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Mixed progress in adolescent health and wellbeing in Aotearoa New Zealand 2001–2019: a population overview from the Youth2000 survey series

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ABSTRACT

We explored progress on key indicators of adolescent health and wellbeing among New Zealand secondary school students over the last two decades. We analysed data from comprehensive surveys conducted in 2001, 2007, 2012 and 2019 ($n = 9546, 9098, 8487, \text{ and } 7311$, respectively). Schools, and students within schools, were randomly selected. Prevalence estimates and adjusted odds ratios show large reductions in substance use (e.g. prevalence of past-month binge drinking declined from 41.5% to 21.8%), sexual experience (31.6% to 20.6%) and past-month risky driving (58.8% to 37.1%). However, from 2012–2019 there were rapid increases in symptoms of depression (13.0% to 22.8%; RADS-SF), suicide thoughts (15.3% to 20.8%) and suicide attempts (3.9% to 6.3%) and declines in emotional wellbeing (76.0% to 69.1%; WHO-5). Changes in family and school contexts were generally positive or minimal, although the proportion of students whose families worry about money for food increased from 2001 to 2019 (7.2% to 12.5%) and access to health services decreased from 2007 to 2019 (83.5% to 78.2%). This study demonstrates that health status and risks among New Zealand adolescents have changed dramatically over 20 years, with areas of large improvement. However, mental wellbeing requires urgent attention.

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Introduction

‘Ka mua, ka muri’

Walking backwards into the future

(Māori whakataukī referring to learning from the past to help forge new paths into the future)

To understand the current and future state of child and youth health in Aotearoa New Zealand, it is necessary to look back. What has changed over the past 20 years, and what do these changes mean for the future? We need to consider the shifting contexts in which young people are growing up, as well as current indicators of their health and wellbeing. After all, it is largely the quality of the relationships and environments that young people experience that determine their health and wellbeing (Viner et al. 2012; Donkin et al. 2018). And those relationships and environments, in turn, are heavily influenced by the wider social and economic context (Viner et al. 2012).

Adolescents – who do not fit neatly into either ‘child’ or ‘adult’ categories – have the right to health, as do people of all ages. This includes ‘access to both timely and appropriate health care as well as the underlying social and economic determinants of health’ (Human Rights Commission 2010, p. 153). Adolescent health is not only important in itself, but also for outcomes in early adulthood and beyond (Sawyer et al. 2012; Clark et al. 2020), for both young people and their communities (Patton et al. 2016). For example, most mental disorders emerge during adolescence or by young adulthood (Solmi et al. 2022), and behaviours in adolescence, such as involvement in sports, predict behaviours for years to come (Bélanger et al. 2015). Identifying and targeting key determinants of adolescent wellbeing can benefit adolescents’ immediate wellbeing and improve future outcomes (Sawyer et al. 2012; Clark et al. 2020).

New Zealand does not have a good track record in adolescent health. Young people aged 10–19 comprise approximately 13% of the population, of which 25% are indigenous Māori youth (Statistics New Zealand 2016). New Zealand youth have poorer wellbeing than those in most Organisation of Economic Co-operation and Development (OECD) member countries (Gromada et al. 2020). For example, the UNICEF Worlds of Influence Report Card 16 ranked New Zealand 35th of 38 countries on overall child wellbeing outcomes, and with the second highest adolescent suicide rate of 41 developed countries (Gromada et al. 2020). There are marked inequities by ethnicity and socioeconomic position. Māori and Pacific young people, for example, are exposed to high levels of material deprivation, poor access to health care, discrimination in multiple domains and higher health needs on many indicators (Crengle et al. 2012; Denny et al. 2016; Clark et al. 2018). Turning these statistics around requires deep understandings of the issues and whole-of-society efforts.

Quality, timely research is important for informing policy, practice, and the development of effective interventions across government (Ministry of Business Innovation and Employment and Ministry of Health 2017). More specifically, measuring key indicators and determinants of adolescent wellbeing, identifying vulnerable youth populations, and monitoring behavioural trends can help inform prevention strategies and the development of effective public health programmes.

We have previously reported adolescent health and wellbeing indicators in New Zealand using data from the New Zealand youth health surveys (the ‘Youth2000’ series), carried out by the Adolescent Health Research Group in secondary schools in 2001, 2007 and 2012 (Adolescent Health Research Group 2003; Denny et al. 2011a; Clark et al. 2013; Fleming

et al. 2014). The Youth 2012 survey revealed improvements between 2001 and 2012 in some important wellbeing indicators. We observed significant decreases in self-reported cigarette smoking, binge drinking and other areas of substance use, pregnancies, risky driving and some areas of violence, as well as improvements in family relationships, school connections, and young people always feeling safe in their neighbourhoods to 2012. However, the 2012 survey also highlighted that some wellbeing indicators had not meaningfully improved or had worsened. Between 2001 and 2012 there were no improvements in the proportion of young people reporting significant depressive symptoms, condom use to protect against sexually transmitted infections, or health care accessibility, among other wellbeing indicators (Clark et al. 2013). Previous Youth2000 surveys also indicated that New Zealand compares unfavourably with other developed nations in rates of teenage pregnancy, mental health concerns and obesity (Clark et al. 2013), further highlighting the need for continued research and public health initiatives targeting this population.

This paper adds new findings, considering the overall trends and changes in key health indicators over the almost two decade period from 2001 to 2019, as well as exploring the most recent period, 2012–2019. It provides a comprehensive, recent snapshot of adolescent health and the contexts that influence it (e.g. family, school and neighbourhood environments and relationships). Importantly, core survey questions remained consistent throughout the Youth2000 series, allowing us to present 2001–2019 trends for key indicators. This is vital for understanding changing health needs among adolescents and identifying priority areas for current and future youth health action.

Materials and methods

This paper reports findings from Youth19 and earlier survey waves in the Youth2000 survey series. These were large, cross-sectional surveys involving 2.6% to 3.9% of New Zealand secondary school students in 2001, 2007, 2012 and 2019. Each survey used a two-stage sample cluster design, randomly selecting schools and then randomly selecting students from the rolls of participating schools. These surveys have been supplemented by smaller surveys of Alternative Education students, those in Teen Parent Units, young people not in education, employment or training (YNEETS), and surveys of school staff, school health services and school management (Clark et al. 2010; Denny et al. 2011b; Milfont and Denny 2017).

Youth19 methods have been published elsewhere (Fleming et al. 2020b; Rivera-Rodriguez et al. 2021). In brief, ethics approval for Youth19 was granted by The University of Auckland Human Subjects Ethics Committee (Reference #022244). The survey took place between May and September 2019 in the Auckland, Northland and Waikato education regions. This region includes 47% of New Zealand's secondary school students, is the most ethnically diverse region of New Zealand, and includes the largest city, smaller urban centres and remote areas. The region also includes socioeconomic groupings that span the spectrum of deprivation in New Zealand. A representative sample of secondary schools in this region was drawn from New Zealand government databases in 2018. Schools with fewer than 50 students in years 9–13 and special schools, where all students had disabilities that prevented them from providing informed consent, were excluded. One school was excluded because it was closing and five eligible schools with school rolls of 50–100 students were excluded in error during the randomisation process. Kura kaupapa Māori (Māori language medium schools) were excluded from

randomisation and sampled using a different sampling frame (see Fleming et al. 2020b; Greaves et al. 2021). To retain comparability with previous survey waves, kura kaupapa Māori students are not included in the current analysis and results from this group will be reported in future publications. Of the 161 remaining secondary schools, 50% were randomly selected from each education district (Auckland, Northland and Waikato), a total of 78 schools, of which 43 agreed to participate. A further two schools were invited to participate as pilot sites and both consented. No significant changes to methods were made following piloting, hence pilot schools were included in the final sample, giving a total of 45 schools and a school response rate of 56%.

