

# Health and wellbeing of Māori secondary school students in New Zealand: Trends between 2001, 2007 and 2012

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Māori are a dynamic, unique and resilient people who have undergone significant social change through an ongoing experience of colonisation.<sup>1,2</sup> The Māori history of colonisation is well documented<sup>3-5</sup> and continues to have direct and ongoing impact on Māori wellbeing through the cumulative effect of intergenerational trauma<sup>6</sup> and interpersonal and structural racism.<sup>7,8</sup> For Māori youth, this is evidenced by significant health, education and social disparities. Māori youth are substantially more likely to report poorer physical health,<sup>9</sup> sexual health,<sup>10,11</sup> mental health<sup>9,12,13</sup> and more harmful substance use<sup>11,14-17</sup> compared to New Zealand European/Pākehā students.

Māori in New Zealand have a youthful age structure, with Māori aged under 24 years representing half of the Māori population, compared with a non-Māori median age of 40 years.<sup>18</sup> Seeking knowledge about the views, perspectives and experiences of Māori youth is crucial to ensuring health and social service interventions are meeting the needs of future generations of Māori and their whānau (extended family). The current study addresses this by reporting on the contemporary health and wellbeing status of New Zealand high school students at specific timeframes over an 11-year period. The health status of Māori secondary school students will be compared to European students (the dominant ethnic group) to explore health disparities over time.

## Abstract

**Objective:** To describe the health status over time of Māori secondary school students in New Zealand compared to European students.

**Methods:** Anonymous representative health surveys of New Zealand secondary school students were conducted in 2001, 2007 and 2012 (total n=27,306 including 5,747 Māori).

**Results:** Compared to 2001, Māori students in 2012 experienced improved health, family and school connections. However, considerable inequity persists with Māori students reporting poorer health, greater exposure to violence and socioeconomic adversity compared to European students. When controlling for socioeconomic deprivation, inequity was substantially reduced, although worse Māori health outcomes remained for general health, mental health, contraceptive use, healthy weight, substance use, access to healthcare and exposure to violence. There was some evidence of convergence between Māori and European students on some indicators.

**Conclusions:** There have been significant improvements for Māori youth in areas of health where there has been investment. Priority areas identified require adequate resourcing alongside addressing systematic discrimination and poverty.

**Implications for public health:** Socioeconomic contexts, discrimination, healthcare access and identified priority health areas must be addressed to improve equity for Māori youth. Building on these gains and hastening action on indicators that have not improved, or have worsened, is required.

**Key words:** Māori, indigenous, adolescent, youth, trends, poverty

## Methods

### Study design and population

This research uses data from the Youth2000 survey series: three nationally representative surveys of high school students in New Zealand undertaken in 2001, 2007 and 2012. The sampling strategy used was consistent over the three waves. Each wave used a two-stage clustered sampling design.

First, one-third of all New Zealand secondary schools were randomly selected. Of the schools selected, 20% of the total school roll was randomly selected to participate, with the aim of recruiting approximately 10,000 students each wave. In school rolls with fewer than 150 students, 30 students were selected. Full details of the methodology and survey design can be found elsewhere.<sup>19</sup>

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The survey was administered using Multi-media Computer Administered Survey Instrument (M-CASI) technology on handheld tablets<sup>20</sup> or laptops (in 2001). The survey was displayed in written and audio form and translated into two official languages of New Zealand, Te Reo Māori and English. The survey consisted of a branching questionnaire (608 items in 2012).

In 2007 and 2012, the height and weight of each student was measured to determine Body Mass Index (BMI) and linked to the students' anonymous survey/data files.

## Measures

**Demographics:** Age, sex and ethnicity were self-reported by students. Using the Statistics New Zealand ethnicity prioritisation

method, students were assigned to one of the following five ethnic groups: Māori, Pacific, Asian, European and Other ethnicity.<sup>21</sup> 'European' included Europeans born in New Zealand as well as those born in Europe and elsewhere.

**Deprivation:** School decile was used to measure deprivation, as it was the only measure that was consistently used over the three waves. New Zealand school deciles are calculated every five years, using New Zealand Census data, and are based on the neighbourhood level household income, parental employment, household crowding, parental qualifications and government income/benefit support. Decile 1 schools are the 10% of schools with the highest proportions of students

from neighbourhoods characterised by low socioeconomic resources (poorest schools); whereas, decile 10 schools are the 10% of schools with the highest proportion of students from neighbourhoods characterised by greater socioeconomic resources (wealthiest schools).<sup>22</sup> See the Supplementary File for a detailed description of questionnaire items used for these analyses (entire survey questionnaires can be found at [www.youthresearch.auckland.ac.nz](http://www.youthresearch.auckland.ac.nz)).

## Analyses

Analyses were conducted with SAS version 9.3[19]. Logistic regression was used to explore variations in outcomes for Māori youth over various waves of the surveys (2001, 2007, 2012) compared to European students. Results are expressed as odds ratios, adjusted for age and sex. All analyses have also been adjusted to account for the unequal probability of selection and the clustered survey design. Interaction terms were used to examine if trends differed by age or gender. Significant interactions are indicated in the results tables but are not presented separately for each age or sex group, as this was not the focus of this analysis. In the majority of cases, interactions were qualitatively similar (i.e. the trends were in the same direction but differed in the magnitude of change).

## Results

The school response rates for the three waves of surveys in 2001, 2007 and 2012 were 86%, 84% and 73%, respectively, and student response rates were 74%, 74% and 68%, respectively (Table 1). The proportion of the total secondary school population in New Zealand who participated over the three waves ranged from 3–4%. The proportions of students by age, year at school, sex and deprivation were generally representative of the New Zealand secondary school population. Across the three survey waves, the mix of female to male participants was similar between the Māori and European samples. However, Māori were over-represented in low decile schools (schools with higher deprivation) with a younger age structure compared to European students (Table 1).

## Social context

After adjusting for age and sex, there were significant differences between Māori and

