

E-cigarette use and the relationship to smoking among Aboriginal and Torres Strait Islander and non-Indigenous Australian Secondary Students, 2017

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Electronic cigarettes (e-cigarettes or vapes) are battery-operated devices that heat a liquid to create an aerosol to be inhaled, a practice known as 'vaping'.¹⁻⁴ The liquid can contain nicotine and some have suggested that e-cigarettes with nicotine may be used as a substitute for traditional tobacco cigarettes and advocate for their use as a cessation aid.^{2,5} However, there are concerns about the limited evidence for effectiveness for smoking cessation, as well as the emerging evidence of harms of e-cigarette use, including from inhalation of flavourings and toxic chemicals.¹⁻⁷

There is also substantial concern that use of e-cigarettes will contribute to uptake of smoking cigarettes among non-smokers and young people, through the re-normalisation of smoking behaviours and nicotine dependence.²⁻⁴ Understanding youth smoking uptake is complex as uptake trajectories are not uniform or linear, with some who experiment progressing to established smoking while other experimenters return to non-smoking.^{8,9} Multiple factors contribute to this progression, including environmental factors (e.g. ease of access) and individual factors. Curiosity is one individual factor that has been shown to be a driver of young people experimenting with both traditional cigarettes and e-cigarettes.^{6,10} Youth risk behaviours cluster and co-occur, reinforced

Abstract

Objective: Estimate the prevalence of e-cigarette use (vaping) among Aboriginal and Torres Strait Islander adolescents and explore the relationship between vaping and tobacco use.

Methods: N=18,199 students aged 12-17 years (n=1,097 Aboriginal and Torres Strait Islander) participating in the 2017 Australian Secondary Students' Alcohol and Drug (ASSAD) Survey self-reported their e-cigarette and lifetime, past month and past week smoking behaviours.

Results: Twenty-two per cent of Aboriginal and Torres Strait Islander students (14% all) reported having ever used e-cigarettes. Significantly greater odds of e-cigarette use among Aboriginal and Torres Strait Islander students was observed overall, but not among regular (past month/week) smokers. There were significant associations between e-cigarette use and any level of smoking for all students ($p < 0.001$), with no variation by Indigenous status. While e-cigarette use was more common among smokers, 28% of Aboriginal and Torres Strait Islander ever-vapers (35% all ever-vapers) were never smokers.

Conclusions: There is substantial prevalence of e-cigarette ever-use among Australian secondary students, including Aboriginal and Torres Strait Islander students, and a strong relationship with tobacco use.

Implications for public health: Policies facilitating e-cigarette access must not undercut tobacco control efforts for adolescents, particularly Aboriginal and Torres Strait Islander people who continue to experience higher smoking rates.

Key words: e-cigarettes, Aboriginal and Torres Strait Islander health, tobacco use, adolescent health, prevention

by shared risk factors, with the trial of one behaviour increasing the likelihood of other behaviours, such as between tobacco, alcohol and cannabis use, and likely e-cigarette use as well.^{2,11-14} However, there is now strong evidence that e-cigarette use among young people (adolescents and young adults) is associated with later uptake of cigarettes,^{2-4,6,15-18} with non-smokers who

use e-cigarettes three times more likely to become smokers.¹⁹

In countries where nicotine-based e-cigarettes are legally available for adults, such as New Zealand, Canada, the United Kingdom and the United States, vaping is becoming or has already become the dominant smoking-related product used by young people, surpassing traditional

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Submitted: January 2022; Revision requested: July 2022; Accepted: July 2022

The authors have stated the following conflict of interest: Prof Chamberlain chairs an NHMRC committee to provide advice to the NHMRC CEO on an e-cigarettes position statement.

