

The Vaping Teenager: Understanding the Psychographics and Interests of Adolescent Vape Users to Inform Health Communication Campaigns

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ABSTRACT

BACKGROUND: Adolescent vaping continues to rise, yet little is known about teen vape users beyond demographics. Effective intervention requires a deeper understanding of the psychographics and interests of adolescent vape users to facilitate targeted communication campaigns.

METHODS: We analyzed the 2017-2018 weighted cross-sectional online survey data from Virginia high school students (N = 1594) to identify and describe subgroups of adolescents who vaped. Participants reported 30-day vape use, identification with 5 peer crowds (Alternative, Country, Hip Hop, Mainstream, Popular), social prioritization, agreement with personal values statements, social media and smartphone use, and television and event preferences. We compared vaping rates and frequency by peer crowd using a chi-square analysis with follow-up testing to identify higher-risk crowds and confirmed associations using binary and multinomial logistic regression models with peer crowd scores predicting vaping, controlling for demographics. We then used chi-square and *t* tests to describe the psychographics, media use, and interests of higher-risk peer crowds and current vape users within those crowds.

RESULTS: Any current vaping was the highest among those with Hip Hop peer crowd identification (25.4%), then Popular (21.3%). Stronger peer crowd identification was associated with increased odds of any current vaping for both crowds, vaping on 1 to 19 days for both crowds, and vaping on 20 to 30 days for Hip Hop only. Compared with other peer crowds and non-users, Hip Hop and Popular youth and current vape users reported greater social prioritization and agreement with values related to being social and fashionable. Hip Hop and Popular youth and current vape users reported heavy Instagram and Snapchat use, as well as unique television show and event preferences.

CONCLUSIONS: Hip Hop and Popular adolescents are most likely to vape and should be priority audiences for vaping prevention campaigns. Findings should guide the development of targeted health communication campaigns delivered via carefully designed media strategies.

KEYWORDS: E-cigarette, vaping, adolescent, psychographics, peer crowd, personal value, social media, health communication

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Introduction

Current (past 30-day) vaping among U.S. adolescents has increased dramatically in recent years.^{1,2} Rates almost doubled from 2017 (11.0% of 12th graders) to 2018 (20.9%), the largest substance use increase ever observed in the 44-year history of the national Monitoring the Future study.¹ Vapes have been the most commonly used tobacco product among adolescents since 2014,² and more than 5 million middle and high school students were current vape users in 2019.³ These dramatic increases have offset reductions in cigarette smoking, fueling an overall increase in adolescent current tobacco use.^{1,4}

This explosion of vaping is concerning because of the risks associated with adolescent vape use. Adolescents who vape are more likely than non-users to initiate cigarette smoking and escalate smoking among those who have already experimented with cigarettes,⁵⁻¹¹ though this association may be due to shared risk factors for vaping and smoking.¹² Researchers are beginning to understand the chemical constituents and health

implications of vape juice and aerosols, which include carcinogens and irritants.^{8,13-17} Although long-term health effects are unknown, vaping may be associated with short-term risks including respiratory symptoms, asthma, and bronchitis among adolescents.^{8,18,19} In addition, nicotine exposure affects adolescent brain development, leading to long-term cognitive issues including memory and attention impairment.²⁰⁻²²

Despite the alarming increase, teens who vape remain a minority of the adolescent population.³ Little is known about which youth are at the greatest risk beyond demographic descriptions, leaving public health interventionists with a limited understanding of who should be prioritized in prevention efforts. Current vaping is more prevalent among male, non-Hispanic White, higher socioeconomic status, and lesbian, gay, and bisexual adolescents and young adults.²³⁻²⁷ In addition, young current vape users often have friends and family members who vape or who accept vaping,²⁸ and use other substances including cigarettes and marijuana.²⁹⁻³¹



Audience psychographics move beyond demographics to provide health communicators with critical insights about values, identities, and interests that can inform effective messaging and campaign strategies.³²⁻³⁵ In addition, these insights are critical for the effective planning and execution of modern digital media campaigns that rely on interest-based targeting to deliver digital advertisements to the intended audience.³⁶ Past studies describing ever and current vape users have typically focused on vaping attitudes and beliefs,³⁷⁻⁴⁰ or have used psychographics and motivations to segment adult, but not adolescent, vape users into discrete subgroups.^{41,42} Only a few studies have examined the psychographics of adolescent or young adult vape users, revealing that novelty-seeking, sensation-seeking, and lower social conservatism are generally associated with ever and current vaping in these populations.^{27,43,44} From this basis, we seek to expand health communicators' understanding of the psychographics, identities, media use, and interests of adolescent current vape users to inform the development of effective vaping prevention campaigns.

Knowing which adolescents vape, what other substances they use, what they care about, and what influences them is crucial to addressing adolescent vaping. Commercial marketing, including vape marketing, relies on audience segmentation to identify population subgroups with shared desires and needs for whom a tailored brand can be built and marketed via targeted media channels.⁴⁵ In health communications, a similar approach is necessary to counter industry marketing by identifying adolescent subgroups at the greatest risk for vaping, developing targeted campaigns that appeal to their shared values, beliefs, and interests, and delivering campaign content via specific media channels and strategies to ensure the target audience is reached.⁴⁵ Health campaigns designed around the psychographics of their target audiences are effective,⁴⁵⁻⁴⁷ but this approach requires a clearly defined audience with unique characteristics for whom appealing content can be tailored. Importantly, campaigns must both tailor messaging (by selecting messaging that caters to audience preferences, values, and interests to capture attention and increase persuasion) and target media delivery (by selecting highly specialized media channels and using state-of-the-art ad-targeting technologies) to effectively reach their target audiences in the modern, cluttered media environment.⁴⁷ Although much is known about the demographics of adolescent vape users, health educators lack crucial information about their values, influences, and interests that is necessary to define an audience and deliver effective, targeted communications.

To fill this gap, we used online survey data to describe the risk profile, psychographic characteristics, and interests of adolescent current vape users in a single U.S. state. We had 2 primary objectives: to identify potential target audiences for adolescent vaping prevention campaigns and to describe the psychographics, media use, and interests of these higher-risk youth to inform campaign planning. First, we sought to define potential target audiences by applying a peer crowd audience

segmentation approach. Peer crowds are macro-level subcultures with shared interests, values, and norms^{47,48} which are associated with adolescent and young adult health behaviors⁴⁹⁻⁵⁷ and have served as the basis for targeted health interventions.⁵⁸⁻⁶⁴ For example, the *Commune* campaign targeting Hipster peer crowd young adults resulted in reductions in cigarette smoking associated with stronger anti-tobacco attitudes among those recalling the campaign,^{58,62} whereas engagement with the *Down and Dirty* campaign was associated with stronger anti-chewing tobacco attitudes and lower odds of current use among Country peer crowd teens.⁶¹ In this study, we examined vaping behavior for 5 adolescent peer crowds previously established in the literature: Alternative (counterculture, value creativity and uniqueness), Country (patriotic, value hard work and being outdoors), Hip Hop (confident, value overcoming struggles and proving themselves), Mainstream (future-oriented, value organization and stability), and Popular (extroverted, value socializing and excitement).^{47,49,50,52,54,55,61} After identifying the highest risk peer crowds, we sought to create a profile of these audiences by examining their broader health risk profiles, psychographics (social prioritization and personal values), digital behaviors (social media and smartphone use), and interests (television shows and events). With this information, we aimed to identify and describe segments of adolescents most in need of targeted vaping interventions to provide clear guidance for health message development and media targeting.

Methods

Sample and design

We collected cross-sectional online survey data from high school students ages 13 to 19 living in the U.S. state of Virginia (N = 1594). Participants were recruited from November 2017 to January 2018 using paid Instagram and Facebook advertisements that directed interested individuals to a screener to determine eligibility (13-19 years old, current high school student, and Virginia resident). Eligible youth were invited to participate in the full survey and provided electronic assent (ages 13-17) or consent (ages 18-19). We delivered a parental opt-out form via email for participants ages 13 to 17. Qualified participants who completed the full survey received a US\$10 electronic gift card incentive. We implemented numerous fraud prevention and detection measures to maximize data integrity, including concealing eligibility criteria during screening, collecting email addresses to prevent duplicate completions, and reviewing responses for inconsistencies. Chesapeake IRB approved the study (No. Pro00023204).

Measures

To address our research objectives, we examined participant demographics; current vaping, tobacco, and other substance use; peer crowd identification; 2 psychographic measures, namely, social prioritization⁶⁵ and personal values; social media

and smartphone use; and television show and event preferences.

