



A 2021 REPORT INTO YOUTH VAPING:

The ARFNZ/SPANZ vaping in NZ youth survey





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This report has been externally peer reviewed by **Dr Stuart Jones** (Counties Manukau DHB) and **Prof Bob Hancox** (University of Otago, Dunedin).

Disclaimer: This report has been externally peer reviewed, however surveys of this nature include potential for sampling and response bias (see limitations section). If information from this report is being used by external parties, clear acknowledgment of the limitations in survey methodology which have been clearly outlined within this report should be cited.



Purpose

The aim of this survey was to determine the current prevalence and patterns of use of electronic nicotine delivery systems (ENDS)/vaping products in secondary schools across New Zealand.

Key findings

- With over 19,000 respondents this survey is one of the largest youth vaping surveys conducted worldwide.
- 27% of those surveyed reported vaping and 15% reported smoking traditional cigarettes in the past week.
- 75% of those vaping, or 20% of total respondents, are vaping daily or several times a day, and the majority are vaping with high nicotine doses.
- Over half of those vaping reported that they were vaping more frequently and at higher nicotine doses compared to last year.
- 86% of students who were vaping more than once a day reported that they were addicted to vaping and 57% felt that it was having an adverse effect on their health.
- The most common source of supply for students was from dairies.

Recommendations by Te Hā Ora: Asthma and Respiratory Foundation NZ

1. Regulations be introduced to limit the content of nicotine available in ENDS/vaping products sold in New Zealand to a maximum of 20mg (2%).
2. Raise the legal age to purchase ENDS/vape products to 21 years.
3. Ban in-front-of-store window advertising and product display by retailers.
4. Prevent the sale of vaping products within a one kilometre radius of any school by retailers.
5. Emphasis must be placed on Aotearoa educational campaigns aimed at youth, and focused on the health harms that vaping can cause.
6. Further surveys are required to investigate the impact of the new regulations introduced under the Smokefree Environments and Regulated Products Act 1990.



Introduction

ENDS (Electronic Nicotine Delivery Systems) or 'vape' products are promoted in New Zealand as a harm reduction tool for current cigarette smokers who have been unable to give up despite smoking cessation support and current Medsafe approved medications. Current smokers make up around 12% of the adult population¹ and ENDS are seen as an aid to achieve Smokefree Aotearoa 2025.

Widespread introduction of these products in 2017 saw the marketing and sale of ENDS onto the New Zealand market with no regulations, including no age restrictions for purchase of the products, no advertising constraints, and no accountability of retailers selling these products. In addition, in a high-profile case in 2018, the tobacco company Philip Morris's heated tobacco product, the IQOS device, was found not to be in breach of the Smoke-free Environments Act, which potentially acted as a public endorsement of the product.² The combination of these influences has led to widespread use of ENDS/vaping products across New Zealand. Billboard, radio, and social media campaigns advertising ENDS products rapidly materialised around the country, all of which were heavily targeted at adolescents.³ Two years later, a concerning trend had started to emerge in New Zealand, and studies such as the Youth19 survey⁴ and ASH Year 10 survey⁵ confirmed that uptake of these products was not limited to adults, but that many ENDS consumers were in fact adolescents.

The eighth World Health Organisation (WHO)⁶ report on the global tobacco epidemic was launched this year, and for the first time, the report presented comprehensive data on ENDS use, associated harms and recommendations to protect public health. A strong focus of this report related to concerns that these products were being marketed to children and adolescents by tobacco and related industries that manufacture them. The major conclusions related to ENDS from this report included:

- 1) that there has been a significant increase in youth vaping in the past decade,
- 2) that ENDS are addictive and not without harm,
- 3) that children and adolescents double their risk of smoking cigarettes if they vape.

While vaping is often perceived as harmless, there is rapidly emerging evidence that vaping is associated with significant physical and behavioural health risks. Although electronic cigarette aerosols appear to be less cytotoxic than compounds inhaled during combustible cigarette use, they do still expose users to carcinogenic and toxic substances and have been shown to have adverse effects on the respiratory and cardiovascular systems, although the long-term effects of these exposures remain unclear.⁷⁻¹²

In addition, vaping has been consistently associated with depression, Attention deficit hyperactivity disorder (ADHD), and conduct disorder in adolescents.¹³ Nicotine exposure has been shown to adversely affect brain development in animal models, and increases the risk of problems with learning and memory.¹⁴

Given these potential negative health consequences, further investigation into youth uptake of vaping products in New Zealand is warranted. The aim of this survey was to determine the current prevalence of self-reported vaping, the relationship with combustible cigarettes, the means of young people's access to e-cigarettes, the nicotine doses, and the impact on health in secondary school students at a national level.

This report was initiated by Te Hā Ora: The Asthma and Respiratory Foundation NZ (ARFNZ), in response to the numerous concerns raised to the Foundation by parents, teachers and schools of Aotearoa.



Methods

AFRNZ developed an online survey aimed at secondary school (Year 9 to 13) students (Appendix 1). A total of 311 New Zealand secondary schools were sent an invitation to participate in the ARFNZ/SPANZ Vaping in New Zealand Youth Survey, via email, by the Secondary Principals' Association of New Zealand (SPANZ). Participation by schools was voluntary. Those schools participating in the survey were given a Uniform Resource Locator (website address) and a QR code to provide to students giving them access to the online survey. Student participation was voluntary and anonymous, and the information collected was confidential. The survey ran during School Term 3, 2021 opening on Monday 26 July and closing on Friday 20 August, 2021.