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Aust NZ J Public Health. 2022; 46:807-13; doi: 10.1111/1753-6405.13299

cigarettes.^{3,20-22} This is not universal though, with smoking increasing among some youth population subgroups.²¹ From 1 October 2021 Australians require a prescription to legally access nicotine containing e-cigarettes.¹ While prior to this, legislation at a state level regarding the sale and regulation of e-cigarettes varied somewhat, all prohibited sales to minors (under 18 years).² There are, however, reports of a widespread proliferation of disposable 'pods' used by young people in Australia.^{6,23}

Smoking is the largest contributing risk factor to the gap in disease burden between Aboriginal and Torres Strait Islander people and non-Indigenous Australians.²⁴ The higher prevalence of tobacco use among Aboriginal and Torres Strait Islander people is inextricably linked to colonisation, from the introduction of commercial tobacco by settlers and its use as a means of payment and control, including in rations to historical and contemporary processes that entrench inequities in all social determinants of health, reinforcing the conditions that lead to smoking and the normalisation of use, including systemic racism.^{25,26} Despite this, through decades of comprehensive tobacco control, Australia has successfully driven smoking rates down to record lows among the overall population of young people,²⁷ as well as among Aboriginal and Torres Strait Islander youth specifically.²⁸⁻³⁰ Between 2005 and 2017 never smoking increased significantly among Aboriginal and Torres Strait Islander students aged 12–17 years from 49% to 70% and a significant decline of current smoking from 21% to 10%.²⁹ Similarly, for the total population of students aged 12–17 years, never smoking increased from 63% to 81% and current smoking declined from 10% to 5%. However, further and ongoing declines are required to bring Aboriginal and Torres Strait Islander smoking prevalence down in line with the broader population and see improvements in future health outcomes. Substantial efforts are in place to this end, including through the national 'Tackling Indigenous Smoking' program.³¹ Yet there is a risk that vaping among young Aboriginal and Torres Strait Islander people, and the subsequent risk of progressing to tobacco use, will undermine these efforts and reverse the hard-won gains over previous decades that aim to reduce the burden of disease from smoking-related illness particularly by preventing youth uptake.

There are limited Australian national data on

youth vaping prevalence. In the 2019 National Drug Strategy Household Survey (NDSHS), 9.6% of young people aged 14–17 years had ever used e-cigarettes, higher among those who were smokers (63.6%) compared with those who were not (7.8%).³² In the 2018/19 National Aboriginal and Torres Strait Islander Health Survey (NATSIHS) 3.8% of 15–17-year-old Aboriginal and Torres Strait Islanders had ever used e-cigarettes.³⁰ However, secondary analysis of the NATSIHS identified significant biases in these data including that many young people were not able to self-report their use without an adult in the room and suggested that the real proportion is likely closer to 30%.³⁰

There is an urgent need to obtain better estimates of youth vaping prevalence, particularly among young Aboriginal and Torres Strait Islander people, and understand the relationship to tobacco use. The Australian Secondary Students' Alcohol and Drug (ASSAD) Survey provides a unique opportunity to explore this through the collection of self-reported data on e-cigarette and tobacco use away from the home environment in a large national sample.

The aims of this study are to estimate the prevalence of e-cigarette use among Aboriginal and Torres Strait Islander young people in a national sample of secondary school students and to explore the relationship between e-cigarette and tobacco use. We will explore these patterns relative to the total population and where appropriate compare directly to the non-Indigenous sample.

Methods

Design and procedure

The ASSAD Survey captures self-reported e-cigarette and tobacco use through an anonymous and confidential paper-based survey administered in schools by research staff. Using stratified two-stage probability sampling, two samples of secondary schools are randomly selected (years 7–10 and 11–12) from each state and territory and stratified by education sector (government, independent, Catholic), excluding schools with fewer than 100 enrolled students. A sample of representative classes from within each participating school is then selected randomly. Further details of the study design and administration have been described elsewhere.²⁷ This current study uses data collected during the 2017 school year from

male and female participants aged 12–17 years who answered the question relating to any use of e-cigarettes (95.2% of the total sample answered this question). A greater proportion of Aboriginal and Torres Strait Islander students had missing vaping data than non-Indigenous students (8% and 5%, respectively).

Ethics approval for this current study was granted by the Cancer Council Victoria Human Research Ethics Committee (HREC1013) and the University of Melbourne HREC (1953771). Permission to conduct the survey was given by school principals. Students gave informed consent and parents provided active or passive consent under protocols approved by the relevant education bodies.

The members of the research team include a senior researcher with Aboriginal lived experience (CC) and researchers with expertise in Indigenous tobacco control research (CC, CH, VW) and youth health research (MS, CC, CH, VW). The ASSAD study adheres to jurisdictional governance procedures for conducting research in schools. Secondary analysis of the data has precluded direct engagement with participants however the findings were shared with the research partners and other relevant stakeholders prior to publication.

