





ORIGINAL ARTICLE

Trends in deprivation in hospitalisations of Indigenous children and young people in Aotearoa New Zealand

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Aim: To examine the 20-year trends in socio-economic inequities in hospitalisations of Māori and non-Māori non-Pacific (NMNP) under-25-year olds in Aotearoa New Zealand.

Methods: Hospital discharge data for Māori and NMNP taitamariki aged under-25 years were extracted from the National Minimum Dataset for the period 2000–2019. Acute or arranged admissions to hospital were included where the primary diagnosis was for a medical condition. Age- and gender-standardised rates (per 1000, 0–24-year old) were calculated for both ethnic groups by area deprivation using the 2013 NZ census estimated resident population. For each ethnic group, inequity indices of socio-economic deprivation (Slope Index of Inequality and Relative Index of Inequality) were computed, using regression modelling, to quantify inequity of medical condition-related hospitalisations and its changes over time.

Results: Hospitalisation rates for medical conditions were consistently higher for Māori than for NMNP under-25-year olds from 2000 to 2019. Māori taitamariki residing in the most deprived (quintile 5) areas were more likely than NMNP to be hospitalised for a medical condition at each time point. Deprivation inequities existed for both ethnic groups and were greater for Māori. Despite reducing deprivation inequities over time, ethnic differences persist on both absolute and relative scales.

Conclusion: Deprivation inequities in hospitalisation for medical conditions persist for Māori taitamariki compared with NMNP and highlights society's tolerance of enduring inequity in health outcomes.

Key words: inequality; inequity; Māori; morbidity; socio-economic factor; tamariki.

What is already known on this topic

- 1 Hospitalisation rates for Māori are higher than for non-Māori non-Pacific (NMNP) under-25-year olds.
- 2 There is a social gradient in hospitalisation rates for Māori and for NMNP.

What this paper adds

- 1 Monitoring temporal patterns of area deprivation by ethnicity contribute to evaluating progress towards equitable outcomes.
- 2 Absolute deprivation inequities are greater and have persisted longer for Māori than for NMNP.
- 3 Despite the overall increase in hospitalisation rates for Māori between 2000 and 2019, inequities on both absolute and relative scales have gradually decreased in the last decade.

Every child has the right to health and well-being from before birth, and should have the same opportunity to achieve their full potential,^{1,2} including optimal and equitable health outcomes. A society with equitable health outcomes involves not only the absence of systemic, unjust and unnecessary differences in the health of individuals or groups within a population but requires

society to recognise that different people at different socio-economic levels require different approaches and resources.^{3–6} Inequitable differences in health outcomes occur when some groups in society (usually the dominant cultures) enjoy privileges and superior living conditions, which are unjustly denied to other groups through discrimination and intergenerational psychosocial stress. Inherent bias in societal systems can mean that services are least available to those in greatest need.^{1,3,6–8}

Children have little control over the circumstances into which they are born, grow up and live.⁸ Multiple intersecting discriminations experienced by some children can have long-lasting impacts into adulthood.^{1,4} Despite Aotearoa New Zealand signifying the importance of healthy happy children by ratifying the United Nations Convention on the Rights of the Child, and

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wanting ‘New Zealand to be the best place in the world for children and young people’² to grow up, for many children, including Māori children or children living in the most deprived areas, attaining optimal health, development and well-being have been elusive.¹ Māori are tangata whenua, the peoples indigenous to Aotearoa New Zealand, and have unique rights, particularly to equitable health status and outcomes, that are reinforced by Te Tiriti o Waitangi and the United Nations Declaration on the Rights of Indigenous Peoples.³

Health inequities remain pervasive in Aotearoa New Zealand,^{3,9,10} and the insufficiency of action to reduce inequities⁹ is evidenced by the continued presence of a socio-economic deprivation gradient for health,¹¹ that is, health outcomes become progressively better with increasing social advantage.⁷ Studies repeatedly present differences for Māori or for children living in the most deprived areas in rates of death and of illnesses requiring hospitalisation, as well as higher levels of material deprivation and adverse health outcomes.^{10–14} There is a paucity of population-level information evaluating the patterns of hospitalisations over time for Māori children aged under-25 years by socio-economic deprivation using absolute and relative terms.