Results

[This is the largest survey on youth vaping conducted in New Zealand.](#)

A total of 19,021 respondents from 283 schools were used in the final analysis (Appendix 2), making this the largest survey on youth vaping conducted in New Zealand. The distribution of year groups 9 to 13 is given (Supplementary data table 1). Self-reported ethnicity was as follows: 62.5% New Zealand European, 9.7% Māori, 5.0% Pacific Peoples, 12.3% Asian and 7.7% other (Supplementary data table 2). A further 2.7% preferred not to say. There was an over-representation of decile 9 and 10 schools (42.5% of respondents) with mid-decile and low-decile schools being under-represented (Supplementary data table 3).

[Smoking and use of e-cigarettes is frequent among our secondary school students.](#)

Of those surveyed, 14.6% reported that they had smoked one or more traditional cigarettes in the last 7 days and 26.6% reported that they had vaped (e-cigarettes) in the past 7 days. Almost all those (98%) who had smoked a traditional cigarette in the last week had also vaped in the last week (Table 1). However, a significant portion (46.2%) of those who had vaped in the last week had not smoked a cigarette.

Table 1: Correlation of those who smoke and/or vaped in the last 7 days

		Smoked cigarette in last 7 days	
		Yes	No
Vaped in last 7 days	Yes	2,713	2,341
	No	66	13,869

Rates of vaping within the last week differed significantly by year group, ethnicity and school decile. The prevalence of vaping was highest in Year 10 and lowest in Year 13 (Figure 1). The highest rates of vaping in the last 7 days were seen in New Zealand Europeans (31.6%) and Māori (31.4%) with the lowest rates being seen in Asians (8.6%, Figure 2). We observed increasing vaping rates as school deciles decreased (Figure 3).