Measures

E-cigarette use

Students were asked if they had ever used e-cigarettes, with those who responded 'No' categorised as never users and those who responded 'Yes, just a few puffs/vapes' to 'Yes, I have used/vaped more than 100 times in my life' categorised as ever users; where they obtained their last e-cigarette (including who they received it from or where it was purchased from); and whether they had ever smoked a tobacco cigarette before vaping initiation. These measures were developed in line with international literature.

Tobacco use

Students were asked if they had ever smoked even part of a cigarette (categorised as ever/never smokers), and if they had smoked in the previous four weeks (categorised as 'past month' use/not) or in the previous seven days using a day-by-day record of the number of cigarettes smoked, if any, on each of the prior seven days (categorised as 'past week' smokers/not). These validated measures have

been asked consistently in each wave of the ASSAD survey since 1984.³³

Indigenous status

Students were asked if they were of Aboriginal or Torres Strait Islander descent. Those who self-identified as being of either Aboriginal descent, Torres Strait Islander descent or both were classified as 'Aboriginal and Torres Strait Islander' students. Those who selected 'No' were classified as 'non-Indigenous' students. Those who did not provide a valid response ($n=92$) are included in the overall ASSAD sample only and excluded from the analyses comparing by Indigenous status (<1%).

Demographics

In addition to Indigenous status, students' age, sex and school postcode were recorded. The latter was used to compute measures of remoteness (using the Australian Bureau of Statistics (ABS) 2016 ASGS categories of major cities, inner regional, outer regional, remote, very remote) and area-level socio-economic status (using tertiles from the 2016 SEIFA Index of Relative Socio-economic Disadvantage).^{34,35} While the results are primarily presented for 12–17-year-olds, and the 12–15/16–17 sub-groups, an additional 14–17 year age group was also used for ever use of e-cigarettes overall to provide a comparison population to the NDSHS.

Statistical analysis

Descriptive statistics are used to describe the study by age-group, sex and Indigenous status with 95% confidence intervals (95%CI) presented for proportions.

We used logistic regression to determine if there were differences in the likelihood of having ever used e-cigarettes between Aboriginal and Torres Strait Islander students and non-Indigenous students. We then explored the relationship between vaping and tobacco smoking status. First, we report previous smoking experience at vaping initiation, the proportion of never smokers who later tried cigarettes after their first vape and the smoking status of ever-vapers at the time of the survey was estimated. Second, we estimate ever, past month and past week tobacco use by ever use of e-cigarettes, overall and separately by Indigenous status. We used logistic regression to determine if there was a difference in the likelihood of being an ever, past month or past week smoker between those who had and had not

used e-cigarettes, for Aboriginal and Torres Strait Islander and non-Indigenous students separately (Table 3). An interaction term (Indigenous status x e-cigarette use) was used to identify differences by Indigenous status in the association between smoking and e-cigarette use.

Unweighted data was used in all logistic regression models and adjusted for clustering within schools and for education sector, state/territory, sex, age (continuous), remoteness (five category) and area level disadvantage. Statistical significance is reported as $p<0.05$. We used STATA MP 16.1 (StataCorp, College Station, Texas) for all analyses.

Results

Sample summary

A total of 18,199 students surveyed (95.2%) reported their ever use of e-cigarettes and were included in the final analytic sample. Of these, 18,107 students (99.5%) had valid data relating to their Indigenous status. Aboriginal and Torres Strait Islander students comprised 6.0% ($n=1,097$) of the total sample, in line with the population distribution of Aboriginal and Torres Strait Islander youth in the 2016 Census (5% aged 12–17 years).³⁶ The proportion of male and female students was relatively similar. There was a greater

proportion of younger (12–15-year-old) students, compared to older (16–17-year-old) students with around one quarter to one third in the older cohort (see Table 1).

