

# Exposure to digital vape marketing among young people in Aotearoa New Zealand

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## ABSTRACT

**AIMS:** Little is known about the exposure of young people in Aotearoa New Zealand to marketing of vape products on social media. This study investigated vaping behaviour and the extent of vape marketing exposure and engagement that young people (14–20 years) report on social media and examined differences across socio-demographic groups.

**METHODS:** An online survey was conducted with 3,698 participants aged between 14–20 years ( $M=17.1$ ;  $SD=1.8$ ). A range of genders (55.7% females, 38.3% males and 6% another gender), ethnicities (25.6% Māori, 46.7% Pākehā or NZ European, 6.5% Pasifika and 21.2% another ethnicity) and social classes took part.

**RESULTS:** Half (50.8%;  $n=1,110$ ) of the respondents ( $N=2,185$ ) reported that they had vaped at least once; vaping history was positively related to exposure to and engagement with digital vape marketing. Half (50.3%;  $n=1,119$ ) of the respondents ( $N=2,224$ ) reported seeing vape marketing on at least one social media platform. Binary logistic regressions showed that younger respondents were more likely to report seeing vape marketing than older respondents, and Māori and Pasifika more likely than other ethnicities. Over a quarter (26%;  $n=563$ ) of respondents ( $N=2,148$ ) reported engaging with vape marketing online, with Māori and Pasifika respondents more likely to engage than other ethnicity groups, and similarly for respondents of lower compared to higher socio-economic status. No interaction effects were found.

**CONCLUSIONS:** Many young people, including a subset under the legal age for purchase, reported seeing vape product marketing on social media platforms. Patterns of exposure to vape product marketing on social media mirror the inequitable marketing exposure of harmful commodities in physical environments. Improved transparency and regulation of social media marketing is required.

Vape products are currently one of the main sources of substance use in young people in Aotearoa New Zealand. A 2019 survey demonstrated that vaping was 2–3 times more prevalent than smoking, with 10% of students vaping regularly (monthly or more often), and 6% weekly or more often, compared with 4% and 2%, respectively, for tobacco smoking.<sup>1</sup> Over 80% of those who vaped reported that they were not smokers, while half of regular vapers said they had never smoked. Dual use of both vapes and cigarettes among Māori was twice the rate compared to the rest of the sample. A 2021 survey with 19,000 year 9–13 students found that 20% were vaping regularly and 15% were smoking, with more than half of respondents reporting that they were vaping more often than they used to, were using higher nicotine products, were feeling addicted and felt that the vaping was damaging their health.<sup>2</sup>

Increasing youth vaping rates have led to recent changes to vaping regulations, including

restrictions on disposable devices, prohibition of new vape outlets within 300m of schools and marae and limits on marketing product brands that target young people.<sup>3</sup> Legislation has imposed R18 sales restrictions and also “*prohibits advertising and sponsorship of vaping products (with some minor exceptions) and bans specific sales promotions*”.<sup>4</sup> Nevertheless, vaping and tobacco companies in Aotearoa New Zealand are marketing on social media platforms to appeal to young people, exposing young people to vape product content online and engaging potential consumers through comments, likes, questions, competitions and sponsorships.<sup>4</sup>

International research highlights how social media has been crucial in publicising, normalising and marketing vape products among young people.<sup>5</sup> Longitudinal US research showed that young people’s (12–17 years) exposure to vape advertising on social media platforms, websites and in gas and convenience stores was associated with vaping 1 year later, while no associations

were found with advertising in newspaper/magazines, radio, billboards or television.<sup>6</sup> In Aotearoa New Zealand, researchers have shown how vape product retailers use Instagram to engage with young people, sponsoring festivals, linking vapes to appealing lifestyles and employing popular influencers.<sup>7</sup> Such findings question industry assurances that e-cigarettes are promoted only as cessation devices to adult smokers.<sup>8</sup>

Online marketing that highlights e-cigarettes as appealing lifestyle products is concerning, especially given the high rates of social media use in young people. Social media marketing differs from conventional marketing, being dynamic, participatory and data-driven, within constantly changing social media feeds that are obscured from public view.<sup>9</sup> The underlying algorithms operate to intensify engagement with marketing content and consumer-driven socialising.<sup>10</sup> We currently know little about the social media marketing of vape products to young people, the dynamics of exposure and engagement with this marketing and how this might vary across socio-demographic groups—information that is occluded within digital environments due to the nature of digital marketing. The current study aimed to 1) examine the vaping behaviours of young people aged 14–20 years, 2) investigate how much young people are exposed to and engage with vape marketing and promotion on the social media platforms they regularly use, and 3) examine whether exposure and engagement varied across different ages, genders, socio-economic groups and ethnicities to identify broad patterns in the digital promotion of vape products to different groups of young people.

