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Awareness and perceived behaviour changes following the New York state vaping flavour ban, 2021–2022

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ABSTRACT

Significance Despite an electronic cigarette (e-cigarette) flavour ban in New York (NY) since May 2020, most youth who vape continue to report vaping restricted flavours. This study aims to examine youth awareness and perceived behaviour change associated with the NY vaping flavour ban.

Methods NY cross-sectional data from 2021 and 2022 ITC Youth Survey were combined and analysed (N=1014). Weighted analyses were used to describe awareness and understanding of the e-cigarette flavour ban, as well as changes in tobacco use behaviour.

Results Only 0.9% (n=8) of NY youth understood the flavour ban, in that they were both aware of the flavour ban in all stores and accurately reported that all non-tobacco flavours were banned. Awareness and understanding of the flavour ban differed by vaping status (p<0.01): respondents who had vaped in the past 12 months or 30 days were more likely (adjusted OR (aOR)=2.15, 95% CI 1.34, 3.45; aOR=2.07, 95% CI 1.17, 3.64, respectively) to be aware of the flavour ban but misunderstand the stores or flavours included. Of the majority of youth who reported awareness of a flavour ban and vaped (n=122) or smoked (n=78) in the past 12 months reported no changes in behaviour (64.0% and 69.7%, respectively).

Conclusions Less than one-third of NY youth, regardless of vaping status, reported that an e-cigarette flavour ban was present where they live. Further, most youth who were aware of the ban misunderstood which flavours were restricted and/or that the ban applied to all stores that sold e-cigarettes. Increased enforcement and educational efforts could improve awareness and understanding of the NY e-cigarette flavour ban.

INTRODUCTION

Adding flavours to electronic cigarettes (e-cigarettes) reduces the perceived harshness of nicotine, increases appeal, and may promote experimentation and established use among youth.^{1–9} New York (NY) was one of many states and localities to pass a restriction on all flavoured e-cigarettes (eg, disposable, cartridge and mod devices) except ‘tobacco’ flavour and ‘unflavoured’, for both retail (May 2020) and online sales (July 2020).¹⁰ This was an effort to fight the youth vaping epidemic.^{11 12} In addition, it was an attempt to prevent youth who may be susceptible to experimenting and regularly using e-cigarettes.¹³ Other flavoured products, such as cigarillos, menthol cigarettes and nicotine pouches without tobacco, still remain available in

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Non-tobacco flavoured electronic cigarettes (e-cigarettes) are appealing and may promote experimentation and established use among youth. Despite a ban on non-tobacco flavours in the state of New York (NY), nearly all past 30-day youth who vaped continued to use restricted flavours.

WHAT THIS STUDY ADDS

⇒ Fewer than one-third of youth in NY, regardless of vaping status, were aware of the e-cigarette flavour restriction where they live. Further, among those who were aware, the majority of youth misunderstood which flavours were restricted or that the ban applied to all stores that sold e-cigarettes.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Lack of awareness and understanding of the NY e-cigarette flavour ban appears to be associated with the continued use of restricted flavour e-cigarettes. Additional educational campaigns and improved policy enforcement could improve awareness and understanding of this and future regulations, and therefore, potential the effects of the policy.

NY.¹⁴ Federally, cigarettes with flavours other than menthol¹⁵ and cartridge-based (only) e-cigarettes with flavours other than tobacco and menthol are banned.¹⁶

Despite the statewide restriction of flavoured e-cigarettes in NY, data from the International Tobacco Control Policy Evaluation Project: Youth Tobacco and Vaping (ITC Youth) Survey showed that nearly all youth who vaped were vaping restricted flavours more than a year following its implementation,¹⁷ consistent with another study that assessed adults who vaped in NY.¹⁸ Further, most youth in NY were obtaining their vaping product(s) from other people rather than purchasing themselves, though most of those purchasing for themselves did so at retail stores; these patterns did not significantly change following the implementation of the flavour ban.¹⁷

The high prevalence of continued use of restricted flavours and ability to obtain flavoured e-cigarettes from retailers may have led to some confusion or complete lack of knowledge about the



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flavour policy. A study assessing adults in NY who vaped found that 71% were aware of the e-cigarette flavour ban before participating in the survey.¹⁸ Awareness among NY youth, however, has not been studied. In addition, awareness of the flavour ban may influence the susceptibility of youth initiating vaping or continuing to vape. The purpose of this study is to examine the awareness of and perceived behaviour change following the NY vaping flavour restriction policy among youth in NY.

METHODS

Study design and participants

Data were from youth aged 16–19 years residing in NY who participated in wave 5 (4 August to 5 September 2021; n=753) or wave 6 (2 August to 12 September 2022; n=261) of the ITC Youth Survey (N=1014).¹⁹ The ITC Youth Survey is a repeated cross-sectional survey conducted online with youth in the USA, Canada and England, recruited through the Nielsen Consumer Insights Global Panel. In 2021 only, youth from NY were over-sampled. Additional information on the study methods can be found in the Technical Reports (<http://davidhammond.ca/projects/e-cigarettes/itc-youth-tobacco-ecig/>).

