



Parent's awareness of, and influence on, their 14–17-year-old child's vaping and smoking behaviours; an analysis of 3242 parent–child pairs in Australia

Sam Egger^a, Christina Watts^a, Anita Dessaix^b, Alecia Brooks^b, Emily Jenkinson^b, Paul Grogan^a, Becky Freeman^{c,*}

^a The Daffodil Centre, The University of Sydney, A Joint Venture with Cancer Council NSW, Woolloomooloo, Australia

^b Cancer Prevention and Advocacy Division, Cancer Council NSW, New South Wales, Australia

^c Prevention Research Collaboration, School of Public Health, Faculty of Medicine and Health, The University of Sydney, Camperdown, Australia

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ABSTRACT

Background: Vaping by young people in Australia is a rapidly emerging public health issue. Evidence shows that parental behaviours and attitudes can play a key role in influencing adolescent behaviours. Considering the health harms of vaping and evidence that it can be a gateway to tobacco smoking for never-smokers, it is important to understand whether parents' smoking and vaping behaviours influence their teenage children's smoking and vaping behaviours.

Methods: Online cross-sectional surveys as part of the *Generation Vape* study, conducted in Australia in 2021/2022, were used to assess parents' influence on, and awareness of, one of their 14–17-year-old child's vaping and smoking behaviours. Participants were 3242 parents and 3242 14–17-year-old teenage children.

Results: The risk of vaping and smoking uptake among 14–17-year-old teenagers was 42% ($p = 0.003$) and 97% ($p < 0.001$) higher, respectively, if their parent was an ever-vaper. The risk of vaping and smoking uptake among teenagers was 81% ($p < 0.001$) and 159% ($p < 0.001$) higher, respectively, if their parent was an ever-smoker. Parents of teenagers who have not vaped were considerably better at correctly predicting this (97% correct) than parents of teenagers who have vaped (70% correct). Compared to parents, teenagers tended to have less agreement with statements suggesting vaping is unsafe or harmful, and more agreement with statements suggesting vaping is relatively safe.

Conclusions: Parental smoking and vaping behaviours are associated with those of their children. Hence, it is important that both tobacco and vaping control policies and interventions are designed to influence behaviours of all demographics, consistent with the evidence.

1. Introduction

Vaping by young people in Australia is an emerging public health issue, with national estimates showing that in 2019, about 1 in 4 (26.1%) Australians aged 18–24 had tried a vape at least once, up from 19.2% in 2016 (Australian Institute of Health and Welfare, 2020). In New South Wales (NSW), Australia's most populous state, the most recent estimates (2021) show that among those over 16, rates of ever-vaping are highest among 16–24 year olds, with 32.7% having ever used a vape (NSW Ministry of Health, 2022). In response to this rapid increase, the Generation Vape study tracks attitudes, beliefs, knowledge,

and behaviours related to vaping, with data collected in 6-monthly waves starting in September 2021 (Watts et al., 2022).

The growth in vape use among young people is a serious public health risk given the well-established harmful effects of nicotine, the known and emerging health impacts of vaping, and the increased risk of future tobacco smoking initiation. Nicotine use in adolescence is associated with attention and mood disorders (Moylan et al., 2012; Treur et al., 2015), and brain development issues (U.S. Department of Health and Human Services, 2016), and there's strong evidence that never-smokers who vape are more likely to subsequently initiate tobacco smoking than those who do not vape (Banks et al., 2022; Yoong et al.,

* Corresponding author at: Charles Perkins Centre, John Hopkins Drive, The University of Sydney, Camperdown, NSW 2001, Australia.

E-mail address: Becky.freeman@sydney.edu.au (B. Freeman).

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2021). There is also evidence that vaping is harmful to health, with outcomes including lung injury, poisoning and toxicity from inhalation, addiction and burns and trauma (Banks et al., 2022).

While studies report that young people experiment with vaping products for reasons such as flavours (Bold et al., 2016; Patrick et al., 2016; Kong et al., 2015; Alexander et al., 2019), ease of access (Kong et al., 2015), and cost (Bold et al., 2016), parental behaviours and attitudes may also play a significant role. Not only is parental smoking a key risk factor for adolescent smoking (Ennett et al., 2010; Tyas and Pederson, 1998), but research has also shown that parental knowledge of adolescents' activities is linked to positive youth adjustment and reduced engagement in risky behaviours like tobacco use (Stattin and Kerr, 2000; Waizenhofer et al., 2004). Given these factors, it is plausible that a similar dynamic of parental vaping and parental knowledge of their child's vaping could influence adolescent vaping behaviours. Initial research shows that adolescents perceive their parents feel that vaping is "less wrong" than smoking, and that such perceptions are associated with adolescent vaping (Fite et al., 2018). Adolescents often start vaping using a device obtained from a family member and receive positive messages from within the family about vaping (Alexander et al., 2019). Parents could be a key group for targeted prevention education, given their potential influence on adolescent behaviours (Alexander et al., 2019; Fite et al., 2018).