School principals or heads of boards of trustees in participating schools provided consent for students to be invited to participate. Information was sent to parents/caregivers, who could opt for their young person to be excluded. In each participating school, 30% of students were randomly selected from the school roll. In two small schools, 100% of students were invited to participate, as requested by school management. On the day of the survey, selected students were invited to attend the room where the survey was held. The purpose of the survey was explained by researchers and via a video, and students who consented remained to participate in the survey.

In total, 12,359 mainstream school students were invited to participate and 7,374 (60%) agreed, representing approximately 6% of all secondary school students in the eligible schools and approximately 2.6% of the total New Zealand population of year 9–13 students. Sixty-three students did not identify as male or female sex and their responses were removed to retain comparability with previous surveys in which ‘male’ and ‘female’ were the only response options for sex, and to allow calibration to national population estimates. A final sample of 7,311 student responses was analysed. Initial findings for trans and gender diverse and questioning students have been reported elsewhere (Fenaughty et al. 2021b) and further analyses are in preparation.

The characteristics of participating students are reported in [Table 1](#).

Methods for the 2001, 2007 and 2012 surveys have been reported previously (Adolescent Health Research Group 2003; Adolescent Health Research Group 2008; Clark et al. 2013). In brief, each survey used similar sampling frames to the 2019 survey, except that the earlier surveys sampled schools throughout New Zealand. The probabilities of selection and response rates vary slightly across each wave. Statistical methods to account for these differences are described below.

Survey content

The Youth2000 surveys explore a broad range of domains that influence adolescent health and wellbeing, including health care, school belonging and safety, family circumstances and connectedness, neighbourhood and community, and health-related behaviours. The core questions in each wave are comparable, with specific areas explored in more depth in each survey.

The 2019 survey comprises 285 questions and includes a focus on areas of wellbeing and connectedness associated with positive outcomes for Māori young people, open-text questions about the challenges young people face and potential solutions (answered in students’ own words), and optional links to digital health and wellbeing tools for participants (Fleming et al. 2020a; Fleming et al. 2020a, 2020b).

Table 1. Demographic characteristics of Youth2000 participants across survey waves (2001, 2007, 2012 and 2019)

	2001		2007		2012		2019	
	N	%	N	%	N	%	N	%
Total schools	114	–	96	–	91	–	45	–
Total students	9,546	100.0	9,098	100.0	8,487	100.0	7,311	100.0
Sex ^a								
Female	5,144	53.9	4,187	46.0	4,618	54.4	3,990	54.6
Male	4,402	46.1	4,911	54.0	3,869	45.6	3,321	45.4
Age ^b								
13 years or under	2,050	21.5	1,859	20.4	1,838	21.7	1,323	18.1
14	2,285	23.9	2,100	23.1	1,895	22.3	1,635	22.4
15	2,178	22.8	1,973	21.7	1,755	20.7	1,620	22.2
16	1,725	18.1	1,743	19.2	1,578	18.6	1,403	19.2
17 years or over	1,308	13.7	1,423	15.6	1,421	16.7	1,330	18.2
Ethnicity ^c								
Māori	2,335	24.5	1,702	18.7	1,697	20.0	1,188	16.2
Pacific	765	8.0	924	10.2	1,200	14.1	915	12.5
Asian	679	7.1	1,126	12.4	1,049	12.4	1,768	24.2
Other ^d	365	3.8	549	6.0	523	6.2	387	5.3
Pākehā & European	5,402	56.6	4,797	52.7	4,018	47.3	3,053	41.8
Neighbourhood deprivation ^{e,f}								
NZDep 1–3 (low deprivation)	–	–	3,216	35.3	2,715	32.0	2,098	28.7
NZDep 4–7	–	–	3,396	37.3	2,995	35.3	2,772	37.9
NZDep 8–10 (high deprivation)	–	–	2,246	24.7	2,670	31.5	1,829	25.0
School decile ^g								
Decile 1–2 (high deprivation)	957	10.0	629	6.9	1,222	14.4	734	10.0
Decile 3–4	1,491	15.6	1,751	19.2	1,411	16.6	1,189	16.3
Decile 5–6	2,361	24.7	2,458	27.0	1,728	20.4	893	12.2
Decile 7–8	2,464	25.8	1,347	14.8	2,254	26.6	1,740	23.8
Decile 9–10 (low deprivation)	2,273	23.8	2,913	32.0	1,872	22.1	2,755	37.7
Urban / rural ^{f,h}								
Urban	–	–	6,688	73.5	6,591	77.7	5,085	69.6
Small towns	–	–	726	8.0	517	6.1	520	7.1
Rural	–	–	1,390	15.3	1,216	14.3	1,095	15.0

NB some percentages do not add to 100 due to missing data.

^a2019 was the first survey in which students were able to report a sex other than male or female. A total of 63 students did not report a male or female sex in 2019. Their health and wellbeing will be reported in other outputs where contexts can be explored more fully.

^bVery few participants were younger than 13 or older than 17, therefore these students were grouped into ‘13 or under’ or ‘17 or over’.

^cEthnicity is categorised using the NZ census ethnicity prioritisation method.

^d‘Other’ ethnicity includes Middle Eastern, Latin American, African, and other ethnicities and ethnicity unknown.

^eNeighbourhood deprivation is categorised using the NZ Deprivation Index 2018.

^fHome addresses allowing the attribution of meshblock and location data were not collected in 2001.

^gSchool decile is determined by the Ministry of Education and indicates the extent to which a school draws students from low socio-economic communities.

^hUrban (population of 10,000 or more), small towns (population between 1,000 and 9,999 people), rural (population fewer than 1,000), based on the Statistical Standard for Geographic Areas 2018 (SSGA18), see Fleming et al. (2020b) for full details.

Measures

All measures were self-reported except for school decile (derived from participating school information), New Zealand Deprivation Index (NZDep) and locale. During the 2007, 2012 and 2019 surveys, each student was invited to enter their main residential address into a separate programme, which identified their census meshblock (neighbourhood area). Specific addresses were then deleted and meshblock numbers retained, so that students’ survey data could be linked with NZDep and locale information.

School decile measures the socio-economic position of a student's school community relative to other schools in Aotearoa (i.e. Decile 1, refers to the 10% of schools from the most socio-economically deprived communities). Criteria are determined by the Ministry of Education based on a range of indicators including household income, parental occupation, household crowding, parental educational qualifications and income/welfare support (Ministry of Education, ND). The indicator does not measure the school performance or quality of education.

The *New Zealand Deprivation Index* 2018 (NZDep2018) is a standard measure based on census data for neighbourhood level deprivation (Atkinson et al. 2019).

Locale is based on Meshblock census and other geographic level data to provide information on the populations within a determined geographical boundary. An urban population is defined as 10,000 or more people, small towns between 1,000 and 9,999 people, and rural fewer than 1,000 (Statistics New Zealand 2017).

Students could select as many ethnic groups as applied to them and were allocated to one group for analysis, using the New Zealand census ethnicity prioritisation method (Ministry of Health 2017).

Most reported indicators were assessed using a single question, consistent across waves, as shown in Tables 2 and 3. The full 2019 survey questionnaire is available on www.youth19.ac.nz.

