

How Healthy Are the Environments of Tamariki and Rangatahi Māori in Aotearoa New Zealand? A Nationwide Cross-Sectional Geospatial Study

JESSE WIKI,^{*} REREMOANA THEODORE,[†] LUKÁŠ MAREK,[‡]
MATT HOBBS,[§] TROY RUHE,^{**} JESSE KOKAUA,^{††} JO BODEN,^{‡‡}
HIRAN THABREW,^{§§} SARAH HETRICK,^{***} BARRY MILNE,^{†††}
AND NICK BOWDEN^{‡‡‡}

^{*} Jesse Wiki is a post-doctoral fellow at the Geospatial Research Institute, University of Canterbury | Te Whare Wānanga o Waitaha.
Corresponding author: jesse.wiki@canterbury.ac.nz

[†] Reremoana Theodore is the director of the Dunedin Multidisciplinary Health and Development Study, University of Otago | Te Whare Wānanga o Ōtākou.

[‡] Lukas Marek is a post-doctoral fellow at the Geospatial Research Institute, University of Canterbury | Te Whare Wānanga o Waitaha.

[§] Matt Hobbs is a senior lecturer at the School of Health Sciences, Faculty of Health, University of Canterbury | Te Whare Wānanga o Waitaha.

^{**} Troy Ruhe is a research fellow at Va'a o Tautai | Centre for Pacific Health at the University of Otago | Te Whare Wānanga o Ōtākou.

^{††} Jesse Kokaua is a senior research fellow at Va'a o Tautai | Centre for Pacific Health, University of Otago | Te Whare Wānanga o Ōtākou.

^{‡‡} Jo Boden is the director of the Christchurch Health and Development Study and a professor in the Department of Psychological Medicine, University of Otago | Te Whare Wānanga o Ōtākou.

^{§§} Hiran Thabrew is a child psychiatrist and paediatrician at Starship Children's Hospital and the director of Te Ara Hāro, Centre for Infant, Child and Adolescent Mental Health, University of Auckland | Waipapa Taumata Rau.

^{***} Sarah Hetrick is an associate professor in the Department of Psychological Medicine, University of Auckland | Waipapa Taumata Rau.

^{†††} Barry Milne is the director of the Centre of Methods and Policy Application in the Social Sciences (COMPASS) and an associate professor in the School of Social Sciences, University of Auckland | Waipapa Taumata Rau.

^{‡‡‡} Nick Bowden is a research fellow at the Department of Women's and Children's Health, University of Otago | Te Whare Wānanga o Ōtākou.

Abstract

The environment impacts the health of children and has lasting impacts over their life course. This is particularly important for tamariki (children, 0–14 years) and rangatahi (youth, 15–24 years) Māori who face persistent inequities and have an integral connection to the land. Yet, there is little nationwide research in this area. Using individual-level microdata and nationwide environmental and socioeconomic data, this research applies descriptive and regression analysis to examine the environments of children and youth in Aotearoa New Zealand, focusing on tamariki and rangatahi Māori. Findings show that tamariki and rangatahi Māori have good access to greenspace, bluespace, fruit and vegetable stores, and dairies. However, it is important to recognise the impact on health and social outcomes is complex and multifaceted.

Keywords: environment, geospatial, population, children and youth, Māori

Disclaimer

These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI, please visit <https://www.stats.govt.nz/integrated-data/>

The natural and built environment plays a crucial role in shaping the health and social outcomes of children and youth. The *natural environment* refers to the physical surroundings that exist in the absence of human intervention or activities while the *built environment* refers to the physical and man-made surroundings in which people live, work and interact (Bird et al., 2018). This includes greenspaces (e.g., parks), bluespaces (e.g., lakes and beaches), and facilities such as schools, health care and shops. Previous research has shown that the design of neighbourhoods and the availability of facilities in the environment can have an impact on the physical and mental health of children and have lasting impacts over their life course (Gascon et al., 2015; Ige-Elegbede et al., 2022; Villanueva et al., 2013). Safe areas to walk, parks, playgrounds and sports fields encourage active play and exercise, contributing to healthier lifestyles and reducing the risk of non-communicable diseases (Ige-Elegbede et al., 2022; Zhou et al., 2022). Access to such environments can also enhance wellbeing and reduce stress (Evans, 2003). Conversely, environments with limited facilities or unsafe outdoor spaces may hinder physical activity and encourage sedentary behaviours, negatively affecting physical and mental health (Bassul et al., 2021; Davison & Lawson, 2006).

The environment also influences children's access to healthy food options. Neighbourhoods with well-designed stores, markets and community gardens can promote access to fresh, nutritious food (Swinburn et al., 2015). On the other hand, neighbourhoods with limited availability of affordable and healthy food, or high availability of unhealthy foods, can contribute to poor dietary choices and a higher risk of nutrition-related health issues among children and youth (Fiechtner et al., 2015; Lake, 2018). Proximity to schools, health care and other essential services are additional aspects of the environment that greatly influence the health of children

and youth. Accessible and safe routes to schools can promote active transportation, such as walking or cycling (Smith et al., 2017), and adequate access to health care services and community resources ensures timely medical care, support and educational opportunities, contributing to positive health and social outcomes. While creating nurturing and supportive environments that prioritise wellbeing and address the various determinants of health and social outcomes is crucial for promoting positive development in children and youth, it is also important to recognise that the influence of the environment on children's health and social outcomes is complex, and multiple factors interact with one another. Likewise, it is important to recognise inequity of environments, with previous research demonstrating less healthy environments for children living in deprived areas (Cetateanu & Jones, 2014; Egli et al., 2020; Olsen et al., 2021), and for children who are Indigenous or from ethnic minority groups (Backholer et al., 2021; Landrigan et al., 2010).