	2001 N (%)	2007 N (%)	2012 N (%)			
<b>Schools</b>						
Invited	133	115	125			
Participated	114 (85.7)	96 (83.5)	91 (72.8)			
<b>Students</b>						
Invited	12,934	12,355	12,503			
Participated (total)	9,567 (74.0)	9,107 (74.0)	8,500 (68.0)			
	<b>Māori<sup>b</sup></b>	<b>European<sup>c</sup></b>	<b>Māori</b>	<b>European</b>	<b>Māori</b>	<b>European</b>
Participated	2,340	5,219	1,702	4,797	1,705	4,024
<b>Year</b>						
Year 9	713 <sup>a</sup> (30.7)	1,295 <sup>a</sup> (24.9)	479 <sup>a</sup> (28.5)	1,140 <sup>a</sup> (24.1)	483 <sup>a</sup> (28.4)	950 <sup>a</sup> (23.6)
Year 10	637 (27.5)	1,156 (22.2)	441 (26.3)	1,095 (23.2)	426 (25.1)	916 (22.8)
Year 11	521 (22.5)	1,197 (23.0)	366 (21.8)	1,029 (21.8)	349 (20.5)	797 (19.8)
Year 12	298 (12.8)	961 (18.5)	252 (15.0)	890 (18.8)	255 (15.0)	751 (18.7)
Year 13	151 (6.5)	595 (11.4)	142 (8.5)	569 (12.0)	187 (11.0)	609 (15.1)
<b>Sex</b>						
Male	1,103 (47.1)	2,385 (45.7)	882 (51.8)	2,631 (54.8)	805 (47.3)	1,791 (44.5)
Female	1,237 (52.9)	2,834 (54.3)	820 (48.2)	2,166 (45.2)	898 (52.7)	2,232 (55.5)
<b>Age</b>						
≤ 13	576 (24.7)	1,068 (20.5)	414 (24.3)	959 (20.0)	414 (24.3)	840 (20.9)
14	661 (28.3)	1,184 (22.7)	434 (25.5)	1,139 (23.7)	437 (25.7)	881 (21.9)
15	540 (23.1)	1,207 (23.1)	387 (22.7)	1,031 (21.5)	355 (20.9)	821 (20.4)
16	359 (15.4)	1,007 (19.3)	268 (15.7)	932 (19.4)	278 (16.3)	778 (19.4)
≥ 17	199 (8.5)	750 (14.4)	199 (11.7)	736 (15.3)	218 (12.8)	699 (17.4)
<b>Decile</b>						
1	166 (7.1)	24 (0.5)	50 (2.9)	11 (0.2)	124 (7.3)	4 (0.1)
2	252 (10.8)	118 (2.3)	130 (7.6)	57 (1.2)	214 (12.6)	75 (1.9)
3	223 (9.5)	176 (3.4)	277 (16.3)	217 (4.5)	241 (14.1)	232 (5.8)
4	308 (13.2)	461 (8.8)	284 (16.7)	460 (9.6)	197 (11.6)	319 (7.9)
5	307 (13.1)	670 (12.8)	214 (12.6)	630 (13.1)	264 (15.5)	579 (14.4)
6	241 (10.3)	624 (12.0)	222 (13.0)	855 (17.8)	117 (6.9)	367 (9.1)
7	274 (11.7)	775 (14.8)	166 (9.8)	478 (10.0)	132 (7.7)	479 (11.9)
8	242 (10.3)	885 (17.0)	62 (3.6)	402 (8.4)	229 (13.4)	863 (21.4)
9	202 (8.6)	734 (14.1)	141 (8.3)	568 (11.8)	130 (7.6)	641 (15.9)
10	125 (5.3)	752 (14.4)	156 (9.2)	1,119 (23.3)	57 (3.3)	465 (11.6)

Notes:

a: Totals for each variable (not shown) are different to the overall total number of participating students due to different numbers of missing data for each.

b: Ethnicity was assigned on the basis of prioritised ethnicity, using the NZ Census ethnicity prioritisation method (Statistics New Zealand. Statistical standard for ethnicity [Internet]. Wellington: Statistics New Zealand; 2005 [cited 15 June 2010]. Available from: <http://www2.stats.govt.nz/domino/external/web/carsweb.nsf/55d63ae38ba3a25e4c2567e6007f6686/35d9b7e17a1d6151cc25701100031353?OpenDocument>).

c: 'European' included Europeans born in New Zealand as well as those born in Europe and elsewhere.

European students in 2012 across nearly all of the variables related to social context (see Table 2, Model 1). Some of the more disparate findings were that Māori students in 2012 were significantly more likely to have moved home two or more times in the previous year (OR=3.15, 95%CI [2.64-3.75]), reported witnessing family violence at home (OR=2.87, 95%CI [2.40-3.42]), experienced sexual abuse (OR=2.40, 95%CI [2.10-2.74]), or been in a serious physical fight (OR=3.60, 95%CI [3.11-4.17]). However, most of these social differences were strongly mediated by socioeconomic deprivation. After adjusting for deprivation, the size of these effects was substantially reduced (see Table 2, Model 2). Compared to European students, Māori students were still more likely to have reported witnessing family violence (OR=1.82, 95%CI [1.40-2.36]), experienced sexual abuse (OR=1.45, 95%CI [1.18-1.78]), or been in a serious physical fight (OR=2.28, 95%CI [1.91-2.71]). They were also less likely to report being bullied (OR=0.55, 95%CI [0.45-0.67]) or report spending enough time with at least one parent (OR=0.77, 95%CI [0.70-0.85]).

### Trends in social context and ethnic differences over time

After adjusting for age and sex, many socio-cultural factors showed small but significant improvements for Māori students between 2001 and 2012 with regards to family circumstances, family connectedness, school connectedness, neighbourhoods, and bullying and violence (see Table 3). Compared to Māori students in 2001, Māori students in 2012 were less likely to have moved home two or more times in the previous year (OR=0.57, 95%CI [0.46-0.71]) and more likely to report being happy about how they got along with their family (OR=1.84, 95%CI [1.63-2.07]) and that their family wanted to know where they were and who they were with (OR=2.54, 95%CI [2.10-3.07]). In 2012, Māori students were more likely to report that they liked school (OR=1.47, 95%CI [1.22-1.79]) and that they always felt safe in their own neighbourhood (OR=1.36, 95%CI [1.16-1.58]). In 2012, students were less likely to report sexual abuse (OR=0.52, 95%CI [0.42-0.64]), or being in a serious physical fight (OR=0.61, 95%CI [0.52-0.73]) compared to their peers in 2001. Māori students in 2012 were more likely to report food insecurity than Māori students in 2001 (OR=1.34, 95%CI [1.06-1.69]).