Prevalence of e-cigarette use

As shown in Table 1, around one in seven ASSAD students (14.0%) reported having ever used e-cigarettes, with Aboriginal and Torres Strait Islander students significantly more likely than non-Indigenous students to be ever users (21.6% compared with (cf) 13.5%; OR 1.79 (1.54,2.09), $p<0.001$). This observed difference between Aboriginal and Torres Strait Islander students and non-Indigenous students was consistent across males and females and within each age group (all $p<0.001$, not shown). Vaping was more common among males (cf females) and older (cf younger) students both overall and among Aboriginal and Torres Strait Islander students. When focusing on the comparison population to the NDSHS (all ASSAD 14–17 year olds), the proportion of students reporting ever use of e-cigarettes was 17.6% (95%CI: 16.3,18.9).

Source of e-cigarettes

Most Aboriginal and Torres Strait Islander students (80.6%) sourced their last e-cigarette from friends, family or at home (84.7% ASSAD

Table 1: Sample overview and ever use of e-cigarettes by age and Indigenous status, 2017.

Demographics	All ASSAD students		Aboriginal & Torres Strait Islander students		Non-Indigenous students	
	n	%	n	%	n	%
Total 12-17 years	18,199	100.0%	1,097	100.0%	17,010	100.0%
Males 12-17	8,417	46.2%	508	46.3%	7,864	46.2%
Females 12-17	9,782	53.8%	589	53.7%	9,146	53.8%
12-15 years	11,558	63.5%	795	72.5%	10,690	62.8%
16-17 years	6,641	36.5%	302	27.5%	6,320	37.2%
14-17 years ^a	12,985	71.4%	757	69.0%	12,167	71.5%
E-cigarette use (ever)	n	% (95% CI)	n	% (95% CI)	n	% (95% CI)
Total 12-17 years	2,549	14.0% (12.9,15.2)	237	21.6% (19.1,24.4)	2,302	13.5% (12.4,14.8)
Males 12-17	1,519	18.0% (16.6,19.6)	131	25.8% (22.2,29.7)	1,382	17.6% (16.1,19.1)
Females 12-17	1,030	10.5% (9.5,11.7)	106	18.0% (15.0,21.4)	920	10.1% (9.0,11.2)
12-15 years	1,208	10.5% (9.4,11.6)	142	17.9% (15.5,20.5)	1,058	9.9% (8.9,11.0)
16-17 years	1,341	20.2% (18.3,22.2)	95	31.5% (26.4,37.0)	1,244	19.7% (17.8,21.7)
14-17 years ^a	2,279	17.6% (16.3,18.9)	198	26.2% (23.2,29.4)	2,072	17.0% (15.7,18.4)
Source of last e-cigarette	n	%	n	%	n	%
Friends	1,407	63.5%	115	57.2%	1,289	64.2%
Family/Home	469	21.2%	47	23.4%	420	20.9%
Parents	172	7.8%	16	8.0%	156	7.8%
Siblings	186	8.4%	20	10.0%	164	8.2%
Taken from home	110	5.0%	11	5.5%	99	4.9%
Bought themselves	245	11.1%	20	10.0%	223	11.1%
Other	94	4.2%	19	9.5%	75	3.7%

Note:

a: Comparison age-group to the National Drug Strategy Household Survey

overall). One in ten (10.0%) Aboriginal and Torres Strait Islander students reported purchasing their last e-cigarette themselves (11.1% ASSAD overall; Table 1).

E-cigarette use by smoking status

As Table 2 highlights, ever use of e-cigarettes was higher among those who had ever smoked cigarettes compared to never smokers for Aboriginal and Torres Strait Islander students (52.2% cf 8.4%) and ASSAD overall (48.0% cf 6.0%). The likelihood of students having ever used e-cigarettes did not significantly vary by Indigenous status among ever smokers (OR 1.23 (0.96, 1.57), $p=0.108$). However, among never smokers, Aboriginal and Torres Strait Islander students were more likely than non-Indigenous students to have ever used e-cigarettes (8.4% cf 5.9%; OR 1.49 (1.14, 1.93), $p=0.003$). For Aboriginal and Torres Strait Islander students 61.0% of past month and 65.3% of past week smokers had ever used e-cigarettes (compared with 56.5% and 61.2% for ASSAD overall, respectively). When the regression was restricted to only those who were past month smokers or past week smokers, Aboriginal and Torres Strait Islander students were no more likely to have used e-cigarettes than their non-Indigenous counterparts (past month smokers: OR 1.19 (0.82, 1.73), $p=0.354$; past week smokers: OR 1.18 (0.75, 1.87), $p=0.474$).

