


# BMJ Open Attitudes towards the New Zealand Government's Smokefree 2025 goal associated with smoking and vaping in university students aged 18 to 24 years: results of a 2018 national cross-sectional survey

Ben Wamamili ,<sup>1</sup> Mark Wallace-Bell,<sup>1</sup> Ann Richardson,<sup>1</sup> Randolph C Grace,<sup>2</sup> Pat Coope<sup>3</sup>

**To cite:** Wamamili B, Wallace-Bell M, Richardson A, *et al.* Attitudes towards the New Zealand Government's Smokefree 2025 goal associated with smoking and vaping in university students aged 18 to 24 years: results of a 2018 national cross-sectional survey. *BMJ Open* 2020;**10**:e037362. doi:10.1136/bmjopen-2020-037362

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-037362>).

Received 30 January 2020  
Revised 05 August 2020  
Accepted 22 September 2020



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

## Correspondence to

Dr Ben Wamamili;  
ben.wamamili@pg.canterbury.ac.nz

## ABSTRACT

**Objective** In March 2011, New Zealand (NZ) launched an aspirational goal to reduce smoking prevalence to 5% or less by 2025 (Smokefree 2025 goal). Little is known about university students' awareness of, support for and perceptions about this goal. We sought to narrow the knowledge gap.

**Setting** University students in NZ.

**Methods** We analysed data from a 2018 cross-sectional survey of university students across NZ. Logistic regression analysis examined the associations between responses about the Smokefree goal with smoking and vaping, while controlling for age, sex and ethnicity. Confidence intervals (95% CI) were reported where appropriate.

**Participants** The sample comprised 1476 students: 919 (62.3%) aged 18 to 20 and 557 (37.7%) aged 21 to 24 years; 569 (38.6%) male and 907 (61.4%) female; 117 (7.9%) Māori and 1359 (92.1%) non-Māori. Of these, 10.5% currently smoked (ie, smoked at least monthly) and 6.1% currently vaped (ie, used an e-cigarette or vaped at least once a month).

**Results** Overall awareness of the Smokefree goal was 47.5% (95% CI: 44.9 to 50.1); support 96.9% (95% CI: 95.8 to 97.8); belief that it can be achieved 88.8% (95% CI: 86.8 to 90.7) and belief that e-cigarettes/vaping can help achieve it 88.1% (95% CI: 86.0 to 89.9). Dual users of tobacco cigarettes and e-cigarettes had greater odds of being aware of the Smokefree goal (OR=3.07, 95% CI: 1.19 to 7.92), current smokers had lower odds of supporting it (OR=0.13, 95% CI: 0.06 to 0.27) and of believing that it can be achieved (OR=0.15, 95% CI: 0.09 to 0.24) and current vapers had greater odds of believing that e-cigarettes/vaping can help to achieve it (OR=8.57, 95% CI: 1.18 to 62.52) compared with non-users.

**Conclusions** The results suggest strong overall support for the Smokefree goal and belief that it can be achieved and that e-cigarettes/vaping can help achieve it. Smoking and vaping were associated with high awareness of the Smokefree goal, but lower support and optimism that it can be achieved.

## Strengths and limitations of this study

- This is the first study in New Zealand to assess the Smokefree 2025 goal: awareness, support, achievability and role of e-cigarettes/vaping, in university students.
- The sample was weighted by sex and university size to improve its representation of the general university student population.
- The main limitation of this study is that a convenience sample was used, which increases the risk of volunteer bias.

## INTRODUCTION

Smoking is a leading cause of preventable death and illness in New Zealand (Aotearoa New Zealand or NZ) and causes an estimated 5000 deaths annually.<sup>1</sup> Smoking also plays a major role in the inequalities in health and well-being between Māori and non-Māori.<sup>2</sup> Furthermore, the economic consequences of smoking are significant<sup>3</sup> and have a huge impact on society, particularly on the poor. For these reasons, tobacco control has been a major social and health policy in NZ.

The overall prevalence of current smoking (ie, smoking at least once a month) in adults aged 15 years or older in NZ is estimated at 14.2%.<sup>4</sup> Māori (the Indigenous people of NZ) have the highest prevalence of smoking at 34% (Pasifika peoples 24.4%, NZ European/Other 12.4% and Asian 8.4%).<sup>4</sup> People aged 35 to 44 (19.8%), 18 to 24 (19.2%) and 25 to 34 (18.3%) have among the highest prevalences of smoking in NZ, with the lowest prevalence in people aged 15 to 17 years (3.8%).<sup>4</sup> A recent study using 2018 data from a representative sample of students from all

eight universities in NZ found 11.1% of respondents aged 18 to 24 years were current smokers.<sup>5</sup> This estimate was substantially lower than that of individuals aged 18 to 24 in the general population (19.2%).<sup>6</sup>

In March 2011, the New Zealand Government adopted the Smokefree Aotearoa 2025 goal (Smokefree 2025 goal or Smokefree goal), which aims to reduce the prevalence of smoking to 5% or less by the year 2025.<sup>7</sup> The Government outlined three main approaches to achieve its smokefree aspirations: (1) protect children from exposure to tobacco marketing and promotion, (2) reduce the supply of, and demand for tobacco and (3) provide the best possible support for quitting smoking.