Measures

Vaping and smoking

Past 30-day use of e-cigarettes and cigarettes were assessed among all youth. Respondents who had ever vaped were asked, 'Which of the following flavours of e-cigarettes or e-liquid have you EVER USED?' with 'Yes', 'No', 'Don't know' and 'Refused' options for each of 12 flavour categories. Participants who had used e-cigarettes in the past 30 days and selected 'Yes' for ever use of more than one flavour category were then asked which flavour(s) they used most often from the list of flavours previously selected for ever use; multiple selection was possible, and 'Don't know' and 'Refused' options were offered. Flavour categories (for ever use and most often) included: 'Tobacco'; 'Mix of tobacco and menthol'; 'Menthol'; 'Mint'; 'Fruit (strawberry, mango, cherry, etc)'; 'Candy, chocolate, desserts or sweets'; 'Clove or other spice'; 'Coffee'; 'A non-alcoholic drink (soda, energy drinks, etc)'; 'An alcoholic drink (wine, whisky, cognac, margarita, cocktails, etc)'; 'Some other flavour' (with follow-up open-ended response field to specify for 'ever' use; verbatim response shown for 'most often' item); 'Unflavoured'. Respondents who had never vaped were asked, 'Have you ever been curious about using e-cigarettes/vaping?'. All respondents (regardless of vaping status) were asked if they thought they would vape in the next 12 months, would be vaping 5 years from now, and would vape if their best friend offered an e-cigarette. Response options for the susceptibility to vaping questions included 'Definitely not' (coded as 'not susceptible' for analysis), 'Probably not', 'Probably yes', 'Definitely yes' and 'Don't know' (all coded as 'susceptible'). Those who refused were omitted from the analysis.

Awareness of flavour policy

All respondents were asked, 'Some cities or states have banned certain flavours in e-cigarettes, cartridges, pods or e-liquids. Are ANY e-cigarette flavours currently banned where you live?' with response options: 'No'; 'Yes, but only in some stores'; 'Yes, in all stores'; 'Don't know'; 'Refused'. Respondents who selected either 'Yes' option were asked 'Which e-cigarette flavours are banned where you live?' with 'select all that apply' options: 'Tobacco'; 'Menthol'; 'Mint'; 'Fruit (strawberry, mango, cherry, etc)'; 'Candy, chocolate, desserts or sweets'; 'Other flavour (Please specify: (open-ended))'; 'Don't know'; 'Refused'. Based on these two questions, an awareness measure was created: (1) understood (ie, selected 'Yes, in all stores', did not select tobacco flavour as being banned, and selected

all non-tobacco flavours); (2) aware but misunderstood (ie, selected either 'Yes, but only in some stores' or selected 'Yes, in all stores' but selected tobacco flavour, or did not select all non-tobacco flavours as banned); (3) not aware/don't know (ie, selected 'No' or 'Don't know'). Further, those who vaped in the past 30 days were asked, 'In the past 30 days, have you used e-cigarettes, cartridges, pods or e-liquids with flavours that are banned where you live?'. If 'Yes', they were asked, 'Which of the banned e-cigarette flavours did you use in the past 30 days?', with options including only the flavours that the respondent reported as banned in the previous item.

Perceived response to flavour ban

Respondents who had used e-cigarettes and/or cigarettes in the past year and reported a local flavour ban were asked, 'Has the ban on e-cigarette flavours changed your overall vaping/e-cigarette use?', and 'Has the ban on e-cigarette flavours changed your cigarette smoking?', respectively. If yes, separate follow-up questions (as applicable) asked, 'HOW has the ban on e-cigarette flavours changed your overall vaping/e-cigarette use?' and 'HOW has the ban on e-cigarette flavour changed your cigarette smoking?'. Options for the vaping follow-up question were 'select all that apply' and included: 'I switched flavours of e-cigarettes because of the flavour ban'; 'I vape less because of the flavour ban'; 'I vape more because of the flavour ban'; 'I stopped vaping because of the flavour ban'; 'The amount I vape has not changed because of the flavour ban'; 'Other (please specify: (open-ended response))'; 'Don't know'; 'Refused'. Responses for the smoking follow-up question were also select all that apply and included: 'I smoke less because of the e-cigarette flavour ban'; 'I smoke more because of the e-cigarette flavour ban'; 'I stopped smoking because of the e-cigarette flavour ban'; 'The amount I smoke has not changed because of the e-cigarette flavour ban'; 'Other (please specify: (open-ended response))'; 'Don't know'; and 'Refused'. Those who selected '... has not changed ...' were recoded as 'No' for the overall change measure.

Demographic characteristics

Respondents were asked their age (years), sex (sex-at-birth, derived from gender where not stated), race/ethnicity (country-specific measure with responses recoded into: non-Hispanic white, black or African American, Hispanic, other/mixed race and not stated) and perceived family socioeconomic status (SES; not meeting basic expenses, just meeting basic expenses, meeting needs with a little left over, living comfortably, don't know, refused; where 'don't know' and 'refused' were combined for analysis purposes).