There was some evidence of convergence between Māori and European students,

**Table 2: Differences in social context between Māori and European students in 2012.**

Risk and protective factors			Model 1 (adjusted for age and sex) Forest plot		Model 2 (adjusted for age, sex and deprivation) Forest plot	
Family circumstances						
Moved home 2 or more times in last year	n	%	95% CI	aOR (95% CI) <sup>a</sup>	p value	p value
	180	10.4	8.9-11.9			
	M					
Parents worry about not having enough money for food (often, all the time)	216	5.4	4.6-6.2	3.15 (2.64-3.75)	<0.0001	1.05 (0.82-1.35)
	E					
	228	14.2	12.1-16.4	1.48 (1.26-1.75)	<0.0001	0.80 (0.64-1.00)
	M					
	E	8.2	7.0-9.4			
Family connectedness						
Relationship with family (I'm happy how we get along)	1154	67.6	65.3-69.9	0.59 (0.53-0.65)	<0.0001	0.89 (0.79-1.02)
	M					
	E	73.4	72.2-74.5			
Spend enough time with at least one parent (mostly)	2943	53.4	51.0-55.9	0.64 (0.59-0.70)	<0.0001	0.77 (0.70-0.85)
	M					
	E	62.9	60.9-64.9			
Family wants to know who you're with and where you are (usually or always)	2518	89.3	87.9-90.8	0.50 (0.43-0.58)	<0.0001	0.98 (0.78-1.23)
	M					
	E	91.3	90.3-92.2			
School connectedness						
Adults at school care (a lot)	421	24.8	22.6-27.0	0.95 (0.85-1.06)	0.3567	1.03 (0.90-1.17)
	M					
	E	26.4	24.4-28.4			
Like school (ok, a bit or a lot)	1068	88.1	86.5-89.7	0.74 (0.64-0.84)	<0.0001	1.04 (0.87-1.23)
	M					
	E	88.8	87.6-89.9			
Neighbourhood						
Have an adult outside the family I feel ok talking to	951	60.7	58.0-63.5	0.94 (0.86-1.03)	0.1745	1.01 (0.89-1.15)
	M					
	E	62.0	60.4-63.6			
Feel safe in own neighbourhood (always)	2434	55.8	53.1-58.5	0.74 (0.67-0.82)	<0.0001	1.03 (0.92-1.15)
	M					
	E	57.3	55.4-59.2			
Bullying and family violence						
Bullied at school (weekly or more)	2219	5.6	4.6-6.6	0.68 (0.59-0.79)	<0.0001	0.55 (0.45-0.67)
	M					
	E	7.7	6.8-8.5			
Witnessed adults at home hit or physically hurt each other	306	10.3	8.5-12.1	2.87 (2.40-3.42)	<0.0001	1.82 (1.40-2.36)
	M					
	E	4.4	3.8-4.9			
Sexual abuse	171	13.4	11.1-15.7	2.40 (2.10-2.74)	<0.0001	1.45 (1.18-1.78)
	M					
	E	8.9	7.9-9.9			
Been in a serious physical fight in the last 12-months	334	22.6	20.2-25.0	3.60 (3.11-4.17)	<0.0001	2.28 (1.91-2.71)
	M					
	E	9.8	8.3-11.3			

Notes:

aOR, adjusted odds ratio; CI, confidence interval; M, Māori; E, European

a: Reference group is European

Table 3: Prevalence and trends in social context factors between 2001, 2007 and 2012.

	2001			2007			2012			Changes from 2001-2012			Trend
	n	%	95% CI	n	%	95% CI	n	%	95% CI	aOR (95% CI)	p-value	Δ	
<b>Family circumstances</b>													
Moved home 2 or more times in last year	M 400	17.1	15.0-19.1	311	18.7	16.9-20.4	180	10.4	8.9-11.9	0.57 (0.46-0.71)	<0.0001	↓	Ethnicity
Parents worry about not having enough money for food (often, all the time)	E 331	6.4	5.6-7.2	393	8.3	7.4-9.2	216	5.4	4.6-6.2	0.84 (0.69-1.04)	0.1043	→	Ethnicity
<b>Family connectedness</b>													
Relationship with family (I'm happy how we get along)	M 1219	53.1	51.1-55.0	1111	66.4	63.8-69.0	1154	67.6	65.3-69.9	1.84 (1.63-2.07)	<0.0001	↑	Ethnicity
Spend enough time with at least one parent (mostly)	E 1246	61.5	59.7-63.2	3415	72.3	70.6-73.9	2943	73.4	72.2-74.5	1.74 (1.58-1.92)	<0.0001	↑	Ethnicity, Sex
Family wants to know who you're with and where you are (usually or always)	M 3387	65.4	63.9-66.9	2880	61.1	59.5-62.7	2518	62.9	60.9-64.9	0.96 (0.84-1.09)	0.5261	→	Ethnicity
<b>School connectedness</b>													
Adults at school care (a lot)	M 573	24.7	22.7-26.7	412	24.7	22.4-26.9	421	24.8	22.6-27.0	0.99 (0.85-1.16)	0.8875	→	Ethnicity
Like school (ok, a bit or a lot)	E 7674	83.3	81.6-85.0	1432	85.4	83.4-87.4	1498	88.1	86.5-89.7	1.27 (1.13-1.42)	<0.0001	↑	Ethnicity
<b>Neighbourhood</b>													
Have an adult feel ok talking to outside family	M 1203	60.7	58.5-62.9	863	57.4	54.9-60.0	951	60.7	58.0-63.5	1.47 (1.22-1.79)	<0.0001	↑	Ethnicity
Feel safe in own neighbourhood (always) <sup>a</sup>	E 951	59.3	57.6-61.0	2550	56.8	55.1-58.6	2434	62.0	60.4-63.6	1.43 (1.24-1.66)	<0.0001	↑	Ethnicity
<b>Bullying and family violence</b>													
Bullied at school (weekly or more)	M 147	6.5	5.4-7.7	83	5.0	4.1-5.9	94	5.6	4.6-6.6	0.99 (0.85-1.15)	0.8531	→	Age
Witnessed adults at home hit or physically hurt each other	E 409	7.9	6.9-8.9	327	6.9	5.9-7.8	306	7.7	6.8-8.5	1.10 (1.00-1.22)	0.0452	↑	Ethnicity, Sex
Sexual abuse <sup>b</sup>	M 137	10.0	8.4-11.6	246	15.3	13.0-17.6	169	10.3	8.5-12.1	1.36 (1.16-1.58)	<0.0001	↑	Ethnicity
Been in a serious physical fight in the last 12-months	E 760	22.8	20.8-24.7	218	16.2	14.1-18.3	203	13.4	11.1-15.7	1.80 (1.58-2.06)	<0.0001	↑	Ethnicity
	M 704	15.8	14.4-17.1	384	9.4	8.2-10.6	334	8.9	7.9-9.9	0.52 (0.42-0.64)	<0.0001	↓	Ethnicity, Sex
	E 816	32.0	29.4-34.6	498	30.0	27.3-32.7	380	22.6	20.2-25.0	0.49 (0.43-0.57)	<0.0001	↓	Ethnicity
		16.0	14.3-17.7	755	16.1	14.4-17.9	391	9.8	8.3-11.3	0.61 (0.52-0.73)	<0.0001	↓	Ethnicity

Notes:

aOR, adjusted odds ratio for the effect of study year on each outcome (i.e. change between 2001 and 2012), adjusted for age and sex; CI, confidence interval; M, Māori; E, European; Δ, change over time; ↑, significant increase; ↓, significant reduction; →, no significant change — Māori, --- European

a. Response options differed: for 2001 and 2007 they were 'yes all the time/yes most of the time/sometimes/ no mostly not/not at all' while for 2012 they were 'all the time/sometimes/ not often/never'

b. Response options differed: for 2001 they were 'never/ one or two times/sometimes/ often', while for 2007 and 2012 they were 'yes/ no'

c. Interaction between wave and Māori and European ethnicity (E), wave and age (A), or wave and sex (S) at p&lt;0.01

with gaps between Māori and European students narrowing on most indicators except for parents worrying about not having enough money for food, and being bullied at school (see Table 3). There were significant interactions between ethnic group and study wave for many of these indicators, suggesting that trends differed for Māori and European students. For example, the proportion of Māori students who reported having moved home two or more times in the past year was initially much higher, but decreased over time (OR=0.57, 95%CI [0.46-0.71]) while levels remained similar among European students (OR=0.84, 95%CI [0.69-1.04]). Likewise, family monitoring increased much more for Māori students (OR=2.54, 95%CI [2.10-3.07]) than European students (OR=1.72, 95%CI [1.50-1.97]) over the same time period. However, there were some cases where convergence appeared to arise from circumstances for European students worsening by a greater degree. For example, the proportion of European students who witnessed family violence in their home increased over the study period (OR=1.64, 95%CI [1.31-2.06]) while levels remained the same for Māori students (OR=1.06, 95%CI [0.81-1.37]). Perception of neighbourhood safety was an indicator that started at a lower level for European students but increased by more over time (OR=1.80, 95%CI [1.58-2.06]) than for Māori students (OR=1.36, 95%CI [1.16-1.58]).