Wellbeing and depressive symptoms were assessed using validated scales. Wellbeing was measured using the WHO-5 Wellbeing Index, with those scoring 13 or more classified as having good wellbeing (World Health Organization 1998). Depressive symptoms were measured using the short form of the Reynolds Adolescent Depression Scale (RADS-SF), with those scoring 28 or more classified as having significant depression symptoms (Reynolds 2002; Milfont et al. 2008).

Suicide thoughts were assessed as an affirmative response to the question 'During the last 12 months have you seriously thought about killing yourself (attempting suicide)?' and suicide attempts as an affirmative response to 'During the last 12 months have you tried to kill yourself (attempted suicide)?' (response options yes/no for both questions). Other questions were categorised as shown in Tables 2 and 3.

Statistical analysis

The indicators presented in this paper were selected prior to commencing analysis using a Data Access Proposal process. We included items reflecting important causes of morbidity and mortality among adolescents in New Zealand (motor vehicle risk behaviours, mental health indicators, sexual health behaviours and activity levels) as well as critical risk and protective factors for this age group (family and school relationships, and inclusion and safety at home, school and in communities) (Patton et al. 2012; Viner et al. 2012; Clark et al. 2013). Items that were included across survey waves were prioritised to allow comparisons. Some health indicators were not included in multiple waves, for example vaping was only included in 2019, hence is not included in this trends analysis (cross-sectional findings are reported elsewhere, see Ball et al. 2021).

Survey data were analysed using R 4.0.1 (R Core Team 2021) and the survey package (v 4.0; Lumley 2020). A two-stage clustered stratified survey design was used, which clustered by school, stratified by education region and weighted for unequal probability of

Table 2. Selected risk and protective factors and social context variables by sex and associations between variables and survey wave (2001, 2012 and 2019)

	2001 (except where specified)		2012		2019		Changes from 2001 ^b to 2019			Changes from 2012 to 2019		
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	OR (95% CI)	Δ	p value	OR (95% CI)	Δ	p value
Family circumstances												
Moved home two or more times in past year												
Total	1,029	10.0 (9.3-10.7)	622	6.9 (6.3-7.5)	526	7.7 (6.8-8.6)	0.75 (0.64-0.86)	↓	<.001	1.12 (0.96-1.31)	-	.141
Female	612	11.0 (9.9-12.2)	342	6.8 (6.0-7.5)	313	7.8 (6.7-9.0)	0.69 (0.57-0.84)	↓	<.001	1.17 (0.96-1.43)	-	.118
Male	417	9.1 (8.1-10.0)	280	7.0 (6.1-8.0)	213	7.5 (6.3-8.7)	0.82 (0.66-1.01)	-	.060	1.08 (0.86-1.35)	-	.531
Parent often or always worry about not having enough money for food												
Total	663	7.2 (6.7-7.8)	918	10.1 (9.3-10.9)	896	12.5 (11.4-13.7)	1.85 (1.61-2.11)	↑	<.001	1.27 (1.11-1.46)	↑	<.001
Female	394	7.7 (6.7-8.6)	522	10.5 (9.3-11.8)	524	12.4 (10.3-14.4)	1.70 (1.35-2.14)	↑	<.001	1.20 (0.95-1.51)	-	.124
Male	269	6.8 (5.8-7.7)	396	9.7 (8.4-11.1)	372	12.7 (10.4-15.0)	2.01 (1.55-2.61)	↑	<.001	1.35 (1.04-1.75)	↑	.025
Always feels safe in neighbourhood ^a												
Total	3,768	43.8 (41.9-45.7)	4,285	55.2 (53.6-56.7)	4,007	58.8 (57.2-60.4)	1.84 (1.66-2.03)	↑	<.001	1.16 (1.06-1.27)	↑	.001
Female	1,775	36.8 (34.7-38.9)	2,323	53.5 (51.7-55.4)	2,028	53.2 (51.2-55.2)	1.96 (1.73-2.21)	↑	<.001	0.99 (0.88-1.10)	-	.817
Male	1,993	51.0 (48.5-53.5)	1,962	56.8 (54.6-59.0)	1,979	64.7 (62.3-67.1)	1.76 (1.52-2.03)	↑	<.001	1.39 (1.21-1.60)	↑	<.001
Family connectedness												
Feel at least one parent cares for them a lot												
Total	8,652	93.0 (92.5-93.6)	7,764	93.4 (92.9-93.9)	5,893	93.2 (92.6-93.9)	1.04 (0.90-1.18)	-	.617	0.97 (0.85-1.12)	-	.702
Female	4,674	93.0 (92.3-93.8)	4,249	93.6 (92.9-94.4)	3,558	93.3 (92.5-94.0)	1.04 (0.88-1.23)	-	.642	0.94 (0.79-1.12)	-	.509
Male	3,978	93.0 (92.1-93.9)	3,515	93.2 (92.4-93.9)	2,335	93.2 (91.9-94.5)	1.03 (0.80-1.32)	-	.821	1.00 (0.79-1.27)	-	.970
Family usually or always wants to know who you are with and where you are												
Total	7,863	83.6 (82.8-84.4)	7,709	90.6 (89.9-91.2)	6,681	91.2 (89.8-92.5)	2.03 (1.70-2.42)	↑	<.001	1.08 (0.90-1.29)	-	.424
Female	4,441	87.8 (86.6-89.0)	4,312	93.5 (92.7-94.3)	3,735	93.7 (92.4-95.0)	2.07 (1.62-2.64)	↑	<.001	1.04 (0.81-1.34)	-	.756
Male	3,422	79.3 (78.0-80.7)	3,397	87.7 (86.7-88.7)	2,946	88.6 (87.0-90.2)	2.03 (1.70-2.43)	↑	<.001	1.09 (0.91-1.32)	-	.349
School												
Feels part of school												
Total	7,602	82.2 (81.2-83.1)	7,390	86.7 (85.9-87.5)	6,165	85.0 (84.0-85.9)	1.23 (1.11-1.35)	↑	<.001	0.87 (0.78-0.96)	↓	.006
Female	4,086	81.7 (80.5-82.9)	4,017	86.5 (85.3-87.8)	3,442	88.3 (86.9-89.7)	1.69 (1.44-1.97)	↑	<.001	1.17 (0.99-1.39)	-	.070
Male	3,516	82.6 (81.2-84.1)	3,373	86.9 (85.9-87.9)	2,723	81.6 (80.0-83.3)	0.94 (0.81-1.08)	-	.371	0.67 (0.58-0.77)	↓	<.001

(Continued)

Table 2. Continued.