The aim of this study was to describe socio-economic inequities in medical condition-related hospitalisations of Māori and non-Māori non-Pacific (NMNP) under-25-year olds in Aotearoa New Zealand.

Methods

A retrospective analysis of hospitalisations for children aged under-25 years (taitamariki) in Aotearoa New Zealand, from 1 January 2000 to 31 December 2019 was conducted.

Hospitalisation data

De-identified publicly funded hospital discharge data were obtained from the National Minimum Dataset (NMDS) for taitamariki discharged from hospital following an acute or arranged admission for a medical (non-injury) condition (ICD-10-AM: A00-R99 as primary diagnosis) during the study period. The NMDS is a national administrative collection containing data on all publicly funded patient discharges submitted by public and private hospitals.¹⁵ It includes demographic data and diagnostic information coded on discharge using the Australian Modification of the International Classification of Diseases and Related Health Problems 10th revision (ICD-10-AM). This study involved analysing the number of hospitalisations (episodes of care) rather than the number of unique taitamariki hospitalised, and therein some individuals with multiple hospital episodes of care during the study period would be represented more than once. The first hospitalisation event of each hospital episode of care was included. Hospitalisations of non-residents, neonates (babies aged 0–27 days), and hospital transfers (between- and within-facilities) were excluded.

Data management and analyses

The analysed demographics were the age at discharge (grouped into 5-year bands), sex/gender, prioritised ethnicity

and socio-economic deprivation using the New Zealand Deprivation Index. Hospitalisations of Māori and NMNP (comprising European, Asian/Indian and other non-Pacific ethnicities) taitamariki for medical conditions ($n = 2\ 107\ 334$) were the focus of this study and identified using the documented prioritised ethnicity. Prioritised ethnicity identifies persons belonging to multiple ethnic groups and the Ministry of Health assigns to a single ethnic group using a prescribed prioritised order. Hospitalisations for the ethnic groupings of Pacific and Not stated were excluded from these analyses. A specific subset of the medical hospitalisations, namely potentially avoidable conditions, were also identified based on the Ministry of Health definition,¹⁶ as these conditions are widely acknowledged as being modifiable through appropriate provision of primary health care, public health and/or social policy interventions.^{16,17}

The New Zealand Deprivation Index is a validated classification system, described elsewhere,¹⁸ that measures socio-economic disadvantage in small geographic areas using census data. Quintile 1 represents people living in the least deprived areas and is used as the reference group in this study; quintile 5 represents the most deprived areas.

All statistical analyses were performed using SAS version 9.4.¹⁹ Denominator data for the number of children aged under-25 years were obtained from the Stats NZ census estimated resident populations by ethnicity and deprivation. Direct age- and gender-standardised rates were calculated using the 2013 New Zealand Census Estimated Resident Population as the standard. In addition to 95% confidence intervals, other tests of statistical significance were conducted, including the use of Poisson regression models to test for linear trends and to derive the Slope Index of Inequality (SII) as an indirect measure of inequity.^{4–6} The SII is an absolute measure of the spread in hospitalisation rates across deprivation quintiles (from most to least deprived). The Relative Index of Inequality (RII)⁵ is also a regression-based measure that examines the relative differences in hospitalisation rates across all deprivation quintiles. A flat regression line, that is, a zero slope across the deprivation quintiles, means no difference on the absolute scale (SII). Similarly, a quotient of one on the relative scale (RII) also means that the hospitalisation rates for the most and for the least deprived quintiles are equal to the overall average hospitalisation rate. Both indices were calculated for Māori and NMNP separately.

Results

Study population and demographic characteristics

The number of hospitalisations for medical conditions in the time period 2000–2019 was 694 252 hospitalisations of 271 339 Māori taitamariki (aged under-25 years) and 1 413 082 hospitalisations of 658 324 NMNP taitamariki.

The demographic distribution of hospitalisations for both ethnic groups overall and by deprivation quintile is presented in Table 1. For Māori, taitamariki residing in the most deprived areas accounted for over 50% of hospitalisations and under 5% in the least deprived areas. Whereas for NMNP, the hospitalisations were similarly spread at approximately 20% in each quintile.

