Support for and likely impacts of endgame measures in the Smokefree Aotearoa Action Plan: findings from the 2020–2021 International Tobacco Control New Zealand (EASE) surveys

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ABSTRACT

AIM: In February 2024, the Aotearoa New Zealand Government repealed legislation to mandate very low nicotine cigarettes (VLNCs), greatly reduce the number of tobacco retailers and disallow sale of tobacco products to people born after 2008 (smokefree generation). We investigated acceptability and likely impacts of these measures among people who smoke or who recently (≤2 years) quit smoking.

METHOD: We analysed data from 1,230 participants from Wave 3 (conducted in late 2020 and early 2021) and 615 participants from Wave 3.5 (conducted in June/July 2021) of the New Zealand arm of the International Tobacco Control (ITC) Policy Evaluation Project. Data were weighted to represent the national population of people who smoke and who recently quit smoking.

RESULTS: Support (excluding "Don't know" responses) was 82.7% (95% confidence interval 77.9, 86.6) for a smokefree generation, 75.0% (95% CI 71.4, 78.3) for mandated VLNCs and 35.2% (95% CI 31.7, 38.9) for retailer reduction. Support was mostly similar by ethnicity, gender, age and evidence of financial hardship, but was higher among people who had recently quit smoking.

Around half of the participants who smoked anticipated quitting completely, switching to vaping or cutting down the amount they smoke if mandated VLNCs or substantial retailer reductions were introduced. If VLNCs were mandated, 19% of people who smoked stated they would carry on smoking like they do now and find a way to get the cigarettes or tobacco they want to smoke.

CONCLUSION: Support for and anticipated actions in response to the smokefree legislation measures call into question the Government's decision to repeal them.

Despite public health efforts, an estimated 363,000 New Zealanders still smoke.[1] Smoking is the leading cause of preventable death in Aotearoa New Zealand. Its impact is substantially greater among certain population groups, including among those with socio-economic disadvantage, and among Māori.[2,3] In 2011, in response to a Māori Affairs Select Committee report, the New Zealand Government adopted a goal to reduce smoking prevalence and tobacco availability to minimal levels by 2025 (the Smokefree Aotearoa 2025 Goal).[4,5]

While a range of tobacco control interventions were introduced over the subsequent decade, these were largely "business-as-usual" approaches. In December 2021, the New Zealand Government introduced the Smokefree Aotearoa 2025 Action Plan (Smokefree Action Plan),[6] to reach a goal of <5% daily smoking prevalence for all groups of New Zealanders by 2025. The plan included three world-first "endgame" measures: 1) mandating very low nicotine cigarettes (VLNCs), 2) a substantial reduction in the number of retailers where tobacco can be sold, and 3) introduction of a "smokefree generation" by disallowing the sale of smoked tobacco products to people born on or after a certain date. Other supporting interventions included increased resources for mass media campaigns to promote smoking cessation and discourage smoking uptake in young people.[6]

In January 2023, smokefree legislation came into force that would implement the three world-first measures in the action plan (the *Smokefree Environments and Regulated Products [Smoked Tobacco] Amendment Act* [*SERPA Act*]). The reduction in retailers was due to be introduced in July 2024, mandated VLNCs in April 2025 and the smokefree generation in January 2027.[7] However, in February 2024, New Zealand's new

Government partially repealed the smokefree legislation, stopping the implementation of all three of these measures.

The International Tobacco Control (ITC) Policy Evaluation Project is an international cohort study, conducted in over 30 countries. It aims to measure the impacts of public health policies to reduce the adverse impacts of smoking.[8] The purpose of this study is to use data from the New Zealand arm of the study to understand 1) the degree of support for the Smokefree Action Plan measures among people who smoke or recently quit smoking, and 2) anticipated responses to the introduction of a retailer reduction and VLNCs among people who smoke. This information is important for establishing the degree of acceptability of the measures and estimating their likely impacts.

Methods

Study design, sampling and recruitment

Data were analysed from Waves 3 and 3.5 of the New Zealand arm of the ITC study (also known as EASE: Evidence for Achieving Smokefree 2025 Equitably). This is an ongoing prospective cohort and repeat cross-sectional study that surveys people who currently smoke or quit smoking within the last 2 years.[8] Survey waves are conducted every 12–18 months, and participants lost to follow-up are replenished by new participants.

Participants are eligible to take part if aged ≥18, living in Aotearoa New Zealand, and:

- currently smoke cigarettes or tobacco at least monthly, and have smoked at least 100 cigarettes in their lifetime, or
- previously smoked at least monthly, have smoked at least 100 cigarettes in their lifetime and quit smoking within the past 24 months.

Wave 3 was conducted online from 8 November to 24 December in 2020 and from 1 February to 27 February in 2021. It included participants from Wave 2 who agreed to participate in follow-up surveys and replenishment participants recruited through an online panel and social media. The sampling scheme was designed to ensure adequate statistical precision and explanatory power for priority population groups, aiming to recruit equal numbers of Māori, Pacific peoples and Non-Māori-Non-Pacific participants (i.e., 533 participants in each group), and 400 participants aged 18–24 years. We undertook active recruitment targeting these groups through posts on the University of Otago Pacific Islands Centre Facebook page, two local/community Facebook groups in areas with large Māori and Pacific populations (Porirua and South Auckland) and targeted paid social media advertisements.

Wave 3.5 was an interim online survey with a shorter questionnaire, conducted online from 8 June to 26 July in 2021. We only invited participants from Wave 3 for this survey, with no replenishment of participants.

Both surveys were implemented by research company Research New Zealand. Full details of the sampling and survey methods are available in the ITC Technical Report.[8]

Data collection and measures

Measures of ethnicity, age, gender, evidence of financial hardship and smoking status were collected. Ethnicity questions were based on the New Zealand Census questions. Smoking status was defined as a "person who smokes daily not intending to quit", "person who smokes daily intending to quit", "person who smokes less than daily but at least monthly" or "person who recently quit smoking". Wording of the survey questions relating to smoking status and financial hardship is shown in the Table 1 legend.

Wording of questions assessing support for policy measures and expected behaviours if policies are introduced are given in Textbox 1 and the results Tables. The question about support for a smokefree generation was included only in Wave 3.5; all other questions are reported from the Wave 3 survey.

Data analysis

Data analysis was conducted in R 4.1 (R Institute, Vienna, Austria), using the survey package[9] to conduct analyses on weighted data, accounting for complex survey design. Weighting was conducted using raked weight calculations drawing on ethnicity, gender, age group and region, with weights calibrated based on population estimates from the New Zealand Health Survey (for survey years 2018–2019 and 2019–2020, combined). These weights permitted estimates to be applicable to the Aotearoa New Zealand population of people who smoke or who have recently quit smoking.

We report prevalence of outcome measures for key demographic and smoking-related sub-groups as weighted percentages with 95% confidence intervals (95% CI). Missing and refused answers

Textbox 1: Survey questions and response options.

Support for Smokefree Action Plan measures:

Questions:

"If you could get nicotine in products other than tobacco products, would you support or oppose a law that reduces the amount of nicotine in cigarettes and tobacco, to make them less addictive?"

"Would you support or oppose a law that reduced the number of places in New Zealand that were allowed to sell tobacco from around 6,000 (the current number) to 300?"

"Would you support or oppose a law that prevents anyone who is currently 18 or younger from ever buying cigarettes or tobacco? This measure would eventually create a tobacco-free generation."

"Do you support or oppose increased government spending on media campaigns to discourage youth and young people from starting to smoke?"

"Do you support or oppose increased government spending on media campaigns to promote quitting smoking?"

"Do you support or oppose the Smokefree 2025 policy goal?" (Note that a description of the goal was given prior to asking this question, worded as follows: "We will now describe the government's Smokefree 2025 goal: the goal aims to reduce the availability of tobacco and the number of people smoking to minimal levels, thereby making New Zealand essentially a smokefree nation by 2025. ['Minimal numbers of people smoking' is often interpreted as: less than 5% of people in all population groups will smoke.]")

Response options:

"Strongly support", "Support", "Strongly oppose", "Oppose" and "Don't know".

Anticipated response to very low nicotine cigarettes:

Question:

"Which ONE of the following would you be MOST LIKELY to do if the amount of nicotine in cigarettes and tobacco was greatly reduced so they were no longer addictive?"

Response options:

"Carry on smoking like I do now, with the cigarettes or tobacco that were available", "Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke", "Reduce the amount I smoke", "Quit smoking entirely", "Switch to vaping/e-cigarettes" and "Don't know".

Anticipated response to a retailer reduction:

Question:

"Which ONE of the following would you be MOST LIKELY to do if the number of places in New Zealand that could sell tobacco was reduced from around 6,000 to 300?"

Response options:

"Carry on smoking like I do now", "Reduce the amount I smoke", "Quit smoking entirely", "Switch to vaping/e-cigarettes" and "Don't know".

were excluded. We estimated support for measures both excluding and including "Don't know" answers. In the results section we present support results with "Don't know" answers excluded, as this directly addresses the question of support from participants who expressed an opinion about support or opposition to the smokefree measures. The corresponding analyses of support measures including "Don't know" as a valid response option are presented in Figure 1 and the Appendices. Anticipated actions are presented with "Don't know" responses excluded.

To compare groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates:[10] smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship. Marginal standardisation and differences for multinomial outcomes (more than two levels) were conducted in Stata 17 (Statacorp, College Station, TX).

Prioritised ethnicity was used for weighting (participants classified as: Māori [including people who also identified as Pacific peoples], Pacific peoples [excluding people who also identified as Māori] or Non-Māori-Non-Pacific). However, the results are reported using a modified total response ethnicity approach[11] to report estimates for Māori and Pacific peoples (relative to an exclusive non-Māori/non-Pacific category). This is to ensure appropriate representation of Māori and Pacific participants. For the analysis using modified total ethnicity, groups included Māori (including people who also identified as Pacific peoples), Pacific peoples (including people who also identified as Māori) or Non-Māori-Non-Pacific (people who do not identify as Māori or Pacific peoples). For reporting of patterning by ethnicity, two separate analyses were run to produce estimates for total Māori (relative to the mutually exclusive Non-Māori-Non-Pacific group) and for total Pacific peoples (relative to the mutually exclusive Non-Māori-Non-Pacific group).

Data for participants reporting "Other" for their gender were excluded from marginally adjusted estimates and differences, as there was an insufficient number to allow for inclusion as a category in the multivariable models (n=18 at W3, n=5 at W3.5).

Ethics

Ethical approval was obtained prior to participant recruitment from the University of Otago Human Ethics Committee (20/020) and University of Waterloo Research Ethics Board (REB #42549). All participants provided consent for participating in the surveys.

Results

Survey participants

Participant characteristics are shown in Table 1 (unweighted percentages to describe the participant profile). In Wave 3, there were 1,230 participants; 80.7% currently smoked and 19.3% had recently quit smoking. In Wave 3.5, there were 615 participants (50% retention from W3); 64.1% currently smoked and 35.9% had recently quit.

Support for the repealed measures

Support for each of the measures is summarised in Figure 1, including values for when "Don't know" answers were included.

Support for the mandated VLNC policy, among those who expressed support or opposition, was 75.0% (Figure 1, Table 2). Support for retailer reduction was 35.2% and support for a smokefree generation was 82.7% (Figure 1, Table 2). When "Don't know" answers were included, support was lower, particularly for VLNCs at 60.5% (Figure 1).

Analyses that excluded "Don't know" values are presented in Table 2. For analyses with "Don't know" answers included, please see Appendix Table 4.

As outlined in Table 2, all three measures had significantly greater support from people who recently quit smoking (compared to people who currently smoked) and from people who smoked less than daily (compared to people who smoked daily and intended to quit). There was lower support for VLNCs and retailer reduction among Māori compared with Non-Māori-Non-Pacific.

Support for mandated VLNCs and a smokefree generation was lower among people aged 18–24 compared to those aged ≥45; however, a substantial majority supported both these measures in all three age groups. People aged 25–44 were also less likely to support a smokefree generation compared to people aged ≥45. People aged 25–44 were more likely to support a retailer reduction compared with people aged ≥45.

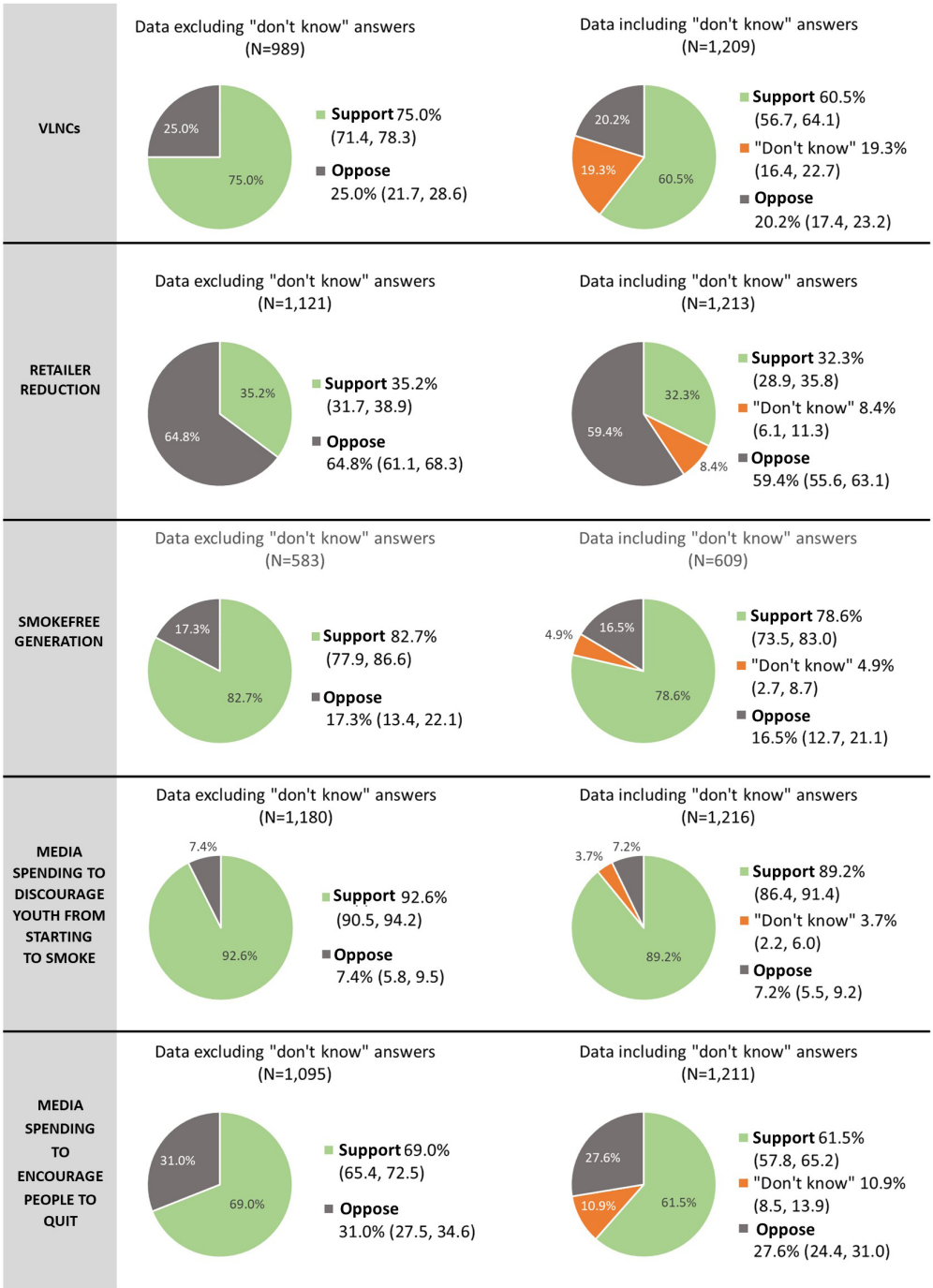
Support for a smokefree generation was higher in females compared to males (absolute marginal difference [aMD] 8.4%, Appendix Table 1). There was no clear evidence of any other differences in support for the three policy measures by ethnicity, age, gender or financial hardship. (Table 2 and Appendix Table 1).

Table 1: Participant characteristics.