In Aotearoa New Zealand, the influence of the environment may be particularly important for tamariki (children, 0–14 years) and rangatahi (youth, 15–24 years) Māori. Both the whenua (land) and moana (ocean/sea) hold a place of high significance for Māori. The importance of the land to Māori is eloquently summarised in the whakataukī (proverb) “Te toto o te tangata, he kai; te oranga o te tangata, he whenua”, meaning while food provides the blood in our veins, our health is drawn from the land (Keane, 2007). The land and waters in te ao Māori (Māori world view) provide spiritual connection through whakapapa (genealogy) and, more pragmatically, provide sustenance. In contemporary society, such beliefs are still upheld but much of the landscape has changed, distorting Māori interactions with the environment. Research has demonstrated that Māori are more likely to live in deprived areas (Loring et al., 2022), and that deprived urban areas are more likely to be health-constraining environments

with an abundance of potentially negative exposures including alcohol outlets, fast-food outlets and takeaway stores (Marek et al., 2021; Sushil et al., 2017; Wiki et al., 2019). Deprived urban areas in Aotearoa New Zealand have also been shown in previous research to have an abundance of other stores, however, including those that are health-promoting such as fruit and vegetable stores and supermarkets (Marek et al., 2021; Sushil et al., 2017; Wiki et al., 2019). In contrast, deprived rural areas in Aotearoa New Zealand lack access to stores and amenities, and while they have a high amount of greenspace and bluespace due to their rurality and proximity to the coast, the usability and safety of such areas may be limited. For example, bluespace may include areas that are not directly accessible or bodies of water that may be dangerous for physical activity and recreation. Additionally, transport paths and routes to destinations may also be more hazardous in rural areas, with roads that have a high speed limit and a lack of cycleways and footpaths. Both types of areas have been associated with negative health and social outcomes and may affect tamariki and rangatahi Māori who face persistent inequities, including lower life expectancy, poorer education and health outcomes, and stigmatisation (Hobbs et al., 2019), and whose connection to the environment is an integral aspect of wellbeing (Crengle et al., 2022; Riva et al., 2009). Yet, there is little nationwide research examining the environments of children in Aotearoa New Zealand, and even less focused on the environments of tamariki and rangatahi Māori.

Using a large population cohort and nationwide data, this research aims to examine associations between environmental features and populations of children and youth in Aotearoa New Zealand with a specific focus on tamariki and rangatahi Māori. The study will address three research questions:

- 1) What type of environments are tamariki and rangatahi Māori living in?

- 2) Do the environments that tamariki and rangatahi Māori live in differ by age group?
- 3) How do the environments of tamariki and rangatahi Māori compare with the environments of the wider youth population?

We examine the spatial proximity of environmental features in the direct neighbourhood (area of residence). We also examine the likelihood of living in a health-promoting or health-constraining environment, living in deprivation, and living in a rural environment. Research question 2 focuses on differences in the environments tamariki and rangatahi Māori are living in by age group (tamariki aged 0–4 and 5–14 years, and rangatahi aged 15–24 years). This examines the age-related independence of young adults and explores how age may change their environmental context (e.g., moving to different areas for work or study). Research question 3 presents a contextual understanding of the environments of tamariki and rangatahi Māori, examining how they compare with those of the wider population in Aotearoa New Zealand including non-Māori/non-Pacific (NMNP) children and youth.

Methodology

Data

This is a nationwide cross-sectional geospatial study that combines individual-level linked microdata with environmental and socio-economic data.

Individual-level data

Individual-level data were derived from the Integrated Data Infrastructure (IDI), which contains de-identified administrative data on people and households for the full population of Aotearoa New Zealand, linked at the individual level (Milne et al., 2019; Stats NZ, 2022a). The IDI is managed by Stats NZ. The participant population was a national cohort

of children/tamariki (0–4 and 5–14 years) and youth/rangatahi (15–24 years), extracted from the administrative population census 2022 data (Stats NZ, 2022b) available in the IDI. This allows for use of the most up-to-date information to describe the environments where children and youth live in Aotearoa New Zealand. Individual-level data included information on age, ethnicity and residential meshblock at 30 June 2022. Ethnicity data were derived from the IDI personal details data set using a total response approach, allowing individuals to identify with multiple ethnicities. Ethnicity was classified into three populations: Māori, Pacific Peoples, and non-Māori/non-Pacific (NMNP). NMNP is used as a reference group to contextualise results in this study, as opposed to referencing to solely non-Māori, as there are many factors associated with Pacific Peoples that may influence the results for Māori due to their shared heritage and the fact that they face many similar social and economic challenges. Findings and discussion of results for Pacific Peoples are presented elsewhere.

Environmental and socio-economic data

Environmental and socio-economic data include the *Healthy Location Index* (HLI) (Marek et al., 2021), *New Zealand Index of Deprivation 2018* (NZDep2018) (Atkinson et al., 2020), and the *Urban Rural Indicator* (Stats NZ, 2019). The area-based environmental and socio-economic data were linked to individuals based on their last known residential meshblock.

The HLI is a nationwide measure of access to health-promoting and health-constraining environments defined at the meshblock level. It is an index that captures access to five health-promoting environmental features – greenspace (e.g., parks), bluespace (e.g., lakes and beaches), physical activity facilities, supermarkets, and fruit and vegetable stores – as well as five health-constraining features – alcohol outlets, fast-food outlets, takeaway stores, gambling venues, and dairy and convenience stores. The index can be interpreted in two ways.