In the current paper, we analysed data from the first three waves of the Generation Vape study, focusing on the 3242 adolescents who had a parent jointly participate in the Generation Vape study (wave 3 was the most recent data available at the time the analysis commenced). In doing this, we were able to examine parents' awareness around one of their adolescent child's vaping habits, and to assess the effect of that parent's smoking and vaping behaviours on their child's smoking and vaping behaviours.

2. Methods

2.1. Study design

This study is part of the larger Generation Vape project, designed to examine vaping and smoking behaviour, product awareness, perceptions, attitudes, and knowledge across four groups (14–17-year-olds, 18–24-year-olds, parents of 14–17-year-olds, and secondary school educators) at multiple times over three years using both qualitative and quantitative methods. Data was obtained from the first three survey waves of 14–17-year-olds and their parents or guardians, conducted in September 2021, April 2022, and September 2022, with mostly different participants in each wave, but with some repeat participants. The questionnaire was pre-tested with young people and parents before administration.

2.2. Participants

Eligible teenage participants were 14–17 years old and eligible 'parent' participants were parents or guardians of children aged 14–17 who were not high school teachers or administrators. Participants were recruited through online panels, for waves 2 and 3 Australia-wide and for wave 1, NSW residents only. Teenage participants were recruited either directly via email or indirectly through their parents, and vice versa. The analyses were limited to the 3242 teen and parent pairs participating in the study (Table 1). The study includes parent-teen pairs only because only these data allow us to assess the associations between parental actions and awareness with the smoking/vaping behaviours of their own teenage children. Of these 3242 parent-teenager pairs, 595 contained a teenager and/or parent that participated in more than one wave; for these pairs, only their earliest wave data were included.

Both teenage and parent respondents had to answer three screening questions to confirm eligibility. These questions were "What is your postcode?", "How old are you?" and "Have you ever seen or heard of

Table 1

Demographic characteristics of study participants.

Demographic characteristic	Teenagers (n = 3242)	Parents (n = 3242)
Gender		
Male	1700 (52%)	1082 (33%)
Female	1509 (47%)	2157 (67%)
Non-binary and other	33 (1%)	3 (0%)
Age (years)		
14	740 (23%)	0 (.)
15	877 (27%)	0 (.)
16	912 (28%)	0 (.)
17	713 (22%)	0 (.)
30–39	0 (.)	499 (15%)
40–49	0 (.)	1780 (55%)
50+	0 (.)	963 (30%)
Aboriginal or Torres Strait Islander		
No	3049 (94%)	3100 (96%)
Yes	185 (6%)	131 (4%)
Prefer not to say	8 (0%)	11 (0%)
Remoteness of residence		
Metro	2473 (76%)	2473 (76%)
Non-metro	762 (24%)	762 (24%)
Not known	7 (0%)	7 (0%)
SES of residence area		
1 - Lowest SES	401 (12%)	401 (12%)
2	505 (16%)	505 (16%)
3	621 (19%)	621 (19%)
4	781 (24%)	781 (24%)
5 - Highest SES	927 (29%)	927 (29%)
Not known	7 (0%)	7 (0%)
Language		
English only	3040 (94%)	2939 (91%)
Another language only	51 (2%)	61 (2%)
English and another language	151 (5%)	242 (7%)
Highest education level		
Year 9–12	n/a ^a	629 (19%)
Diploma/certificate/ apprenticeship	n/a ^a	1256 (39%)
University degree	n/a ^a	1352 (42%)
Prefer not to say	n/a ^a	5 (0%)
Household income per year		
<\$52,000	n/a ^a	483 (15%)
\$52,000 to <\$104,000	n/a ^a	1042 (32%)
≥\$104,000	n/a ^a	1508 (47%)
Prefer not say/Don't know	n/a ^a	209 (6%)

^a Parent-specific variable not asked of teenagers.

vapes or e-cigarettes?". The latter ensured only those with prior knowledge of vaping could participate. Key demographic characteristics were monitored to ensure a representative sample, and pre-established caps were placed on gender and age. Parental consent was required for all 14–17-year-olds. Participants also had to consent after receiving a Participant Information Statement. Ethics approval was granted by the University of Sydney Human Research Ethics Committee (project number 2021/442) in July 2021.