Characteristic	Wave 3 N=1,230	Wave 3.5 N=615
	unweighted N (%) unless otherwise stated	
Age (years)*		
Mean (SD)	38.0 (14.8)	41.2 (15.2)
18–24	326 (26.5%)	111 (18.0%)
25–44	528 (42.9%)	267 (43.4%)
≥45	376 (30.6%)	237 (38.5%)
Gender		
Male	442 (35.9%)	206 (33.5%)
Female	770 (62.6%)	404 (65.7%)
Other	18 (1.5%)	5 (0.8%)
Ethnicity**		
Māori	492 (40.0%)	210 (34.1%)
Pacific peoples	238 (19.3%)	102 (16.6%)
Non-Māori-Non-Pacific	546 (44.4%)	319 (51.9%)
Smoking status^		
People who smoke daily	700 (56.9%)	295 (48.0%)
with no intent to quit	182 (14.8% of total)	89 (14.5% of total)
with intent to quit	474 (38.5% of total)	184 (29.9% of total)
no response to question on intent to quit#	44 (3.6% of total)	22 (3.6% of total)
People who smoke less than daily	292 (23.7%)	99 (16.1%)
People who have recently quit smoking	238 (19.3%)	221 (35.9%)
Evidence of financial hardship^^		
Yes	345 (28.0%)	141 (22.9%)
No	847 (68.9%)	450 (73.2%)
No response to question on financial hardship#	38 (3.1%)	24 (3.9%)

*Age for Wave 3.5 was calculated as age at date of W3 data collection to allow direct comparisons.
**Some participants identified as both Māori and Pacific peoples (n=46 [3.7%] from Wave 3 and n=16 [2.6%] from Wave 3.5) and are reported in both categories, resulting in percentages adding to over 100%.
^"Daily smoker, wanting to quit" is defined as a person who smoked daily and selected one of the following options when asked "Are you planning to quit smoking?": "within the next month", "between 1–6 months from now" or "sometime in the future, beyond 6 months".
^^Financial hardship is defined as answering "yes" to the following question: "In the last 30 days, because of a shortage of money, were you unable to pay any important bills on time, such as electricity, telephone or rent bills?".
#This includes participants who refused to answer, answered "Don't know", or had missing data for this question.

Figure 1: Support for the measures with "Don't know" responses included and excluded.



Percentages are weighted data. Support combines answers of "strongly support" or "support". Oppose combines answers of "strongly oppose" and "oppose". Data for support for a smokefree generation are from Wave 3.5; all other data are from Wave 3. Values in brackets are 95% confidence intervals.

For each measure we excluded participants who refused to answer. The number (%) excluded for Wave 3 were: mandated very low nicotine cigarettes: 21/1,230 (1.7%); retailer reduction: 17/1,230 (1.4%); media campaign spending to reduce youth uptake: 14/1,230 (1.1%); media campaign spending to encourage smoking cessation: 19/1,230 (1.5%). The number (%) excluded for Wave 3.5 were: smokefree generation: 6/615 (1.0%).

Very low nicotine cigarettes = VLNCs.

Table 2: Support for measures to mandate very low nicotine cigarettes, reduce retailer availability and introduce a smokefree generation ("Don't know" responses excluded).

	N support/N answered (%)	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
"If you could get nicotine in products other than tobacco products, would you support or oppose a law that reduces the amount of nicotine in cigarettes and tobacco, to make them less addictive?"				
Total support	727/989	75.0 (71.4, 78.3)	N/A	N/A
Support by smoking status:				
- Smokes	574/793	72.1 (67.8, 76.0)	72.3 (67.4, 76.7)	Reference
- Recently quit	153/196	84.6 (77.7, 89.6)	84.7 (77.8, 89.7)	**12.4 (4.3, 20.5)**
Support by smoking status and intent to quit:				
- Smokes daily not intending to quit	69/130	51.3 (39.8, 62.6)	48.9 (37.9, 60.1)	Reference
- Smokes daily intending to quit	293/388	75.8 (70.1, 80.7)	76.0 (69.8, 81.2)	**27.0 (14.8, 39.3)**
- Smokes less than daily	196/250	78.6 (71.6, 84.3)	80.8 (74.1, 86.1)	**31.9 (19.1, 44.7)**
- Recently quit	153/196	84.6 (77.7, 89.6)	84.2 (77.3, 89.3)	**35.3 (21.8, 48.7)**
Support by total ethnicity:*				
- Māori	276/402	66.5 (60.6, 71.9)	68.7 (62.1, 74.7)	**-9.0 (-17.0, -1.0)**
- Pacific peoples	136/183	75.7 (67.5, 82.3)	77.3 (68.7, 84.1)	-0.4 (-9.5, 8.7)
- Non-Māori-Non-Pacific	341/441	78.6 (73.2, 83.1)	77.7 (72.6, 82.1)	Reference
Support by age group:				
- 18–24	180/264	65.0 (57.4, 72.0)	61.4 (53.2, 69.0)	**-18.3 (-27.5, -9.0)**
- 25–44	322/430	75.9 (70.4, 80.7)	76.4 (70.7, 81.3)	-3.2 (-10.5, 4.0)
- ≥45	225/295	78.5 (71.9, 83.9)	79.6 (74.1, 84.3)	Reference
"Would you support or oppose a law that reduced the number of places in New Zealand that were allowed to sell tobacco from around 6,000 (the current number) to 300?"				
Total support	402/1,121	35.2 (31.7, 38.9)	N/A	N/A
Support by smoking status:				
- Smokes	294/907	30.0 (26.4, 33.8)	28.7 (25.2, 32.6)	Reference
- Recently quit	108/214	53.2 (44.1, 62.2)	56.9 (47.5, 65.9)	**28.2 (18.0, 38.3)**
Support by smoking status and intent to quit:				
- Smokes daily not intending to quit	28/169	13.2 (8.5, 19.8)	13.1 (8.5, 19.5)	Reference
- Smokes daily intending to quit	135/426	29.1 (24.0, 34.7)	27.6 (22.7, 33.2)	**14.6 (7.0, 22.1)**
- Smokes less than daily	124/274	46.7 (39.5, 54.1)	44.5 (37.0, 52.3)	**31.5 (21.9, 41.0)**
- Recently quit	108/214	53.2 (44.1, 62.2)	57.2 (47.8, 66.1)	**44.2 (33.5, 54.8)**

Table 2 (continued): Support for measures to mandate very low nicotine cigarettes, reduce retailer availability and introduce a smokefree generation ("Don't know" responses excluded).

Support by total ethnicity:*				
- Māori	141/443	28.3 (23.6, 33.5)	29.3 (23.7, 35.5)	**-9.3 (-17.1, -1.6)**
- Pacific peoples	74/215	35.5 (27.9, 43.9)	31.3 (23.9, 39.9)	-7.3 (-16.9, 2.3)
- Non-Māori-Non-Pacific	197/505	37.5 (32.4, 42.9)	38.6 (33.6, 43.9)	Reference
Support by age group:				
- 18–24	98/299	37.0 (30.2, 44.4)	28.2 (22.2, 35.0)	-3.9 (-13.0, 5.2)
- 25–44	206/479	41.1 (35.5, 46.9)	42.1 (36.3, 48.0)	**10.0 (1.7, 18.3)**
- ≥45	98/343	28.5 (23.0, 34.6)	32.1 (26.4, 38.4)	Reference
"Would you support or oppose a law that prevents anyone who is currently 18 or younger from ever buying cigarettes or tobacco? This measure would eventually create a tobacco-free generation."				
Total support	498/583	82.7 (77.9, 86.6)	N/A	N/A
Support by smoking status:				
- Smokes	315/375	80.6 (74.8, 85.3)	80.4 (74.4, 85.3)	Reference
- Recently quit	183/208	89.9 (82.3, 94.5)	89.0 (81.2, 93.8)	**8.6 (0.3, 16.9)**
Support by smoking status and intent to quit:				
- Smokes daily not intending to quit	64/83	72.2 (58.6, 82.6)	70.0 (56.4, 80.8)	Reference
- Smokes daily intending to quit	157/197	81.4 (72.0, 88.1)	81.0 (71.6, 87.8)	11.0 (-3.4, 25.4)
- Smokes less than daily	76/93	83.3 (71.8, 90.7)	85.1 (74.7, 91.7)	**15.1 (0.2, 30.0)**
- Recently quit	183/208	89.9 (82.3, 94.5)	88.7 (80.9, 93.6)	**18.7 (4.9, 32.5)**
Support by total ethnicity:*				
- Māori	168/197	79.8 (69.7, 87.2)	80.9 (71.7, 87.7)	1.1 (-9.4, 11.5)
- Pacific peoples	83/96	85.0 (73.0, 92.2)	87.3 (77.9, 93.0)	7.3 (-2.5, 17.2)
- Non-Māori-Non-Pacific	258/305	82.5 (75.9, 87.5)	79.9 (72.5, 85.7)	Reference
Support by age group:				
- 18–24	77/103	71.9 (57.3, 82.9)	71.4 (55.9, 83.1)	**-17.7 (-32.6, -2.8)**
- 25–44	212/250	80.1 (71.7, 86.6)	77.9 (68.8, 85.0)	**-11.2 (-21.0, -1.4)**
- ≥45	209/230	89.3 (83.2, 93.3)	89.1 (82.7, 93.3)	Reference

When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Values in bold indicate statistically significant absolute marginal differences compared to the reference value.
Participants who refused to answer or answered "Don't know" were excluded. See Figure 1 for detail.
Support represents combined answers of "strongly support" or "support" (compared to "strongly oppose" and "oppose"). Data for all questions are from Wave 3, with the exception of support for a smokefree generation, which were from Wave 3.5.
*Total ethnicity data are presented for Māori and Pacific peoples. Some participants identified as both Māori and Pacific peoples (see Table 1); comparisons for these two groups are made to an exclusive non-Māori-non-Pacific group.

Support for increased media campaign spending and Aotearoa New Zealand's Smokefree goal

Support for increased media campaign spending to reduce youth uptake of cigarette smoking was 92.6% among those who expressed support or opposition (Figure 1). Support for media campaign spending to encourage smoking cessation was 69.0% (Figure 1). For detailed analyses by smoking status, ethnicity, age, gender or evidence of financial hardship see Appendix Tables 2, 3 and 5.

Overall support for the Smokefree Aotearoa goal of less than 5% daily smoking prevalence by 2025 was 56.7% (95% confidence interval 52.8, 60.5) when "Don't know" answers were excluded. When "Don't know" answers were included, support was 52.1% (95% confidence interval 48.3, 55.9, "Don't know" was 8.1%, oppose was 39.8%). For details, including support by smoking status, ethnicity, age, gender and evidence of financial hardship see Appendix Tables 2, 3 and 5.

Anticipated response to mandated VLNCs and retailer reduction

As outlined in Table 3, in response to the introduction of mandated VLNCs, 18.4% of people who smoke thought that they would reduce the amount they smoked, 13.0% thought they would quit smoking entirely and 14.3% thought they would switch to vaping.

In response to a reduction in retailer availability, 21.6% of people who currently smoke thought they would reduce the amount they smoked, 12.3% thought they would quit smoking entirely and 12.9% thought they would switch to vaping.

As demonstrated in Table 3, most of the responses varied by smoking status. For both measures, people who smoked daily and did not intend to quit smoking were more likely to report that they would "*carry on smoking like I do now*" than people who smoked daily and intended to quit and people who smoked less than daily.

In response to the introduction of VLNCs, men (compared to women) and people aged 18–24 years (compared to 45 and over) were more likely to report that they would "*carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke*." People aged 18–24 and people aged 25–44 were less likely to "*carry on smoking like I do now, with the cigarettes or tobacco that were available*" compared to people aged 45 and over. People aged 25–44 were also more likely to "*reduce the amount I smoke*" compared to people aged 45 and over. Values are available in Appendix Tables 6 and 7.

In response to a retailer reduction, people aged 18–24 and people aged 25–44 years were less likely to "*quit smoking entirely*" compared to people aged 45 and over. People aged 25–44 were more likely to "*reduce the amount I smoke*" compared to people aged 45 and over. People with evidence of financial hardship were less likely than those not in financial hardship to report that they would "*quit smoking entirely*." Values are available in Appendix Tables 8 and 9.

There were no major differences in anticipated responses by ethnicity (Appendix Tables 6 and 8).

Discussion

Among people who smoke or recently quit smoking there was strong support for mandated VLNCs (75%) and smokefree generation (83%) policies, as well as increased mass media expenditure. Support for a retailer reduction was the only measure with less than majority support (35%). People who smoked, particularly daily smokers without intent to quit, consistently demonstrated less support for the measures than people who had recently quit smoking. The findings were broadly in line with earlier findings from Wave 2 of the ITC NZ (EASE) Survey (conducted 2016–2017).[12]

The relatively low level of support for a retailer reduction aligns with other Aotearoa New Zealand-based studies.[12–15] A previous qualitative study among people who smoke found concern that a reduction in retailers could increase tobacco product prices, elevate stress due to changes in routine and reduce viability for local businesses.[14]

Around 50% of participants who smoked anticipated that they would reduce the amount they smoke, quit smoking completely or switch to vaping if either mandated VLNCs or substantial retailer reductions were introduced. The proportion anticipating these behaviour changes in response to mandated VLNCs (46%) was much greater than the proportion who stated they would try and obtain tobacco products they wanted to smoke (19%), presumably homegrown or illicit cigarettes or tobacco. These findings highlight that 1) many people who smoke anticipate the introduction of a retailer reduction or VLNCs would have helped them to reduce the amount they smoke or stop smoking, and 2) in contrast to arguments that these measures are likely to greatly increase the illicit market,[16] only a minority of participants reported they would consider taking steps to

Table 3: Anticipated responses to the introduction of very low nicotine cigarettes and a retailer reduction ("Don't know" responses excluded).

		n/N	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
Anticipated response to the introduction of very low nicotine cigarettes: total					
	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	288/908	35.1 (31.2, 39.2)	N/A	N/A
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	170/908	19.2 (16.0, 22.9)	N/A	N/A
	- Reduce the amount I smoke	184/908	18.4 (15.5, 21.7)	N/A	N/A
	- Quit smoking entirely	132/908	13.0 (10.6, 15.9)	N/A	N/A
	- Switch to vaping/ e-cigarettes	134/908	14.3 (11.6, 17.5)	N/A	N/A
Anticipated response to the introduction of very low nicotine cigarettes: by smoking status					
Smokes daily not intending to quit	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	91/172	55.2 (45.3, 64.7)	50.9 (42.3, 59.6)	Reference
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	50/172	32.8 (23.7, 43.4)	35.6 (26.9, 44.2)	
	- Reduce the amount I smoke	23/172	9.7 (5.8, 16.0)	11.1 (5.7, 16.5)	
	- Quit smoking entirely	3/172	0.4 (0.1, 1.4)	0.4 (0.0, 0.9)	
	- Switch to vaping/ e-cigarettes	5/172	1.8 (0.7, 4.8)	2.0 (0.0, 3.9)	
Smokes daily intending to quit	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	124/428	30.9 (25.5, 36.8)	31.1 (25.2, 37.0)	**-19.8 (-30.2, -9.3)**

Table 3 (continued): Anticipated responses to the introduction of very low nicotine cigarettes and a retailer reduction ("Don't know" responses excluded).