### Health and wellbeing indicators

Significant differences between Māori students and European students persisted across all of the individual and interpersonal health behaviour variables after controlling for age and sex. Māori youth reported poorer health outcomes for general health, injuries, risky driving behaviours and healthcare access compared to European students. Significant inequity remained in the areas of mental health, substance use, sexual health, and nutrition and physical activity (see Table 4, Model 1). After adjusting for socioeconomic deprivation, age and gender, the magnitude of the association between Māori ethnicity and health indicators was substantially reduced. However, inequities remained for general health, substance use, sexual health, nutrition and physical activity, motor vehicle risk-taking behaviours and access to healthcare (see Table 4, Model 2). Of note, Māori students were more likely than European students to rate their general



health as fair or poor (OR=1.39, 95%CI [1.14-1.69]), to have attempted suicide in the past 12 months (OR=1.88, 95%CI [1.35-2.60]), to have used cigarettes monthly or more often (OR=2.08, 95%CI [1.62-2.66]), and to have had at least one episode of binge-drinking in the past four weeks (OR=1.72, 95%CI [1.48-2.00]). Compared to European students, Māori students were more likely to have ever had sexual intercourse (OR=2.30, 95%CI [1.94-2.74]) and to have ever been pregnant or got someone pregnant (OR=2.63, 95%CI [1.90-3.65]). Māori students were more likely to be overweight or obese (OR=1.89, 95%CI [1.66-2.16]), but more likely to report eating five or more fruit or vegetables a day (OR=1.33, 95%CI [1.10-1.60]). Māori students were more likely to report wanting to see a health provider but not being able to (OR=1.35, 95%CI [1.15-1.59]).

### *Trends for health and wellbeing indicators and ethnic differences over time*

Many individual and interpersonal health behaviour items showed large improvements for Māori students between 2001 and 2012 (Table 5). Māori students in 2012 were less likely than Māori students in 2001 to have attempted suicide in the past year (OR=0.53, 95%CI [0.41-0.68]), to report monthly or more cigarette use (OR=0.29, 95%CI [0.23-0.36]), binge-drinking (OR=0.41, 95%CI [0.35-0.48]) or marijuana use (OR=0.31, 95%CI [0.25-0.38]). Māori students in 2012 were less likely to report that they had ever had sexual intercourse (OR=0.56, 95%CI [0.47-0.66]), or had ever been pregnant or got someone pregnant (OR=0.59, 95%CI [0.45-0.77]). There was an increase in the proportion of Māori students always wearing a seatbelt (OR=1.45, 95%CI [1.26-1.68]), and large decreases in students who were passengers (OR=0.40, 95%CI [0.34-0.46]) or drivers (OR=0.32, 95%CI [0.25-0.39]) in cars being driven dangerously or under the influence of alcohol or drugs. More Māori students in 2012 than in 2007 reported eating five or more fruit or vegetables a day (OR=1.28, 95%CI [1.04-1.57]). However, some things did worsen for Māori over this time period. While fewer Māori reported having had sex, the Māori students who were having sex were less likely to report that they used a condom the last time they had sex (OR=0.75, 95%CI [0.61-0.92]) or less likely to always use contraception (OR=0.76, 95%CI [0.59-1.00]). Fewer Māori students in 2012 reported accessing healthcare they

needed in the past year, compared to 2001 (OR=0.76, 95%CI [0.63-0.93]).

There was again some evidence of convergence, with levels for Māori and European students' gaps narrowing over time for most individual and interpersonal health behaviour indicators, with the exception of: rating general health as fair or poor, using a condom the last time they had sex, consistent contraception use and accessing healthcare. Similar to trends in the socio-cultural context, significant interactions between ethnic group and study wave for many of these indicators suggest that trends differed for Māori and European students. Generally, this was because things had improved more for Māori students. For example, the proportion of Māori students who reported using marijuana at least monthly was initially much higher but decreased more over time (OR=0.31, 95%CI [0.25-0.38]) than for European students (OR=0.43, 95%CI [0.36-0.51]). Likewise, the proportion of Māori students who reported ever having sexual intercourse was initially much higher but decreased more over time (OR=0.56, 95%CI [0.47-0.66]) than for European students (OR=0.76, 95%CI [0.67-0.86]).

### **Discussion**

The current study uses data from a nationally representative survey series at set timeframes over an 11-year period (2001, 2007, 2012), involving more than 27,000 New Zealand secondary school students, including 5,747 indigenous Māori. We have highlighted the social and demographic patterns that characterise contemporary Māori youth health. Our finding that, with some exceptions, health among Māori secondary school students is improving is heartening. Furthermore, health inequities between Māori and European students have reduced in some areas. This provides some evidence of the cumulative success of various strategies for Māori youth across this timeframe of the study (2001–2012). Policy and legislative changes during this time period, including increased taxation on alcohol and tobacco, raising the driving age to 16, and lowering the legal breath and blood alcohol limit to zero for drivers under 20 years, may have contributed to the significant reductions in risky driving and substance use.<sup>23</sup> In addition, youth health services including school-based health services, school curricula, social marketing, and an international trend to

fewer risk-taking behaviours among high school-aged students may have contributed to improved wellbeing for all youth in New Zealand,<sup>24-28</sup> particularly Māori youth. However, health and social inequities persist for Māori youth compared to European youth in specific areas: within their socio-cultural contexts (e.g. exposure to violence, poverty, food insecurity and inaccessible healthcare); and individual and inter-personal areas (e.g. obesity, mental and sexual health). This can be illustrated with New Zealand's high suicide rates (48.0 per 100,000 for Māori youth, non-Māori youth rate of 16.9 per 100,000); where rates of suicide grow consistently higher with increasing deprivation,<sup>29,30</sup> poor healthcare access<sup>31</sup> and exposure to discrimination.<sup>32,33</sup> It would appear that important areas of wellbeing for Māori youth have had far less investment, service provision and policy consideration compared to others.

Socioeconomic factors were shown to mediate the health inequities between Māori and European students for some social factors and some health and wellbeing outcomes, emphasising the intrinsic relationship between health and the social and community context for Māori youth and their whānau/families. This pattern strongly aligns with the social determinants of health model, whereby axes of social and materially located privilege are understood to affect health, producing ethnic and socioeconomic disparities in health outcomes.<sup>34,35</sup> However, explanations for persistent inequities between Māori and European youth still largely remain unaccounted for by socioeconomic status, pointing to larger systemic bias in health and social service delivery in New Zealand. Given that one-quarter (25.5%) of all Māori participants in this study experienced some form of ethnic discrimination at school, in healthcare or with the police,<sup>32,33</sup> ethnic discrimination has a real influence on wellbeing, particularly mental health, for Māori students. This may be understood as a consequence of the cumulative effect of colonising practices on indigenous people, constituting historical trauma and having a negative impact on health through stress,<sup>6,28,36</sup> coupled with the effects of ongoing racism that has a measurable biological influence on health.<sup>7,37</sup> Living in environments with racism, social marginalisation and scarce resources limits contextual whānau function and the likelihood of young people flourishing.<sup>38</sup>

Table 4: Differences between Māori and European for health and wellbeing indicators in 2012.

