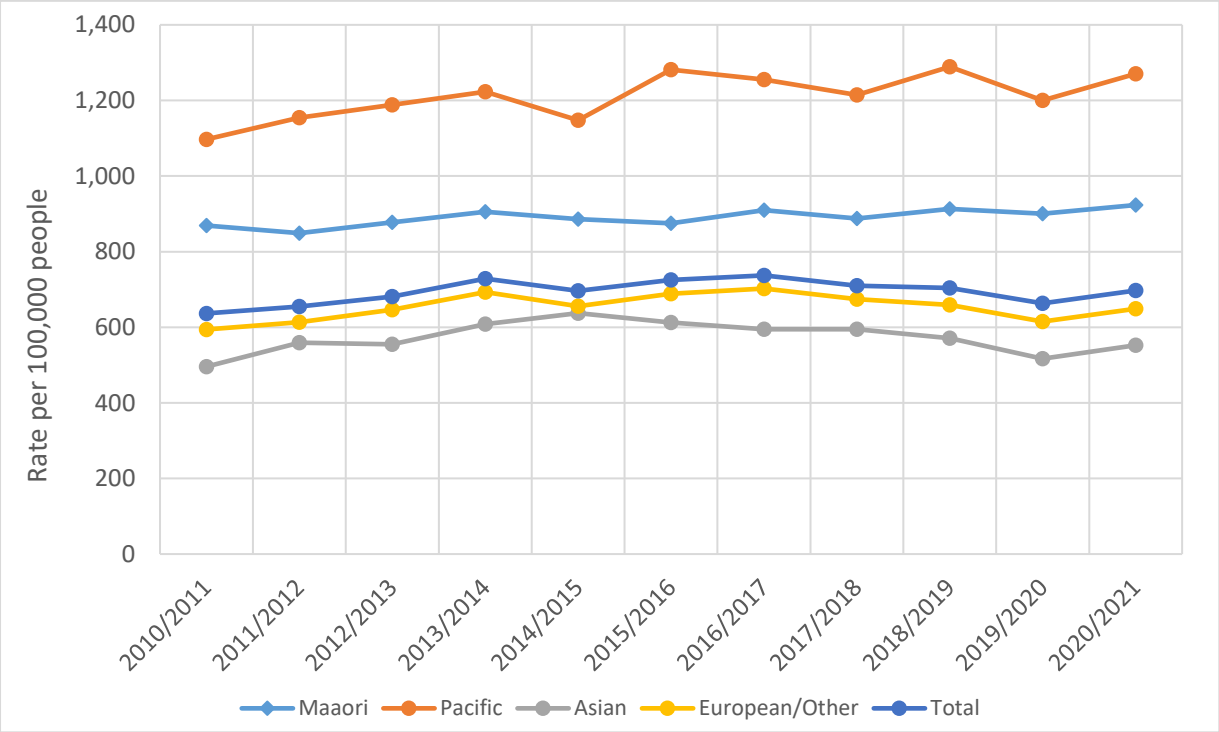
Table 20 Age-standardised chest pain hospitalisation rate per 100,000 adults (aged 15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	634	749	580	763
2011/2012	597	809	578	769
2012/2013	627	832	625	781
2013/2014	651	900	626	796
2014/2015	717	904	620	770
2015/2016	682	960	635	775
2016/2017	712	930	646	769
2017/2018	715	881	685	756
2018/2019	724	805	701	701
2019/2020	772	735	648	702
2020/2021	871	818	702	737
2010/11 to 2020/21	37%	9%	21%	-3%

Age standardised chest pain hospitalisation rates in New Zealand by ethnicity

The total age standardised chest pain hospitalisation rate increased by 9% in New Zealand from 637 per 100,000 in 2010/11 to 697 in 2020/21 (Figure 19). Pacific people have the highest chest pain hospitalisation rate at 1,270 per 100,000 followed by Māori at 923 in 2020/21. Asian have the lowest chest pain hospitalisation rate at 552 per 100,000. This compares to European/ other 649 per 100,000.

Figure 19 Age-standardised chest pain hospitalisation rate per 100,000 adults (aged 15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Atrial Fibrillation and Flutter (AF)

The absolute number of AF hospitalisations increased by 49% and 46% (Table 21) in New Zealand and the Northern Region from 2010/11 to 2020/21. In 2020/21, there were 12,902 hospitalisations with a primary diagnosis code of AF in New Zealand. This compared to 31,603 hospitalisations with either a primary or secondary diagnosis code of AF (41% primary), suggesting AF is a common comorbidity of hospitalisation in patients presenting with other causes.

The admissions in Northland were flat between 2010/11 and 2020 but increased sharply by 34% in 2020/21 from 2019/20. All Districts in the Northern Region increased significantly in 2020/21.

Table 21 Total number of hospitalisations for AF in adults (aged 15+ years old) by District in the Northern Region and New Zealand (primary and all diagnosis), 2010/11 to 2020/21.

	Northland	Waitemata	Auckland	Counties Manukau	Total – Northern Region	New Zealand (primary diagnosis)	New Zealand (all diagnosis)
2010/2011	445	1,061	711	890	3,107	8,663	26,181
2011/2012	502	1,141	774	983	3,400	9,316	27,633
2012/2013	487	1,179	862	988	3,516	9,458	27,339
2013/2014	517	1,247	772	1,036	3,572	9,909	28,435
2014/2015	494	1,218	804	995	3,511	10,004	27,997
2015/2016	492	1,329	833	1,024	3,678	10,365	28,851
2016/2017	509	1,386	821	1,062	3,778	10,782	30,004
2017/2018	536	1,427	923	1,087	3,973	11,058	31,890
2018/2019	496	1,391	900	1,197	3,984	11,418	31,906
2019/2020	472	1,323	919	1,171	3,885	11,096	29,132
2020/2021	634	1,605	1,016	1,294	4,549	12,902	31,603
2010/11 – 2020/21	42%	51%	43%	45%	46%	49%	21%

Although the volume of hospitalisation in Northland and Counties Manukau increased by more than 40%, the age standardised hospitalisation rates for AF increased by 2% and 4%, respectively, from 2010/11 to 2020/21 (Table 22). In contrast, age standardised hospitalisation rates for AF in Waitemata and Auckland increased by at least 10% over the same period. Initially, Northland had the highest rate of admission and decreased to the lowest in 2019/20 before a steep increase of 30% in 2010/21.