Smokes daily intending to quit	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	81/428	17.8 (13.7, 22.6)	17.9 (13.3, 22.6)	**-17.6 (-27.3, -8.0)**
	- Reduce the amount I smoke	104/428	22.6 (18.1, 27.7)	21.1 (16.3, 25.9)	**10.0 (2.6, 17.3)**
	- Quit smoking entirely	69/428	15.0 (11.2, 19.8)	15.4 (10.8, 20.0)	**15.0 (10.4, 19.6)**
	- Switch to vaping/ e-cigarettes	50/428	13.8 (10.1, 18.5)	14.4 (9.9, 18.9)	**12.4 (7.4, 17.4)**
Smokes less than daily	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	57/274	24.5 (18.5, 31.7)	25.2 (18.1, 32.2)	**-25.8 (-37.2, -14.3)**
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	34/274	10.0 (6.6, 14.9)	9.4 (5.2, 13.7)	**-26.2 (-36.2, -16.1)**
	- Reduce the amount I smoke	49/274	17.7 (12.6, 24.3)	17.9 (12.0, 23.9)	6.8 (-1.5, 15.1)
	- Quit smoking entirely	57/274	20.7 (15.4, 27.4)	21.7 (15.3, 28.2)	**21.3 (14.8, 27.8)**
	- Switch to vaping/ e-cigarettes	77/274	27.1 (20.6, 34.7)	25.8 (18.5, 33.1)	**23.8 (16.2, 31.5)**
Anticipated response to a retailer reduction: total					
	- Carry on smoking like I do now	466/939	53.2 (49.1, 57.2)	N/A	N/A
	- Reduce the amount I smoke	217/939	21.6 (18.6, 25.1)	N/A	N/A
	- Quit smoking entirely	121/939	12.3 (9.9, 15.1)	N/A	N/A
	- Switch to vaping/ e-cigarettes	135/939	12.9 (10.5, 15.7)	N/A	N/A
Anticipated response to a retailer reduction: by smoking status					
Smokes daily not intending to quit	- Carry on smoking like I do now	143/176	86.6 (80.0, 91.3)	85.0 (79.1, 90.8)	Reference
	- Reduce the amount I smoke	25/176	11.4 (7.0, 17.9)	13.0 (7.3, 18.6)	
	- Quit smoking entirely	4/176	1.0 (0.3, 3.6)	0.9 (0.0, 2.2)	
	- Switch to vaping/ e-cigarettes	4/176	1.0 (0.3, 3.2)	1.1 (0.0, 2.4)	

Table 3 (continued): Anticipated responses to the introduction of very low nicotine cigarettes and a retailer reduction ("Don't know" responses excluded).

Smokes daily intending to quit	- Carry on smoking like I do now	199/450	44.6 (38.9, 50.4)	45.3 (39.2, 51.3)	**-39.7 (-48.2, -31.1)**
	- Reduce the amount I smoke	127/450	28.0 (23.1, 33.4)	25.8 (20.8, 30.8)	**12.9 (5.2, 20.5)**
	- Quit smoking entirely	67/450	13.7 (10.4, 18.0)	14.6 (10.4, 18.8)	**13.7 (9.2, 18.2)**
	- Switch to vaping/ e-cigarettes	57/450	13.7 (10.2, 18.3)	14.3 (10.0, 18.6)	**13.2 (8.6, 17.7)**
Smokes less than daily	- Carry on smoking like I do now	100/273	37.4 (30.6, 44.7)	38.2 (30.5, 45.9)	**-46.8 (-56.7, -36.9)**
	- Reduce the amount I smoke	56/273	19.8 (14.5, 26.5)	18.8 (12.6, 24.9)	5.8 (-2.9, 14.5)
	- Quit smoking entirely	46/273	19.0 (13.7, 25.6)	21.1 (14.5, 27.7)	**20.1 (13.4, 26.9)**
	- Switch to vaping/ e-cigarettes	71/273	23.8 (18.2, 30.5)	22.0 (15.8, 28.2)	**20.8 (14.5, 27.2)**

Data are from Wave 3 participants. Values in bold are statistically significant absolute marginal differences compared to the reference value.
Wording of the questions is provided in Textbox 1.
For the overall number of participants in each group and the definition of financial hardship, see Table 1. Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.
For the total value for anticipated response to very low nicotine cigarettes, 7 out of 992 participants (0.7%) were excluded as they refused to answer or had no response, and 77 out of 992 participants (7.8%) were excluded as they answered "Don't know".
For the total value for anticipated response to a retailer reduction, 8 out of 992 participants (0.8%) were excluded as they refused to answer or had no response recorded, and 45 out of 992 participants (4.5%) were excluded as they answered "Don't know".
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Electronic cigarettes = e-cigarettes.

obtain cigarettes with a higher nicotine content should VLNCs be introduced. However, the finding that some people who smoke would be likely to seek out illicit cigarettes or tobacco suggests that if a mandated VLNC policy is introduced additional actions to combat illicit trade should be introduced (such as increased resources for customs), as was planned in the Smokefree Aotearoa 2025 Action Plan.[6]

Importantly, there was no significant difference in anticipated responses to a retailer reduction or mandated VLNCs by ethnicity. Our findings are consistent with a recent study of anticipated responses to these measures in over 700 Māori who smoke.[17] They also align with modelling that suggests the interventions could significantly reduce smoking prevalence for Māori and Pacific peoples.[6,18,19]

A key strength of this study is that it provides results that are directly relevant to the three *SERPA Act* measures that were recently repealed, drawn from the people most affected by smoking. The sample is sufficiently large to provide robust indications of support and anticipated changes in response to the measures. It also allows us to evaluate differences in support by smoking status, intent to quit smoking and ethnicity.

Another strength is our presentation of data on support for the measures with and without "Don't know" answers. This allows results to be compared to other studies assessing support for smokefree measures, regardless of whether they opt to include or exclude "Don't know" answers.[12,20–25] Levels of support for the measures were largely similar, regardless of whether "Don't know" answers were included or excluded, as "Don't know" responses were rare. However, support for mandated VLNCs dropped substantially

when "Don't know" responses were included, reflecting the high percentage of "Don't know" responses (19%). The high level of "Don't know" responses for this policy likely reflects the unfamiliarity of VLNCs among people who smoke, as they have not been available in New Zealand. Of note, international studies have found at least 50% support for VLNC policies among participants in trials who had used VLNCs for several weeks.[20,21] Our findings emphasise the importance of assessing understanding of proposed policy measures and the need for public education.

One limitation of this study is that the recruitment target for Pacific participants was not reached, meaning that results for this group are less precise than for Māori or Non-Māori-Non-Pacific respondents.

Another limitation is that the study data were collected before the *SERPA Act* changes to include the three action plan measures were passed and subsequently repealed in early 2024. It is possible that responses to the survey questions may have changed in response to these events. At the time of writing, we are in the process of analysing data from Wave 4 (conducted in 2022) and recruiting for Wave 5 (September 2024), which will provide further insights. However, the results from Waves 3 and 3.5 align with findings from a population-based survey conducted in late 2023 in response to the news that the Government intended to repeal the three smokefree measures. Of those surveyed, support for retention of the three key measures was 68% for reduction in retailer numbers, 77% for mandated VLNCs and 65% for a smokefree generation.[26]

Our findings call into question the Government's decision to repeal the 2023 *SERPA Act* measures to reduce retailer numbers, mandate VLNCs and introduce a smokefree generation. The introduction of VLNCs and a smokefree generation were strongly supported by people who smoke or who have recently quit smoking, and retailer reductions by a majority of people who had recently quit. Anticipated responses to a reduction in retail numbers and VLNCs indicated that these measures had the potential to reduce smoking prevalence substantially and equitably.

COMPETING INTERESTS

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Appendices

Appendix Table 1: Outcomes by gender and financial hardship: support for implementation of very low nicotine cigarettes and reduction in retailer availability, with "Don't know" responses excluded.

	N support/N answered	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
"If you could get nicotine in products other than tobacco products, would you support or oppose a law that reduces the amount of nicotine in cigarettes and tobacco, to make them less addictive?"				
Total	727/989	75.0 (71.4, 78.3)	N/A	N/A
Gender:				
- Male	283/385	75.4 (69.7, 80.3)	74.8 (69.3, 79.7)	Reference
- Female	442/602	74.4 (70.1, 78.4)	75.6 (71.3, 79.6)	0.8 (-5.7, 7.3)
Evidence of financial hardship:				
- No	517/678	77.6 (73.2, 81.5)	76.8 (72.5, 80.6)	Reference
- Yes	188/278	68.2 (61.1, 74.5)	70.6 (63.8, 76.5)	-6.2 (-13.6, 1.1)
"Would you support or oppose a law that reduced the number of places in New Zealand that were allowed to sell tobacco from around 6,000 (the current number) to 300?"				
Total	402/1,121	35.2 (31.7, 38.9)	N/A	N/A
Gender:				
- Male	176/418	38.5 (33.0, 44.3)	37.8 (32.5, 43.4)	Reference
- Female	225/701	31.3 (27.3, 35.5)	32.6 (28.4, 37.0)	-5.2 (-12.0, 1.5)
Evidence of financial hardship:				
- No	262/775	34.7 (30.4, 39.2)	35.0 (31.0, 39.3)	Reference
- Yes	125/314	35.9 (29.6, 42.9)	36.8 (30.1, 43.9)	1.7 (-6.1, 9.5)
"Would you support or oppose a law that prevents anyone who is currently 18 or younger from ever buying cigarettes or tobacco? This measure would eventually create a tobacco-free generation."				
Total	498/583	82.7 (77.9, 86.6)	N/A	N/A
Gender:				
- Male	160/196	78.4 (70.4, 84.8)	77.9 (70.3, 84.1)	Reference
- Female	337/386	87.6 (82.8, 91.1)	86.4 (80.7, 90.5)	**8.4 (0.1, 16.7)**
Evidence of financial hardship:				
- No	370/428	84.2 (78.6, 88.5)	83.5 (77.9, 87.9)	Reference
- Yes	110/136	75.0 (63.4, 83.9)	75.1 (64.1, 83.7)	-8.3 (-19.0, 2.3)

Appendix Table 1 (continued): Outcomes by gender and financial hardship: support for implementation of very low nicotine cigarettes and reduction in retailer availability, with "Don't know" responses excluded.

Very low nicotine cigarette and retailer reduction data are from Wave 3 participants. Smokefree generation data are from Wave 3.5 participants.
Values in bold are statistically significant absolute marginal differences compared to the reference value.
Support is defined as answering "strongly support" or "support".
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
For the overall number of participants in each group and the definition of financial hardship, see Table 1 of the corresponding journal article. Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.
See Appendix Table 4 for these analyses including "Don't know" answers.

Appendix Table 2: Outcomes by smoking status, ethnicity and age: support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal, with "Don't know" responses excluded.

	N support/N answered	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
"Do you support or oppose increased government spending on media campaigns to discourage youth and young people from starting to smoke?"				
Total	1,087/1,180	92.6 (90.5, 94.2)	N/A	N/A
Support by smoking status:				
- Smokes	872/951	91.7 (89.2, 93.6)	92.0 (89.6, 93.9)	Reference
- Recently quit	215/229	95.5 (90.1, 98.0)	94.8 (89.6, 97.5)	2.8 (-1.2, 6.8)
Support by smoking status and intent to quit:				
- Smokes daily not intending to quit	143/169	82.7 (74.2, 88.8)	81.5 (73.4, 87.6)	Reference
- Smokes daily intending to quit	419/456	91.9 (88.3, 94.5)	92.4 (88.9, 94.9)	**10.9 (3.1, 18.7)**
- Smokes less than daily	272/285	97.3 (94.8, 98.6)	97.5 (95.3, 98.7)	**15.9 (8.6, 23.3)**
- Recently quit	215/229	95.5 (90.1, 98.0)	94.8 (89.5, 97.5)	**13.2 (5.0, 21.5)**
Support by total ethnicity:				
- Māori	426/467	90.3 (86.2, 93.3)	91.1 (86.7, 94.2)	-1.1 (-5.8, 3.6)
- Pacific	208/222	94.9 (90.9, 97.2)	95.3 (91.2, 97.5)	3.0 (-1.1, 7.1)
- Non-Māori-Non-Pacific	494/535	92.9 (89.7, 95.1)	92.3 (89.0, 94.6)	Reference
Support by age group:				
- 18–24	287/315	91.1 (86.7, 94.2)	89.3 (84.0, 93.0)	-3.5 (-9.1, 2.1)
- 25–44	467/510	93.1 (90.1, 95.2)	93.2 (90.3, 95.3)	0.4 (-3.6, 4.3)
- ≥45	333/355	92.7 (88.3, 95.5)	92.8 (88.7, 95.5)	Reference

Appendix Table 2 (continued): Outcomes by smoking status, ethnicity and age: support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal, with "Don't know" responses excluded.

"Do you support or oppose increased government spending on media campaigns to promote quitting smoking?"				
Total	764/1,095	69.0 (65.4, 72.5)	N/A	N/A
Support by smoking status:				
- Smokes	602/882	66.4 (62.3, 70.4)	66.9 (62.4, 71.2)	Reference
- Recently quit	162/213	77.7 (69.7, 84.1)	77.9 (69.6, 84.4)	**10.9 (1.9, 20.0)**
Support by smoking status and intent to quit:				
- Smokes daily not intending to quit	71/158	46.6 (36.4, 57.0)	46.4 (36.5, 56.6)	Reference
- Smokes daily intending to quit	291/422	66.7 (60.7, 72.2)	68.2 (61.6, 74.1)	**21.8 (10.1, 33.4)**
- Smokes less than daily	219/272	81.6 (75.1, 86.6)	82.4 (75.7, 87.6)	**36.0 (23.9, 48.0)**
- Recently quit	162/213	77.7 (69.7, 84.1)	77.3 (69.0, 83.9)	**30.8 (17.6, 44.1)**
Support by total ethnicity:				
- Māori	291/440	63.5 (57.8, 68.8)	65.0 (58.8, 70.8)	-6.3 (-14.1, 1.6)
- Pacific	141/201	70.0 (61.6, 77.3)	69.4 (60.6, 77.0)	-1.9 (-11.4, 7.7)
- Non-Māori-Non-Pacific	358/496	70.8 (65.5, 75.6)	71.3 (66.1, 76.0)	Reference
Support by age group:				
- 18–24	210/289	74.1 (67.5, 79.7)	68.5 (60.7, 75.3)	0.0 (-10.0, 10.0)
- 25–44	339/482	69.9 (64.2, 75.0)	71.1 (65.5, 76.0)	2.6 (-5.6, 10.8)
- ≥45	215/324	65.9 (59.3, 71.9)	68.5 (61.9, 74.3)	Reference
"Do you support or oppose the Smokefree 2025 policy goal?" *				
Total	634/1,118	56.7 (52.8, 60.5)	N/A	N/A
Support by smoking status:				
- Smokes	475/904	49.8 (45.6, 54.0)	49.3 (44.9, 53.8)	Reference
- Recently quit	159/214	79.7 (72.1, 85.6)	80.4 (72.8, 86.3)	**31.1 (22.6, 39.5)**
Support by smoking status and intent to quit:				
- Smokes daily not intending to quit	36/168	17.1 (11.6, 24.5)	17.2 (11.7, 24.6)	Reference
- Smokes daily intending to quit	237/431	54.0 (48.0, 59.9)	54.1 (47.7, 60.5)	**36.9 (28.1, 45.8)**
- Smokes less than daily	189/268	70.0 (62.7, 76.4)	70.0 (62.2, 76.8)	**52.8 (43.0, 62.6)**
- Recently quit	159/214	79.7 (72.1, 85.6)	79.8 (72.2, 85.8)	**62.6 (53.0, 72.2)**
Support by total ethnicity:				
- Māori	238/453	49.8 (44.2, 55.4)	52.9 (46.8, 59.0)	-7.1 (-14.6, 0.5)

Appendix Table 2 (continued): Outcomes by smoking status, ethnicity and age: support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal, with "Don't know" responses excluded.

- Pacific	114/207	56.6 (47.6, 65.2)	54.6 (46.5, 62.5)	-5.4 (-14.5, 3.8)
- Non-Māori-Non-Pacific	302/500	59.8 (54.2, 65.2)	60.0 (55.0, 64.8)	Reference
Support by age group:				
- 18–24	177/302	58.7 (51.5, 65.5)	50.8 (43.8, 57.8)	-1.5 (-10.9, 7.9)
- 25–44	294/483	63.7 (58.0, 69.1)	64.2 (58.8, 69.2)	**11.8 (4.0, 19.6)**
- ≥45	163/333	48.5 (41.9, 55.2)	52.3 (46.1, 58.4)	Reference

When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Values in bold are statistically significant absolute marginal differences compared to the reference value.
Participants who refused to answer or answered "Don't know" were excluded. 21/1,230 (1.7%) of participants refused to answer the question "Do you support or oppose the Smokefree 2025 policy goal?" 91/1,230 (7.4%) answered "Don't know". For refusal and "Don't know" values for other outcomes, see Figure 1.
Support represents combined answers of "strongly support" or "support" (compared to "strongly oppose" and "oppose"). Data for all questions are from Wave 3.
Total ethnicity data are presented for Māori and Pacific. Some participants identified as both Māori and Pacific (see Table 1); comparisons for these two groups are made to an exclusive non-Māori-non-Pacific group.
*A description of the goal was given prior to asking this question, worded as follows: "*We will now describe the Government's Smokefree 2025 goal: the goal aims to reduce the availability of tobacco and the number of people smoking to minimal levels, thereby making New Zealand essentially a smokefree nation by 2025. ('Minimal numbers of people smoking' is often interpreted as: less than 5% of people in all population groups will smoke.).*"

Appendix Table 3: Outcomes by gender and financial hardship: support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal, with "Don't know" responses excluded.