Health and wellbeing indicators			Model 1 (adjusted for age and sex)			Model 2 (adjusted for age, sex and level or household deprivation)		
			n	%	95% CI	Forest plot	aOR (95% CI)	p value
<b>Health and emotional wellbeing</b>	Rated general health as fair or poor		M 179	10.5	8.7-12.4		1.60 (1.37-1.88)	<0.0001
			E 275	6.8	5.9-7.8			0.0011
	Clinically significant depressive symptoms (RADSS-SF ≥ 28)		M 224	13.9	11.3-16.5		1.13 (0.99-1.30)	0.0627
			E 478	12.1	10.8-13.4			0.7934
	Attempted suicide in last 12-months <sup>a</sup>		M 110	6.5	5.2-7.9		3.40 (2.62-4.43)	<0.0001
<b>Substance use</b>	Monthly or more cigarette use		E 107	2.7	2.0-3.3			0.0002
			M 166	10.1	8.4-11.8		5.23 (4.24-6.47)	<0.0001
	At least one episode of binge drinking in last 4 weeks		E 181	4.5	3.7-5.4			<0.0001
			M 521	32.5	30.1-34.9		3.27 (2.86-3.72)	<0.0001
	Monthly or more marijuana use		E 982	24.9	22.8-27.0			<0.0001
<b>Sexual health</b>	Ever had sexual intercourse <sup>b</sup>		M 229	14.3	12.2-16.4		3.95 (3.34-4.66)	<0.0001
			E 311	7.9	6.8-9.0			<0.0001
	Used a condom last time they had sex		M 589	35.6	32.7-38.5		3.95 (3.44-4.53)	<0.0001
			E 894	22.6	20.7-24.5			<0.0001
	Always used contraception		M 302	53.8	49.9-57.7		0.90 (0.76-1.06)	0.2036
<b>Nutrition and physical activity</b>	Always used a condom		E 510	57.9	54.5-61.3			<0.0001
	Ever been pregnant or got someone pregnant		M 204	48.3	42.3-54.3		0.51 (0.42-0.62)	<0.0001
			E 487	70.1	66.8-73.4			<0.0001
	Overweight or obese <sup>c</sup>		M 184	43.8	38.1-49.6		0.63 (0.51-0.78)	0.0924
			E 340	48.5	44.7-52.4			<0.0001
<b>Injuries and motor vehicle risk behaviours</b>	Physical activity for at least 60 minutes every day in last week		M 106	6.4	5.1-7.7		5.17 (3.90-6.86)	<0.0001
			E 84	2.1	1.6-2.7			<0.0001
	Always wear a seatbelt when driving/being driven in a car		M 726	43.8	41.2-46.4		2.11 (1.88-2.38)	<0.0001
	Passenger in a car driven by a risky driver in the last month		E 1123	28.2	26.3-30.1			0.0677
	Driver engaging in risky driving in the last month		M 295	17.9	15.8-20.0		1.16 (1.09-1.35)	0.0554
<b>Health care access</b>	Medically attended injury in last 12-months		E 553	14.0	12.6-15.5			<0.0001
			M 176	10.7	8.9-12.6		0.44 (0.39-0.49)	<0.0001
	Accessed health care in last 12-months		E 3157	78.6	76.9-80.3			<0.0001
	Wanted to see a health provider but weren't able to		M 737	43.7	41.0-46.3		2.16 (1.93-2.41)	<0.0001
			E 1464	36.7	34.9-38.5			<0.0001

Notes:

aOR, adjusted odds ratio; CI, confidence interval; M, Māori; E, European

a: In 2001 only students who reported that they had thought about attempting suicide were asked if they had made a suicide attempt. In 2007 and 2012 all students were asked this question.

b: In 2012 students were asked if they had ever had sexual intercourse, not including sexual abuse. In 2001 and 2007 students were asked what age they first had sexual intercourse (or could respond never), and sexual abuse was not explicitly excluded.

c: According to IOTF cut-offs (Cole TJ, Lobstein T. Extended international (IOTF) body mass index cut-offs for thinness, overweight and obesity. *Pediatric obesity*. 2012;7(4):284-94).

Table 5: Prevalence and trends for health and wellbeing indicators between 2001, 2007, 2012.