Statistical analysis

Descriptive statistics were estimated for sample demographics, e-cigarette use, awareness of e-cigarette flavour restriction, use of restricted flavours and perceived effects of flavour restrictions on e-cigarette, as well as cigarette, use. Differences in sample characteristics, vaping behaviour and smoking behaviour by year of data collection were assessed using Pearson's χ^2 test. In addition, susceptibility to vaping was assessed by awareness and knowledge of the NY flavour ban using Pearson's χ^2 test as part of the goal for the flavour ban in NY was to prevent youth initiation. Finally, multinomial logistic regressions were used to assess vaping (past 12 months and past 30 days) and its association with awareness and understanding of the e-cigarette flavour ban. Models were adjusted for age and sex and the ORs and 95% CIs are reported. On the other hand, logistic regressions were used to assess the association between awareness and understanding

of the e-cigarette flavour ban with vaping susceptibility. Models were adjusted for past 30-day vaping status (except curious about vaping), age and sex, and the relative risk ratios and 95% CIs are reported. All analyses used cross-sectional survey weights. All information for how weights were constructed can be found in the Technical Reports.¹⁹ A $p < 0.05$ was considered statistically significant. Analyses were conducted using Stata V.15 software (StataCorp, College Station, Texas).

RESULTS

Sample characteristics

Following the NY vaping flavour ban, sample characteristics did not differ significantly between youth surveyed in August 2022 ($n=753$) and those surveyed in August 2021 ($n=261$) on age, sex, race/ethnicity, perceived family SES, use of e-cigarettes in the past 12 months, use of e-cigarettes in the past 30 days, nor dual use of e-cigarettes and cigarettes in the past 30 days. Cigarette smoking in the past 30 days was significantly lower in 2022 than 2021 (1.8% vs 3.7%, respectively; $\chi^2=3.23$, $p=0.044$; see online supplemental table 1).

Awareness of the NY e-cigarette flavour restriction

All youth

Among all youth surveyed in NY ($N=1014$), about 1–2 years post flavour ban, 40.1% ($n=400$) reported that they were unsure if any e-cigarette flavours were banned where they live, 29.6% ($n=304$) incorrectly reported no flavours were banned, 23.6% ($n=235$) reported a flavour ban but only in some stores (incorrect), 6.7% ($n=74$) correctly reported a flavour ban in all stores and 0.1% ($n=1$) refused to answer (see figure 1A). Among youth who reported that there was a vaping flavour ban in all and/or some stores, 11.8% ($n=55$) reported (incorrectly) that tobacco flavour was banned, 25.3% ($n=80$) correctly reported menthol flavours were banned and 17.3% ($n=44$) correctly reported other non-tobacco flavours were banned (eg, mint, fruit, candy, chocolate, desserts); 24.3% ($n=88$) did not know which flavours were banned. Awareness and identification of which flavours were included in the e-cigarette ban did not statistically differ between the two survey years.

Using the measure derived to account for both awareness and correctly selecting banned flavours, across both survey years, only 0.9% ($n=8$) of NY youth understood the flavour ban, in that they were both aware of the flavour ban in all stores and accurately reported that all non-tobacco flavours (including menthol, mint, fruit, and candy, chocolate, desserts or sweets) were banned and that tobacco was not. Nearly one-third (29.4%; $n=301$) were aware of the flavour ban but misunderstood it, reporting only in some stores and/or incorrectly identifying which flavours were included. Most youth (69.7%; $n=704$) reported that there was no flavour ban, or they did not know if there was a ban. Between 2021 and 2022, there was no difference in awareness and understanding of the flavour ban. Females had 1.93 times (95% CI 1.24, 2.98) greater odds than males of reporting that they were unsure if there was a flavour ban compared with reporting that there was no flavour ban. There were no other significant differences by demographic characteristics in the derived measure for awareness and understanding of the e-cigarette flavour ban (see table 1).

Susceptibility to vaping

When youth were asked if they thought they would be vaping in the next 12 months, regardless of their current vaping status, 57.6% ($n=581$) responded 'definitely not' while 42.4% ($n=427$) responded else wise and were considered susceptible to vaping

($n=6$ refused). The measure for awareness and understanding of the NY e-cigarette flavour ban about 1–2 years post implementation was associated with perceived likelihood of vaping in the next 12 months ($\chi^2=15.37$, $p=0.038$): those classified as susceptible to vaping in the next 12 months had a higher proportion of youth reporting being unaware or not knowing if there was an e-cigarette flavour ban (62.9%, $n=257$) while 35.6% ($n=164$) were aware but misunderstood the flavour ban, and 1.6% ($n=6$) were aware and fully understood the flavour ban. Further, those who were aware of the flavour ban but misunderstood what stores and flavours were included compared with those who were unaware or did not know were 1.63 (95% CI 1.03, 2.56) times more likely to be susceptible to vaping in the next 12 months. However, this association was not statistically significant after adjustment for past 30-day vaping status, age and sex. Other susceptibility measures (curious about vaping, would vape if a friend offered an e-cigarette and perceived likelihood of vaping 5 years from now) were not associated with awareness and understanding of the NY e-cigarette flavour ban.

