Awareness of electronic cigarette industry practices and their associations with anti-electronic cigarette attitudes among susceptible US young adults

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ABSTRACT

Background Public education exposing cigarette industry practices have been effective in changing attitudes and preventing smoking among young people. It is unclear how much young adults are aware of e-cigarette industry practices, and how this awareness relates to anti-e-cigarette attitudes. We examined demographic correlates of awareness of e-cigarette industry practices and anti-e-cigarette attitudes, and the association between awareness of these practices with anti-e-cigarette attitudes.

Methods A US sample of young adults aged 18–30 years who do not use commercial tobacco products but are susceptible to e-cigarette use were cross-sectionally surveyed through online panel services from August 2021 to January 2022. Respondents reported their demographics, awareness of cigarette industry practices, awareness of e-cigarette industry practices and their level of agreement with four anti-e-cigarette attitude statements. We used multivariable linear regressions to examine demographic associations and the relationship between awareness of e-cigarette industry practices with each anti-e-cigarette attitude, adjusting for demographics and awareness of cigarette industry practices.

Results Generally, Hispanic and Black young adults (vs White) and those with <US$75 000 annual household income (vs ≥US$75 000) knew of fewer e-cigarette industry practices. Black young adults (vs White) and those with <US$75 000 annual household income (vs ≥US$75,000) also had lower levels of agreement with anti-e-cigarette attitudes. Awareness of e-cigarette industry practices (vs awareness of zero practices) were associated with stronger agreement with each of the four anti-e-cigarette attitudes.

Discussion Public education exposing e-cigarette industry practices may promote anti-e-cigarette attitudes among susceptible young adults who do not use commercial tobacco products. Future research should investigate the utility of anti-e-cigarette industry messaging.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Exposing the cigarette industry's tactics is an effective cigarette smoking prevention approach.
⇒ It is unclear if young adults are aware of e-cigarette industry practices and if that relates to anti-e-cigarette attitudes.

WHAT THIS STUDY ADDS

⇒ Young adults from minoritised populations in the USA may be less aware of e-cigarette industry practices.
⇒ Awareness of e-cigarette industry practices were associated with stronger agreement with anti-e-cigarette attitudes.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Findings provide support for strategies that expose e-cigarette industry marketing practices among young adults.
⇒ Future prevention research should continue to test the effects of messaging about e-cigarette industry practices on related attitudes and use intentions among all age groups.

INTRODUCTION

US young adults have a high prevalence of electronic cigarette (e-cigarette) use overall (9.4% in 2020).[1 2] In 2021, 61.4% of US young adults (18–24 years) who used e-cigarettes have never smoked cigarettes.[3] Thus, a notable proportion of young adults who never smoked cigarettes are using e-cigarettes[4 5] and are not engaging in e-cigarette use behaviour as a tobacco harm reduction strategy. Previous studies have shown that e-cigarette use alone may pose substantial health risks including respiratory harm,[6–8] susceptibility to illness[6] and negative consequences of nicotine to the developing brain.[9 10] Previous research has also found associations between e-cigarette use and subsequent initiation of cigarette smoking among young adults,[11 12] which can lead to cumulative negative health effects from potential dual or poly commercial tobacco use.[13] Therefore, preventing e-cigarette use initiation among young adults, especially those who have not used commercial tobacco products, is an important public health concern.

