

# Assessment of School Staff Knowledge and Perceptions of Student E-cigarette Use and Resource Needs, and E-cigarettes Confiscated at 12 North Carolina High Schools — 2019

Lauren J. Tanz, Courtney Heck, Carolyn T.A. Herzig, Leah M. Ranney, Sally Herndon, Jim Martin, Marisa Hast, Eileen McGowan, Guido Baler, Mays Shamout, Brian A. King, Michael A. Tynan, Susan M. Kansagra

**BACKGROUND** E-cigarettes are the most commonly used tobacco product among US youth and are regularly used on school grounds. We assessed school staff's awareness of students' e-cigarette use, response by schools, and resources needed to address use, and examined e-cigarettes confiscated by school staff in North Carolina to guide prevention and identify needed resources.

**METHODS** In May 2019, staff from a random sample of 25 of 451 North Carolina public and charter high schools were invited to complete an online survey and semistructured interview; 12 schools consented to ≥ 1 component (survey, N = 514; interviews, N = 35). Staff knowledge and perceptions of students' e-cigarette use and school tobacco policies were assessed, including school efforts to address e-cigarette use. E-cigarette products confiscated by nine schools from students during the 2018–2019 school year were collected.

**LIMITATIONS** Only 12 public high schools participated, and these schools might not be representative of all North Carolina high schools. Quantitative surveys were not collected from all staff at participating schools; however, the response rate was 62% and included different staff positions and both urban and rural schools. Finally, e-cigarette products collected by schools might not be representative of all devices used by students.

**RESULTS** Among surveyed staff, 33% observed students using e-cigarettes on school grounds; 86% believed e-cigarette use somewhat or largely contributes to learning disruptions. Overall, 94% of respondents knew their school's policy prohibits student e-cigarette use on school grounds, and 57% were not confident their school has resources to help students quit. From 35 interviews, themes included concern that schools' tobacco-free policies do not deter use and additional resources are needed to address e-cigarette use in schools. Of 336 collected devices, there were different e-cigarette types and most (65%) e-liquid bottles were flavored.

**CONCLUSION** Efforts are warranted to incorporate evidence-based curricula; educate staff, parents, and youth regarding health risks of e-cigarette use; and help youth quit e-cigarettes.

The US Surgeon General declared youth e-cigarette use an epidemic in 2018 [1]. In 2020, 19.6% (3.02 million) of US high school students reported current e-cigarette use [2]. Among North Carolina high school students, e-cigarette use rose 89.4%, from 1.7% in 2011 to 20.9% in 2019 [3]. E-cigarettes are available in youth-appealing flavors, including menthol, mint, candy, and fruit [4, 5]. In 2020, 84.7% of high school students who currently used e-cigarettes reported using flavored products [2].

The e-cigarette landscape has changed rapidly, since the first products were introduced; newer generations of products, including “pod mod” systems (e.g., JUUL) contain nicotine salts, delivering higher concentrations of nicotine with less throat irritation [1]. Nicotine is highly addictive, can harm adolescent brain development, and can prime the brain for addiction to other drugs [5]. In addition to nicotine, e-cigarette aerosol can include other harmful ingredients [5]. E-cigarettes can also include tetrahydrocannabinol (THC), the primary psychoactive ingredient in cannabis [4]. Approximately one-third of US youth e-cigarette users in 2016 reported ever using cannabis in e-cigarettes [6].

North Carolina schools are required to have a policy prohibiting tobacco product use, including e-cigarettes, on school grounds or at school-sponsored events [7]. However, media reports indicate students use e-cigarettes during school [8, 9]. A 2018 survey reported 18% of students aged 12–17 had seen JUUL used in school [10, 11]. In 2018, the US Surgeon General identified teachers as allies who can reduce youth e-cigarette use [5]. It is important to assess school staff knowledge of types, student use, and harms of e-cigarettes and to develop evidence-based interventions that staff can implement, because other than parents, teachers are the adults who most frequently interact with school-aged children. A recent national survey of teachers and administrators found that fewer than half could identify a JUUL, and that policies were difficult

Electronically published July 7, 2023.

Address correspondence to Lauren J. Tanz, 4770 Buford Hwy, MS 106-8, Atlanta, GA 30341 (ltanz@cdc.gov).