First, it can be used as an indicator of co-occurrence of health-promoting and health-constraining features in the environment (i.e., the overall index – either 9 or 3 categories). And secondly, it can be split to consider each feature separately and independently, focusing on health-promoting and health-constraining features by individual domains (deciles or distances), where decile 1 (D1) indicates the best access and decile 10 (D10) indicates the worst access. This study uses both aspects of the HLI to gain an in-depth understanding of the environments where tamariki and rangatahi Māori live. We used the NZDep2018 (Atkinson et al., 2020) as a measure of area-level deprivation. The score was collapsed to deciles (D) where D1 represents the least-deprived areas and D10 the most-deprived areas. The urbanicity of an area is based on the Urban Rural Indicator 2018, which categorises areas based on the number of residents, population density and coverage of built physical structures (Stats NZ, 2019). We used four urban area categories (major urban, large urban, medium urban and small urban), two rural categories (rural settlement and rural other), and one combined category of water (inland, inlet and oceanic areas).

Analysis

Descriptive and regression analyses were used to describe the environments where tamariki and rangatahi Māori live. Descriptive analyses were stratified by age for children/tamariki (0–4 and 5–14 years) and youth/rangatahi (15–24 years). The HLI is an index made up of many components. It is important to examine broad patterns at the highest level of the index. This is done using the I co-occurrence aspect of the HLI to measure if the direct environment (meshblock of residence) where a young person lives is classified as either health-promoting or health-constraining, when considering all environmental features together. It is also important to break this down into more

detail to examine differences within each component as there may be some aspects of the HLI that have more influence than others. This is done using the individual domain aspect of the HLI to measure the distance from each young person's direct neighbourhood (meshblock of residence) to each environmental feature, providing a spatial understanding of the proximity of all features.

We used lognormal linear regression with a logarithm of distance to the nearest feature in individual domains as the dependent variable to analyse variation in access to those features by ethnicity (Māori versus NMNP), age group and also their interaction. The models for all ten domains were adjusted for deprivation and urbanicity. For differences in categorical variables (nine categories of the HLI and three categories of the simplified HLI) by ethnicity and age, we used ordered logistic regression models, similarly adjusted for deprivation and urbanicity. Māori were used as the reference group as a way of identifying non-Indigenous privilege. This is an approach that is consistent with kaupapa Māori and has been used in previous research to challenge Western constructions of research and avoid deficit framing of Indigenous results (Haitana et al., 2020; Manuel et al., 2023). All statistical analysis and graphic outputs were created using R v4.3 (R Core Team, 2021).

Results

Table 1 shows the population structure of children and youth used in this study. The total sample of Māori ($n = 417,420$) comprised 259,227 tamariki (82,860 aged 0–4 years and 176,367 aged 5–14 years) and 158,193 rangatahi (aged 14–25 years). The percentage in each age group is similar to that of the wider NMNP children and youth population. Results show that Māori are well-represented across most of the urban-rural spectrum while NMNP children and youth are more urbanised. Results also highlight that a high proportion of tamariki and

rangatahi Māori live in areas of high deprivation, particularly the most-deprived areas (D10), a stark contrast to that of the wider NMNP children and youth population. Māori are over-represented in the most-deprived areas and underrepresented in the least-deprived areas, with 25.24 per cent of tamariki and rangatahi Māori living in the most-deprived areas (D10) yet only 4.56 per cent living in the least-deprived areas (D1). Furthermore, 53.27 per cent of tamariki and rangatahi Māori live in the three most-deprived deciles (D8, D9 and D10) compared with 21.97 per cent of the NMNP children and youth population. This is a pattern that is persistent across age groups (Figure 1) and highlights inequities between Māori and NMNP children and youth.

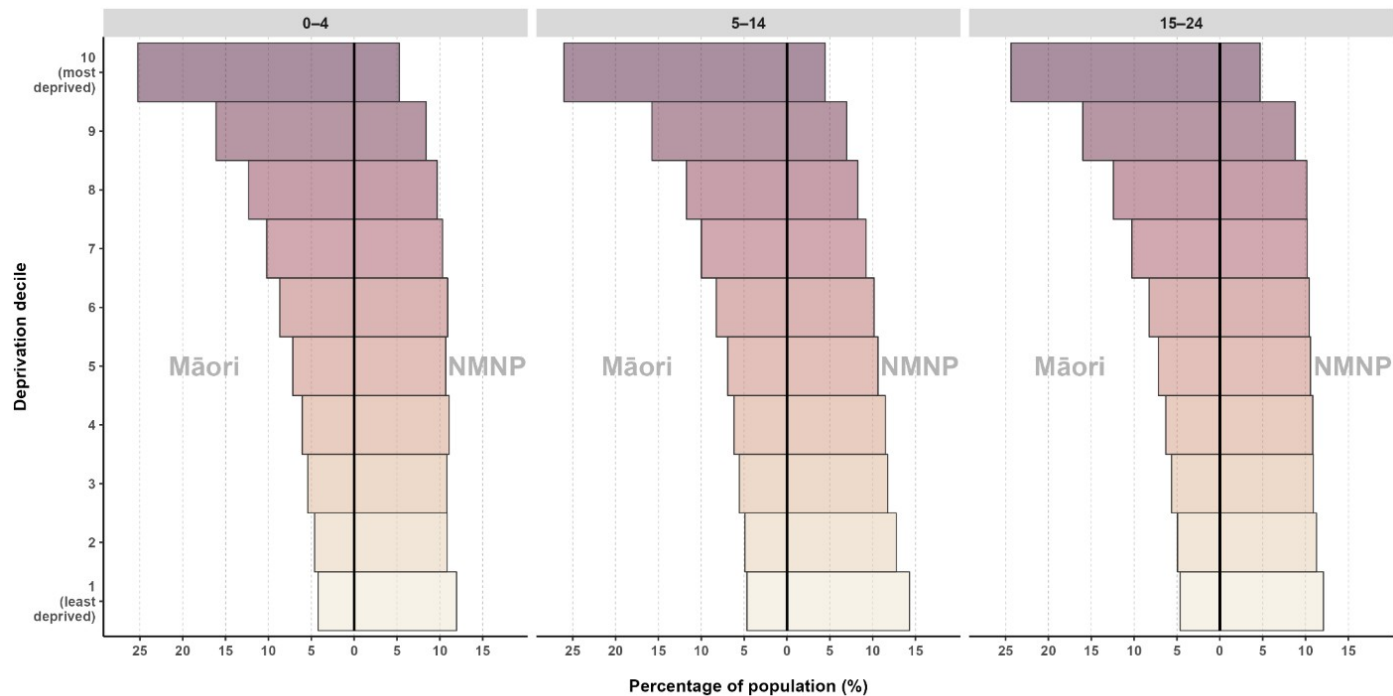
Table 1: Sociodemographic characteristics of children and youth in Aotearoa by deprivation and urban rural indicators