	2001 (except where specified)		2012		2019		Changes from 2001 ^b to 2019			Changes from 2012 to 2019		
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	OR (95% CI)	Δ	p value	OR (95% CI)	Δ	p value
Feels safe at school all or most of the time												
Total	7,334	78.7 (77.4-80.1)	7,352	87.1 (85.7-88.5)	6,331	87.0 (85.2-88.9)	1.82 (1.52-2.17)	↑	<.001	1.00 (0.81-1.22)	-	.978
Female	4,007	79.8 (77.7-82.0)	4,065	88.7 (86.9-90.5)	3,474	88.6 (86.8-90.4)	1.97 (1.58-2.46)	↑	<.001	1.00 (0.77-1.28)	-	.969
Male	3,327	77.6 (75.8-79.4)	3,287	85.5 (83.8-87.2)	2,857	85.5 (82.6-88.3)	1.69 (1.32-2.18)	↑	<.001	1.00 (0.76-1.30)	-	.975
Health Care												
Accessed health care in the past 12 months^b												
		(2007 data)										
Total	7,299	83.5 (82.6-84.4)	6,608	80.5 (79.5-81.4)	5,493	78.2 (77.1-79.3)	0.71 (0.65-0.78)	↓	<.001	0.87 (0.80-0.95)	↓	.003
Female	3,444	84.9 (83.7-86.2)	3,706	83.3 (81.7-84.8)	3,037	80.0 (78.6-81.0)	0.70 (0.62-0.79)	↓	<.001	0.79 (0.70-0.91)	↓	<.001
Male	3,855	82.1 (80.9-83.2)	2,902	77.8 (76.3-79.2)	2,456	76.7 (75.0-78.4)	0.72 (0.64-0.81)	↓	<.001	0.94 (0.83-1.07)	-	.352
Forgone health care (unable to access health care when wanted or needed at least once in past 12 months)^b												
		(2007 data)										
Total	1,485	16.7 (15.9-17.6)	1,564	17.9 (17.1-18.7)	1,448	20.1 (18.9-21.4)	1.26 (1.14-1.38)	↑	<.001	1.16 (1.05-1.27)	↑	.003
Female	804	19.1 (17.7-20.4)	968	20.8 (19.6-22.0)	845	21.1 (19.7-22.4)	1.13 (1.00-1.28)	↑	.043	1.02 (0.91-1.13)	-	.780
Male	681	14.4 (13.3-15.5)	596	15.1 (14.0-16.1)	603	19.2 (17.5-20.9)	1.41 (1.23-1.63)	↑	<.001	1.34 (1.17-1.54)	↑	<.001
Violence and Abuse												
Bullied at school weekly or more in the past 12 months												
Total	656	7.1 (6.5-7.7)	525	6.3 (5.7-6.8)	383	5.9 (4.9-6.9)	0.82 (0.67-1.00)	-	.051	0.93 (0.76-1.15)	-	.515
Female	265	5.0 (4.3-5.7)	261	5.6 (5.0-6.3)	202	5.6 (4.6-6.6)	1.14 (0.89-1.45)	-	.300	1.00 (0.80-1.25)	-	.984
Male	391	9.3 (8.4-10.1)	264	6.9 (6.0-7.8)	181	6.1 (4.8-7.5)	0.64 (0.49-0.83)	↓	<.001	0.88 (0.67-1.17)	-	.382
Witnessed an adult at home hit or physically hurt another adult in past 12 months^b												
		(2007 data)										
Total	901	9.9 (9.3-10.6)	607	6.8 (6.2-7.3)	405	6.1 (5.6-6.6)	0.59 (0.52-0.66)	↓	<.001	0.90 (0.79-1.02)	-	.087
Female	455	10.7 (9.6-11.8)	342	6.6 (5.7-7.5)	257	6.7 (5.9-7.4)	0.60 (0.51-0.70)	↓	<.001	1.01 (0.84-1.22)	-	.922
Male	446	9.2 (8.2-10.1)	265	6.9 (6.1-7.7)	148	5.5 (4.5-6.5)	0.58 (0.46-0.72)	↓	<.001	0.78 (0.63-0.98)	↓	.033

Ever experienced sexual violence, abuse or unwanted sexual behaviour ^c

Total	2,080	22.6 (21.7-23.5)	1,386	15.9 (14.9-16.9)	1,196	18.0 (17.0-19.1)	0.75 (0.69-0.82)	↓	<.001	1.16 (1.05-1.29)	↑	.004
Female	1,395	28.9 (27.5-30.4)	980	21.5 (20.2-22.8)	904	26.1 (23.9-28.2)	0.87 (0.76-0.99)	↓	.034	1.29 (1.12-1.47)	↑	<.001
Male	685	16.2 (14.9-17.5)	406	10.3 (9.0-11.6)	292	9.7 (8.7-10.7)	0.56 (0.48-0.65)	↓	<.001	0.94 (0.78-1.12)	-	.476

The numbers reported (n) are based on the raw number of responses. The reported percentages, odds ratios (OR) and 95% confidence intervals (CI) are national prevalence estimates (i.e. the data has been calibrated to adjust for differences between the national population of students and those who took part in the surveys). Arrows indicate a statistically significant difference.

NA – Not applicable because there was not a comparable question and/or response options to 2019 for the wave(s) that ORs have not been reported.

^aResponse options in 2001 and 2007 were 'yes, all the time' / 'yes, most of the time' / 'sometimes' / 'no, mostly not' / 'not at all'. In 2012 and 2019, options were 'all the time' / 'sometimes' / 'not often' / 'never'.

^b2019 has been compared to 2007 instead of 2001 (and the 2007 data has been reported) because the question was not asked in 2001 or was not comparable.

^cStudents responded 'yes' or 'maybe / not sure'. In 2007 and 2012 there was also an 'I don't want to answer' response option.

Table 3. Selected health and wellbeing variables by sex and associations between variables and survey wave (2001, 2012 and 2019)

	2001 (except where specified)		2012		2019		Changes from 2001 ^a to 2019			Changes from 2012 to 2019		
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	OR (95% CI)	Δ	p value	OR (95% CI)	Δ	p value
General health												
General health (good, very good or excellent)												
Total	8,683	92.2 (91.7-92.8)	7,699	91.5 (90.8-92.3)	6,569	91.0 (90.1-91.8)	0.84 (0.74-0.97)	↓	.014	0.93 (0.80-1.08)	-	.328
Female	4,595	90.4 (89.5-91.2)	4,088	88.9 (87.8-90.1)	3,511	89.0 (88.0-90.1)	0.87 (0.75-1.00)	↓	.049	1.01 (0.87-1.18)	-	.882
Male	4,088	94.1 (93.4-94.8)	3,611	94.1 (93.3-94.9)	3,058	92.9 (91.7-94.0)	0.81 (0.66-1.00)	-	.057	0.82 (0.66-1.02)	-	.077
Emotional and mental health												
Good psychological wellbeing (WHO-5 ≥ 13) over past 2 weeks ^a												
		(2007 data)										
Total	6,804	78.2 (77.4-79.0)	6,306	76.0 (75.0-77.0)	4,835	69.1 (67.6-70.6)	0.62 (0.57-0.68)	↓	<.001	0.70 (0.64-0.77)	↓	<.001
Female	2,887	72.2 (70.9-73.4)	3,233	70.0 (68.3-71.6)	2,331	60.1 (58.4-61.8)	0.58 (0.53-0.64)	↓	<.001	0.65 (0.58-0.72)	↓	<.001
Male	3,917	84.3 (83.1-85.4)	3,073	82.0 (81.1-83.0)	2,504	78.1 (76.2-80.0)	0.67 (0.58-0.77)	↓	<.001	0.78 (0.69-0.89)	↓	<.001
Significant depressive symptoms (RADS-SF)												
Total	1,154	11.8 (11.1-12.5)	1,078	13.0 (12.2-13.9)	1,727	22.8 (21.4-24.1)	2.21 (2.00-2.44)	↑	<.001	1.96 (1.76-2.19)	↑	<.001
Female	782	14.7 (13.5-15.8)	763	17.4 (16.1-18.6)	1,218	29.0 (27.2-30.9)	2.38 (2.09-2.71)	↑	<.001	1.94 (1.72-2.20)	↑	<.001
Male	372	8.8 (8.0-9.7)	315	8.7 (7.6-9.8)	509	16.4 (14.9-17.9)	2.03 (1.74-2.37)	↑	<.001	2.06 (1.72-2.46)	↑	<.001
Seriously thought about committing suicide in the past 12 months ^a												
		(2007 data)										
Total	1,231	14.5 (13.7-15.2)	1,307	15.3 (14.5-16.2)	1,501	20.8 (19.2-22.4)	1.55 (1.39-1.74)	↑	<.001	1.45 (1.29-1.63)	↑	<.001
Female	795	19.4 (18.2-20.6)	937	20.8 (19.2-22.3)	1,002	24.6 (22.8-26.4)	1.35 (1.20-1.53)	↑	<.001	1.24 (1.09-1.42)	↑	.002
Male	436	9.5(8.6-10.4)	370	10.0 (9.0-11.0)	499	16.9 (14.8-19.1)	1.94 (1.62-2.34)	↑	<.001	1.84 (1.53-2.22)	↑	<.001
Suicide attempt in past 12 months ^b												
Total	739	7.1 (6.5-7.7)	377	3.9 (3.4-4.3)	439	6.3 (5.5-7.0)	0.88 (0.75-1.03)	-	.104	1.67 (1.40-1.99)	↑	<.001
Female	536	9.6 (8.4-10.7)	284	5.5 (4.8-6.3)	310	7.4 (6.2-8.6)	0.76 (0.61-0.94)	↓	.012	1.37 (1.10-1.71)	↑	.006
Male	203	4.6 (3.9-5.3)	93	2.2 (1.7-2.8)	129	5.1 (3.7-6.5)	1.12 (0.81-1.55)	-	.507	2.36 (1.60-3.49)	↑	<.001
Sexual health												
Ever had consensual sexual intercourse ^c												
Total	2,847	31.6 (30.5-32.8)	1,990	25.8 (24.7-26.9)	1,180	20.6 (19.6-21.7)	0.56 (0.52-0.61)	↓	<.001	0.75 (0.68-0.82)	↓	<.001
Female	1,505	30.7 (29.0-32.4)	1,080	26.1 (24.7-27.5)	577	17.9 (16.8-19.0)	0.49 (0.44-0.55)	↓	<.001	0.62 (0.56-0.69)	↓	<.001
Male	1,342	32.6 (30.7-34.5)	910	25.5 (23.5-27.5)	603	23.5 (21.7-25.2)	0.63 (0.56-0.72)	↓	<.001	0.90 (0.78-1.03)	-	.131