	N support/N answered	**Weighted percentage (95% CI)**	**Marginally standardised percentage (95% CI)**	**Absolute difference (95% CI)**
"Do you support or oppose increased government spending on media campaigns to discourage youth and young people from starting to smoke?"				
Total	1,087/1,180	92.6 (90.5, 94.2)	N/A	N/A
Gender:				
- Male	389/430	91.8 (88.2, 94.3)	91.6 (87.9, 94.2)	Reference
- Female	697/749	93.5 (91.1, 95.3)	93.5 (90.9, 95.4)	1.9 (-2.0, 5.8)
Evidence of financial hardship:				
- No	756/813	93.3 (90.8, 95.2)	93.1 (90.6, 95.0)	Reference
- Yes	301/333	90.3 (85.4, 93.6)	90.7 (85.9, 94.0)	-2.4 (-6.9, 2.0)

Appendix Table 3 (continued): Outcomes by gender and financial hardship: support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal, with "Don't know" responses excluded.

"Do you support or oppose increased government spending on media campaigns to promote quitting smoking?"				
Total	764/1,095	69.0 (65.4, 72.5)	N/A	N/A
Gender:				
- Male	288/403	70.8 (65.2, 75.9)	70.8 (65.1, 75.9)	Reference
- Female	475/691	67.0 (62.3, 71.4)	68.2 (63.5, 72.6)	-2.5 (-9.5, 4.4)
Evidence of financial hardship:				
- No	544/757	71.1 (66.7, 75.2)	71.1 (66.8, 75.0)	Reference
- Yes	203/307	64.5 (57.6, 70.8)	65.0 (57.9, 71.4)	-6.1 (-13.7, 1.4)
"Do you support or oppose the Smokefree 2025 policy goal?" *				
Total	634/1.118	56.7 (52.8, 60.5)	N/A	N/A
Gender:				
- Male	251/413	60.2 (54.3, 65.9)	59.3 (53.9, 64.6)	Reference
- Female	383/702	52.7 (48.0, 57.5)	54.7 (50.1, 59.2)	-4.6 (-11.1, 1.9)
Evidence of financial hardship:				
- No	442/767	58.6 (53.9, 63.1)	58.6 (54.2, 62.8)	Reference
- Yes	171/318	51.5 (44.2, 58.7)	53.4 (47.0, 59.7)	-5.2 (-12.3, 1.9)

Data are from Wave 3 participants. Values in bold are statistically significantly absolute marginal differences compared to the reference value.
Support is defined as answering "strongly support" or "support".
For the overall number of participants in each group and the definition of financial hardship, see Table 1 in the corresponding journal article.
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.
See Appendix Table 5 for these analyses including "Don't know" answers.
*A description of the goal was given prior to asking this question, worded as follows: "*We will now describe the Government's Smokefree 2025 goal: the goal aims to reduce the availability of tobacco and the number of people smoking to minimal levels, thereby making New Zealand essentially a smokefree nation by 2025. ('Minimal numbers of people smoking' is often interpreted as: less than 5% of people in all population groups will smoke.).*"

Appendix Table 4: Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

	N support/N answered	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
"If you could get nicotine in products other than tobacco products, would you support or oppose a law that reduces the amount of nicotine in cigarettes and tobacco, to make them less addictive?"				
Total:				
- Support	727/1,209	60.5 (56.7, 64.1)	N/A	N/A
- Oppose	262/1,209	20.2 (17.4, 23.2)	N/A	N/A
- Don't know	220/1,209	19.3 (16.4, 22.7)	N/A	N/A
Support by smoking status:				
- Smokes	574/974	57.6 (53.5, 61.7)	57.8 (53.3, 62.3)	Reference
- Recently quit	153/235	70.2 (61.5, 77.7)	70.1 (61.3, 78.8)	**12.2 (2.0, 22.6)**
Oppose by smoking status:				
- Smokes	219/974	22.3 (19.1, 25.9)		
- Recently quit	43/235	12.8 (8.6, 18.6)		
Don't know by smoking status:				
- Smokes	181/974	20.0 (16.8, 23.7)		
- Recently quit	39/235	17.0 (10.8, 25.6)		
Support by smoking status and quit intent:				
- Smokes daily not intending to quit	69/174	36.4 (27.9, 45.9)	34.4 (25.5, 43.3)	Reference
- Smokes daily intending to quit	293/469	63.2 (57.6, 68.5)	64.3 (58.5, 70.0)	**29.9 (19.6, 40.2)**
- Smokes less than daily	196/288	66.5 (58.2, 73.9)	68.1 (59.9, 76.2)	**33.7 (21.4, 45.9)**
- Recently quit	153/235	70.2 (61.5, 77.7)	69.4 (60.7, 78.0)	**35.0 (22.2, 47.7)**
Oppose by smoking status and quit intent:				
- Smokes daily not intending to quit	61/174	34.6 (25.7, 44.8)		
- Smokes daily intending to quit	95/469	20.2 (16.0, 25.1)		
- Smokes less than daily	54/288	18.1 (13.2, 24.3)		
- Recently quit	43/235	12.8 (8.6, 18.6)		
Don't know by smoking status and quit intent:				
- Smokes daily not intending to quit	44/174	28.9 (20.9, 38.6)		
- Smokes daily intending to quit	81/469	16.6 (12.9, 21.1)		

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

- Smokes less than daily	38/288	15.4 (9.4, 24.1)		
- Recently quit	39/235	17.0 (10.8, 25.6)		
Support by total ethnicity:				
- Māori	276/483	55.2 (49.7, 60.5)	57.2 (51.1, 63.5)	-6.3 (-14.4, 0.2)
- Pacific	136/232	59.0 (50.4, 67.1)	59.7 (50.5, 68.8)	-3.9 (-14.3, 6.5)
- Non-Māori-Non-Pacific	341/539	63.4 (57.9, 68.6)	63.6 (58.7, 68.6)	Reference
Oppose by total ethnicity:				
- Māori	126/483	27.8 (23.2, 32.9)		
- Pacific	47/232	19.0 (13.7, 25.7)		
- Non-Māori-Non-Pacific	100/539	17.3 (13.6, 21.8)		
Don't know by total ethnicity:				
- Māori	81/483	17.0 (13.3, 21.5)		
- Pacific	49/232	22.0 (15.2, 30.8)		
- Non-Māori-Non-Pacific	98/539	19.3 (15.2, 24.2)		
Support by age:				
- 18–24	180/320	53.4 (46.4, 60.3)	51.9 (44.6, 59.3)	**-13.8 (-23.5, -4.1)**
- 25–44	322/515	61.6 (55.7, 67.1)	60.6 (54.6, 66.6)	-5.1 (-13.4, 3.2)
- 45 and above	255/374	62.4 (56.0, 68.5)	65.7 (59.9, 71.6)	Reference
Oppose by age:				
- 18–24	84/320	28.8 (22.9, 35.4)		
- 25–44	108/515	19.6 (15.6, 24.3)		
- 45 and above	70/374	17.1 (12.7, 22.5)		
Don't know by age:				
- 18–24	56/320	17.8 (13.1, 23.8)		
- 25–44	85/515	18.8 (14.4, 24.3)		
- 45 and above	79/374	20.5 (15.7, 26.4)		
Support by gender:				
- Male	283/440	63.8 (57.9, 69.3)	63.0 (57.2, 68.8)	Reference
- Female	442/766	56.6 (52.1, 61.1)	59.2 (54.7, 63.6)	3.8 (-11.2, 3.6)

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

Oppose by gender:				
- Male	102/440	20.8 (16.6, 25.8)		
- Female	160/766	19.4 (16.4, 22.9)		
Don't know by gender:				
- Male	55/440	15.4 (11.3, 20.6)		
- Female	164/766	23.9 (20.0, 28.3)		
Support by evidence of financial hardship:				
- No	517/838	62.4 (57.9, 66.7)	62.2 (58.1, 66.4)	Reference
- Yes	188/333	55.1 (47.9, 62.1)	58.3 (51.4, 65.3)	-3.9 (-11.8, 4.0)
Oppose by evidence of financial hardship:				
- No	161/838	18.0 (14.8, 21.7)		
- Yes	90/333	25.7 (20.4, 31.9)		
Don't know by evidence of financial hardship:				
- No	160/838	19.6 (16.1, 23.6)		
- Yes	55/333	19.2 (13.5, 26.4)		
"Would you support or oppose a law that reduced the number of places in New Zealand that were allowed to sell tobacco from around 6,000 (the current number) to 300?"				
Total:				
- Support	402/1,213	32.3 (28.9, 35.8)	N/A	N/A
- Oppose	719/1,213	59.4 (55.6, 63.1)	N/A	N/A
- Don't know	92/1,213	8.4 (6.1, 11.3)	N/A	N/A
Support by smoking status:				
- Smokes	294/980	27.6 (24.2, 31.2)	26.4 (23.0, 29.8)	Reference
- Recently quit	108/233	48.2 (39.4, 57.2)	52.4 (42.7, 62.0)	**26.0 (15.5, 36.5)**
Oppose by smoking status:				
- Smokes	613/980	64.4 (60.4, 68.2)		
- Recently quit	106/233	42.4 (33.8, 51.4)		
Don't know by smoking status:				
- Smokes	73/980	8.0 (5.7, 11.1)		
- Recently quit	19/233	9.4 (4.5, 18.6)		

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

Support by smoking status and quit intent:				
- Smokes daily not intending to quit	28/180	12.5 (8.1, 18.8)	12.4 (7.3, 17.5)	Reference
- Smokes daily intending to quit	135/465	26.9 (22.2, 32.2)	25.5 (20.6, 30.4)	**13.1 (6.0, 20.3)**
- Smokes less than daily	124/292	41.9 (34.6, 49.5)	39.2 (31.6, 46.8)	**26.8 (17.5, 36.2)**
- Recently quit	108/233	48.2 (39.4, 57.2)	52.9 (43.3, 62.6)	**40.6 (29.6, 51.5)**
Oppose by smoking status and quit intent:				
- Smokes daily not intending to quit	141/180	82.2 (75.1, 87.6)		
- Smokes daily intending to quit	291/465	65.5 (60.0, 70.6)		
- Smokes less than daily	150/292	47.7 (40.1, 55.5)		
- Recently quit	106/233	42.4 (33.8, 51.4)		
Don't know by smoking status and quit intent:				
- Smokes daily not intending to quit	11/180	5.3 (2.7, 10.2)		
- Smokes daily intending to quit	39/465	7.6 (5.4, 10.6)		
- Smokes less than daily	18/292	10.4 (4.7, 21.4)		
- Recently quit	19/233	9.4 (4.5, 18.6)		
Support by total ethnicity:				
- Māori	141/487	25.9 (21.5, 30.8)	27.1 (21.7, 32.5)	**-8.7 (-16.0, -1.3)**
- Pacific	74/235	32.2 (25.1, 40.2)	27.9 (19.9, 35.8)	-7.9 (-17.3, 1.4)
- Non-Māori-Non-Pacific	197/537	34.5 (29.6, 39.7)	35.8 (31.0, 40.5)	Reference
Oppose by total ethnicity:				
- Māori	302/487	65.6 (60.4, 70.4)		
- Pacific	141/235	58.5 (49.9, 66.6)		
- Non-Māori-Non-Pacific	308/537	57.5 (52.0, 62.9)		
Don't know by total ethnicity:				
- Māori	44/487	8.5 (6.2, 11.7)		
- Pacific	20/235	9.3 (4.5, 18.1)		
- Non-Māori-Non-Pacific	32/537	7.9 (4.9, 12.6)		
Support by age:				
- 18–24	98/322	34.7 (28.2, 41.7)	26.7 (20.6, 32.8)	-3.3 (-12.1, 5.5)
- 25–44	206/521	36.9 (31.6, 42.6)	37.4 (31.7, 43.2)	7.4 (-0.7, 15.5)
- 45 and above	98/370	26.4 (21.2, 32.2)	30.0 (24.3, 35.8)	Reference

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

Oppose by age:				
- 18–24	201/322	59.0 (52.0, 65.7)		
- 25–44	273/521	52.9 (47.1, 58.7)		
- 45 and above	245/370	66.2 (59.9, 72.1)		
Don't know by age:				
- 18–24	23/322	6.3 (3.9, 10.1)		
- 25–44	42/521	10.1 (6.4, 15.7)		
- 45 and above	27/370	7.4 (4.3, 12.4)		
Support by gender:				
- Male	176/443	35.5 (30.3, 41.2)	34.5 (29.1, 39.9)	Reference
- Female	225/767	28.4 (24.8, 32.4)	30.2 (26.2, 34.2)	-4.3 (-11.0, 2.4)
Oppose by gender:				
- Male	242/443	56.8 (50.9, 62.5)		
- Female	476/767	62.5 (58.1, 66.7)		
Don't know by gender:				
- Male	25/443	7.7 (4.5, 12.9)		
- Female	66/767	9.1 (6.6, 12.4)		
Support by evidence of financial hardship:				
- No	262/837	31.9 (27.9, 36.1)	32.2 (28.4, 36.1)	Reference
- Yes	125/340	32.7 (26.7, 39.3)	33.5 (26.6, 40.4)	1.3 (-6.5, 9.0)
Oppose by evidence of financial hardship:				
- No	513/837	60.0 (55.5, 64.4)		
- Yes	189/340	58.4 (51.3, 65.1)		
Don't know by evidence of financial hardship:				
- No	62/837	8.1 (5.5, 11.7)		
- Yes	26/340	8.9 (4.9, 15.5)		
"Would you support or oppose a law that prevents anyone who is currently 18 or younger from ever buying cigarettes or tobacco? This measure would eventually create a tobacco-free generation."				
Total:				
- Support	498/609	78.6 (73.5, 83.0)	N/A	N/A
- Oppose	85/609	16.5 (12.7, 21.1)	N/A	N/A

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

- Don't know	26/609	4.9 (2.7, 8.7)	N/A	N/A
Support by smoking status:				
- Smokes	315/392	77.1 (71.2, 82.1)	76.8 (71.2, 82.4)	Reference
- Recently quit	183/217	83.8 (71.7, 91.4)	83.6 (75.9, 91.3)	6.8 (-2.8, 16.3)
Oppose by smoking status:				
- Smokes	60/392	18.6 (14.0, 24.2)		
- Recently quit	25/217	9.4 (5.1, 16.6)		
Don't know by smoking status:				
- Smokes	17/392	4.3 (2.4, 7.8)		
- Recently quit	9/217	6.7 (1.7, 23.0)		
Support by smoking status and quit intent:				
- Smokes daily not intending to quit	64/89	67.8 (54.8, 78.5)	63.5 (51.0, 76.1)	Reference
- Smokes daily intending to quit	157/183	78.6 (69.0, 85.8)	78.5 (70.4, 86.7)	**15.0 (0.2, 29.8)**
- Smokes less than daily	76/98	80.1 (68.8, 88.0)	82.0 (72.9, 91.1)	**18.5 (3.0, 33.9)**
- Recently quit	183/217	83.8 (71.7, 91.4)	83.0 (75.5, 90.6)	**19.5 (5.3, 33.7)**
Oppose by smoking status and quit intent:				
- Smokes daily not intending to quit	19/89	26.1 (16.3, 39.1)		
- Smokes daily intending to quit	22/183	18.0 (11.4, 27.2)		
- Smokes less than daily	17/98	16.1 (9.0, 27.2)		
- Recently quit	25/217	9.4 (5.1, 16.6)		
Don't know by smoking status and quit intent:				
- Smokes daily not intending to quit	6/89	6.1 (2.4, 14.5)		
- Smokes daily intending to quit	4/183	3.4 (1.0, 11.0)		
- Smokes less than daily	5/98	3.8 (1.4, 10.1)		
- Recently quit	9/217	6.7 (1.7, 23.0)		
Support by total ethnicity:				
- Māori	168/207	77.4 (67.6, 84.8)	78.9 (71.0, 86.7)	2.2 (-8.5, 12.9)
- Pacific	83/101	76.3 (60.4, 87.1)	78.5 (68.2, 88.8)	1.9 (-10.6, 14.3)
- Non-Māori-Non-Pacific	258/317	79.1 (72.4, 84.6)	76.6 (70.0, 83.3)	Reference

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

Oppose by total ethnicity:				
- Māori	29/207	19.6 (12.4, 29.4)		
- Pacific	13/101	13.5 (6.9, 24.6)		
- Non-Māori-Non-Pacific	47/317	16.8 (11.9, 23.1)		
Don't know by total ethnicity:				
- Māori	10/207	3.1 (1.4, 6.8)		
- Pacific	5/101	10.3 (2.9, 30.4)		
- Non-Māori-Non-Pacific	12/317	4.1 (1.9, 8.5)		
Support by age:				
- 18–24	77/109	71.1 (56.8, 82.2)	71.1 (57.5, 84.7)	**-15.4 (-30.3, -0.4)**
- 25–44	212/264	73.6 (64.6, 81.0)	72.0 (63.7, 80.3)	**-14.5 (-24.6, -4.3)**
- 45 and above	209/236	86.8 (80.5, 91.2)	86.5 (80.8, 92.1)	Reference
Oppose by age:				
- 18–24	26/109	27.9 (16.9, 42.3)		
- 25–44	38/264	18.2 (12.3, 26.2)		
- 45 and above	21/236	10.4 (6.5, 16.4)		
Don't know by age:				
- 18–24	6/109	1.0 (0.4, 2.7)		
- 25–44	14/264	8.2 (3.9, 16.5)		
- 45 and above	6/236	2.8 (1.2, 6.6)		
Support by gender:				
- Male	160/205	74.2 (65.7, 81.2)	73.0 (65.6, 80.4)	Reference
- Female	337/403	83.7 (78.6, 87.8)	83.5 (78.4, 88.6)	**10.5 (1.5, 19.4)**
Oppose by gender:				
- Male	36/205	20.4 (14.4, 28.2)		
- Female	49/403	11.9 (8.5, 16.5)		
Don't know by gender:				
- Male	9/205	5.3 (2.1, 12.8)		
- Female	17/403	4.4 (2.4, 7.8)		
Support by evidence of financial hardship:				
- No	370/448	80.6 (74.9, 85.2)	79.7 (74.6, 84.7)	Reference

Appendix Table 4 (continued): Support for implementation of very low nicotine cigarettes, reduction in retailer availability and introduction of a smokefree generation: analysis with "Don't know" responses included.