NC Med J. 2023;84(6):XXX-XXX. ©2023 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2023/84601

to enforce because e-cigarettes can be discreet in appearance, aerosol, and scent [12]. However, data are limited regarding school staff's awareness of student e-cigarette use in schools, school policies, actions taken, resources needed, and types of e-cigarettes students use. To guide North Carolina's prevention efforts and identify resources needed in schools to address e-cigarette use, we assessed these topics among school staff from a sample of 12 North Carolina high schools. Additionally, we analyzed e-cigarette products confiscated by staff from students in these schools during 2018–2019.

## **Methods**

### ***Study Population***

In May 2019, a random sample of 25 of all 451 public and charter high schools in North Carolina was invited to participate in the assessment, which consisted of an online quantitative survey, in-person semistructured qualitative interviews, and a product assessment. The 25 selected schools were identified using a random number procedure. The principal of each selected school was sent an email inviting staff to participate. Schools were classified into rural and urban areas using 2010 Rural-Urban Commuting Area (RUCA) codes from the US Department of Agriculture [13]. No incentives were offered to the schools for participation.

### ***Online Quantitative Survey***

The principal of each school emailed the survey to all full- and part-time school staff at participating high schools, including administrators, teachers, coaches, security, and janitorial staff. It consisted of 44 closed-ended questions that were pre-tested in a California-based survey. After survey completion, respondents were asked to volunteer for an in-person interview.

### ***In-Person Interviews***

We conducted three interviews per school. If at least one principal or assistant principal volunteered, one was selected; remaining interviewees for each school were randomly selected. The interviews were conducted one-on-one and lasted ~30 minutes. Interviewees provided verbal consent to allow recording of the interview. Interviewees were asked open-ended questions on the same topics assessed during the online survey to obtain more in-depth information regarding staff knowledge of student e-cigarette use behaviors and actions taken, as well as resources needed to address youth e-cigarette use in schools. For example, questions to assess resources at schools included, "What steps has your school taken to reduce students' use of e-cigarettes?" and, "What kind of training or resources on e-cigarette or vaping devices are needed to better inform school staff about this issue?" Probes were also provided for each question so the interviewer could ask follow-up questions. Interview questions were pre-tested in high school staff who participated in a California-based study. No incentives were

provided to interviewees. Interviewers were trained in qualitative interview techniques by CDC staff.

### ***Product Assessment***

Principals and assistant principals at each school were asked to provide all e-cigarette products, including devices, pods or cartridges, e-liquid bottles, and chargers, confiscated from students or found on school grounds during the 2018–2019 academic year. When schools wanted to keep products, pictures were taken. Confiscated e-cigarette products were categorized as e-cigarettes, pods or cartridges, e-liquid bottles, or other items (e.g., chargers). E-cigarettes were then categorized by brand and e-liquid bottles were categorized as flavored or not.

### ***Descriptive and Qualitative Analysis***

Results of descriptive analysis of quantitative surveys were reported as proportions for categorical variables or medians and interquartile ranges for continuous variables. Analyses of questions about actions taken by schools to prevent or reduce student e-cigarette use were restricted to the highest-level administrator (i.e., principal, or assistant principal) who responded to remove within-school clustering. Data were stratified by urban and rural location; results were similar and are presented in aggregate.

All interviews were professionally transcribed. A codebook was created containing themes using interview guide topics. Four investigators (LR, GB, CH, LD) revised the codebook and established uniformity among coders. Using standard protocols, coders independently coded the same transcripts and identified any additional codes. To reach consensus, all coders reviewed and discussed coding decisions from one transcript. Inter-rater reliability was tested through the Dedoose Training Center, which reports a pooled Cohen's kappa statistic to summarize inter-rater reliability across multiple items [14]. Twenty-two excerpts were randomly pulled from a previously coded transcript and all coders re-coded each excerpt. The pooled kappa across coders range was 0.64–0.90, indicating good to excellent agreement. Transcripts were then divided among coders and independently coded. Prominent themes and illustrative quotes across participants were identified.

### ***Ethics Considerations***

The Centers for Disease Control and Prevention reviewed this assessment for human subjects protection and it was determined to be a non-research activity. All participants provided written consent and were provided information on youth tobacco use prevention, education, and cessation after the interview.

## **Results**

### ***Participating Schools***

Of 25 schools invited, 12 schools (48%) in 11 counties geographically dispersed across North Carolina consented

to survey participation. Ten were public schools and two were public charter schools. Of these, staff from 10 participated in in-person interviews and nine schools provided confiscated e-cigarette products or allowed pictures to be taken. Based on RUCA codes, one school was in a rural area, one in small-town core, two in micropolitan area core, five in metropolitan area high commuting, and three in metropolitan area core. School size ranged from < 200 students to > 1700 students (median: 805 students).