Smoking experience at vaping initiation

On the day they were surveyed, 72.3% of Aboriginal and Torres Strait Islander students who had ever vaped had also ever smoked (65.1% ASSAD) while 27.7% were never smokers (34.9% ASSAD). Around one third (32.8%) of Aboriginal and Torres Strait Islander students were never smokers when they first vaped (46.2% ASSAD); 31.0% had previously smoked at least 10 cigarettes (22.7% ASSAD). Just over a quarter (26.0%) of Aboriginal and Torres Strait Islander students who had never smoked a cigarette when they had their first vape reported ever smoking at the time of the survey (27.2% ASSAD) (Figure 1).

Relationship between ever use of e-cigarettes and smoking status

Ever smoking was higher among Aboriginal and Torres Strait Islander students who had ever used e-cigarettes compared to those who had not (72.3% cf 17.9%; OR 12.18 (8.44, 17.58), $p<0.001$), with similar differences observed for past month (37.9% cf 6.6%; OR 7.56 (5.14, 11.14), $p<0.001$) and past week (28.8% cf 4.1%; OR 7.75 (5.03, 11.95), $p<0.001$)

smoking. This same pattern of results was observed among all ASSAD students (Table 3). Specifically, compared to non-e-cigarette users, ever (65.1% cf 11.4%; OR 13.41 (12.00, 15.00), $p<0.001$), past month (33.2% cf 4.1%; OR 9.33 (8.21, 10.61), $p<0.001$) and past week (23.9% cf 2.4%; OR 9.61 (8.28, 11.15), $p<0.001$) smoking was higher among e-cigarette users for ASSAD overall.

Interaction tests showed no significant difference ($p>0.05$) in the relationship between ever use of e-cigarettes and ever, past month or past week smoking between Aboriginal and Torres Strait Islander students and non-Indigenous students. The relationship between ever use of e-cigarettes and ever smoking was consistent within the age and sex sub-groups for Aboriginal and Torres Strait Islander students, non-Indigenous students, and ASSAD overall (all $p<0.001$; Supplementary File 1).

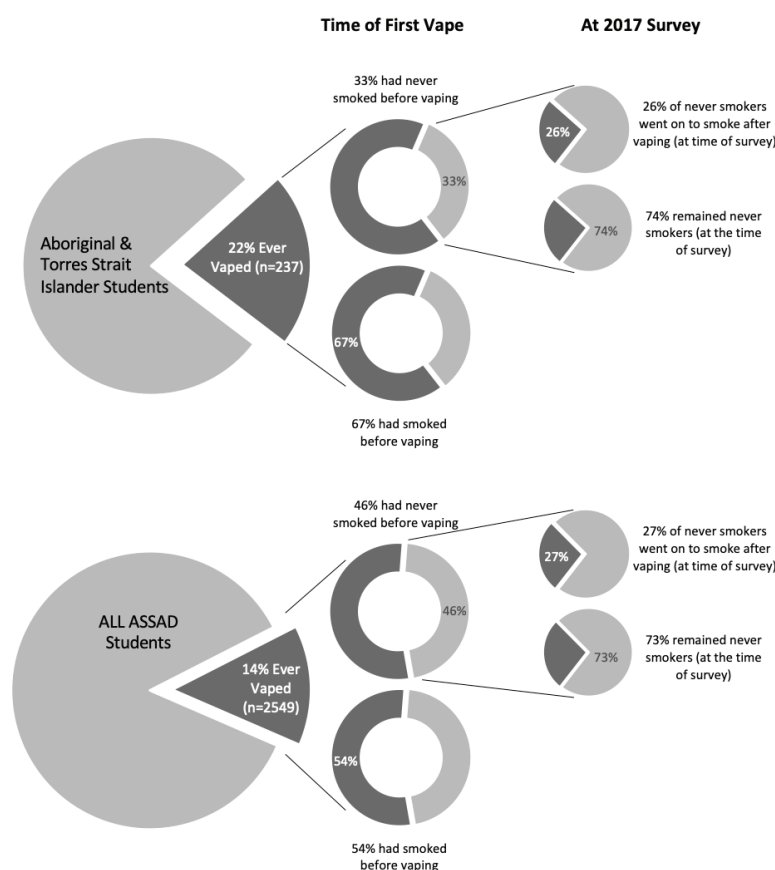
Discussion

This cross-sectional study of youth e-cigarette use found a substantial prevalence of ever vaping among students overall, including