2.3. Measures

2.3.1. Sociodemographic variables

Demographic characteristics of teenage and parent participants included gender, age, remoteness of residence area (metro, non-metro areas), socioeconomic status (SES) of the residence area (divided into

quintiles) (Australian Bureau of Statistics, 2016), language spoken at home (English and/or another language) and Aboriginal or Torres Strait Islander status. Parents were asked about their highest education level and household income per year, and teens were asked about their current school year.

2.3.2. Parents awareness of their teenage child's vaping usage

Parents were asked "As far as you know, has your child (or any of your children aged 14–17) ever vaped?". Response options were "Yes, they definitely have", "I strongly suspect they have", "I don't think they have", "I am confident they have not" and "I don't know".

2.3.3. Safety of vaping perceptions

All participants were asked their level of agreement on a 5-point Likert scale (with agreement scored from 'strongly disagree'=1 to 'strongly agree'=5 for analysis) with 8 statements relating to the safety of vaping. The statements were "Vapes are unsafe to use", "Vaping can harm the developing brain", "Vaping can damage the lungs", "Vaping during adolescence can cause addiction", "It is unsafe to use vapes around others", "Vapes are healthier than smoking tobacco cigarettes", "Vapes help smokers to quit" and "Nicotine is harmless".

2.3.4. Parental vaping and smoking (risk factors variables)

The risk factors of interest for teenagers' smoking and vaping habits were their parent's vaping and smoking habits. Consequently, "parent vape status" was derived as a dichotomous variable (ever-vaper, never-vaper), with ever-vapers defined as self-reported ex- or current-vapers. Similarly, "parent smoke status" was derived as a dichotomous variable (ever-smoker, never-smoker), with ever-smokers self-reported ex- or current-smokers of "cigarettes, roll your own (rollies), cigars, shisha [or] pipes". Additional questions asked of parents (but not of teenagers) allowed us to also create 3-category "parent vape status" and "parent smoke status" variables dividing the ever-user categories into ex- and current- user categories.

2.3.5. Teenager vaping status and smoking status (outcome variables)

Primary outcomes were teenagers' smoking status and vaping status. Consequently, "teenager vape status" was derived as a dichotomous outcome (ever-vaper, never-vaper), with ever-vapers defined as having vaped on at least 10 occasions (and with never-vapers being those who are not ever-vapers). Similarly, "teenager smoke status" was derived as a dichotomous outcome (ever-smoker, never-smoker), with ever-smokers defined as having smoked at least 10 cigarettes including "cigarettes, roll your own (rollies), cigars, shisha [or] pipes" (and never-smokers being those who are not ever-smokers).

2.3.6. Teenager prior vaping and prior smoking (confounder variables)

A potential confounder of the effects of parental smoking/vaping on teenager smoking is teenagers' e-cigarette use prior to the use of any combustible tobacco product. Similarly, a potential confounder of the effects of parental smoking/vaping on teenager vaping is teenagers' combustible tobacco use prior to the use of any e-cigarette product. Hence, we constructed the dichotomous variables "teenager prior vaping" and "teenager prior smoking" using teenagers' vaping status, smoking status and responses to the question "Which did you try first: vaping or smoking?" (which was asked of teenagers who had tried both smoking and vaping). Specifically, teenagers were classified "yes" for "teenager prior vaping" if they had initiated vaping *prior* to any use of combustible tobacco products. They were classified "no" if they had *not* initiated vaping *prior* to any use of combustible tobacco products (ie either never vaped or started vaping but *not prior* to trying a combustible tobacco product). Similarly, teenagers were classified "yes" for "teenager prior smoking" if they had initiated smoking *prior* to any use of e-cigarettes, and "no" if they had *not* initiated smoking *prior* to any use of e-cigarettes.

2.4. Statistical methods

The accuracy of parents' belief about whether their teenage child had tried vaping was assessed using Cohen's kappa statistic. For this analysis, parents who reported "I don't think they have" or "I am confident they have not" were categorised as believing their child had not tried vaping, and those who reported "Yes, they definitely have" or "I strongly suspect they have" were categorised as believing their child had tried vaping. Cohen's kappa can be interpreted as the probability of agreement beyond chance (i.e., adjusted for the probability of agreement at random). As a rule of thumb for kappa values, Landis and Koch suggested the following categories: Perfect (kappa = 1.00), Almost Perfect (0.81–1.00), Substantial (0.61–0.80), Moderate (0.41–0.60), Fair (0.21–0.40), Slight (0.00–0.20), and Poor (~0.00) (Landis and Koch, 1977). In addition, the sensitivity, specificity, positive predictive value (PPV) and negative predicted value (NPV) of parents' belief about whether their teenage child had tried vaping were also calculated. For the 8 statements relating to the safety of vaping, mean differences between parent and teenage children in agreement scores were calculated using regression analyses with generalised estimating equation (GEE) adjustment of standard errors for the clustering of parent and teenager pairs (Fitzmaurice et al., 2012).