Vaping status

Awareness about 1–2 years post implementation differed significantly based on past 12-month vaping status ($\chi^2=30.24$, $p=0.001$; see figure 1B). However, correctly identifying which flavours were included in the e-cigarette flavour ban did not differ based on past 12-month vaping status. The derived measure for awareness and understanding of the flavour ban also differed significantly by past 12-month vaping ($\chi^2=26.09$, $p=0.002$; see table 1). Among youth who vaped in the past 12 months ($n=271$), only 1.4% ($n=4$) reported a flavour ban and correctly identified which flavours were restricted, while 42.2% ($n=118$) reported a ban on flavoured e-cigarettes but misidentified where or which flavours were restricted. Similarly, 0.8% ($n=4$) of youth who did not use e-cigarettes in the past 12 months reported a flavour ban and correctly identified which flavours were restricted, while 25.5% ($n=183$) identified the flavour restriction but misidentified where or which flavours were restricted. Those who vaped in the past 12 months were 2.15 (95% CI 1.34, 3.45) times more likely to be aware of the e-cigarette flavour ban but misunderstood in which store or flavours were included in the ban compared with those who were unaware or did not know about the ban, after adjustment for age and sex. Findings for flavour ban awareness ($\chi^2=27.15$, $p=0.001$; see figure 1C), as well as the derived measure for awareness and understanding of which flavours were restricted ($\chi^2=13.81$, $p=0.009$; see table 1), among youth who vaped in the past 30 days were similar to those who vaped in the past 12 months. Finally, those who vaped in the past 30 days were 2.07 (95% CI 1.17, 3.64) times more likely to be aware of the e-cigarette flavour ban but misunderstood in which store or flavours were included in the ban compared with those who were unaware or did not know about the ban, after adjustment for age and sex.

Flavours used in past 30 days

Among youth who used e-cigarettes in the past 30 days ($n=151$), 94.4% ($n=139$) reported vaping a non-tobacco flavour (ie, a restricted flavour) most often in the past 30 days about 1–2 years following the flavour ban. Among youth who vaped in the past 30 days and reported that there was an e-cigarette flavour ban ($n=75$), nearly all (97.4%; $n=71$) reported vaping a non-tobacco (ie, restricted) flavour most often in the past 30 days; however, only about half (51.4%; $n=38$) thought that they were