Demographics. Participants provided their birthdate, from which we calculated their age. Participants also indicated their gender (male, female) and race/ethnicity (Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian-Pacific Islander, and non-Hispanic other including multiracial and American Indian or Alaska Native).

Past 30-day vape use. Participants reported the number of days in the past 30 days on which they used e-cigarettes or vapes, with response options of 0, 1 or 2, 3 to 5, 6 to 9, 10 to 19, 20 to 29, and all 30 days. To mirror commonly reported statistics, we examined both any current vaping (1-30 days) and frequency of vaping defined as occasional use (1-19 days) or frequent use (20-30 days).⁶⁶

Past 30-day tobacco and substance use. Participants also reported the number of days in the past 30 days on which they used cigarettes; cigars, cigarillos, and little cigars (cigar products); smokeless tobacco; hookah; alcohol; marijuana; and prescription medication without a prescription. Those who reported any past 30-day use were considered current users of that item.

Peer crowd identification. Participants completed Rescue Agency's I-Base Survey[®], a photo-based tool that measured identification with 5 peer crowds: Alternative, Country, Hip Hop, Mainstream, and Popular. The I-Base Survey has identified consistent patterns of peer crowd prevalence and health risks in adolescents across the United States.^{49-52,55,57,61,64} In brief, participants viewed a grid of 40 photos of unknown female adolescents and selected 3 who would best and 3 who would least fit with their main group of friends; they then repeated the process with male photos. Photos were presented in random order to each participant to reduce order effects, and represented a mix of races/ethnicities and peer crowds determined through prior qualitative research. Participants earned positive points for the peer crowds of photos selected as the best fit and negative points for those selected as the least fit, resulting in a score ranging from -12 to 12 for each of the 5 crowds. For analyses, we assigned participants to each crowd with which they had at least some identification, defined as a score of 1 or more on the I-Base Survey for that crowd. Participants could be assigned to more than 1 peer crowd as they could score positively for multiple crowds.

Social prioritization index. Participants completed the social prioritization index (SPI), a validated measure of the degree to which an individual places importance on their social life that is associated with young adult cigarette use.^{58,59,65} The SPI included 13 questions: 8 items wherein participants selected 1 response that best described them from a pair (up for anything/pick and choose what to do, outgoing/low-key, center of

attention/lay low, street smart/book smart, partier/studier, wing it/plan it out, the carefree one/the responsible one, in a picture I . . . strike a pose/smile big); 3 true or false items (In groups of people, I am rarely the center of attention; I have considered being an entertainer or actor; I can look anyone in the eye and tell a lie with a straight face); 1 item asking how many nights they went out for fun in the past week (0-1, 2-3, 4-5, 6-7 nights); and 1 item asking how late they typically stayed out when they went out for fun (9:59-10:59 PM, 11:00 PM-12:59 AM, 1:00-2:59 AM, 3:00 AM or later). To calculate the SPI score (range: 0-17), participants received 1 point for each socially oriented selection for the 8 descriptive pairs and 3 true/false questions, and received 0 points for selecting 0-1 nights per week or 9:59-10:59 PM, 1 point for 2-3 nights per week or 11:00 PM-12:59 AM, 2 points for 4-5 nights per week or 1:00-2:59 AM, and 3 points for 6-7 nights per week or 3:00 AM or later.

Personal values. Participants viewed 26 personal values statements (e.g., I think it is more important to live in the moment than focus on the future) and rated each on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree).

Past 7-day social media use. Participants reported if they had consumed or created content on 6 social media platforms in the past 7 days: Facebook, Instagram, Twitter, Tumblr, Snapchat, and Pinterest.

Lifetime smartphone use. Participants were asked if they had a smartphone, and if so, if they had ever used their smartphone to engage in 9 different activities (e.g., listen to an online radio or a music service such as Pandora or Spotify; watch movies or TV shows through a paid subscription service like Netflix).

Television show preferences. Participants selected all television shows they regularly watched from a list of 24 broadcast and streaming shows popular with youth (e.g., *13 Reasons Why*, *Ridiculousness*).

Event preferences. Participants selected all events they regularly attended from a list of 25 leisure time events youth might attend (e.g., sports games, high school dances).

Statistical analysis

Respondents were required to complete the survey, so no data were missing. Data were weighted to the gender, race/ethnicity, and urban/rural demographics of Virginia teens for all analyses. As a first step, we ran weighted and unweighted frequencies and means for demographic measures.

To address our first objective of identifying which adolescents were at the greatest risk, we used chi-square tests to compare the rates of current vaping and vaping frequency among those who did and did not identify with each crowd, using follow-up *z* tests with Bonferroni correction to identify specific

significant differences. To confirm that associations persisted while controlling for demographics, we ran separate binary and multinomial logistic regression models for each peer crowd, with a single peer crowd's score (range: -12 to 12) predicting odds of current vaping, or of occasional or frequent vaping, while controlling for age, gender, and race/ethnicity. We also ran binary logistic regression models for each crowd to predict odds of any current cigarette, cigar product, smokeless tobacco, hookah, alcohol, and marijuana use, and any current prescription medication misuse, to understand the broader risk profile of the peer crowds. We ran separate models for each peer crowd to avoid multicollinearity associated with including all 5 scores in a single model.

After identifying 2 peer crowds at elevated risk for vaping, we addressed our second objective of developing interest-based profiles of these potential target audiences by describing their psychographics (SPI and personal values), social media and smartphone use, and television and event preferences. We first compared frequencies and means for those who did and did not identify with the 2 crowds of interest, using chi-square tests and *t* tests to identify significant differences. Then, within the 2 peer crowds, we compared frequencies and means between current vape users and non-users, using chi-square tests and *t* tests to identify significant differences. This approach allowed us to identify the characteristics of the 2 peer crowds of interest to inform campaign content and media targeting, as well as to hone in on psychographics and interests that specifically characterized current vape users within the higher-risk crowds. Due to the relatively small subset of participants who were frequent vape users, we focused on any current use to improve the reliability of results. Tables present items that differed significantly between groups in at least 1 analysis and had endorsement rates above 5.0%.

Results

The weighted mean age of the sample was 16.47 years, and about half identified as female (50.8%) and as non-Hispanic White (55.3%) (Table 1). The most common peer crowd identifications were Popular (63.1%) and Mainstream (62.6%). Race/ethnicity and gender breakdowns differed by crowd (Supplemental Appendix Table 1).

Consistent with 2018 National Youth Tobacco Survey results,² 20.6% of Virginia high school students in our sample currently vaped (Table 2). A significantly greater proportion of those with any Hip Hop peer crowd identification currently vaped (25.4%) than those with no Hip Hop identification (18.0%, $P < .001$). In binary logistic regression models using each peer crowd score (-12 to 12) to predict odds of current vaping while controlling for demographics, a 1-point increase in the Popular score was associated with a 4% increase in odds of current vaping, whereas a 1-point increase in the Hip Hop score was associated with a 10% increase.

Further differentiating current vape users in the sample, 17.0% were occasional vape users (1-19 days in the past 30 days)

and 3.7% were frequent users (20-30 days). Those with any Hip Hop identification reported higher rates of occasional vaping (21.2%) than others (14.6%, $P < .05$). Although rates of frequent vaping did not differ significantly for any peer crowd, stronger Hip Hop identification was associated with greater odds of both occasional and frequent vaping. Stronger Popular identification was associated with greater odds of occasional vaping only. In addition, stronger Hip Hop identification was associated with greater odds of current cigarette, cigar product, hookah, alcohol, and marijuana use, whereas stronger Popular identification was associated with lower odds of use for many products.

Based on the chi-square tests and logistic regression results, we identified the Hip Hop and Popular peer crowds as being at elevated risk for vaping. We then characterized the psychographics (Table 3), social media and smartphone use (Table 4), and interests (Table 5) of Hip Hop and Popular youth in general, as well as Hip Hop and Popular current vape users in particular.

Overall, Hip Hop participants were social, trendy individuals interested in hip hop/rap music and sports. Compared with those with no Hip Hop identification, Hip Hop youth had higher SPI scores, in particular describing themselves as partiers, street smart, and carefree (Table 3). Hip Hop youth more often agreed that they make decisions quickly, are fashionable, are social people with lots of friends, and are tougher than most people. In contrast, they less often agreed that they are patriotic, good students, care what others think about them, care about keeping their bodies free from toxins, and follow the rules. A greater proportion of Hip Hop youth used Snapchat in the past week and used their smartphones to look up sports scores or analyses than those with no Hip Hop identification (Table 4). Many TV shows more often endorsed by Hip Hop youth revolved around hip hop/rap musical interests, such as *Love & Hip Hop*, *The Rap Game*, and *Wild 'N Out* (Table 5). Similarly, Hip Hop youth more often indicated that they regularly attend hip hop concerts and dance clubs than others, as well as basketball and football games.