Over the last decade, using Smokefree Environments legislation, the Government has put in place a number of measures to reduce smoking, notably an annual 10% tobacco tax increase,<sup>8</sup> restrictions on the display of tobacco in retail outlets and in recent years, a softer approach to electronic cigarette or e-cigarette use (vaping) to encourage smokers to transition to vaping and/or use e-cigarettes as a tool to quit smoking. The Ministry of Health has been supportive of vaping being used as part of harm reduction<sup>9</sup> and in June 2019 it launched a website to provide 'credible' information about vaping to New Zealanders.<sup>10</sup> Until recently (27 March 2018),<sup>11</sup> it was illegal to sell nicotine-containing e-cigarettes in NZ but individuals could import small amounts (up to a 3-month supply) for personal use. In 2018/2019 the overall prevalence of current vaping (ie, vaping at least once a month) in NZ was estimated at 4.7% (8.8% in people aged 18 to 24 years)<sup>4</sup> and 6.1% in university students aged 18 to 24 years.<sup>12</sup>

Literature on the Smokefree goal (awareness, support, perceptions on its achievability and the potential role of e-cigarettes or vaping) is lacking. Available data come from the 2018 Youth Insights Survey (YIS), which included 2758 Year 10 students (predominantly ages 14 and 15 years) from across the country.<sup>13</sup> The YIS forms part of the New Zealand Youth Tobacco Monitor (NZYTM), a collaborative effort by the Health Promotion Agency (HPA) and Action on Smoking and Health (ASH).<sup>13</sup>

In 2018, 45% of Year 10 students were aware of the Smokefree goal, but significant disparities were present across the predominant ethnic groups.<sup>13</sup> Students who identified as NZ European/Other were more likely to be aware of the goal, while Pacific students were less likely to be aware of the goal, 80% of the students supported the goal, with higher support among non-Māori and non-Pacific (82%) compared with Māori (72%) and Pacific (67%) students.<sup>13</sup> The report used prioritised ethnicity, where each participant was assigned to a single ethnic group based on the ethnicities that they identified with, in the prioritised order of Māori, Pacific, Asian and European/Other.<sup>13</sup> Support for the goal was higher in females than males (83% vs 78%), never smokers than ex-smokers and current smokers (86% vs 69% and 32%), and students attending high decile (86%) and medium decile (80%) schools, compared with those attending low

decile schools (70%).<sup>13</sup> School deciles are a measure of the socio-economic position of a school's student community relative to other schools throughout the country, for example, decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of students from low socio-economic communities.<sup>14</sup> In 2018, 5.0% of Year 10 students were current smokers and 1.9% smoked daily.<sup>15</sup>

The current paper examines the associations between responses about the Smokefree goal (awareness, support, belief that it can be achieved and that e-cigarettes/vaping can help to achieve it) with smoking, vaping, age, sex and ethnicity in university students aged 18 to 24. The Smokefree goal is an essential component of the NZ health policy and we hope that our findings will provide vital data that could assist policymakers in tobacco control in NZ and beyond.

## METHODS

Data were obtained from a national cross-sectional survey of university students in NZ in March to May 2018. The survey collected data on cigarette smoking, vaping, the Smokefree 2025 goal and participant health in the previous 12 months.<sup>5 12 16</sup> A convenience sample had to be used, rather than a random sample, because complete enrolment lists of students were not available from the universities, due to concerns about privacy issues.

We acknowledge the limitations of using a convenience sample, including increased risk of volunteer bias, which could lead to underestimation, or overestimation of certain prevalence estimates. We weighted data based on sex of participants (male or female) and university size (representation in our sample relative to university size based on data from the Ministry of Education).<sup>17</sup>

## The survey

Information about the project, including its objectives, eligibility and how to participate, and a URL link that allowed participants to complete the survey online on a computer or smartphone was distributed widely on student platforms (including Facebook). Furthermore, research assistants (RAs) from participating universities approached students on campus (in libraries, cafes, halls of residence) and invited them to complete the survey on paper (using printed questionnaires) or online by scanning QR codes using smartphones. Training was provided to RAs prior to deployment and supervision and support were provided throughout the data collection process. All efforts were made to have a minimum of two and a maximum of six RAs per university, depending on university size, stationed at different colleges or campuses to capture data from diverse student groups.