	Māori		NMNP	
	<i>n</i>	%	<i>n</i>	%
Total	417,420	100.00 %	988,551	100.00 %
<i>Age</i>				
0-4	82,860	19.85%	174,378	17.64%
5-14	176,367	42.25%	174,378	41.14%
15-24	158,193	37.90%	407,475	41.22%
<i>Deprivation</i>				
D1 (least deprived)	19,044	4.56%	128,238	12.97%
D2	20,310	4.87%	116,727	11.81%
D3	23,196	5.56%	111,039	11.23%
D4	25,899	6.20%	110,154	11.14%
D5	29,487	7.06%	104,916	10.61%
D6	34,794	8.34%	102,885	10.41%
D7	42,300	10.13%	97,155	9.83%
D8	50,529	12.11%	91,926	9.30%
D9	66,435	15.92%	78,801	7.97%
D10 (most)	105,372	25.24%	46,482	4.70%

deprived)				
NA	54	0.01%	228	0.02%
<i>Urban-Rural</i>				
Major urban area	163,293	39.12%	529,947	53.61%
Large urban area	86,088	20.62%	122,967	12.44%
Medium urban area	35,511	8.51%	82,041	8.30%
Small urban area	60,720	14.55%	86,838	8.78%
Rural settlement	17,256	4.13%	27,717	2.80%
Rural other	54,549	13.07%	139,038	14.06%

Notes: 1. NMNP = non-Māori/non-Pacific.
2. Total group counts may not sum up to the same number due to random rounding of data.

Figure 1: Deprivation of places where children and youth live in Aotearoa New Zealand by age group, based on New Zealand Index of Deprivation 2018 decile



Note:

NMNP = non-Māori/non-Pacific.

Table 2 shows the median distance to the closest environmental feature by individual HLI domains for tamariki and rangatahi Māori. Results show that rangatahi (15–24 years) live closer to most of the built environmental features considered: fruit and vegetable stores, supermarkets, physical activity facilities, fast-food outlets, takeaway shops, dairies, alcohol outlets and gaming venues. This is followed by tamariki aged 0–4 years, with those aged 5–14 years shown to have the farthest distance to the above features. There is little difference in distance to the closest greenspace and bluespace by age group; however, greenspace is shown to be more accessible than bluespace overall (Table 2). Apart from greenspace and bluespace, which are largely natural features, the most accessible feature of the environment is alcohol outlets and the least accessible is fruit and vegetable stores. Comparative results for NMNP children and youth are included in the supplementary notes (Table S1).

As mentioned earlier, the HLI can be interpreted in two ways, the first of which is as an indicator of co-occurrence of health-promoting and health-constraining features in the environment (i.e., the overall index), presented in Figure 2 and Figure 3. Figure 2 shows results for the overall index with all nine categories including health-promoting environments (where there is more access to environmental ‘goods’ and less access to environmental ‘bads’), health-constraining environments (where there is more access to environmental bads and less access to environmental goods), and environments classed as neither (where there is a balance of access to both environmental goods and bads). It provides a broad overview of the percentage of the population living in each type of environment. Figure 3 looks in further detail at the health-promoting and health-constraining aspects of the overall HLI (those in pink and green only within Figure 2), allowing for a more in-depth examination of these environments. It shows access to health-promoting and health-

constraining environments by accessibility decile from the most accessible (or nearest) to the least accessible (or furthest), stratified by age group and ethnicity. Overall, there are few differences in the percentage of Māori who live in health-promoting environments by age group, although there are slightly more rangatahi who live in health-constraining environments and environments classed as neither health-promoting nor health-constraining when compared with tamariki. These environments are often dense urban areas that

Table 2. Median distance (in metres) to the closest environmental feature by individual Healthy Location Index (HLI) domains for tamariki and rangatahi Māori

	Age 0-4	Age 5-14	Age 15-24
HLI Domain	Median (in m) (q ₁ ; q ₃)	Median (in m) (q ₁ ; q ₃)	Median (in m) (q ₁ ; q ₃)
Fruit & vegetables	3,972 (1,866; 11,935)	4,029 (1,900; 12,201)	3,568 (1,745; 10,506)
Supermarkets	1,682 (1,024; 3,197)	1,703 (1,035; 3,311)	1,613 (985; 2,973)
Physical activity	1,606 (926; 3,241)	1,634 (953; 3,378)	1,495 (866; 2,917)
Greenspace	141 (50; 250)	141 (50; 250)	141 (50; 250)
Bluespace	667 (361; 1,083)	658 (354; 1,082)	655 (354; 1,080)
Fast foods	2,239 (1,223; 6,129)	2,310 (1,261; 6,705)	2,040 (1,118; 5,080)
Takeaways	1,139 (643; 2,427)	1,173 (666; 2,552)	1,076 (606; 2,245)
Dairies	1,025 (553; 2,067)	1,056 (576; 2,151)	980 (526; 1,916)
Alcohol outlets	679 (400; 1,146)	693 (409; 1,171)	645 (370; 1,096)

