Supplemental Information

SUPPLEMENTAL RESULTS

Description of Nicotine Vaping Frequency Outcomes

Number of days participants reported vaping nicotine in the past 30 days was assessed at each wave ("In the last 30 days, how many days did you use e-cigarettes with nicotine?" Responses: 0, 1–2, 3–5, 6–9, 10–14, 15–19, 20–24, 25–29, or 30 days); responses were recoded into quantitative count variables by taking the mean integer within each response range (0, 2, 4, 8, 12, 17, 22, 27, or 30 days), as in previous work.[20] Participants also reported their usual number of nicotine vaping episodes per vaping day ("On the days you vaped nicotine, how many times did you usually pick up your e-cigarette device to vape?" Responses: 0, 1, 2, 3–5, 6–9, 10–14, 15–20, or >20 times per day) and puffs taken per nicotine vaping episode ("Each time you picked up your e-cigarette to vape nicotine, how many puffs did you usually take before putting it away?" Responses: 0, 1, 2, 3–5, 6–9, 10–14, 15–20, or >20 puffs) in the past 30 days in 2 separate items used previously.[20] Responses were recoded into quantitative count variables as the lowest value within the response option (0, 1, 2, 3, 6, 10, 15, or 20 puffs or episodes) per previous work.[20] Although the nicotine vaping episodes per day and puffs per episode have not undergone extensive validation study, previous research demonstrating a positive association between the nicotine concentration level vaped by youth and their subsequent number of vaping episodes per day and puffs per episode at follow-up[20] supports the criterion validity of these measures.

Initial Psychometric Evidence of Vaping Frequency Outcomes

To further probe the convergent validity of these items, we calculated associations between past-30-day nicotine vaping days vaped, vaping episodes per day, and puffs per episode at each time point in the current sample. If these items accurately assess vaping frequency, they would be expected to correlate with one another because youth who have a stronger motivation to vape would be expected to use on more days, report more vaping episodes per day, and take more puffs during each episode. As illustrated in Supplemental Table 8, there were moderate to strong correlations between the 3 frequency measures (Pearson correlations: mean = 61.4; range = 0.46–0.80; all $P < .001$), providing initial support for the convergent validity of these measures.

Assessment of Unmeasured Confounding

To estimate the extent of unmeasured confounding, we calculated the E value, a measure of the potential for bias arising from unmeasured confounders in observational studies,[41] for the primary models in Table 3. The E value provides an estimate of the minimum strength of association that an unmeasured confounder would need to account for to negate the observed association between nontraditional-flavored e-cigarette use and subsequent vaping patterns conditional on the included covariates.[42] Using the association estimates and CIs from the adjusted models in Table 3, we calculated E values for all significant odds and RRs. The E value for the observed adjusted OR of 3.76 (95% CI 1.20 to 10.31) for the association of use of any nontraditional flavors with past-6-month vaping status was 6.98. The E value for the adjusted RR of 2.41 (95% CI 1.08 to 5.92) for the association of use of nontraditional flavors with the number of puffs per vaping episode was 4.25. Thus, to negate the significant associations between nontraditional-flavored e-cigarette use and the 2 vaping outcomes observed in this study, fairly strong unmeasured confounding associations would need to remain over and above adjustment for the existing 16 covariates included in the analysis. This extent of unmeasured confounding is unlikely.

Influence of Students Who Did Not Report Vaping in the Past 30 Days at Exposure Waves

The survey packet was divided into separate sections based on sets of items addressing common constructs. Preceding the set of items of each section was a brief introductory label that described the ensuing survey items. The item for e-cigarette flavor used was imbedded within a section of the survey packet with several items about vaping patterns and products used. Across waves 1 to 4, the label for this section varied

between "Vaping," "Vaping in the Past 30 Days," and "In the last 30 days." Consequently, it is possible that findings may differ between students who provided e-cigarette flavor data but did not report vaping within the past 30 days at 1 or more exposure waves (N = 95) potentially because of inconsistent reporting versus the remainder of the sample (N = 383). To address whether this difference influenced the pattern of exposure to flavored e-cigarettes, we created a time-invariant binary variable distinguishing these 2 groups for several analyses. The prevalence of use of e-cigarettes in nontraditional flavors pooled across exposure waves did not differ between those who reported not vaping in the past 30 days at ≥1 exposure wave (93.3%) and the remainder of the sample (93.9%). To examine the potential influence of past-30-day e-cigarette use status on the association of flavor used and subsequent vaping, we retested all models in Table 3, adding the interaction term for the past-30-day use group by the nontraditional–versus–traditional-only flavor measure. The interactions were not significant in any of the models ($P > .37$), providing no evidence that the association between nontraditional flavors and subsequent vaping persistence and progression differed by past-30-day e-cigarette use status.