- Yes	110/139	70.0 (56.8, 80.5)	71.0 (60.4, 81.5)	-8.7 (-20.1, 2.7)
Oppose by evidence of financial hardship:				
- No	58/448	15.2 (11.0, 20.5)		
- Yes	26/139	23.3 (14.8, 34.6)		
Don't know by evidence of financial hardship:				
- No	20/448	4.3 (2.3, 7.8)		
- Yes	3/139	6.8 (1.5, 25.6)		

Very low nicotine cigarette and retailer reduction data are from Wave 3 participants. Smokefree generation data are from Wave 3.5 participants.
Values in bold are statistically significant absolute marginal differences compared to the reference value.
Support is defined as answering "strongly support" or "support".
For the overall number of participants in each group and the definition of financial hardship, see Table 1 of the corresponding journal article.
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
In keeping with the aims of the study, sensitivity analyses were conducted only on support outcomes.
Total ethnicity data are presented for Māori and Pacific peoples. Some participants identified as both Māori and Pacific (see Table 1); comparisons for these two groups are made to an exclusive non-Māori-non-Pacific group.

Appendix Table 5: Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

	N support/N answered	**Weighted percentage (95% CI)**	**Marginally standardised percentage (95% CI)**	**Absolute difference (95% CI)**
"Do you support or oppose increased government spending on media campaigns to discourage youth and young people from starting to smoke?"				
Total:				
- Support	1,087/1,216	89.2 (86.4, 91.4)	N/A	N/A
- Oppose	93/1,216	7.2 (5.5, 9.2)	N/A	N/A
- Don't know	36/1,216	3.7 (2.2, 6.0)	N/A	N/A
Support by smoking status:				
- Smokes	872/980	87.7 (84.4, 90.4)	87.7 (84.3, 91.0)	Reference
- Recently quit	215/236	94.1 (88.9, 97.0)	93.9 (90.1, 97.7)	**6.3 (1.2, 11.3)**
Oppose by smoking status:				
- Smokes	79/980	7.9 (6.1, 10.3)		
- Recently quit	14/236	4.5 (2.0, 9.7)		

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

Don't know by smoking status:				
- Smokes	29/980	4.3 (2.5, 7.3)		
- Recently quit	7/236	1.4 (0.5, 3.8)		
Support by smoking status and quit intent:				
- Smokes daily not intending to quit	143/177	75.6 (64.8, 83.9)	75.2 (66.5, 83.8)	Reference
- Smokes daily intending to quit	419/470	89.3 (85.1, 92.3)	89.5 (85.8, 93.2)	**14.3 (5.0, 23.6)**
- Smokes less than daily	272/290	93.9 (88.9, 96.8)	93.8 (89.2, 98.4)	**18.6 (9.0, 28.2)**
- Recently quit	215/236	94.1 (88.9, 97.0)	93.9 (90.0, 97.7)	**18.7 (9.0, 28.4)**
Oppose by smoking status and quit intent:				
- Smokes daily not intending to quit	26/177	15.8 (10.2, 23.8)		
- Smokes daily intending to quit	37/470	7.9 (5.4, 11.4)		
- Smokes less than daily	13/290	2.6 (1.4, 5.0)		
- Recently quit	14/236	4.5 (2.0, 9.7)		
Don't know by smoking status and quit intent:				
- Smokes daily not intending to quit	8/177	8.6 (3.1, 21.5)		
- Smokes daily intending to quit	14/470	2.9 (1.4, 6.0)		
- Smokes less than daily	5/290	3.5 (1.3, 9.1)		
- Recently quit	7/236	1.4 (0.5, 3.8)		
Support by total ethnicity:				
- Māori	426/486	86.5 (82.0, 89.9)	85.3 (80.3, 90.4)	-5.0 (-10.9, 0.9)
- Pacific	208/231	89.9 (83.4, 94.0)	88.0 (81.3, 94.6)	-2.4 (-9.8, 5.0)
- Non-Māori-Non-Pacific	494/543	90.3 (86.2, 93.3)	90.4 (87.2, 93.5)	Reference
Oppose by total ethnicity:				
- Māori	41/486	9.3 (6.4, 13.2)		
- Pacific	14/231	4.8 (2.6, 8.6)		
- Non-Māori-Non-Pacific	41/543	6.9 (4.7, 10.0)		
Don't know by total ethnicity:				
- Māori	19/486	4.3 (2.5, 7.3)		
- Pacific	9/231	5.3 (2.3, 12.1)		
- Non-Māori-Non-Pacific	8/543	2.8 (1.1, 7.0)		

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

Support by age:				
- 18–24	287/324	88.4 (83.5, 92.0)	86.5 (81.3, 91.7)	-2.0 (-8.5, 4.5)
- 25–44	467/521	91.0 (87.6, 93.6)	91.0 (88.0, 94.1)	2.5 (-2.2, 7.2)
- 45 and above	333/371	87.6 (81.8, 91.7)	88.5 (84.6, 92.4)	Reference
Oppose by age:				
- 18–24	28/324	8.6 (5.6, 12.9)		
- 25–44	43/521	6.8 (4.7, 9.7)		
- 45 and above	22/371	6.9 (4.3, 11.1)		
Don't know by age:				
- 18–24	9/324	3.0 (1.4, 6.5)		
- 25–44	11/521	2.2 (1.0, 4.8)		
- 45 and above	16/371	5.5 (2.7, 11.0)		
Support by gender:				
- Male	389/442	88.0 (83.3, 91.5)	87.4 (83.4, 91.4)	Reference
- Female	697/772	90.6 (87.9, 92.8)	91.2 (88.7, 93.7)	3.8 (-0.9, 8.5)
Oppose by gender:				
- Male	41/442	7.9 (5.4, 11.3)		
- Female	52/772	6.3 (4.6, 8.6)		
Don't know by gender:				
- Male	12/442	4.2 (2.0, 8.6)		
- Female	23/772	3.1 (1.8, 5.0)		
Support by evidence of financial hardship:				
- No	756/839	89.9 (86.5, 92.5)	89.6 (86.9, 92.3)	Reference
- Yes	301/341	87.3 (81.7, 91.4)	88.2 (83.7, 92.6)	-1.4 (-6.5, 3.6)
Oppose by evidence of financial hardship:				
- No	57/839	6.4 (4.6, 8.8)		
- Yes	32/341	9.4 (6.2, 14.1)		
Don't know by evidence of financial hardship:				
- No	26/839	3.7 (2.0, 6.7)		
- Yes	8/341	3.3 (1.2, 8.3)		

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

"Do you support or oppose increased government spending on media campaigns to promote quitting smoking?"				
Total:				
- Support	764/1,211	61.5 (57.8, 65.2)	N/A	N/A
- Oppose	331/1,211	27.6 (24.4, 31.0)	N/A	N/A
- Don't know	116/1,211	10.9 (8.5, 13.9)	N/A	N/A
Support by smoking status:				
- Smokes	602/976	59.0 (54.9, 63.1)	59.3 (55.0, 63.7)	Reference
- Recently quit	162/235	69.9 (60.9, 77.5)	70.2 (61.8, 78.7)	**10.9 (1.0, 20.8)**
Oppose by smoking status:				
- Smokes	280/976	29.8 (26.2, 33.7)		
- Recently quit	51/235	20.0 (14.2, 27.5)		
Don't know by smoking status:				
- Smokes	94/976	11.1 (8.5, 14.4)		
- Recently quit	22/235	10.1 (5.1, 18.8)		
Support by smoking status and quit intent:				
- Smokes daily not intending to quit	71/175	42.2 (32.8, 52.3)	42.3 (32.6, 52.0)	Reference
- Smokes daily intending to quit	291/467	60.3 (54.5, 65.9)	61.8 (55.7, 68.0)	**19.5 (8.4, 30.7)**
- Smokes less than daily	219/291	71.7 (63.3, 78.9)	71.0 (62.8, 79.2)	**28.7 (15.8, 41.6)**
- Recently quit	162/235	69.9 (60.9, 77.5)	69.9 (61.5, 78.3)	**27.6 (14.2, 41.0)**
Oppose by smoking status and quit intent:				
- Smokes daily not intending to quit	87/175	48.4 (38.9, 58.1)		
- Smokes daily intending to quit	131/467	30.1 (25.1, 35.7)		
- Smokes less than daily	53/291	16.2 (11.6, 22.1)		
- Recently quit	51/235	20.0 (14.2, 27.5)		
Don't know by smoking status and quit intent:				
- Smokes daily not intending to quit	17/175	9.3 (5.3, 16.0)		
- Smokes daily intending to quit	45/467	9.5 (6.5, 13.7)		
- Smokes less than daily	19/291	12.1 (6.5, 21.4)		
- Recently quit	22/235	10.1 (5.1, 18.8)		

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

Support by total ethnicity:				
- Māori	291/488	55.9 (50.4, 61.2)	56.8 (50.6, 62.9)	**-9.9 (-17.9, -1.8)**
- Pacific	141/231	57.4 (48.6, 65.7)	54.8 (45.7, 63.9)	**-11.8 (-22.1, -1.5)**
- Non-Māori-Non-Pacific	358/537	65.2 (59.7, 70.3)	66.6 (61.6, 71.7)	Reference
Oppose by total ethnicity:				
- Māori	149/488	32.2 (27.3, 37.4)		
- Pacific	60/231	24.6 (18.3, 32.1)		
- Non-Māori-Non-Pacific	138/537	26.9 (22.4, 31.9)		
Don't know by total ethnicity:				
- Māori	48/488	12.0 (8.5, 16.5)		
- Pacific	30/231	18.0 (11.3, 27.5)		
- Non-Māori-Non-Pacific	41/537	7.9 (5.1, 12.2)		
Support by age:				
- 18–24	210/322	66.5 (59.8, 72.6)	63.5 (56.4, 70.6)	3.8 (-6.1, 13.7)
- 25–44	339/520	63.0 (57.2, 68.6)	64.4 (58.6, 70.2)	4.7 (-4.0, 13.4)
- 45 and above	215/369	57.7 (51.3, 64.0)	59.7 (53.3, 66.1)	Reference
Oppose by age:				
- 18–24	79/322	23.3 (18.2, 29.3)		
- 25–44	143/520	27.2 (22.5, 32.5)		
- 45 and above	109/369	29.8 (24.4, 35.9)		
Don't know by age:				
- 18–24	33/322	10.2 (6.6, 15.3)		
- 25–44	38/520	9.8 (6.2, 15.0)		
- 45 and above	45/369	12.4 (8.4, 17.9)		
Support by gender:				
- Male	288/440	62.5 (56.7, 68.0)	62.3 (56.4, 68.1)	Reference
- Female	475/768	60.4 (55.8, 64.8)	62.5 (57.9, 67.1)	0.2 (-7.2, 7.7)
Oppose by gender:				
- Male	115/440	25.8 (21.2, 30.9)		
- Female	216/768	29.7 (25.7, 34.1)		

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

Don't know by gender:				
- Male	37/440	11.7 (8.0, 16.9)		
- Female	77/768	9.9 (7.3, 13.1)		
Support by evidence of financial hardship:				
- No	544/838	63.6 (59.1, 67.9)	63.9 (59.7, 68.1)	Reference
- Yes	203/337	56.4 (49.2, 63.3)	58.0 (51.0, 64.9)	-6.0 (-13.7, 1.8)
Oppose by evidence of financial hardship:				
- No	213/838	25.8 (22.1, 29.9)		
- Yes	104/337	31.1 (25.3, 37.6)		
Don't know by evidence of financial hardship:				
- No	81/838	10.5 (7.9, 14.0)		
- Yes	30/337	12.5 (7.5, 20.2)		
"Do you support or oppose the Smokefree 2025 policy goal?" *				
Total:				
- Support	634/1,209	52.1 (48.3, 55.9)	N/A	N/A
- Oppose	484/1,209	39.8 (36.2, 43.5)	N/A	N/A
- Don't know	91/1,209	8.1 (6.1, 10.7)	N/A	N/A
Support by smoking status:				
- Smokes	475/977	45.4 (41.4, 49.5)	44.9 (40.8, 49.1)	Reference
- Recently quit	159/232	75.2 (67.5, 81.5)	75.5 (68.4, 82.6)	**30.5 (21.9, 39.1)**
Oppose by smoking status:				
- Smokes	429/977	45.8 (41.7, 49.9)		
- Recently quit	55/232	19.2 (13.6, 26.4)		
Don't know by smoking status:				
- Smokes	73/977	8.8 (6.4, 12.0)		
- Recently quit	18/232	5.6 (3.1, 10.0)		
Support by smoking status and quit intent:				
- Smokes daily not intending to quit	36/178	16.0 (10.9, 23.0)	16.2 (10.1, 22.2)	Reference
- Smokes daily intending to quit	237/468	49.6 (43.9, 55.4)	49.6 (43.3, 55.9)	**33.4 (24.9, 42.0)**
- Smokes less than daily	189/288	62.5 (54.2, 70.1)	62.2 (54.1, 70.2)	**46.0 (35.9, 56.1)**
- Recently quit	159/232	75.2 (67.5, 81.5)	75.2 (68.1, 82.2)	**59.0 (49.4, 68.6)**

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

Oppose by smoking status and quit intent:				
- Smokes daily not intending to quit	132/178	77.6 (69.6, 83.9)		
- Smokes daily intending to quit	194/468	42.2 (36.7, 48.0)		
- Smokes less than daily	79/288	26.8 (20.8, 33.8)		
- Recently quit	55/232	19.2 (13.6, 26.4)		
Don't know by smoking status and quit intent:				
- Smokes daily not intending to quit	10/178	6.4 (3.2, 12.4)		
- Smokes daily intending to quit	37/468	8.1 (5.3, 12.2)		
- Smokes less than daily	20/288	10.7 (5.4, 20.3)		
- Recently quit	18/232	5.6 (3.1, 10.0)		
Support by total ethnicity:				
- Māori	238/485	46.2 (40.8, 51.6)	49.2 (43.5, 54.9)	-6.0 (-13.5, 1.6)
- Pacific	114/230	50.7 (42.2, 59.2)	49.3 (41.6, 57.0)	-5.9 (-14.9, 3.2)
- Non-Māori-Non-Pacific	302/540	55.0 (49.5, 60.4)	55.2 (50.5, 59.8)	Reference
Oppose by total ethnicity:				
- Māori	215/485	46.6 (41.2, 52.0)		
- Pacific	93/230	38.9 (31.1, 47.3)		
- Non-Māori-Non-Pacific	198/540	37.0 (31.9, 42.3)		
Don't know by total ethnicity:				
- Māori	32/485	7.2 (4.8, 10.8)		
- Pacific	23/230	10.4 (6.2, 16.7)		
- Non-Māori-Non-Pacific	40/540	8.0 (5.2, 12.1)		
Support by age:				
- 18–24	177/325	55.1 (48.2, 61.9)	47.7 (41.0, 54.5)	-0.2 (-9.4, 9.0)
- 25–44	294/517	58.6 (52.8, 64.1)	58.7 (53.6, 63.8)	**10.7 (2.9, 18.6)**
- ≥45	163/367	44.1 (37.9, 50.6)	48.0 (42.1, 53.8)	Reference
Oppose by age:				
- 18–24	125/325	38.8 (32.4, 45.8)		
- 25–44	189/517	33.4 (28.4, 38.8)		
- ≥45	170/367	46.8 (40.5, 53.3)		

Appendix Table 5 (continued): Support for measures to increase media campaign spending and the Smokefree Aotearoa 2025 goal: analysis with "Don't know" responses included.