Figure 1: Year group and vaping within the last 7 days

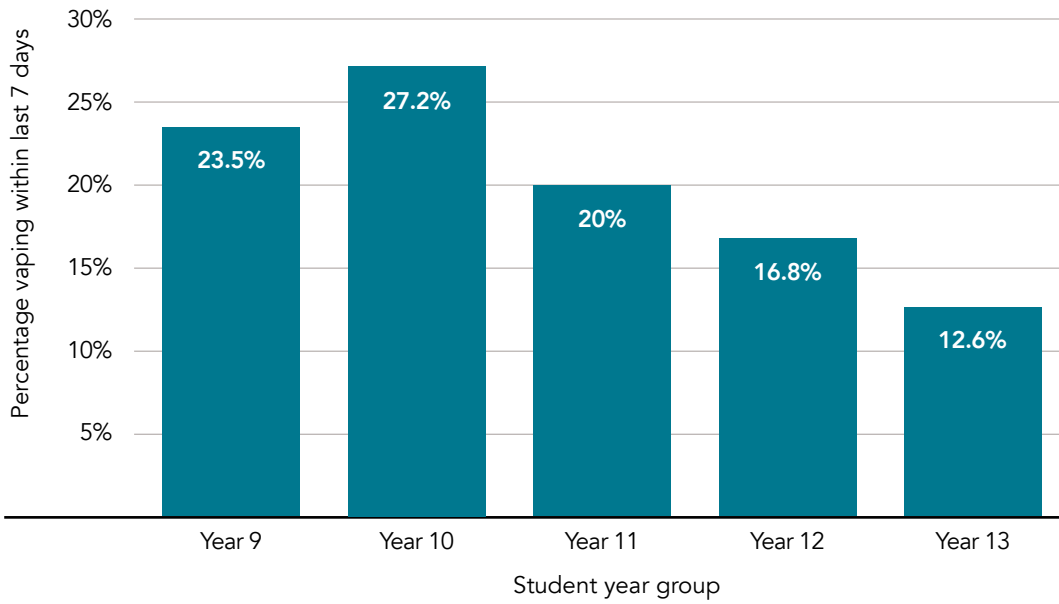


Figure 2: Ethnicity and vaping within the last 7 days

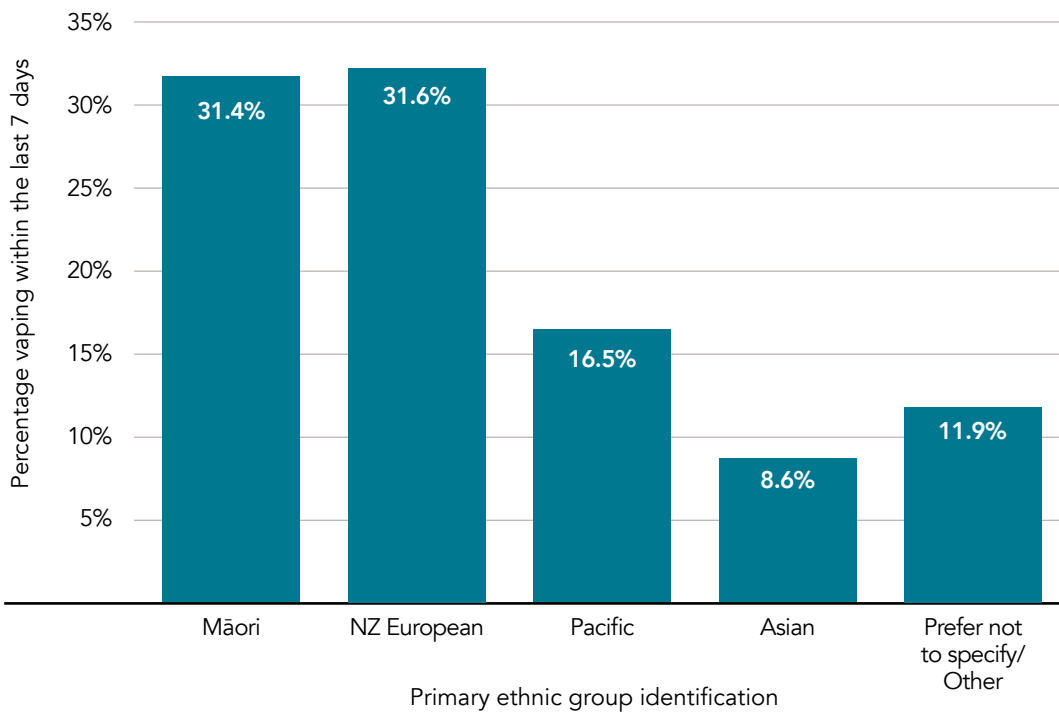
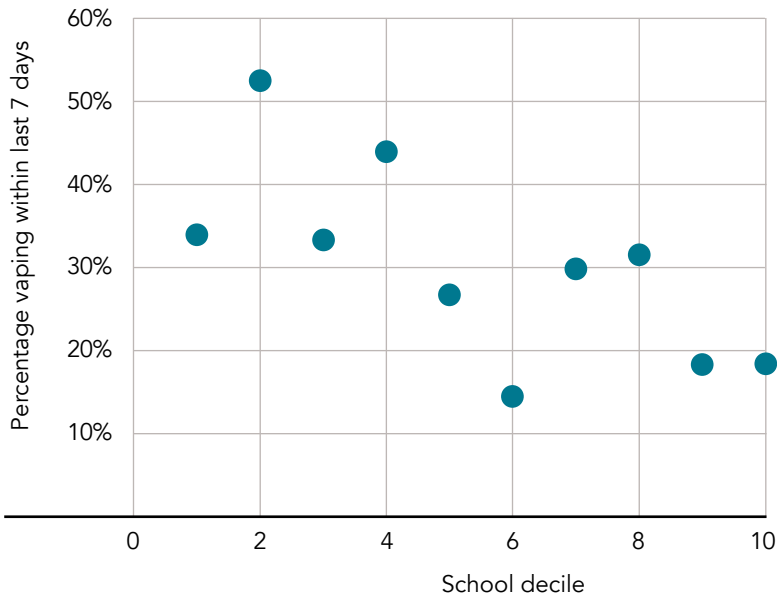




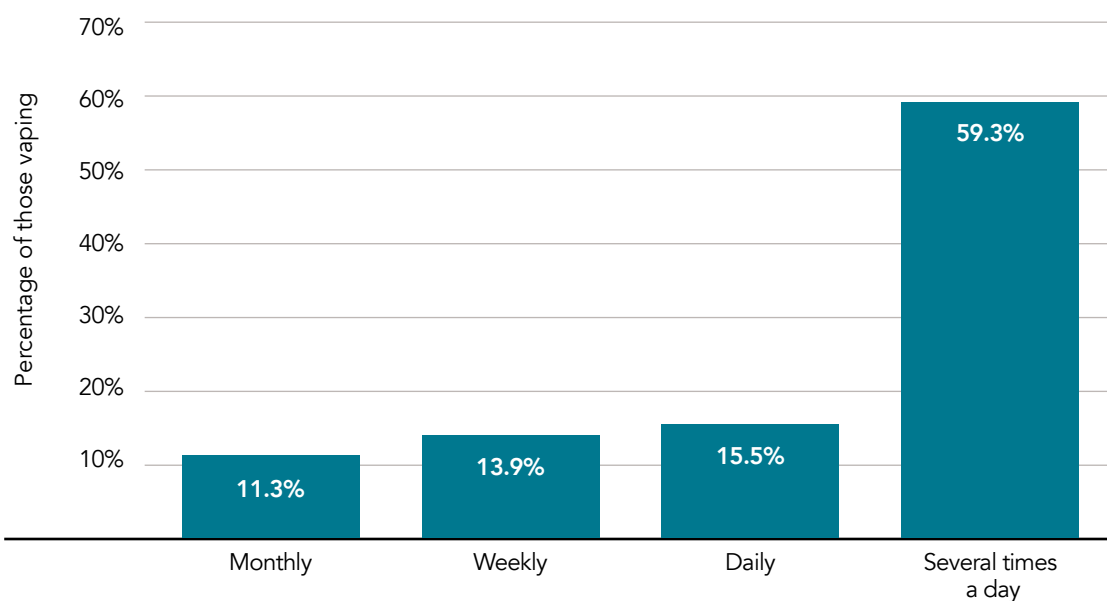
Figure 3: School decile and vaping within the last 7 days