To be eligible, participants had to be enrolled in at least one university in NZ. Participants were also required to answer 'Yes' to the question 'Do you agree to take part in this survey?' before completing the survey. Participants

taking the survey online could not proceed without a 'Yes' response to this question, while all participants who completed the survey on paper were deemed to have consented even if they did not provide a response.<sup>12</sup>

Participants, regardless of survey route (online or paper) could opt to enter into a draw to win 1 of 10 NZ\$100 cash prizes after completing the survey as a token of appreciation for participation.<sup>12</sup> Data were de-identified before analysis, and duplicate entries in the online survey were removed with the help of the Internet Protocol (IP) address.<sup>12</sup> Additional information on sampling, sample size and procedures used is available elsewhere.<sup>5 12</sup>

### Participants

The current analysis is a continuation of work using a data set of responses from participants aged 18 to 24 years<sup>5 12</sup> which allowed for comparisons on smoking and vaping to be made with estimates from population surveys that use a similar age band.<sup>4</sup> This data set contains 1476 participants who met the criteria for inclusion in the current analysis, and data on their demographic information and Smokefree 2025 questions were used.

### Patient and public involvement

No patients were involved in this project; university students were surveyed.

### Survey measures

#### Demographic variables

Ethnicity data were prioritised for Māori: all those who selected Māori were defined as Māori and those who did not select Māori were defined as non-Māori, similar to previous research.<sup>13</sup> This was necessary because of small numbers of Pasifika students. Years lived in NZ (5 or less) was used as proxy for international students, based on our previous work.<sup>5</sup> Participants could select one or more of the eight universities in NZ: Auckland University of Technology, Lincoln University, Massey University, University of Auckland, University of Canterbury, University of Otago, University of Waikato and Victoria University of Wellington. This variable helped us to assess the representativeness of the sample based on university size.

#### The Smokefree 2025 goal

A brief description of the Smokefree 2025 goal was provided before the first question that asked, 'The New Zealand Government wants to reduce the proportion of people who smoke from around 16% (1 in 6) currently to less than 5% (1 in 20) by 2025. This is the Smokefree 2025 Goal. Before today, were you aware of this goal?' The response options were 'Yes' and 'No'. This question has been validated previously.<sup>18 19</sup>

Participants were also asked (1) 'Do you support this goal?', (2) 'Do you think this goal can be achieved?' and (3) 'Do you think e-cigarettes/vaping can help achieve this goal?'. The response options for all three questions were 'Definitely yes', 'Somewhat yes', 'Not really', 'Definitely not' and 'No opinion'. These were later grouped into two levels, 'Definitely/somewhat yes' and 'Other'.

Other included those who said not really, definitely not and no opinion. This was done because of small numbers for the responses included in 'Other'.

### Smoking and vaping

Participants were asked, 'Have you ever smoked cigarettes or tobacco at all, even just a few puffs' and those who answered 'Yes' to this question were asked, 'Which of the following best describes how often you smoke cigarettes or tobacco now?' and response options were 'At least once a day', 'At least once a week', 'At least once a month' and 'Less often than once a month'. Those who reported smoking at least once a month or more frequently were defined as 'current smokers,' consistent with previous research.<sup>5 20 21</sup> This question was adapted from Marsh *et al.*<sup>22</sup> and the New Zealand Tobacco Use Survey.<sup>23</sup>

Participants were also asked about their e-cigarette use. Respondents who answered 'Yes' to the question, 'Have you ever tried an e-cigarette or vaping device?' were described as 'ever vapers' and asked, 'How often do you currently use an e-cigarette or vaping device?'. The response options were 'Daily or almost daily', 'Less than daily, but at least once a week', 'Less than weekly, but at least once a month', 'Less than monthly', 'Not at all' and 'Don't know'. Those who reported vaping at least once a month or more frequently were defined as 'current vapers', consistent with previous studies.<sup>12 24-27</sup> The questions on vaping were adapted from Pearson and others.<sup>28</sup>

Respondents were grouped into four groups: (1) current smoker and current vaper (dual user), (2) current smoker and non-current vaper (current smoker), (3) current vaper and non-current smoker (current vaper) and (4) non-current smoker and non-current vaper (non-user).