2.4.1. Main analysis

Poisson regression with robust variance was used to assess the effects of parents' vaping and smoking behaviours (independent variables) on teenagers' ever-vaping and ever-smoking status (dependent variables), with relative risk (RR) as the effect measure and with other independent variables listed below the relevant tables. We chose RR as the measure of effect due to its ease of interpretation and for consistency with our previous publication (Watts et al., 2022).

2.4.2. Supplementary analysis

First, we re-ran our main analysis but with the dependent variables "recent ever-vaper" and "recent ever-smoker" for teenagers, respectively, redefined as having vaped on at least 10 occasions and having vaped in the past 30 days, and as having smoked at least 10 cigarettes and having smoked in the past 30 days (Supplementary Table 1). Wave 1 data were excluded from this analysis because many regions in Australia were in strict lockdowns due to COVID-19 outbreaks, thus affecting past 30-day vaping and smoking measures. Second, we re-ran our main analysis but after recategorizing teenagers who have: 1) smoked less than 10 cigarettes in their lifetime as ever-smokers rather than never-smokers and 2) vaped on less than 10 occasions in their lifetime as ever-vapers rather than never-vapers (Supplementary Table 2). Third, we repeated our main analysis using logistic regression to estimate odds ratios (ORs), thus allowing our estimates to be compared—and potentially pooled in future meta-analyses—with estimates from similar studies who estimated ORs (Supplementary Table 3).

3. Results

3.1. Participant characteristics

Among the 3242 teenagers, 52% were male, 6% were Aboriginal or Torres Strait Islanders, 76% lived in a metropolitan area and 94% spoke English only at home (Table 1). Among the teenagers, 95% had never smoked at least 10 cigarettes, thus classified as 'never-smokers,' and 91% had not vaped on at least 10 occasions, thus classified as 'never-vapers' (Table 2). Additionally, 77% had not smoked even a few puffs, and 71% had not vaped even a few puffs. The distributions of characteristics between teenage study participants in the paired sample analysis of the current study and all teenagers in the Generation Vape study were generally similar, with the exception that the entire group was slightly older (Supplementary Table 4). Among the 3242 parents, 33% were male, 4% were Aboriginal or Torres Strait Islanders, and 91%

Table 2
Smoking and vaping characteristics of study participants.

Smoking and vaping characteristics	Teenagers (n = 3242)	Parents(n = 3242)
Smoke status^a		
Never-smoker	3088 (95%)	1310 (40%)
Ever-smoker	154 (5%)	1932 (60%)
Vape status^b		
Never-vaper	2937 (91%)	2393 (74%)
Ever-vaper	305 (9%)	849 (26%)
Smoke/vape status^{a,b} combined		
Never-vaper, never-smoker	2908 (90%)	1288 (40%)
Ever-vaper, never-smoker	180 (6%)	22 (1%)
Never-vaper, ever-smoker	29 (1%)	1105 (34%)
Ever-vaper, ever-smoker	125 (4%)	827 (26%)
Teenager lifetime smoke quantity		
Have not smoked, not even a few puffs	2486 (77%)	n/a ^{^^}
A few puffs	471 (15%)	n/a ^{^^}
More than a few puffs but <10 cigarettes	131 (4%)	n/a ^{^^}
10 to <100 cigarettes	100 (3%)	n/a ^{^^}
100+ cigarettes	54 (2%)	n/a ^{^^}
Teenager lifetime vape quantity		
Have not vaped, not even a few puffs	2294 (71%)	n/a ^{^^}
A few puffs	438 (14%)	n/a ^{^^}
More than a few puffs but <10 occasions	205 (6%)	n/a ^{^^}
10 to <100 occasions	184 (6%)	n/a ^{^^}
100+ occasions	121 (4%)	n/a ^{^^}
Parent smoke status^a (3 categories)		
Never-smoker	n/a [^]	1310 (40%)
Ex-smoker	n/a [^]	986 (30%)
Current-smoker	n/a [^]	946 (29%)
Parent vape status^b (3 categories)		
Never-vaper	n/a [^]	2393 (74%)
Ex-vaper	n/a [^]	278 (9%)
Current-vaper	n/a [^]	571 (18%)
Teenager prior smoking[#]		
No	3120 (96%)	n/a [*]
Yes	122 (4%)	n/a [*]
Teenager prior vaping^{##}		
No	3109 (96%)	n/a [*]
Yes	133 (4%)	n/a [*]

^a Ever-smoker is defined for teenagers as having smoked at least 10 cigarettes, and for parents as self-reported ex- or current-smoker. Never-smokers are those who are not ever-smokers.