Always use contraception to prevent pregnancy ^d												
Total	1,099	61.4 (59.2-63.6)	870	59.5 (56.9-62.2)	366	56.2 (52.5-59.9)	0.81 (0.68-0.96)	↓	.017	0.87 (0.73-1.05)	-	.153
Female	613	60.5 (57.3-63.7)	511	62.2 (58.6-65.8)	222	60.2 (55.7-64.8)	0.99 (0.79-1.25)	-	.931	0.92 (0.72-1.17)	-	.509
Male	486	62.5 (59.2-65.8)	359	56.5 (52.5-60.4)	144	52.3 (46.1-58.6)	0.66 (0.49-0.88)	↓	.005	0.85 (0.63-1.14)	-	.274
Always use condoms to protect against STIs ^{d,e}												
Total	898	48.3 (46.0-50.5)	683	45.9 (43.5-48.2)	249	36.8 (32.5-41.2)	0.63 (0.51-0.77)	↓	<.001	0.69 (0.56-0.85)	↓	<.001
Female	445	42.0 (38.9-45.0)	346	40.1 (36.5-43.6)	129	32.5 (28.5-36.6)	0.67 (0.53-0.83)	↓	<.001	0.72 (0.57-0.91)	↓	.007
Male	453	55.3 (52.3-58.4)	337	52.5 (49.1-55.8)	120	40.9 (33.5-48.4)	0.56 (0.40-0.78)	↓	<.001	0.63 (0.45-0.88)	↓	.007
Physical Activity												
Vigorous physical activity 7+ times in the past week ^a												
		(2007 data)										
Total	1,619	18.2 (17.0-19.3)	1,537	18.6 (17.8-19.5)	1,065	16.6 (15.8-17.3)	0.90 (0.81-0.98)	↓	.023	0.87 (0.80-0.94)	↓	<.001
Female	458	11.2 (10.0-12.4)	588	12.2 (11.1-13.4)	420	11.8 (10.9-12.7)	1.06 (0.91-1.23)	-	.455	0.96 (0.84-1.10)	-	.565
Male	1,161	25.1 (23.5-26.7)	949	25.0 (23.7-26.2)	645	21.4 (20.3-22.6)	0.82 (0.73-0.91)	↓	<.001	0.82 (0.74-0.90)	↓	<.001
Substance Use												
Cigarette use monthly or more often												
Total	1,597	17.5 (16.4-18.7)	474	5.9 (5.2-6.5)	262	4.7 (4.1-5.2)	0.23 (0.20-0.27)	↓	<.001	0.78 (0.66-0.93)	↓	.005
Female	1,002	19.9 (18.3-21.4)	260	5.6 (4.6-6.6)	155	5.0 (4.2-5.8)	0.21 (0.17-0.26)	↓	<.001	0.88 (0.68-1.14)	-	.336
Male	595	15.1 (13.6-16.7)	214	6.2 (5.3-7.0)	107	4.3 (3.4-5.2)	0.25 (0.20-0.32)	↓	<.001	0.69 (0.53-0.89)	↓	.004
Used marijuana at least once in the past 4 weeks												
Total	1,641	19.1 (18.0-20.2)	672	9.4 (8.4-10.5)	562	9.9 (8.8-10.9)	0.46 (0.40-0.53)	↓	<.001	1.05 (0.89-1.25)	-	.559
Female	865	18.0 (16.5-19.5)	303	7.8 (6.6-9.0)	276	9.5 (8.0-10.9)	0.48 (0.39-0.58)	↓	<.001	1.24 (0.98-1.56)	-	.076
Male	776	20.3 (18.3-22.2)	369	11.1 (9.7-12.4)	286	10.3 (8.7-11.8)	0.45 (0.37-0.56)	↓	<.001	0.92 (0.74-1.15)	-	.466
Binge drinking at least once in the past 4 weeks ^f												
Total	3,451	41.5 (39.9-43.0)	1,840	25.3 (23.8-26.8)	1,221	21.8 (20.1-23.4)	0.39 (0.35-0.44)	↓	<.001	0.82 (0.72-0.93)	↓	.002
Female	1,829	40.0 (38.2-41.7)	995	24.9 (23.3-26.4)	642	20.7 (18.9-22.6)	0.39 (0.34-0.45)	↓	<.001	0.79 (0.69-0.91)	↓	.001
Male	1,622	43.0 (40.8-45.2)	845	25.7 (23.1-28.4)	579	22.8 (19.9-25.7)	0.39 (0.32-0.47)	↓	<.001	0.85 (0.69-1.06)	-	.148
Motor vehicle risk behaviours												
Always wear a seatbelt when in a car												
Total	6,176	67.3 (65.9-68.7)	6,238	74.9 (73.6-76.3)	5,231	75.7 (74.0-77.3)	1.51 (1.36-1.68)	↑	<.001	1.04 (0.93-1.17)	-	.493
Female	3,353	67.8 (66.1-69.5)	3,412	75.6 (73.7-77.6)	2,889	77.3 (75.3-79.3)	1.62 (1.41-1.86)	↑	<.001	1.10 (0.94-1.28)	-	.240
Male	2,823	66.8 (64.6-69.0)	2,826	74.2 (72.5-75.9)	2,342	74.0 (71.5-76.5)	1.41 (1.20-1.66)	↑	<.001	0.99 (0.84-1.16)	-	.884

(Continued)

Table 3. Continued.