Table 2: Prevalence of ever use of e-cigarettes by Indigenous status and tobacco use.	
Sub-group (n/total)	Ever used e-cigarettes % (95% CI)
Never smokers only (12-17 years)	
All ASSAD students (880/14,619)	6.0% (5.4, 6.7)
Aboriginal & Torres Strait Islander (64/765)	8.4% (6.6, 10.5)**
Non-Indigenous (815/13,779)	5.9% (5.3, 6.6)
Ever smokers only (12-17 years)	
All ASSAD students (1,639/3,415)	48.0% (45.8, 50.2)
Aboriginal & Torres Strait Islander (167/320)	52.2% (46.4, 57.9)
Non-Indigenous (1,463/3,081)	47.5% (45.2, 49.7)
Past month smokers only (12-17 years)	
All ASSAD students (840/1,486)	56.5% (53.7, 59.4)
Aboriginal & Torres Strait Islander (89/146)	61.0% (52.6, 68.7)
Non-Indigenous (747/1,335)	56.0% (53.0, 58.9)
Past week smokers only (12-17 years)	
All ASSAD students (600/981)	61.2% (58.1, 64.2)
Aboriginal & Torres Strait Islander (66/101)	65.3% (56.3, 73.4)
Non-Indigenous (531/877)	60.5% (57.1, 63.9)

Notes:
Significantly greater likelihood of Ever Use of E-cigarettes ($p<0.05$) between Aboriginal and Torres Strait Islander students, and non-Indigenous students, from logistic regression (OR) adjusted for school, state, age, sex, remoteness, SEIFA indicated by * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Figure 1: Vaping initiation and tobacco experience among ever vapers 12-17.



Aboriginal and Torres Strait Islander students, and a very strong relationship between vaping and any level of tobacco use (ever, past month, past week). Although vaping was most common among smokers, the study found that a significant proportion of vapers had never smoked (around one third). Aboriginal and Torres Strait Islander students had a greater likelihood of ever vaping overall and among never smokers, compared to non-Indigenous students, but the likelihood of vaping did not differ significantly between Aboriginal and Torres Strait Islander and non-Indigenous smokers. Our finding that e-cigarette use was more prevalent in Aboriginal and Torres Strait Islander students aligns with that observed among Māori students in Aotearoa New Zealand.^{20,21} As with other studies we have found more vaping among smokers than never smokers, and a strong association between the two.^{3,5,20,32} Although the proportion of never smokers vaping is relatively small, the much higher prevalence of never smoking translates to a large number of adolescents. Several reviews have demonstrated a longitudinal association between vaping and subsequent uptake of smoking,^{2-4,6,15-17,37} including that non-smokers who vape are three times more likely to become smokers.¹⁹ While some note that this may be due to shared risk factors or 'common liability', others have shown e-cigarette use to be an independent risk factor for smoking after accounting for known shared risk factors.^{16,37} While our data are cross-sectional and we cannot determine temporal sequencing, having ever vaped was strongly associated with recent smoking behaviour. Further, a quarter of those who had never smoked

when they first vaped had gone on to try cigarettes. Although we are limited in the inferences that can be made about causality and trajectories, this study strongly supports previous ASSAD study findings of the clustering of risk behaviours among young Aboriginal and Torres Strait Islander people, and youth in general, and the notion that each risk behaviour increases the likelihood of the others.¹¹ This points to the need to build vaping prevention and education into broader comprehensive program responses that address common determinants of substance use. Protective factors identified for Aboriginal and Torres Strait Islander youth in relation to tobacco and cannabis use are likely to be similarly important for vaping. These include good mental health, strong family relationships, stable housing and no criminal justice interactions.^{38,39}

This study found 18% of 14–17-year-old students overall had ever vaped in 2017, approximately double that reported for this age-group in the 2016 and 2019 NDSHS (9–10%).^{32,40} From the 2018/19 NATSIHS, 4% of Aboriginal and Torres Strait Islander youth aged 15–17 years reported ever use of e-cigarettes,³⁰ considerably lower than our best comparison estimates of 26% among 14–17-year-olds and 31% among 16–17-year-olds. However, these figures align with the NATSIHS data when restricted to those young people who were able to self-report their vaping experience without a parent present; among this group 30% of 15–17-year-olds had ever vaped.³⁰ This suggests the likely underestimation of youth vaping prevalence in Australia and reinforces concerns around underreporting of youth substance use where a parent is present or answering as

a proxy.³⁰ It also highlights the importance of government investment in monitoring systems such as the ASSAD survey that is conducted in classrooms explicitly out of view of parents (and without teacher involvement).