Characteristics of vape users within the Hip Hop peer crowd largely reflected an amplification of the broader crowd's profile. Hip Hop vape users had higher SPI scores than non-users within the crowd, and they described themselves as partiers, street smart, carefree, and up for anything (Table 3). They more often agreed that they are fashionable, use their clothes to express their identity, and are tough, and less often agreed that they follow the rules, follow tradition, and care about keeping their bodies free from toxins than non-users. A greater proportion of Hip Hop vape users reported using Snapchat, Instagram, and Twitter in the past week than non-users (Table 4). Hip Hop vape users also more often reported using their smartphones to look up sports scores and analyses, stream music, and make video calls than non-users. Hip Hop vape users more often reported watching 2 cartoon shows, *The Boondocks* and *Bob's Burgers*, than non-users (Table 5). Similar to the overall

Table 1. Unweighted and weighted sample descriptive statistics.

	UNWEIGHTED		WEIGHTED	
	PERCENTAGE	N	PERCENTAGE	N
Age, mean (SD)	16.45	(1.17)	16.47	(1.19)
Female	62.4	994	50.8	810
Race/ethnicity				
Hispanic	10.5	167	11.8	188
Non-Hispanic White	56.8	906	55.3	881
Non-Hispanic Black	11.3	180	21.0	335
Non-Hispanic Asian-Pacific Islander	11.6	185	5.1	81
Non-Hispanic Other	9.8	156	6.8	108
Alternative peer crowd				
In crowd	42.4	676	43.2	689
Not in crowd	57.6	918	56.8	905
Country peer crowd				
In crowd	48.8	778	46.9	748
Not in crowd	51.2	816	53.1	846
Hip Hop peer crowd				
In crowd	32.2	514	35.5	566
Not in crowd	67.8	1080	64.5	1028
Mainstream peer crowd				
In crowd	64.6	1029	62.6	997
Not in crowd	35.4	565	37.4	597
Popular peer crowd				
In crowd	64.5	1028	63.1	1006
Not in crowd	35.5	566	36.9	588

crowd, a greater proportion of Hip Hop vape users indicated that they attend dance clubs, hip hop concerts, basketball games, and football games than non-users.

Popular youth shared some characteristics with Hip Hop youth, but also differed in key ways. Although Popular and Hip Hop youth both reported higher SPI scores than others, the specific SPI items they endorsed often differed (Table 3). Though both Hip Hop and Popular youth described themselves as partiers, Popular youth also described themselves as the center of attention, outgoing, and up for anything, which were not significant in Hip Hop analyses. Similar to Hip Hop youth, Popular youth more often agreed that they are fashionable and are social people with lots of friends. However, Popular youth also more often agreed that they care about being good students, keeping their bodies free from toxins, and being patriotic, items with which Hip Hop youth less often agreed. Popular youth also more often agreed that family is important,

that they try to follow tradition, and that they are religious than other youth. Popular youth more often reported using Instagram, Snapchat, and Twitter than other youth and more often used their smartphones to look up sports scores or analyses and to stream music or video content (Table 4). Compared with others, Popular youth more often reported watching teen dramas, including *13 Reasons Why*, *Jane the Virgin*, *Pretty Little Liars*, and *Riverdale* (Table 5). Sports were favored by Popular youth, as they more often reported attending basketball, football, baseball, and soccer games than others. They also more often reported attending church events, community service events, high school dances, and pop and country music concerts.

Popular vape users shared many traits with the broader Popular crowd as well as with Hip Hop vape users. Similar to Hip Hop vape users, Popular vape users reported higher SPI scores than non-users, describing themselves as outgoing,

Table 2. Weighted frequencies and adjusted odds ratios for peer crowd risk behaviors.

	PAST 30-DAY VAPE USE			PAST 30-DAY OTHER RISK BEHAVIOR					ALCOHOL	MARIJUANA	PRESCRIPTION MEDICATION
	ANY USE	1-19 DAYS	20-30 DAYS	CIGARETTES	CIGAR PRODUCTS	SMOKELESS TOBACCO	HOOKAH				
Full sample (%)	20.6	17.0	3.7	11.6	6.9	3.5	3.8	32.7	20.3	6.7	
Alternative											
In crowd (%)	19.4	16.0	3.5	15.4***	8.0	4.1	4.5	32.2	23.9**	8.3*	
Not in crowd (%)	21.5	17.8	3.9	8.6	6.1	3.1	3.3	33.0	17.6	5.5	
AOR	0.97	0.97	0.98	1.12***	1.06	1.00	1.05	1.01	1.07***	1.08**	
Country											
In crowd (%)	18.7	15.3	3.5	8.7***	4.6***	4.0	2.7*	28.5***	16.3***	6.3	
Not in crowd (%)	22.2	18.4	3.8	14.1	8.9	3.1	4.7	36.3	23.8	7.1	
AOR	0.94***	0.95**	0.93*	0.91***	0.96	1.11**	0.97	0.92***	0.91***	0.95*	
Hip Hop											
In crowd (%)	25.4***	21.2*	4.2	14.0*	9.5**	3.7	4.8	35.0	27.2***	7.4	
Not in crowd (%)	18.0	14.6	3.4	10.2	5.4	3.3	3.2	31.3	16.5	6.3	
AOR	1.10***	1.10***	1.11**	1.07***	1.08**	1.00	1.07*	1.06***	1.11***	1.03	
Mainstream											
In crowd (%)	18.2**	14.9*	3.3	8.7***	5.2***	2.2***	2.8**	32.0	16.9***	6.0	
Not in crowd (%)	24.7	20.3	4.4	16.2	9.6	5.7	5.4	33.7	26.1	7.9	
AOR	0.95**	0.95*	0.94	0.89***	0.91**	0.84***	0.90*	0.99	0.92***	0.94	
Popular											
In crowd (%)	21.3	17.3	3.9	10.1*	6.1	3.0	3.3	32.5	18.7*	5.2**	
Not in crowd (%)	19.6	16.3	3.2	13.9	8.3	4.4	4.6	32.8	23.1	9.3	
AOR	1.04*	1.04*	1.04	0.94**	0.95*	0.91*	0.96	1.00	0.98	0.94*	

Abbreviation: AOR, adjusted odds ratio.

Percentages represent the use rate for those with and without identification with a given peer crowd; asterisks indicate a statistically significant difference between "in crowd" and "not in crowd" for each peer crowd. Regression models use the peer crowd score (range: -12 to 12) to predict odds while controlling for age, gender, and race/ethnicity. Boldface indicates statistical significance ($P < .05$).

* $P < .05$; ** $P < .01$; *** $P < .001$.

Table 3. Weighted frequencies for psychographic measures by peer crowd and current vaping status.

	FULL SAMPLE (%)	HIP HOP PEER CROWD			POPULAR PEER CROWD			
		NOT IN CROWD (%)	IN CROWD (%)	IN CROWD NON-USER (%)	NOT IN CROWD (%)	IN CROWD (%)	IN CROWD NON-USER (%)	
SPI score (0-17), mean	6.05	5.77	6.56***	6.16	7.73***	6.32***	5.91	7.86***
SPI items								
Center of attention	32.3	30.7	35.2	35.3	34.7	37.3***	36.5	40.4
Outgoing	44.7	45.9	42.6	41.8	45.1	49.8***	47.3	58.9**
Partier	40.4	35.3	49.6***	45.4	62.5***	42.9**	37.5	63.1***
Street smart	41.6	39.1	46.1**	42.8	55.6**	42.7	40.4	51.2**
Strike a pose	37.9	34.6	43.7***	44.1	42.4	36.4	34.7	42.5*
The carefree one	37.9	35.7	41.9*	38.9	50.7*	36.9	34.1	47.2***
Up for anything	53.4	54.3	51.8	49.2	59.4*	56.7***	54.8	63.6*
Wing it	48.1	47.0	50.1	50.2	49.7	48.5	46.1	57.3**
FALSE: rarely center of attention	42.1	39.2	47.3**	46.6	49.7	46.3***	45.6	49.1
TRUE: considered being an entertainer/actor	50.3	47.9	54.8**	53.7	57.6	50.4	49.9	52.6
TRUE: can lie with a straight face	64.6	61.3	70.7***	65.2	86.1***	64.8	61.7	76.1***
Score for the number of nights out for fun (0-3), mean	0.60	0.58	0.64	0.54	0.95***	0.66***	0.58	0.95***
Score for time out until (0-3), mean	0.51	0.48	0.58**	0.49	0.84***	0.54	0.44	0.90***
Personal values								
Being the center of attention	34.0	33.9	34.1	32.5	38.9	38.2***	38.0	38.8
Care a lot what others think	54.0	55.8	50.5*	52.0	46.5	55.6	55.3	56.8
Corporations should make money ethically	73.8	76.6	68.7***	68.1	70.8	71.8*	72.0	71.4
Enjoy things others think are weird	68.8	69.8	66.8	67.8	63.9	63.1***	64.3	58.7
Environmental activist	34.1	36.7	29.5**	29.1	30.6	34.5	35.1	31.9
Family is important	72.6	73.2	71.4	74.5	62.5**	76.0***	77.9	69.0**