Association of Number of Nontraditional Flavors Used and Vaping Patterns

As a supplemental analysis of potential graded (dose-response) associations between flavored e-cigarette exposure and outcomes, total number of nontraditional flavors vaped was calculated as a 5-level exposure variable (0 [traditional flavors only] vs 1, 2, 3, or ≥4 nontraditional flavors), and models were retested by using this variable. Results revealed heterogeneity in associations of the number of nontraditional flavors used, with probability and frequency of e-cigarette use being based on how many flavors were used. Use of 1 vs 0 nontraditional flavors was not significantly associated with any vaping prevalence or frequency outcomes 6 months later (Supplemental Table 7). In contrast, after adjustment for covariates, use of ≥4 vs 0 nontraditional flavors was positively associated with past-6-month vaping prevalence (OR = 5.32 [95% CI 1.42 to 19.97]), vaping episodes per day (RR = 2.29 [95% CI 1.07 to 6.37]), and puffs per vaping episode (RR = 3.12 [95% CI 1.22 to 6.96]). The association of ≥4 vs 0 nontraditional flavors with number of days vaped was not significant (RR = 2.20 [95% CI 0.70 to 7.91]). The categories for 2 and 3 nontraditional flavors used generally exhibited association estimates that were between the 1 flavor and ≥4 flavor categories, suggesting a graded association between exposure to more nontraditional flavors and study outcomes.

Association of Number of Traditional-Flavored or Flavorless Products Used and Subsequent Vaping Outcomes

To determine if a similar graded association was observed with the traditional-flavored or flavorless products, we created a number of traditional-flavored or flavorless products 4-level variable (0, 1, 2, or 3; range: 0–3 products; coded as a continuous variable because of low frequency counts) and a parallel 4-level continuous variable for the total number of nontraditional-flavor products used (0, 1, 2, or ≥3, range: 0–3 products). We then tested 2 sets of univariable models: (1) those including time and the 4-level continuous total number of traditional-flavored or flavorless products as the only 2 regressors and (2) those including time and the 4-level continuous total number of nontraditional-flavored products used as the only 2 regressors. Illustrated in Supplemental Table 8, the total number of traditional-flavored or flavorless products used was not associated with past-6-month vaping (OR = 1.04 [95% CI 0.67 to 1.54]), the number of nicotine vaping days in the past 30 days (RR = 1.15 [95% CI 0.79 to 1.68]), the number of nicotine vaping episodes per day (RR = 1.17 [95% CI 0.88 to 1.60]), or the number of puffs per nicotine vaping episode (RR = 1.19 [95% CI 0.86 to 1.63]). In concordance with the primary results (Table 3), the total number of nontraditional flavors used continuous 4-level variable was significantly associated with past-6-month vaping (OR = 1.55 [95% CI 1.21 to 2.00]) and the number of puffs per nicotine vaping episode (RR = 1.40 [95% CI 1.16 to 1.68]) but not the number of vaping days in the past 30 days (RR = 1.22 [95% CI 0.98 to 1.51]) or the number of nicotine vaping episodes per day (RR = 1.26 [95% CI 0.98 to 1.56]). We then tested a multivariable model that included time, the number of traditionally flavored or flavorless products variable, and the number of nontraditionally flavored products variable as simultaneous regressors to parse the associations of the 2 flavor categories with vaping outcomes. The results of these models followed a similar pattern to the univariate models, with associations being slightly attenuated. In these multivariable models, total number of traditional-flavored or flavorless products used was not associated with past-6-month vaping (OR = 0.98 [95% CI 0.64 to 1.51]), the number of nicotine vaping days in the past 30 days (RR = 1.10 [95% CI 0.76 to 1.60]), the number of nicotine vaping episodes per day (RR = 1.14 [95% CI 0.84 to 1.54]), or the number of puffs per nicotine vaping episode (RR = 1.13 [95% CI 0.82 to 1.54]). In these multivariable models, the total number of nontraditional flavors used was significantly associated