The e-cigarette industry brands itself as 'do-gooders'[14 15] despite its deployment of the same insidious marketing practices the cigarette industry once used to sell cigarettes to young people.[16] For example, during the mass launch of e-cigarette products in the tobacco marketplace, the e-cigarette industry used models depicting young adults,[14] compensated social media influencers to promote e-cigarettes,[17] sponsored social events and music concerts,[18] and gave away free e-cigarette products at sampling events.[14 18] In fact, JUUL Labs, an e-cigarette company playing a disproportionately large role in the vaping epidemic among young people,[19 20] illegally marketed its e-cigarettes

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as less harmful than cigarettes without authorisation from the US Food and Drug Administration,[21] pitched their e-cigarettes as a 'switching programme' offering discount prices to current cigarette smokers in Indigenous communities,[22] misrepresented their e-cigarettes as 'totally safe' in schools, and sponsored youth summer programmes.[14 23] Other e-cigarette industry marketing practices currently offered this year in 2023 also include discount programmes to veterans,[24] subscription programmes[25] and money-back guarantees for their e-cigarette products.[25]

Previous research and cigarette smoking prevention efforts have shown that exposing the cigarette industry's marketing practices through public education campaigns can influence young people's attitudes about cigarette smoking and the cigarette industry, to in turn help prevent cigarette smoking initiation.[26–28] Drawing from these effective cigarette smoking prevention strategies, perhaps exposing the e-cigarette industry may be one effective public education approach to help prevent e-cigarette use among susceptible young adults. Little is known about young adults' awareness of the e-cigarette industry's marketing practices, and how awareness of these practices may influence attitudes about the e-cigarette industry and e-cigarette use. To help fill these research gaps and inform future e-cigarette prevention research, we examined demographic correlates of awareness of e-cigarette industry practices and anti-e-cigarette attitudes given the variability in e-cigarette advertising exposure,[29 30] susceptibility[31] and use behaviours among young adults.[32 33] We also assessed a sample of young adults' awareness of e-cigarette industry practices and examined the relationship between this awareness of e-cigarette industry practices with anti-e-cigarette attitudes. We hypothesised that awareness of e-cigarette industry practices would be associated with stronger agreement with anti-e-cigarette attitudes.

METHODS

Study design

Eligible respondents were young adults 18–30 years old who reported never using any commercial tobacco products but were susceptible to using e-cigarettes. Respondents were recruited and completed a cross-sectional survey through Qualtrics online panel services from August 2021 to January 2022. Qualtrics online panellists are recruited through several panellist provider channels, including website intercept recruitment, member referrals, targeted email lists, gaming sites, customer loyalty web portals, permission-based networks and social media. Qualtrics US online panellists aged 18–30 years were invited to participate in this study through an email invitation sent from Qualtrics. We characterised never use of commercial tobacco products as reporting 'no' not even one or two times/puffs of cigarettes, electronic vaping products (eg, e-cigarettes, vape pens, personal vaporisers and mods, e-cigars, e-pipes, e-hookahs and hookah pens), large cigars, little filtered cigars, cigarillos, hookah tobacco (eg, shisha, waterpipe), smokeless tobacco (eg, snus pouches, loose snus, moist snuff, dip, spit and chewing tobacco), and heated tobacco products (eg, IQOS). To assess respondents' susceptibility to e-cigarette use, respondents were first provided a written description of e-cigarettes adapted from the Population Assessment of Tobacco and Health (PATH) Study:[34] 'The following questions ask about electronic vaping products, such as e-cigarettes, vape pens, personal vaporizers and mods, e-cigars, e-pipes, e-hookahs and hookah pens. These products are battery-powered and produce vapor or aerosol instead of smoke. Some electronic vaping products can be bought as one-time, disposable products, while others can be bought as reusable kits with cartridges or a tank system. They typically use a nicotine liquid called "e-liquid", although the amount of nicotine can vary and some may not contain any nicotine at all. Some common brands include Vuse, Blu, Logic, MarkTen, NJOY, eGo, and iTaste.' Respondents were then asked the following four e-cigarette susceptibility questions: Do you think that you will use a vape soon?; Do you think that you will use a vape in the next year?; Do you think that in the future you might experiment with vapes?; If one of your best friends were to offer you a vape, would you use it? Response options included: 'definitely yes', 'probably yes', 'probably not' and 'definitely not'. Respondents were considered susceptible to e-cigarettes if they reported any combination of response other than 'definitely not' to all four of these questions. Respondents were considered susceptible if they reported 'definitely not' to only one of the four questions. Overall, 17 831 US online panellists were screened, and 1329 were eligible and completed the survey after providing their informed consent. Respondent compensation was based on Qualtrics panel provider compensation systems, which included rewards, membership points and gift cards.