## Methods

All research processes were carefully designed to be bicultural in an effort to recruit equal numbers of Māori and non-Māori participants. The research received ethical approval from the Victoria University of Wellington Human Ethics Committee.

### Survey

An online survey with six sections was designed and piloted with young people. It asked questions about internet access, social media use and activity, exposure to and engagement with vape, alcohol and tobacco marketing online, changes in social media use during COVID-19 lockdowns and vaping, drinking and smoking behaviours.

Here we focus on vaping results only.

### Demographic measures

Information was collected on respondents' age, gender, ethnic group(s) they belong to, sexual orientation, student and/or work status, who lives in their household, area of residence (e.g., town, city) and parent or caregiver status. Perceived socio-economic status (SES) was assessed by asking “how well off economically do you think your whānau/family is” and giving five response categories ranging from “not well off at all” to “very well off” (following Sverberg et al.<sup>11</sup>).

### Internet access and use

Questions asked about devices used to connect to the internet, type of connection, frequency of internet use, time spent on the internet, the capacity of their connection and who pays for it.

### Social media use

Respondents reported on the social media platforms they had used in the previous month (from a list of 18, and open text for any others).

### Exposure to vape product marketing online

Respondents were asked if they recalled “seeing any vape product advertising on the following social media” and responded for each of the platforms used in the previous month.

### Engagement with vape products online

Respondents were asked if they had done any of the following in the past 6 months: liked a vape brand; shared a status, picture or video related to a vape brand; followed a vape brand; entered a competition linked to a vape brand; searched for vape adverts on websites; used an image filter or effect related to vaping; engaged with other vape brand content; or purchased vape products online.

### Vaping behaviour

Respondents were asked if they had “ever vaped/used an e-cigarette”; those who said yes were also asked “how often do you vape now” (Never—I don't vape now; Occasionally; Once or twice a month; Once or twice a week; Most days; Daily).

### Procedure

We worked with a Māori graphic designer to develop a logo for the project and survey. A digital marketing agency was used to recruit respondents

aged 16–20 years from diverse socio-economic status backgrounds, gender identities and ethnicities. The campaign ran over a 6-week period in early 2022. The survey landing page provided the aims of the study and what participation would involve, and respondents agreed to take part under these conditions. At the end, participants were offered the opportunity to enter a prize draw to win one of six prizes. In total, 3,063 young people aged 16–20 took the survey.

To recruit participants aged 14–15, a number of high schools and kura across Aotearoa New Zealand were contacted in the last half of 2022, informed about the research and asked to assist with recruitment. Schools who agreed sent out an email to parents and caregivers of Year 10 students outlining the research and ensuring they consented to their young person being sent a link to the online survey, or stating they did not want the survey link to be provided to their young person. The survey link was subsequently sent to relevant Year 10 students; 731 respondents aged 14–15 completed the survey.

### Participants

Following data screening, the final sample consisted of 3,698 participants. The mean age was 17.1 (SD=1.8), with between 307–665 within each age (see Table 1). Participants could select more than one gender identity; 96.2% checked one and 3.8% checked more than one category. Gender responses were recoded into three discrete categories with multiple responses grouped together, as shown in Table 1. Over half the sample identified as female, over a third as male, and 6% as another (or more than one) gender identity. Participants could select more than one ethnicity group; 73.6% selected one ethnicity and 26.4% selected more than one. Where participants selected more than one, we first re-coded selection of Māori into the Māori category, and then Pasifika into the Pasifika category, to provide independent groups as shown in Table 1. Almost half the sample were Pākehā or NZ European, with over a quarter identifying as Māori. Most respondents reported that they were heterosexual (68%), with 13% reporting that they were bisexual and 5% currently unsure of their sexuality. Most lived in cities (68%), with the rest in towns (26%) and in rural locations (6%). Most respondents were students (84%), while a small number (56; 1.4%) were parents.

### Analytic strategy

Exploratory bivariate analyses were conducted

on all the primary variables, and the detailed results are provided in the Appendices. The central analyses assessed the associations of vaping behaviour, exposure to vape marketing online and engagement with vape marketing online for the four socio-demographic variables. As there are correlations among the socio-demographic variables, the central analyses were conducted using three binary logistic regressions to control for confounding. Interaction effects were also sought, but none were found that achieved statistical significance. Two new variables were created for the logistic regressions: age was dichotomised (14–17, 18–20) and SES was trichotomised (low, middle, high). Statistical analyses were conducted using IBM SPSS Statistics v.20. Confidence intervals (95% CI) were reported; two-sided  $p < 0.05$  was considered statistically significant.