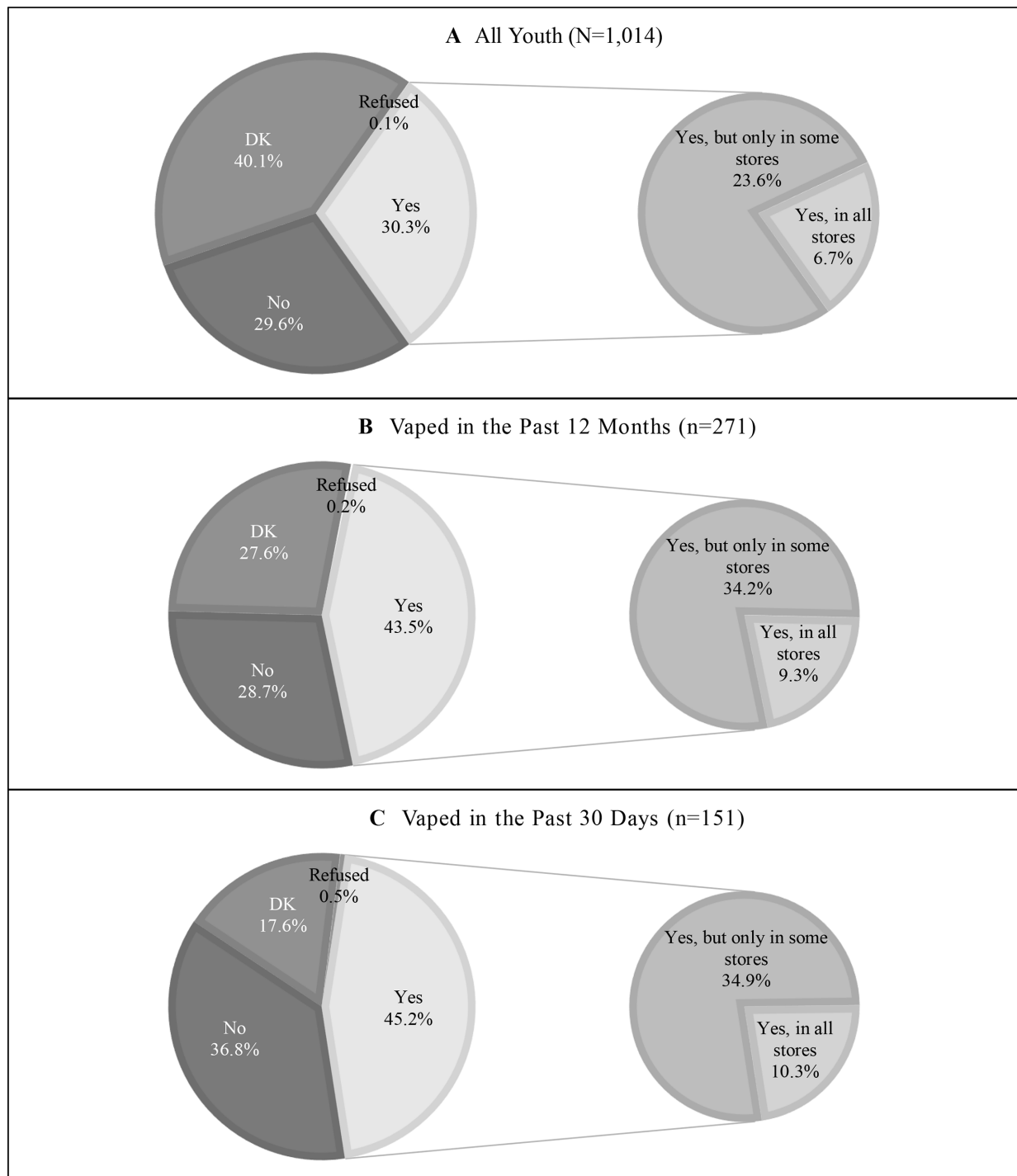


Figure 1 (A–C) Reporting awareness of flavour ban in New York, overall and by vaping status. Youth were asked, 'Some cities or states have banned certain flavours in e-cigarettes, cartridges, pods or e-liquids. Are ANY e-cigarette flavours currently banned where you live?'. All respondents could select one from the following options: No; Yes, but only in some stores; Yes, in all stores; Don't Know (DK); Refused. Response distributions are shown for all youth (A), youth who vaped in the past 12 months (B) and youth who vaped in the past 30 days (C). The pie-of-pie chart depicts the smaller slices of the 'yes' option in the main pie chart.

using a restricted flavour, based on the question that directly asked if they used a flavour that was banned. On the other hand, among the 43.3% (n=28) who believed they were not using a restricted flavour based on their understanding of the flavour ban, nearly all (96.4%; n=26) were in fact using a restricted flavour, based on the flavour they reported using most often in the past 30 days.

Perceived response to NY e-cigarette flavour ban

Vaping response

Among those who vaped in the past 12 months and reported that there was an e-cigarette flavour ban in NY in all or some stores (n=122) 1–2 years post implementation, nearly two-thirds (64.0%; n=74) reported that they did not change their e-cigarette use. On the other hand, 28.4% (n=40) reported that the ban on flavours

Table 1 Sample demographic characteristics according to awareness and understanding of the New York e-cigarette flavour ban (n=1013)