MEASURES

Demographics

As a part of the survey, we asked respondents to report their age (coded as a continuous variable), race and ethnicity (coded as Hispanic (any race); Black/African American; White; or another race (ie, American Indian or Alaska Native, Asian, multiracial, Native Hawaiian or Pacific Islander, or 'other' race)), gender identity (coded as man; or woman), educational level (coded as ≤ high school or GED degree; vocational school or some college; or ≥ a college degree), annual household income (coded as <US$75,000; or ≥US$75,000), and sexual orientation (coded as heterosexual; or LGB+ (lesbian or gay, bisexual, or 'something else')). We assessed gender identity with the response options of 'man', 'woman', 'non-binary', 'transgender' and 'none of these describe me'. We excluded gender identities of 'non-binary', 'transgender', and 'none of these describe me' from the analysis due to small sample sizes. We also used a cut-point of <US$75 000 vs ≥US$75 000 for annual household income in the analysis to capture the median annual household income of the sample.

Awareness of cigarette industry practices

Respondents were instructed that for the purpose of this study, the 'cigarette industry' refers to companies that are active in the production, distribution or marketing of cigarettes in the USA. Respondents were then asked whether they thought cigarette companies engaged in 11 cigarette industry practices reported elsewhere.[35] Response options to each item were 'yes', 'no' or 'don't know.' We recoded responses to represent awareness of each cigarette industry practice (ie, yes=1; no/don't know=0) and counted the number of cigarette industry practices participants were aware of to create an overall score ranging from 0 to 11 practices.

Awareness of e-cigarette industry practices

Respondents were instructed that for the purpose of this study, the 'electronic vaping industry' refers to companies that are active in the production, distribution or marketing of electronic vaping products in the USA and excluded heated tobacco products. Respondents were asked whether they thought the e-cigarette industry engaged in 12 e-cigarette industry practices (eg, 'Sponsoring youth summer camps using their brand names';

'Offering programs with exclusive benefits for certain groups [eg, military members/veterans and their spouses, teachers, first responders]'; and 'Offering subscription services that include discounts, free shipping, auto-shipping, concierge hotlines, and exclusive deals') (see all e-cigarette industry practices and overall proportions of awareness of each practice in online supplemental materials) with response options of 'yes', 'no', and 'don't know'. We recoded responses to represent awareness of each e-cigarette industry practice (ie, yes=1; no/don't know=0). We counted the number of practices respondents were aware of to create an overall score ranging from 0 to 12 practices. We also created an ordinal variable (1=0 practices, 2=1–4 practices, 3=5–8 practices, 4=9–12 practices) to examine the non-linear relationships between awareness of e-cigarette industry practices and each of the four anti-e-cigarette attitudes.

Anti-e-cigarette attitudes

Respondents were asked to report their level of agreement (1=strongly disagree to 4=strongly agree) to four e-cigarette attitude statements adapted from previous cigarette smoking-related research among young adults.[26 36 37] These statements assessed attitudes towards e-cigarette use ('Not vaping is a way to express independence.')[26] and reactions toward the e-cigarette industry ('Taking a stand against vaping is important to me.'; 'I want to be involved with efforts to get rid of vaping'; and 'I would like to see electronic vaping companies go out of business.').[36–38] For the analysis, each statement was treated as an outcome variable with stronger agreement scores representing stronger anti-e-cigarette attitudes.