Implications for public health

Evidence indicates there is a link between e-cigarette use and later tobacco use.¹⁹ There is a need to prevent the use of e-cigarettes among Aboriginal and Torres Strait Islander adolescents, and all Australian young people generally, including education about their addictive potential and health harms.^{2,3,41} Restrictions on the advertising and promotion of e-cigarettes via digital media channels, which commonly highlight product features that are attractive to youth such as novel flavours,⁴² are also required given that most Australian adolescents are active social media users.⁴³ Further, a ban on flavoured e-cigarettes (in line with conventional cigarettes) has potential to reduce e-cigarette experimentation and use among all adolescents by minimising their appeal.⁴⁴ Finally, we need to carefully monitor the impact of changes (effective 1 October 2021) that provide access to e-cigarettes to adults through prescriptions, as it may contribute to increasing the risk of uptake among young people by providing more home access opportunities from parents and other adult family members. In 2017 most students accessed e-cigarettes through friends, followed by family/at home. It will be important to monitor whether avenues for accessing e-cigarettes change following the policy change.

While these policy decisions have been made for the general Australian population, they

Table 3: Relationship between e-cigarette ever use and smoking status (ever, past month, past week), all ASSAD, Aboriginal and Torres Strait Islander students and non-Indigenous students 12–17 years, 2017.

	All ASSAD students		Aboriginal & Torres Strait Islander students		Non-Indigenous students	
	Ever smokers % (95% CI) (n/total)	OR (95% CI)	Ever smokers % (95% CI) (n/total)	OR (95% CI)	Ever smokers % (95% CI) (n/total)	OR (95% CI)
Never used e-cigs	11.4% (10.3,12.7) (1,776/15,515)	1.00	17.9% (15.4,20.7) (153/854)	1.00	11.1% (9.9,12.4) (1,618/14,582)	1.00
Ever used e-cigs	65.1% (62.4,67.7) (1,639/2,519)	13.41 (12.00,15.00)***	72.3% (66.0,77.8) (167/231)	12.18 (8.44,17.58)***	64.2% (61.4,66.9) (1,463/2,278)	13.34 (11.84,15.04)***
	Past month smokers		Past month smokers		Past month smokers	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Never used e-cigs	4.1% (3.6,4.7) (646/15,569)	1.00	6.6% (5.1,8.6) (57/858)	1.00	4.0% (3.5,4.6) (588/14,630)	1.00
Ever used e-cigs	33.2% (30.5,36.1) (840/2,528)	9.33 (8.21,10.61)***	37.9% (31.8,44.4) (89/235)	7.56 (5.14,11.14)***	32.7% (29.9,35.6) (747/2,283)	9.41 (8.22,10.77)***
	Past week smokers		Past week smokers		Past week smokers	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Never used e-cigs	2.4% (2.1,2.8) (381/15,564)	1.00	4.1% (2.9,5.6) (35/858)	1.00	2.4% (2.0,2.8) (346/14,625)	1.00
Ever used e-cigs	23.9% (21.6,26.3) (600/2,510)	9.61 (8.28,11.15)***	28.8% (23.5,34.8) (66/229)	7.75 (5.03,11.95)***	23.4% (21.0,25.9) (531/2,271)	9.68 (8.18,11.45)***