Don't know by age:				
- 18–24	23/325	6.0 (3.6, 10.0)		
- 25–44	34/517	8.1 (5.3, 12.2)		
- ≥45	34/367	9.1 (5.7, 14.2)		
Support by gender:				
- Male	251/441	55.2 (49.4, 61.0)	54.7 (49.5, 59.8)	Reference
- Female	383/765	48.6 (44.1, 53.1)	50.3 (46.2, 54.4)	-4.4 (-11.0, 2.3)
Oppose by gender:				
- Male	162/441	36.5 (31.1, 42.2)		
- Female	319/765	43.5 (39.1, 48.1)		
Don't know by gender:				
- Male	28/441	8.3 (5.3, 12.8)		
- Female	63/765	7.9 (5.9, 10.5)		
Support by evidence of financial hardship:				
- No	442/833	53.5 (48.9, 58.0)	53.6 (49.7, 57.5)	Reference
- Yes	171/341	47.9 (40.9, 54.9)	50.1 (44.0, 56.1)	-3.5 (-10.6, 3.5)
Oppose by evidence of financial hardship:				
- No	325/833	37.8 (33.6, 42.3)		
- Yes	147/341	45.1 (38.3, 52.2)		
Don't know by evidence of financial hardship:				
- No	66/833	8.7 (6.2, 12.0)		
- Yes	23/341	7.0 (4.2, 11.3)		

Data are from Wave 3 participants. Values in bold are statistically significant absolute marginal differences compared to the reference value.
Support is defined as answering "strongly support" or "support".
For the overall number of participants in each group and the definition of financial hardship, see Table 1 in the corresponding journal article.
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
In keeping with the aims of the study, sensitivity analyses were conducted only on "support" outcomes.
Total ethnicity data are presented for Māori and Pacific peoples. Some participants identified as both Māori and Pacific (see Table 1); comparisons for these two groups are made to an exclusive non-Māori-non-Pacific group.
* A description of the goal was given prior to asking this question, worded as follows: "*We will now describe the Government's Smokefree 2025 goal: the goal aims to reduce the availability of tobacco and the number of people smoking to minimal levels, thereby making New Zealand essentially a smokefree nation by 2025. ('Minimal numbers of people smoking' is often interpreted as: less than 5% of people in all population groups will smoke.)*."

Appendix Table 6: Outcomes by ethnicity and age: anticipated responses to the introduction of very low nicotine cigarettes, with "Don't know" responses excluded.

		n/N	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
Total					
	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	288/908	35.1 (31.2, 39.2)	N/A	N/A
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	170/908	19.2 (16.0, 22.9)	N/A	N/A
	- Reduce the amount I smoke	184/908	18.4 (15.5, 21.7)	N/A	N/A
	- Quit smoking entirely	132/908	13.0 (10.6, 15.9)	N/A	N/A
	- Switch to vaping/ e-cigarettes	134/908	14.3 (11.6, 17.5)	N/A	N/A
Total ethnicity					
Māori	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	117/368	34.8 (29.1, 40.9)	35.6 (29.0, 42.2)	0.8 (-7.8, 9.5)
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	74/368	20.4 (15.9, 25.8)	20.0 (14.4, 25.6)	1.1 (-6.3, 8.5)
	- Reduce the amount I smoke	67/368	16.6 (12.7, 21.3)	13.8 (10.0, 17.6)	-5.2 (-11.2, 0.9)
	- Quit smoking entirely	59/368	14.9 (11.2, 19.5)	16.7 (12.0, 21.5)	5.3 (-0.4, 11.0)
	- Switch to vaping/ e-cigarettes	51/368	13.4 (9.9, 17.9)	13.8 (9.4, 18.3)	-2.0 (-8.3, 4.3)
Pacific peoples	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	45/183	27.5 (20.1, 36.4)	31.0 (22.1, 39.9)	-3.7 (-14.4, 6.9)
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	40/183	22.6 (15.8, 31.2)	20.1 (12.2, 28.0)	1.1 (-8.1, 10.4)

Appendix Table 6 (continued): Outcomes by ethnicity and age: anticipated responses to the introduction of very low nicotine cigarettes, with "Don't know" responses excluded.

Pacific peoples	- Reduce the amount I smoke	42/183	23.6 (16.8, 32.0)	21.6 (14.1, 29.1)	2.7 (-6.2, 11.6)
	- Quit smoking entirely	25/183	13.0 (7.6, 21.3)	13.8 (6.7, 21.0)	2.4 (-5.3, 10.1)
	- Switch to vaping/ e-cigarettes	31/183	13.4 (8.8, 19.9)	13.4 (7.9, 18.9)	-2.5 (-9.5, 4.6)
Non-Māori-Non-Pacific	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	131/393	37.5 (31.6, 43.7)	34.7 (29.2, 40.3)	Reference
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	68/393	18.1 (13.4, 24.0)	18.9 (14.2, 23.6)	
	- Reduce the amount I smoke	81/393	17.4 (13.4, 22.3)	19.0 (14.3, 23.6)	
	- Quit smoking entirely	54/393	11.9 (8.7, 16.1)	11.4 (8.2, 14.7)	
	- Switch to vaping/ e-cigarettes	59/393	15.1 (11.1, 20.2)	15.9 (11.5, 20.2)	
Age					
18–24	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	56/246	24.6 (18.5, 31.9)	26.6 (18.6, 34.6)	**-14.7 (-25.3, -4.1)**
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	57/246	23.5 (17.5, 30.7)	30.1 (24.0, 36.2)	**16.1 (6.7, 25.7)**
	- Reduce the amount I smoke	39/246	12.8 (8.8, 18.4)	12.5 (7.6, 17.4)	-0.4 (-7.5, 6.7)
	- Quit smoking entirely	40/246	14.4 (10.0, 20.4)	11.3 (6.9, 15.6)	-6.6 (-14.1, 0.9)
	- Switch to vaping/ e-cigarettes	54/246	24.6 (18.3, 32.4)	19.5 (13.7, 25.4)	5.6 (-2.4, 13.6)
25–44	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	121/401	30.1 (24.6, 36.3)	30.0 (24.0, 36.2)	**-11.2 (-20.3, -2.1)**
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	71/401	20.4 (15.6, 26.1)	21.1 (15.8, 26.5)	7.2 (0.0, 14.3)

Appendix Table 6 (continued): Outcomes by ethnicity and age: anticipated responses to the introduction of very low nicotine cigarettes, with "Don't know" responses excluded.

25–44	- Reduce the amount I smoke	104/401	24.8 (19.9, 30.5)	24.0 (18.7, 29.4)	**11.1 (3.9, 18.4)**
	- Quit smoking entirely	56/401	11.8 (8.5, 16.1)	11.3 (7.8, 14.9)	-6.5 (-13.2, 0.2)
	- Switch to vaping/ e-cigarettes	49/401	12.9 (9.0, 18.1)	13.4 (9.0, 19.2)	-0.5 (-7.6, 6.5)
≥45	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	111/261	45.5 (38.4, 52.8)	41.3 (34.6, 48.0)	Reference
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	42/261	16.0 (10.7, 23.1)	14.0 (9.2, 18.8)	
	- Reduce the amount I smoke	41/261	13.4 (9.5, 18.5)	12.9 (8.2, 17.7)	
	- Quit smoking entirely	36/261	13.7 (9.6, 19.3)	17.8 (12.0, 23.6)	
	- Switch to vaping/ e-cigarettes	31/261	11.4 (7.8, 16.4)	13.9 (8.7, 19.2)	

Data are from Wave 3 participants. Values in bold are statistically significant absolute marginal differences compared to the reference value.
Wording of the question was "Which ONE of the following would you be MOST LIKELY to do if the amount of nicotine in cigarettes and tobacco was greatly reduced so they were no longer addictive?" Answer options were worded as per the text in the Table.
For the overall number of participants in each group and the definition of financial hardship, see Table 1. Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.
For the total value, 7 out of 992 participants (0.7%) were excluded, as they refused to answer or had no response, and 77 out of 992 participants (7.8%) were excluded, as they answered "Don't know".
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Total ethnicity data are presented for Māori and Pacific peoples. Some participants identified as both Māori and Pacific (see Table 1); comparisons for these two groups are made to an exclusive non-Māori-non-Pacific group.
Electronic cigarettes = e-cigarettes.

Appendix Table 7: Outcomes by gender and financial hardship: anticipated responses to the introduction of very low nicotine cigarettes, with "Don't know" responses excluded.

		n/N	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute difference (95% CI)
Total					
	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	288/908	35.1 (31.2, 39.2)	N/A	N/A
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	170/908	19.2 (16.0, 22.9)	N/A	N/A
	- Reduce the amount I smoke	184/908	18.4 (15.5, 21.7)	N/A	N/A
	- Quit smoking entirely	132/908	13.0 (10.6, 15.9)	N/A	N/A
	- Switch to vaping/ e-cigarettes	134/908	14.3 (11.6, 17.5)	N/A	N/A
Gender					
Male	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	108/343	32.3 (26.6, 38.6)	31.4 (25.1, 37.7)	Reference
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	76/343	23.0 (17.7, 29.2)	23.1 (17.9, 28.7)	
	- Reduce the amount I smoke	63/343	17.1 (12.9, 22.3)	16.5 (12.0, 21.0)	
	- Quit smoking entirely	50/343	13.5 (9.8, 18.3)	14.7 (10.2, 19.2)	
	- Switch to vaping/ e-cigarettes	46/343	14.1 (10.1, 19.3)	14.3 (9.9, 18.7)	
Female	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	180/564	38.3 (33.4, 43.6)	38.1 (33.3, 42.8)	6.7 (-1.3, 14.7)

Appendix Table 7 (continued): Outcomes by gender and financial hardship: anticipated responses to the introduction of very low nicotine cigarettes, with "Don't know" responses excluded.

Female	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	94/564	14.9 (11.8, 18.6)	14.7 (11.4, 18.0)	**-8.3 (-14.9, -1.8)**
	- Reduce the amount I smoke	120/564	19.9 (16.3, 24.0)	19.8 (15.9, 23.7)	3.3 (-2.6, 9.3)
	- Quit smoking entirely	82/564	12.4 (9.7, 15.7)	11.8 (8.9, 14.6)	-3.0 (-8.4, 2.5)
	- Switch to vaping/ e-cigarettes	88/564	14.5 (11.5, 18.3)	15.7 (12.2, 19.2)	1.4 (-4.3, 7.0)
Evidence of financial hardship					
No	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	202/606	36.9 (32.1, 42.1)	36.1 (31.4, 40.7)	Reference
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	99/606	17.7 (13.8, 22.5)	17.7 (13.9, 21.4)	
	- Reduce the amount I smoke	127/606	18.3 (14.9, 22.4)	18.5 (14.9, 22.1)	
	- Quit smoking entirely	89/606	12.8 (10.0, 16.2)	13.1 (10.2, 16.1)	
	- Switch to vaping/ e-cigarettes	89/606	14.3 (11.1, 18.2)	14.6 (11.2, 18.0)	
Yes	- Carry on smoking like I do now, with the cigarettes or tobacco that were available	74/273	28.3 (22.1, 35.4)	30.2 (23.2, 37.1)	-5.9 (-14.1, 2.3)
	- Carry on smoking like I do now, but find a way to get the cigarettes or tobacco I want to smoke	66/273	23.8 (18.1, 30.6)	23.4 (16.8, 30.0)	5.7 (-1.7, 13.1)
	- Reduce the amount I smoke	52/273	18.5 (13.6, 24.6)	16.7 (11.6, 21.9)	-1.8 (-7.9, 4.4)
	- Quit smoking entirely	41/273	14.1 (9.5, 20.5)	13.7 (8.6, 18.9)	0.6 (-5.2, 6.4)
	- Switch to vaping/ e-cigarettes	40/273	15.4 (10.7, 21.5)	16.0 (10.3, 21.6)	1.4 (-5.2, 7.9)

Data are from Wave 3 participants. Values in bold are statistically significant absolute marginal differences compared to the reference value.

Appendix Table 7 (continued): Outcomes by gender and financial hardship: anticipated responses to the introduction of very low nicotine cigarettes, with "Don't know" responses excluded.

Wording of the question was "Which ONE of the following would you be MOST LIKELY to do if the amount of nicotine in cigarettes and tobacco was greatly reduced so they were no longer addictive?" Answer options were worded as per the text in the Table.
For the overall number of participants in each group and the definition of financial hardship, see Table 1 of the corresponding journal article. Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.
For the total value, 7 out of 992 participants (0.7%) were excluded, as they refused to answer or had no response, and 77 out of 992 participants (7.8%) were excluded, as they answered "Don't know".
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Of note, some participants identified as both Māori and Pacific (please see Table 1 for detail).
Electronic cigarettes = e-cigarettes.

Appendix Table 8: Outcomes by ethnicity and age: anticipated responses to the introduction of a retailer reduction, with "Don't know" responses excluded.

		n/N	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute marginal difference (95% CI)
Total					
	- Carry on smoking like I do now	466/939	53.2 (49.1, 57.2)	N/A	N/A
	- Reduce the amount I smoke	217/939	21.6 (18.6, 25.1)	N/A	N/A
	- Quit smoking entirely	121/939	12.3 (9.9, 15.1)	N/A	N/A
	- Switch to vaping/ e-cigarettes	135/939	12.9 (10.5, 15.7)	N/A	N/A
Total ethnicity					
Māori	- Carry on smoking like I do now	199/386	54.8 (49.0, 60.6)	55.4 (49.6, 61.2)	1.3 (-6.9, 9.5)
	- Reduce the amount I smoke	83/386	20.1 (15.9, 25.1)	18.4 (13.9, 22.9)	-2.9 (-9.6, 3.7)
	- Quit smoking entirely	52/386	12.9 (9.7, 17.1)	14.5 (10.3, 18.7)	4.1 (-1.0, 9.3)
	- Switch to vaping/ e-cigarettes	52/386	12.1 (8.9, 16.4)	11.6 (7.8, 15.4)	-2.4 (-8.1, 3.2)
Pacific peoples	- Carry on smoking like I do now	79/187	42.6 (33.9, 51.8)	46.2 (37.6, 54.8)	-7.9 (-18.3, 2.5)
	- Reduce the amount I smoke	48/187	29.3 (21.6, 38.5)	23.6 (16.0, 31.2)	2.3 (-6.7, 11.2)
	- Quit smoking entirely	27/187	12.9 (8.2, 19.8)	15.5 (8.9, 22.2)	5.1 (-2.2, 12.5)

Appendix Table 8 (continued): Outcomes by ethnicity and age: anticipated responses to the introduction of a retailer reduction, with "Don't know" responses excluded.