Table 1 Demographic characteristics for hospitalisations of under-25-year old for medical conditions, by ethnicity and deprivation quintile, Aotearoa New Zealand 2000–2019

	Total†		1 (least deprived)		2		3		4		5 (most deprived)	
	n	%	n	%	n	%	n	%	n	%	n	%
<i>Total medical hospitalisations</i>												
Māori												
Total medical	694 252	100	30 363	4	51 869	7	84 677	12	160 830	23	365 877	53
Medical: PAH	308 960	45	12 987	43	22 589	44	36 869	44	70 611	44	165 645	45
Gender												
Male	259 108	37	12 083	40	20 397	39	32 107	38	59 812	37	134 448	37
Female	435 143	63	18 280	60	31 472	61	52 570	62	101 018	63	231 428	63
Age groups (years)												
0–4	236 149	34	9733	32	17 217	33	27 840	33	54 322	34	126 823	35
5–9	59 595	9	3050	10	4820	9	7438	9	13 753	9	30 505	8
10–14	53 095	8	2645	9	4417	9	6925	8	11 921	7	27 157	7
15–19	139 035	20	6208	20	10 414	20	17 266	20	32 241	20	72 771	20
20–24	206 378	30	8727	29	15 001	29	25 208	30	48 593	30	108 621	30
Non-Māori non-Pacific (NMNP)												
Total medical	1 413 082	100	243 307	17	256 375	18	287 227	20	338 344	24	286 820	20
Medical: PAH	556 871	39	99 166	41	102 959	40	113 777	40	129 523	38	111 072	39
Gender												
Male	581 229	41	110 516	45	110 408	43	119 482	42	131 840	39	108 581	38
Female	831 849	59	132 791	55	145 967	57	167 743	58	206 503	61	178 238	62
Age groups (years)												
0–4	418 793	30	75 972	31	78 465	31	86 535	30	97 310	29	80 280	28
5–9	143 976	10	30 443	13	28 650	11	29 408	10	30 777	9	24 642	9
10–14	136 612	10	30 136	12	27 821	11	28 295	10	28 043	8	22 248	8
15–19	284 306	20	49 364	20	51 103	20	56 437	20	68 435	20	58 731	20
20–24	429 395	30	57 392	24	70 336	27	86 552	30	113 779	34	100 919	35

† Includes hospitalisations where a deprivation score could not be assigned. PAH, potentially avoidable hospitalisation.

Hospitalisation rates for medical conditions

Figure 1 and Table 2 show that the standardised hospitalisation rates by ethnicity were higher for Māori than for NMNP. Both

ethnic groups had increases in hospitalisations between 2000 and 2009, before subsequent declines (Fig. 1). These changes were statistically significant only for Māori (2000–2009 – slope: 2.3, $P < 0.0001$; 2010–2019 – slope: 0.8, $P = 0.038$). The absolute

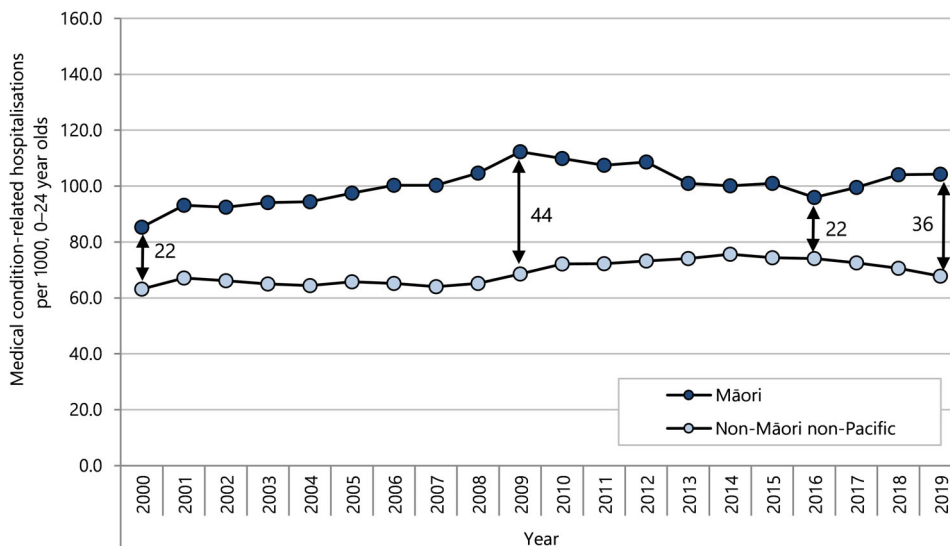


Fig. 1 Trends in medical-condition hospitalisations rate of under-25-year olds, by ethnicity, Aotearoa New Zealand 2000–2019. Ethnicity is level 1 prioritised. Rates are age- and sex-standardised. Arrows represent rate difference.