^b Ever-vaper is defined for teenagers as having vaped on at least 10 occasions, and for parents as self-reported ex- or current-vaper. Never-vapers are those who are not ever-vapers.

^{^^} Not asked in parent questionnaire.

[^] Response options of “current-” and “ex-” were not available to teenagers in teenager questionnaire.

[#] Teenagers were classified “yes” for “teenager prior smoking” if they had initiated smoking *prior* to any use of e-cigarettes. They were classified “no” for “teenager prior smoking” if they had *not* initiated smoking *prior* to any use of e-cigarettes (either never smoked or started smoking but *not prior* to trying an e-cigarette).

^{##} Teenagers were classified “yes” for “teenager prior vaping” if they had initiated vaping *prior* to any use of combustible tobacco products. They were classified “no” if they had *not* initiated vaping *prior* to any use of combustible tobacco products (ie either never vaped or started vaping but *not prior* to trying a combustible tobacco product).

^{*} Variable not calculated for parents because only teenager prior vaping/smoking is relevant for predicting teenagers smoking/vaping outcomes. Numbers are frequencies and column percentages.

spoke English only at home (Table 1). Forty percent of parents had never smoked and 74% had never vaped. A notable difference in the vaping/smoking behaviours of parents and teenagers was that only 2.6% of parent ever-vapers (22/849) had never smoked, while 59.0% of teenage ever-vapers (180/305) had never smoked (Table 2).

3.2. Parents awareness of their teenage child's vaping usage

There was ‘substantial’ agreement between parents’ beliefs and the reality of their teenage child having tried vaping ($\kappa = 0.73$) (Table 3). Specifically, 89% of parents who predicted their child had not tried vaping were correct, while 95% of parents who predicted their child had tried vaping were correct. Parents of teenagers who had not

Table 3

Accuracy of parent's belief about their teenage child's vaping status.

Parent's belief about teen's vaping history	Teen's vaping history			
	Has not tried vaping*	Has tried vaping*	Total	
Has not tried vaping	2226	266	2492	NPV = 89% PPV = 95%
Has tried vaping	32	668	700	
Don't know	36	14	50	
Total	2294	948	3242	
	Specificity = 97%	Sensitivity = 70%	Kappa = 0.73	

* Trying vaping includes having had a few puffs or more.

^ Combination of parent's responses "I don't think they have" and "I am confident they have not".

^^ Combination of parent's responses "Yes, they definitely have" and "I strongly suspect they have".

tried vaping were considerably better at correctly predicting this (specificity = 97%) than the parents of teenagers who had tried vaping (sensitivity = 70%).

3.3. Safety of vaping perceptions

For both parents and teenagers, ever-vapers had lower mean agreement scores for all five negative statements about vaping safety than their never-vaper counterparts (Table 4). Conversely, ever-vapers had higher mean agreement scores for all three positive statements about vaping safety than their never-vaper counterparts. Ever-vapers also agreed on average (that is, they had mean scores above the neutral score of 3) with the five negative statements about vaping safety, except for "it is unsafe to use vapes around others" among teenage ever-vapers. Compared to parents, teenagers had significantly lower mean agreement scores for all five negative statements about vaping safety, and significantly lower mean agreement scores for all the three positive statements about vaping safety.

3.4. The effects of parents' vaping and smoking on teenagers' vaping and smoking

3.4.1. Main analyses

After adjustment for factors listed below Table 5, the risk of vaping uptake for teenagers was 42% higher (RR = 1.42, 95% CI [1.13, 1.79]) if their parent was an ever-vaper (compared to never-vaper). Similarly, teenagers whose parent was an ever-smoker had a 81% higher risk of vaping uptake (RR = 1.81, 95% CI [1.37, 2.39]) than teenagers whose parent was a never-smoker. The risk of smoking uptake was 97% higher (RR = 1.97, 95% CI [1.36, 2.88]) for teenagers whose parent was an ever-vaper (compared to never-vaper), and 159% higher (RR = 2.59, 95% CI [1.55, 4.33]) for teenagers whose parent was an ever-smoker (compared to never-smoker).