Statistical analysis

We used descriptive statistics (eg, frequencies, proportions, means and SD) to summarise sample characteristics. We used multivariable linear regression models to examine demographic associations with awareness of e-cigarette industry practices and each of the four anti-e-cigarette attitudes. We also used multivariable linear regression models to examine associations between awareness of e-cigarette industry practices with each anti-e-cigarette attitude statement, adjusting for demographics and awareness of cigarette industry practices. Since scatterplots revealed non-linear relationships between awareness of e-cigarette industry practices and each of the four anti-e-cigarette attitudes, we used the categorical (as opposed to the continuous) awareness of e-cigarette industry practices variable as the independent variable for these multivariable linear regression models. We adjusted for awareness of cigarette industry practices to account for potential confounding relationships between awareness of cigarette industry practices, e-cigarette industry practices and anti-e-cigarette attitudes.[39] All analyses were conducted in SPSS V.28 (IBM Corp, Armonk, New York, USA).

RESULTS

Sample demographics

Sample demographic characteristics by awareness of e-cigarette industry practices and the four anti-e-cigarette attitudes are shown in table 1. Overall, the mean age of sampled young adult respondents was 24.44 years (SD=3.40 years). A large proportion of respondents self-identified as White (61.2%),

Table 1 Sample characteristics by awareness of e-cigarette industry practices and anti-e-cigarette attitudes (n=1329)

				Anti-e-cigarette attitudes			
Demographic characteristics	Sample		Awareness of e-cigarette industry practices	Express independence by not using e-cigarettes	Stand against e-cigarette use	Involvement to get rid of e-cigarettes	Support for e-cigarette companies to go out of business
	% (n)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Overall	–	–	5.12 (3.05)	2.92 (0.88)	2.90 (0.88)	2.99 (0.86)	2.99 (0.85)
Age	–	24.44 (3.40)	–	–	–	–	–
Race and ethnicity							
Hispanic	14.1 (187)		4.10 (3.11)	2.69 (0.85)	2.72 (0.87)	2.84 (0.85)	2.79 (0.85)
Black	16.3 (216)		3.90 (3.99)	2.59 (0.97)	2.62 (0.90)	2.75 (0.96)	2.78 (0.88)
White	61.2 (811)		5.70 (2.79)	3.10 (0.82)	3.06 (0.84)	3.11 (0.82)	3.12 (0.82)
Other race	8.5 (112)		4.92 (2.97)	2.71 (0.78)	2.62 (0.82)	2.81 (0.83)	2.81 (0.83)
Gender							
Men	49.8 (645)		5.71 (2.95)	3.04 (0.86)	3.01 (0.89)	3.05 (0.88)	3.09 (0.86)
Women	50.2 (651)		4.57 (3.07)	2.83 (0.88)	2.81 (0.85)	2.94 (0.85)	2.92 (0.83)
Education							
≤high school/GED	39.4 (523)		4.64 (3.10)	2.82 (0.90)	2.82 (0.90)	2.93 (0.88)	2.90 (0.87)
Some college	26.9 (357)		5.07 (3.03)	3.01 (0.82)	2.96 (0.81)	3.03 (0.85)	3.07 (0.82)
≥college degree	33.8 (449)		5.71 (2.92)	2.97 (0.88)	2.95 (0.89)	3.02 (0.85)	3.04 (0.85)
Annual household income							
<US$75 000	48.8 (648)		4.40 (3.11)	2.62 (0.92)	2.63 (0.90)	2.74 (0.93)	2.72 (0.89)
≥US$75 000	51.2 (681)		5.80 (2.61)	3.21 (0.73)	3.16 (0.77)	3.22 (0.72)	3.25 (0.72)
Sexual orientation							
Heterosexual	88.3 (1143)		5.29 (3.05)	2.97 (0.87)	2.94 (0.87)	3.02 (0.86)	3.05 (0.83)
LGB+	11.7 (152)		4.37 (2.79)	2.72 (0.86)	2.72 (0.81)	2.83 (0.88)	2.68 (0.84)

Other race category includes individuals identifying as American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, multiracial or 'other'; LGB+ category includes individuals identifying as lesbian, gay, bisexual or 'something else'; some n totals for categories within variables do not sum to total sample size due to sporadic missing data (<3% of cases for any individual variable); anti-e-cigarette attitude level of agreement 1=strongly disagree to 4=strongly agree.