Pacific peoples	- Switch to vaping/ e-cigarettes	33/187	15.2 (9.9, 22.5)	14.6 (8.6, 20.7)	0.5 (-6.7, 7.8)
Non-Māori-Non-Pacific	- Carry on smoking like I do now	209/404	56.4 (50.4, 62.3)	54.2 (49.6, 61.2)	Reference
	- Reduce the amount I smoke	90/404	19.3 (15.2, 24.2)	21.4 (16.5, 26.2)	
	- Quit smoking entirely	46/404	11.6 (8.2, 16.1)	10.4 (7.2, 13.6)	
	- Switch to vaping/ e-cigarettes	59/404	12.7 (9.4, 17.0)	14.1 (8.2, 18.1)	
Age					
18–24	- Carry on smoking like I do now	118/253	48.3 (40.7, 56.0)	57.2 (50.3, 64.2)	1.7 (-8.1, 11.5)
	- Reduce the amount I smoke	46/253	16.3 (11.6, 22.3)	14.7 (9.5, 20.0)	0.3 (-7.2, 7.9)
	- Quit smoking entirely	31/253	12.2 (8.0, 18.1)	9.3 (5.3, 13.3)	**-7.8 (-14.9, -0.8)**
	- Switch to vaping/ e-cigarettes	58/253	23.2 (17.2, 30.6)	18.7 (13.0, 24.4)	5.8 (-2.0, 13.6)
25–44	- Carry on smoking like I do now	181/412	46.6 (40.5, 52.8)	49.1 (43.0, 55.1)	-6.5 (-15.5, 2.5)
	- Reduce the amount I smoke	128/412	30.3 (25.0, 36.2)	28.7 (23.0, 34.4)	**14.3 (6.6, 22.0)**
	- Quit smoking entirely	54/412	11.8 (8.5, 16.2)	10.6 (7.4, 13.8)	**-6.6 (-13.0, -0.1)**
	- Switch to vaping/ e-cigarettes	49/412	11.3 (8.1, 15.6)	11.6 (7.8, 15.3)	-1.3 (-7.5, 5.0)
≥45	- Carry on smoking like I do now	167/274	62.7 (55.8, 69.1)	55.6 (49.2, 61.9)	Reference
	- Reduce the amount I smoke	43/274	14.2 (10.2, 19.4)	14.4 (9.4, 19.4)	
	- Quit smoking entirely	36/274	12.8 (8.9, 18.2)	17.2 (11.6, 22.8)	
	- Switch to vaping/ e-cigarettes	28/274	10.2 (6.8, 15.1)	12.9 (7.8, 17.9)	

Data are from Wave 3 participants. Values in bold are statistically significant absolute marginal differences compared to the reference value.
Wording of the questions was "Which ONE of the following would you be MOST LIKELY to do if the number of places in New Zealand that could sell tobacco was reduced from around 6,000 to 300?" Answer options were worded as per the text in the Table. For the overall number of participants in each group and the definition of financial hardship, see Table 1. Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.

Appendix Table 8 (continued): Outcomes by ethnicity and age: anticipated responses to the introduction of a retailer reduction, with "Don't know" responses excluded.

For the total value, 8 out of 992 participants (0.8%) participants were excluded as they refused to answer or had no response recorded, and 45 out of 992 participants (4.5%) were excluded as they answered "Don't know".
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Total ethnicity data are presented for Māori and Pacific peoples. Some participants identified as both Māori and Pacific (see Table 1); comparisons for these two groups are made to an exclusive non-Māori-non-Pacific group.

Appendix Table 9: Outcomes by gender and financial hardship: anticipated responses to the introduction of retailer reduction, with "Don't know" responses excluded.

		n/N	Weighted percentage (95% CI)	Marginally standardised percentage (95% CI)	Absolute difference (95% CI)
Total					
	- Carry on smoking like I do now	466/939	53.2 (49.1, 57.2)	N/A	N/A
	- Reduce the amount I smoke	217/939	21.6 (18.6, 25.1)	N/A	N/A
	- Quit smoking entirely	121/939	12.3 (9.9, 15.1)	N/A	N/A
	- Switch to vaping/ e-cigarettes	135/939	12.9 (10.5, 15.7)	N/A	N/A
Gender					
Male	- Carry on smoking like I do now	175/352	53.1 (46.8, 59.4)	52.6 (46.8, 58.3)	Reference
	- Reduce the amount I smoke	88/352	22.0 (17.4, 27.5)	22.2 (17.1, 27.2)	
	- Quit smoking entirely	45/352	13.1 (9.4, 17.9)	13.1 (9.2, 17.1)	
	- Switch to vaping/ e-cigarettes	44/352	11.8 (8.4, 16.3)	12.1 (8.3, 16.0)	
Female	- Carry on smoking like I do now	291/586	53.3 (48.3, 58.1)	53.3 (48.8, 57.7)	0.8 (-6.5, 8.1)
	- Reduce the amount I smoke	129/586	21.2 (17.6, 25.4)	20.0 (16.2, 23.8)	-2.3 (-8.6, 4.0)
	- Quit smoking entirely	76/586	11.4 (8.9, 14.6)	11.6 (8.7, 14.5)	-1.5 (-6.4, 3.4)
	- Switch to vaping/ e-cigarettes	90/586	14.1 (11.1, 17.8)	15.2 (11.7, 18.6)	3.0 (-2.1, 8.2)

Appendix Table 9 (continued): Outcomes by gender and financial hardship: anticipated responses to the introduction of retailer reduction, with "Don't know" responses excluded.

Evidence of financial hardship					
No	- Carry on smoking like I do now	314/631	54.5 (49.5, 59.3)	52.7 (48.2, 57.0)	Reference
	- Reduce the amount I smoke	135/631	19.1 (15.7, 23.1)	20.3 (16.6, 24.0)	
	- Quit smoking entirely	88/631	13.8 (10.7, 17.5)	13.8 (10.7, 16.9)	
	- Switch to vaping/ e-cigarettes	94/631	12.6 (9.9, 15.9)	13.3 (10.2, 16.3)	
Yes	- Carry on smoking like I do now	141/280	50.3 (43.0, 57.6)	53.6 (46.9, 60.3)	1.0 (-7.1, 9.0)
	- Reduce the amount I smoke	71/280	25.8 (19.8, 32.8)	23.2 (17.1, 29.2)	2.9 (-4.1, 9.9)
	- Quit smoking entirely	32/280	9.5 (6.4, 13.8)	9.0 (5.6, 12.4)	**-4.8 (-9.2, -0.3)**
	- Switch to vaping/ e-cigarettes	36/280	14.4 (9.8, 20.9)	14.2 (8.9, 19.5)	0.9 (-5.3, 7.1)

Data are from Wave 3 participants. Values in bold are statistically significant absolute marginal differences compared to the reference value.
Wording of the questions was "Which ONE of the following would you be MOST LIKELY to do if the number of places in New Zealand that could sell tobacco was reduced from around 6,000 to 300?" Answer options were worded as per the text in the Table.
For the overall number of participants in each group and the definition of financial hardship, see Table 1 of the corresponding journal article. Note that N answered values vary from the values in Table 1, as participants who refused to answer or answered "Don't know" were excluded.
For the total value, 8 out of 992 participants (0.8%) participants were excluded as they refused to answer or had no response recorded, and 45 out of 992 participants (4.5%) were excluded as they answered "Don't know".
When comparing groups, we present marginally standardised percentages and absolute differences (with 95% CI) that adjust for potential confounding from the following covariates: smoking status and quit intention, prioritised ethnicity, gender, age group and financial hardship.
Electronic cigarettes = e-cigarettes.

The prevalence of aortic stenosis in Māori undergoing clinically indicated echocardiography compared to New Zealand Europeans

Matthew K Moore, Gregory T Jones, Gillian Whalley, Michael JA Williams, Ralph A Stewart, Sean Coffey

ABSTRACT

AIM: There are limited data on the prevalence of calcific aortic valve disease (CAVD) in Māori and known inequities in outcomes after aortic valve intervention. Our study aimed to investigate the prevalence of CAVD in Māori.

METHODS: Data from initial clinically indicated echocardiograms performed between 2010 to 2018 in patients aged ≥18 years were linked to nationally collected outcome data. Ethnicity was defined using protocols from the Ministry of Health.

RESULTS: Of the 23,635 patients, 1,312 (5.6%) identified as Māori, and 22,323 (94.4%) as European. Prevalence of aortic stenosis was 5.3% in Māori and 9.9% in Europeans. Age-specific prevalence did not differ between the two groups. Māori with CAVD were more than twice as likely to have advanced cardiac impairment (right ventricular dysfunction) than Europeans (10.1% vs 4.6, p<0.001).

CONCLUSIONS: Age-specific CAVD rates did not differ between Māori and Europeans, though Māori had a higher proportion of advanced cardiac impairment, which is likely unrelated to CAVD. Differences in population structure likely explain the difference in overall prevalence of CAVD. The improving life expectancy in Māori may lead to increasing incidence of CAVD, thus strategies to improve detection and medical management of CAVD should begin as soon as possible.

Calcific aortic valve disease (CAVD) consists of a spectrum of abnormalities, from thickening and calcification of the valve without haemodynamic significance (aortic sclerosis [ASc]) to calcification of the leaflets and reduction in valve opening (aortic stenosis [AS]) resulting in increased left ventricular afterload. AS affects over 9 million people world-wide, with age being a key risk factor for CAVD, alongside other markers of general cardiovascular risk including diabetes, dyslipidaemia and hypertension.[1–4] Variants in certain genes have also been associated with CAVD,[5,6] but while there has been significant progress in understanding the pathobiology of the disease and interventional treatment of severe disease, there have been no advances in medical therapies.[7–9]

The most recent data for the prevalence of CAVD in New Zealand came from the National Health Committee in 2014, which found that Māori had a lower age-standardised prevalence of severe CAVD compared to non-Māori.[10] There are currently no peer-reviewed publications examining the prevalence or incidence of CAVD in Māori. Recent work found markedly worse outcomes for Māori following treatment for severe CAVD, with Māori patients having significantly reduced survival following both transcatheter aortic valve implantation (TAVI) and surgical aortic valve replacement (SAVR) compared to Europeans, despite being significantly younger.[11,12]

Thus, we sought to investigate the prevalence and significance of CAVD in Māori undergoing clinically indicated echocardiography to provide information to researchers and clinicians.

Methods

Study cohort and approval

The study cohort for this retrospective study consisted of all patients over 18 years old who underwent clinically indicated echocardiography at Dunedin Hospital or Invercargill Hospital over a 9-year period between 1 January 2010 and 31 December 2018. Consultation with Māori was undertaken with the Ngāi Tahu Research Consultation Committee, and ethical approval was granted by the New Zealand Central Health

and Disability Ethics Committee (ref: 21/CEN/15). Locality approval was provided by Health New Zealand – Te Whatu Ora Southern.

Collection and cleaning of echocardiographic data

Data were stored in the syngo Dynamics echocardiographic picture archiving and communication system (PACS) (version VA20F, Siemens Healthineers, Erlangen, Germany), and extracted using the syngo Dynamics Data Miner. Subsequent studies on the same patient and any studies with missing CAVD status (n=1,323) were excluded, leading to an initial cohort size of 24,699. Of these, 23,635 identified as either Māori or European. Details of data extraction, cleaning, comprehensive variable definitions and non-ethnicity stratified outcomes are described in detail elsewhere.[13,14] Categorical variables, including CAVD status, were defined using tailored functions that analysed free-text fields for relevant phrases. CAVD classification was hence based on the reading cardiologist's clinical description in the echocardiography report. Mild-to-moderate and moderate-to-severe stenosis were coded as mild and moderate disease, respectively. Patients who had undergone previous SAVR or TAVI were described separately. When aggregating CAVD severity, those who had undergone aortic valve implantation (AVI) were included in the AS category.

Determination of extravalvular cardiac impairment

In order to further identify differences in CAVD phenotype, patients were categorised into CAVD stages using a previously developed staging system based on extravalvular cardiac impairment.[15] For clarity in this manuscript, "impairment" refers to this staging system, whereas "severity" refers to the common clinical understanding of mild, moderate and severe stenosis. While CAVD is not necessarily the cause of any identified extravalvular impairment, especially at lower levels of CAVD severity, higher stages of disease have been shown to be good predictors of prognosis in patients with CAVD.[16,17] Left ventricular (LV) mass was calculated using the Devereux formula. Body surface area was frequently not available in our dataset, so the upper limits of the normal range of absolute LV mass were used.[18] Similarly, E/e', a surrogate measure of mean left atrial pressure, is not measured in those with significant mitral valvular disease, mitral annular calcification, arrhythmia or other settings where E/e' is known to be inaccurate, and hence was assumed to be abnormal if it was not recorded.[19]

- Stage 0: No extravalvular cardiac impairment
- Stage 1: LV mass >224 (male) or >162 (female), E/e' >14 or not measured, or left ventricular ejection fraction <40%
- Stage 2: Moderately or worse dilated left atrium, atrial fibrillation, or moderate or worse mitral regurgitation
- Stage 3: Right ventricular systolic pressure >60mmHg, or moderate or worse tricuspid regurgitation
- Stage 4: Moderately or worse impaired right ventricular systolic function

Data validation

To investigate the accuracy of Data Miner output, 100 studies were randomly selected, with the dataset categorisation compared to the final echocardiography report. This revealed excellent agreement.[13]

Statistical analysis

All analysis was performed on a de-identified dataset with National Health Index numbers replaced by anonymous identifiers. Continuous data are expressed as mean (standard deviation) if normally distributed, and otherwise as median (interquartile range). Data were analysed using the Mann–Whitney U-test if continuous and non-normally distributed, and with ANOVA if normally distributed. Categorical variables were analysed using the Chi-squared test. All analyses, including data cleaning, were performed using RStudio with R version 3.6.3.[20–22] Age standardisation was performed using the RStudio package epitools.[23]

Results

Of the 23,635 people in the cohort, 1,312 (5.6%) identified as Māori, and 22,323 (94.4%) were European (Table 1). Māori were significantly younger than European patients (55.4 years vs 64.9 years, p<0.001), but the sex distribution was not significantly different between the two ethnicities (p=0.64). The proportion of bicuspid aortic valve disease appeared similar in both ethnicities (1.3% vs 1.6%).

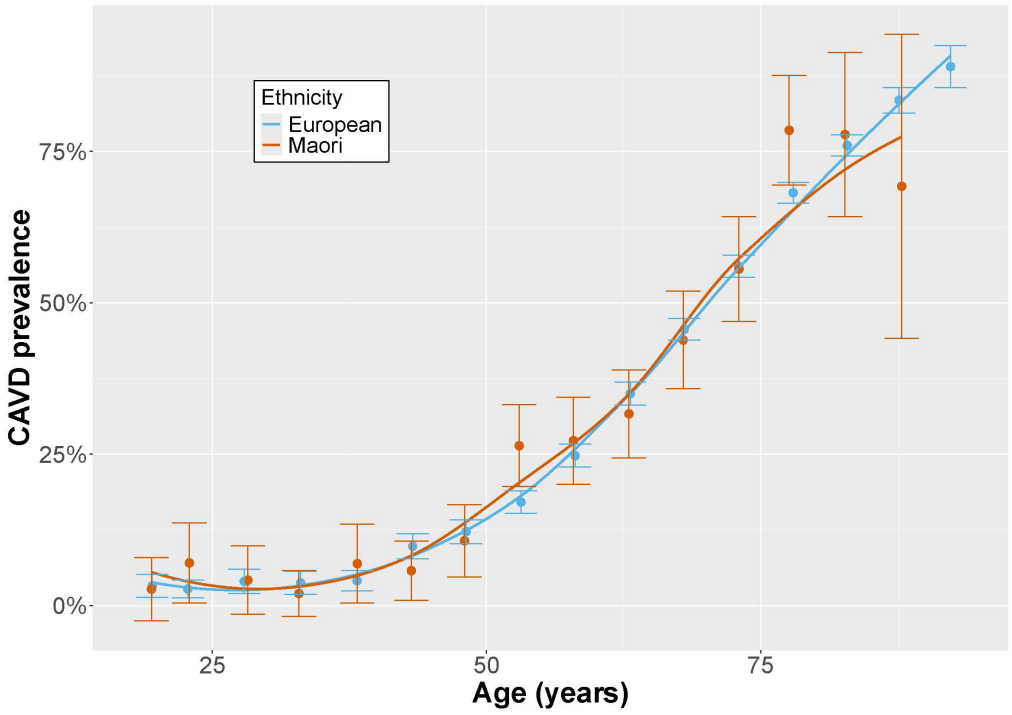
The proportion of any CAVD increased markedly with age. It was present in 50% of 70-year-olds

Table 1: Cohort characteristics.