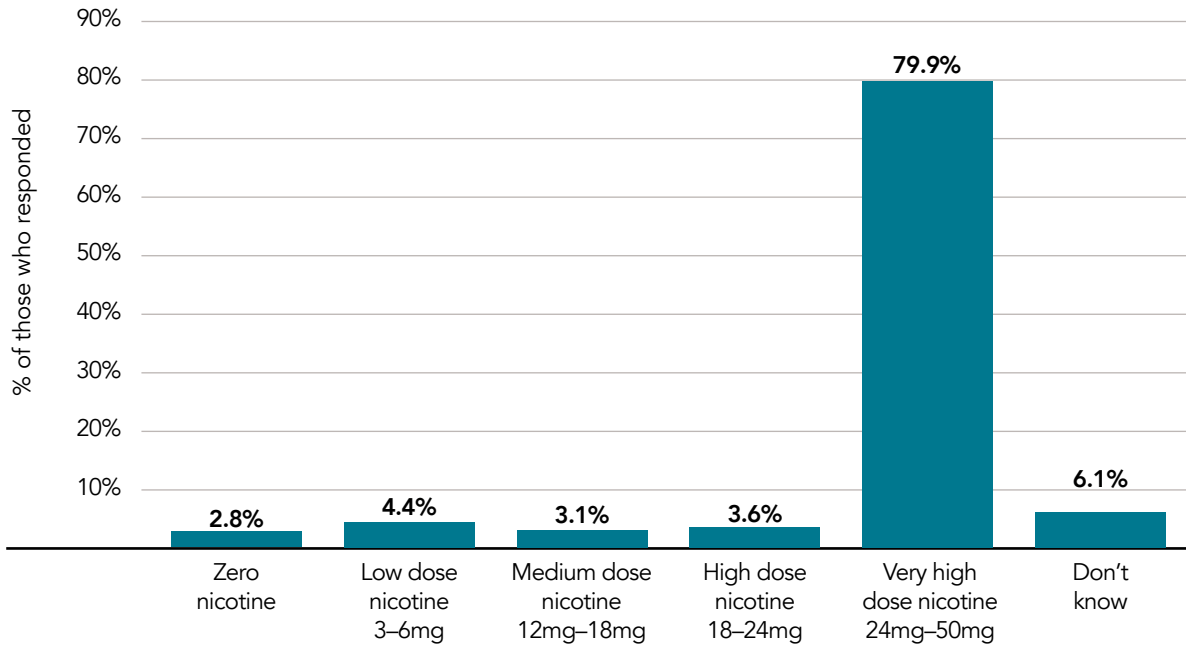


Most of those vaping are vaping several times a day and vaping with high nicotine doses.

Of the total respondents, 19.9% said they were vaping either daily or multiple times a day. Analysis of the respondents who reported vaping in the past week found 59.3% were vaping several times a day, and the majority, 79.9%, were vaping at very high nicotine levels (between 24mg–50mg), (Figure 4 and 5). Only 2.8% reported using zero nicotine vapes. There was a difference in distribution across dose range by frequency of vaping, with those vaping most frequently being more likely to be vaping at the highest doses (Supplementary Data Table 4).

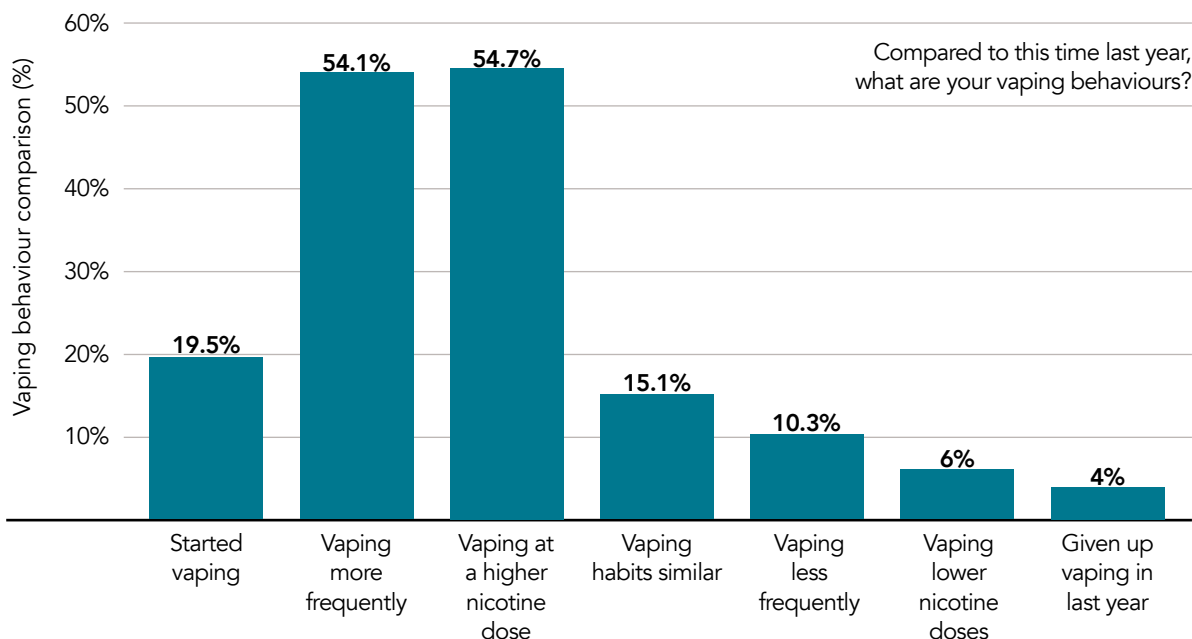
Figure 4: Frequency of vaping



**Figure 5: Nicotine concentrations in the vapes**

Most of those vaping reported that they were vaping more frequently and at higher nicotine doses compared to last year.

When asked about their vaping habits compared to last year, half of the students (54.1%) reported they were vaping more frequently than this time last year, and 54.7% reported that they were vaping at higher nicotine doses than the previous year. Only 4% reported having given up vaping, with 19.5% reporting starting vaping since the previous year (Figure 6).

Figure 6: Comparison of vaping behaviours compared to the previous year

*Note that more than 1 option could be selected, so all sources are included exceeding 100%.



Many students who were vaping felt that it was having an effect on their health and felt that they were addicted to vaping.

A high percentage of students who vaped (46.9%) reported that vaping had a negative impact on their health, and 63.3% of those who vaped responded that they felt addicted to their vaping. In addition, 13.5% reported being in trouble at school and 15.1% in trouble at home because of vaping. Despite this, 64.7% reported being happy with the amount and the concentration of the nicotine they vaped. There were also differences in response to both whether students believed they were addicted to vaping and whether vaping had an effect on their health, depending on the frequency of their vaping (Table 2).