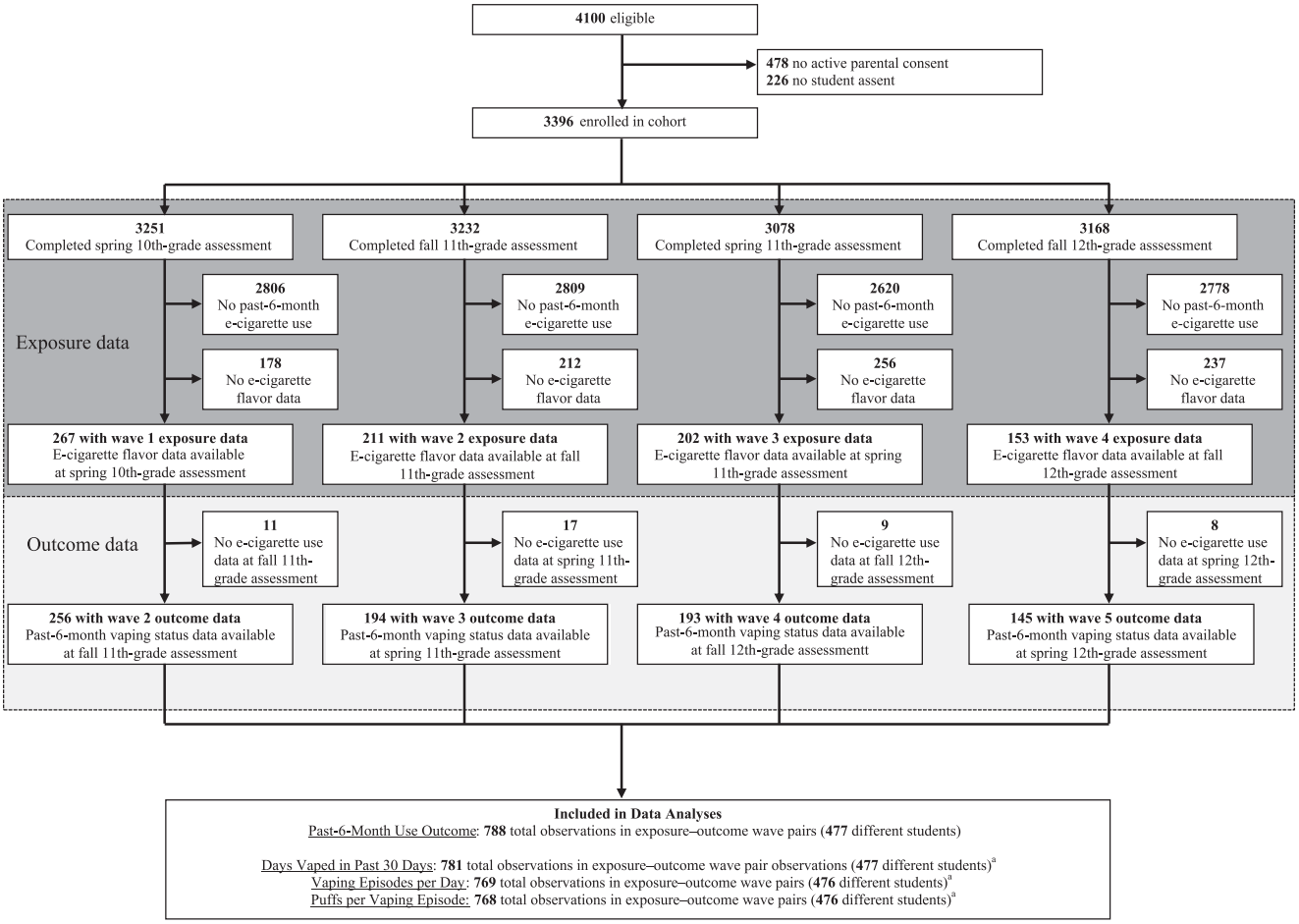
with past-6-month vaping (OR = 1.51 [95% CI 1.20 to 2.01]) and the number of puffs per nicotine vaping episode (RR = 1.39 [95% CI 1.15 to 1.68]) but not number of vaping days in the past 30 days (RR = 1.21 [95% CI 0.97 to 1.51]) or the number of nicotine vaping episodes per day (RR = 1.20 [95% CI 0.94 to 1.49]).