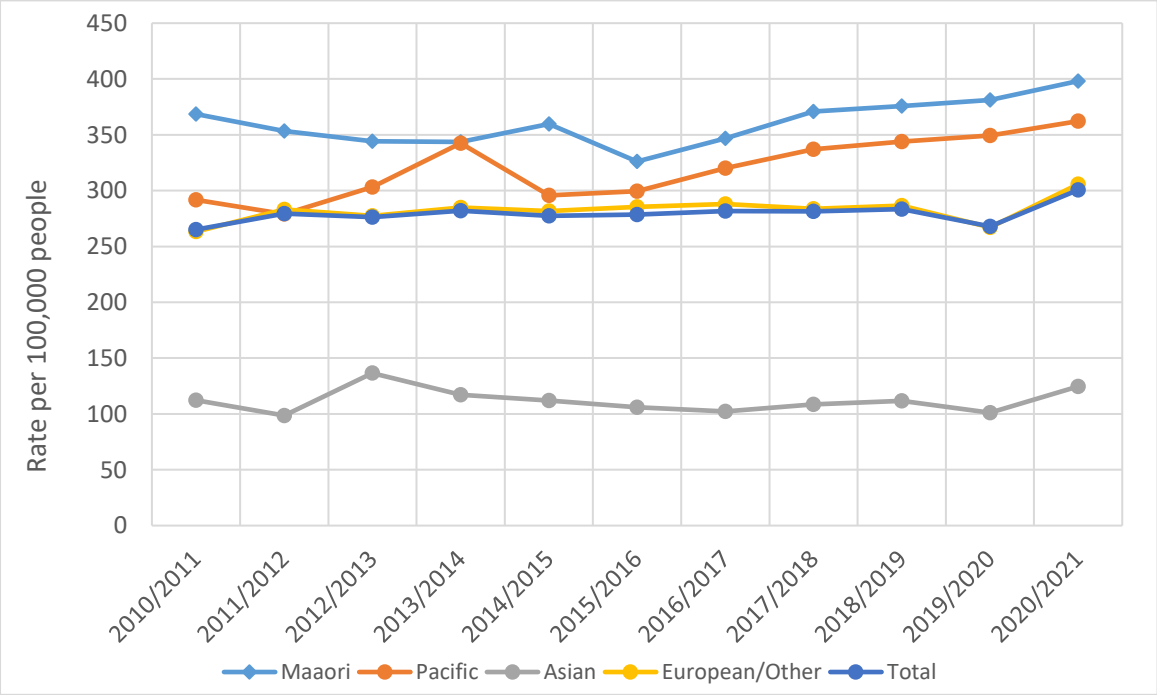
Table 22 Age-standardised AF hospitalisation rate per 100,000 adults (aged 15+ years old) by District in the Northern Region, 2010/11 to 2020/21.

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	326	292	267	315
2011/2012	355	304	279	336
2012/2013	334	302	300	330
2013/2014	343	310	261	332
2014/2015	319	295	267	309
2015/2016	308	314	272	307
2016/2017	304	319	262	307
2017/2018	312	319	289	307
2018/2019	275	303	276	327
2019/2020	256	279	275	312
2020/2021	332	327	293	329
2010/11 - 2020/21	2%	12%	10%	4%

Age standardised atrial fibrillation/ flutter hospitalisation rates in New Zealand by ethnicity

The age standardised atrial fibrillation/ flutter (AF) hospitalisation rate (after being adjusted for transfers) increased by 13% (Figure 20) from 265 per 100,000 in 2010/11 to 301 per 100,000 in 2020/21 in New Zealand. Correspondingly, Māori and Pacific age standardised AF hospitalisation increased by 8% and 24% to 398 and 362 per 100,000 respectively in 2020/21. Asian increased by 11% to only 124 per 100,000 in 2020/21 and European/other group increased by 16% to 301 per 100,000.

Figure 20 Age-standardised AF hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Heart Failure (HF)

The absolute number of HF hospitalisation increased by 47% (Table 23) from 2010/11 to 2020/21 in New Zealand and 51% in the Northern Region. Heart failure is a common co-morbidity of hospitalisation in patients presenting with other causes. The 11,334 hospitalisations with a primary diagnosis code of heart failure accounts for 44% of all heart failure hospitalisation (inclusive of primary and secondary codes, n=25,690) in 2020/21 in New Zealand.

Table 23 Total number of HF hospitalisations in adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Northern Region	New Zealand
2010/2011	330	826	662	830	2,648	7,732
2011/2012	298	856	626	869	2,649	8,138
2012/2013	350	891	658	906	2,805	8,179
2013/2014	360	987	684	852	2,883	8,392
2014/2015	381	973	683	987	3,024	8,811
2015/2016	428	987	725	1,057	3,197	9,095
2016/2017	451	1,050	780	1,185	3,466	9,909
2017/2018	482	1,203	778	1,177	3,640	10,281
2018/2019	525	1,291	865	1,224	3,905	10,812
2019/2020	510	1,251	854	1,228	3,843	10,978
2020/2021	543	1,346	918	1,184	3,991	11,334
2010/11 - 2020/21	65%	63%	39%	43%	51%	47%

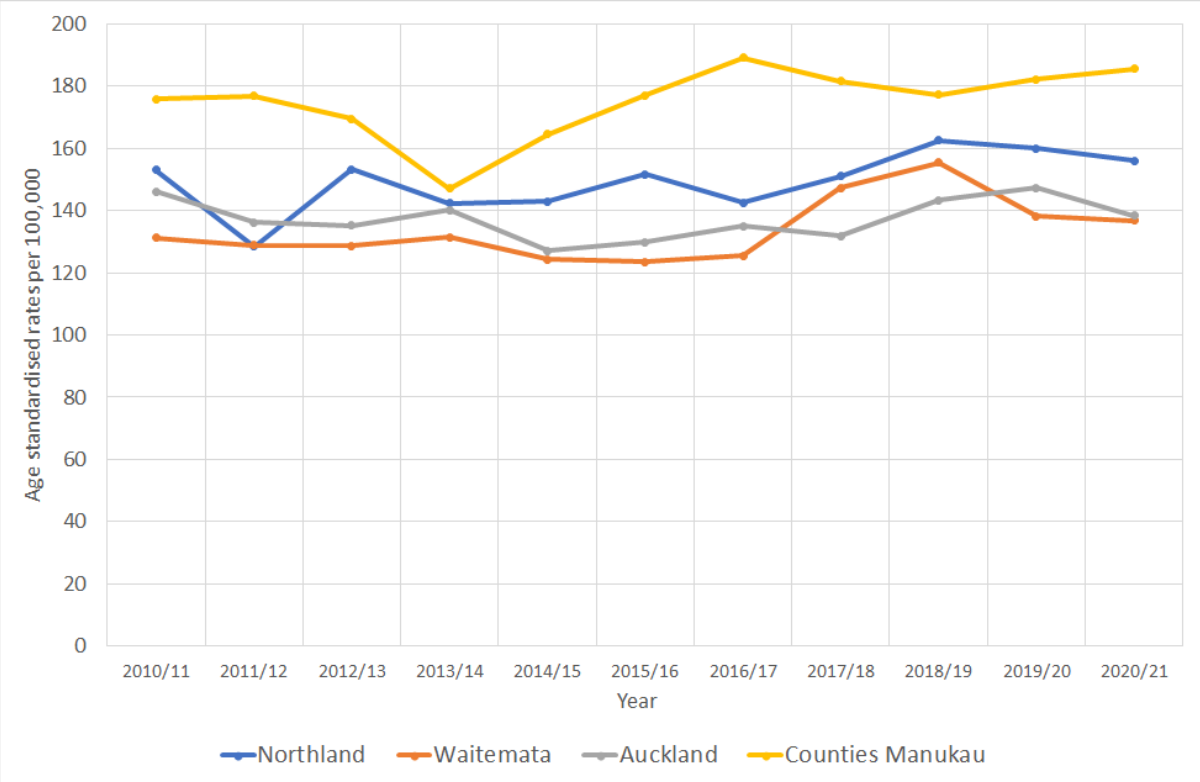
The age standardised heart failure (HF) hospitalisation rate (after adjustment for transfers) increased by 11% from 238 per 100,000 in 2010/11 to 264 in 2020/21 in New Zealand (Table 24). While age-standardised HF hospitalisation rates in Counties Manukau fell by -1% from 2010/11 to 2020/21 at 309 per 100,000, Counties Manukau remained with the highest HF hospitalisation rates in the Northern region. Northland, Waitemata, and Auckland HF hospitalisation rates increased by 13%, 16% and 6% from 2010/11 to 2020/21, respectively.