3.4.2. Supplementary analysis

Results from our analysis looking at teenagers' recent (past 30 days) vaping and smoking behaviours as outcomes were similar in magnitude to those obtained from our main analysis (Supplementary Table 1). Estimates of effects were generally weaker after recategorizing teenagers who have: 1) smoked less than 10 cigarettes in their lifetime as ever-smokers rather than never-smokers and 2) vaped on less than 10 occasions in their lifetime as ever-vapers rather than never-vapers (Supplementary Table 2). For example, the adjusted RR for teenage smoking uptake according to parent smoke status decreased from RR = 2.59 in the main analysis (Table 5) to RR = 1.64 after recategorizing ever-smoker teenagers.

4. Discussion

Vaping among teenagers has been highlighted in multiple high-profile Australian media outlets as a growing concern among parents warranting strong public health action (Australian Broadcasting

Corporation, 2022). Our study shows that parents in our sample were better at predicting their child's vaping status if the child was a never-vaper. This aligns with other research showing that while adolescent vaping overall is a concern to parents, their own children vaping is less concerning (Patel et al., 2019). Additionally, parents often discount the impact their own smoking and vaping has on children, attributing factors like peer pressure or teenage rebellion to harmful or risky behaviours (Tilson et al., 2004). Our study shows that parental smoking and vaping are both independently associated with increased risks of their children both smoking and vaping. Teenagers in our study viewed vaping as safer and less harmful than their parents did, which may reflect vaping rates being higher in younger age groups in Australia (Australian Institute of Health and Welfare, 2020).

In our study, the adjusted relative risk of smoking uptake for teenagers was 159% higher if their participant parent was an ever-smoker, or 173% higher odds in terms of relative odds (Supplementary Table 2) rather than relative risk. This finding is considerably higher than the 72% higher odds estimated in a 2011 meta-analysis of 10 studies from 11 countries, none of which included Australia (Leonardi-Bee et al., 2011). While it is not entirely clear why our cohort had a substantially higher relative odds, one possibility could be that the 5% prevalence of teenage ever-smokers in our study is notably lower than the study-specific teenage smoking prevalences in the meta-analysis, ranging from 12% to 35%. That is, when the odds of smoking in the reference group is low, even a small absolute increase in the probability of smoking can produce a disproportionately large odds ratio. We also found that teenagers whose parent was an ever-smoker had a 81% higher adjusted relative risk of vaping uptake (or 102% higher in terms of odds) than teenagers whose parent was a never-smoker. While our 102% higher odds estimate is also larger than the 41% reported in a 2018 meta-analysis of 10 studies from 9 countries (again, none from Australia) (Wang et al., 2018), such differences are not unexpected given that e-cigarette usage is rapidly evolving worldwide, and that vaping and smoking behaviours are likely to vary dramatically across cultures and countries.

While many studies have examined the effects of parental smoking on adolescent smoking and vaping, few have explored the effects of parental vaping. A 2018 UK study of 1152 11–18-year-olds found significant positive unadjusted associations between parental vaping and both youth smoking and vaping, but these became non-significant after adjustment for confounders (East et al., 2018). Another UK study of 3291 youth aged 10–15 years surveyed from 2015 to 2017 concluded that associations between parental and youth vaping were explained by measured confounding and that associations between parental vaping and youth smoking "could be explained by relatively weak unmeasured confounding" (Green et al., 2020). In contrast, our study's relationships between parental vaping and teenager vaping and smoking outcomes remained strong after adjustment, seeming less likely to be explained by weak unmeasured confounding.

Consistent with tobacco control research, our results illustrate why both tobacco and vaping interventions and control policies should not focus solely on young people, but take a whole of population approach that benefits both adults and young people. This approach has already

Table 4
Mean agreement scores where respondents were asked “How strongly do you agree or disagree with each of the following statements about vapes?”.