## Results

Most participants (97%) reported using the internet “almost constantly” or “several times a day”. When asked about how much time they spend on the internet “on a normal day,” 91% reported 3 or more hours. Specifically, 1,700 (56.2%) stated they spent 5 or more hours per day on the internet, 1,038 (34.3%) 3–4 hours, 241 (8%) between 1–2 hours and 45 (1.5%) less than one hour per day. They were high users of social media platforms and reported using between 1–20 different platforms in the past month ( $M=5.1$ ; median=6). The most commonly used platforms were Instagram (92.2%), YouTube (85.6%), Snapchat (72.8%), TikTok (72.3%) and Facebook (67.5%). The average time users reported spending on these platforms each day varied: 2.8 hours (TikTok), 2.5 hours (YouTube), 1.9 hours (Instagram), 1.7 hours (Snapchat) 1.3 hours (Facebook).

### Vaping behaviour

Of the 2,185 participants who responded about whether they had ever vaped, half reported they had ( $n=1,110$ ; 50.8%), and half had not ( $n=1,075$ ; 49.2%). Of those who had ever vaped, 425 (38.4%) reported they do not vape now, while 297 (26.8%) reported that they now vaped daily or most days. To examine whether there were differences in vaping history (yes/no) across age, gender, ethnicity and SES groups, a binary logistic regression was undertaken. This and subsequent regressions were each run twice with different ethnicity reference groups in order to obtain all comparisons of interest. The model was significant ( $\chi^2$  [8,

**Table 1:** Description of the sample (N=3,698).

<b>Age (N=3,424)</b>	<b>n</b>	<b>%</b>
14	386	11.3
15	307	9.0
16	646	18.9
17	586	17.1
18	665	19.4
19	464	13.6
20	370	10.8
<b>Gender (N=3,382)</b>		
Wahine/tamahine/woman/girl	1,817	55.7
Tane/tama/man/boy	1,251	38.3
Transgender, agender, non-binary, intersex, something else	195	6.0
<b>Ethnicity (N=3,365)</b>		
Māori	851	25.6
Pākehā or NZ European	1,552	46.7
Pasifika (Samoan, Cook Islands, Tongan, Niuean, Fijian)	215	6.5
Other	704	21.2
<b>Perceived socio-economic status (N=3,136)</b>		
Not well off at all	153	4.1
Not particularly well off	501	13.5
Fairly well off	1,154	31.2
Rather well off	734	19.8
Very well off	192	5.2
Prefer not to say	402	10.9
<b>Sexuality (N=3,309)</b>		
Straight (heterosexual)	2,236	67.6
Gay/lesbian	117	3.6
Bisexual	440	13.3
Queer, pansexual, asexual, something else	250	7.5
Takatāpui	12	0.4

**Table 1 (continued):** Description of the sample (N=3,698).

Not sure yet	170	5.1
Prefer not to say	84	2.5
<b>Place of residence (N=3,196)</b>		
Major city	1,743	54.5
Other city	426	13.3
Town	525	16.4
Small town	306	9.6
In the country	196	6.1

**Table 2:** Binary logistic regression showing differences in vaping history by age, gender, ethnicity and socio-economic status (SES).

	Adjusted odds ratio	95% CI for odds ratio		p-value
		Lower	Upper	
<b>Age<sup>1</sup> 18–20 vs 14–17 years</b>	2.26	1.86	2.74	<0.001
<b>Gender</b>				0.007
Female vs male	1.38	1.13	1.69	0.002
Female vs other	1.21	0.83	1.78	0.324
<b>Ethnicity</b>				<0.001
Māori vs Pākehā	1.84	1.43	2.35	<0.001
Māori vs Pasifika	1.34	0.83	2.16	0.227
Māori vs Other	2.89	2.16	3.86	<0.001
Pasifika vs Pākehā	1.90	1.20	3.00	0.006
Pasifika vs Other	2.47	1.49	4.08	<0.001
<b>Socio-economic status (SES)</b>				0.067
Low vs middle SES	1.35	1.04	1.74	0.022
Low vs high SES	1.28	0.98	1.67	0.073

<sup>1</sup>Coding: Vaping history 1 = yes, 0 = no. For all category contrasts in the predictor variables, the left-hand category = 1 and the right-hand category = 0. This coding favours odds ratios greater than 1 for ease of interpretation.

**Table 3:** Binary logistic regression showing differences in exposure to vape product advertising on social media by age, gender, ethnicity and socio-economic status (SES).