Test of Differences in Vaping Outcomes Between Youth Who Used Nontraditional Flavors Only and Those Who Used Both Traditional and Nontraditional Flavors in the Same Wave

The primary analysis aggregated youth who used nontraditional flavors only (observations = 140) and those who used both traditional and nontraditional flavors, including flavorless products (observations = 599) into the same category. To determine if these categories were associated with different vaping outcomes, we retested the primary unadjusted models using a regressor variable that split these classifications into separate categories to conduct head-to-head comparisons of vaping outcomes. Given the results above indicating that number of nontraditional flavors used predicted vaping outcomes and that cases in which youth use of e-cigarettes in both nontraditional and traditional (versus only nontraditional) flavors also involved use of significantly more nontraditional flavors (mean = 2.31 [SD 0.86] vs 1.64 [SD 0.85]; $P < .001$), we also included the number of nontraditional flavors as an additional covariate in the model to adjust for confounding with the bifurcation of youth who used nontraditional flavors only and those who used both traditional and nontraditional flavors. The results showed no significant differences between the 2 categories in vaping outcomes, and the number of nontraditional flavors variable significantly predicted greater odds of vaping continuation (OR = 1.53 [95% CI 1.20 to 2.02]) and higher number of puffs per vaping episode (RR = 1.37 [95% CI 1.10 to 1.67]) 6 months later (Supplemental Table 11).

Test of Differences in Vaping Outcomes Across Youth Who Did Versus Did Not Transition Between Use of Traditional Flavors Only and Use of Nontraditional Flavors Across Waves

There were 23 total students who transitioned between use of traditional flavors only and use of nontraditional flavors across different waves (13 students reported transitioning from use of traditional flavors only to use of nontraditional flavors at a subsequent wave, and 10 students transitioned from nontraditional-flavor use to traditional-flavor use only at a subsequent wave). To determine the influence of such transitions on the study results, we tested new models additionally including a time-invariant flavor-transition variable contrasting youth with (n = 23) versus without (n = 455) cross-wave transitions between use of traditional flavors only and use of nontraditional flavors. Model results showed no difference between youth with versus without cross-wave flavor transitions in vaping outcomes, and the association of the original use of nontraditional-flavored e-cigarette use and vaping continuation (OR = 3.78 [95% CI 1.23 to 10.42]) and a higher number of puffs per vaping episode (RR = 2.37 [95% CI 1.06 to 6.26]) 6 months later remained statistically significant (Supplemental Table 12).



SUPPLEMENTAL FIGURE 1

Participant flowchart. [a] Because of missing data for these outcomes, the number of observations and students are lower than for the past-6-month outcome.

SUPPLEMENTAL TABLE 4 Characteristics of Students Included in Versus Excluded From the Analytic Sample

Sample Characteristics	Students Included in the Primary Analytic Sample (N = 478)	Students Excluded From the Primary Analytic Sample (N = 2918)	Group Difference,[a] P
Male sex, *n* (%)	251 (52.5)	1330 (45.6)	.006
Age, y, mean (SD)	16.10 (0.44)	16.09 (0.41)	.39
Race and/or ethnicity, *n* (%)			.003
Hispanic ethnicity	217 (46.7)	1388 (48.5)	
White	102 (21.9)	442 (15.4)	
Asian American	92 (19.8)	607 (21.2)	
Other	54 (11.6)	424 (14.8)	
Parents graduated college (versus less education), *n* (%)	196 (47.5)	1286 (51.1)	.18
Sensation-seeking score, mean (SD)	33.02 (9.66)	31.38 (9.13)	.001

Denominators may be less than totals in column headings because of missing data. Age is a continuous variable; UPPS Impulsive Behavior Scale sensation-seeking score range: 0 to 48.
[a] Tests of differences in sample characteristics by inclusion in the analytic sample were conducted with χ^2 tests for categorical variables and 1-way analysis of variance for continuous variables.

SUPPLEMENTAL TABLE 5 Vaping Outcomes by E-cigarette Flavor Category Used for Each Exposure–Outcome Wave Pairings

Exposure	Past-6-mo Vaping Status, *N* (%)	No. d Vaped Nicotine in Past 30 d, Mean (SD)	No. Nicotine Vaping Episodes per d, Mean (SD)	No. Puffs per Nicotine Vaping Episode, Mean (SD)
Wave 1 (exposure) → wave 2 (outcomes)				
Only tobacco, menthol, mint, or flavorless (N = 16)	8 (50.0)	1.31 (3.79)	1.56 (4.97)	0.50 (1.10)
Any nontraditional flavor (N = 240)	146 (60.8)	3.03 (7.41)	2.46 (5.27)	3.03 (5.73)
Wave 2 (exposure) → wave 3 (outcomes)				
Only tobacco, menthol, mint, or flavorless (N = 10)	4 (40.0)	5.00 (10.61)	4.60 (8.33)	3.20 (6.41)
Any nontraditional flavor (N = 184)	112 (60.9)	3.32 (7.18)	3.31 (6.06)	2.78 (5.16)
Wave 3 (exposure) → wave 4 (outcomes)				
Only tobacco, menthol, mint, or flavorless (N = 11)	4 (36.4)	0.27 (0.90)	1.00 (1.95)	0.27 (0.65)
Any nontraditional flavor (N = 182)	120 (65.9)	3.97 (8.44)	3.54 (6.45)	3.01 (5.32)
Wave 4 (exposure) → wave 5 (outcomes)				
Only tobacco, menthol, mint, or flavorless (N = 12)	5 (41.7)	4.83 (9.31)	3.50 (6.84)	2.50 (4.40)
Any nontraditional flavor (N = 133)	97 (72.9)	7.06 (10.93)	5.79 (7.71)	4.05 (5.88)