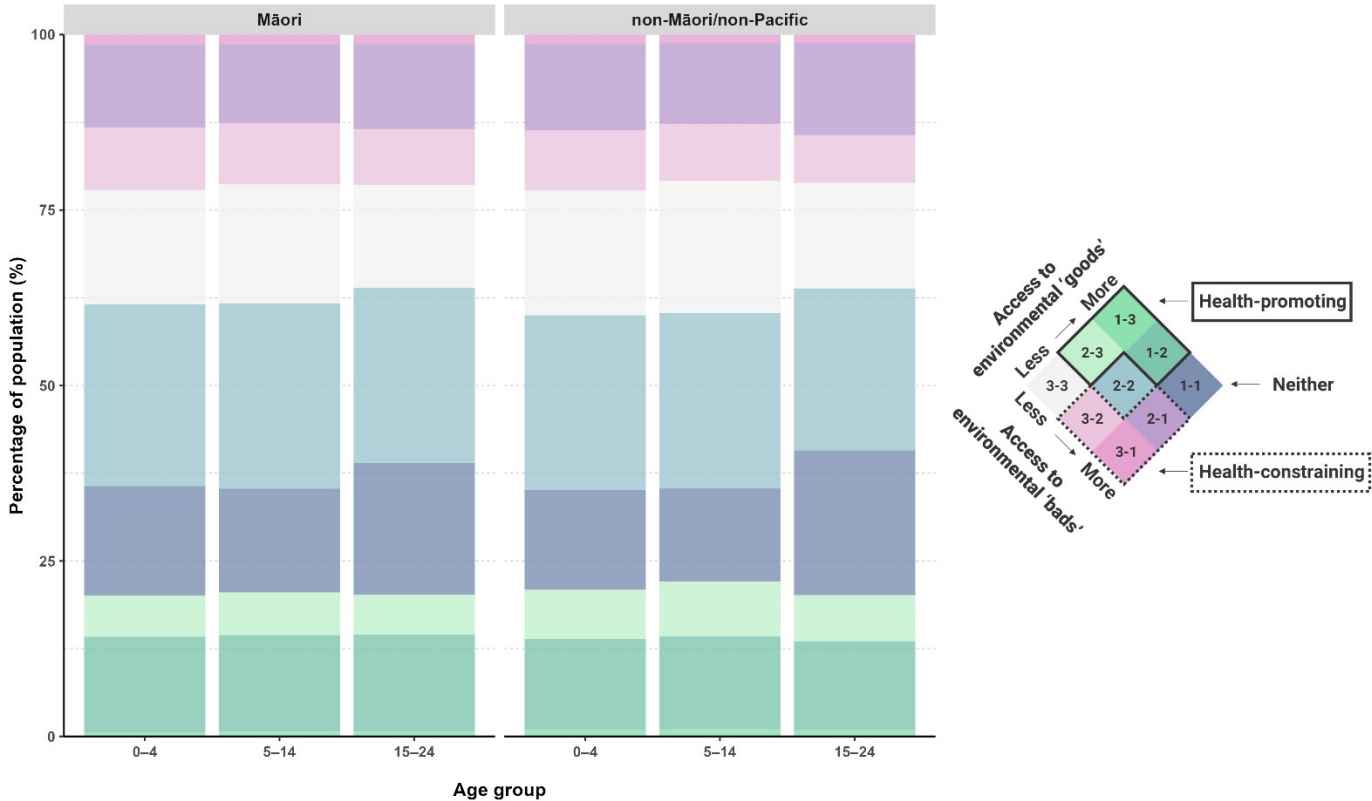
HLI Domain	Age 0-4	Age 5-14	Age 15-24
	Median (in m) (q ₁ ; q ₃)	Median (in m) (q ₁ ; q ₃)	Median (in m) (q ₁ ; q ₃)
Gaming venues	1,546 (940; 2,750)	1,571 (959; 2,846)	1,490 (899; 2,602)

Note: m = metres; q₁ and q₃ = first and third quartile

have a high number of all environmental features considered in this study, including both health-promoting and health-constraining features. A similar pattern is seen for NMNP children and youth. Interestingly, when compared with tamariki and rangatahi Māori, NMNP children and youth are less likely to live in areas with low access to health-constraining environments, meaning that health-constraining environments are more accessible for this group. NMNP children and youth are also more likely to live in areas with low access to health-promoting environments, including features of the natural environment such as greenspace and bluespace (see Figure S1 in the supplementary notes).