Table 24 Age-standardised HF hospitalisation rate (excluding transfers) per 100,000 adults (aged 15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand
2010/2011	244	226	254	313	238
2011/2012	211	222	230	322	244
2012/2013	240	227	238	319	240
2013/2014	232	244	240	287	240
2014/2015	240	232	232	321	245
2015/2016	261	227	241	333	246
2016/2017	262	233	249	356	259
2017/2018	270	263	247	338	262
2018/2019	286	275	271	343	269
2019/2020	271	256	258	332	265
2020/2021	276	262	269	309	264
2010/11 to 2020/21	13%	16%	6%	-1%	11%

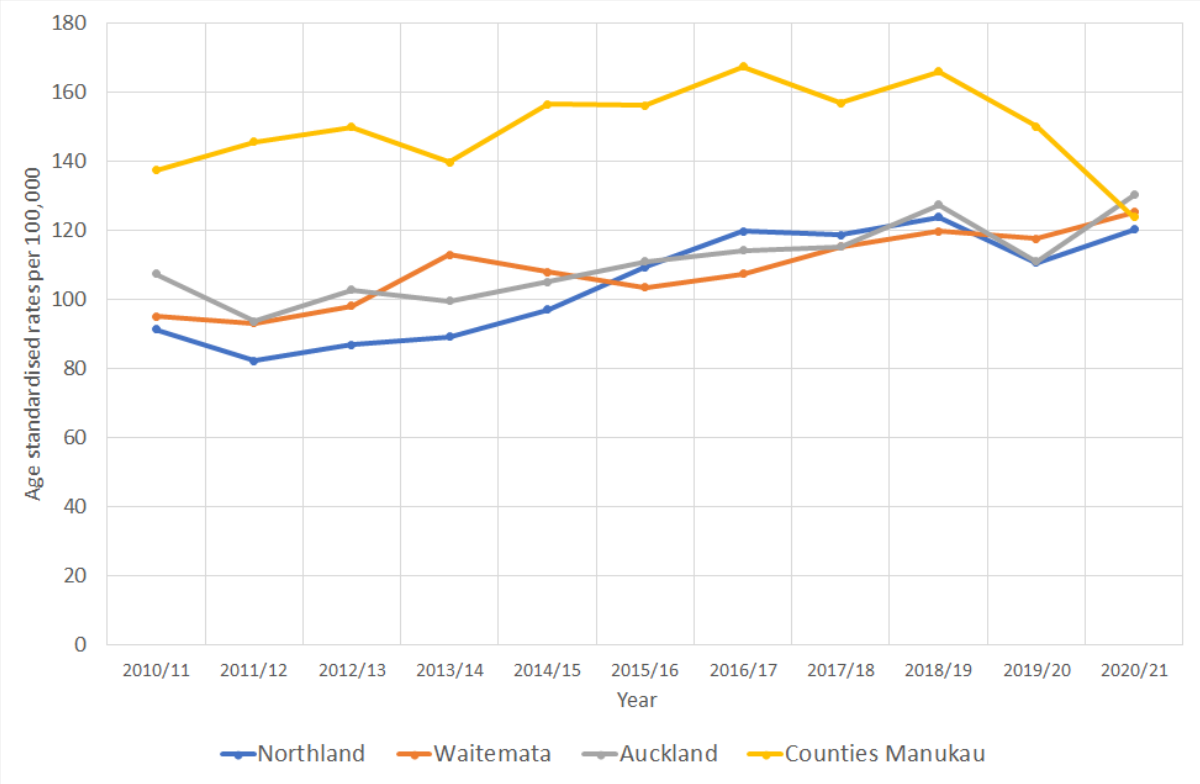
The age-standardised first HF hospitalisation rate (Figure 21) increased more modestly (6% increase in Counties Manukau, 2% in Northland, 4% in Waitemata, and a fall of 5% in Auckland) compared to the 5-year readmission rates (Figure 22) in the Northern region.

Figure 21 Age-standardised first HF hospitalisation rate per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21



The 5-year HF readmission rates increased by 24% in Northland and Waitemata and 18% in Auckland Districts from 2010/11 to 2020/21. However, Counties Manukau decreased by -11% over the same period (Figure 22).

Figure 22 Age-standardised 5-year HF readmission rate per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21



Age specific heart failure hospitalisation rates in New Zealand

Table 25 shows the age specific HF hospitalisation rate for the 15 to 44 year old age group increased by 73% from 12 per 100,000 in 2010/11 to 21 per 100,000 in 2020/21, albeit starting from a very low base. This compares to a more moderate relative increase in the 45 to 65 age group (37% increase) and over 65-year-olds (4% increase) over the same time period. As expected, age specific rates are much higher in the older populations.

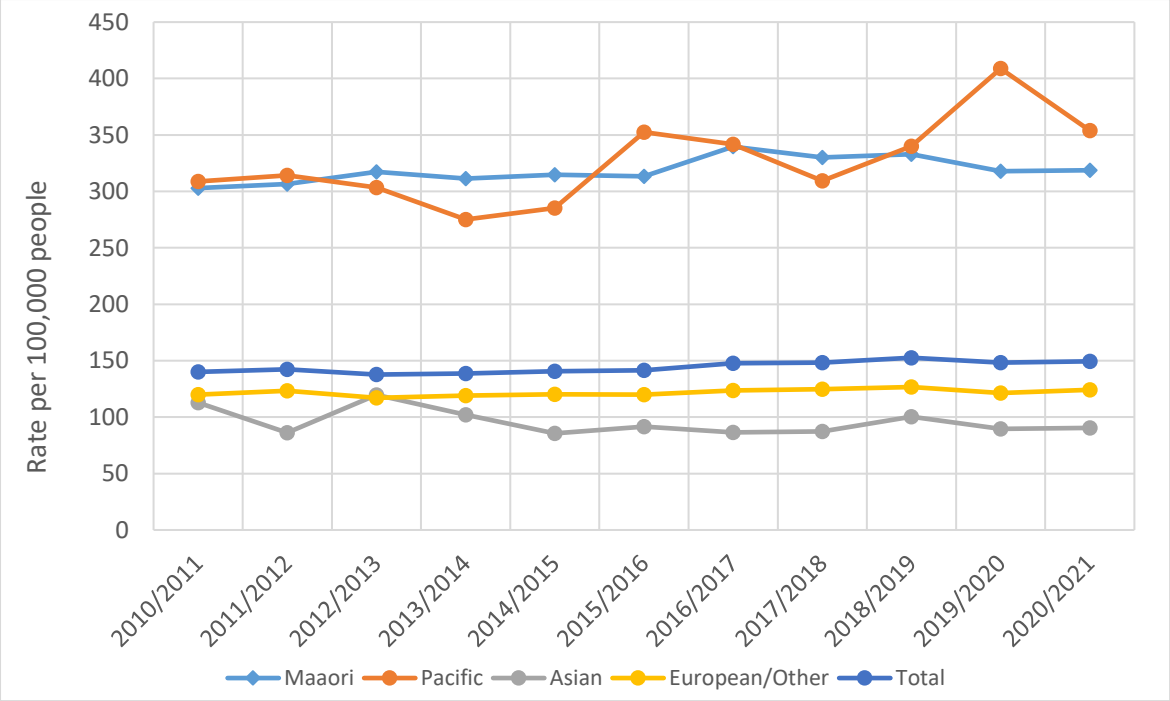
Table 25 Age specific HF hospitalisation (excluding transfers) per 100,000 adults (15+ years old) by age in NZ, 2010/11 to 2020/21