Table 2 Number, rate, rate differences and rate ratios for medical condition-related hospitalisations of under-25-year olds by ethnicity and deprivation, Aotearoa New Zealand 2000–2019

Medical condition-related hospitalisations								
	Deprivation	Number	Rate	95% CI	SRD	95% CI	SRR	95% CI
Māori	Quintile 1 (least deprived)	30 363	53.45	53.37–53.53	0.0		1.00	
	Quintile 2	51 869	69.97	69.89–70.05	16.5	15.7–17.4	1.31	1.31–1.31
	Quintile 3	84 677	74.88	74.81–74.95	21.4	20.7–22.2	1.40	1.40–1.40
	Quintile 4	160 830	95.47	95.40–95.53	42.0	41.3–42.8	1.79	1.78–1.79
	Quintile 5 (most deprived)	365 877	131.90	131.8–132.0	78.5	77.7–79.2	2.47	2.46–2.47
	Total	694 252	101	100.5–100.6				
Non-Māori non-Pacific	Quintile 1 (least deprived)	243 307	51.26	51.23–51.29	0.0		1.00	
	Quintile 2	256 375	59.47	59.44–59.50	8.2	7.9–8.5	1.16	1.16–1.16
	Quintile 3	287 227	67.39	67.36–67.43	16.1	15.8–16.5	1.31	1.31–1.32
	Quintile 4	338 344	81.74	81.71–81.78	30.5	30.1–30.8	1.59	1.59–1.60
	Quintile 5 (most deprived)	286 820	96.39	96.34–96.44	45.1	44.7–45.5	1.88	1.88–1.88
	Total	1 413 082	69	69.15–69.18				

Rates: age- and gender-standardised and per 1000, reference group: Quintile 1, SRD: adjusted rate difference and per 1000, SRR: adjusted rate ratio.

difference in rates increased from 22 in 2000 to 44 in 2009, then declined to 22 in 2016 but increased again in the subsequent years.

For both ethnicities, the rates of hospitalisation were lowest in quintile 1 (least deprived) and progressively increased as deprivation increased. The increase in hospitalisation rate as deprivation increased was more marked for Māori, as shown in the relative gap (rate ratio) between quintile 5 and quintile 1 for Māori of 2.47, compared with 1.88 for NMNP (Table 2). This finding was apparent and consistent across all years in the time period (Fig. 2). Statistically, significant increases were observed across all years for Māori in quintiles 4 and 5, and over the whole time period in all quintiles for NMNP. Statistically, significant decreases were only observed for Māori in quintile 2. Of particular note, the standardised hospitalisation rate/1000 for Māori in quintile

5 (most deprived) reached peak levels in 2009 (slope: 4.7, $P < 0.0001$), before declining in 2010–2019 (slope: -1.5 , $P = 0.0004$).

Hospitalisations on the absolute scale

A visual inspection of the absolute gap in hospitalisation rates between the quintiles 5 (most deprived) and 1 (least deprived) areas in Figure 2 suggested that the difference between the two quintiles was greater for Māori than for NMNP. This was confirmed using SII, which shows the increase in absolute deprivation inequities in hospitalisations in the Māori population began earlier, was more severe, and persisted for a longer time period than that seen in the NMNP population (Fig. 3). For Māori, the decrease in SII seen after 2009 has been slower and by 2019 had