(Continued)

Table 3. (Continued)

	FULL SAMPLE (%)		HIP HOP PEER CROWD		POPULAR PEER CROWD		POPULAR PEER CROWD	
	NOT IN CROWD (%)	IN CROWD (%)	NOT IN CROWD (%)	IN CROWD (%)	NOT IN CROWD (%)	IN CROWD (%)	NOT IN CROWD (%)	IN CROWD (%)
Fashionable	50.6	57.0*	52.4	70.6***	44.4	57.8***	55.9	65.0*
Follow the rules	60.9	52.3***	58.4	34.7***	55.1	59.4	64.4	41.1***
Follow tradition	37.7	35.9	38.3	29.2*	33.0	39.5**	42.2	29.4***
Good reputation in the community	73.2	68.6	70.2	63.9	64.8	75.5***	75.8	74.8
Good student	87.3	83.6*	84.8	79.9	83.0	87.7**	88.3	85.5
Keep body free from toxins	60.8	54.7*	58.9	42.4***	54.6	61.0*	65.9	42.7***
Live a long, healthy life	73.2	73.4	73.0	74.3	69.7	75.3*	76.0	72.9
Live in the moment	45.0	48.4	46.6	53.8	43.9	47.6	45.3	56.3**
Make decisions quickly	32.3	38.0*	36.9	41.7	34.0	34.5	32.3	43.0**
Others hold me back from my goals	53.6	60.7**	59.2	65.3	56.3	56.0	54.4	62.0*
Patriotic person	48.7	39.9***	40.8	37.5	39.7	49.1***	47.6	54.2
Religious person	42.7	42.5	43.8	38.2	37.4	45.7**	47.5	39.3*
Social person with lots of friends	52.8	58.7*	56.5	65.3	40.6	63.2***	60.9	72.3**
Spend time outdoors	45.1	41.7	41.2	43.1	38.9	46.8**	46.0	50.2
Support local music and artists	52.7	54.2	51.8	61.8*	57.5	50.7**	49.7	54.5
Tougher than most people	54.6	61.8**	59.5	68.8*	56.3	57.8	56.1	64.0*
Use clothes to express identity	60.3	60.6	58.1	68.1*	64.1	58.2*	57.3	61.7

Abbreviation: SPI, social prioritization index.
 Boldface indicates statistical significance ($P < .05$).
 * $P < .05$; ** $P < .01$; *** $P < .001$.

Table 4. Weighted frequencies for past 7-day social media and lifetime smartphone use by peer crowd and current vaping status.

	FULL SAMPLE (%)	HIP HOP PEER CROWD		POPULAR PEER CROWD		IN CROWD USER (%)	IN CROWD NON-USER (%)	
		NOT IN CROWD (%)	IN CROWD (%)	NOT IN CROWD (%)	IN CROWD (%)			
Social media use								
Facebook	60.6	61.9	58.4	58.9	61.4	60.2	60.7	58.2
Instagram	86.6	86.7	86.4	83.7	83.4	88.6**	86.5	95.8***
Pinterest	24.6	26.4	21.5*	20.8	22.8	25.7	26.3	23.8
Snapchat	83.9	81.7	88.0**	85.3	77.2	87.9***	85.7	95.8***
Tumblr	17.2	18.4	15.0	14.4	22.8	13.9***	13.6	15.0
Twitter	41.6	43.8	37.6*	34.0	38.1	43.7*	43.8	43.5
Smartphone use								
Apps that automatically delete messages	79.9	78.8	81.7	81.3	76.4	81.8*	80.3	87.5*
Messaging apps	42.8	43.5	41.5	42.3	46.8	40.6*	41.2	38.2
Online shopping	85.4	84.6	86.9	86.4	84.9	85.7	83.8	92.3**
Sports scores or analysis	40.6	37.5	46.5***	43.1	31.6	45.9***	43.1	55.8**
Stream movies or TV	79.7	78.7	81.9	81.8	73.3	83.5***	82.4	87.5
Stream music	87.4	87.1	88.1	86.2	84.2	89.2**	88.7	91.3
Video call/chat	84.0	83.0	86.0	83.4	81.9	85.2	83.8	90.4*

Boldface indicates statistical significance ($P < .05$).

* $P < .05$; ** $P < .01$; *** $P < .001$.

Table 5. Weighted frequencies for television show and event preferences by peer crowd and current vaping status.

TV shows	FULL SAMPLE (%)	HIP HOP PEER CROWD			POPULAR PEER CROWD			IN CROWD USER (%)	IN CROWD NON-USER (%)	IN CROWD USER (%)	IN CROWD NON-USER (%)
		NOT IN CROWD (%)	IN CROWD (%)	IN CROWD NON-USER (%)	IN CROWD USER (%)	NOT IN CROWD (%)	IN CROWD (%)				
<i>13 Reasons Why</i>	28.0	27.5	28.8	29.1	27.8	20.4	32.4***	31.8	34.7		
<i>American Idol</i>	7.8	7.6	8.1	8.1	8.3	5.3	9.2**	9.3	8.9		
<i>Bob's Burgers</i>	25.1	23.8	27.5	25.4	34.0*	29.2	22.8**	20.8	29.9**		
<i>Duck Dynasty</i>	9.2	9.9	7.9	6.6	11.8*	8.2	9.8	8.5	14.6**		
<i>Girl Code</i>	5.6	4.5	7.8**	6.4	11.1	4.8	6.1	5.8	7.0		
<i>Jane the Virgin</i>	11.0	11.2	10.8	10.4	11.8	8.2	12.6**	12.6	12.7		
<i>Love & Hip Hop</i>	5.8	3.2	10.8***	10.6	11.1	7.0	5.2	6.1	2.3*		
<i>NCIS</i>	13.0	13.7	11.8	13.5	6.9*	12.9	13.1	13.9	10.3		
<i>Pretty Little Liars</i>	12.8	12.8	12.7	14.5	7.6*	8.5	15.2***	15.2	15.4		
<i>Rick and Morty</i>	31.4	30.6	32.8	31.5	36.8	36.4	28.5**	27.0	33.8		
<i>Ridiculousness</i>	17.1	15.2	20.5**	19.2	24.3	18.5	16.2	15.3	19.6		
<i>Riverdale</i>	25.3	26.8	22.6	23.5	20.1	18.2	29.4***	28.8	31.8		
<i>The 100</i>	10.1	9.8	10.6	8.7	16.0*	7.3	11.7**	11.1	14.1		
<i>The Bachelor/ette</i>	5.2	6.1	3.5*	3.3	4.2	1.9	7.2***	6.8	8.4		
<i>The Boondocks</i>	10.0	6.7	16.1***	13.5	23.6**	12.4	8.6*	7.4	13.1**		
<i>The Rap Game</i>	6.0	2.8	11.8***	11.6	12.5	6.6	5.7	6.2	3.8		
<i>Wild 'N Out</i>	15.9	8.8	29.0***	28.8	29.4	17.7	14.9	14.1	17.8		

(Continued)

Table 5. (Continued)