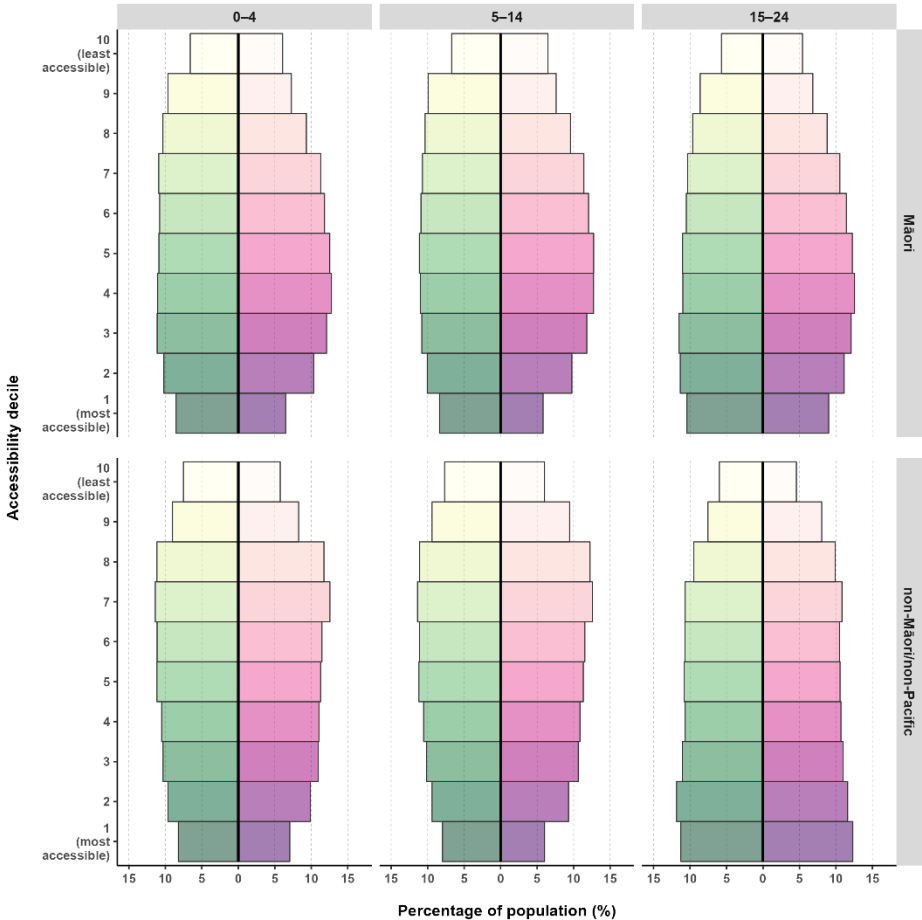
The second way in which the HLI can be interpreted is by splitting the above categories up to consider each feature separately, to focus independently on health-promoting and health-constraining features by individual domains, where decile 1 indicates the best access and decile 10 indicates the worst access. Figure 4 shows results for these individual domains by accessibility decile. Results show that rangatahi Māori (aged 15–24 years) live closer to all the built environmental features considered: fruit and vegetable stores, supermarkets, physical activity facilities, fast-food outlets, takeaway shops, dairies and convenience stores, alcohol outlets and gaming venues. This pattern is similar for both Māori and NMNP but does not extend to features of the natural environment such as greenspace and bluespace (Figure 4).

Figure 2: How healthy is the (built) environment where children and youth in Aotearoa New Zealand live, by ethnicity and age group?



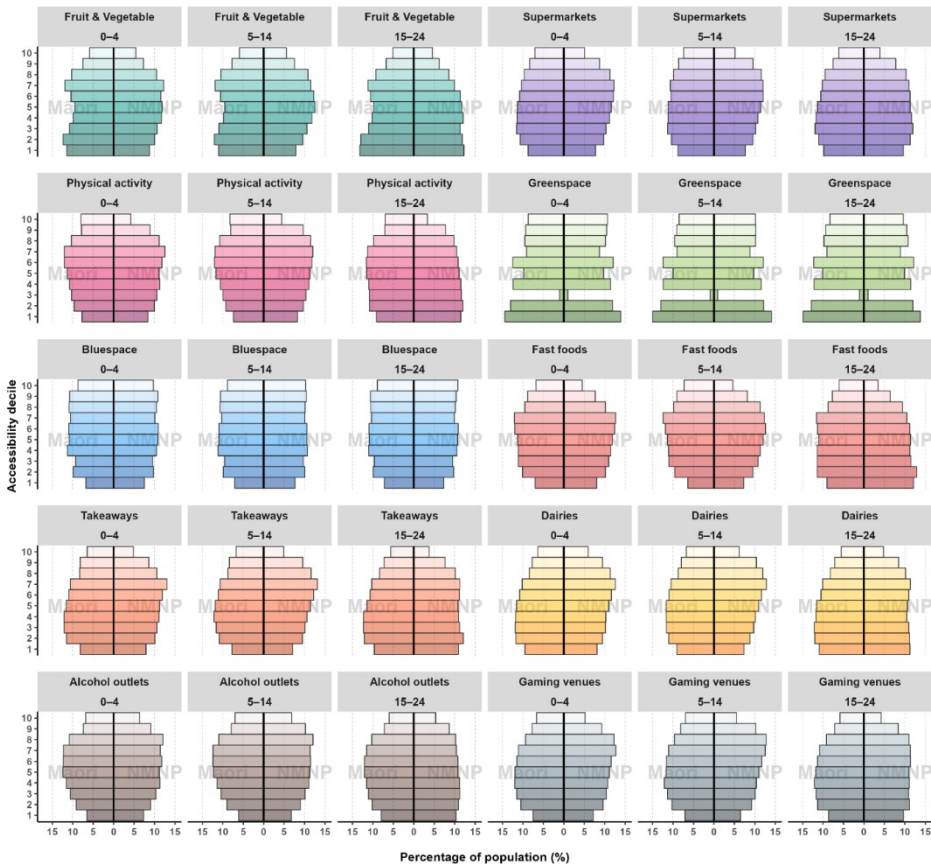
Note: Percentage of population calculated from the Healthy Location Index.

Figure 3: Accessibility of children and youth in Aotearoa New Zealand to health-promoting and health-constraining environments, by accessibility decile, ethnicity and age group



Notes: 1. Percentages calculated from the Healthy Location Index.
2. Pink are health-constraining environments and green are health-promoting environments.