	Adjusted odds ratio	95% CI for odds ratio		p-value
		Lower	Upper	
<b>Age<sup>1</sup> 18–20 vs 14–17 years</b>	0.74	0.62	0.89	0.002
<b>Gender</b>				0.758
Female vs male	1.04	0.85	1.26	0.713
Female vs other	0.90	0.62	1.30	0.578
<b>Ethnicity</b>				<0.001
Māori vs Pākehā	1.47	1.16	1.85	0.001
Māori vs Pasifika	0.85	0.54	1.34	0.474
Māori vs Other	1.72	1.31	2.26	<0.001
Pasifika vs Pākehā	1.73	1.12	2.69	0.014
Pasifika vs Other	2.03	1.28	3.23	0.002
<b>Socio-economic status (SES)</b>				0.084
Low vs middle SES	1.26	0.99	1.61	0.061
Low vs high SES	1.32	1.02	1.70	0.033

<sup>1</sup>Coding: Vape advertising exposure 1 = yes, 0 = no. For all category contrasts in the predictor variables, the left-hand category = 1 and the right-hand category = 0. This coding favours odds ratios greater than 1 for ease of interpretation.

**Table 4:** Binary logistic regression showing differences in engagement with vape marketing by age, gender, ethnicity and socio-economic status (SES).

	Adjusted odds ratio	95% CI for odds ratio		p-value
		Lower	Upper	
<b>Age<sup>1</sup> 18–20 vs 14–17 years</b>	1.21	.97	1.50	0.084
<b>Gender</b>				0.403
Female vs male	1.17	0.93	1.47	0.191
Female vs other	0.99	0.65	1.51	0.950
<b>Ethnicity</b>				<0.001
Māori vs Pākehā	1.85	1.43	2.40	<0.001
Māori vs Pasifika	0.98	0.61	1.57	0.925
Māori vs Other	2.41	1.74	3.34	<0.001

**Table 4 (continued):** Binary logistic regression showing differences in engagement with vape marketing by age, gender, ethnicity and socio-economic status (SES).

Pasifika vs Pākehā	1.90	1.20	3.00	0.006
Pasifika vs Other	2.47	1.49	4.10	<0.001
<b>Socio-economic status (SES)</b>				0.005
Low vs middle SES	1.30	0.99	1.70	0.056
Low vs high SES	1.62	1.21	2.17	0.001

<sup>1</sup>Coding: Vape marketing engagement 1 = yes, 0 = no. For all category contrasts in the predictor variables, the left-hand category = 1 and the right-hand category = 0. This coding favours odds ratios greater than 1 for ease of interpretation.

N=1,860] = 160.34,  $p < 0.001$ ) and age, gender and ethnicity groups made statistically significant contributions to the model, as shown in Table 2. The odds of older respondents (18–20 years) having ever vaped are 2.26 times greater than those for younger respondents (14–17 years). For females, the odds of having a vaping history are 1.38 times greater than those for males. The odds of having vaped among Māori respondents are 1.84 times greater than those for Pākehā, and 2.89 times greater than those for other ethnicities, excluding Pasifika. Pasifika respondents have 1.9 times greater the odds of having a vaping history compared with Pākehā, and 2.47 times greater compared with other ethnicities, excluding Māori. There is a tendency for a vaping history to be more common in lower SES groups, but this overall trend did not achieve statistical significance ( $p = 0.067$ ).

### Exposure to vape product advertising on social media

Within the total sample of 3,698 participants, 2,224 (60.1%) responded to whether or not they had seen vape product advertising on any of the social media platforms they reported using regularly. Of these, 1,119 (50.3%) reported they had seen such advertising on at least one platform, while 1,105 (49.7%) responded that they had seen none. Vape advertising was most commonly seen on Instagram (65%), TikTok (58.1%), YouTube (36.4%), Facebook (28%) and Snapchat (25.8%). A binary logistic regression was undertaken to explore differences in vaping advertisement exposure online across age, gender, ethnicity and SES groups. The model was significant ( $\chi^2 [8, N = 1,903] = 40.63, p < 0.001$ ) and age and ethnicity made statistically significant contributions, as shown in Table 3. The odds ratio of 0.74 shows an inverse relationship with age: younger respondents

(14–17) are more likely than older respondents (18–20) to have been exposed to vape product advertising. Māori respondents have 1.47 times greater the odds of having seen vaping advertisements on social media compared with Pākehā, and 1.72 times greater the odds compared with other ethnicities. Pasifika respondents have 1.73 times greater the odds of having seen vaping advertisements compared with Pākehā, and 2.03 times greater the odds compared with other ethnicity groups. Again, the trend towards advertising exposure being more common in lower SES respondents is suggestive but not statistically significant.

### Engagement with vape marketing on social media

Of the 2,148 participants who responded to whether they had engaged online with vape product marketing, 563 (26.2%) reported that they had engaged with at least one of the seven vape-related activities listed. Most commonly they had purchased vape products online ( $n = 270; 48.0\%$ ), liked a vape brand on social media ( $n = 228; 40.5\%$ ) or shared something related to a vape brand ( $n = 221; 39.3\%$ ). Among those who had purchased vape products online, 38% ( $n = 102$ ) were aged 14–17 years.