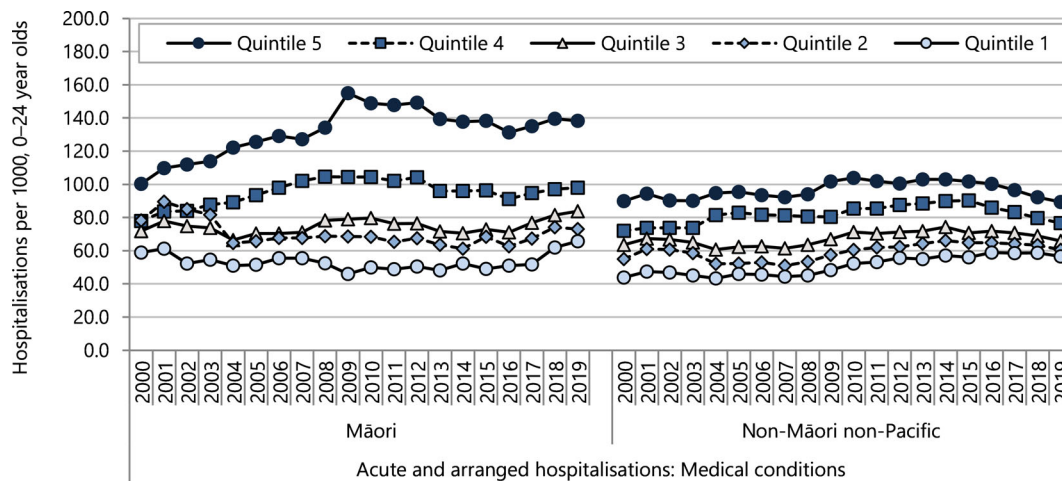


Fig. 2 Trends in medical-condition hospitalisations rate of under-25-year olds, by deprivation and ethnicity, Aotearoa New Zealand 2000–2019. Ethnicity is level 1 prioritised. Rates are age- and gender-standardised. Quintile 1 is least deprived and quintile 5 is most deprived.

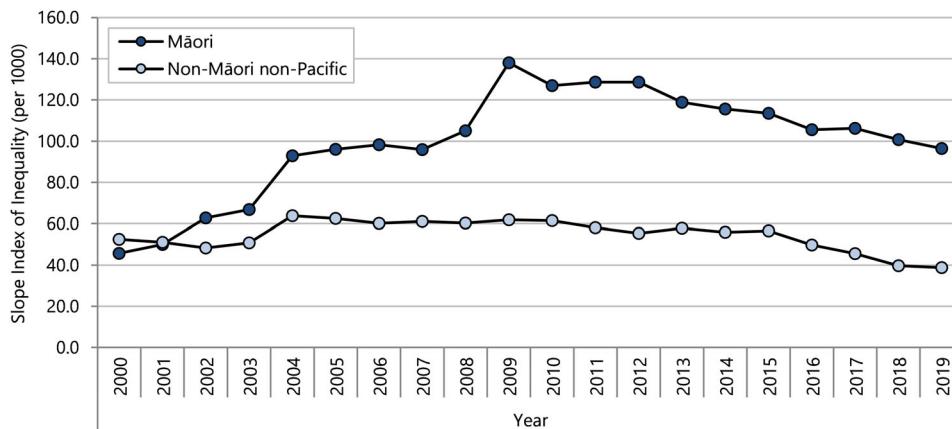


Fig. 3 Trends in medical-related hospitalisations on the absolute scale (SII), by ethnicity and time, Aotearoa New Zealand 2000–2019.

only reached levels equivalent to 2007. For NMNP, the rise in SII began later (2002), peaked in 2004 and by 2017, the SII was lower than in 2002 (Fig. 3).

Hospitalisations on the relative scale

Relative to the overall average rate (as measured using RII), the level of deprivation inequities was similar for both ethnic groups between 2004 and 2007. After which, a marked increase was observed for Māori in 2009, followed by similar patterns of annual decline for both ethnic groups (Fig. 4).

Discussion

The findings from this study indicate:

- 1 Māori taitamariki aged under-25 years had higher rates of hospitalisation for medical conditions than NMNP, particularly those from the most deprived (quintile 5) areas.
- 2 Deprivation gradients existed for both ethnic groups but to a lesser degree for NMNP.
- 3 Hospitalisations by area deprivation on both absolute and relative scales were greater for Māori during 2009–2019.

4 Since 2009, declines on both absolute and relative scales were observed for the two ethnic groups; however, the reduction has been slower for Māori.

The high and increased rate of hospitalisation for Māori, compared to NMNP taitamariki, both overall and among those in the most deprived areas are consistent with findings reported elsewhere.^{11–13,20,21} This study confirms the presence of health inequity between Māori and NMNP and also within the population of Māori taitamariki by social and material deprivation. This study expands upon earlier studies through the inclusion of complex inequity measures on absolute and relative scales.