Table 2 Demographic correlates of awareness of e-cigarette industry practices and anti-e-cigarette attitudes (n=1232)

Demographic characteristics	Awareness of e-cigarette industry practices		Anti-e-cigarette attitudes: Express independence by not using e-cigarettes		Stand against e-cigarette use		Involvement to get rid of e-cigarettes		Support for e-cigarette companies to go out of business	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI	B	95% CI
Age	0.01	−0.05 to 0.06	0.01	0.00 to 0.03	0.00	−0.01 to 0.02	0.01	−0.01 to 0.03	−0.01	−0.02 to 0.01
Race and ethnicity										
Hispanic	**−0.95**	**−1.46 to −0.42**	−0.04	−0.18 to 0.11	**−0.17**	**−0.32 to −0.02**	−0.10	−0.25 to 0.05	−0.09	−0.24 to 0.07
Black	**−1.47**	**−1.97 to −0.98**	−0.11	−0.25 to 0.03	**−0.30**	**−0.44 to −0.16**	**−0.21**	**−0.35 to −0.07**	**−0.21**	**−0.35 to −0.06**
White	REF	–	REF	–	REF	–	REF	–	REF	–
Other race	−0.50	−1.11 to 0.11	−0.08	−0.25 to 0.09	**−0.21**	**−0.38 to −0.03**	**−0.27**	**−0.45 to −0.10**	**−0.12**	**−0.30 to −0.06**
Gender										
Men	**0.63**	**0.30 to 0.97**	0.02	−0.07 to 0.11	0.06	−0.04 to 0.16	0.06	−0.03 to 0.16	−0.00	−0.10 to 0.10
Women	REF	–	REF	–	REF	–	REF	–	REF	–
Education										
≤high school/ GED	−0.41	−0.82 to 0.01	0.10	−0.02 to 0.21	0.07	−0.05 to 0.18	0.11	−0.02 to 0.22	0.07	−0.06 to 0.19
Some college	**−0.50**	**−0.93 to −0.08**	0.11	−0.01 to 0.23	**0.14**	**0.02 to 0.27**	0.10	−0.02 to 0.22	0.08	−0.05 to 0.20
≥college degree	REF	–	REF	–	REF	–	REF	–	REF	–
Annual household income										
<US$75 000	**−0.54**	**−0.90 to −0.17**	**−0.44**	**−0.54 to −0.34**	**−0.47**	**−0.58 to −0.37**	**−0.45**	**−0.55 to −0.34**	**−0.41**	**−0.52 to −0.30**
≥US$75 000	REF	–	REF	–	REF	–	REF	–	REF	–
Sexual orientation										
Heterosexual	REF	–	REF	–	REF	–	REF	–	REF	–
LGB+	−0.47	−1.03 to 0.08	**−0.21**	**−0.37 to −0.05**	−0.08	−0.24 to 0.08	−0.02	−0.18 to 0.14	−0.03	−0.19 to 0.13

Other race category includes individuals identifying as American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, multiracial or 'other'; LGB+ category includes individuals identifying as lesbian, gay, bisexual or 'something else'; B indicates unstandardised beta coefficient; bold values indicate statistical significance p<0.05.

with smaller proportions of respondents self-identifying as Black (16.3%), Hispanic ((any race); 14.1%), or of other racial groups (8.5%). Half of the sampled young adults identified as women (50.2%) (vs men, 49.8%). Approximately a third of the sample had completed a ≤high school education (39.4%), some college education (26.9%) or a ≥college degree (33.8%), with about equal proportions reporting an annual household income of <US$75 000 (48.8%) and ≥US$75 000 (51.2%). The majority of respondents identified with heterosexual sexual orientation (88.3%) compared with LGB+ sexual orientation (11.7%). On average, respondents were aware of 5.12 (SD=3.05) of the 12 e-cigarette industry practices included and agreed with anti-e-cigarette attitudes, as indicated with a mean range of 2.90–2.99 (SD range=0.85–0.88) across the four anti-e-cigarette attitudes.