		Changes from 2001-2012																			
		2001				2007				2012				aOR (95% CI)				p-value	Δ	Interaction <sup>a</sup>	Trend
		n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI								
Health and emotional wellbeing	Rated general health as fair or poor	M	218	9.3	8.0-10.6	179	10.7	9.1-12.4	179	10.5	8.7-12.4				1.13 (0.89-1.44)	0.315	→	Ethnicity			
		E	349	6.6	5.9-7.4	288	6.1	5.3-6.8	275	6.8	5.9-7.8				1.03 (0.86-1.24)	0.7643	→				
	Clinically significant depressive symptoms (RADS-SF ≥ 28)	M	340	14.9	13.5-16.3	169	10.6	8.9-12.2	224	13.9	11.3-16.5				0.92 (0.72-1.18)	0.51	→				
		E	518	10.3	9.2-11.3	432	9.3	8.3-10.3	478	12.1	10.8-13.4				1.20 (1.02-1.41)	0.0248	↑				
Attempted suicide in last 12-months	M	271	11.8	10.1-13.5	114	6.9	5.6-8.2	110	6.5	5.2-7.9				0.53 (0.41-0.68)	<0.0001	↓	Ethnicity				
	E	294	5.7	4.9-6.6	172	3.6	3.0-4.2	107	2.7	2.0-3.3				0.46 (0.35-0.61)	<0.0001	↓					
Substance use	Monthly or more cigarette use	M	575	27.5	25.1-29.8	287	18.7	16.2-21.2	166	10.1	8.4-11.8				0.29 (0.23-0.36)	<0.0001	↓	Ethnicity, Age			
		E	766	15.1	13.8-16.4	336	7.5	6.7-8.3	181	4.5	3.7-5.4				0.26 (0.21-0.32)	<0.0001	↓				
	At least one episode of binge drinking in last 4 weeks	M	1012	51.2	48.9-53.5	762	51.0	47.9-54.1	521	32.5	30.1-34.9				0.41 (0.35-0.48)	<0.0001	↓	Ethnicity, Age			
		E	2035	41.1	39.3-43.0	1589	35.6	33.4-37.8	982	24.9	22.8-27.0				0.41 (0.36-0.46)	<0.0001	↓				
Monthly or more marijuana use	M	671	34.1	31.8-36.5	317	22.3	19.8-24.8	229	14.3	12.2-16.4				0.31 (0.25-0.38)	<0.0001	↓	Ethnicity, Age				
	E	788	16.3	14.9-17.7	418	9.7	8.6-10.8	311	7.9	6.8-9.0				0.43 (0.36-0.51)	<0.0001	↓					
Sexual health	Ever had sexual intercourse	M	1050	47.6	45.0-50.2	827	55.8	52.2-59.3	589	35.6	32.7-38.5				0.56 (0.47-0.66)	<0.0001	↓	Ethnicity, Age			
		E	1346	26.5	25.0-27.9	1464	33.4	31.2-35.6	894	22.6	20.7-24.5				0.76 (0.67-0.86)	<0.0001	↓				
	Used a condom last time they had sex	M	577	61.9	58.8-65.0	470	59.5	56.1-62.9	302	53.8	49.9-57.7				0.75 (0.61-0.92)	0.0066	↓	Ethnicity			
		E	810	65.1	62.5-67.7	956	67.9	65.5-70.3	510	57.9	54.5-61.3				0.79 (0.66-0.95)	0.0124	↓				
Always used contraception	M	355	51.3	46.0-56.7	278	52.2	48.1-56.3	204	48.3	42.3-54.3				0.84 (0.62-1.16)	0.2904	→					
	E	621	69.8	66.8-72.7	657	68.3	64.7-72.0	487	70.1	66.8-73.4				0.92 (0.75-1.13)	0.4189	→					
Always used a condom	M	322	46.4	42.1-50.7	209	36.1	32.3-40.0	184	43.8	38.1-49.6				0.95 (0.71-1.27)	0.7428	→					
	E	464	52.2	49.1-55.2	512	50.5	47.3-53.6	340	48.5	44.7-52.4				0.93 (0.76-1.13)	0.4627	→	Ethnicity				
Ever been pregnant or got someone pregnant	M	221	10.1	8.6-11.5	174	11.7	10.2-13.3	106	6.4	5.1-7.7				0.59 (0.45-0.77)	0.0001	↓					
	E	200	3.9	3.3-4.5	164	3.7	3.1-4.3	84	2.1	1.6-2.7				0.53 (0.39-0.72)	0.0001	↓					
Nutrition and physical activity	Overweight or obese	M	-	-	-	765	46.5	43.4-49.7	726	43.8	41.2-46.4				*0.89 (0.76-1.05)	0.1627	→				
		E	-	-	-	1294	27.7	26.0-29.4	1123	28.2	26.3-30.1				*1.02 (0.90-1.16)	0.7547	→				
	Eat 5 or more fruit/veg a day	M	-	-	-	236	14.7	12.8-16.6	295	17.9	15.8-20.0				*1.28 (1.04-1.57)	0.0198	↑	Age			
		E	-	-	-	522	11.2	10.2-12.3	553	14.0	12.6-15.5				*1.29 (1.24-1.91)	0.0017	↑				
Physical activity for at least 60 minutes every day in last week	M	-	-	-	185	12.3	10.1-14.5	176	10.7	8.9-12.6				*0.90 (0.69-1.16)	0.4032	→	Age				
	E	-	-	-	521	11.8	10.3-13.3	374	9.5	8.5-10.5				*0.86 (0.75-1.00)	0.0483	↓					
Injuries and motor vehicle risk behaviours	Always wear a seatbelt when driving/being driven in a car	M	1298	55.9	53.5-58.3	1044	62.7	60.2-65.3	1103	65.3	62.7-67.9				1.45 (1.26-1.68)	<0.0001	↑	Ethnicity			
		E	3639	70.0	68.1-71.8	3705	78.8	77.0-80.6	3157	78.6	76.9-80.3				1.57 (1.38-1.78)	<0.0001	↑				
	Passenger in a car driven by a risky driver in the last month	M	2910	65.2	62.9-67.5	896	54.0	51.2-56.7	737	43.7	41.0-46.3				0.40 (0.34-0.46)	<0.0001	↓	Ethnicity, Age			
		E	1492	56.2	54.6-57.7	1998	42.6	40.8-44.4	1464	36.7	34.9-38.5				0.44 (0.40-0.49)	<0.0001	↓				
Driver engaging in risky driving in the last month	M	623	31.8	29.2-34.3	276	29.0	26.1-31.8	147	15.3	12.9-17.7				0.32 (0.25-0.39)	<0.0001	↓	E, A				
	E	1034	24.4	22.0-26.7	615	26.3	23.6-28.9	292	14.9	12.8-16.9				0.40 (0.33-0.48)	<0.0001	↓					
Medically attended injury in last 12-months	M	-	-	-	933	56.8	53.6-60.1	1006	59.9	56.8-62.9				*1.16 (0.98-1.37)	0.093	→					
	E	-	-	-	2678	57.3	55.2-59.3	2394	59.9	57.4-62.4				*1.15 (1.02-1.30)	0.0266	↑					
Health care access	Accessed health care in last 12-months	M	-	-	-	1355	82.3	80.6-84.0	1304	78.4	75.8-81.0				*0.76 (0.63-0.93)	0.0058	↓				
		E	-	-	-	4020	86.1	84.9-87.3	3311	82.8	81.2-84.5				*0.76 (0.65-0.89)	0.0005	↓				
	Wanted to see a health provider but weren't able to	M	-	-	-	373	22.6	20.1-25.1	370	21.9	19.9-24.0				*0.94 (0.79-1.13)	0.5211	→				
		E	-	-	-	642	13.7	12.8-14.7	622	15.5	14.3-16.7				*1.11 (0.99-1.26)	0.0785	→				

Notes:

aOR, adjusted odds ratio for the effect of study year on each outcome (i.e. change between 2001 and 2012), adjusted for age and sex; CI, confidence interval; M, Māori; E, European; Δ, change over time; ↑, significant increase; ↓, significant reduction; —, no significant change; —, Māori; —, European

\* aOR for change between 2007 and 2012

a: Interaction between wave and Māori and European ethnicity (E), wave and age (A), or wave and sex (S) at p&lt;0.01

- Questions not asked in 2001

This study found that while there has been significant improvement for Māori youth over the 2001–2012 time period, they are disproportionately exposed to socioeconomic adversity compared to European students, and the impact of socioeconomic disadvantage for Māori carries more significant health burdens. Exposure to poverty is particularly damaging during the adolescence period,<sup>39,40</sup> particularly when coupled with discrimination.<sup>41,42</sup> Obligations under Te Tiriti o Waitangi, the founding document of Indigenous and settler governance in New Zealand, is testament to our ancestors' aspirations for bicultural partnership. In contemporary times, this translates to the right to equity of values<sup>43</sup> and health and social outcomes.<sup>44,45</sup> This signals a strong need for services and clinicians to explore and transform discriminatory policies, practices and procedures that systematically disadvantage Māori youth and their whānau as well as supporting whānau aspirations for their children through poverty alleviation strategies.<sup>38,46</sup>

### Strengths and limitations

This study used data from New Zealand's largest and most comprehensive surveys exploring health and wellbeing among Māori in secondary schools. Although the Youth2000 survey series were not Māori-specific (i.e. they were nationally representative and included non-Māori), participants had the option of completing the survey in te reo Māori (with Māori language voiceover) and could swap between Māori and English versions during the survey. Where possible, reliable and validated scales were used to measure items of wellbeing, specifically the WHO-5, RADS-SF. Further, each version of the survey (2001, 2007 and 2007) underwent extensive piloting.