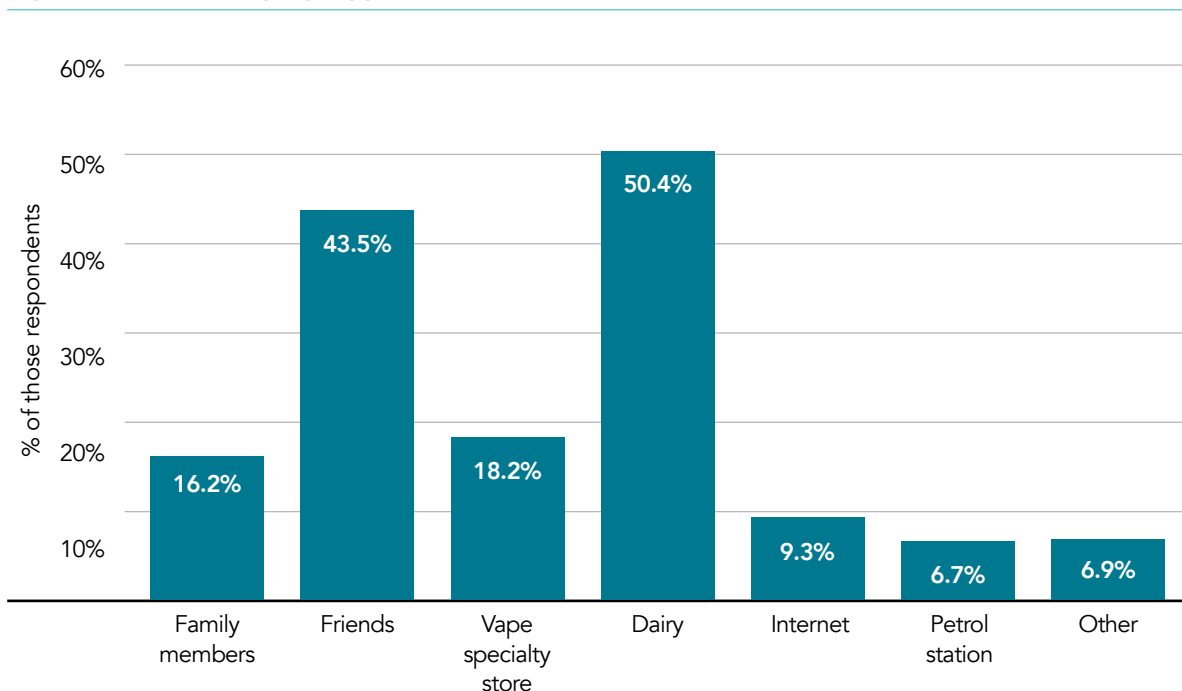
Table 2: Effect of frequency of vaping and impact on health and feelings of addiction

		Monthly	Weekly	Daily	Several times a day
Feel addicted to vaping?	Yes	58 (10.1%)	120 (17.3%)	423 (53.8%)	2,588 (86.3%)
	No	498 (86.8%)	574 (81.9%)	363 (46.2%)	410 (13.7%)
Vaping effect on health	Yes	133 (23.2%)	216 (30.8%)	321 (40.8%)	1,704 (56.8%)
	No	406 (70.7%)	444 (63.3%)	406 (51.7%)	1,147 (38.2%)

The most common source of supply for students was from dairies.

The greatest proportion of students (50.4%) obtain their vapes from dairies with the next most common source being from friends (43.5%, Figure 7). Students were much less likely to source vapes from specialty vape stores compared to dairies.

Figure 7: Source of vaping supplies



*Note that more than 1 option could be selected, so all sources are included exceeding 100%.



Commentary

This current survey is the largest ever survey conducted into youth vaping in New Zealand. Major findings included:

- 1) that 27% of respondents had vaped and 15% had smoked a traditional cigarette in the last week,
- 2) the majority of those vaping are vaping several times a day and vaping with high nicotine doses,
- 3) the majority of those vaping reported that they were vaping more frequently and at higher nicotine doses compared to last year,
- 4) many students who were vaping felt that it was having an effect on their health and felt that they were addicted to vaping, and
- 5) that the most common source of supply for students was from dairies, followed by friends.

The prevalence of vaping reported in this survey is substantially higher than that found in previous surveys, with 26.6% of students reporting that they had vaped within the last week, and with the majority (75%) of those vaping reporting daily use. The 2019 ASH Year 10 survey⁵, one of the largest youth smoking surveys in the world, found that regular e-cigarette use (monthly or more often) increased from 3.5% in 2015 to 12% in 2019. The Youth19 study⁴ which surveyed over 7,000 students aged between 13 and 18 years from 52 secondary schools in 2019, found that overall 38% of students had 'ever tried vaping', with 10% vaping regularly (monthly or more often) and 6% vaping weekly or more often. Our finding suggests that there has been a marked increase in the prevalence of vaping in secondary school students between 2019 and 2021.

There has been great interest and debate as to whether ENDS are a useful tool for smoking cessation, or potentially a gateway to traditional cigarette smoking in youth. Concerningly, 14.6% of students surveyed reported smoking one or more traditional cigarettes in the last 7 days, again a much higher prevalence than previously reported. Almost all (98%) of those who reported smoking in the last week also reported vaping in the last week. The Youth19 survey⁴ reported that 14.8% of adolescents had ever smoked, with only 2.4% smoking weekly or more often. The ASH 2019 Year 10 survey⁵ found that only 5.9% of Year 10 students regularly smoked (monthly or more often), with 2.1% reporting daily smoking. Of note, previous ASH Year 10 surveys reported substantial falls in regular smoking up until 2016. Widespread introduction and marketing of ENDS to New Zealand began around 2017 and the ASH Year 10 survey⁵ data between 2017 and 2019 showed, for the first time, small increases in regular cigarette use. Although small, these were the first increases seen in the two decades this annual survey has run.