	2001 (except where specified)		2012		2019		Changes from 2001 ^a to 2019			Changes from 2012 to 2019		
	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	OR (95% CI)	Δ	p value	OR (95% CI)	Δ	p value
Dangerous/risky/drink driving as passenger or driver in past month ⁹												
Total	5,462	58.8 (57.6-60.0)	3,002	37.1 (35.9-38.4)	1,825	34.0 (31.2-36.8)	0.36 (0.32-0.41)	↓	<.001	0.87 (0.76-1.00)	↓	.0499
Female	2,869	57.3 (55.9-58.7)	1,612	36.2 (34.6-37.7)	968	32.2 (28.9-35.4)	0.35 (0.30-0.42)	↓	<.001	0.84 (0.71-0.99)	↓	.035
Male	2,593	60.3 (58.4-62.3)	1,390	38.1 (36.0-40.1)	857	36.0 (32.1-39.8)	0.37 (0.31-0.45)	↓	<.001	0.91 (0.76-1.10)	-	.346

The numbers reported (n) are based on the raw number of responses. The reported percentages, odds ratios (OR) and 95% confidence intervals (CI) are national prevalence estimates (i.e. the data has been calibrated to adjust for differences between the national population of students and those who took part in the surveys). NA – Not applicable because there was not a comparable question and/or response options to 2019 in the wave(s) for which ORs have not been reported.

^a2019 has been compared to 2007 instead of 2001 (and the 2007 data has been reported) because either the question was not asked in 2001 or was not comparable.

^bIn 2001, only students who reported they had thought about attempting suicide in the past 12 months were asked if they had made a suicide attempt. Students who responded they had not thought about attempting suicide were coded as 'no' for attempting suicide. In 2007, 2012 and 2019, all students were asked the attempted suicide question.

^cIn 2012 and 2019, students were asked whether they had ever had sexual intercourse, not including sexual abuse. In 2001 and 2007, students were asked what age they first had sexual intercourse (and could respond 'never'), and the question did not explicitly exclude sexual abuse.

^dFor contraceptive use and condom use, students who had not had sex in the previous three months or who responded that the question did not apply to them were excluded from the analyses.

^eFor condom use, '(or your partner)' was added to the question wording from the 2007 survey wave onwards.

^fFive or more alcoholic drinks in one 4-hour session.

⁹In the past month, had either driven dangerously (i.e. speeding, racing, burnouts) or driven when drinking, or had been a passenger in a car driven dangerously or by someone who had been drinking

selection. Data were calibrated for non-response using a raking method (Lumley 2010) based on respondent age, sex, ethnicity, and school decile using administrative data from the Ministry of Education (<https://www.educationcounts.govt.nz/statistics/school-rolls>) to provide national prevalence estimates. Missing data for individual items were not imputed (see also Fleming et al. 2020b; Rivera-Rodriguez et al. 2021).

Data are presented as numbers (n), representing the raw numbers of survey participants, and national prevalence estimates (%) with 95% confidence intervals. We conducted logistic regressions using calibrated data to compare responses on included items over the full period (2001–2019) and the most recent period (2012–2019) and reported odds ratios for both periods (Tables 2 and 3).

Results

Risk and protective factors

Contextual risk and protective factors for health and wellbeing are shown in Table 2. In 2019, 8% of students had moved house two or more times in the past year, fewer than in 2001 (10%) (odds ratio (OR) 0.75, 95% confidence interval (CI) 0.64–0.86, $p < 0.001$) but not significantly different from 2012 (7%). The proportion of students whose parents often or always worried about not having enough money for food was higher in 2019 (13%) than in 2001 (7%) (OR 1.85, 95% CI 1.61–2.11, $p < 0.001$) and 2012 (10%) (OR 1.27, 95% CI 1.11–1.46, $p < 0.001$).

Students reported high levels of family connectedness; in 2019, 93% of students reported at least one parent or person who acts as a parent cares about them a lot, and 91% reported that their family usually or always want to know where they are and who they are with. Although neither indicator was significantly different from 2012, the proportion of students who reported that their family always wants to know their whereabouts increased markedly from 84% in 2001 (OR 2.03, 95% CI 1.70–2.42, $p < 0.001$).

A high proportion of students reported feeling part of their school in 2019 (85%), particularly female students (88%, 82% for males). Although feeling part of school improved for females from 2001 (82%) (OR 1.69, 95% CI 1.44–1.97, $p < 0.001$), it worsened for males from 2012 (87%) (OR 0.67, 95% CI 0.58–0.77, $p < 0.001$). In 2019, most students reported feeling safe at school all or most of the time (87%), a marked improvement from 2001 (79%) (OR 1.82, 95% CI 1.52–2.17, $p < 0.001$), although there was no significant change from 2012 (87%).

Fifty-nine percent of students reported that they always feel safe in their neighbourhood in 2019; this was higher among males (65%) than females (53%). Feeling safe in their neighbourhood improved for students overall from 2001 (44%) (OR 1.84, 95% CI 1.66–2.03, $p < 0.001$), and for males from 2012 (57%) (OR 1.39, 95% CI 1.21–1.60, $p < 0.001$).

Health care access questions were included from 2007. In 2007, 84% of students had accessed health care in the previous 12 months; this was slightly higher for females (85%) than males (82%). In 2019, 78% of students had accessed health care in the previous 12 months. Accessing health care declined for students overall from 2007 (84%) to 2019 (OR 0.71, 95% CI 0.65–0.78, $p < 0.001$), and for females from 2012 to 2019 (83% to 80%) (OR

0.79, 95% CI 0.70-0.91, $p < 0.001$). Further, in 2019, one in five students (20%) were unable to access health care when they wanted or needed it at least once in the previous 12 months, an increase for students overall from 2007 (17%) (OR 1.26, 95% CI 1.14-1.38, $p < 0.001$) and an increase for males from 2012 (15% to 19%) (OR 1.34, 95% CI 1.17-1.54, $p < 0.001$).

In 2019, 6% of students reported that they had been bullied at school weekly or more often in the previous 12 months, a decrease since 2001 for males (9% to 6%) (OR 0.64, 95% CI 0.49-0.83, $p < 0.001$).

Six percent of students in 2019 had witnessed adults at home hit or physically hurt another adult in the previous 12 months, a decrease from 2007, the first year the question was asked in a comparable way (2007, 10%) (OR 0.59, 95% CI 0.52-0.66, $p < 0.001$). Male students were also less likely to report witnessing such events in the previous 12 months in 2019 (6%) than in 2012 (7%) (OR 0.78, 95% CI 0.63-0.98, $p = 0.033$).

In 2019, nearly one in five students (18%) responded 'Yes' or 'Maybe / not sure' when asked if they had ever experienced sexual violence, abuse or unwanted sexual behaviour. This was more common among females (26%) than males (10%) and less prevalent overall than in 2001 (23%) (OR 0.75, 95% CI 0.69-0.82, $p < 0.001$).

Health status

Most participants in each survey wave reported good, very good or excellent perceived health. Although there was no significant change from 2012, there was a small but significant decline from 2001 to 2019 (92% to 91%) (OR 0.84, 95% CI 0.74-0.97, $p = 0.014$).