### Data analysis

Logistic regression analysis examined the associations between responses to questions about the Smokefree 2025 goal with smoking and vaping, while controlling for age, sex and ethnicity. The variables were coded as follows: smoking and vaping status (1 = dualuser, 2 = current smoker, 3 = current vaper, 4 = non-user), age (0 = 18 to 20years, 1 = 21 to 24 years), sex (0 = female, 1 = male), ethnicity (0 = Māori, 1 = Non-Māori), awareness of the Smokefree goal (0 = No, 1 = Yes), support for the Smokefree goal (0 = 'other', 1 = 'definitely/somewhat yes'), belief that the Smokefree goal can be achieved (0 = 'other', 1 = 'definitely/somewhat yes') and belief that e-cigarettes/vaping can help to achieve the Smokefree goal (0 = 'other', 1 = 'definitely/somewhat yes'). All statistical analyses were performed using IBM SPSS Statistics V.25 and two-sided  $p < 0.05$  was considered statistically significant. CIs (95% CI) were reported where appropriate.

## RESULTS

Tables 1 and 2 have been adapted from our previous work. Table 1 shows the characteristics of the sample,

**Table 1** Demographic characteristics of participants<sup>5 12</sup>

Variable	Sample (n=1476) %
<b>Age</b>	
18–20 years	919 (62.3)
21–24 years	557 (37.7)
<b>Sex</b>	
Male	569 (38.6)
Female	907 (61.4)
<b>Ethnicity</b>	
Māori	117 (7.9)
Non-Māori	1359 (92.1%)
<b>Years lived in New Zealand</b>	
<6 years	307 (20.8)
≥6 years	1471 (78.9)
Missing data	5 (0.3)
<b>Currently smoke</b>	
Yes	155 (10.5%)
No	1321 (89.5%)
<b>Currently vape</b>	
Yes	90 (6.1%)
No	1386 (93.9%)

NZ, New Zealand.

which comprised 1476 students: 62.3% were aged 18 to 20, 61.4% female, 92.1% non-Māori, 78.9% had lived in NZ for 6 years or more, 10.5% current smokers and 6.1% current vapers. [Table 2](#) compares the characteristics of

**Table 2** Characteristics of students in this study versus NZ university students in 2018<sup>5 12</sup>

	This paper (%)	NZ university student population (%)†
<b>Student type</b>		
Domestic	79.2*	82.0
International	20.8*	18.0
<b>Ethnicity</b>		
Māori	7.9	9.6
Non-Māori	92.1	90.4
<b>Sex</b>		
Male	38.6	41.8
Female	61.4	58.2

\*We used the time lived in NZ as proxy for defining domestic students (having lived in NZ for ≥6 years) and international students (having lived in NZ for <6 years).

†Source: Ministry of Education.<sup>17</sup> Data extracted from Excel sheets ENR.31, ENR.32 and ENR.34. NZ, New Zealand.

**Table 3** Logistic regression model predicting likelihood of being aware of the Smokefree goal

	p	OR	95% CI
Age	0.622	1.06	0.85 to 1.31
Sex	0.236	1.14	0.92 to 1.42
Ethnicity	0.201	0.78	0.53 to 1.15
<b>Smoking and vaping status</b>			
Dual user	0.021	3.07	1.19 to 7.92
Current smoker	0.039	1.48	1.02 to 2.14
Current vaper	0.003	2.18	1.29 to 3.67

Reference categories: age (21 to 24 years), sex (male), ethnicity (non-Māori), smoking and vaping status (non-user).

participants included in this paper with those of the 2018 NZ university student population.

### Overall awareness and thoughts

Among those who responded, 684 (47.5%, 95% CI: 44.9 to 50.1) were aware of the Smokefree goal before completing the survey (97.6% response rate); 1309 (96.9%, 95% CI: 95.8 to 97.8) supported it (91.5% response rate); 923 (88.8%, 95% CI: 86.8 to 90.7) thought it can be achieved (70.4% response rate), and 967 (88.1%, 95% CI: 86.0 to 89.9) thought e-cigarettes/vaping can help achieve it (74.4% response rate).

### Awareness of the Smokefree goal

The model, with 1441 cases included (35 missing cases), containing all predictors (age, sex, ethnicity, current smoking, current vaping and dual use) was significant,  $\chi^2$  (6, n=1441)=23.585, p=0.001, indicating that the model was able to distinguish between respondents who were aware and who were unaware of the Smokefree goal.

As shown in [table 3](#), only current smoking, current vaping and dual use made a unique significant contribution to the model. The strongest predictor of reporting awareness of the Smokefree goal was dual use, which had an OR of 3.07 (95% CI: 1.19 to 7.92) implying that for dual users the odds of being aware of the Smokefree goal was over three times that for non-users.