Notes:
Significantly greater likelihood of smoking (ever/past month/past week) between ever and never users of e-cigarettes, from logistic regression (OR) adjusted for school, state, age, sex, remoteness, SEIFA indicated by *p<0.05 ***p<0.001
***p<0.001

present an unacceptable risk for Aboriginal and Torres Strait Islander people who continue to experience higher smoking prevalence as an ongoing consequence of historical government policies, entrenched inequities and systemic racism, the same factors that would be contributing to the higher prevalence of e-cigarette use as well.²⁵ The experience in Aotearoa New Zealand suggests that those living in higher smoking prevalence communities, such as Māori youth, may be more susceptible to transitioning from vaping to cigarette use.²¹ These common patterns for cigarette and e-cigarette use across different Indigenous populations reflect the systems-level changes required to address these racialised inequities.⁴⁵ Even when controlling for many socioeconomic factors (remoteness, area-level disadvantage, school type), the difference in vaping prevalence observed in this study indicates additional (unmeasured) risk determinants, such as racism and discrimination. Tobacco use is the cause of half of all deaths in Aboriginal and Torres Strait Islander adults.⁴⁶ In response, Aboriginal Community-controlled organisations have been driving and leading Indigenous tobacco control as a key priority to improve health outcomes in their communities.^{25,31} The evidence for the use of e-cigarettes as a cessation aid is not strong^{1,4,5} and any small benefit may be outweighed by the risk that widespread use among youth could increase the prevalence of adolescent tobacco smokers, undoing decades of successful tobacco control achievements and undermining ongoing work to continue to drive down smoking rates among Aboriginal and Torres Strait Islander people.

Limitations

This study has several key limitations that need to be noted. First, the ASSAD sample while national may not be representative and could underestimate true vaping prevalence among 12–17-year-olds due to the selection of schools (excluding small schools) and the fact it only reflects the behaviours of those adolescents currently attending school. There was some missing vaping data, with a greater proportion of Aboriginal and Torres Strait Islander students and smokers missing; this likely also underestimates the prevalence and strength of relationship. Second the study uses self-reported data which may be subject to bias; however, a strength of the study is that this data is collected without

parent involvement. Third the cross-sectional nature of the study and analysis means we are limited in our ability to tease out the causal pathways between vaping and smoking. Fourth, we were only able to report ever/never vaping among Aboriginal and Torres Strait Islander students in this study; future survey waves will provide data on current/recent usage which may provide greater insight into longer term use beyond early experimentation. Finally, this study used 2017 data and we could expect higher rates now in 2022, particularly as other jurisdictions report a jump in adolescent e-cigarette use following the proliferation of disposable 'pod' devices from around 2017.^{21,22} Unfortunately, due to COVID-19 related interruptions, the 2020 ASSAD survey was delayed to 2022. Therefore, a key strength of this analysis is that it presents the most current and reliable overview of youth vaping in Australia, and the first comprehensive analysis of vaping among young Aboriginal and Torres Strait Islander people. Issues around youth underreporting substance use in other surveys³⁰ demonstrates the ASSAD survey continues to be the most reliable source of national data.

Conclusions

A substantial proportion of young people have tried vaping including never smokers who are trying e-cigarettes before tobacco cigarettes. More Aboriginal and Torres Strait Islander students have tried vaping than non-Indigenous students, however, there is a very strong relationship between vaping and smoking for all youth. There is likely an underestimation of youth e-cigarette use in other national datasets. Policy-makers need to be vigilant in ensuring that providing prescription access to vaping for cessation and lack of enforcement of illicit use does not undercut tobacco control efforts for adolescents, particularly for Aboriginal and Torres Strait Islander people who continue to experience higher rates of smoking as a consequence of historical policies, enduring racism and ongoing inequities.

Acknowledgements

The authors thank and acknowledge the government and non-government education authorities, the school principals, teachers, and students who cooperated to make this study possible. We thank the research staff for assistance with data collection. The ASSAD

survey receives funding from the Australian Government Department of Health and State and Territory Governments of New South Wales, Victoria, Queensland, South Australia, Western Australia, Tasmania, the Northern Territory and the ACT; as well as from Cancer Councils in Victoria, South Australia, Queensland and Tasmania, Cancer Institute NSW and the South Australian Health and Medical Research Institute. CC receives an NHMRC Career Development Fellowship (1161065). CC chairs an NHMRC committee to provide advice to the NHMRC CEO on an e-cigarettes position statement.

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Supporting Information

Additional supporting information may be found in the online version of this article:

Supplementary File 1: Likelihood of ever smoking cigarettes by ever use of e-cigarettes, Indigenous status, age, sex, 2017.