A binary logistic regression was undertaken to explore differences in engagement with vape marketing online across age, gender, ethnicity and SES groups. The model was significant ( $\chi^2 [8, N = 1,841] = 67.12, p < 0.001$ ), with ethnicity and SES contributing, as shown in Table 4. The odds of Māori respondents engaging with vape marketing are 1.85 times greater than those for Pākehā and 2.41 times greater than those for other ethnicities. The odds of Pasifika respondents engaging with vape marketing are 1.9 times greater than those for Pākehā and 2.47 times greater than those for

other ethnicity groups. Respondents of low SES have 1.62 times greater the odds of engaging with vape advertisements compared with those of high SES.

### Associations between vaping history with vape marketing exposure and engagement on social media

Chi-squared analyses were undertaken to explore associations between vape marketing exposure and engagement and vaping history (ever vaped). Respondents who reported seeing vape marketing on social media were more likely to have a vaping history ( $\chi^2=75.36$ ,  $p<.001$ , Cramers  $V = .19$ ) than those who had never vaped. Similarly, those who reported engaging with vape marketing on social media were significantly more likely to have a vaping history than those who had never vaped ( $\chi^2 = 406.94$ ,  $p<.001$ , Cramers  $V = .44$ ; see Appendices for contingency tables).

## Discussion

These findings show that high numbers of young people recall being exposed to vape product marketing on social media platforms, and they are engaging with this marketing in ways that encourage its use as an appealing lifestyle product. This includes young people who are under the legal age of product purchase (18 years), some of whom report purchasing vape products online. It is unlikely that these young people are using vaping as a smoking cessation tool. This marketing appears in young people's social media feeds in ways that cannot be easily tracked or assessed by researchers.

Half of the sample reported having vaped previously, while fewer (8%) reported being current regular vapers. Older respondents (18–20 years), female respondents and Māori and Pasifika respondents were all more likely to report having ever vaped, with no differences found across socio-economic groups. These rates are similar to those reported from the Youth19 survey, in which 10% of students reported vaping regularly (monthly or more), and 6% weekly or more.<sup>1</sup> Previous research with university students in Aotearoa New Zealand found daily vaping rates had increased from 2.7% in 2018 to 5.4% in 2019, with males and older students having higher odds of vaping.<sup>12</sup>

Despite the small number of participants who were current vapers, half of the sample had seen vape product advertising on the social media

platforms they use regularly. However, this varied across the socio-demographic groups. Those aged 17 and under were more likely to report seeing vape product advertising compared to those aged 18–20, even though older respondents were more likely to regularly vape. This finding may be explained by the self-reported nature of this data. For older participants vaping may be normalised, and therefore its marketing may be less likely to be noticed or recalled. In contrast, those aged 14–17 years may be at a stage where they are considering vaping, their peers may be starting to vape and they may be more aware of older people vaping. As a result, they may be primed to notice vaping, more susceptible and therefore more likely to think about, notice and recall vape product advertising compared to older participants. There is also the possibility that the industry finds ways to target younger people who are developing formative behaviours and attitudes. Further, respondents were asked about seeing “vape product advertising”; their interpretation of advertising may be broader than paid advertisements and could include organic content from influencers and other popular figures.

While there were no differences in exposure to vape product marketing by gender or socio-economic status groups, Māori and Pasifika respondents were more likely to report seeing vape product advertising than other ethnicity groups. This relationship was not explained by socio-economic status. This finding is concerning given the higher rates of vaping in Māori and Pasifika respondents and raises the possibility that Māori and Pasifika are targeted more than others with vape marketing on their preferred platforms. We do not yet know if higher exposure to vape advertising in the digital environment replicates higher exposure in physical environments. Laking (2023) argues that “*although sales and marketing has had a big part [of the debate over vaping], it is not the whole story*”.<sup>13</sup> We agree with his analysis that the life experiences of young people are crucial, particularly given Māori experiences of colonisation, poverty and racism<sup>14</sup> as the critical context for understanding some drivers of vaping. Yet this must be considered alongside the strategies of the tobacco industry, which has systematically promoted and targeted Indigenous peoples with commercialised nicotine products.<sup>15,16</sup>

Over a quarter of the sample reported that they had actively engaged with vape product marketing on social media platforms, including purchasing



vape products online, “liking” a vape brand on social media or sharing something related to a vape brand. Māori and Pasifika respondents were more likely to report engaging with vape marketing online than other ethnic groups, again raising issues around the broader life contexts of these young people as drivers of vaping. Lower socio-economic groups were more likely to engage with vape marketing online than higher groups, although there were no differences found by age or gender. Concerningly, of those respondents who reported purchasing vape products online, more than a third (over 100) were aged 14–17. This highlights that current legislation to prohibit underage young people purchasing vape products does not appear to be effective in the digital environment.