The total was 478. Past-6-mo vaping status included vaping e-cigarettes with or without nicotine in the past 6 months (yes or no). Number of days vaped nicotine in past 30 days range: 0 to 30. Number of nicotine vaping episodes per day range: 0 to 20. Number of puffs per nicotine vaping episode range: 0 to 20.

SUPPLEMENTAL TABLE 6 Prevalence of Use of Each Individual E-cigarette Flavor at Each Exposure Wave

	Exposure Wave				Pooled Across Waves 1–4 (N = 788), No. Observations, %[a]
	Wave 1 (n = 256), No. Students, %[b]	Wave 2 (n = 194), No. Students, %[b]	Wave 3 (n = 193), No. Students, %[b]	Wave 4 (n = 145), No. Students, %[b]	
Flavorless	16 (6.3)	10 (5.2)	12 (6.2)	12 (8.3)	50 (6.3)
Tobacco	10 (3.9)	5 (2.6)	3 (1.6)	6 (4.1)	24 (3.0)
Menthol or mint	30 (11.7)	32 (16.5)	44 (22.8)	38 (26.2)	144 (18.3)
Fruit	183 (71.5)	136 (70.1)	140 (72.5)	102 (70.3)	561 (71.2)
Candy	85 (33.2)	65 (33.5)	81 (42.0)	68 (46.9)	299 (37.9)
Sweets or dessert	65 (25.4)	53 (27.3)	65 (33.7)	46 (31.7)	229 (29.1)
Buttery	10 (3.9)	14 (7.2)	18 (9.3)	12 (8.3)	54 (6.9)
Blends or combinations	76 (29.7)	63 (32.5)	67 (34.7)	54 (37.2)	260 (33.0)
Other	20 (7.8)	28 (14.4)	17 (8.8)	8 (5.5)	73 (9.3)

Students were instructed to select all flavors that apply. Each flavor (row) is not mutually exclusive.
[a] Denominator for percent values reflect the total number of exposure wave observations; because students used ≥2 flavors within a wave, percentages total >100% for the column.
[b] Denominators for percent values reflect the total number of students at a respective wave; because students used ≥2 flavors within a wave, percentages total >100% for the column.

SUPPLEMENTAL TABLE 7 Association of Covariates With Vaping Outcomes From the Adjusted Model