### Support for the Smokefree goal

The model, with 1351 cases included (125 missing cases) containing all predictors was significant,  $\chi^2$  (6, n=1351)=34.236, p<0.001, indicating that the model was able to distinguish between respondents who supported and who did not support the Smokefree goal.

As shown in [table 4](#), only current smoking made a unique significant contribution to the model, with an OR of 0.13 (95% CI: 0.06 to 0.27) implying that for current smokers the odds of supporting the Smokefree goal was significantly lower than that for non-users. Equivalently (and possibly easier to interpret), participants who were neither current smokers nor current vapers had odds of 7.69 (=1/0.13) with 95% CI: 3.70 to 16.67 of supporting

**Table 4** Logistic regression model predicting likelihood of supporting the Smokefree goal

	p	OR	95% CI
Age	0.058	0.54	0.29 to 1.02
Sex	0.487	0.80	0.42 to 1.52
Ethnicity	0.680	1.26	0.43 to 3.72
<b>Smoking and vaping status</b>			
Dual user	0.281	0.32	0.04 to 2.57
Current smoker	<0.001	0.13	0.06 to 0.27
Current vaper	0.164	0.42	0.12 to 1.43

Reference categories: age (21 to 24 years), sex (male), ethnicity (non-Māori), smoking and vaping status (non-user).

the Smokefree goal compared with participants who were current smokers.

#### Belief that Smokefree goal can be achieved

The model, with 1039 cases included (437 missing cases), containing all predictors was significant,  $\chi^2$  (6, n=1039)=70.539,  $p<0.001$ , indicating that the model was able to distinguish between respondents who believed and who did not believe that the Smokefree goal could be achieved.

As shown in [table 5](#), only sex, current smoking and dual use made a unique significant contribution to the model. The strongest predictor of believing that the Smokefree goal can be achieved was current smoking, which had an OR of 0.15 (95% CI: 0.09 to 0.24) implying that for current smokers the odds of believing that the Smokefree goal can be achieved was significantly lower than that for non-users. Equivalently (and possibly easier to interpret), participants who were neither current smokers nor current vapers had odds of 6.67 (=1/0.15) with 95% CI: 4.17 to 11.1 of believing that the Smokefree goal can be achieved compared with participants who were current smokers.

**Table 5** Logistic regression model predicting likelihood of believing that the Smokefree goal can be achieved

	p	OR	95% CI
Age	0.114	1.42	0.92 to 2.19
Sex	0.001	0.50	0.33 to 0.76
Ethnicity	0.746	1.14	0.53 to 2.46
<b>Smoking and vaping status</b>			
Dual user	0.045	0.24	0.06 to 0.97
Current smoker	<0.001	0.15	0.09 to 0.24
Current vaper	0.224	0.57	0.23 to 1.41

Reference categories: age (21 to 24 years), sex (male), ethnicity (non-Māori), smoking and vaping status (non-user).

**Table 6** Logistic regression model predicting likelihood of believing that e-cigarettes/vaping can help to achieve the Smokefree goal

	p	OR	95% CI
Age	0.994	1.00	0.68 to 1.47
Sex	0.510	0.88	0.60 to 1.29
Ethnicity	0.742	1.12	0.57 to 2.19
<b>Smoking and vaping status</b>			
Dual user*			
Current smoker	<0.001	0.34	0.20 to 0.58
Current vaper	0.034	8.57	1.18 to 62.52

Reference categories: age (21 to 24 years), sex (male), ethnicity (non-Māori), smoking and vaping status (non-user).

\*Maximum likelihood estimates were unable to be calculated for dual users because of quasi-complete separation in the data. This was because all 20 dual users responded that e-cigarettes/vaping can help to achieve the Smokefree goal.

#### Belief that e-cigarettes/vaping can help to achieve the Smokefree goal

The model, with 1098 cases included (378 missing cases), containing all predictors was significant,  $\chi^2$  (6, n=1098)=31.433,  $p<0.001$ , indicating that the model was able to distinguish between respondents who believed and who did not believe that e-cigarettes/vaping can help to achieve the Smokefree goal.

As shown in [table 6](#), only current smoking and current vaping made a unique significant contribution to the model. The strongest predictor of believing that e-cigarettes/vaping can help to achieve the Smokefree goal was current vaping, which had an OR of 8.57 (95% CI: 1.18 to 62.52) implying that for current vapers the odds of believing that e-cigarettes/vaping can help to achieve Smokefree goal was over eight times that for non-users.

## DISCUSSION

We found strong support for the Smokefree 2025 goal, and belief that it can be achieved and that e-cigarettes/vaping can help achieve it, despite low overall awareness of the goal among participants. Smokers and dual users had greater odds of being aware of the goal but lower odds of supporting it or of believing that it can be achieved compared with participants who neither smoked nor vaped (non-users). Females had greater odds of believing that the Smokefree goal can be achieved and vapers and non-smokers had greater odds of believing that e-cigarettes/vaping can help achieve it.