Associations with awareness of e-cigarette industry practices and anti-e-cigarette attitudes

Sample proportions by awareness of e-cigarette industry practices and the four anti-e-cigarette attitudes are described in table 1. Table 2 describes demographic associations with awareness of e-cigarette industry practices and the four anti-e-cigarette attitudes. Hispanic and Black respondents (vs White respondents), those with some college education (vs ≥college degree), and those with <US$75 000 annual household income (vs ≥US$75 000 annual household income) knew fewer e-cigarette industry practices, whereas men (vs women) were aware of more e-cigarette industry practices. In comparison to White respondents, Hispanic respondents had lower agreement with taking a stand against e-cigarette use. Additionally, Black respondents and those who self-identify with a race captured as 'other race' in this analysis (ie, American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, multiracial or 'other') also had lower agreement with taking a stand against e-cigarette use, involvement with efforts to get rid of e-cigarettes and support for e-cigarette companies going out of business compared to White respondents. Those with <US$75 000 annual household income (vs ≥US$75 000 annual household income) had lower agreement with all four anti-e-cigarette attitudes including not using e-cigarettes is a way to express independence, taking a stand against e-cigarette use is important, wanting to be involved with efforts to get rid of e-cigarettes and wanting to see e-cigarette companies go out of business.

Lastly, table 3 describes the associations between awareness of e-cigarette industry practices and each of the four anti-e-cigarette attitudes. The multivariable linear regression models, adjusted for demographics and awareness of cigarette industry practices, showed that awareness of e-cigarette industry practices (ie, awareness of 1–4 practices, 5–8 practices, and 9–12 practices vs 0 practices) were associated with stronger agreement with each of the four anti-e-cigarette attitudes.

DISCUSSION

Overall, we found that racial and ethnic minority young adults and those with lower annual household income in this sample knew of fewer e-cigarette industry practices and had lower agreement with anti-e-cigarette attitudes compared with White young adults and those with higher annual household income, respectively. Among this sample of US young adults who have not used commercial tobacco products but are susceptible to e-cigarette use, we also found that being aware of e-cigarette industry practices was associated with stronger anti-e-cigarette attitudes, which may suggest that increasing awareness of

Table 3 Associations between awareness of e-cigarette industry practices with anti-e-cigarette attitudes (n=1232)

	Outcome variables							
	Anti-e-cigarette attitudes							
	Express independence by not using e-cigarettes		Stand against e-cigarette use		Involvement to get rid of e-cigarettes		Support for e-cigarette companies to go out of business	
Independent variable	B	95% CI	B	95% CI	B	95% CI	B	95% CI
Awareness of e-cigarette industry practices								
0 practices	REF	–	REF	–	REF	–	REF	–
1–4 practices	**0.24**	**0.07 to 0.40**	**0.18**	**0.01 to 0.35**	**0.19**	**0.02 to 0.36**	**0.26**	**0.09 to 0.43**
5–8 practices	**0.39**	**0.22 to 0.57**	**0.47**	**0.30 to 0.65**	**0.47**	**0.29 to 0.65**	**0.46**	**0.28 to 0.64**
9–12 practices	**0.30**	**0.07 to 0.52**	**0.40**	**0.17 to 0.62**	**0.45**	**0.22 to 0.69**	**0.37**	**0.14 to 0.60**

Multivariable linear regression models adjusted for age, race and ethnicity, gender, education, annual household income, sexual orientation, and awareness of cigarette industry practices; B indicates unstandardised beta coefficient; bold values indicate statistical significance p<0.05.

e-cigarette industry practices may influence attitudes that protect against e-cigarette use initiation.