There is now an abundance of publications which have associated ENDS use among young non smokers with later cigarette use.¹⁵ Yoong et al recently published a systematic review (36 publications) and meta-analysis (23 publications) of prospective longitudinal studies that described the association between ENDS use among non-smokers aged < 20 years with subsequent tobacco use. They found that ever users of ENDS had over a three times risk of ever cigarette use. The recent WHO Report on the Global Tobacco Epidemic, 2021¹ concluded 'Children and adolescents who use ENDS can double their risk of smoking cigarettes'. Observational studies cannot establish cause and effect. However, the temporal relationship between the introduction and increase in vaping, and the apparent increase in youth smoking, is deeply concerning and warrants further investigation.

Nicotine is a highly addictive substance, and nicotine addiction is central to the business model of the tobacco industry. It is highly concerning that the majority (79.9%) of those who reported vaping within the last week in our survey, also reported using ENDS with very high (>24 mg) nicotine doses.



To put this into perspective, smoking a packet of 20 cigarettes results in an individual inhaling between 22 to 36 mg of nicotine.¹⁶ The free base nicotine found in cigarettes is relatively bitter and usually unpalatable in high concentrations. However, ENDS manufacturers have developed nicotine salt formulations that deliver higher levels of nicotine to the user while masking its harshness, which means it is very easy for youth to inhale the equivalent amount of nicotine that is in a packet of cigarettes, in a short time.

In our survey, there was a significant relationship between the frequency of vaping and the nicotine dose in the ENDS used, with almost all of those (95%) vaping several times a day using high doses, compared to only 38.7% of those who reported vaping monthly. Also of concern is that when asked to compare their vaping behaviours to last year, over half reported vaping more frequently and at higher nicotine doses. Overall, 63% of those who had vaped in the last week reported that they felt addicted to their vaping. Again, there was a significant association between frequency of vaping and reporting feeling addicted, with 86.3% of those vaping several times a day reporting that they felt addicted to vaping. Our findings suggest that a significant portion of secondary school students are addicted to nicotine.

In our study, almost half of those who had vaped within the last week reported that they thought vaping was having an effect on their health, with those vaping most frequently being more likely to report this. While the long-term health effects of ENDS use are still unknown, there is an abundance of evidence to demonstrate that these products are not harmless.⁵⁻¹⁰ Studies in cell cultures, animal models, and human studies have linked ENDS use to several biological processes involved in the pathogenesis of respiratory disease in humans.¹⁷ There is evidence that vaping makes the lungs more susceptible to infection.¹⁸ Epidemiological studies have also shown association of ENDS use with asthma, chronic bronchitis and COPD.¹⁹ A new and serious respiratory condition, electronic-cigarette or vaping product use-associated lung injury (EVALI), has been well documented.²⁰ Adverse effects on the cardiovascular system have also been described with ENDS use being associated with increases in heart rate and blood pressure, increased oxidative stress, endothelial dysfunction and platelet activation.¹⁹ Epidemiological studies have also linked ENDS use to an increased risk of myocardial infarction.²¹ Dual use of cigarettes and ENDS is common, as was the case in our study. A number of studies have suggested that dual use is associated with an increased risk of respiratory and cardiovascular conditions relative to single product use alone.^{22,23,24} Nicotine also poses health risks to children, adolescents and pregnant women. Studies have shown deleterious effects of nicotine on brain development, potentially leading to learning difficulties and anxiety.²⁵⁻²⁹ These findings have resulted in numerous medical societies and scientific organisations acknowledging that ENDS are not safe for use in youth and young adults, and calling for regulation.³⁰

As of the 11th of November 2020, the sale of vaping products to anyone under the age of 18 years was prohibited under The Smokefree Environments and Regulated Products (Vaping) Amendment Act 2020. Although the vast majority of secondary school students are under 18 years of age, they were still managing to access vaping products, despite the R18 regulations. In our study, those who vaped reported that dairies, followed by friends, were the most common sources of vape supplies. As of August 11th 2021, further provisions of the Act were phased in, which included general retailers only being able to sell vaping products in tobacco, mint or menthol flavours. It is hoped that these new regulations will reduce youth accessing vapes, and it will be important to do follow-up studies to assess this.



Many parents, teachers and schools have raised concerns to the Foundation and in the media. Our survey findings show those concerns are justified. Given the rapid and increasing uptake of vaping by secondary school students, tougher regulations are required to protect our youth.

Te Hā Ora: Asthma and Respiratory Foundation New Zealand recommends the following:

1. Regulations be introduced to limit the content of nicotine available in ENDS/vaping products sold in New Zealand, to a maximum of 20 mg (2%). This would be in-line with the maximum nicotine concentrations of 20 mg/mL (2.0%) that is allowed in the European Union according to directive 2014/40/EU of the European Parliament and the European Union Council.³¹
2. Raise the legal age to purchase ENDS/vape products to 21 years. The US Food and Drug Administration (FDA) increased the purchasing age in the US for ENDS and vaping products from 18 years to 21 years in December 2019, a move strongly supported by the American Lung Association as a way to “reduce youth access to tobacco products and help save lives”.
3. Ban in-front-of-store window advertising or product display by retailers. The visual appeal of ENDS and vaping products to youth is well documented, and the associated influence that this can have on adolescents being attracted to ENDS.
4. Prevent the sale of vaping products within a one kilometre radius of any school by both specialist and non-specialist vape retailers. Several published studies have investigated the presence of vape shops within walkable distances of schools, and easy access by students to vaping products. Studies suggest that the point-of-sale access by general retailers close to schools, may contribute to e-cigarette use among youth.³²
5. Emphasis must be placed on Aotearoa educational campaigns aimed at youth, and focused on the health harms that vaping can cause. Examples of such campaigns currently being run internationally include the Centres for Disease Control and Prevention (CDC): ‘Protecting Young People from E-Cigarettes’ and ‘Know the Risks’ campaign, Coalition: The Tobacco-Free Schools Initiative; National Institutes of Health: Smokefree Teen; Campaign for Tobacco-Free Kids: ‘Protect Kids: Fight Flavored E-Cigarettes’ campaign; Ad Council and American Lung Association: ‘Talk about Vaping’ campaign; FDA: ‘The Real Cost’ campaign; and ‘The Tobacco Prevention Toolkit’ from Stanford Medicine. In New Zealand, we currently have information available from the ARFNZ’s ‘Don’t Get Sucked In’ website, as well as a number of other sources (Appendix 3) but there is a need for a concerted education campaign.
6. Further surveys are required to investigate the impact of the new regulations introduced under the Smokefree Environments and Regulated Products Act 1990.

Limitations

Limitations for any survey of this nature include a potential for sampling and response bias. We do not know what method different schools used to disseminate the invitation to participate in the survey to their students. While there were high responses from approximately 20 schools, the majority of schools had low response rates to the survey. As such, the response cannot be regarded as a random sampling of the school age population, and significant sampling bias is possible. This means that these results are not generalisable to the overall secondary school population of New Zealand. The survey was also self-reported and performed in an unsupervised manner. As such, data integrity is not guaranteed. Steps were taken during analysis to exclude surveys that were internally inconsistent, or where data integrity problems were clearly evident. Despite these limitations, the survey does represent self-reported behaviour of a large number of school students with respect to vaping.



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Appendix 1: Survey questionnaire

Q1. Which school do you go to?

Q2. Which year group are you in?

Q3. Ethnicity

- Māori
- NZ European
- Pacific
- Asian
- Prefer not to specify
- Other (please specify)

Q4. Have you smoked one or more traditional cigarettes in the last 7 days?

- Yes
- No

Q5. Have you vaped (e-cigarettes) in the last 7 days

- Yes
- No

Q6. If you have vaped, where do you get your vape supplies from? You can tick multiple answers.

- Not vaped
- From family members
- From friends
- From a vape speciality store
- From a dairy
- From internet suppliers
- From a petrol station
- Other (please specify)

Q7. Thinking about the *last time* that you vaped - how much nicotine was in the vape?

- Zero-nicotine 0mg
- Low dose nicotine 3mg–6mg
- Medium dose nicotine 12mg–18mg
- High dose nicotine 18mg– 4mg
- Very high dose nicotine 24mg–50mg
- Don't know / unsure

Q8. How often do you use vape products (e-cigarettes)?

- Never
- Monthly
- Weekly
- Daily
- Several times a day



Q9. If you use vapes or e-cigarettes on a daily basis, what time of day do you usually have your first vape?

- Don't vape daily
- Wake in the night to vape
- Before breakfast
- Before school
- During the morning
- Middle of the day
- During the afternoon
- In the evening

Q10. If you are a regular user of vapes or e-cigarettes, have they replaced traditional cigarettes?

- Not a regular user of vapes
- Vaping has replaced traditional cigarettes
- Now I use vapes as well as traditional cigarettes
- I vape but I have never been a regular smoker of traditional cigarettes

Q11. Compared to this time last year, which of these statements is true? You can tick multiple boxes.

- I have started vaping since this time last year.
- I am vaping more frequently than this time last year.
- I am vaping at higher doses of nicotine than this time last year.
- My vaping habits are very similar to this time last year.
- I am vaping less frequently than this time last year.
- I am vaping at lower doses of nicotine than this time last year.
- I have given up vaping in the last year.

Q12. Which of the following statements are true about your vaping habits? You can tick multiple boxes.

- I have got into trouble at school because of vaping.
- I have got into trouble at home because of vaping.
- My education has been affected by my vaping / I have missed class time because of vaping.
- I am happy with the amount that I vape and the concentration of nicotine.
- I have tried to reduce my vaping.
- I have tried to reduce the concentration of nicotine that I am vaping.
- I have sought help regarding my vaping (eg from a teacher, counsellor, 1737, Public Health Nurse, etc)
- I rarely think about my vaping.
- Vaping has had no effect on my school or home life.
- None of the above.

Q13. Do you think vaping has had an effect on your health?

- No
- Yes
- How has vaping effected your health? (please specify)

Q14. If you vape regularly do you feel that you are addicted to your vape?