At a local level, this paper reports slightly higher awareness of the Smokefree goal (47.5% vs 45%) and substantially higher support for it (96.9% vs 80%), compared with the findings of Year 10 students.<sup>13</sup> At an international level, the per cent supporting the Smokefree goal reported in our study was nearly three times the support for a 'complete ban on use or sale of tobacco' (34.9%) reported in a 2010 study of 18 European countries.<sup>29</sup> In

both studies smokers were less likely to support smoke-free propositions. The questions used in these studies were however not exactly similar or interchangeable: our study assessed support for an ‘existing policy’ that seeks to reduce the prevalence of smoking to 5% or less<sup>7</sup> whereas the European study assessed support for a ‘hypothetical policy’ that could make smoking or cigarette sales illegal.<sup>29</sup>

In logistic regression analysis, ethnicity did not make any significant contribution to the models in the current study. This result was unexpected considering that Māori generally have higher prevalence of smoking<sup>4</sup> and would therefore be expected to have greater awareness of the Smokefree goal and any associated implications for smokers (ie, increasing cost of tobacco products), compared with non-Māori.

Smokers would generally be expected to be aware of policies and interventions that have a direct impact on them. This argument is supported by our finding of greater odds of awareness of the Smokefree goal among smokers and dual users compared with participants who neither smoked nor vaped. Consistent with 2012 data from Year 10 students,<sup>18</sup> smokers were less optimistic about the achievability of the Smokefree goal. Follow-up data may be necessary to help us understand why smokers seem less optimistic about a smokefree future.

The role of vaping in tobacco control remains controversial with proponents arguing that vaping could help reduce smoking and the public health burden of smoking<sup>30–38</sup> and opponents arguing that vaping might undermine tobacco control policies and create new nicotine addicts who could then transition to smoking.<sup>30 33 34 37</sup> If students are using vaping as a way to stop smoking tobacco cigarettes, then vaping may encourage cessation. This was the main reason for the less restrictive regulations in NZ to increase access to vaping. We are not aware of any other national study that has investigated attitudes towards vaping as a contributor to a tobacco endgame strategy. Besides narrowing the knowledge gap, this information is very relevant in NZ and in other countries considering New Zealand’s approach on vaping. In the current study, vapers and non-smokers had greater odds of believing that e-cigarettes/vaping can help to achieve the Smokefree goal. A plausible reason for this finding could be that non-smokers viewed vaping more positively than smokers.

The main strength of this study lies in its relatively large sample that was closely similar to the general university student population in terms of student type, ethnicity and sex (table 2). This makes our results potentially generalisable to the wider university student population.

This study has a number of limitations. First, we had to use a convenience sample, which increases the risk of volunteer bias that could lead to underestimation or overestimation of prevalence estimates. Data were however, weighted to partly address this. Second, we did not use any measure of socio-economic status (SES), which prevented us from assessing its potential contribution to the reported prevalence estimates. Literature from

NZ and elsewhere suggest that people from higher SES groups are more likely to attend university than people from lower SES groups.<sup>39–41</sup>

The implications of our findings are twofold. First, they suggest that more work might be needed to raise awareness of the Smokefree goal among students (and the general population). This could be through comprehensive mass media campaigns that reach the wider population over prolonged periods<sup>42</sup> as well as targeted adverts/posts on media platforms that are popular with students.<sup>43 44</sup> Furthermore, Smokefree 2025 material and information about cessation services could be included in orientation packs for new students. Second, our findings suggest strong support for the Smokefree goal, and optimism that it can be achieved. This calls for ongoing data collection to engage with the public and continuously monitor progress on this hugely important public health policy for NZ.

## CONCLUSIONS

The results suggest strong overall support for the Smokefree 2025 goal and belief that it can be achieved and that e-cigarettes/vaping can help to achieve it. Smoking and vaping were associated with strong awareness of the Smokefree goal, but with less support and belief that it can be achieved.

The level of awareness, overall, was however disappointing, and this calls for a renewed push to publicise this unique public health policy in the population (students, and the wider public). Future surveys should help us to understand whether increased awareness changes attitudes towards a smokefree future.

### Author affiliations

<sup>1</sup>School of Health Sciences, University of Canterbury, Christchurch, New Zealand

<sup>2</sup>School of Psychology, Speech and Hearing, University of Canterbury, Christchurch, New Zealand

<sup>3</sup>College of Education, Health and Human Development, University of Canterbury, Christchurch, New Zealand

**Acknowledgements** We wish to acknowledge university students who took part in this research. We also wish to extend our thanks to research assistants and staff of Student Job Search, who supported the in-person data collection process.