We found that awareness of e-cigarette industry practices was associated with stronger agreement that *not* using e-cigarettes is a way to express independence, support for taking a stand against e-cigarette use, wanting to be involved with efforts to get rid of e-cigarettes, and wanting to see e-cigarette companies go out of business. Using attitudinal measures adapted within this present study, previous cigarette smoking-related research has found that attitudes supporting actions against the tobacco industry were negatively associated with current smoking behaviour and positively associated with quitting smoking intentions among young adults.[36 38] Future research is needed to examine associations between anti-e-cigarette attitudes with intentions to avoid e-cigarette use and investigate whether anti-e-cigarette attitudes affect e-cigarette use initiation and use behaviours. Previous research has also found that mass media campaigns exposing the tobacco industry's tactics, like the Truth Campaign, have been effective in lowering the risk of smoking initiation among young people.[26] Thus, public education messaging revealing the e-cigarette industry's marketing practices may potentially resonate with young adults' values, and may be useful in helping to prevent e-cigarette use during the crucial period between susceptibility and initiation. Formative e-cigarette prevention research used to inform the Truth campaign to reduce the prevalence of e-cigarette use among young people also identified social acceptability of e-cigarette use, independence from e-cigarette use and anti-e-cigarette industry sentiments as potential messaging themes.[40] This present study provides additional support that exposing e-cigarette industry practices in messaging may help shape attitudes among young adults. However, other previous research has also found that anti-e-cigarette industry public education messaging did not perform as well as other messaging themes.[41] Another important consideration may be identifying e-cigarette prevention themes that resonate with young adults, while not minimising intentions for older adults who smoke cigarettes and are interested in using e-cigarettes to quit smoking cigarettes. Overall, our findings suggest that future research should examine whether educating young adults about e-cigarette industry practices can help intervene on the progression from susceptibility to e-cigarette use initiation among young adults who do not use commercial tobacco products. In addition to e-cigarette prevention messaging, other potential avenues for prevention interventions may include engaging young adults as tobacco control peer health educators and capacity building for active participation in implementing tobacco control policies (eg, smoking bans).

Overall, young adult respondents on average were aware of 5.12 of the 12 e-cigarette industry practices we included in this study. This also suggests that public health and prevention strategies have the opportunity to provide young adults with new information and increase their awareness and knowledge about e-cigarette industry practices, which in turn may influence their anti-e-cigarette attitudes. Demographic correlates of awareness of e-cigarette industry practices and anti-e-cigarette attitudes suggest that racial and ethnic and other minoritised populations (ie, those with lower income) in the USA may know of fewer e-cigarette industry practices and have less agreement with anti-e-cigarette attitudes than White respondents at this time. While future research is needed to better understand and contextualise these findings, racial and ethnic minoritised populations have lower prevalence of ever and current use of e-cigarettes,[42] though may also have varying use patterns (eg, higher dual and occasional use compared with frequent use)[33] compared with White populations. Previous research has also found that young people with higher socioeconomic status, in which income is a proximal measure, have higher exposure to e-cigarette advertising through various channels than those with lower income.[43] Differential exposure may impact awareness of some of these e-cigarette industry practices including offering subscription services (eg, discounts, free shipping, auto-shipping, concierge hotlines and exclusive deals), programmes with exclusive benefits for certain groups (eg, military members/veterans and their spouses, teachers, first responders) and 30-day 100% satisfaction guarantees that are a part of the e-cigarette industry's marketing practices.[24 25] Future research should explore young adults' perceptions of these practices and whether these practices in particular have utility in e-cigarette prevention strategies compared with educating young adults about more deliberately targeted practices like approaching Indigenous health agencies to start 'switching' programmes from cigarettes to e-cigarette products. Given the demographic associations with the variables of interest, future research may explore the potential impact of public education messages that expose e-cigarette industry marketing practices among subgroups like Black gender and sexual minority young people.[44 45] Perhaps, public health efforts that increase awareness of e-cigarette industry practices can help shift e-cigarette-related attitudes and interest in use, and help reduce these disparities that are present at intersectional identities.