Events	FULL SAMPLE (%)	HIP HOP PEER CROWD			POPULAR PEER CROWD			IN CROWD USER (%)	IN CROWD NON-USER (%)	IN CROWD USER (%)
		NOT IN CROWD (%)	IN CROWD (%)	IN CROWD NON-USER (%)	NOT IN CROWD (%)	IN CROWD (%)	IN CROWD NON-USER (%)			
Art exhibits	14.5	16.1	11.7*	11.3	13.2	16.8	13.1*	13.0	13.6	
Auto races	5.3	6.0	4.1	4.3	2.8	6.1	4.9	4.0	8.4**	
Baseball games	10.1	10.5	9.4	9.0	10.4	7.1	11.8**	10.6	16.4*	
Basketball games	22.3	19.6	27.2***	24.8	34.0*	17.5	25.1***	22.5	35.0***	
Church events	24.3	24.5	23.9	26.0	17.4*	20.2	26.6**	28.9	18.2**	
Community service	18.4	19.6	16.3	14.9	20.3	14.5	20.8**	21.3	18.7	
Country concerts	5.8	6.1	5.1	4.7	6.3	4.3	6.7*	5.9	8.9	
Dance clubs	5.4	3.9	8.1***	6.2	13.3**	5.3	5.5	5.2	6.5	
Farmers markets	10.3	12.1	7.2**	6.4	9.0	11.0	9.9	8.3	16.0***	
Football games	35.2	32.5	40.1**	35.9	52.1***	25.9	40.7***	36.8	55.1***	
High school dances	34.5	34.8	34.0	32.2	39.2	29.9	37.2**	34.8	45.8**	
Hip hop concerts	13.4	10.6	18.6***	14.9	29.2***	12.2	14.1	10.6	27.1***	
Pop concerts	13.7	13.5	13.9	12.8	17.4	9.7	16.0***	12.8	27.7***	
Rock concerts	14.2	15.2	12.4	10.4	18.1*	18.9	11.4***	9.6	18.3***	
Science fairs	6.0	6.2	5.7	4.5	9.0*	7.3	5.3	5.1	6.1	
Soccer games	15.2	15.7	14.5	14.7	14.6	9.9	18.4***	19.2	15.4	
Video game tournaments	7.5	7.3	7.8	8.5	6.3	9.9	6.1**	6.4	4.7	

Boldface indicates statistical significance ($P < .05$).
 * $P < .05$; ** $P < .01$; *** $P < .001$.

partiers, street smart, carefree, and up for anything (Table 3). Popular vape users also more often agreed that they care about being fashionable, social, and tough than non-users and less often agreed that they care about keeping their bodies free from toxins and following the rules, similar to Hip Hop vape users. Although, overall, Popular youth more often agreed that they value family, tradition, and religion than other youth, Popular vape users less often agreed with these items than non-users. Similar to the broader Popular peer crowd and to Hip Hop vape users, Popular vape users more often reported using Instagram and Snapchat, and using their smartphones to look up sports scores and place video calls (Table 4). Popular vape users, like Hip Hop vape users, more often reported watching *The Boondocks* and *Bob's Burgers* than non-users (Table 5). Similar to the broader Popular crowd, Popular vape users more often reported attending sports games, high school dances, and concerts than non-users, though they less often reported attending church events.

Discussion

This study identified a subset of adolescents at the greatest risk for vaping, and the psychographic characteristics and interests that should inform the creation of targeted health communications messages and media delivery strategies for these youth. The Hip Hop and Popular peer crowds were at the greatest risk for current vaping, aligning with earlier representative data from Virginia and similar studies of young adults.^{52,53,56} Interestingly, although both crowds were at increased risk for current vaping, their broader risk profiles diverged, indicating a need for differentiated health messaging for the 2 crowds. Hip Hop youth had greater odds of vaping frequently, which may indicate an escalation to nicotine addiction, and were more likely to use other tobacco products and substances. Popular youth, however, were at increased risk for occasional vaping only, with reduced risk for several other substances including cigarettes.

Understanding the psychographics and interests of Hip Hop and Popular youth, and Hip Hop and Popular current vape users in particular, provides insights for health communications campaign development and hints at possible explanations for differential risk by crowd. Hip Hop and Popular youth and current vape users reported higher mean SPI scores than other youth, and endorsed personal values related to being fashionable and sociable. These findings paint a psychographic portrait of Hip Hop and Popular youth and current vape users as individuals who care about their social lives, are trend sensitive, and are strongly influenced by their social environments. This portrait aligns with vape marketing campaigns, which often feature celebrities, associate vaping with socializing and partying, and use sleek, modern designs reminiscent of trendy technology such as iPhones,^{37,67-69} all of which likely appeal to the youth described here. To effectively counter industry marketing and media depictions that may appeal to Hip Hop and Popular adolescents, health educators must create relevant

messaging that breaks the connection between vaping and social status or trendiness, and motivates youth to reconsider vaping as a key feature of their social lives. Furthermore, as current vape users in this study cared less about following rules and protecting their bodies from toxins than non-users, campaign messaging must look beyond authoritative tones and typical scare tactic messaging to cultivate a socially influential brand that can persuade higher-risk youth to avoid vaping by speaking directly to their priorities and values.

Hip Hop and Popular adolescents and current vape users also reported extensive smartphone and social media use, in particular the use of Instagram, Snapchat, sports analysis sites, and video/music streaming services. Heavy social media use may contribute to adolescent vaping as user- and industry-generated vaping content abounds across platforms,⁷⁰⁻⁷⁴ and early research suggests that heavier social media use and exposure to vape advertisements on social media are associated with willingness and intentions to vape.⁷⁵ Given the known association between exposure to online tobacco marketing and adolescent tobacco initiation and progression,^{76,77} heavy social media use among Hip Hop and Popular adolescents may further explain why these youth vape. At the same time, these findings can guide health communicators in selecting relevant campaign channels and delivering content via targeted advertisements. Vaping prevention campaigns must meet higher-risk adolescents where they are to deliver messaging to the target audience using the cutting-edge ad-targeting technology employed by commercial advertisers. Although not yet ubiquitous in public health, the targeted placement of paid campaign advertising has been successfully applied to deliver health communications to intended audiences for initiatives including the U.S. Food and Drug Administration's *The Real Cost* general market and *Fresh Empire* Hip Hop adolescent tobacco education campaigns.^{35,61,78,79} In addition, to counter the abundance of pro-vaping content youth encounter online, health communication campaigns must cultivate active, appealing social media presences to establish themselves as relatable and trustworthy social influencers and interject tailored prevention messaging into the pro-vaping social media environments of higher-risk youth.^{80,81}

Finally, Hip Hop and Popular youth and current vape users reported specific television and event preferences. Although vaping is currently rare in television programming,^{82,83} exposure to vape advertisements on television and to vaping in other forms of media including music videos is common and may promote positive attitudes toward vaping among youth.⁸⁴⁻⁸⁹ Although it is unclear if Hip Hop and Popular adolescents are disproportionately exposed to vape advertisements or onscreen vaping, continued monitoring is warranted to track how vaping is depicted over time and if exposure to vaping in media is associated with risks similar to that of exposure to cigarette smoking in movies.⁹⁰ In addition, little is known about vape industry sponsorship or promotion at events, an important topic for future work given the tobacco industry's historical use of events

for product promotion.^{91,92} Although less is known about how television and event preferences may influence vaping risk, this information is incredibly useful to health educators for campaign tailoring and media targeting. Interests can be used to build media targeting profiles that concentrate message delivery and dosage on those most at risk, increasing chances for successful attention and persuasion. Television preference data can inform media buys,⁹³ identify potential influencer partnerships, and reveal opportunities to engage with the target audience about relevant televised events.⁸¹ Event preference data can inform the selection of relevant settings for advertisements and identify opportunities for in-person engagement with the target audience. With this wealth of information, health educators can develop targeted health communication interventions that effectively reach and persuade higher-risk adolescents.

Although the Hip Hop and Popular peer crowds shared some psychographics and preferences, differences between the crowds indicate that separate campaigns are necessary. In particular, different messaging approaches are needed to appropriately address the more frequent, established nature of vaping among Hip Hop youth, who may require cessation resources, and the less frequent, possibly social nature of vaping among Popular youth. Experimental studies have demonstrated the promise of peer crowd-targeted smoking prevention messaging,⁹⁴⁻⁹⁶ and evaluation studies of peer-crowd-targeted campaigns reveal success in addressing cigarette and smokeless tobacco use.^{58-62,64} Peer crowd targeting may also be a means of more effectively addressing tobacco use disparities. Previous literature suggests that non-Hispanic White youth are at the greatest risk for vaping,^{23-25,27} but this study indicates that the Hip Hop peer crowd, which overrepresents racial/ethnic minorities (Supplemental Appendix Table 1),^{50-52,54} is at the greatest risk for frequent vaping, identifying a higher-risk group that might otherwise be missed by campaigns using demographic segmentation. This study provides a preliminary insight into who these youth are, what they care about, and the media they consume; future research must test potential campaign messages with youth from the targeted peer crowd to ensure that tailored content resonates and motivates positive behavior change.

Limitations

It is important to note several limitations of this study. Generalizability is unclear as we surveyed a convenience sample recruited via social media from a single state, although peer crowd risk findings did align with previous observations from varied samples and locations.^{52,53,55,56} We did not collect vape brand preferences, and did not distinguish between vaping nicotine, tetrahydrocannabinol (THC) or marijuana products, and flavors only, which should be explored to determine if users of different products have unique characteristics and interests. We also cannot discern causality, such as whether any of these psychographic characteristics or interests predisposed teens to

increased interest in vaping, or if targeted industry marketing or other factors may have contributed to disparities.