**Contributors** BW (PhD student) planned the study, collected and analysed data and wrote the manuscript. MW-B, AR and RCG are BW’s supervisors and contributed to the planning, study design and writing the manuscript. PC contributed to the study design, data collection, data weighting and analysis.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** University of Canterbury Human Ethics Committee. Research Ethics ID: HEC 2017/42/LR-PS.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** No data are available.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which

permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iD

Ben Wamamili <http://orcid.org/0000-0002-3112-022X>

#### REFERENCES

- Ministry of Health. Health effects of smoking, 2019. Available: <https://www.health.govt.nz/your-health/healthy-living/addictions/smoking/health-effects-smoking>
- Blakely T, Fawcett J, Hunt D, *et al*. What is the contribution of smoking and socioeconomic position to ethnic inequalities in mortality in New Zealand? *Lancet* 2006;368:44–52.
- O’Dea D, Richard Edwards GT. Heather gifford, report on Tobacco taxation in New Zealand 2007.
- Ministry of Health. New Zealand health survey: annual data explorer - Tobacco use, 2019. Available: [https://minhealthnz.shinyapps.io/nz-health-survey-2018-19-annual-data-explorer/\\_w\\_07aaf3d4/#/explore-indicators](https://minhealthnz.shinyapps.io/nz-health-survey-2018-19-annual-data-explorer/_w_07aaf3d4/#/explore-indicators)
- Wamamili B, Wallace-Bell M, Richardson A, *et al*. Cigarette smoking among university students aged 18-24 years in New Zealand: results of the first (baseline) of two national surveys. *BMJ Open* 2019;9:e032590.
- Ministry of Health. Annual data explorer - Tobacco use, 2019. Available: [https://minhealthnz.shinyapps.io/nz-health-survey-2017-18-annual-data-explorer/\\_w\\_0811ceee/\\_w\\_4a6ab761/\\_w\\_cdfe1214/#/explore-indicators](https://minhealthnz.shinyapps.io/nz-health-survey-2017-18-annual-data-explorer/_w_0811ceee/_w_4a6ab761/_w_cdfe1214/#/explore-indicators)
- Parliament NZ. *Government response to the report of the maori affairs select committee on its inquiry into the tobacco industry in aotearoa and the consequences of tobacco use for maori (final response)*. New Zealand Parliament: Wellington, 2011.
- Stats NZ. Excise duty increase for cigarettes and tobacco, 2018. Available: <https://www.stats.govt.nz/methods/excise-duty-increase-for-cigarettes-and-tobacco>
- Ministry of Health. Vaping and smokeless tobacco. Ministry of Health position statement–vaping products 2018 12 September 2018. Available: <https://www.health.govt.nz/our-work/preventative-health-wellness/tobacco-control/vaping-smokeless-including-heated-tobacco>
- Ministry of Health. Vaping facts, 2019. Available: <https://vapingfacts.health.nz/>
- The District Court of New Zealand. *Ministry of Health v Philip Morris (New Zealand) Ltd* [2018] NZDC 4478, 2018. Available: <http://www.districtcourts.govt.nz/all-judgments/2018-nzdc-4478-moh-v-morris/>
- Wamamili B, Wallace-Bell M, Richardson A, *et al*. Electronic cigarette use among university students aged 18-24 years in New Zealand: results of a 2018 national cross-sectional survey. *BMJ Open* 2020;10:e035093.
- Gurram N. ‘Smokefree 2025’ goal awareness and support among 14 and 15-year-olds: results from the 2018 youth insights survey. Wellington: Health Promotion Agency, 2019.
- Ministry of Education. School deciles, 2019. Available: <https://www.education.govt.nz/school/funding-and-financials/resourcing/operational-funding/school-decile-ratings/>
- Action for smokefree 2025, 2018 ASH Year 10 snapshot - topline results 2018.
- Wamamili B. Change in smoking intentions of university students in New Zealand following simulated cigarette price increases: results of the first of two cross-sectional surveys. *N Z Med J* 2020;133:46–53.
- Ministry of Education. Students enrolled at New Zealand’s tertiary institutions: provider based enrolments - statistical tables, 2019. Available: <https://www.educationcounts.govt.nz/statistics/tertiary-education/participation>
- White J. *Young people’s awareness of ‘Smokefree 2025’*. Wellington: Health Promotion Agency Research and Evaluation Unit, 2013.