The findings come from a cross-sectional survey of secondary school students aged 12 to 19 and cannot be used to determine cause and effect relationships or generalised to all Māori youth. Māori attending secondary school and present on the day of the survey were more likely to come from stable socio-cultural environments, compared to those who were absent, did not attend school and who attended alternative education units.<sup>47,48</sup> Consequently the results from each survey wave are likely to present a positively skewed view of Māori youth health and wellbeing in New Zealand. Additionally, the 2012 survey

had a lower response rate, which may have introduced a response bias. Although risk and protective factors and the related question items were identified from relevant literature, there is little research espousing the reliability and validity of these items among Māori youth. Further exploration and qualitative research are required to explore these factors.

Finally, the global financial crisis and housing shortages in New Zealand since 2012 are likely to have an impact on the health status of today's youth. The Youth2000 survey series is New Zealand's only comprehensive and representative source of health and wellbeing data; their continuance is essential to monitor ongoing trends, declines and improvements in Māori youth wellbeing. The next wave of surveys is overdue and urgently required to monitor outcomes for Māori and provide essential information for policy and service development.

### Conclusion

This paper highlights the major improvements in health and social outcomes for Māori secondary school students over the 2001–2012 period. These findings suggest that when resources are prioritised to reduce inequities, they can make a difference in areas such as substance use and motor vehicle risk taking behaviour. However, exposure to poverty as a major driver of inequities stubbornly remains, particularly for areas such as mental health and suicidality. Similarly, sexual health, obesity and poor access to healthcare remain areas that have had comparatively little resourcing. Urgent attention is required to address these under-served areas of health acknowledging ongoing colonialism and interstices of racism, sexism, fat stigma, poverty and violence that threatens Māori youth wellbeing. Māori youth as Te Tiriti o Waitangi partners need better – and deserve better. This should be a major driver for action.

### References

1. Penehira M. Mouri Whakapapa: Re-positioning Māori resistance and Wellbeing in Sexual and Reproductive Health. In: *Proceedings of the New Zealand Sexual Health Society Conference: Raising the Bar*; 2012; Palmerston North Convention Centre, New Zealand; 2012
2. Kingi TK, Waiti J. Whānau Resilience: A Case Study. In: *Proceedings of the Nga Pae o te Maramatanga Horizons of Insight Seminar*; 2011 June; Wharenui, Waipapa Marae; Auckland, New Zealand; University of Auckland; 2011.

3. Orange C. Introduction. In: *The Turbulent Years : The Maori Biographies from the Dictionary of New Zealand Biography*. 1870-1900. Volume 2. Wellington (NZ): Bridget Williams Books; 1994. p. xxviii, 249.
4. Glover M, Rousseau B. "Your child is your whakapapa": Māori considerations of assisted human reproduction and relatedness. *SITES*. 2007;4(2):117-36.
5. Taonui R. Mana Tamariki: Cultural Alienation. *AlterNative*. 2010;6(3):187-202.
6. Walters KL, Simoni JM. Reconceptualizing native women's health: An 'Indigenist' stress-coping model. *Am J Public Health*. 2002;92(4):520-4.
7. Harris R, Tobias M, Jeffreys M, Waldegrave K, Karlsen S, Nazroo J. Racism and health: The relationship between experience of racial discrimination and health in New Zealand. *Soc Sci Med*. 2006;63(6):1428-41.
8. Robson B, Harris R. *Hauora: Māori Standards of Health IV. A Study of the Years 2000-2005*. Wellington (NZ): University of Otago Te Rōpū Rangahau Hauora a Eru Pōmare; 2007.
9. Crengle S, Clark TC, Robinson E, Bullen P, Dyson B, Denny S, et al. *The Health and Wellbeing of Maori New Zealand Secondary School Students in 2012. Te Ara Whakapiki Taitamariki: Youth'12*. Auckland (NZ): University of Auckland; 2013.
10. Clark TC, Lucassen MFG, Fleming T, Peiris-John R, Ikihele A, Teevale T, et al. Changes in the sexual health behaviours of New Zealand secondary school students, 2001–2012: findings from a national survey series. *Aust N Z J Public Health*. 2016;40(4):329-36.
11. Clark TC, Moselen E, Dixon R, The Adolescent Health Research Group, Lewycka S. *Sexual and Reproductive Health & Sexual Violence Among New Zealand Secondary School Students: Findings from the Youth'12 National Youth Health and Wellbeing Survey*. Auckland (NZ): University of Auckland; 2015.
12. Fleming TM, Clark T, Denny S, Bullen P, Crengle S, Peiris-John R, et al. Stability and change in the mental health of New Zealand secondary school students 2007–2012: Results from the national adolescent health surveys. *Aust N Z J Psychiatry*. 2014;48(5):472-80.
13. New Zealand Mortality Review Data Group. *Child and Youth Mortality Review Committee - 12th Data Report, 2011–15*. Wellington (NZ): New Zealand Child and Youth Mortality Review Committee; 2016.
14. Fleming T, Lee AC, Moselen E, Clark TC, Dixon R, The Adolescent Health Research Group. *Problem Substance Use Among New Zealand Secondary School Students: Findings from the Youth'12 National Youth Health and Wellbeing Survey*. Auckland (NZ): University of Auckland; 2014.
15. Clark TC, Fleming T, Bullen P, Crengle S, Denny S, Dyson B, et al. Health and well-being of secondary school students in New Zealand: Trends between 2001, 2007 and 2012. *J Paediatr Child Health*. 2013;49(11):925-34.
16. McClintock K, Huriwai T, Levy M, McClintock R. *Māori Rangatahi and Addictions Review of Key Issues*. Wellington (NZ): National Centre for Māori Health, Māori Workforce Development and Excellence; 2015.
17. Mental Health Commission. *Child and Youth Mental Health and Addiction*. Wellington (NZ): Government of New Zealand; 2011.
18. Statistics New Zealand. *Maori Population Article* [Internet]. Wellington (NZ): Government of New Zealand; 2015 [cited 2018 Oct 3]. Available from: [http://www.stats.govt.nz/browse\\_for\\_stats/people\\_and\\_communities/maori/maori-population-article-2015](http://www.stats.govt.nz/browse_for_stats/people_and_communities/maori/maori-population-article-2015)
19. Clark T, Fleming T, Bullen P, Crengle S, Denny S, Dyson B, et al. *Youth'12 Prevalence Tables: The Health and Wellbeing of New Zealand Secondary School Students in 2012*. Auckland (NZ): University of Auckland; 2013.
20. Watson PD, Denny SJ, Adair V, Ameratunga SN, Clark TC, Crengle SM, et al. Adolescents' perceptions of a health survey using multimedia computer-assisted self-administered interview. *Aust N Z J Public Health*. 2001;25(6):520-4.
21. Statistics New Zealand. *Statistical Standard for Ethnicity* [Internet]. Wellington (NZ): Government of New Zealand; 2005 [cited 15 June 2010]. Available from: <http://www2.stats.govt.nz/domino/external/web/carsweb.nsf/55d63ae38ba3a25e4c2567e6007f6686/35d9b7e17a1d6151cc25701100031353?OpenDocument>