Conclusions

Tackling adolescent vaping requires understanding who is at the greatest risk and how to reach them with relevant, persuasive messaging. Although current vaping is increasingly common among U.S. adolescents, risk is not evenly distributed, and prevention efforts should rely on psychographic segmentation, audience tailoring, and media targeting to effectively and efficiently reach higher-risk adolescents.⁴⁵ Although establishing a deeper understanding of the psychographics and interests of higher-risk adolescents may appear burdensome, in fact it is necessary to ensure that limited public health funds are spent on the populations facing the greatest challenges,⁴⁶ particularly in today's online media environment where platform targeting tools cater toward advertisers who know the interests of their audiences. Our findings provide a detailed portrait of adolescents who are at increased risk for current vaping, information which should directly inform health communication campaign planning. Future campaigns should incorporate our findings to create messages relevant to the psychographics and risk profiles of these youth, which are delivered using carefully selected media strategies reflecting the greatest opportunities to reach the target audience efficiently. Addressing the urgent adolescent vaping crisis requires looking deeper than demographics to understand and leverage knowledge about who adolescent vape users are and what they care about, to create health communications campaigns that appeal to and persuade those at the greatest risk.

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Author Contributions

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Supplemental Material

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REFERENCES

1. Miech R, Johnston L, O'Malley PM, Bachman JG, Patrick ME. Adolescent vaping and nicotine use in 2017–2018—U.S. national estimates. *N Engl J Med*. 2019;380:192-193. doi:10.1056/NEJMc1814130.

2. Gentzke AS, Creamer M, Cullen KA, et al. Vital signs: tobacco product use among middle and high school students—United States, 2011–2018. *Morb Mortal Wkly Rep.* 2019;68:157–164. doi:10.15585/mmwr.mm6806e1.
3. Cullen KA, Gentzke AS, Sawdey MD, et al. E-Cigarette use among youth in the United States. *JAMA.* 2019;322:2095–2103. doi:10.1001/jama.2019.18387.
4. Cullen KA, Ambrose BK, Gentzke AS, Apelberg BJ, Jamal A, King BA. Notes from the field: use of electronic cigarettes and any tobacco product among middle and high school students—United States, 2011–2018. *Morb Mortal Wkly Rep.* 2018;67:1276–1277. doi:10.15585/mmwr.mm6745a5.
5. Soneji S, Barrington-Trimis JL, Wills TA, et al. Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: a systematic review and meta-analysis. *JAMA Pediatr.* 2017;171:788–797. doi:10.1001/jamapediatrics.2017.1488.
6. Watkins SL, Glantz SA, Chaffee BW. Association of noncigarette tobacco product use with future cigarette smoking among youth in the Population Assessment of Tobacco and Health (PATH) study, 2013–2015. *JAMA Pediatr.* 2018;172:181–187. doi:10.1001/jamapediatrics.2017.4173.
7. Stanton CA, Bansal-Travers M, Johnson AL, et al. Longitudinal e-cigarette and cigarette use among US youth in the PATH study (2013–2015). *J Natl Cancer Inst.* 2019;111:1088–1096. doi:10.1093/jnci/djz006.
8. National Academies of Sciences, Engineering, and Medicine. Public health consequences of e-cigarettes. <http://nationalacademies.org/hmd/Reports/2018/public-health-consequences-of-e-cigarettes.aspx>. Published January 23, 2018. Accessed November 25, 2019.
9. Wills TA, Sargent JD, Gibbons FX, Pagano I, Schweitzer R. E-cigarette use is differentially related to smoking onset among lower risk adolescents. *Tob Control.* 2016;26:534–539. doi:10.1136/tobaccocontrol-2016-053116.
10. Berry KM, Fetterman JL, Benjamin EJ, et al. Association of electronic cigarette use with subsequent initiation of tobacco cigarettes in US youths. *JAMA Netw Open.* 2019;2:e187794. doi:10.1001/jamanetworkopen.2018.7794.
11. Chaffee BW, Watkins SL, Glantz SA. Electronic cigarette use and progression from experimentation to established smoking. *Pediatrics.* 2018;141:e20173594. doi:10.1542/peds.2017-3594.
12. Kim S, Selya AS. The relationship between electronic cigarette use and conventional cigarette smoking is largely attributable to shared risk factors. *Nicotine Tob Res.* 2020;22:1123–1130. doi:10.1093/ntr/ntz157.
13. Kaur G, Pinkston R, Mclemore B, Dorsey WC, Batra S. Immunological and toxicological risk assessment of e-cigarettes. *Eur Respir Rev.* 2018;27:170119. doi:10.1183/16000617.0119-2017.
14. Eltorai AE, Choi AR, Eltorai AS. Impact of electronic cigarettes on various organ systems. *Respir Care.* 2019;64:328–336. doi:10.4187/respcare.06300.
15. Erythropel HC, Davis LM, de Winter TM, et al. Flavorant-solvent reaction products and menthol in JUUL e-cigarettes and aerosol. *Am J Prev Med.* 2019;57:425–427. doi:10.1016/j.amepre.2019.04.004.
16. Omaiye EE, McWhirter KJ, Luo W, Pankow JF, Talbot P. High-nicotine electronic cigarette products: toxicity of JUUL fluids and aerosols correlates strongly with nicotine and some flavor chemical concentrations. *Chem Res Toxicol.* 2019;32:1058–1069. doi:10.1021/acs.chemrestox.8b00381.
17. Rubinstein ML, Delucchi K, Benowitz NL, Ramo DE. Adolescent exposure to toxic volatile organic chemicals from e-cigarettes. *Pediatrics.* 2018;141:e20173557. doi:10.1542/peds.2017-3557.
18. McConnell R, Barrington-Trimis JL, Wang K, et al. Electronic cigarette use and respiratory symptoms in adolescents. *Am J Respir Crit Care Med.* 2017;195:1043–1049. doi:10.1164/rccm.201604-0804OC.
19. Schweitzer RJ, Wills TA, Tam E, Pagano I, Choi K. E-cigarette use and asthma in a multiethnic sample of adolescents. *Prev Med.* 2017;105:226–231. doi:10.1016/j.ypmed.2017.09.023.
20. England LJ, Bunnell RE, Pechacek TF, Tong VT, McAfee TA. Nicotine and the developing human: a neglected element in the electronic cigarette debate. *Am J Prev Med.* 2015;49:286–293. doi:10.1016/j.amepre.2015.01.015.
21. Goriounova NA, Mansvelder HD. Short- and long-term consequences of nicotine exposure during adolescence for prefrontal cortex neuronal network function. *Cold Spring Harb Perspect Med.* 2012;2:a012120. doi:10.1101/cshperspect.a012120.