	Association With Study Outcomes			
	Past-6-mo Vaping Status, OR (95% CI)	No. d Vaped Nicotine in Past 30 d, RR (95% CI)	No. Nicotine Vaping Episodes per d, RR (95% CI)	No. Puffs per Nicotine Vaping Episode, RR (95% CI)
Time-invariant covariates				
Age[a]	1.25 (0.94 to 1.67)	1.09 (0.86 to 1.38)	1.05 (0.79 to 1.39)	1.06 (0.81 to 1.43)
Female sex	1.10 (0.65 to 1.84)	1.14 (0.74 to 1.74)	1.78 (1.03 to 3.08)	1.12 (0.75 to 1.65)
Race and/or ethnicity				
Hispanic	Reference	Reference	Reference	Reference
White	2.07 (0.93 to 4.60)	1.61 (1.40 to 1.87)	1.93 (0.96 to 3.27)	1.32 (0.74 to 2.34)
Asian American	1.79 (0.76 to 4.17)	1.32 (0.85 to 2.05)	1.81 (0.92 to 3.56)	1.46 (0.83 to 2.58)
Other	1.05 (0.41 to 2.69)	1.25 (0.94 to 1.66)	1.46 (0.87 to 2.49)	0.73 (0.39 to 1.36)
Parent(s) graduated college	1.11 (0.65 to 1.90)	1.14 (0.72 to 1.82)	1.22 (0.66 to 2.25)	1.25 (0.83 to 1.89)
E-cigarette device type				
Cigalike, mini e-cigarette, or slim model	Reference	Reference	Reference	Reference
Midsize e-cigarette or vape pen	0.75 (0.35 to 1.38)	1.49 (0.82 to 2.70)	1.62 (0.77 to 3.43)	0.99 (0.59 to 1.68)
Advanced personal vaporizer or Mod	1.46 (0.79 to 2.69)	2.38 (1.45 to 3.91)	2.22 (1.08 to 4.58)	2.45 (1.58 to 3.81)
Age started vaping[a]	0.67 (0.48 to 0.93)	0.89 (0.83 to 0.94)	0.87 (0.61 to 1.14)	0.93 (0.89 to 0.97)
Sensation-seeking score[a,b]	1.26 (0.98 to 1.64)	0.95 (0.76 to 1.19)	0.99 (0.75 to 1.31)	1.09 (0.98 to 1.18)
Time-varying covariates				
No. d smoked cigarettes in past 30 d	1.03 (0.96 to 1.12)	1.06 (0.99 to 1.13)	1.03 (0.96 to 1.12)	1.01 (0.95 to 1.05)
No. cigarettes smoked per d	1.11 (1.03 to 1.22)	1.06 (0.92 to 1.21)	1.02 (0.97 to 1.07)	1.08 (0.97 to 1.19)
E-cigarette nicotine concentration[c]	1.04 (0.77 to 1.40)	1.44 (1.07 to 1.93)	1.10 (0.80 to 1.52)	1.20 (1.04 to 1.51)
No. d vaped nicotine in past 30 d	1.06 (1.01 to 1.11)	1.06 (1.03 to 1.09)	1.06 (1.02 to 1.11)	1.01 (0.98 to 1.03)
No. nicotine vaping episodes per d	1.02 (0.97 to 1.07)	1.03 (0.99 to 1.07)	1.05 (1.01 to 1.11)	1.03 (0.99 to 1.06)
No. puffs per vaping episode	1.01 (0.96 to 1.06)	1.01 (0.98 to 1.05)	1.02 (0.97 to 1.08)	1.07 (1.04 to 1.11)
Past-6-mo use of other tobacco products[d]	1.67 (0.99 to 2.80)	1.60 (1.02 to 2.49)	1.80 (1.08 to 3.00)	1.83 (1.27 to 2.62)
Peer vaping	2.10 (1.12 to 3.96)	3.03 (1.72 to 5.37)	1.09 (0.65 to 1.83)	1.27 (0.78 to 2.05)

Estimates are of association of time-varying, time-lagged regressors at waves 1 to 4 and time-invariant covariates with vaping outcomes 6 mo postexposure assessment at waves 2 to 5 from logistic repeated-measures random-effect regression models including school random effects (total observations: range 768–788; totals for each outcome are presented in Supplemental Fig 1). Models include use of e-cigarettes in nontraditional flavors, time, and all time-invariant and time-varying covariates as simultaneous regressors.

[a] Continuous variables were rescaled (mean 0; SD 1) such that the estimates indicate the change in odds or rate in the outcome associated with 1 SD higher on the covariate.

[b] UPPS Impulsive Behavior Scale sensation-seeking score range: 0 to 48.

[c] E-cigarette nicotine concentration range: 0 to 3 (0 = 0 mg/mL, 1 = 1–5 mg/mL, 2 = 6–17 mg/mL, and 3 = ≥18 mg/mL).

[d] Past-6-month use of other tobacco products, hookah tobacco waterpipe, smokeless tobacco, cigars, little cigars, or cigarillos (yes or no).

SUPPLEMENTAL TABLE 8 Correlations Among Past-30-Day E-cigarette Use Frequency Outcomes at Each Assessment

Variable	Wave 1			Wave 2			Wave 3			Wave 4			Wave 5		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1. No. d vaped nicotine in past 30 d	—	0.59	0.46	—	0.65	0.53	—	0.70	0.54	—	0.67	0.59	—	0.80	0.54
2. No. nicotine vaping episodes per d	—	—	0.53	—	—	0.66	—	—	0.60	—	—	0.65	—	—	0.61
3. No. puffs per nicotine vaping episode	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Pearson *r* coefficients are reported. All $P < .001$. —, not applicable.