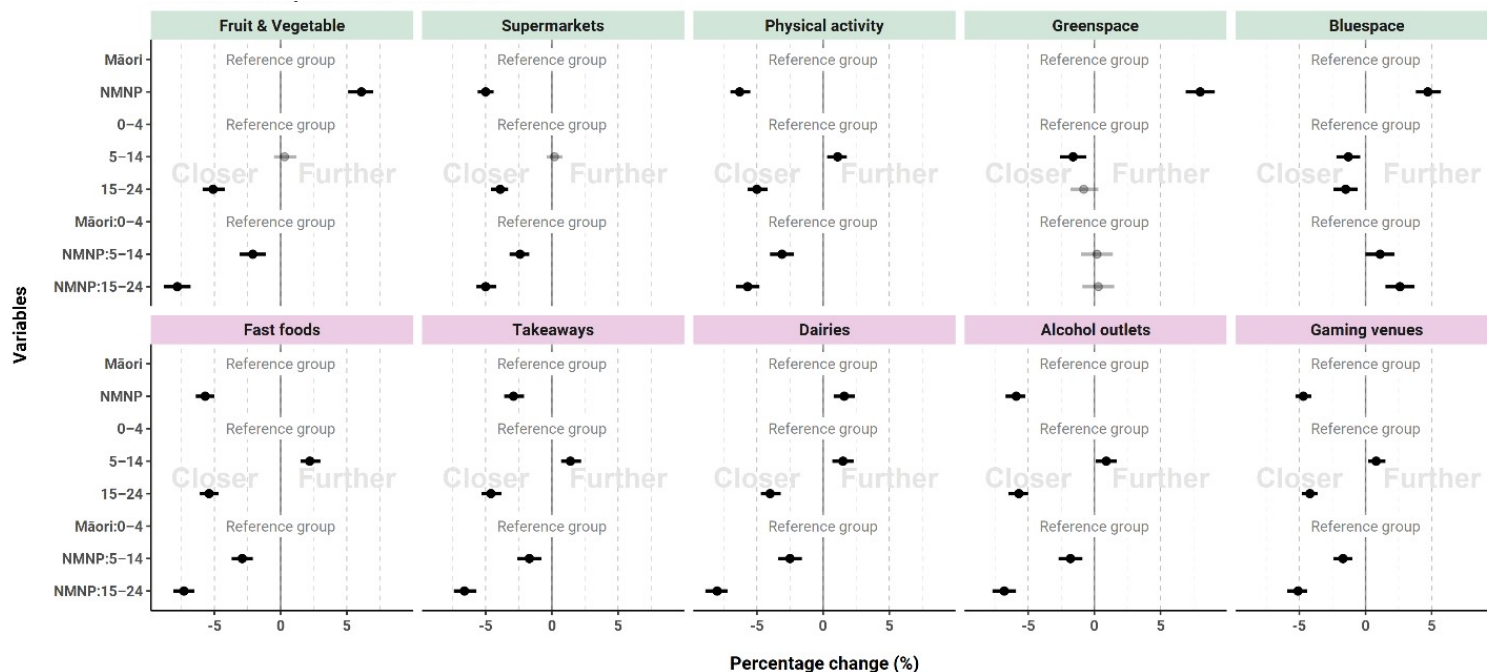
Figure 4: Accessibility of children and youth to health-promoting and health-constraining environmental features, by ethnicity, age group and accessibility decile



Notes: 1. The environmental features are based on the domains of the Healthy Living Index.
2. y-axis (Accessibility decile): 1 = most accessible; 10 = least accessible.
3. NMNP = non-Māori/non-Pacific.

Figure 5 shows results of the lognormal model, with distance to the nearest feature by individual HLI domains as the dependent variable, and ethnicity and age as independent variables. Models also included the interaction of ethnicity and age as this proved to be statistically significant with meaningful differences in marginal means when tested by two-way ANOVA (not presented). Models were further adjusted for area-level deprivation and urban-rural classification. Regression coefficients in Figure 5 are represented as percentage change in distance to the nearest environmental feature, and full results of regression models and diagnostics are available in the supplementary notes (Table S2 and Table S3). Results demonstrate that when compared with Māori, NMNP children and youth live farther from fruit and vegetable stores, greenspace, bluespace and dairies, but closer to supermarkets, physical activity facilities, fast-food outlets, takeaway shops, alcohol outlets and gaming venues (Figure 5). Figure 5 also reinforces the previous results, showing that those aged 15–24 years tend to live closer to features of the built environment, both those considered health-constraining, such as fast-food and alcohol outlets, as well as those considered health-promoting, such as supermarkets and physical activity facilities. They do not live closer to some features of the natural environment, however, particularly greenspace. Such associations are further moderated for combinations of ethnicity and age. Understandably, accessibility to all environmental features is also associated with area-level deprivation and urban-rural classification (Table S2 in the supplementary notes), with features of the built environment being closer in urban and more-deprived areas while natural features are closer in rural and more-deprived areas.

Figure 5: Accessibility of children and youth in Aotearoa New Zealand to health-promoting and health-constraining environmental features, by ethnicity and age group



Notes: 1. Health-promoting environmental features are shaded green; health-constraining environmental features are shaded pink.

2. The environmental features are based on the domains of the Healthy Living Index.

3. Transparent lines and points show variables with p -value ≥ 0.05 .

4. Models adjusted for deprivation and urban-rural classification.

Discussion

This research examined associations between environmental features and populations of children and youth in Aotearoa New Zealand with a specific focus on tamariki and rangatahi Māori. It explored the type of environments where tamariki and rangatahi Māori live, including differences by age group, and compared this with the environments of the wider populations of children and youth to provide additional context.