| Characteristic | Overall | Awareness and understanding | | | P value |
|---|------------|-----------------------------|-------------------------|----------------------|---------|
| | | Understood | Aware but misunderstood | Not aware/don't know | |
| Total, N (%) | 1013 (100) | 8 (0.9) | 301 (29.4) | 704 (69.7) | |
| Wave, N (%) | | | | | 0.1258 |
| August 2021 | 752 (53.1) | 7 (1.6) | 231 (28.5) | 514 (69.8) | |
| August 2022 | 261 (46.9) | 1 (0.1) | 70 (30.4) | 190 (69.6) | |
| Age in years, N (%) | | | | | 0.1131 |
| 16 | 209 (20.9) | 1 (0.5) | 47 (22.0) | 161 (77.5) | |
| 17 | 252 (27.9) | 0 | 82 (30.0) | 170 (70.0) | |
| 18 | 326 (31.6) | 5 (2.3) | 91 (30.2) | 230 (67.5) | |
| 19 | 226 (19.6) | 2 (0.3) | 81 (35.2) | 143 (64.5) | |
| Sex, N (%) | | | | | 0.4786 |
| Male | 288 (52.1) | 4 (1.3) | 87 (29.8) | 197 (68.9) | |
| Female | 725 (47.9) | 4 (0.4) | 214 (29.0) | 507 (70.6) | |
| Race/ethnicity, N (%) | | | | | 0.0764 |
| Non-Hispanic white | 418 (68.3) | 6 (1.3) | 133 (32.2) | 279 (66.5) | |
| Black or African American | 167 (9.8) | 2 (0.3) | 37 (18.9) | 128 (80.8) | |
| Hispanic | 136 (6.5) | 0 | 44 (25.9) | 92 (74.1) | |
| Other/mixed race | 277 (14.7) | 0 | 80 (24.2) | 197 (75.8) | |
| Don't know/refused | 15 (0.7) | 0 | 7 (44.3) | 8 (55.7) | |
| Perceived family SES, N (%) | | | | | 0.6926 |
| Not meeting basic expenses | 40 (4.3) | 0 | 8 (20.0) | 32 (80.0) | |
| Just meeting basic expenses | 270 (24.7) | 3 (0.6) | 88 (34.0) | 179 (65.4) | |
| Meeting needs with a little left over | 322 (33.3) | 3 (1.5) | 91 (25.9) | 228 (72.6) | |
| Living comfortably | 319 (33.8) | 2 (0.8) | 100 (31.5) | 217 (67.7) | |
| Don't know/refused | 51 (3.8) | 0 | 10 (18.2) | 41 (81.8) | |
| Past 12-month vaping, N (%) | | | | | 0.0020 |
| Vaped | 270 (23.5) | 4 (1.4) | 118 (42.2) | 148 (56.4) | |
| Did not vape | 743 (76.5) | 4 (0.8) | 183 (25.5) | 556 (73.8) | |
| Past 30-day vaping, (N%) | | | | | 0.0091 |
| Vaped | 150 (10.9) | 2 (0.8) | 73 (44.6) | 75 (54.6) | |
| Did not vape | 863 (89.1) | 6 (0.9) | 228 (27.6) | 629 (71.5) | |
| Past 30-day smoking, N (%) | | | | | 0.0973 |
| Smoked | 94 (2.8) | 1 (0.1) | 42 (39.8) | 51 (60.0) | |
| Did not smoke | 919 (97.2) | 7 (0.9) | 259 (29.1) | 653 (70.0) | |
| Curious about vaping, N (%) | | | | | 0.0550 |
| Susceptible to vaping | 272 (40.2) | 1 (0.4) | 75 (18.9) | 196 (67.7) | |
| Not susceptible to vaping | 363 (59.8) | 1 (0.6) | 75 (31.9) | 287 (80.5) | |
| Think I will vape in the next 12 months, N (%) | | | | | 0.0380 |
| Susceptible to vaping | 427 (38.2) | 6 (1.6) | 164 (35.6) | 257 (62.9) | |
| Not susceptible to vaping | 581 (61.8) | 2 (0.5) | 135 (25.7) | 444 (73.9) | |
| Would vape if a friend offered me an e-cigarette, N (%) | | | | | 0.1003 |
| Susceptible to vaping | 476 (42.1) | 7 (1.6) | 172 (33.9) | 297 (64.5) | |
| Not susceptible to vaping | 531 (57.9) | 1 (0.4) | 127 (26.3) | 403 (73.3) | |
| Think I will be vaping 5 years from now, N (%) | | | | | 0.0641 |
| Susceptible to vaping | 400 (35.8) | 5 (1.7) | 142 (35.0) | 253 (63.3) | |
| Not susceptible to vaping | 609 (63.2) | 3 (0.5) | 157 (26.2) | 449 (73.3) | |

One participant refused to report on awareness of the NY e-cigarette flavour ban and was omitted from this analysis. Demographic characteristic distributions are shown by a derived measure for awareness and understanding of the flavour ban. The derived measure is based on the following questions: (1) 'Are any e-cigarette flavours currently banned where you live?' and (2) 'Which e-cigarette flavours are banned where you live?'. Based on responses for these questions, participants were categorised into 1 of 3 possible options: (1) understood, (ie, selected 'Yes, in all stores', did not select tobacco flavour as being banned, and selected all non-tobacco flavours); (2) aware but misunderstood (ie, selected either 'Yes but only in some stores' or selected 'Yes, in all stores' but selected tobacco flavour, or did not select all non-tobacco flavours as banned); (3) not aware/don't know (ie, selected 'No' or 'Don't know'). The p values were calculated by Pearson's χ^2 to describe differences in sample characteristics by awareness and understanding of the flavour ban.

SES, socioeconomic status.

changed their overall e-cigarette use. When these 40 respondents were asked to select how their e-cigarette use changed because of the flavour ban, 23.8% (n=14) reported that they stopped vaping in response to the flavour ban and 43.3% (n=15) reported that they

vaped less; 16.3% (n=12) reported switching e-cigarette flavours, 4.9% (n=4) reported vaping more and 1.9% (n=1) refused. There was no significant association with perceived changes in vaping and understanding of the flavour ban.

Smoking response

Among the 78 youth who reported smoking cigarettes in the past 12 months and reported that there was an e-cigarette flavour ban 1–2 years following the ban, more than half (69.7%, $n=45$) reported that there was no change in their cigarette smoking due to the ban, while 28.9% ($n=23$) reported that their smoking behaviour did change. Among youth who reported a change in their smoking behaviour because of the e-cigarette flavour ban ($n=23$), 86.0% ($n=15$) reported that they smoked less, 30.5% ($n=4$) reported that they stopped smoking, 17.7% ($n=10$) reported smoking more and 4.7% ($n=3$) reported no change. There was no significant association with perceived changes in smoking and understanding of the flavour ban.