Statement	Never-vaper			Ever-vaper		
	Parent (n = 2393)	Teenager (n = 2937)	Difference	Parent (n = 849)	Teenager (n = 305)	Difference
Negative statements about vaping safety:						
Vapes are unsafe to use	4.47	3.97	0.50	3.77	3.07	0.70
Vaping can harm the developing brain	4.45	4.02	0.43	3.92	3.27	0.65
Vaping can damage the lungs	4.58	4.16	0.42	4.08	3.60	0.48
Vaping during adolescence can cause addiction	4.59	4.11	0.48	4.19	3.53	0.66
It is unsafe to use vapes around others	4.26	3.77	0.49	3.59	2.96	0.63
Positive statements about vaping safety:						
Vapes are healthier than smoking tobacco cigarettes	2.19	2.87	-0.68	3.14	3.63	-0.49
Vapes help smokers to quit	2.39	2.82	-0.43	3.24	3.42	-0.18
Nicotine is harmless	1.45	1.93	-0.48	2.03	2.41	-0.38

* Agreement was scored on a 5-point scale with a score of 5 being “strongly agree”, a score of 1 being “strongly disagree” and a score of 3 being neutral.

** Ever-vaper is defined for teenagers as having vaped on at least 10 occasions, and for parents as self-reported ex- or current-vaper. Never-vapers are those who are not ever-vapers.

proven successful in tobacco control in Australia, with comprehensive programs and interventions such as mass media campaigns, smoke free policies and restrictions on industry marketing targeted to the general population playing key roles (Levy et al., 2018; Pierce et al., 2012). Despite this success, vaping rates are rising in Australia, particularly amongst young people (Australian Institute of Health and Welfare, 2021). Moreover, given the considerable evidence of increased risks of smoking uptake in non-smokers who initiate vaping (Banks et al., 2022; Yoong et al., 2021), there is a risk that e-cigarette use in young Australians could undo decades of successful whole-of-population tobacco control policies. While the family setting plays a role in vaping uptake by young people, it is important not to overlook other key drivers such as product design, marketing, and accessibility. Ensuring that parents are well supported by an environment that reinforces that vaping products are only accessible to smokers who may benefit from use as a cessation aid is crucial. Shifting responsibility for adolescent vaping solely onto parents ignores the role of commercial actors, including retailers and importers illegally selling highly appealing products to children (NSW Health, 2022). Greater enforcement of Australian vaping laws is needed to ensure nicotine-containing vaping products are only accessible to adult smokers for smoking cessation.

An additional noteworthy finding from our study is the difference in perceptions of vaping safety between ever-vapers and never-vapers, as well as between parents and teenagers. Specifically, ever-vapers were generally less aligned with negative safety statements and more aligned with positive ones than never-vapers. Moreover, teenagers tended to have lower agreement with negative safety statements and higher agreement with positive safety statements compared to parents. These divergent views suggest that health education campaigns aimed at adolescents could potentially be beneficial in addressing misconceptions about the safety and harms of vaping. Furthermore, even though parents in our study generally had a more accurate perception of vaping risks, tailored information (encompassing resources and support), including for vaping parents, may assist in clarifying misperceptions that could influence their children’s attitudes towards vaping. The potential benefits of tailoring parent-specific information become even more pronounced considering our finding that parents possess high awareness of their teenager’s vaping habits. Such tailored information would be perceived as highly relevant by parents of ever-vapers who are aware of their child’s vaping behaviours, thus increasing the likelihood of their active engagement.

Our study has limitations. First, the analysis assessing the accuracy of parent’s belief about their teenage child’s vaping is based on a question that doesn’t necessarily refer to the 14–17-year-old child who completed the survey (i.e. the question asks “... has your child (or any of your children aged 14–17) ever vaped?”). Consequently, while our analysis suggests parents have a high level of awareness of one of their teenage child’s vaping status, the true level may be higher if some parents are referring to a different 14–17-year-old child with a discordant vaping status to the child who completed the survey. Second, our study examines only one parent’s smoking and vaping behaviours, which may not capture the full family context influencing a teen’s behaviour. This limitation could attenuate estimated associations and would seemingly be more of a problem when the responding parent does not vape or smoke, but other parent figures do, compared to when only the responding parent vapes or smokes, but other parent figures do not. On the other hand, if there is a strong correlation between the behaviours of all parent figures, this limitation will be less impactful. Future waves of the study will consider including questions about non-responding parent’s smoking and vaping status.

Addressing the rapid rise in adolescent vaping is a public health priority in Australia (Australian Government Department of Health and Aging, 2022). Our results show that parental smoking and vaping impacts on both teenagers’ vaping and smoking behaviours, suggesting that policies targeting adolescents alone are unlikely to be as successful as a whole-population approach. Enforcing and strengthening

Table 5

The effects of parent's vaping and smoking behaviour on their teenage child's vaping and smoking behaviour.