SUPPLEMENTAL TABLE 9 Association of Number of Nontraditional Flavors Used With Vaping Outcomes

	Past-6-mo Vaping Status, OR (95% CI)	No. d Vaped Nicotine in Past 30 d, RR (95% CI)	No. Nicotine Vaping Episodes per d, RR (95% CI)	No. Puffs per Nicotine Vaping Episode, RR (95% CI)
Unadjusted models[a]				
1 vs 0 nontraditional flavors	4.15 (1.52 to 9.59)	2.20 (0.99 to 6.48)	1.72 (0.81 to 3.63)	2.15 (0.99 to 5.31)
2 vs 0 nontraditional flavors	6.93 (2.17 to 13.51)	2.83 (1.14 to 6.35)	2.04 (0.89 to 4.66)	3.93 (1.75 to 8.86)
3 vs 0 nontraditional flavors	4.90 (1.81 to 12.82)	2.19 (0.92 to 5.13)	2.64 (1.18 to 6.13)	3.80 (1.66 to 7.62)
4+ vs 0 nontraditional flavors	7.22 (2.90 to 15.83)	3.72 (1.41 to 8.53)	2.81 (1.25 to 6.34)	4.27 (1.90 to 8.42)
Adjusted models[b]				
1 vs 0 nontraditional flavors	2.02 (0.66 to 6.20)	1.36 (0.63 to 4.32)	1.49 (0.67 to 4.10)	1.86 (0.81 to 4.29)
2 vs 0 nontraditional flavors	5.00 (1.39 to 17.96)	1.91 (0.89 to 7.50)	2.00 (0.74 to 5.42)	2.85 (1.17 to 6.46)
3 vs 0 nontraditional flavors	4.08 (1.14 to 14.60)	1.41 (0.65 to 5.44)	2.14 (0.91 to 6.83)	2.54 (1.01 to 6.49)
4+ vs 0 nontraditional flavors	5.32 (1.42 to 19.97)	2.20 (0.70 to 7.91)	2.29 (1.07 to 6.37)	3.12 (1.22 to 6.96)

The total number was 476 to 478 (768–788 observations). Displayed are the estimates of association of time-varying, time-lagged regressors at waves 1 to 4 and time-invariant covariates with vaping outcomes 6 month postexposure assessment at waves 2 to 5 from repeated-measures random-effect logistic regression models including school random effects (totals available for each outcome are presented in Supplemental Fig 1).

[a] Unadjusted models include time-varying flavored e-cigarette use and time of assessment as sole regressors with school-level random effects.

[b] Adjusted models include time-varying flavored e-cigarette use and time of assessment regressors as well as age (continuous), sex, race and/or ethnicity (Hispanic, white, Asian American, and other), highest level of parental education (college graduate versus less education), e-cigarette device type (cigalike, midsize, or Mod), age of vaping onset (continuous), and sensation seeking (range: 0–48) as time-invariant covariates and past-30-day frequency of nicotine vaping (range: 0–30 days), past-30-day frequency of cigarette smoking (range: 0–30 days), cigarettes smoked per day on each smoking day (range: 0–20 cigarettes), number of nicotine vaping episodes per day (range: 0–20 episodes), number of puffs per nicotine vaping episode (range: 0–20 puffs), e-cigarette nicotine concentration (coded continuously: 0 mg/mL = 0, 1–5 mg/mL = 1, 6–17 mg/mL = 2, and 18–24 mg/mL = 3), past-6-month noncigarette tobacco product use (yes or no), and past-30-day peer e-cigarette use (yes or no) as time-varying covariates.

SUPPLEMENTAL TABLE 10 Associations of Number of Nontraditionally Flavored Products Used and Number of Traditionally Flavored or Flavorless Products Used With Vaping Outcomes

	Past-6-mo Vaping Status, OR (95% CI)	No. d Vaped Nicotine in Past 30 d, RR (95% CI)	No. Nicotine Vaping Episodes per d, RR (95% CI)	No. Puffs per Nicotine Vaping Episode, RR (95% CI)
Univariable models[a]				
No. traditional flavors or flavorless products[b]	1.04 (0.67 to 1.54)	1.15 (0.79 to 1.68)	1.17 (0.88 to 1.60)	1.19 (0.86 to 1.63)
No. nontraditional-flavor products[c]	1.55 (1.21 to 2.00)	1.22 (0.98 to 1.51)	1.26 (0.98 to 1.56)	1.40 (1.16 to 1.68)
Mutivariable model[d]				
No. traditional flavors or flavorless products[b]	0.98 (0.64 to 1.51)	1.10 (0.76 to 1.60)	1.14 (0.84 to 1.54)	1.13 (0.82 to 1.54)
No. nontraditional-flavor products[c]	1.51 (1.20 to 2.01)	1.21 (0.97 to 1.51)	1.20 (0.94 to 1.49)	1.39 (1.15 to 1.68)

Displayed are the estimates of association of time-varying, time-lagged regressors at waves 1 to 4 and time-invariant covariates with vaping outcomes 6 month postexposure assessment at waves 2 to 5 from repeated-measures random-effect logistic regression models including school random effects (totals available for each outcome are presented in Supplemental Fig 1).