Social media’s algorithmic marketing models aim to find the most valuable audience for the advertiser. Scholars from different disciplines have theorised how these systems target and deliver advertisements in ways that are likely to lead to skewed outcomes along racialised and gendered lines (e.g., Ali et al.<sup>17</sup>). This has been described as “discrimination by optimisation,” even when marketers and advertisers aim to be inclusive.<sup>17,18</sup> While many platforms do not allow advertisers to explicitly target users by ethnicity, algorithms generate “ethnic affinity” categories and social proximity data to personalise advertisements and content in ways that can be racialised and discriminatory.<sup>19</sup> There is very little published empirical work that demonstrates these processes in action; one exception is a study of algorithmically targeted advertising of university scholarships in the USA, which concluded it reproduced ethnic inequities.<sup>20</sup>

### Limitations

We need to treat these results with some caution, as they were obtained from a self-selected sample of people who chose to respond to an online survey regarding social media use and marketing. This sample may be more likely than other young people to both notice and engage with vape marketing online. The SES measure asked participants to rate their own perceptions of how well off their family is, and a more objective SES measure might have led to different results.

However, previous researchers have noted difficulties in conceptualising and measuring SES among adolescents.<sup>11</sup> They have argued that perceived SES assesses more salient dimensions of their social status than more objective measures (such as parents’ occupation), because these perceptions arise from their view of their social position within their own social worlds.<sup>11</sup> The survey design meant that all marketing exposure and engagement questions were asked for every social media platform that respondents reported using regularly. We had not anticipated that respondents would report such a large number of platforms, and this meant that many were replying to every question for a large number of platforms. This may explain the drop-off in responses for the digital marketing section in the online questionnaire and help explain why there were more missing data in this section. Reporting biases may also have affected these findings; for example, some questions may have been deemed more sensitive by specific groups who therefore chose to either not answer the question, or to answer in a way that portrayed them more positively (e.g., higher SES groups, particular age groups may have chosen not to respond about particular topics).

### Conclusions

Despite the limitations of the study, these findings raise concerns about the high levels of vape product marketing that young people are being exposed to on social media platforms, and the inequitable targeting of such marketing. While not detracting from the potential effects of such specific targeting and exposure, we need to consider these findings within their context, where colonial trauma, structural forms of disadvantage and racism are associated with higher use of addictive products and inequitable health outcomes for Māori.<sup>13,21</sup> It is also worth noting that the patterns of exposure to digital marketing identified in this study are normally occluded due to the ways in which social media platforms operate, and only become apparent through the retrospective recall of users. Such lack of transparency is an issue that needs to be urgently addressed.

**COMPETING INTERESTS**

Nil.

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## Appendices

### Appendix 1: Bivariate associations among the socio-demographic variables

Appendix Table 1: Association between age and gender.

			Gender			Total
			Wahine/female	Tane/male	All others	
Age	14–17	Count	927	792	101	1,820
		% within age	50.9%	43.5%	5.5%	100.0%
	18–20	Count	889	458	94	1,441
		% within age	61.7%	31.8%	6.5%	100.0%
Total		Count	1,816	1,250	195	3,261
		% within age	55.7%	38.3%	6.0%	100.0%

Chi-square (2, N=3,261) = 46.88,  $p < .001$ , Cramers V=.12

Appendix Table 2: Association between age and ethnicity.

			Ethnicity				Total
			Māori	Pākehā	Pasifika	Other	
Age	14–17	Count	487	835	129	408	1,859
		% within age	26.2%	44.9%	6.9%	21.9%	100.0%
	18–20	Count	364	716	85	296	1,461
		% within age	24.9%	49.0%	5.8%	20.3%	100.0%
Total		Count	851	1,551	214	704	3,320
		% within age d	25.6%	46.7%	6.4%	21.2%	100.0%

Chi-square (3, N=3,320) = 6.15,  $p = .11$ , Cramers V=.04

Appendix Table 3: Association between age and SES.