22. Smith RF, McDonald CG, Bergstrom HC, Ehlinger DG, Brielmaier JM. Adolescent nicotine induces persisting changes in development of neural connectivity. *Neurosci Biobehav Rev.* 2015;55:432–443. doi:10.1016/j.neubiorev.2015.05.019.
23. Kann L, McManus T, Harris WA, et al. Youth risk behavior surveillance—United States, 2017. *MMWR Surveill Summ.* 2018;67:1–114. doi:10.15585/mmwr.ss6708a1.
24. Miech RA, Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE, Patrick ME. Monitoring The Future national survey results on drug use, 1975–2018: volume I, secondary school students. http://monitoringthefuture.org/pubs/monographs/mtf-vol1_2018.pdf. Published June 2019. Accessed November 25, 2019.
25. Hartwell G, Thomas S, Egan M, Gilmore A, Petticrew M. E-cigarettes and equity: a systematic review of differences in awareness and use between sociodemographic groups. *Tob Control.* 2017;26:e85–e91. doi:10.1136/tobaccocontrol-2016-053222.
26. Perikleous EP, Steiropoulos P, Paraskakis E, Constantinidis TC, Nena E. E-cigarette use among adolescents: an overview of the literature and future perspectives. *Front Public Health.* 2018;6:86. doi:10.3389/fpubh.2018.00086.
27. Vallone DM, Bennett M, Xiao H, Pitzer L, Hair EC. Prevalence and correlates of JUUL use among a national sample of youth and young adults. *Tob Control.* 2019;28:603–609. doi:10.1136/tobaccocontrol-2018-054693.
28. Barrington-Trimis JL, Berhane K, Unger JB, et al. Psychosocial factors associated with adolescent electronic cigarette and cigarette use. *Pediatrics.* 2015;136:308–317. doi:10.1542/peds.2015-0639.
29. Curran KA, Burk T, Pitt PD, Middleman AB. Trends and substance use associations with e-cigarette use in US adolescents. *Clin Pediatr (Phila).* 2018;57:1191–1198. doi:10.1177/000922818769405.
30. Demissie Z, Everett Jones S, Clayton HB, King BA. Adolescent risk behaviors and use of electronic vapor products and cigarettes. *Pediatrics.* 2017;139:e20162921. doi:10.1542/peds.2016-2921.
31. McCabe SE, West BT, Veliz P, Boyd CJ. E-cigarette use, cigarette smoking, dual use, and problem behaviors among U.S. adolescents: results from a national survey. *J Adolesc Health.* 2017;61:155–162. doi:10.1016/j.jadohealth.2017.02.004.
32. Dutta-Bergman MJ. A descriptive narrative of healthy eating: a social marketing approach using psychographics in conjunction with interpersonal, community, mass media and new media activities. *Health Mark Q.* 2003;20:81–101. doi:10.1300/j026v20n03_06.
33. Berg CJ, Haardörfer R, Getachew B, Johnston T, Foster B, Windle M. Fighting fire with fire: using industry market research to identify young adults at risk for alternative tobacco product and other substance use. *Soc Mar Q.* 2017;23:302–319. doi:10.1177/1524500417718533.
34. Lefebvre RC, McCormack L, Taylor O, Bann C, Rausch P. A quantitative approach to segmentation for prescription drug safety programs. *J Soc Mark.* 2016;6:335–360. doi:10.1108/JSOCM-06-2014-0037.
35. Santiago S, Talbert EC, Benozo G. Finding Pete and Nikki: defining the target audience for “The Real Cost” campaign. *Am J Prev Med.* 2019;56:S9–S15. doi:10.1016/j.amepre.2018.07.040.
36. Betsch C. Social media targeting of health messages. A promising approach for research and practice. *Hum Vaccin Immunother.* 2014;10:2636–2637. doi:10.4161/hv.32234.
37. Gorukanti A, Delucchi K, Ling P, Fisher-Travis R, Halpern-Felsher B. Adolescents' attitudes towards e-cigarette ingredients, safety, addictive properties, social norms, and regulation. *Prev Med.* 2017;94:65–71. doi:10.1016/j.ypmed.2016.10.019.
38. McKelvey K, Baiocchi M, Halpern-Felsher B. Adolescents' and young adults' use and perceptions of pod-based electronic cigarettes. *JAMA Netw Open.* 2018;1:e183535. doi:10.1001/jamanetworkopen.2018.3535.
39. McKelvey K, Popova L, Pepper JK, Brewer NT, Halpern-Felsher B. Adolescents have unfavorable opinions of adolescents who use e-cigarettes. *PLoS ONE.* 2018;13:e0206352. doi:10.1371/journal.pone.0206352.
40. Romijnders KAGJ, van Osch L, de Vries H, Talhout R. Perceptions and reasons regarding e-cigarette use among users and non-users: a narrative literature review. *Int J Environ Res Public Health.* 2018;15:1190. doi:10.3390/ijerph15061190.
41. Yule JA, Tinson JS. Youth and the sociability of “vaping”: a consumer behavior perspective on vaping. *J Consum Behav.* 2017;16:3–14. doi:10.1002/cb.1597.
42. Farrimond H. A typology of vaping: identifying differing beliefs, motivations for use, identity and political interest amongst e-cigarette users. *Int J Drug Policy.* 2017;48:81–90. doi:10.1016/j.drugpo.2017.07.011.
43. Case KR, Harrell MB, Pérez A, et al. The relationships between sensation seeking and a spectrum of e-cigarette use behaviors: cross-sectional and longitudinal analyses specific to Texas adolescents. *Addict Behav.* 2017;73:151–157. doi:10.1016/j.addbeh.2017.05.007.
44. Berg CJ, Haardörfer R, Lewis M, et al. DECOY: documenting experiences with cigarettes and other tobacco in young adults. *Am J Health Behav.* 2016;40:310–321. doi:10.5993/AJHB.40.3.3.
45. Dietrich T, Rundle-Thiele S, Kubacki K, eds. *Segmentation in Social Marketing: Process, Methods and Application.* Singapore: Springer; 2017.
46. Ling PM, Holmes LM, Jordan JW, Lisha NE, Bibbins-Domingo K. Bars, nightclubs, and cancer prevention: new approaches to reduce young adult cigarette smoking. *Am J Prev Med.* 2017;53:S78–S85. doi:10.1016/j.amepre.2017.03.026.
47. Moran MB, Walker MW, Alexander TN, Jordan JW, Wagner DE. Why peer crowds matter: incorporating youth subcultures and values in health education campaigns. *Am J Public Health.* 2017;107:389–395. doi:10.2105/AJPH.2016.303595.
48. Sussman S, Pokhrel P, Ashmore RD, Brown BB. Adolescent peer group identification and characteristics: a review of the literature. *Addict Behav.* 2007;32:1602–1627. doi:10.1016/j.addbeh.2006.11.018.
49. Stalgaitis CA, Wagner DE, Djakaria M, Jordan JW. Understanding adversity and peer crowds to prevent youth health risks. *Am J Health Behav.* 2019;43:767–780. doi:10.5993/AJHB.43.4.10.
50. Walker MW, Navarro MA, Hoffman L, Wagner DE, Stalgaitis CA, Jordan JW. The Hip Hop peer crowd: an opportunity for intervention to reduce tobacco use among at-risk youth. *Addict Behav.* 2018;82:28–34. doi:10.1016/j.addbeh.2018.02.014.