22. Ministry of Education. *Deciles* [Internet]. Wellington (NZ): Government of New Zealand; 2001 [cited 2008 Sep]. Available from: <http://www.minedu.govt.nz/educationSectors/Schools/SchoolOperations/Resourcing/OperationalFunding/Deciles.aspx>
23. Lewycka S, Fleming T, Clark TC. Downwards trends in adolescent risk-taking behaviours in New Zealand: Exploring driving forces for change. *J Paediatr Child Health*. 2018;54(6):602-8.
24. Denny S, Grant S, Galbreath R, Clark TC, Fleming T, Bullen P, et al. *Health Services in New Zealand Secondary Schools and the Associated Health Outcomes for Students*. Auckland (NZ): University of Auckland; 2014.
25. Hastings G, Anderson S, Cooke E, Gordon R. Alcohol marketing and young people's drinking: a review of the research. *J Public Health Policy*. 2005;26(3):296-311.
26. Thornley L, Marsh K. *What Works in Social Marketing to Young People? Systematic Review for the Health Research Council of New Zealand and the Ministry of Youth Development*. Wellington (NZ): Ministry of Social Development; 2010.
27. de Looze M, Raaijmakers Q, Ter Bogt T, Bendtsen P, Farhat T, Ferreira M, et al. Decreases in adolescent weekly alcohol use in Europe and North America: evidence from 28 countries from 2002 to 2010. *Eur J Public Health*. 2015;25 Suppl 2:69-72.
28. Hublet A, Bendtsen P, de Looze ME, Fotiou A, Donnelly P, Vilhjalmsson R, et al. Trends in the co-occurrence of tobacco and cannabis use in 15-year-olds from 2002 to 2010 in 28 countries of Europe and North America. *Eur J Public Health*. 2015;25 Suppl 2:73-5.
29. Ministry of Social Development. *The Social Report 2016 – Te pūrongo oranga tangata*. Wellington (NZ): Government of New Zealand; 2016.
30. McDonald GK, Chalmers SH, Hii J, Wolfe N, Szymanska KE, Davison JA. *Child and Youth Mortality Review Committee 13th Data Report 2012–16*. Wellington (NZ): Child and Youth Mortality Review Committee, Health Quality and Safety Commission of New Zealand; 2018.
31. Clark T, Robinson E, Crengle S, Fleming T, Ameratunga S, Denny S, et al. Risk and protective factors for suicide attempt among indigenous Māori youth in New Zealand: The role of family connection as a moderating variable. *J Aborig Health*. 2011;7(1):16-31.
32. Williams, AD, Clark, TC, Lewycka, S. *The associations between cultural identity and mental health outcomes for indigenous Māori youth*. *Frontiers in Public Health*. 2018 (in press). Statistics New Zealand. Māori age structure. Article (internet). Wellington (NZ): Government of New Zealand; 2015 [cited 2017 Dec]. Available from: <https://www.health.govt.nz/our-work/populations/maori-health/tatau-kahukura-maori-health-statistics/tatauranga-taupori-demographics/age-structure>
33. Crengle S, Robinson E, Ameratunga S, Clark T, Raphael D. Ethnic discrimination prevalence and associations with health outcomes: Data from a nationally representative cross-sectional survey of secondary school students in New Zealand. *BMC Public Health*. 2012;12(1):45.
34. Commission on Social Determinants of Health. *Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health*. Final Report. Geneva (CHE): World Health Organization; 2008.
35. Robson B, Cormack D, Cram F. Social and Economic Indicators. In: Robson B, Harris R, editors. *Hauora: Māori Standards of Health IV: A Study of the Years 2000-2005*. Wellington (NZ): University of Otago Department of Public Health; 2007. p. 21-32.
36. Thayer ZM, Kuzawa CW. Ethnic discrimination predicts poor self-rated health and cortisol in pregnancy: Insights from New Zealand. *Soc Sci Med*. 2015;128:36-42.
37. Harris R, Cormack D, Tobias M, Yeh L-C, Talamaivao N, Minster J. The pervasive effects of racism: Experiences of racial discrimination in New Zealand over time and associations with multiple health domains. *Soc Sci Med*. 2012;74(3):408-15.
38. Edwards S, McCreanor T, Moewaka Barnes H. Maori family culture: A context of youth development in Counties/Manukau. *Kotuitui: N Z J Soc Sci Online*. 2007;2:1-15. doi: 10.1080/1177083X.2007.9522420
39. Denny S, Lewycka S, Utter J, Fleming T, Peiris-John R, Sheridan J, et al. The association between socioeconomic deprivation and secondary school students' health: Findings from a latent class analysis of a national adolescent health survey. *Int J Equity Health*. 2016;15(1):109.
40. Devenish B, Hooley M, Mellor D. The pathways between socioeconomic status and adolescent outcomes: A systematic review. *Am J Community Psychol*. 2017;59(1-2):219-38.
41. Cheng ER, Cohen A, Goodman E. The role of perceived discrimination during childhood and adolescence in understanding racial and socioeconomic influences on depression in young adulthood. *J Pediatr*. 2015;166(2):370-7. e1.
42. Hou Y, Kim SY, Wang Y, Shen Y, Orozco-Lapray D. Longitudinal reciprocal relationships between discrimination and ethnic affect or depressive symptoms among Chinese American adolescents. *J Youth Adolesc*. 2015;44(11):2110-21.
43. Robson B. *Mana Whakamarama - Equal Explanatory Power: Maori and Non Maori Sample Size in National Health Surveys*. Wellington (NZ): University of Otago Wellington School of Medicine and Health Sciences; 2002.
44. Ministry of Health. *Whaia te ora mo te iwi [electronic resource]: Strive for the Good Health of the People: Maori Health Policy Objectives of Regional Health Authorities and the Public Health Commission*. Wellington (NZ): New Zealand Department of Health; 1993.
45. Marsden M. *The Woven Universe: Selected Writings of Rev Maori Marsden*. Otaki (NZ): Estate of Rev. Maori Marsden; 2003.
46. Dyall L. *Maori Demographic Strategy as a Means to Enhance Maori Potential*. Unpublished observation.
47. Clark TC, Smith J, Raphael D, Jackson C, Denny S, Fleming T, et al. Kicked out of school and suffering: The health needs of youth attending Alternative Education in New Zealand. *Youth Stud Aust*. 2011;29(4):10-17.
48. Clark TC, Smith JM, Raphael D, Jackson C, Fleming T, Denny S, et al. *Youth'09: The Health and Wellbeing of Young People in Alternative Education*. Auckland (NZ): University of Auckland; 2010.

## Supporting Information

Additional supporting information may be found in the online version of this article:

**Supplementary Appendix 1:** Questionnaire items and responses.