	15-44	45-64	65+
2010/2011	12	114	1,055
2011/2012	12	119	1,080
2012/2013	13	125	1,044
2013/2014	12	114	1,066
2014/2015	14	121	1,076
2015/2016	16	128	1,068
2016/2017	20	142	1,101
2017/2018	21	148	1,102
2018/2019	22	148	1,137
2019/2020	20	156	1,111
2020/2021	21	156	1,099
2010/11 to 2020/21	73%	37%	4%

Age standardised heart failure hospitalisation rates in New Zealand by ethnicity

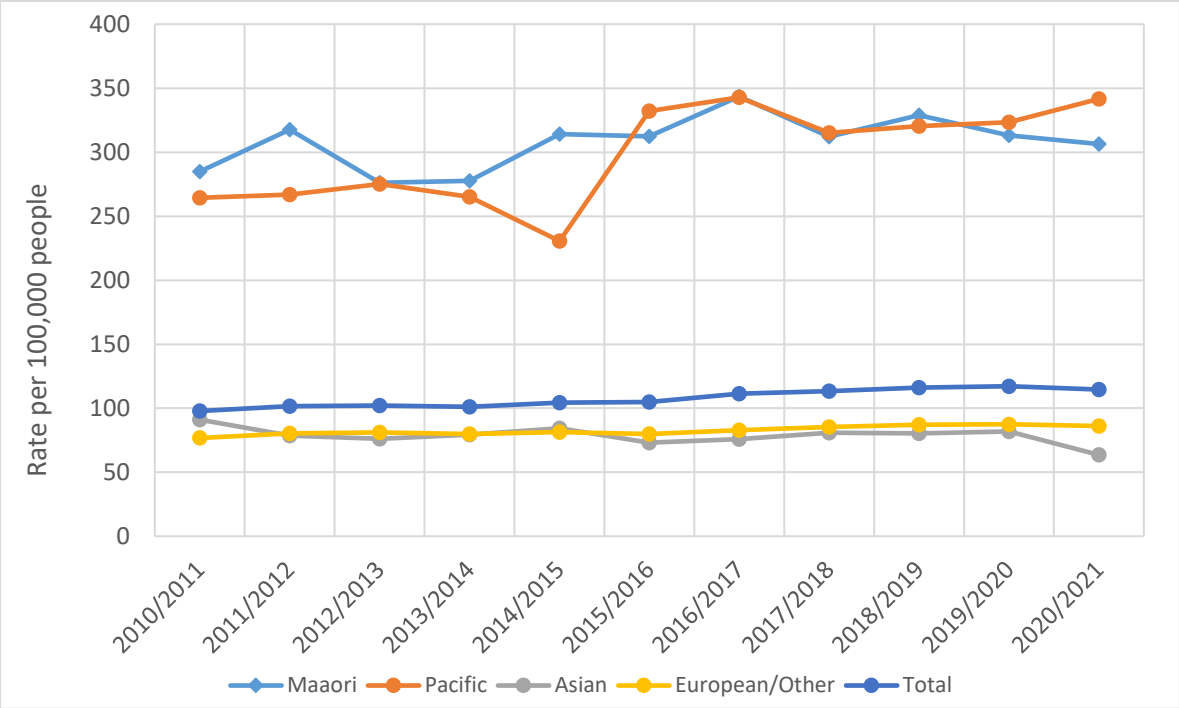
The age standardised first HF hospitalisation rate increased by 7% from 140 per 100,000 in 2010/11 to 149 in 2020/21 in New Zealand (Figure 23). The ethnic differences in first hospitalisation rates continued to widen with Māori and Pacific first HF hospitalisation rate increased by 5% and 15% respectively compared to a 4% increase in European/Other and a 20% fall in Asian. In 2020/21, Pacific first HF hospitalisation rate is 293% or 185% higher than the corresponding rates of Asian and European/Other group. Similarly, Māori first HF hospitalisation rate is 254% and 157% higher than the Asian and European/Other group.

Figure 23 Age-standardised first HF hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Compared to the 7% increase in first HF hospitalisation rate, the 5-year HF readmission rates increased more rapidly by 17% from 2010/11 to 115 per 100,000 by 2020/21 in New Zealand (Figure 24). Māori and Pacific 5-year HF readmission rates had increased by 8% and 29% respectively over the same time period. This compares to 12% in European/Other and a 30% fall in Asian. Of note, in 2020/21, the Pacific 5-year HF readmission rate was 434% above the Asian age standardised rates or 298% higher than the European/Other group. The Māori 5-year HF readmission rate was 378% and 256% higher than their Asian and European/Other counterparts respectively.

Figure 24 Age-standardised 5 year HF readmission rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



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High degree Heart Block

High degree heart block (HB) in this report refers to sick sinus syndrome and 2nd degree HB or above which are possible indications for a permanent pacemaker. The hospitalisations for HB are on the rise with a substantial increase of 87% for Waitemata from 2010/11 to 2020/21, followed by Northland (50%), Counties Manukau (29%) and Auckland (22%). Overall, hospitalisation for HB increased by 50% from 2010/11 to 2020/21 in the Northern Region Districts. This compares to a 61% increase in New Zealand over the same time period.

Table 26 Total number of hospitalisations (all diagnosis including primary and secondary, including transfers) for HB in adults (aged 15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Total Northern Region	New Zealand
2010/2011	117	207	152	158	634	1,840
2011/2012	141	211	146	177	675	1,969
2012/2013	130	244	146	143	663	2,062
2013/2014	138	207	145	154	644	2,106
2014/2015	123	244	150	166	683	2,104
2015/2016	137	225	154	174	690	2,132
2016/2017	194	309	223	202	928	2,519
2017/2018	142	343	166	237	888	2,613
2018/2019	150	305	195	215	865	2,730
2019/2020	160	316	184	215	875	2,662
2020/2021	176	387	186	204	953	2,955
2010/11 - 2020/21	50%	87%	22%	29%	50%	61%

HB is a common co-morbidity that is often captured by secondary diagnosis codes (n=1,158) making up of 39% of all HB hospitalisations inclusive of all primary and secondary codes (n=2955) in New Zealand in 2020/21. Common scenarios where heart blocks are coded as secondary diagnosis include a person presenting with Inferior wall myocardial infarction and subsequently developed a high degree heart block, or a person who had a transcatheter aortic valve replacement (TAVI) and subsequently developed heart block after the procedure.