51. Lee YO, Jordan JW, Djakaria M, Ling PM. Using peer crowds to segment Black youth for smoking intervention. *Health Promot Pract.* 2014;15:530-537. doi:10.1177/1524839913484470.
52. Jordan JW, Stalgaitis CA, Charles J, Madden PA, Radhakrishnan AG, Saggese D. Peer crowd identification and adolescent health behaviors: results from a statewide representative study. *Health Educ Behav.* 2019;46:40-52. doi:10.1177/1090198118759148.
53. Lisha NE, Jordan JW, Ling PM. Peer crowd affiliation as a segmentation tool for young adult tobacco use. *Tob Control.* 2016;25:i83-i89. doi:10.1136/tobaccocontrol-2016-053086.
54. Navarro MA, Stalgaitis CA, Walker MW, Wagner DE. Youth peer crowds and risk of cigarette use: the effects of dual peer crowd identification among Hip Hop youth. *Addict Behav Rep.* 2019;10:100204. doi:10.1016/j.abrep.2019.100204.
55. Stalgaitis CA, Navarro MA, Wagner DE, Walker MW. Who uses tobacco products? Using peer crowd segmentation to identify youth at risk for cigarettes, cigar products, hookah, and e-cigarettes. *Subst Use Misuse.* 2020;55:1045-1053. doi:10.1080/10826084.2020.1722698.
56. Moran MB, Villanti AC, Johnson A, Rath J. Patterns of alcohol, tobacco, and substance use among young adult peer crowds. *Am J Prev Med.* 2019;56:e185-e193. doi:10.1016/j.amepre.2019.02.010.
57. Lee YO, Curry LE, Fiocco L, et al. Peer crowd segmentation for targeting public education campaigns: Hip Hop youth and tobacco use. *Prev Med Rep.* 2019;14:100843. doi:10.1016/j.pmedr.2019.100843.
58. Ling PM, Lee YO, Hong J, Neilands TB, Jordan JW, Glantz SA. Social branding to decrease smoking among young adults in bars. *Am J Public Health.* 2014;104:751-760. doi:10.2105/AJPH.2013.301666.
59. Kalkhoran S, Lisha NE, Neilands TB, Jordan JW, Ling PM. Evaluation of bar and nightclub intervention to decrease young adult smoking in New Mexico. *J Adolesc Health.* 2016;59:222-229. doi:10.1016/j.jadohealth.2016.04.003.
60. Fallin A, Neilands TB, Jordan JW, Hong JS, Ling PM. Wreaking "havoc" on smoking: social branding to reach young adult "Partiers" in Oklahoma. *Am J Prev Med.* 2015;48:S78-S85. doi:10.1016/j.amepre.2014.09.008.
61. Wagner DE, Fernandez P, Jordan JW, Saggese DJ. Freedom from chew: using social branding to reduce chewing tobacco use among Country peer crowd teens. *Health Educ Behav.* 2019;46:286-294. doi:10.1177/1090198118806966.
62. Ling PM, Lisha NE, Neilands TB, Jordan JW. Join the commune: a controlled study of social branding influencers to decrease smoking among young adult hipsters [published online ahead of print February 20, 2020]. *Am J Health Promot.* doi:10.1177/0890117120904917.
63. Toledo G, McQuoid J, Ling PM. "It's not too aggressive": key features of social branding anti-tobacco interventions for high-risk young adults [published online ahead of print February 28, 2020]. *Health Promot Pract.* doi:10.1177/1524839920910372.
64. Guillory J, Henes A, Farrelly MC, et al. Awareness of and receptivity to the Fresh Empire tobacco public education campaign among Hip Hop youth. *J Adolesc Health.* 2020;66:301-307. doi:10.1016/j.jadohealth.2019.09.005.
65. Lisha NE, Neilands TB, Jordan JW, Holmes LM, Ling PM. The social prioritization index and tobacco use among young adult bar patrons. *Health Educ Behav.* 2016;43:641-647. doi:10.1177/1090198115621867.
66. Wang TW, Gentzke AS, Creamer MR, et al. Tobacco product use and associated factors among middle and high school students—United States, 2019. *MMWR Surveill Summ.* 2019;68:1-22. doi:10.15585/mmwr.ss6812a1.
67. Grana RA, Ling PM. "Smoking revolution": a content analysis of electronic cigarette retail websites. *Am J Prev Med.* 2014;46:395-403. doi:10.1016/j.amepre.2013.12.010.
68. Keamy-Minor E, McQuoid J, Ling PM. Young adult perceptions of JUUL and other pod electronic cigarette devices in California: a qualitative study. *BMJ Open.* 2019;9:e026306. doi:10.1136/bmjopen-2018-026306.
69. Harty D. JUUL hopes to reinvent e-cigarette ads with "Vaporized" campaign. *Ad Age.* June 23, 2015. <https://adage.com/article/cmo-strategy/juul-hopes-reinvent-e-cigarette-ads-campaign/299142>. Accessed September 26, 2019.
70. Hébert ET, Case KR, Kelder SH, Delk J, Perry CL, Harrell MB. Exposure and engagement with tobacco- and e-cigarette-related social media. *J Adolesc Health.* 2017;61:371-377. doi:10.1016/j.jadohealth.2017.04.003.
71. Cho YJ, Thrasher JF, Reid JL, Hitchman S, Hammond D. Youth self-reported exposure to and perceptions of vaping advertisements: findings from the 2017 International Tobacco Control Youth Tobacco and Vaping Survey. *Prev Med.* 2019;126:105775. doi:10.1016/j.pmed.2019.105775.
72. Cho H, Li W, Shen L, Cannon J. Mechanisms of social media effects on attitudes toward e-cigarette use: motivations, mediators, and moderators in a national survey of adolescents. *J Med Internet Res.* 2019;21:e14303. doi:10.2196/14303.
73. Laestadius LI, Wahl MM, Cho YI. #Vapelife: an exploratory study of electronic cigarette use and promotion on Instagram. *Subst Use Misuse.* 2016;51:1669-1673. doi:10.1080/10826084.2016.1188958.
74. Czaplicki L, Kostygina G, Kim Y, et al. Characterising JUUL-related posts on Instagram [published online ahead of print July 2, 2019]. *Tob Control.* doi:10.1136/tobaccocontrol-2018-054824.
75. Vogel EA, Ramo DE, Rubinstein ML, et al. Effects of social media on adolescents' willingness and intention to use e-cigarettes: an experimental investigation [published online ahead of print January 8, 2020]. *Nicotine Tob Res.* doi:10.1093/ntr/ntaa003.
76. Soneji S, Yang J, Knutzen KE, et al. Online tobacco marketing and subsequent tobacco use. *Pediatrics.* 2018;141:e20172927. doi:10.1542/peds.2017-2927.
77. Choi K, Rose SW, Zhou Y, Rahman B, Hair E. Exposure to multi-media tobacco marketing and product use among youth: a longitudinal analysis. *Nicotine Tob Res.* 2020;22:1036-1040. doi:10.1093/ntr/ntz096.
78. Ross C, Shaw S, Marshall S, et al. Impact of a social media campaign targeting men who have sex with men during an outbreak of syphilis in Winnipeg, Canada. *Can Commun Dis Rep.* 2016;42:45-49. doi:10.14745/ccdr.v42i02a04.
79. Guo M, Ganz O, Cruse B, et al. Keeping it fresh with Hip-Hop teens: promising targeting strategies for delivering public health messages to hard-to-reach audiences. *Health Promot Pract.* 2020;21:61S-71S. doi:10.1177/1524839919884545.
80. Hair EC, Cantrell J, Pitzer L, et al. Estimating the pathways of an antitobacco campaign. *J Adolesc Health.* 2018;63:401-406. doi:10.1016/j.jadohealth.2018.04.008.
81. Hair E, Pitzer L, Bennett M, et al. Harnessing youth and young adult culture: improving the reach and engagement of the truth® campaign. *J Health Commun.* 2017;22:568-575. doi:10.1080/10810730.2017.1325420.
82. Truth Initiative. While you were streaming: smoking on demand. <https://truthinitiative.org/sites/default/files/media/files/2019/07/WUWS-SOD-FINAL.pdf>. Published July 2, 2019. Accessed November 25, 2019.
83. Rath JM, Bennett M, Vallone D, Hair EC. Content analysis of tobacco in episodic programming popular among youth and young adults. *Tob Control.* 2019;29:475-479. doi:10.1136/tobaccocontrol-2019-055010.
84. Margolis KA, Donaldson EA, Portnoy DB, Robinson J, Neff LJ, Jamal A. E-cigarette openness, curiosity, harm perceptions and advertising exposure among U.S. middle and high school students. *Prev Med.* 2018;112:119-125. doi:10.1016/j.pmed.2018.04.017.
85. Padon AA, Lochbuehler K, Maloney EK, Cappella JN. A randomized trial of the effect of youth appealing e-cigarette advertising on susceptibility to use e-cigarettes among youth. *Nicotine Tob Res.* 2018;20:954-961. doi:10.1093/ntr/ntx155.
86. Farrelly MC, Duke JC, Crankshaw EC, et al. A randomized trial of the effect of e-cigarette TV advertisements on intentions to use e-cigarettes. *Am J Prev Med.* 2015;49:686-693. doi:10.1016/j.amepre.2015.05.010.
87. Marynak K, Gentzke A, Wang TW, Neff L, King BA. Exposure to electronic cigarette advertising among middle and high school students—United States, 2014-2016. *Morb Mortal Wkly Rep.* 2018;67:294-299. doi:10.15585/mmwr.mm6710a3.
88. Knutzen KE, Moran MB, Soneji S. Combustible and electronic tobacco and marijuana products in hip-hop music videos, 2013-2017. *JAMA Intern Med.* 2018;178:1608-1615. doi:10.1001/jamainternmed.2018.4488.
89. Allem J-P, Escobedo P, Cruz TB, Unger JB. Vape pen product placement in popular music videos. *Addict Behav.* 2019;93:263-264. doi:10.1016/j.addbeh.2017.10.027.
90. Leonardi-Bee J, Nderi M, Britton J. Smoking in movies and smoking initiation in adolescents: systematic review and meta-analysis. *Addiction.* 2016;111:1750-1763. doi:10.1111/add.13418.
91. Roeseler A, Feighery EC, Cruz TB. Tobacco marketing in California and implications for the future. *Tob Control.* 2010;19:i21-i29. doi:10.1136/tc.2009.031963.
92. Ling PM, Haber LA, Wedl S. Branding the rodeo: a case study of tobacco sports sponsorship. *Am J Public Health.* 2010;100:32-41. doi:10.2105/AJPH.2008.144097.
93. Santiago S, Mahoney C, Murray MP Jr, Benozzi G. "The Real Cost": reaching at-risk youth in a fragmented media environment. *Am J Prev Med.* 2019;56:S49-S56. doi:10.1016/j.amepre.2018.07.041.
94. Moran MB, Murphy ST, Sussman S. Campaigns and cliques: variations in effectiveness of an antismoking campaign as a function of adolescent peer group identity. *J Health Commun.* 2012;17:1215-1231. doi:10.1080/10810730.2012.688246.
95. Moran MB, Sussman S. Translating the link between social identity and health behavior into effective health communication strategies: an experimental application using antismoking advertisements. *Health Commun.* 2014;29:1057-1066. doi:10.1080/10410236.2013.832830.
96. Moran MB, Sussman S. Changing attitudes toward smoking and smoking susceptibility through peer crowd targeting: more evidence from a controlled study. *Health Commun.* 2015;30:521-524. doi:10.1080/10410236.2014.902008.