Parent vape/smoke status	Teenage ever-vaper n/N (%)	RR for teenage ever-vaper (compared to never-vaper) [*]		Teenage ever-smoker n/N (%)	RR for teenage ever-smoker (compared to never-smoker) ^{**}	
		Unadjusted RR	Adjusted RR		Unadjusted RR	Adjusted RR
Total:	305/3242 (9%)			154/3242 (5%)		
Parent vape status [*]						
Never-vaper	171/2393 (7%)	ref.	ref.	72/2393 (3%)	ref.	ref.
Ever-vaper	134/849 (16%)	2.21 (1.79, 2.73)	1.42 (1.13, 1.79)	82/849 (10%)	3.21 (2.36, 4.36)	1.97 (1.36, 2.88)
p-value		<0.001	0.003		<0.001	<0.001
Parent vape status [*] (3 categories)						
Never-vaper	171/2393 (7%)	ref.	ref.	72/2393 (3%)	ref.	ref.
Ex-vaper	34/278 (12%)	1.71 (1.21, 2.42)	1.13 (0.83, 1.55)	21/278 (8%)	2.51 (1.57, 4.02)	1.71 (1.03, 2.83)
Current-vaper	100/571 (18%)	2.45 (1.95, 3.08)	1.64 (1.24, 2.16)	61/571 (11%)	3.55 (2.56, 4.93)	2.15 (1.42, 3.24)
p-value		<0.001	0.002		<0.001	0.001
Parent smoke status ^{**}						
Never-smoker	62/1310 (5%)	ref.	ref.	20/1310 (2%)	ref.	ref.
Ever-smoker	243/1932 (13%)	2.66 (2.03, 3.48)	1.81 (1.37, 2.39)	134/1932 (7%)	4.54 (2.85, 7.23)	2.59 (1.55, 4.33)
p-value		<0.001	<0.001		<0.001	<0.001
Parent smoke status ^{**} (3 categories)						
Never-smoker	62/1310 (5%)	ref.	ref.	20/1310 (2%)	ref.	ref.
Ex-smoker	118/986 (12%)	2.53 (1.88, 3.40)	2.01 (1.51, 2.67)	50/986 (5%)	3.32 (1.99, 5.54)	2.43 (1.44, 4.11)
Current-smoker	125/946 (13%)	2.79 (2.08, 3.74)	1.45 (1.04, 2.02)	84/946 (9%)	5.82 (3.60, 9.40)	2.93 (1.64, 5.22)
p-value		<0.001	<0.001		<0.001	<0.001

^{*} Ever-vaper is defined for teenagers as having vaped on at least 10 occasions, and for parents as self-reported ex- or current-vaper. Never-vapers are those who are not ever-vapers.

^{**} Ever-smoker is defined for teenagers as having smoked at least 10 cigarettes, and for parents as self-reported ex- or current-smoker. Never-smokers are those who are not ever-smokers.

[^] RRs adjusted for teenage child's gender, age, Aboriginal or Torres Strait Islander status, remoteness of residence, SES of residence area, language spoken at home, parent's corresponding vaping variable [3 categories] or smoking variable [3 categories] (eg. parent vape status is adjusted for parent smoke status [3 categories] and vice versa) and teenager vaping outcome models adjusted for teenager prior smoking while teenager smoking outcome models adjusted for teenager prior vaping.

Australia's prescription-only model that restricts electronic nicotine delivery systems to smokers seeking to quit would both decrease young peoples' access and avoid the further normalisation of vaping products as recreational, consumer goods.

Author agreement

All authors have seen and approved the final version of this manuscript. We confirm that the article is our original work, has not received prior publication and is not under consideration for publication elsewhere.

Ethics approval

Ethical approval for the study was provided by The University of Sydney Human Research Ethics Committee. Project number: 2021/442.

Contributors

All authors contributed to the study design and data collection strategy. SE led the data analysis. All authors contributed to manuscript writing and approved the final version of the paper.

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Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: BF reports being a member of the Australian National Health and Medical Research Council Electronic Cigarettes Working Committee (May 2020), receiving consultancy payment for e-cigarette policy review for the NSW National Heart Foundation (December 2019), receiving reimbursement for travel expenses to attend the Oceania Tobacco Control Conference (2017) to present on e-cigarettes and cessation and the National Taiwan University for presenting on e-cigarette regulation (2016), providing opinion (unpaid) at the Australian Parliament's Standing Committee on Health, Aged Care and Sport public hearing into the Use and Marketing of Electronic Cigarettes and Personal Vaporisers (8 September 2017) and leading a contract on e-cigarette regulation in Australia for the Commonwealth Department of Health (2016). No other authors have conflicts of interest to declare.

Data availability

The authors do not have permission to share data.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.addbeh.2023.107931>.

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