The age standardised HB hospitalisation rate (after adjustment for transfers) increased by 28% (Table 28) in New Zealand from 2010/11 to 2020/21. In the Northern Region, after excluding transfers, the age-standardised HB hospitalisations were the highest in Waitemata closely followed by Northland (Table 28). The differing trends between Districts may be worth exploring.[4]

Table 27 Age-standardised HB hospitalisation rate (primary diagnosis, excluding transfers) per 100,000 adults (aged 15+ years old) by District in the Northern Region and New Zealand, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand
2010/2011	39	26	30	31	28
2011/2012	40	28	27	33	30
2012/2013	38	31	32	26	32
2013/2014	39	28	30	23	31
2014/2015	32	34	32	27	30
2015/2016	33	33	32	27	29
2016/2017	52	36	38	31	33
2017/2018	33	39	31	38	33
2018/2019	32	33	31	31	33
2019/2020	36	32	31	27	33
2020/2021	39	40	25	27	35
2010/11 - 2020/21	1%	54%	-17%	-10%	28%

Table 28 Age-standardised HB hospitalisation rate (all diagnosis, excluding transfers) per 100,000 adults (aged 15+ years old) by District in the Northern Region and New Zealand, 2010/11 to 2020/21

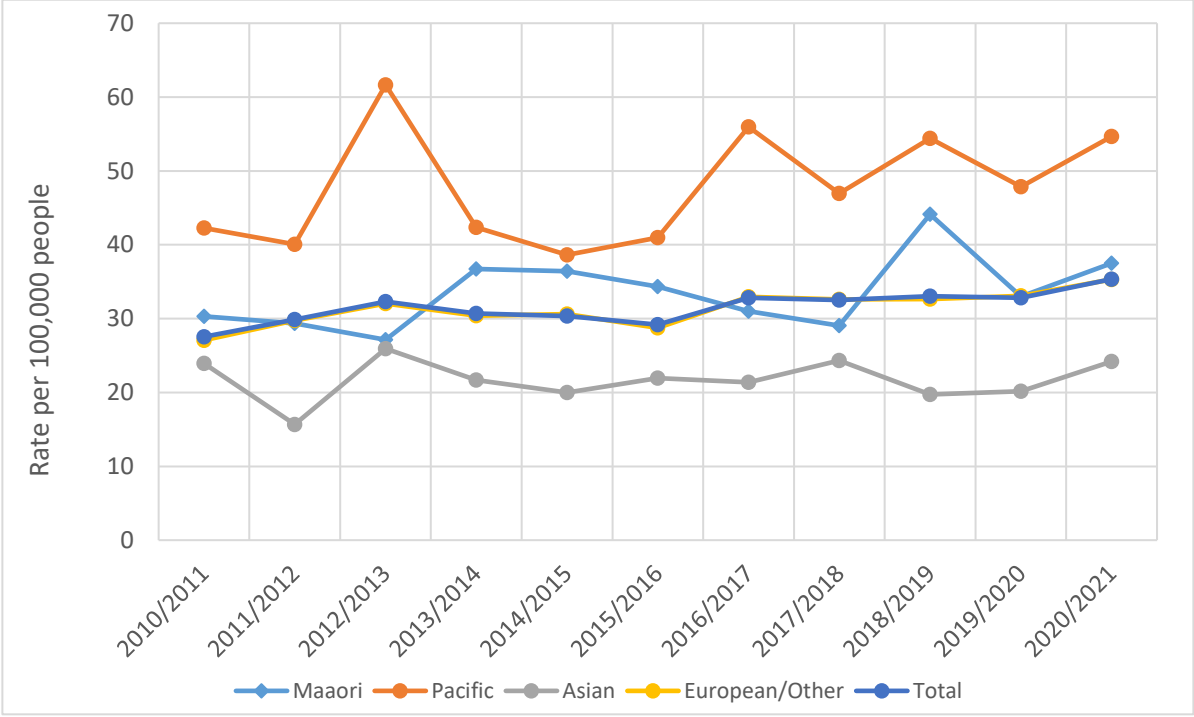
	Northland	Waitemata	Auckland	Counties Manukau	New Zealand
2010/2011	61	47	58	59	49
2011/2012	75	48	55	60	51
2012/2013	69	52	53	51	53
2013/2014	67	45	51	53	52
2014/2015	62	54	52	55	52
2015/2016	67	49	52	52	50
2016/2017	81	61	74	61	57
2017/2018	55	66	53	67	58
2018/2019	60	57	61	60	58
2019/2020	59	56	57	57	54
2020/2021	62	66	55	52	58
2010/11 - 2020/21	1%	39%	-5%	-12%	19%

[4] For example in coding practice changes. May be worth checking for any data artefact in the first instance, given how the proportions of primary and secondary diagnosis vary by districts.

Age standardised high degree heart block hospitalisation rates in New Zealand by ethnicity

Pacific people have the highest HB hospitalisation (primary diagnosis) rate at 55 per 100,000 (Figure 25) in 2020/21 in New Zealand, followed by Māori at 38, European/ other at 35, Asian at.

Figure 25 Age-standardised HB hospitalisation rate (primary diagnosis, excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Supraventricular Tachycardia

The total number of supraventricular tachycardia (SVT) hospitalisations in New Zealand (primary diagnosis) increased by 30% from 2010/11 to 2020/21.

Table 29: Total number supraventricular tachycardia hospitalisations (primary diagnosis in adults (15+ years old) by District in the Northern Region and in New Zealand, 2010/11 to 2020/21 – no adjustment for transfers

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand overall
2010/2011	34	194	109	199	1,380
2011/2012	42	173	125	186	1,347
2012/2013	55	199	168	181	1,491
2013/2014	60	191	153	174	1,486
2014/2015	54	229	172	208	1,663
2015/2016	52	249	165	224	1,745
2016/2017	64	239	156	217	1,637
2017/2018	70	259	143	245	1,698
2018/2019	69	277	175	197	1,661
2019/2020	62	258	152	207	1,629
2020/2021	79	262	171	238	1,798
2010/11 - 2020/21	132%	35%	57%	20%	30%

In 2020/21, about 61% of all hospitalisations that included a (primary or secondary) diagnosis of SVT did so as a primary diagnosis in New Zealand.

Table 30: Total number supraventricular tachycardia hospitalisations (all diagnoses) in adults (15+ years old) by District in the Northern Region and in New Zealand, 2010/11 to 2020/21 – no adjustment for transfers

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand overall
2010/2011	58	282	177	286	2,108
2011/2012	69	262	201	282	2,144
2012/2013	95	287	230	270	2,316
2013/2014	99	273	238	279	2,335
2014/2015	100	317	262	335	2,608
2015/2016	93	363	268	338	2,726
2016/2017	114	362	263	331	2,739
2017/2018	140	408	248	352	2,908
2018/2019	120	431	283	327	2,805
2019/2020	98	419	251	304	2,689
2020/2021	128	445	279	364	2,948
2010/11 - 2020/21	121%	58%	58%	27%	40%

Across the Northern Region, after excluding transfers but inclusive of both primary and secondary diagnosis, Northland has the highest increase (116%) in supraventricular tachycardia hospitalisations, followed by Waitemata (60%), Auckland (57%) and lastly, Counties Manukau (32%) from 2010/11 to 2020/21 (Table 31).

Table 31 Total number of hospitalisations for supraventricular tachycardia excluding transfers (all diagnosis) in adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand overall
2010/2011	57	267	176	273	2,025
2011/2012	67	246	200	272	2,086
2012/2013	91	270	230	255	2,255
2013/2014	96	261	236	269	2,288
2014/2015	95	298	256	321	2,541
2015/2016	88	342	266	323	2,653
2016/2017	107	342	260	314	2,671
2017/2018	129	378	246	335	2,818
2018/2019	115	396	283	310	2,718
2019/2020	97	384	247	295	2,612
2020/2021	123	427	276	359	2,872
2010/11 - 2020/21	116%	60%	57%	32%	42%

Counties Manukau and Waitemata have highest the supraventricular tachycardia hospitalisation rate in the Northern region in 2020/21 (Table 32).