DISCUSSION

Just under one-third of youth respondents in NY, including both those who did and did not vape, reported that an e-cigarette flavour ban was present where they live 1–2 years after the flavour ban implementation. Differences were observed between males and females: females were more likely than males to report that they were unsure if there was a flavour ban rather than reporting that there is not flavour ban where they live. This potentially may be because males are more likely to have higher estimates of self-estimated intelligence, also known as the male hubris, female humility effect.²⁰ Further, among those who were aware of the e-cigarette flavour ban, very few correctly identified which flavours were banned and that the ban applied to all stores. Those who reported a flavour ban were generally aware that tobacco flavours were not banned, but many were unaware that menthol and other non-tobacco flavours, including mint, fruit and candy, were banned. As expected, awareness was greater among those who vaped in the past 30 days and those who lacked a firm commitment not to vape in the next 12 months. The lack of awareness among youth who did not vape is likely because they were not directly affected by the ban (ie, it is not salient to them). Further, despite the ban, the vast majority of youth who vaped in the past 30 days reported current use of a restricted flavour,¹⁷ which potentially has led to confusion as to the nature of the ban.

Enforcement of the ban falls under the purview of the NY Department of Health. Greater enforcement on the sale of restricted flavour e-cigarettes would likely improve awareness. However, when NY passed a statewide restriction on all flavoured e-cigarettes in 2020,¹⁰ the COVID-19 pandemic was the main priority of health departments, including NY. As health department resources were primarily allotted to COVID-19-related activities,^{21–24} retail shops may have been able to continue selling popular flavours that were restricted without any issues or consequences due to lax or inconsistent enforcement of the flavour ban. While the initial resource-intensive response to COVID-19 has ended, more state resources could be available to monitor tobacco-related policy violations, enforcement still appears to be lacking. Therefore, consumers may misunderstand or be unaware of the flavour ban, as the restricted flavours are still readily available.

The flavour ban was passed to reduce the appeal of e-cigarettes, particularly among youth.^{24 25} Despite low enforcement and awareness of the NY e-cigarette flavour ban, over one-quarter of those who were aware of the ban and who vaped or smoked in the past 12 months reported changes in their respective behaviours following the e-cigarette flavour ban. More reported using their product less or stopping it all together than using the product more. Sales data analyses have also noted a reduction

in e-cigarette sales following the e-cigarette ban in NY.^{26 27} However, a recent study using US retail sale data matched with new flavour policy data found that for every one less e-cigarette pod sold due to a flavour ban, there were an additional 15 cigarettes sold.²⁸ Our findings from this analysis indicate that less than one-fifth of NY youth who smoked in the past 12 months reported smoking more, but should be interpreted with caution due to low power and the ‘select all that apply’ nature of the question. Further, switching between e-cigarettes and cigarettes cannot be explicitly assessed. Awareness of the flavour ban did appear to be associated with perceived likelihood that youth would vape in the next 12 months. That is, prior to adjustment for demographic characteristics, those who were aware of the ban but misunderstood the flavours or stores included in the ban were more likely to report that they would definitely not vape in the next 12 months. This potentially may be due to the greater exposure to and knowledge of vaping and vaping policies due to an interest in vaping.²⁹ Alternatively, the ban may not deter consumers if they misunderstand it. For example, if the consumer does not realise that a particular flavour is restricted, they may be more likely to report that they are likely to vape in the future because that flavour is enticing.

There are limitations of this analysis to note. First, only 2 years of data were available that assessed the awareness of an e-cigarette flavour ban. Additional data waves could provide more information on how awareness and understanding may change as time since policy implementation increases. In addition, there is not enough data to parse out the relative contributions of contemporaneous effects that may have overshadowed the announcements of the e-cigarette flavour ban in NY (eg, EVALI, COVID-19 pandemic, federal cartridge-based e-cigarette flavour ban). These events may have contributed to the lack of awareness and a misunderstanding of the flavour ban, including which products and flavours were included under the ban. Further, there is a lack of information on other variables that may influence awareness, understanding and use of restricted flavours, such as type of school (public vs private), type of area they live in (urban vs rural) and parental e-cigarette use behaviour. Finally, awareness of the flavour ban was not assessed until 1-year post-policy and data are retrospective. Therefore, immediate changes in behaviour influenced by fear or concern of penalisation among retailers may have been missed. However, the questions ask specifically about awareness and perceived behaviour changes as a result of a flavour ban where they reported change, clarifying attribution of associations to the policy.

While all types of e-cigarettes and retailers are included under the NY flavour ban and shipment of vapour products to NY consumers is illegal,¹⁰ many NY youth continue to vape restricted flavours.³⁰ Since the federal e-cigarette flavour ban only includes cartridge-based products^{16 31} and there is an apparent lack of barriers to purchasing restricted flavours in NY,³² it is not surprising that there are misperceptions and lack of awareness associated with the NY flavour ban. Increased enforcement, public health campaigns and educational efforts could improve awareness and understanding of the NY e-cigarette flavour ban. Further, restricting distributors from shipping non-tobacco flavoured e-cigarettes to retailers could improve awareness and understanding. Recently, The City of New York (NYC, plaintiff) filed a complaint with the US District Court to sue various vape shops and owners (defendant) for the marketing, distribution and sale of flavoured e-cigarettes.³³ They claim that the defendants are endangering the safety and health of the people of NYC. As additional actions are taken to penalise vape shops for

the marketing, distribution, and sale of flavoured e-cigarettes, awareness is expected to increase. Further, increased funding to the NY Tobacco Control Programme to support these efforts would help tremendously. Ultimately, it is important to continue monitoring the awareness as enforcement efforts increase, as it may be an indicator of the policy's effectiveness and/or the need for stricter retail enforcement.