- Yes
- No

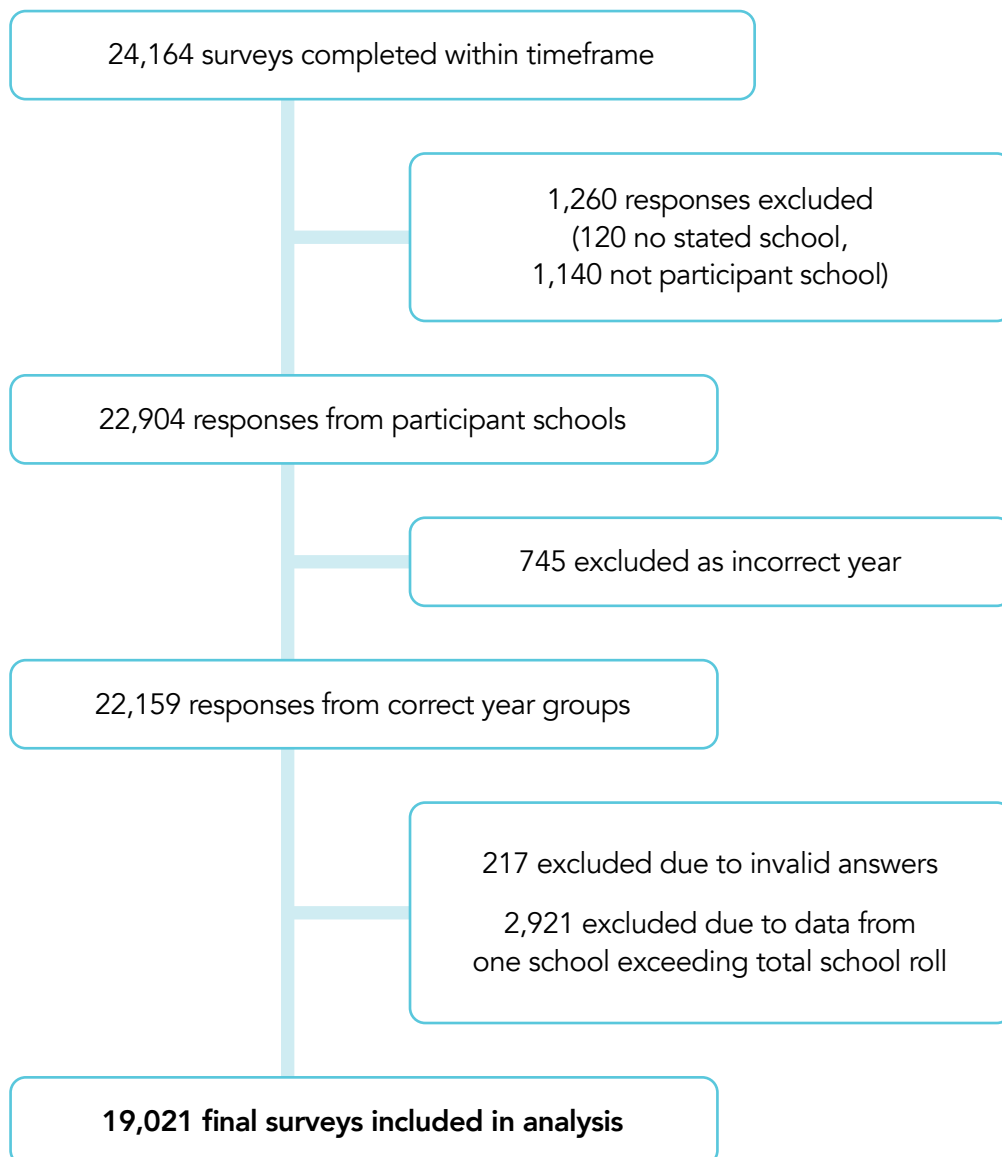


Appendix 2: Methodology

For the final analysis, answers were excluded for the following reasons: the name of the school was omitted, a school not on the invited list of 311 responded, respondents were below Year 9, survey answers did not go beyond question 4, or if there were contradictory answers.

284 schools across the country made up the final analysis, with a total of 19,021 respondents (Figure 1).

Figure 1: Surveys included in the final analysis





Appendix 3: Aotearoa vaping educational campaigns

Don't get sucked in

Information, resources and a quiz so you can make sure you don't get sucked into vaping.

Vaping facts

Ministry of Health, NZ

Learn about vaping

Smokefree NZ

Why quit smoking?

Health Navigator



Supplementary data

Table 1: School years

School year	Count (%)
Year 9	4,466 (23.5%)
Year 10	5,165 (27.2%)
Year 11	3,800 (20.0%)
Year 12	3,191 (16.8%)
Year 13	2,399 (12.6%)

Table 2: Ethnicity

Māori	1,840 (9.7%)
NZ European	11,873 (62.5%)
Pacific	945 (5.0%)
Asian	2,349 (12.3%)
Other	1,472 (7.7%)
Prefer not to say	5,522 (2.7%)
Missing	20 (0.1%)

Table 3: School deciles

1	538 (2.8%)
2	419 (2.2%)
3	1,747 (9.2%)
4	974 (5.1%)
5	1,164 (6.1%)
6	2,860 (15.0%)
7	1,892 (9.9%)
8	1,321 (6.9%)
9	2,913 (15.3%)
10	5,169 (27.2%)
Missing	23 (0.1%)

Table 4: Vaping frequency and amount of nicotine in mg

	Zero nicotine 0mg	Low dose nicotine 3mg–6mg	Medium dose nicotine 12mg–18mg	High dose nicotine 18mg–24mg	Very high dose nicotine 24mg–50mg	Don't know/ unsure
Monthly n = 573	62 (10.8%)	69 (12.0%)	57 (9.9%)	35 (6.1%)	222 (38.7%)	128 (22.3%)
Weekly n = 700	44 (6.3%)	57 (8.1%)	55 (7.8%)	55 (7.8%)	392 (55.9%)	97 (13.8%)
Daily n = 786	24 (3.1%)	59 (7.5%)	28 (3.6%)	47 (6.0%)	581 (73.9%)	47 (6.0%)
Several times daily n=2,999	11 (0.4%)	39 (1.3%)	15 (0.5%)	45 (1.5%)	2,850 (95.0%)	39 (1.3%)

There was a statistical significant difference in distribution across dose range by frequency of vaping – with those vaping most frequently more likely to be vaping at highest doses ($p < 0.001$ Chi squared test).