Table 32 Age-standardised rate supraventricular tachycardia hospitalisation (all diagnosis) per 100,000 adults (aged 15+ years old) in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	44	70	59	87
2011/2012	49	63	66	83
2012/2013	63	66	75	78
2013/2014	68	63	74	80
2014/2015	65	70	81	94
2015/2016	60	78	82	90
2016/2017	72	77	78	84
2017/2018	77	82	71	88
2018/2019	70	84	83	79
2019/2020	59	79	68	73
2020/2021	68	85	74	85
2010/11 - 2020/21	55%	21%	25%	-2%

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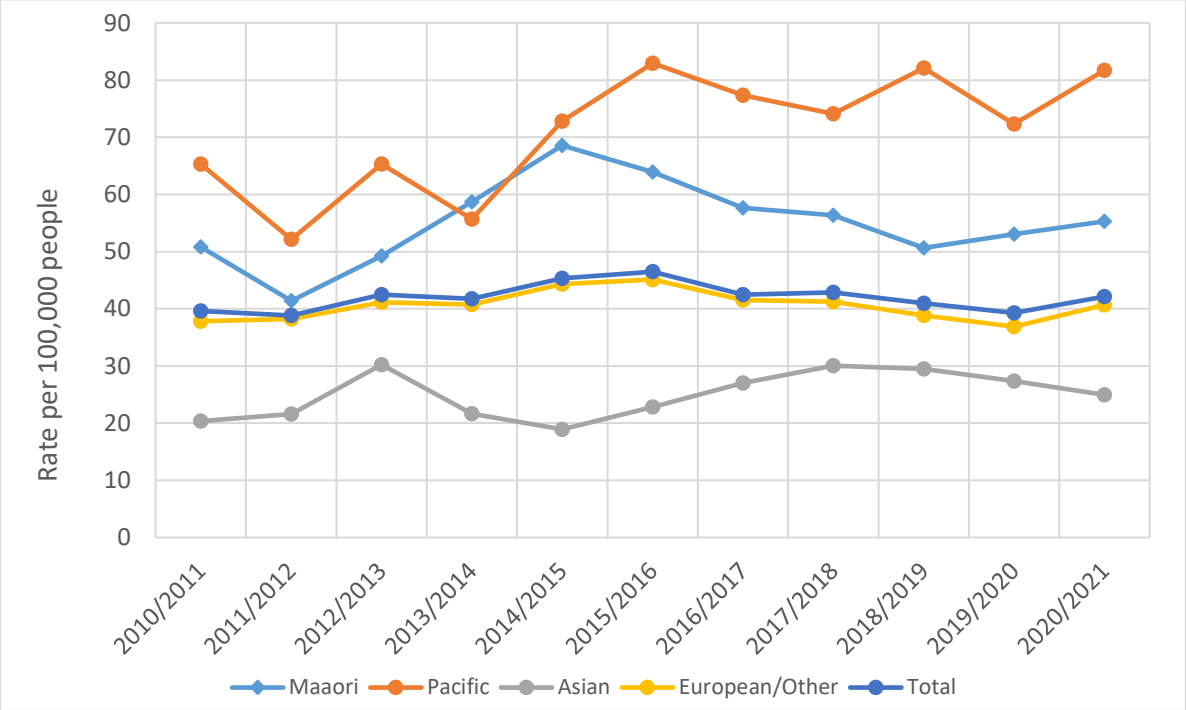
Age standardised supraventricular tachycardia hospitalisation rates in New Zealand by ethnicity

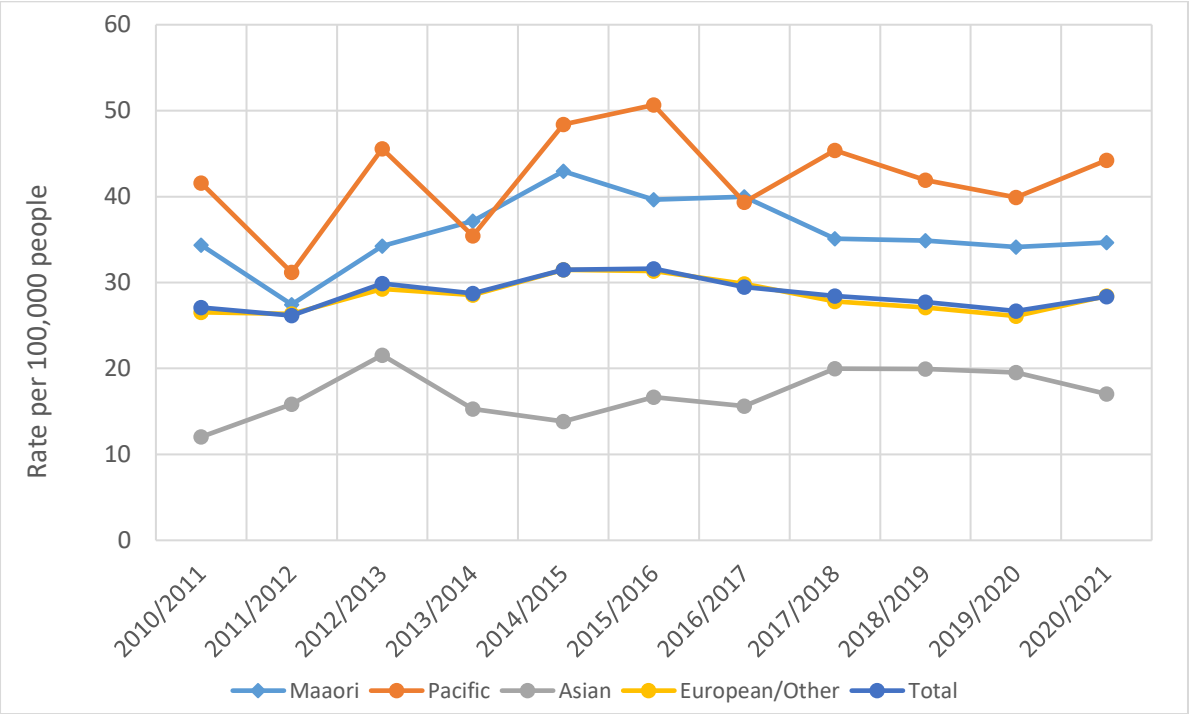
Figure 26 shows the SVT hospitalisation rate (excluding transfers) increased by 25% for Pacific people and 9% for Māori from 2010/11 to 2020/21. Overall, the SVT hospitalisation rate in New Zealand increased by 6% over the same time period from 2010/11 (40 per 100,000) (Figure 26) to 2020/21 (42). Pacific people have the highest SVT hospitalisation rate at 82 per 100,000 followed by Māori at 55 per 100,000 in 2020/21. Asian have the lowest SVT hospitalisation rate at 25 per 100,000. This compares to European/ other at 41 per 100,000.