### Online Quantitative Survey

Overall, 959 school staff were sent the quantitative survey and 599 responded (62%). Of these, 25 were excluded because they only answered demographic questions; 60 were excluded because they were staff for middle schools attached to high schools. The final analytic sample was 514 school staff from 12 schools. Median number of surveys returned by school was 48 (interquartile range [IQR]: 30–59).

Among 514 respondents, 67% were female; 34% were aged 40–49 years and 28% were aged ≥ 50 years (Table 1). Respondents worked at their current school for a median of six years (IQR: 2–12 years); most were teachers (76%). Forty (8%) reported ever personally using e-cigarettes, with 20% of those reporting past month use.

Most respondents (91%) indicated that e-cigarette use among students is somewhat (45%) or very (46%) problematic (Table 2). The majority of respondents (90%) also reported student e-cigarette use is a somewhat (43%) or high (47%) priority concern for their school administration. Overall, most respondents (86%) reported that they are somewhat (51%) or very (35%) confident in their ability to recognize e-cigarettes. Most respondents (79%) reported that e-cigarette use among students is very harmful, with none reporting that it is not at all harmful. Additionally, 86% of respondents reported that students' e-cigarette use somewhat (65%) or largely (21%) contributes to disturbances in learning.

Among 167 (33%) respondents who reported seeing students use e-cigarettes on school grounds during the 2018–2019 school year, 79% saw students use in bathrooms, 68% in parking lots or personal vehicles, and 48% in classrooms (Table 2). Among non-principal and non-assistant principal respondents (n = 155) who reported seeing students use e-cigarettes on school grounds, 83% reported some students to school administrators; 35% confiscated the e-cigarette and did not return it. Among principals and assistant principals (n = 16), 88% reported assigning out-of-school suspensions, confiscating the e-cigarette, and notifying parents/guardians. In contrast, smaller numbers of principals and assistant principals referred students to counseling (n = 3), a drug program (n = 1), or a tobacco use prevention program (n = 2).

Approximately 90% of respondents were aware that school policy prohibits e-cigarette use by students in school

**TABLE 1.**  
**Demographic Information of School Staff Survey**  
**Respondents From 12 High Schools—North Carolina, 2019**  
**(N = 514)**

Demographics	No. (%)
Sex	
Male	155 (30)
Female	344 (67)
Prefer not to answer	15 (3)
Age, yrs (n = 513)	
20–29	62 (12)
30–39	111 (22)
40–49	175 (34)
≥ 50	145 (28)
Prefer not to answer	20 (4)
Occupational information	
Years worked at current school, median (IQR)	6 (2, 12)
Current position <sup>a</sup>	
Principal or Assistant Principal	16 (3)
Teacher	391 (76)
Administrative Staff	20 (4)
School Counselor	15 (3)
Coach or Athletic Director	38 (7)
Other <sup>b</sup>	77 (15)
Staff e-cigarette use	
Ever used e-cigarettes	40 (8)
Used e-cigarettes in the past month <sup>c</sup>	8 (20)

IQR, interquartile range.

N (%) unless otherwise noted. N = 514 unless otherwise noted.

Frequencies might not add to N = 514 because of missing data.

Percentages may not add to 100% because of rounding.

<sup>a</sup>Categories are not mutually exclusive.

<sup>b</sup>Includes school paraeducators, librarians, nurses, psychologists, supervisors, security, janitorial or maintenance staff, and bus drivers.

<sup>c</sup>Among n = 40 respondents who ever used e-cigarettes.

buildings, vehicles, and on school grounds (Table 3). A similar proportion correctly reported that they knew the policy prohibits use by school staff and visitors. A lower proportion correctly reported that the school policy prohibits e-cigarette use at off-campus school-sponsored events by both students (78%) and staff and visitors (71%). Ninety percent reported that they were somewhat (51%) or very confident (39%) their school effectively enforces policy.

Based on responses from the highest-level administrator at each school (i.e., principal or assistant principal), 5 out of 11 reported increased bathroom or hallway patrol was implemented during the past 12 months. Five respondents reported that their school held informational meetings for teachers, four reported educational sessions for students and parents, and three sent an email or letter to parents. Some reported their school had installed cameras (n = 3), educational posters (n = 3), or tobacco-free school signs (n = 1), or adopted e-cigarette prevention curricula or programs (n = 1).