[a] Univariable models include only time and either the number of traditional flavors or flavorless products or the number of nontraditional-flavor products as only 2 regressors.

[b] Four-level continuous variable (scored: 0, 0 products [n = 599]; 1, 1 product [n = 169]; 2, 2 products [n = 11]; and 3, 3 products [n = 9]).

[c] Four-level continuous variable (scored: 0, 0 products [n = 49]; 1, 1 product [n = 386]; 2, 2 products [n = 118]; and 3, ≥3 products [n = 225]).

[d] Multivariable models include time, the number of traditional flavors or flavorless products variable, and the number of nontraditional-flavor products variable as simultaneous regressors.

SUPPLEMENTAL TABLE 11 Associations of Number of Nontraditionally Flavored Products Used and Number of Traditionally Flavored or Flavorless Products Used With Vaping Outcomes

	Past-6-mo Vaping Status, OR (95% CI)	No. d Vaped Nicotine in Past 30 d, RR (95% CI)	No. Nicotine Vaping Episodes per d, RR (95% CI)	No. Puffs per Nicotine Vaping Episode, RR (95% CI)
Use of e-cigarettes in both traditional and nontraditional flavors versus nontraditional flavors only	1.73 (0.95 to 3.79)	1.43 (0.90 to 2.28)	1.24 (0.91 to 2.08)	1.46 (0.94 to 2.41)
No. nontraditional flavors[a]	1.53 (1.20 to 2.02)	1.24 (0.99 to 1.56)	1.22 (0.95 to 1.51)	1.37 (1.10 to 1.67)
Time	1.11 (0.90 to 1.37)	1.14 (0.96 to 1.37)	1.10 (0.94 to 1.27)	1.07 (0.92 to 1.25)

Displayed are the estimates of association of time-varying, time-lagged regressors at waves 1 to 4 with vaping outcomes 6 month postexposure assessment at waves 2 to 5 from repeated-measures random-effect logistic regression models including school random effects. The model included time, the binary use of e-cigarettes in both traditional and nontraditional flavors (n = 140) versus nontraditional flavors only (n = 599) variable, and the number of nontraditional-flavor products used as simultaneous regressors.

[a] Four-level continuous variable (scored: 0, 0 products; 1, 1 product; 2, 2 products; and 3, ≥3 products).

SUPPLEMENTAL TABLE 12 Associations of Cross-Wave Transitions in Flavored E-cigarette Use With Vaping Outcomes

	Past-6-mo Vaping Status, OR (95% CI)	No. d Vaped Nicotine in Past 30 d, RR (95% CI)	No. Nicotine Vaping Episodes per d, RR (95% CI)	No. Puffs per Nicotine Vaping Episode, RR (95% CI)
Use of e-cigarettes in any nontraditional flavor[a]	3.78 (1.23 to 10.42)	1.42 (0.55 to 4.84)	1.66 (0.71 to 5.38)	2.37 (1.06 to 6.26)
Cross-wave flavor-transition status[b]	1.04 (0.37 to 2.54)	1.07 (0.41 to 2.66)	1.02 (0.52 to 2.35)	1.16 (0.88 to 2.71)

Displayed are the estimates of association of time-invariant and time-varying, time-lagged regressors at waves 1 to 4 with vaping outcomes 6 month postexposure assessment at waves 2 to 5 from repeated-measures random-effect logistic regression models including school random effects. The model included time, time-varying use of e-cigarettes in any nontraditional flavor, and cross-wave flavor-transition status as simultaneous regressors.

[a] Use of e-cigarettes in any nontraditional flavor, time-varying variable assessed at each exposure wave at waves 1 to 4 of ≥1 nontraditional flavor (fruit, candy, blends, sweets or desserts, other, or buttery [N = 739]) versus use of flavorless, tobacco-flavored, or mint- or menthol-flavored e-cigarettes only (N = 49).

[b] Cross-wave flavor-transition status, time-invariant variable contrasting students with (n = 23) versus without (n = 455) cross-wave transitions between use of traditional flavors only and use of nontraditional flavors.

SUPPLEMENTAL REFERENCES

41. VanderWeele TJ, Ding P. Sensitivity analysis in observational research: introducing the e-value. *Ann Intern Med*. 2017;167(4):268–274
42. Haneuse S, VanderWeele TJ, Arterburn D. Using the e-value to assess the potential effect of unmeasured confounding in observational studies. *JAMA*. 2019;321(6):602–603