When considering the overall HLI, there are few differences in the percentage of Māori who live in health-promoting areas by age group. There are, however, more rangatahi (15-24 years) who live in health-constraining environments and environments classed as neither health-promoting nor health-constraining when compared with tamariki (aged 0-4 and 5-14 years). These environments tend to be dense urban areas that have a high number of all the environmental features considered in the study. The higher percentage of rangatahi in these areas may be due to more Māori of this age group living in dense urban areas, primarily major cities, for education and employment opportunities, which tend to be closely related (Sander & Testa, 2013). This pattern is similar to that of the wider youth population. When considering individual domains of the HLI, results show that those aged 15-24 years live closer to almost all the environmental factors considered, aligning with the above point. Additionally, when compared with Māori, NMNP children and youth live further from fruit and vegetable stores, greenspace, bluespace and dairies, but closer to supermarkets, physical activity facilities, fast-food outlets, takeaway shops, alcohol outlets and gaming venues. At first glance, the finding that Māori are more likely to live near health-promoting features may appear contrary to the fact that there is a high proportion of Māori living in the most-deprived areas, and such

areas have been shown in international research to have a greater number of unhealthy food outlets (Cetateanu & Jones, 2014). However, previous research from Aotearoa New Zealand has shown a similar but slightly different pattern compared with overseas findings, in that both unhealthy and healthy food outlets are greater in deprived areas (Sushil et al., 2017). Moreover, many of the environmental factors included in this study are more common in areas of moderate-to-high deprivation (D7 and D8) than in the most highly deprived areas (D9 and D10) (Marek et al., 2021; Wiki et al., 2019). This may explain our finding that Māori have less access to health-constraining environments because the highest proportion of Māori live in the most highly deprived areas (D9 and D10).

Results also show that a high proportion of tamariki and rangatahi Māori live in urban areas, as this is where the majority of all New Zealanders live (around 87 per cent of the total population (O'Neill, 2023)), but also in small urban areas (14.55 per cent of the Māori population) and rural areas (17.20 per cent of the Māori population). When compared with the wider NMNP children and youth population — which is 8.78 per cent and 16.86 per cent, respectively — the higher proportion of tamariki and rangatahi Māori in small urban areas is even more apparent. This is important to note as previous research from Aotearoa New Zealand has shown worse health outcomes in small urban areas (Marek et al., 2020), as well as higher mortality rates in rural areas (Nixon et al., 2023). While living further away from major urban areas means an increase in availability of natural features considered positive for health, such as greenspace and bluespace, as well as fruit and vegetable stores, which are often located in rural areas and on the outskirts of cities and are less concentrated than other food outlet types, it is important to recognise that the usability of such environmental features may differ by context. For example, greenspace in an urban area is likely to be a park, sports field or garden area. Given the density of the

built environment in such areas, greenspace is often purposefully used to promote recreation and access to nature, enhancing wellbeing (Barton & Rogerson, 2017; Coventry et al., 2019). In contrast, much of the greenspace in rural areas is likely to be farmland or other land used for agriculture, which is largely privately owned and not accessible or appropriate for recreation. Therefore, the usability of greenspace can vary greatly depending on the context, as can the usability of bluespace and other environmental features. Further research is needed in this area to examine relationships between availability, accessibility and utilisation.

To our knowledge, this is the first nationwide study in Aotearoa New Zealand to look specifically at the environments of tamariki and rangatahi Māori using individual-level data and a nationwide Healthy Location Index. While this study provides a useful basis for further research and has several strengths, including the use of nationwide environmental data and a large enough population sample to enable the examination of population subgroups, it also has several limitations that should be acknowledged when interpreting the findings. Limitations include that the study is a cross-sectional design, and therefore only provides a snapshot of the environment at one point in time. As the environment may have a cumulative effect on health and social outcomes over time, further research is needed that incorporates longitudinal data. Additionally, this study uses area-level data rather than individual addresses to analyse accessibility. This provides less specificity, although it does account for broad spatial patterns while simultaneously ensuring data confidentiality is retained.

Furthermore, while this study has presented an understanding of the built and natural environments where tamariki and rangatahi Māori live, including the availability and accessibility of environmental features, this does not necessarily correspond to the usability and utilisation of these features, which may also be influenced by quality, safety,

acceptability and affordability. For example, while fruit and vegetable stores may be accessible in some areas, this study cannot ascertain their usage, which may be influenced by the quality of the food sold there, the price of the food, individual transport needs, and road safety considerations. Likewise, while there may be greenspace in an area, this may or may not be usable for physical activity and socialising due to its type (e.g., sports field, garden area, park), quality and the safety of the surrounding area. Ensuring tamariki and rangatahi Māori can access and utilise health-promoting environments could result in improved physical and mental health outcomes. Thus, utilisation of environmental features has not been examined within this study but provides an interesting area for further research.

Further research would also benefit from expanding the features considered in the HLI to include those more specifically related to children, such as schools and active transport routes. This would align with calls for increased specificity in this area (Giles-Corti et al., 2005). Features with specific relevance to Māori, such as marae, may be another useful inclusion, although further qualitative research is needed more widely to ascertain what features are of importance to Māori and why. Finally, while research has been conducted in some urban areas of Aotearoa New Zealand exploring how place impacts on rangatahi/youth (Hodgson et al., 2020), future research is needed to gain a rural perspective as scholars have argued that the perspectives of rural youth have been largely marginalised from youth studies (Farrugia, 2014).

Conclusion

The natural and built environment plays a crucial role in shaping the health and social outcomes of children and youth. Using a large population cohort and nationwide data, this research examined associations between environmental

features and populations of children and youth in Aotearoa New Zealand with a specific focus on tamariki and rangatahi Māori. Findings show that Māori have better access than NMNP children and youth to greenspace, bluespace, fruit and vegetable stores and dairies and that there is an interaction between age and ethnicity. It is important to recognise that such findings are influenced by both deprivation and urban/rural differences, however, and that the impact of the environment where a person lives on health and social outcomes is complex and multifaceted. Access alone is often not enough, as it is also the quality and safety of spaces that is important. To create healthier and more equitable communities, it is essential to design and develop environments that promote physical activity, access to healthy food, social interaction and safety. The study's findings allow for a better understanding of the environments of tamariki and rangatahi Māori in Aotearoa New Zealand, providing an opportunity for structural change that can help reduce health and social inequities and improve the wellbeing of individuals and communities. This is a growing area of research and of interest to politicians, policymakers, and those involved in iwi and hapū planning.

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