Contributors LMS was responsible for primary conceptualisation of the analysis, carried out the initial analysis, drafted the initial manuscript, reviewed and revised the manuscript, and is guarantor. DH designed the data collection instruments, was responsible for the funding acquisition, supervised data collection and critically reviewed the manuscript for important intellectual content. JLR participated in the data collection. KAK, RO'C and AH critically reviewed the manuscript for important intellectual content. All authors participated in developing the concept and design of this study, analysis and interpretation of data, drafting or revising of the manuscript, and approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Supplemental Table 1: Sample Demographic Characteristics According to Survey Year and Past 30-day Vaping Status (N=1,014)

| Characteristic | Survey Year | | | p-value | Vaping Status | | p-value |
|---------------------------------------|------------------|-------------------|-------------------|---------|----------------|--------------------------|---------|
| | Total N=1,014 | Aug 2021 n=753 | Aug 2022 n=261 | | Vaped n=151 | Did not vape n=863 | |
| Age, N(%) | | | | 0.1843 | | | 0.0145 |
| 16 years | 209 (20.8) | 172 (23.4) | 37 (17.9) | | 18 (9.1) | 191 (22.3) | |
| 17 years | 252 (27.9) | 182 (25.2) | 70 (31.0) | | 48 (42.0) | 204 (26.2) | |
| 18 years | 327 (31.6) | 240 (34.2) | 87 (28.8) | | 46 (30.3) | 281 (31.8) | |
| 19 years | 226 (19.6) | 159 (17.2) | 67 (22.3) | | 39 (18.7) | 187 (19.7) | |
| Sex, N(%) | | | | 0.5577 | | | 0.6359 |
| Male | 289 (52.2) | 224 (50.8) | 65 (53.7) | | 46 (49.3) | 243 (52.5) | |
| Female | 725 (47.9) | 529 (49.2) | 196 (46.3) | | 105 (50.7) | 620 (47.5) | |
| Race/Ethnicity, N(%) | | | | 0.3424 | | | 0.7575 |
| Non-Hispanic White | 418 (68.3) | 296 (67.7) | 122 (69.0) | | 78 (72.9) | 340 (67.7) | |
| Black or African American | 167 (9.8) | 122 (8.5) | 45 (11.3) | | 16 (7.3) | 151 (10.1) | |
| Hispanic | 136 (6.5) | 112 (8.0) | 24 (4.8) | | 22 (6.7) | 114 (6.5) | |
| Other | 277 (14.7) | 212 (15.1) | 65 (14.2) | | 34 (12.6) | 243 (15.0) | |
| Don't know | 16 (0.8) | 11 (0.8) | 5 (0.7) | | 1 (0.5) | 15 (0.8) | |
| Perceived Family SES, N(%) | | | | 0.0555 | | | 0.294 |
| Not meeting basic expenses | 40 (4.3) | 22 (2.6) | 18 (6.2) | | 10 (8.3) | 30 (3.8) | |
| Just meeting basic expenses | 270 (24.7) | 189 (22.0) | 81 (27.8) | | 44 (25.5) | 226 (24.6) | |
| Meeting needs with a little left over | 322 (33.3) | 241 (32.3) | 81 (34.5) | | 43 (28.6) | 279 (33.9) | |
| Living comfortably | 320 (33.9) | 258 (39.3) | 62 (27.8) | | 51 (36.7) | 269 (33.5) | |
| Don't know | 51 (3.8) | 35 (3.9) | 16 (3.8) | | 2 (0.9) | 49 (4.2) | |
| Past 12-month vaping, N(%) | | | | 0.2847 | | | <0.0001 |
| Vaped | 271 (23.5) | 184 (21.6) | 87 (25.8) | | 151 (100) | 120 (14.1) | |
| Did not vape | 743 (76.5) | 569 (78.4) | 174 (74.2) | | 0 | 743 (85.9) | |
| Past 30-day vaping, (N%) | | | | 0.8895 | | | |
| Vaped | 151 (11.0) | 106 (10.8) | 45 (11.2) | | | | |
| Did not vape | 863 (89.0) | 647 (89.2) | 216 (88.8) | | | | |

| | | | | | | |
|----------------------------------|------------|------------|------------|---------------|-----------|-------------------|
| Past 30-day smoking, N(%) | | | | 0.0435 | | <0.0001 |
| Smoked | 94 (2.8) | 79 (3.7) | 15 (1.8) | | 59 (17.9) | 35 (1.0) |
| Did not smoke | 920 (97.2) | 674 (96.3) | 246 (98.2) | | 92 (82.2) | 828 (99.0) |

NOTES: Demographic characteristic distributions are shown for the entire sample, by survey year, and by vaping status. The p-values were calculated by Pearson's chi-square to describe differences in sample characteristics by survey year and past 30-day vaping status. Bolded p-value indicates significance and p<0.05.