	Overall (N=23,635)	**Māori (N=1,312)**	**European (N=22,323)**
Age (years)			
Mean (SD)	64.40 (16.70)	55.40 (16.70)	64.90 (16.60)
Sex			
Female	11,027 (46.7)	621 (47.3)	10,406 (46.6)
Male	12,608 (53.3)	691 (52.7)	11,917 (53.4)
Aortic valve maximum velocity (m/s)			
Mean (SD)	1.47 (0.87)	1.32 (0.69)	1.47 (0.88)
Not reported	2,374 (11.2)	134 (11.4)	2,240 (11.2)
CAVD severity			
No CAVD	13,464 (57.0)	915 (69.7)	12,549 (56.2)
Sclerosis	7,839 (33.2)	327 (24.9)	7,512 (33.7)
Mild	895 (3.8)	25 (1.9)	870 (3.9)
Moderate	522 (2.2)	16 (1.2)	506 (2.3)
Severe	370 (1.6)	8 (0.6)	362 (1.6)
AVI	545 (2.3)	21 (1.6)	524 (2.3)
Mitral annular calcification			
Yes	3,302 (14.0)	108 (8.2)	3,194 (14.3)
No	19,988 (84.6)	1,186 (90.4)	18,802 (84.2)
Not reported	345 (1.5)	18 (1.4)	327 (1.5)
Bicuspid aortic valve			
Yes	311 (1.3)	21 (1.6)	290 (1.3)
No	23,324 (98.7)	1,291 (98.4)	22,033 (98.7)

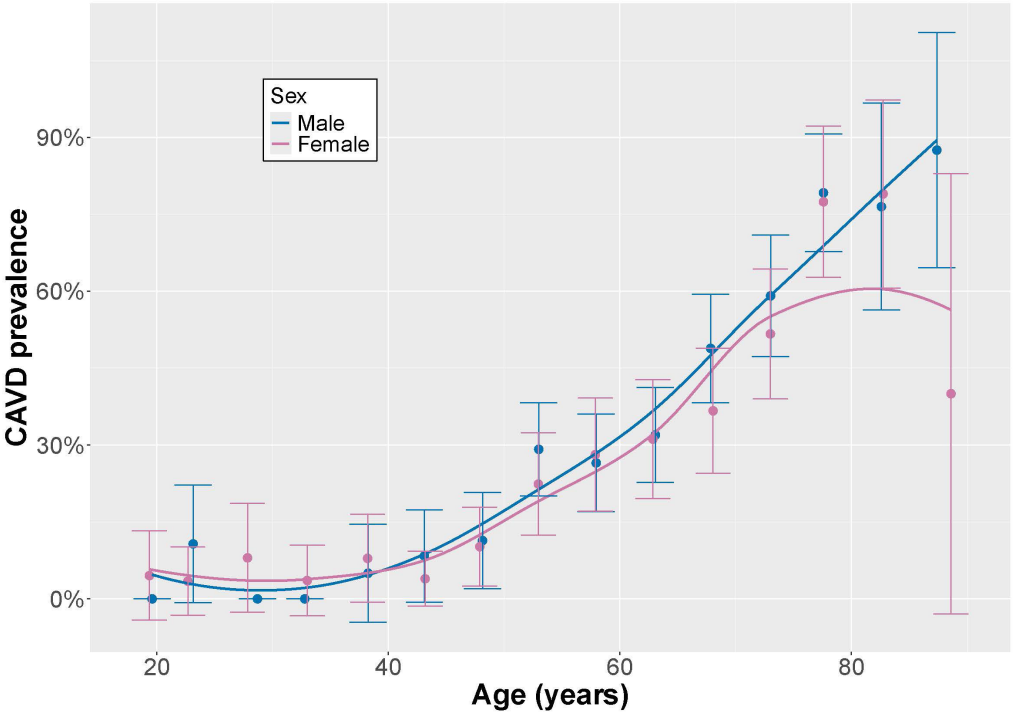
SD = standard deviation; CAVD = calcific aortic valve disease; AVI = aortic valve intervention.

Figure 1: Age-related prevalence of calcific aortic valve disease stratified by ethnicity in patients undergoing clinically indicated echocardiography.



Points are the proportion within each 5-year age band and the average age within each band. Error bars represent 95% confidence intervals. The plotted curve was fitted using locally weighed smoothing (LOESS regression function).

Figure 2: Age-related prevalence of calcific aortic valve disease in Māori, stratified by sex.



Points are the proportion within each 5-year age band and the average age within each band. Error bars represent 95% confidence intervals. The plotted curve was fitted using locally weighed smoothing (LOESS regression function).

Table 2: Proportion of Māori and Europeans with different severity of CAVD.

	Māori (n=1,313)	European (n=22,323)	Corrected p-value
Aortic sclerosis	327 (24.9)	7,512 (33.7)	<0.001
Aortic stenosis	70 (5.3)	2,262 (10.1)	<0.001
Any CAVD	397 (30.2)	9,774 (43.8)	<0.001

Cell values are expressed in n (%) and P determined using a two-sided Z-test (with Bonferroni correction for multiple testing).
CAVD = calcific aortic valve disease.

Table 3: Age-standardised rates per 100,000 of CAVD by ethnicity with 95% confidence intervals in patients undergoing clinically indicated echocardiography.

	Māori	European
Aortic sclerosis	9,100 (7,700–11,300)	7,900 (7,600–8,300)
Aortic stenosis	2,100 (1,500–3,600)	2,600 (2,400–3,000)
Any CAVD	11,200 (9,700–13,400)	10,600 (10,100–11,100)

CAVD = calcific aortic valve disease.

in the cohort (Figure 1). Across all age brackets, CAVD prevalence did not appear to differ between Māori and Europeans. Similarly, the prevalence of CAVD in Māori did not differ by sex (Figure 2). However, the overall prevalence of CAVD, AS and ASc were all significantly lower in Māori than in Europeans (Table 2).

In order to identify the effect of underlying age distributions, the prevalence of ASc, AS and any CAVD was age standardised using the World Health Organization standard population (Table 3). Rates of age-standardised CAVD were not different between the two ethnicities.

Rates of specific comorbid pathologies of the heart and surrounding structures in those with any CAVD are presented in Table 4. Using a previously developed staging system for extra-valvular cardiac impairment, patients were categorised into stages (Table 5). Notably, Māori had twice the proportion of stage 4 impairment compared with Europeans (10.1% vs 4.6%, p<0.001), and a slightly reduced proportion of stage 1 impairment (49.7% vs 55.7% in Europeans, p<0.01). Rates of stage 0, 2 and 3 impairment were similar between the two ethnicities.

Discussion

In this large descriptive study of over 20,000 patients undergoing clinically indicated echocardiography, including 1,313 Māori patients, overall rates of CAVD were lower in Māori than in Europeans (30.2% vs 40.3%). Age-unadjusted prevalence of AS in Europeans was almost double that in Māori (9.9% vs 5.3%). However, when age standardised, prevalence of CAVD was similar between the two groups (11.2 per 1,000 in Māori vs 10.6 per 1,000 in Europeans). There did not appear to be sex-related differences in CAVD in Māori.

Recent epidemiological data on the rate of CAVD in Māori are limited. The National Health Committee's review of AS in New Zealand, published in 2014, found that Māori had a lower age-standardised prevalence of severe AS than non-Māori.[10] This is concordant with our non-adjusted data, noting that low numbers prevented accurate age-standardisation for severe AS on its own. Comparisons with international data can be challenging. This is because routinely acquired data (such as hospital discharges) often only report clinically significant, usually severe, AS, and because the age groups studied and definitions of CAVD used can differ between reports. A 2013 meta-analysis found a pooled AS prevalence of 12.4% in those over 75 years old, which is similar to the overall rate in Europeans in our cohort, but over double that of Māori.[1] International evidence shows that CAVD is less

Table 4: Rate of comorbid pathologies of the heart and surrounding structures in those with any CAVD (sclerosis or aortic stenosis).

	Māori (N=397)	European (N=9,774)	Overall (N=10,171)
Left ventricular systolic dysfunction			
Normal	258 (65.0%)	6,725 (68.8%)	6,983 (68.7%)
Hyperdynamic	3 (0.8%)	150 (1.5%)	153 (1.5%)
Mild	37 (9.3%)	1,026 (10.5%)	1,063 (10.5%)
Moderate	21 (5.3%)	637 (6.5%)	658 (6.5%)
Severe	25 (6.3%)	424 (4.3%)	449 (4.4%)
Not reported	53 (13.4%)	812 (8.3%)	865 (8.5%)
Right ventricular systolic dysfunction			
Normal	268 (67.5%)	7,739 (79.2%)	8,007 (78.7%)
Hyperdynamic	0 (0%)	13 (0.1%)	13 (0.1%)
Mild	56 (14.1%)	767 (7.8%)	823 (8.1%)
Moderate	27 (6.8%)	328 (3.4%)	355 (3.5%)
Severe	15 (3.8%)	112 (1.1%)	127 (1.2%)
Not reported	31 (7.8%)	815 (8.3%)	846 (8.3%)
Right ventricular systolic pressure ≥25mmHg			
Yes	160 (40.3%)	4,032 (41.3%)	4,192 (41.2%)
No	93 (23.4%)	2,085 (21.3%)	2,178 (21.4%)
Not reported	144 (36.3%)	3,657 (37.4%)	3,801 (37.4%)
Mitral stenosis			
None	375 (94.5%)	9,361 (95.8%)	9,736 (95.7%)
Mild	0 (0%)	57 (0.6%)	57 (0.6%)
Moderate	0 (0%)	17 (0.2%)	17 (0.2%)
Severe	1 (0.3%)	5 (0.1%)	6 (0.1%)
MVR/repair	9 (2.3%)	69 (0.7%)	78 (0.8%)
Rheumatic valve	3 (0.8%)	9 (0.1%)	12 (0.1%)
Not reported	9 (2.3%)	256 (2.6%)	265 (2.6%)
Aortic regurgitation			
None	337 (84.9%)	8,445 (86.4%)	8,782 (86.3%)
Mild	51 (12.8%)	1,213 (12.4%)	1,264 (12.4%)

Table 4 (continued): Rate of comorbid pathologies of the heart and surrounding structures in those with any CAVD (sclerosis or aortic stenosis).

	Māori (N=397)	European (N=9,774)	Overall (N=10,171)
Moderate	8 (2.0%)	84 (0.9%)	92 (0.9%)
Severe	1 (0.3%)	32 (0.3%)	33 (0.3%)
Mitral regurgitation			
None	261 (65.7%)	6,394 (65.4%)	6,655 (65.4%)
Mild	78 (19.6%)	2,348 (24.0%)	2,426 (23.9%)
Moderate	16 (4.0%)	352 (3.6%)	368 (3.6%)
Severe	9 (2.3%)	73 (0.7%)	82 (0.8%)
Not reported	33 (8.3%)	607 (6.2%)	640 (6.3%)
Pulmonary regurgitation			
None	243 (61.2%)	5,111 (52.3%)	5,354 (52.6%)
Mild	18 (4.5%)	457 (4.7%)	475 (4.7%)
Moderate	0 (0%)	7 (0.1%)	7 (0.1%)
Severe	1 (0.3%)	2 (0.0%)	3 (0.0%)
Not reported	135 (34.0%)	4,197 (42.9%)	4,332 (42.6%)
Tricuspid regurgitation			
None	253 (63.7%)	6,343 (64.9%)	6,596 (64.9%)
Mild	82 (20.7%)	1,899 (19.4%)	1,981 (19.5%)
Moderate	22 (5.5%)	327 (3.3%)	349 (3.4%)
Severe	5 (1.3%)	40 (0.4%)	45 (0.4%)
Not reported	35 (8.8%)	1,165 (11.9%)	1,200 (11.8%)

CAVD = calcific aortic valve disease; MVR = mitral valve replacement.

Table 5: Stage of cardiac impairment in those with any CAVD, stratified by ethnicity.

	Māori (n=376)	European (n=9,250)
Stage 0	53 (14.1)	1,313 (14.2)
Stage 1	187 (49.7)	5,152 (55.7)
Stage 2	86 (22.9)	2,099 (22.7)
Stage 3	12 (3.2)	263 (2.8)
Stage 4	38 (10.1)	423 (4.6)

Cells are formatted as n (%). Chi-squared test: X-squared=25.578, df=4, p<0.001. CAVD = calcific aortic valve disease.

prevalent in certain ethnic groups, with this work primarily occurring in the United States of America (USA). There are limited data on the prevalence of CAVD in Indigenous populations; however, there is literature relating to non-European minority populations. Comparison with this work is useful, as inequities in health outcomes and access to care exist in those nations, and it is therefore important to note if similar or different findings have been made. Prior research has identified that African American patients have a lower prevalence of severe AS when compared to Caucasian patients (0.29% vs 0.91%).[24] This gap in prevalence existed across age bands, which was not observed in our study. A further study of Medicare beneficiaries in the USA found a similar result, with white patients having a higher overall prevalence of AS compared to Black, Hispanic or Asian/North American Native patients.[25] However, they also found that outcomes of all-cause hospitalisation, heart failure hospitalisation and 1-year mortality were significantly worse for Black patients than white patients. Unfortunately, a similar trend has been observed in New Zealand when examining outcomes following both TAVI and SAVR: Māori have significantly worse survival than Europeans (80.1% vs 93.9%), despite being over a decade younger at the time of TAVI (67.9 vs 80.6 years),[11] and worse survival even at 30 days post-SAVR.[12]

Certain key comorbidities were examined to determine if there were differences in cardiac impairment, outside the degree of stenosis. We applied a previously described staging criteria, based on the degree of cardiac impairment, to those with CAVD.[15] Strikingly, Māori were more than twice as likely to have stage 4 impairment compared with Europeans (10.1% vs 4.6, $p<0.001$). This finding suggests that although Māori have similar rates of CAVD to Europeans of the same age, their overall burden of cardiac impairment is significantly greater. The cardiac impairment is not likely to be directly related to CAVD in the majority of patients—there is no direct causal explanation for how ASc or mild AS, for example, would lead to right ventricular dysfunction. However, more advanced cardiac impairment is likely to impact on future mortality, as well as make subsequent valve intervention a higher-risk procedure. This may, for example, make less invasive approaches such as TAVI more appropriate in the setting of significant extravalvular cardiac impairment. In addition, earlier detection of extravalvular cardiac impairment will allow earlier management of this prior to any requirement for valvular intervention.

To our knowledge, this is the first large study to examine prevalence of CAVD in Māori undergoing clinically indicated echocardiography. A particular strength of our study is not just in its numbers, but in the availability of other echocardiographic information that allows us to further characterise the structural aspects of the heart. Several limitations to our study exist. For instance, we do not have information available on other cardiovascular risk factors, such as hypertension and diabetes, which are known to be associated with CAVD and are more prevalent in Māori.[2,26,27] Secondly, our study population might not be generalisable to all Māori in New Zealand, as the study locale was entirely in the lower South Island. It was also restricted to patients that were referred and received clinically indicated echocardiography and thus cannot explore the true population prevalence of CAVD. There may be a referral or access bias to echocardiography. Māori are more likely to live in remote and rural locations and may have limited access to healthcare overall,[28] so the numbers noted here may well be an under-estimate. Exploratory analyses revealed that there would be insufficient statistical power to draw valid inferences around outcomes following diagnosis of CAVD, and hence further longitudinal analysis was not performed.

In summary, there are similar age-specific rates of CAVD in Māori and Europeans, but with Māori having a higher proportion of more advanced cardiac impairment. The lower non-adjusted prevalence of CAVD in Māori is due to the different population structure, with lower life expectancy in Māori, rather than any apparent difference in prevalence at any specific point over the lifespan. As such, the lower non-adjusted prevalence is likely another representation of the health inequity faced by Māori—in short, we do not see as much CAVD in Māori because Māori do not live long enough to get it.

In the future, the improving life expectancy in Māori may well lead to increasing incidence of CAVD. The higher proportion of cardiac impairment means that attempts to improve detection through access to echocardiography, and, ideally, medical management of both the valve disease and associated cardiac impairment, should begin as soon as possible.

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