Figure 26 Age-standardised SVT hospitalisation rate (primary diagnosis, excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



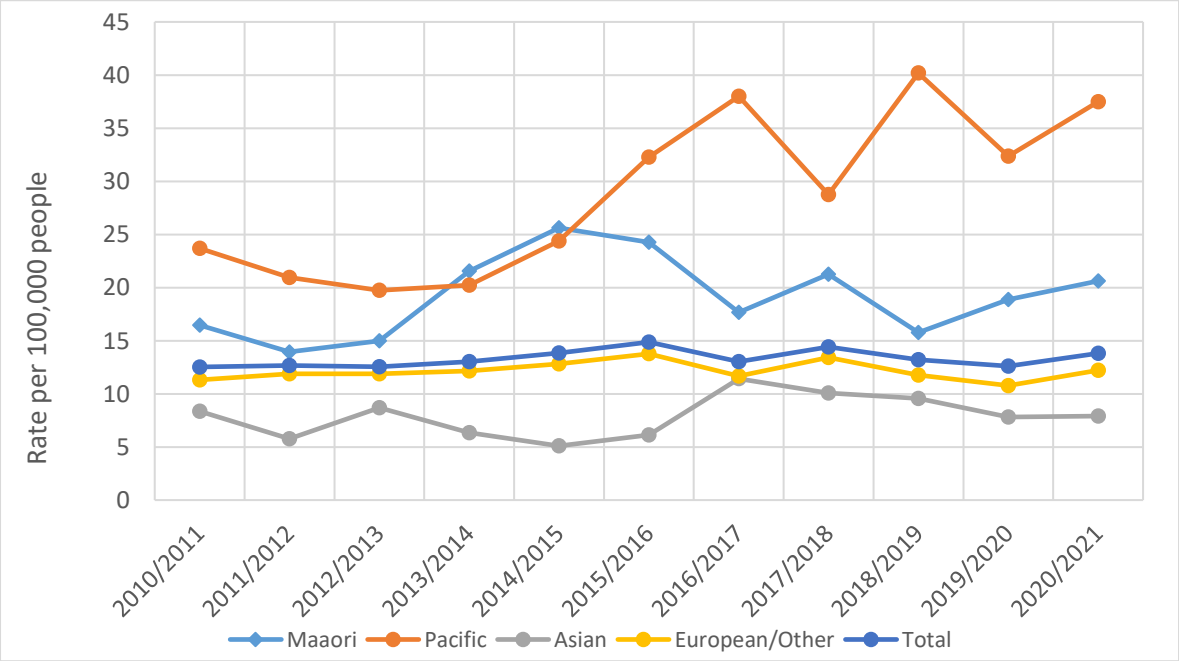
SVT can be managed symptomatically by medication or potentially curative ablation procedures. In 2020/21, The age standardised 5-year readmission rate for SVT at 14 per 100,000 (Figure 27) in New Zealand is lower than the first SVT hospitalisation rate in New Zealand at 28 per 100,000 (Figure 28).

Figure 27 Age-standardised first SVT hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



The age standardised SVT 5-year readmission rate increased by 10% in New Zealand overall from 2010/11 to 2020/21 (Figure 28). However, Māori and Pacific SVT 5-year readmission rates increased by 25% and 58% respectively over the same period, suggesting possible unmet need in accessing potentially curative treatment.

Figure 28 Age-standardised rate of 5-year readmission for SVT (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in New Zealand, 2010/11 to 2020/21



Valvular Heart Disease

The number of valvular heart disease hospitalisations in Waitemata increased by 107% from 2010/11 to 2020/21 (Table 33). This is partly related to the 257% increase in the number of transfers from 2010/11 to 2020/21 in Waitemata (Table 34). A similar trend is evident in admissions in Auckland increasing by 41% over the same time period. Hospitalisations in Northland gradually increased from 2014 to 2018 and decreased by -15% overall from 2010/11 to 2020/21. Valvular heart disease hospitalisations remain relatively stable in Counties Manukau over the 10 years period with a one-off drop in numbers in 2020/21.

Table 33 Total number of valvular heart disease hospitalisations in adults (15+ years old) by District in the Northern Region, and in New Zealand 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	Northern Region	New Zealand overall
2010/2011	177	227	155	240	799	2,244
2011/2012	132	318	151	298	899	2,746
2012/2013	132	371	186	281	970	2,814
2013/2014	133	340	128	204	805	2,687
2014/2015	174	382	160	221	937	2,954
2015/2016	190	374	157	271	992	3,230
2016/2017	218	357	152	252	979	3,142
2017/2018	179	404	171	270	1,024	3,219
2018/2019	160	463	228	277	1,128	3,259
2019/2020	138	392	200	289	1,019	3,130
2020/2021	151	471	218	233	1,073	3,435
2010/11 to 2020/21	-15%	107%	41%	-3%	34%	53%

Table 34 Total Number of Inter-hospital transfers for valvular heart disease in adults (15+ years old) by District in the Northern Region and in New Zealand, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand overall
2010/2011	15	37	1	34	170
2011/2012	18	58	6	41	209
2012/2013	8	71	3	35	222
2013/2014	8	46		21	160
2014/2015	24	82	1	42	261
2015/2016	18	81	2	49	273
2016/2017	23	87	1	45	301
2017/2018	21	93	2	43	274
2018/2019	16	135	6	60	340
2019/2020	13	123	2	51	308
2020/2021	15	132	3	42	379
2010/11 to 2020/21	0%	257%	-	24%	123%

There are opposing VHD hospitalisation trends by District and the variations in inter-hospital transfer rates that may merit further investigation in the difference in clinical treatment thresholds in the context of multimorbidity for valvular heart disease between Districts. For examples, Waitemata and Auckland had increases of 33% and 8% respectively in age standardised VHD hospitalisation rates (adjusted for transfers) from 2010/11 to 2020/21 (Table 36). This compares to an opposing trend in Counties Manukau and Northland having falls of 32% and 42% respectively.

Table 35 Age-standardised valvular heart disease hospitalisation rate per 100,000 adults (15+ years old) by District in the Northern Region, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau
2010/2011	132	62	58	83
2011/2012	95	87	56	102
2012/2013	93	96	65	92
2013/2014	89	86	43	64
2014/2015	114	95	54	69
2015/2016	119	89	52	82
2016/2017	131	83	49	73
2017/2018	102	91	53	80
2018/2019	89	102	71	73
2019/2020	73	84	60	76
2020/2021	78	97	63	59
2010/11 to 2020/21	-41%	55%	9%	-29%

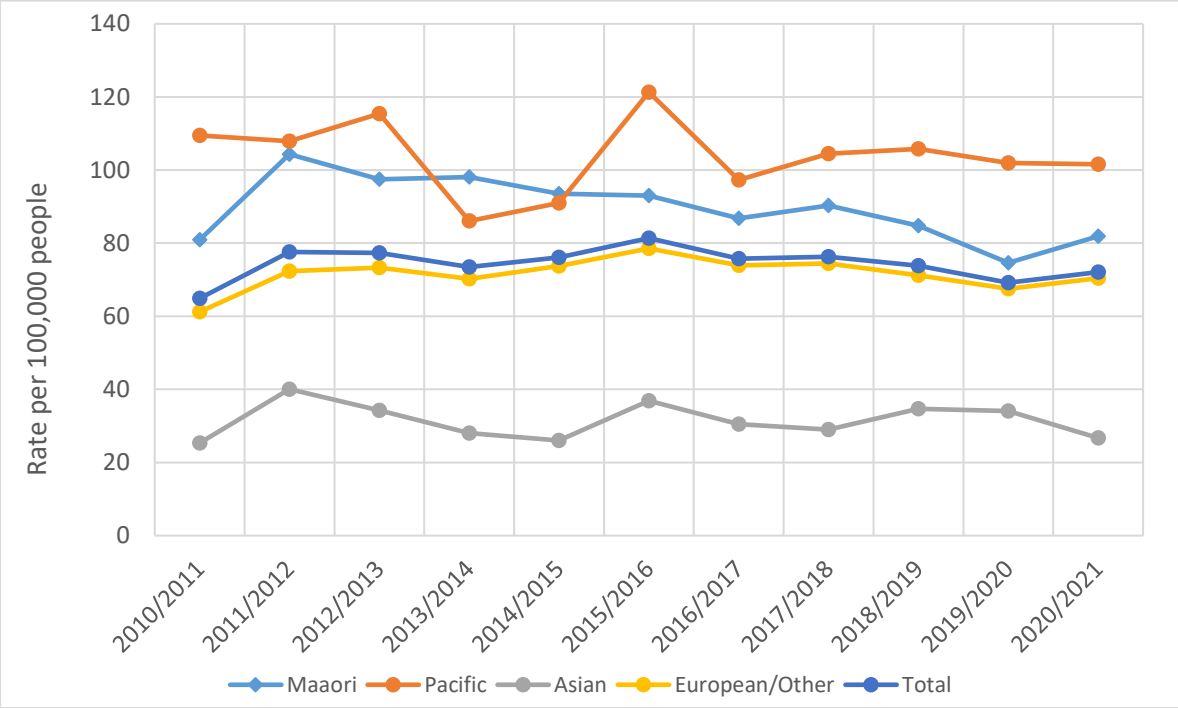
Table 36 Age-standardised valvular heart disease hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by District in the Northern Region and New Zealand, 2010/11 to 2020/21