The differences presented reveal the high and persistent level of health inequity experienced by Māori taitamariki within Aotearoa New Zealand. Inequity is related not only to differences in the day-to-day circumstances which impact on the lives and well-being of taitamariki and their whānau (such as housing conditions and barriers to care), but also to the way that social, political and economic policy decisions impact on the wider social and environmental determinants of health.^{7,22}

The inequity was highlighted by the fact that nearly half of the medical hospitalisations for Māori in this study were potentially avoidable (which was consistent with an earlier study²³) and the slower decline in health inequity, on both

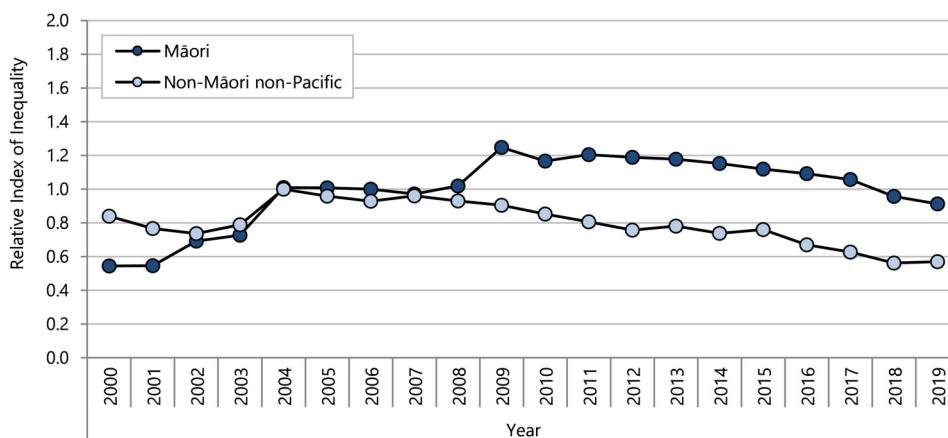


Fig. 4 Trends in medical-related hospitalisations on the relative scale (RII), by ethnicity and time, Aotearoa New Zealand 2000–2019.

absolute and relative scales, observed in recent years. Given unequal access to services heightens health inequities,^{1,22} these observations suggest that access to, and quality of, primary care services delivered to children may not have improved despite removal of fees for children accessing these services.^{22,24} Access restrictions may also reflect non-fee related barriers in conjunction with the lasting effects of the 2008–2010 Global Financial Crisis (GFC). For whānau living in the most deprived (quintile 5) areas, the GFC drove increased unemployment, decreased discretionary income, increased need for benefits, and increased hospitalisation rates for children.^{11,21,25} This study noted that the impact on hospitalisations during and following the GFC on Māori whānau was substantially greater than that for NMNP families.

Increasing rates of non-fee related barriers have been documented for children as limited accessibility and availability of primary care appointments, lack of transport or of childcare for siblings, associated costs arising from the appointment, and awareness of unpaid fees for other family members. The flow-on consequences were increased inability for under-15-year old to get a GP appointment within 24 h, increased rates of attendance at emergency departments, and unfilled prescriptions, particularly for Māori.^{13,21,26} This study was not able to investigate the impact on hospitalisation rates from health policies targeting specific barriers, which warrant consideration in future analyses.

Strengths and limitations

Information on who has attended and been treated by primary care was not available outside of the Primary Health Organisations or the individual practices in which it is held. This lack of nationally available primary care utilisation data at an individual level prevents the determination of primary care involvement prior to hospitalisation, which would have strengthened the interpretation of the results. The analyses were based on counts of hospitalisations and did not reflect individual children hospitalised nor were readmissions excluded. Condition-specific hospitalisations were not examined in depth in this study and warrant consideration in future analyses.

Conclusion

Māori taitamariki residing in the most deprived areas were more likely than NMNP to be hospitalised for a medical condition at each time point over the period 2000–2019. In the last decade, deprivation inequalities of hospitalisations declined for both ethnic groups, although more slowly for Māori. In spite of reducing deprivation inequities, in absolute and relative terms, differences by ethnicity persist. Persisting deprivation differences in hospitalisation rates for medical conditions for Māori taitamariki compared with NMNP do not suggest that being Māori is a predictor of hospitalisation but rather highlights society's tolerance of enduring inequity in health outcomes.

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Black beauty by Alyssa Rodrigues (aged 13) from “A Pop of Colour” art competition, Youth Arts, Children’s Hospital at Westmead