			SES			Total
			Low	Middle	High	
Age	14–17	Count	301	613	558	1,472
		% within age	20.4%	41.6%	37.9%	100.0%
	18–20	Count	353	541	367	1,261
		% within age	28.0%	42.9%	29.1%	100.0%
Total		Count	654	1,154	925	2,733
		% within age	23.9%	42.2%	33.8%	100.0%

Chi-square (2, N=2,733) = 31.97,  $p < .001$ , Cramers V=.11

**Appendix Table 4:** Association between gender and ethnicity.

			Ethnicity				Total
			Māori	Pākehā	Pasifika	Other	
<b>Gender</b>	Wahine/female	Count	486	835	114	353	1,788
		% within gender	27.2%	46.7%	6.4%	19.7%	100.0%
	Tane/male	Count	302	560	84	281	1,227
		% within gender	24.6%	45.6%	6.8%	22.9%	100.0%
	All others	Count	40	103	7	41	191
		% within gender	20.9%	53.9%	3.7%	21.5%	100.0%
<b>Total</b>		Count	828	1,498	205	675	3,206
		% within gender	25.8%	46.7%	6.4%	21.1%	100.0%

Chi-square (6, N=3,206) = 12.25, p=.06, Cramers V=.04

**Appendix Table 5:** Association between gender and SES.

			SES			Total
			Low	Middle	High	
<b>Gender</b>	Wahine/female	Count	377	647	458	1,482
		% within gender	25.4%	43.7%	30.9%	100.0%
	Tane/male	Count	205	411	385	1,001
		% within gender	20.5%	41.1%	38.5%	100.0%
	All others	Count	45	62	58	165
		% within gender	27.3%	37.6%	35.2%	100.0%
<b>Total</b>		Count	627	1,120	901	2,648
		% within gender	23.7%	42.3%	34.0%	100.0%

Chi-square (4, N =2,648) = 19.14, p=.001, Cramers V=.06

**Appendix Table 6:** Association between ethnicity and SES.

			SES			Total
			Low	Middle	High	
<b>Ethnicity</b>	Māori	Count	234	263	139	636
		% within ethnicity	36.8%	41.4%	21.9%	100.0%
	Pākehā	Count	253	541	544	1,338
		% within ethnicity	18.9%	40.4%	40.7%	100.0%

**Appendix Table 6 (continued):** Association between ethnicity and SES.

<b>Ethnicity</b>	Pasifika	Count	43	72	38	153
		% within ethnicity	28.1%	47.1%	24.8%	100.0%
	Other	Count	115	265	202	582
		% within ethnicity	19.8%	45.5%	34.7%	100.0%
<b>Total</b>		Count	645	1,141	923	2,709
		% within ethnicity	23.8%	42.1%	34.1%	100.0%

Chi-square (6, N=2,709) = 115.99, p<.001, Cramers V=.15

## Appendix 2: Bivariate associations among the vaping variables (behaviour, marketing exposure and engagement marketing)

Appendix Table 7: Association between vaping behaviour and advert exposure.

			Seen advert		Total
			No	Yes	
<b>Ever vaped</b>	No	Count	626	417	1,043
		% within ever vaped	60.0%	40.0%	100.0%
	Yes	Count	447	638	1,085
		% within ever vaped	41.2%	58.8%	100.0%
<b>Total</b>		Count	1,073	1,055	2,128
		% within ever vaped	50.4%	49.6%	100.0%

Chi-square (1, N=2,128) = 75.36, p<.001, Cramers V=.19

Appendix Table 8: Association between vaping behaviour and advert engagement.

			Engaged with advert		Total
			No	Yes	
<b>Ever vaped</b>	No	Count	952	60	1,012
		% within ever vaped	94.1%	5.9%	100.0%
	Yes	Count	580	470	1,050
		% within ever vaped	55.2%	44.8%	100.0%
<b>Total</b>		Count	1,532	530	2,062
		% within ever vaped	74.3%	25.7%	100.0%

Chi-square (1, N=2,062) = 406.94, p<.001, Cramers V=.44

Appendix Table 9: Association between advert exposure and engagement.

			Engaged with advert		Total
			No	Yes	
<b>Seen advert</b>	No	Count	905	151	1,056
		% within advert seen	85.7%	14.3%	100.0%
	Yes	Count	639	406	1,045
		% within advert seen	61.1%	38.9%	100.0%
<b>Total</b>		Count	1,544	557	2,101
		% within advert seen	73.5%	26.5%	100.0%

Chi-square (1, N=2,101) = 162.52, p<.001, Cramers V=.28

### Appendix 3: Bivariate associations between socio-demographic and vaping variables

Appendix Table 10: Chi-squared analyses of associations between socio-demographic variables (age, gender, ethnicity and SES) with vaping behaviour.