- Puthipiroj P, White J. *Young people’s awareness of ‘Smokefree 2025’ - 2014*. Wellington: Health Promotion Agency Research and Evaluation Unit, 2015.
- Ling PM, Neilands TB, Glantz SA. Young adult smoking behavior: a national survey. *Am J Prev Med* 2009;36:389–94.
- Alexander C, Piazza M, Mekos D, *et al*. Peers, schools, and adolescent cigarette smoking. *J Adolesc Health* 2001;29:22–30.
- Marsh L, Cousins K, Gray A, *et al*. The association of smoking with drinking pattern may provide opportunities to reduce smoking among students. *Kōtuitui: New Zealand Journal of Social Sciences Online* 2016;11:72–81.
- Ministry of Health. New Zealand Tobacco use survey (NZTUS), 2019. Available: <https://www.hpa.org.nz/sites/default/files/Questionnaire%20for%20HSC%20website-FINAL-120413.pdf>
- Shiplo S, Czoli CD, Hammond D. E-Cigarette use in Canada: prevalence and patterns of use in a regulated market. *BMJ Open* 2015;5:e007971.
- Littlefield AK, Gottlieb JC, Cohen LM, *et al*. Electronic cigarette use among college students: links to gender, race/ethnicity, smoking, and heavy drinking. *J Am Coll Health* 2015;63:523–9.
- Tavolacci M-P, Vasiliiu A, Romo L, *et al*. Patterns of electronic cigarette use in current and ever users among college students in France: a cross-sectional study. *BMJ Open* 2016;6:e011344.
- Spindle TR, Hiler MM, Cooke ME, *et al*. Electronic cigarette use and uptake of cigarette smoking: a longitudinal examination of U.S. college students. *Addict Behav* 2017;67: :66–72.
- Pearson JL, Hitchman SC, Brose LS, *et al*. Recommended core items to assess e-cigarette use in population-based surveys. *Tob Control* 2018;27:341–6.
- Gallus S, Lugo A, Fernandez E, *et al*. Support for a tobacco endgame strategy in 18 European countries. *Prev Med* 2014;67:255–8.
- Bell K, Keane H. Nicotine control: e-cigarettes, smoking and addiction. *Int J Drug Policy* 2012;23:242–7.
- Ayers JW, Ribisl KM, Brownstein JS. Tracking the rise in popularity of electronic nicotine delivery systems (electronic cigarettes) using search query surveillance. *Am J Prev Med* 2011;40:448–53.
- Biener L, Hargraves JL. A longitudinal study of electronic cigarette use among a population-based sample of adult smokers: association with smoking cessation and motivation to quit. *Nicotine Tob Res* 2015;17:127–33.
- Cahn Z, Siegel M. Electronic cigarettes as a harm reduction strategy for tobacco control: a step forward or a repeat of past mistakes? *J Public Health Policy* 2011;32:16–31.
- Riker CA, Lee K, Darville A, *et al*. E-Cigarettes: promise or peril? *Nurs Clin North Am* 2012;47:159–71.
- Etter J-F, Bullen C. Electronic cigarette: users profile, utilization, satisfaction and perceived efficacy. *Addiction* 2011;106:2017–28.
- Hitchman SC, Brose LS, Brown J, *et al*. Associations between e-cigarette type, frequency of use, and quitting smoking: findings from a longitudinal online panel survey in Great Britain. *Nicotine Tob Res* 2015;17:1187–94.
- Palazzolo DL. Electronic cigarettes and vaping: a new challenge in clinical medicine and public health. A literature review. *Front Public Health* 2013;1:56.
- Polosa R, Caponnetto P, Morjaria JB, *et al*. Effect of an electronic nicotine delivery device (e-cigarette) on smoking reduction and cessation: a prospective 6-month pilot study. *BMC Public Health* 2011;11:786.
- Jerrim J, Chmielewski AK, Parker P. Socioeconomic inequality in access to high-status colleges: a cross-country comparison. *Res Soc Stratif Mobil* 2015;42:20–32.
- Alon Sigal. The evolution of class inequality in higher education: competition, exclusion, and adaptation. *American Sociological Review* 2009;74:731–55.
- Fergusson DM, Woodward LJ. Family socioeconomic status at birth and rates of university participation. *New Zealand Journal of Educational Studies* 2000;35:25–36.
- Edwards R, Hoek J, van der Deen F. Smokefree 2025- use of mass media in New Zealand lacks alignment with evidence and needs. *Aust N Z J Public Health* 2014;38:395–6.
- Tess PA. The role of social media in higher education classes (real and virtual) – a literature review. *Comput Human Behav* 2013;29:A60–8.
- Hargittai Eszter. Whose space? differences among users and non-users of social network sites. *Journal of Computer-Mediated Communication* 2007;13:276–97.