Using the WHO-5 Wellbeing Index (World Health Organization 1998), 69% of students' scores in 2019 indicated good, very good or excellent wellbeing (positive psychological wellbeing) in the previous two weeks. This was lower for females (60%) than males (78%). Wellbeing worsened for students overall since 2007 (78%) when this measure was first included (OR 0.62, 95% CI 0.57-0.68, $p < 0.001$), and also since 2012 (76%) (OR 0.70, 95% CI 0.64-0.77, $p < 0.001$).

Scores on the short form of the Reynolds Adolescent Depression Scale (RADS-SF) (Reynolds 2002) indicated that 23% of students were experiencing significant depressive symptoms in 2019; this was higher for females (29%) than for males (16%). A greater proportion of students reported significant depressive symptoms in 2019 than in 2001 (12%) (OR 2.21, 95% CI 2.00-2.44, $p < 0.001$) and 2012 (13%) (OR 1.96, 95% CI 1.76-2.19, $p < 0.001$).

In 2019, 21% of students had seriously thought about attempting suicide in the previous year; this was more common for females (25%) than for males (17%). In 2001, the suicidal thoughts question did not include the word 'seriously', therefore we compared 2019 with 2007. A greater proportion of students seriously thought about committing suicide in 2019 than in 2007 (15%) (OR 1.55, 95% CI 1.39-1.74, $p < 0.001$) and 2012 (15%) (OR 1.45, 95% CI 1.29-1.63, $p < 0.001$). In 2019, 6% of students reported attempting suicide in the previous 12 months, a decrease from 2001 for female students (10% to 7%) (OR 0.76, 95% CI 0.61-0.94, $p = 0.012$) however an increase since 2012 for both females (6% to 7%) (OR 1.37, 95% CI 1.10-1.71, $p = 0.006$) and males (2% to 5%) (OR 2.36, 95% CI 1.60-3.49, $p < 0.001$).

About one in five students in 2019 (21%) reported they had previously experienced consensual sexual intercourse, a decrease from 2001 for students overall (32%) (OR 0.56, 95% CI 0.52-0.61, $p < 0.001$) and a decrease from 2012 for females (26% to 18%) (OR 0.62, 95% CI 0.56-0.69, $p < 0.001$).

Use of contraception and condoms were calculated for sexually active students (those who had had sex in the last three months). Students who were not sexually active or who reported that the question did not apply to them were excluded from analyses. In 2019, 56% of sexually active students reported always using contraception to prevent pregnancy, a decrease from 2001 for males (63% to 52%) (OR 0.66, 95% CI 0.49-0.88, $p = 0.005$). Also in 2019, 37% of students reported always using condoms to protect against sexually transmitted infections (STIs), a decrease since 2001 (48%) (OR 0.63, 95% CI 0.51-0.77, $p < 0.001$) and 2012 (46%) (OR 0.69, 95% CI 0.56-0.85, $p < 0.001$).

In 2019, 17% of students had participated in vigorous physical activity seven or more times in the past week; this was more common for males (21%) than females (12%). The response categories for this item changed from 2007 onwards, therefore we compared 2019 with 2007. The proportion of male students reporting this level of physical activity was lower in 2019 (21%) than in 2007 (25%) (OR 0.82, 95% CI 0.73-0.91, $p < 0.001$) and 2012 (25%) (OR 0.82, 95% CI 0.74-0.90, $p < 0.001$).

Substance use among students decreased markedly between 2001 and 2019. In 2019, 5% of youth smoked cigarettes monthly or more often, a decrease from 2001 overall (18%) (OR 0.23, 95% CI 0.20-0.27, $p < 0.001$) and a decrease from 2012 for male students (6% to 4%) (OR 0.69, 95% CI 0.53-0.89, $p = 0.004$). In 2019, 10% of students had used marijuana in the previous four weeks, a decrease since 2001 (19%) (OR 0.46, 95% CI 0.40-0.53, $p < 0.001$), and 22% reported binge drinking at least once in the previous four weeks, also lower than in 2001 for students overall (42%) (OR 0.39, 95% CI 0.35-0.44, $p < 0.001$) and lower than in 2012 for female students (25% to 21%) (OR 0.79, 95% CI 0.69-0.91, $p < 0.001$).

Motor vehicle risk behaviours also declined since 2001. In 2019, about three-quarters of students (76%) reported always wearing a seatbelt when in a car, an increase since 2001 (67%) (OR 1.51, 95% CI 1.36-1.68, $p < 0.001$), however there was no significant change from 2012 (75%). About a third of students (34%) reported that, in the past month, they had driven dangerously (i.e. speeding, racing, burnouts) or when drinking, or been a passenger in a car that was driven dangerously or by someone who had been drinking. Risky (dangerous or drink) driving as a passenger or driver was less common in 2019 than in 2001 for students overall (59%) (OR 0.36, 95% CI 0.32-0.41, $p < 0.001$) and less common than in 2012 for female students (36% to 32%) (OR 0.84, 95% CI 0.71-0.99, $p = 0.035$).

Discussion

This paper used data from a series of cross-sectional adolescent health and wellbeing surveys involving a total of over 34,000 New Zealand secondary school students from 2001 to 2019. The large samples and comparable methods allow examination of changes in New Zealand adolescent health status over almost two decades. This paper provides an overview of key indicators for the total secondary school population. It highlights that adolescent health and wellbeing challenges are far from immutable problems

inherent to teenagers across generations. Rather, strengths and risks in critical adolescent health indicators have shifted dramatically from 2001 to 2019.

Our findings present a mixed picture. Many key risk behaviours have decreased, with very large declines in risky driving, binge drinking, marijuana use and especially cigarette smoking since 2001. These changes represent significant health gains for young people as they move into their adult lives. In contrast, there are very concerning increases in symptoms of depression, suicide thoughts and suicide attempts and declines in psychological wellbeing since 2012. Other changes in health status are less dramatic or clear-cut. Rates of vigorous physical activity have declined overall and, while fewer secondary school students are sexually active, the proportion of sexually active students always using contraception and condoms has declined.

Alongside these shifts in health status and behaviours, there are changes in important influences on adolescent health. Long-term trends for many risk and protective factors were positive (i.e. moving in the direction compatible with improved health and wellbeing). However, the proportion of students reporting that their families worry about money for food appears to have risen steadily since 2001. There was no good news regarding health care access: the proportion of students who had accessed health services in the previous year decreased, and the proportion who reported forgone health care (i.e. inability to access services when needed) increased over both long-term (2001–2019) and shorter-term (2012–2019) periods.

Notably, many of the positive changes in risk behaviours and environments (e.g. reduced substance use, reduced risky driving, reduced bullying, reduced sexual coercion, and increased sense of belonging at school) were concentrated in the 2001–2012 period, while major increases in mental distress occurred over the 2012–2019 period.

Declines in risky behaviour mirror trends in comparable nations, e.g. higher seatbelt use and less drink driving in the United States (US; Kann et al. 2018); declining rates of tobacco, alcohol and marijuana use in multiple nations (ESPAD Group 2015; Guerin and White 2018; Kann et al. 2018; Johnston et al. 2019); and lower levels of sexual activity, with reduced condom use among sexually active US adolescents (Kann et al. 2018). Likewise, New Zealand is not alone in reporting a rapid recent decline in emotional wellbeing among adolescents. Researchers have observed sharp increases in anxiety and distress or depressive symptoms from around 2010 up to and including 2019, particularly among female adolescents and particularly in high-income, English-speaking nations and some Western European and Nordic countries (Bor et al. 2014; Wise 2016; Kann et al. 2018; Keyes et al. 2019; Patalay and Gage 2019). Notably, these data predate the COVID-19 pandemic, which has reportedly markedly increased stress in many nations.