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand
2010/2011	120	52	58	72	65
2011/2012	82	70	54	87	78
2012/2013	88	78	65	81	77
2013/2014	84	75	43	58	73
2014/2015	98	74	54	56	76
2015/2016	108	70	51	68	81
2016/2017	117	63	49	60	76
2017/2018	90	71	53	67	76
2018/2019	80	72	69	58	74
2019/2020	66	57	59	62	69
2020/2021	70	70	63	49	72
2010/11 to 2020/21	-42%	33%	8%	-32%	11%

Age standardised valvular heart disease rates in New Zealand by ethnicity

Figure 29 shows the Māori and Pacific age-standardised valvular heart disease hospitalisation rates remained elevated over the last 10 years.

Figure 29 Age-standardised valvular heart disease hospitalisation rate (excluding transfers) per 100,000 adults (15+ years old) by ethnicity in NZ, 2010/11 to 2020/21



The substantially higher Māori and Pacific valvular heart disease hospitalisation rate in the younger age groups (Table 37) are mostly explained by the much higher prevalence of rheumatic heart disease prevalence. The European/Other higher VHD hospitalisation rate in the 65 and over age groups may be explained by the older age structure within the older bands compared to other ethnic groups.

Table 37: Age specific valvular heart disease hospitalisation rate (excluding transfers) per 100,000 adults by ethnicity in NZ, in 2020/21

Age specific rates (per 100,000)	**Māori**	**Pacific**	**Asian**	**Euro/ Other**	**NZ Overall**
00-14	8	3	2	2	3
15-44	13	28	3	4	7
45-64	106	122	25	40	51
65+	227	264	94	301	283
Age standardised (overall 15+)	82	102	27	70	72

The regional variations in age specific VHD hospitalisation rates are more marked for people aged 65 and over, where Waitemata had a 58% increase and Auckland a 6% increase in VHD

hospitalisation rates from 2010/11 to 2020/21 (Table 38). In contrast, Northland and Counties Manukau fell by 41% and 34% respectively over the same period. Waitemata had the highest rate of inter-hospital transfers for VHD in the 65 and over age group (120 per 100,000) (Table 39) in 2020/21. This compared to only 31 per 100,000 in Counties Manukau and 28 per 100,000 in 2020/21. The variations in the change in transfer rates for VHD over the 10 year period by Districts suggest there may be difference in intervention threshold by Districts as the one of the common reasons for inter-hospital transfer is for surgical intervention.

Table 38 Age-standardised rate of hospitalisation for VHD (excluding transfers) per 100,000 adults (65+ years old) by District in the Northern Region and New Zealand 2020/2021

	Northland	Waitemata	Auckland	Counties Manukau	New Zealand
2010/2011	459	188	222	249	241
2011/2012	324	275	226	288	291
2012/2013	329	295	248	266	294
2013/2014	309	311	163	177	268
2014/2015	404	302	201	208	287
2015/2016	442	288	193	258	309
2016/2017	435	258	195	212	288
2017/2018	383	295	216	277	301
2018/2019	315	301	270	169	285
2019/2020	269	235	236	210	268
2020/2021	269	296	235	165	283
2010/11 - 2020/21	-41%	58%	6%	-34%	18%

Table 39 Age-standardised rate of transfer for VHD per 100,000 adults (aged 65+ years old) in selected Districts and New Zealand, 2010/11 to 2020/21

	Northland	Waitemata	Counties Manukau	New Zealand
2010/2011	43	34	39	19
2011/2012	51	79	52	26
2012/2013	18	63	37	23
2013/2014	25	50	19	19
2014/2015	71	87	47	28
2015/2016	54	76	43	27
2016/2017	62	96	40	32
2017/2018	48	76	56	27
2018/2019	31	126	38	33
2019/2020	32	119	45	32
2020/2021	28	120	31	35
2010/11 - 2020/21	-36%	256%	-20%	83%

Appendices

Appendix A: ICD codes

Table 40 List of ICD codes used for data extraction in the current analysis

START	END	LABEL
I200	I200	Acute coronary syndrome
I210	I229	Acute coronary syndrome
I48	I4899	Atrial fibrillation and flutter
E1053	E1053	Coronary heart disease
E1153	E1153	Coronary heart disease
E1453	E1453	Coronary heart disease
I20	I2599	Coronary heart disease
R07	R07099	Chest pain
R072	R0799	Chest pain
G45	G4699	Stroke
I60	I6999	Stroke
I441	I44199	Heart block
I442	I4429	Heart block
I453	I4539	Heart block
I495	I4959	Heart block
I110	I11099	Heart failure
I130	I13099	Heart failure
I132	I13299	Heart failure
I50	I5099	Heart failure
E1051	E1051	Peripheral vascular disease
E1052	E1052	Peripheral vascular disease
E1151	E1151	Peripheral vascular disease
E1152	E1152	Peripheral vascular disease
E1451	E1451	Peripheral vascular disease
E1452	E1452	Peripheral vascular disease
I70	I7999	Peripheral vascular disease
I470	I47099	Supraventricular tachycardia
I471	I47199	Supraventricular tachycardia
I472	I472	Ventricular tachycardia
I05	I0899	Valvular heart disease
I34	I3799	Valvular heart disease

Appendix B: % of hospitalisations with a primary diagnosis

Table 41: % of hospitalisations with a primary diagnosis by condition in 2020/21.

Disease category	Number of hospitalisations with primary diagnosis only	Number of hospitalisations with primary diagnosis and secondary diagnoses	% of hospitalisations within a selected disease category with a primary diagnosis
Coronary heart disease	22,237	30,892	72%
Stroke	15,376	19,354	79%
Peripheral vascular disease	5,622	14,268	39%
Chest pain	29,068	37,126	78%
Atrial fibrillation and flutter	12,902	31,603	41%
Heart failure	11,334	25,690	44%
Heart block (sick sinus, second degree or above)	1,797	2,955	61%
Supraventricular tachycardia	1,798	2,948	61%
Valvular heart disease	3,435	7,168	48%