There are limitations to this study. Young adult respondents in this analysis were recruited through Qualtrics online panel services and may not be representative of e-cigarette-susceptible young adults who have not used commercial tobacco products in the USA. Our survey question assessing educational level did not specify whether 'college degree' indicated an Associate's or Bachelor's degree. Additionally, we did not assess respondents' geographical region, which may impact their e-cigarette-related attitudes, given geography and regional differences are a segmentation dimension of the tobacco industry's targeted marketing.[46] Future studies should explore potential variation in e-cigarette-related attitudes between these college education levels and across US geographical regions among young adults. Due to small sample sizes, we were unable to include gender minority populations. Future research should examine associations between awareness of e-cigarette industry practices and anti-e-cigarette attitudes among gender minority populations including transgender, non-binary and queer identifying individuals. Future research should also disaggregate data to examine these associations among subpopulations to further understand whether raising awareness about e-cigarette industry practices may be an effective public health strategy and can help address e-cigarette use disparities at intersectional identities. It would also be important to examine patterns of awareness of e-cigarette industry practices or subgroup variations to identify awareness of which e-cigarette industry practices may be most beneficial in shaping attitudes. While our written e-cigarette description was adapted from a national survey, we did not specify in our description of e-cigarettes to exclude cannabis vapes, which may have influenced respondents' e-cigarette-related responses. Despite these study limitations, this research helps inform future e-cigarette prevention research and offers a potential public education messaging strategy for investigation. Importantly, public health and prevention strategies are needed to help prevent susceptibility and also change the attitudinal and behavioural pathway during the critical period from e-cigarette susceptibility to use.

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Supplemental Table.

Awareness of e-cigarette industry practices among overall sample of young adults susceptible to e-cigarette use (n=1,329)

Do you think the electronic vaping industry engages in any of the following activities?	**Yes**	**No/Don't Know**
	% (n)	% (n)
1. Offering subscription services that include discounts, free shipping, auto-shipping, concierge hotlines, and exclusive deals[b]	46.1 (611)	53.9 (715)
2. Offering programs with exclusive benefits for certain groups (e.g., military members/veterans and their spouses, teachers, first responders)[b]	38.6 (511)	61.4 (812)
3. Offering 30-day 100% satisfaction guarantees with a full refund[b]	40.6 (538)	59.4 (788)
4. Running youth vaping prevention programs[a]	35.8 (474)	64.3 (852)
5. Financially supporting advocacy networks that support access to electronic vaping products[a]	43.4 (576)	56.6 (751)
6. Offering discounts for referring a friend or family member to use their brand of electronic vaping products[b]	42.8 (568)	57.2 (759)
7. Giving school presentations about electronic vaping products to youth[a]	36.2 (480)	63.8 (486)
8. Sponsoring youth summer camps using their brand names[a]	36.8 (487)	63.2 (836)
9. Claiming that electronic vaping products are less harmful than cigarettes[a]	54.6 (725)	45.4 (602)
10. Claiming that electronic vaping products help people quit smoking[a]	49.6 (658)	50.4 (668)
11. Are silent about youth vaping outside of the U.S. where youth vaping is not banned by law[a]	44.6 (590)	55.4 (733)
12. Making sales pitches to American/Indian/Native American health agencies to start "switching" programs from cigarettes to electronic vaping products[a]	41.7 (553)	58.3 (772)

Note: Response categories were "yes"; "no"; "don't know"; responses of "no" and "don't know" were combined for analysis; some n totals for categories within variables do not sum to total sample size due to sporadic missing data (<1% of cases for any individual variable); [a] indicates that this was a previously reported e-cigarette industry practice; [b] indicates that this is an e-cigarette industry practice that is current as of September 2023.

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