The finding that mental health problems and substance use are trending in opposite directions runs counter to models that conceptualise a set of underlying risk factors common to both phenomena (e.g. experience of childhood adversity, troubled family relationships, neighbourhood deprivation). Some researchers propose that both trends are associated with increasing use of the internet, particularly social media, and the pervasiveness of smartphones (Twenge et al. 2018). While social media and smartphone use have exploded since 2012, levels of social media and smartphone use are not uniformly associated with increased mental distress among individuals, a finding repeatedly reported in large-scale studies and analyses (Ivie et al. 2020; Odgers and Jensen 2020; Orben 2020; Boer et al. 2021). Factors related to internet use for some users, rather

than use in itself, may be key here. These include experiences of cyber bullying, negative social comparisons and reduced face-to-face time with family and peers (Orben 2020; Odgers and Jensen 2020).

There are myriad other potential causal processes for secular trends too. Parenting norms have changed in high-income countries, for example parental monitoring has increased, along with declines in childhood injuries and risks, and conceivably resilience (Craig et al. 2014). Face-to-face time with friends and levels of exercise among adolescents appear to have declined over recent decades. Likewise, several studies have reported increases in individualism, perfectionism and school and other expectations (Burke et al. 2018; Saeri et al. 2018). There may also be effects associated with climate change, future-focused anxieties, political contexts and reductions in social consensus. New Zealand adolescents, among others, report high levels of concern about climate change and future opportunities (Fleming et al. 2020a). Within New Zealand, impacts of racism, colonisation and intergenerational trauma are critical (see Graham and Masters-Awatere 2020; Talamaivao et al. 2020). The impacts of income distribution and cost of living and other policy changes should also be explored. Certainly, work from the Youth2000 series and others has shown that deprivation and housing costs affect young people's current lives and are important for future expectations (Denny et al. 2016; Saeri et al. 2018; Clark et al. 2021a).

None of these single factor explanations are a strong fit for the timing and pace of changes. While it may seem trite to propose that underlying causes for changes in population rates of health indicators are likely to be complex and interacting, we propose that this is the case. Social media, parenting customs, socioeconomic environments and political contexts are complex systems. Risk and protective factors may act and interact in different ways for different groups of young people and might produce 'emergent outcomes', where important changes are observed without linear links to simple causal processes (Matheson 2016; Matheson 2020).

This is not an excuse for inaction. Investing in this age group brings both short- and long-term benefits (Mokdad et al. 2016; Clark et al. 2020), particularly for population groups with a youthful age structure and especially where there are major inequities. Approaches that support adolescent wellbeing or reduce risks are well known and remain important (Viner et al. 2012; Salam et al. 2016). These include actions to address long term determinants of health, for example, reducing childhood poverty and increasing access to resources, as recommended by the UNICEF Report on child wellbeing (Gromada et al. 2020). Likewise, racism and ethnic discrimination are associated with a range of adverse health outcomes (Crengle et al. 2012; Williams et al. 2018) and forgone healthcare among adolescents in New Zealand (Peiris-John et al. 2022). The World Health Organization recommends creating adolescent-responsive health services to overcome stigmatisation and discrimination (World Health Organization 2021). Strengthening social support for young people in schools will also help to mitigate risks (Delaruelle et al. 2021). Timely and equitable access to quality health care services is important for adolescent health (Salam et al. 2016). Despite increases in funding for primary care and school-based health services in New Zealand, ongoing actions to improve access and reduce inequities in access to health care are required.

In terms of more specific health behaviours and outcomes, policy action to reduce the affordability, availability and visibility of tobacco has had a dramatic impact on youth

smoking, yet successive governments have lagged on similar alcohol control policies. The science on reducing alcohol harm (including violence, sexual assault, car crashes and suicide) is clear. Increasing the price of alcohol (e.g. through taxation or minimum pricing) and reducing alcohol availability and marketing are the key measures recommended by the World Health Organization (2016), and by multiple New Zealand Government commissioned reports (Government Inquiry into Mental Health and Addiction 2018).

Mental health requires serious attention. New Zealand communities have expressed enormous frustration at insufficient mental health support, and, despite increases in funding, waitlists for mental health support remain dangerously long in many communities. Innovative approaches to address bottlenecks in health professional training and increase availability of services are required. Alongside these, mental health promotion and illness prevention activities are critical. Robust science has demonstrated the importance of early life experiences, reducing exposure to trauma, ending discrimination, and ensuring inclusive environments for all for long-term mental health gains (Arango et al. 2018; Celso et al. 2018; Government Inquiry into Mental Health and Addiction 2018).

This paper presents a snapshot of adolescent wellbeing across the total New Zealand population. Other Youth19 publications show that ethnic inequities and inequities for young people with disabilities and who are sexual and gender minorities remain pronounced (Fenaughty et al. 2021a; Fenaughty et al. 2021b; Peiris-John et al. 2021; Roy et al. 2021; Peiris-John et al. 2022). Urgent action is needed to support the health and wellbeing of Māori and Pacific adolescents, LGBTI+ adolescents, those with disabilities, and those living in disadvantaged communities (Clark et al. 2021b; Fenaughty et al. 2021a; Fenaughty et al. 2021b; Roy et al. 2021).

Strengths of the Youth2000 survey series include rigorous sampling and use of large, diverse, representative samples of New Zealand secondary school students. There are also important limitations. In Youth19, only schools in the northern areas of New Zealand were included. Although data were calibrated to match the sample to national population counts, students in excluded regions will have some different experiences and challenges. Rates of participation by schools with different demographic profiles differed by survey wave, with, for example, differing ratios of male and female students in some years (Adolescent Health Research Group 2013). Again, survey calibration adjusts for key differences in population structures, but may not capture all nuances. For all surveys, only students who were at school when the surveys took place and who elected to participate were included. Students who face greater challenges are more likely to be absent from school, therefore the true level of some indicators and determinants of wellbeing may be worse than what our data suggest. Responses were anonymous, and seating was spaced to ensure participants' privacy, however even with these steps, social desirability biases may have influenced responses.

We examined indicators and determinants of youth wellbeing and changes over time for students overall and for females and males. Students who did not report a male or female sex were not included in this analysis to maintain consistency across survey waves. Importantly, gender diverse young people report major disparities and unmet need, and these require full consideration in context. Students attending kura kaupapa Māori were excluded from these analyses as kura kaupapa Māori were surveyed in 2007 and 2019 only, thus inclusion would add bias to the trends. There will also be

important differences in health and wellbeing by ethnicity, socioeconomic position and experiences such as discrimination and differing community contexts. Future research should explore equity and needs among specific population groups and further contextualise the findings, for example examining links between specific risks such as food insecurity with specific outcomes such as mental health problems. Analyses are underway to understand contexts and opportunities for rangatahi Māori and other population groupings and researchers are encouraged to apply to access Youth2000 survey data to explore specific questions. Finally, Youth19 data predates the COVID-19 worldwide pandemic and therefore provides a baseline for measuring changes in youth wellbeing during and following the pandemic. It is important that collection of directly comparable data continues.

Conclusions

There have been major health gains in substance use and risky behaviours for New Zealand secondary school students in 20 years, however there have also been rapid increases in mental distress from 2012 and reductions in access to health care. This is important, it suggests that contexts and policies might be important and adolescent challenges are amendable to change.

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