Socio-demographic variable	Subgroup	Ever vaped						df (N)	Chi-square	p-value	Cramer's V
		No		Yes		Total					
		Count	%	Count	%	Count	%				
Age	14–17	721	58.1	519	48.9	1,240	100				
	18–20	354	37.5	591	62.5	945	100				
	All ages	1,075	49.2	1,110	50.8	2,185	100				
								1 (2,185)	91.81	<.001	.21
Gender	Wahine/female	524	44.4	655	55.6	1,179	100				
	Tane/male	432	55.2	350	44.8	782	100				
	Other genders	72	49.0	75	51.0	147	100				
	All genders	1,028	48.8	1,080	51.2	2,108	100				
								2 (2,108)	21.95	<.001	.10
Ethnicity	Māori	181	34.5	343	65.5	524	100				
	Pākehā	529	50.0	529	50.0	1,058	100				
	Pasifika	59	50.9	57	49.1	116	100				
	Other	292	62.5	175	37.5	467	100				
	All ethnicities	1,061	49.0	1,104	51.0	2,165					
								3 (2,165)	78.61	<.001	.19



**Appendix Table 10 (continued):** Chi-squared analyses of associations between socio-demographic variables (age, gender, ethnicity and SES) with vaping behaviour.

<b>SES</b>	Low	172	39.3	266	60.7	438	100				
	Middle	417	51.0	401	49.0	818	100				
	High	355	52.4	322	47.6	677	100				
	All SES	944	48.8	989	51.2	1,933					
									2 (1,933)	21.06	<.001

**Appendix Table 11:** Chi-squared analyses of associations between socio-demographic variables (age, gender, ethnicity and SES) with vape advert exposure.

Socio-demographic variable	Subgroup	Seen vape advert						df (N)	Chi-square	p-value	Cramer's V
		No		Yes		Total					
		Count	%	Count	%	Count	%				
<b>Age</b>	14–17	592	46.8	672	53.2	1,264	100				
	18–20	513	53.4	447	46.6	960	100				
	All ages	1,105	49.7	1,119	50.3	2,224	100				
									1 (2,224)	9.51	.002
<b>Gender</b>	Wahine/female	587	48.4	625	51.6	1,212	100				
	Tane/male	400	50.7	389	49.3	789	100				
	Other genders	74	50.3	73	49.7	147	100				
	All genders	1,061	49.4	1,087	50.6	2,148	100				
									2 (2,148)	1.04	.60

**Appendix Table 11 (continued):** Chi-squared analyses of associations between socio-demographic variables (age, gender, ethnicity and SES) with vape advert exposure.

<b>Ethnicity</b>	Māori	221	41.5	311	58.5	532	100				
	Pākehā	567	52.7	508	47.3	1,075	100				
	Pasifika	46	37.4	77	62.6	123	100				
	Other	257	54.3	216	45.7	473	100				
	All ethnicities	1,091	49.5	1,112	50.5	2,203	100				
								3 (2,203)	29.63	< .001	.12
<b>SES</b>	Low	193	43.1	255	56.9	448	100				
	Middle	431	51.4	407	48.6	838	100				
	High	371	53.5	323	46.5	694	100				
	All SES	995	50.3	985	49.7	1,980	100				
									2 (980)	12.54	.002

**Appendix 12:** Chi-squared analyses of associations between socio-demographic variables (age, gender, ethnicity and SES) with vape advert engagement.

<b>Socio-demographic variable</b>	<b>Subgroup</b>	<b>Engaged with vape advert</b>						<b>df (N)</b>	<b>Chi-square</b>	<b>p-value</b>	<b>Cramer's V</b>
		<b>No</b>		<b>Yes</b>		<b>Total</b>					
		<b>Count</b>	<b>%</b>	<b>Count</b>	<b>%</b>	<b>Count</b>	<b>%</b>				
<b>Age</b>	14–17	919	75.8	293	24.2	1,212	100				
	18–20	666	71.2	270	28.8	936	100				
	All ages	1,585	73.8	563	26.2	2,148	100				
									1 (2,148)	5.96	.02

**Appendix 12 (continued):** Chi-squared analyses of associations between socio-demographic variables (age, gender, ethnicity and SES) with vape advert engagement.

<b>Gender</b>	Wahine/female	829	71.5	330	28.5	1,159	100				
	Tane/male	595	77.4	174	22.6	769	100				
	Other genders	106	73.1	39	26.9	145	100				
	All genders	1,530	73.8	543	26.2	2,073	100				
									2 (2,073)	8.21	.02
<b>Ethnicity</b>	Māori	313	61.3	198	38.7	511	100				
	Pākehā	805	77.3	237	22.7	1,042	100				
	Pasifika	77	64.7	42	35.3	119	100				
	Other	375	82.1	82	17.9	457	100				
	All ethnicities	1,570	73.7	559	26.3	2,129	100				
									3 (2,129)	69.15	<.001
<b>SES</b>	Low	281	65.5	148	34.5	429	100				
	Middle	605	74.6	206	25.4	811	100				
	High	538	79.9	135	20.1	673	100				
	All SES	1,424	74.4	489	25.6	1,913	100				
									2 (1,913)	28.73	<.001