Although 57% of all respondents reported that prevention measures taken by their school were somewhat (52%) or very (5%) sufficient to reduce student e-cigarette use, nearly half

**TABLE 2.**  
**School Staff Perceptions and Observations of E-cigarette Use on School Grounds From 12 High Schools—North Carolina, 2019**  
**(N = 514)**

Staff perceptions of e-cigarette use	No. (%)
Use of e-cigarettes among students	
Not a problem	46 (9)
Somewhat problematic	232 (45)
Very problematic	236 (46)
Priority issue for administration (n = 513)	
Not a priority	50 (10)
Somewhat a priority	222 (43)
High priority	241 (47)
Confidence in ability to recognize e-cigarettes (n = 513)	
Not confident	72 (14)
Somewhat confident	263 (51)
Very confident	178 (35)
Harmfulness of e-cigarette use among students	
Not at all harmful	0 (0)
Moderately harmful	87 (17)
Very harmful	406 (79)
Don't know	21 (4)
E-cigarette use contribution to disturbances in learning and education (n = 505)	
Not contributing	72 (14)
Somewhat contributing	327 (65)
Largely contributing	106 (21)
Substances e-cigarettes can contain <sup>a</sup>	
Nicotine	473 (92)
Cannabis (with THC)	406 (79)
CBD oil (without THC)	404 (79)
Alcohol	51 (10)
Other	6 (1)
None	2 (0.4)
Don't know	60 (12)

(43%) reported they were insufficient (Table 3). Similarly, 34% of respondents were not confident their school had resources to prevent student e-cigarette use, and 57% were not confident their school had resources to help students quit e-cigarettes. The top resources respondents reported needing were education for parents (55%), resources to help students quit (45%), and updated curricula (38%).

In total, 74% of respondents reported being in favor of a state law to raise the minimum legal age to purchase tobacco products from 18 to 21, and 72% favored a law to ban flavored tobacco products.

### **In-Person Interviews**

Thirty-five interviews were conducted; 48% of interviewees were female, 71% were teachers, and 23% were principals or assistant principals. Interviewees worked at their current school for a median of six years (IQR: 2-12 years). Three common themes emerged: pervasiveness of e-cigarette use; varying consequences for student e-cigarette use; and absence of scientific information and educational resources concerning harms of e-cigarettes.

Interviewees reported that student e-cigarette use was common and perceived this was likely attributable to ease of access, product novelty, flavors, and marketing campaigns

designed to appeal to youth. Concerns included easy access to e-cigarettes from family, friends, and online sellers, and access to distribution networks within schools from other students. Additionally, interviewees reported that they perceived students of all social groups used e-cigarettes, and some perceived that health and safety misconceptions among students might contribute to widespread use in schools. One interviewee stated, *"I mean, every kid does it. It's not one type of kid that does it. Every kid does it."* Interviewees were concerned about the perceived increase in drug use at their schools and reported they believed students were using e-cigarette devices for cannabis in addition to nicotine: *"Kids got pods with THC in it and...they are high as a kite."*

Principals and assistant principals were more knowledgeable about tobacco policies than most teachers and other respondents. Additionally, teachers and other respondents were often unaware of disciplinary processes that occurred after reporting students who used or possessed e-cigarettes. Teachers were adamant they should not be the ones searching students thought to be in possession of e-cigarettes, whereas principals, assistant principals, and school security openly discussed searching students for e-cigarettes. Interviewees described varying enforcement, both between and within schools, ranging from one day in-

TABLE 2 CONTINUED.

Staff who observed students' use of e-cigarettes on school grounds during the 2018-2019 school year	No. (%)
Location of students seen using e-cigarettes (n = 167) <sup>a</sup>	
Bathrooms	132 (79)
Parking lots or personal vehicles	113 (68)
Classrooms	80 (48)
Hallways	58 (35)
Locker rooms	44 (26)
Sidewalks	43 (26)
Sports fields	34 (20)
School vehicles	32 (19)
Cafeteria	11 (7)
Other	2 (1)
Actions staff reported taking after observing students using e-cigarettes on school grounds	No. = 155 <sup>ab</sup> (%)
Reported student to school administration	128 (83)
Confiscated e-cigarette and did not return it	54 (35)
Gave student verbal warning	31 (20)
Notified parent or guardian	13 (8)
Assigned detention	4 (3)
Took no action	5 (3)
Confiscated the e-cigarette and returned it to student at end of class or day	2 (1)
Other	4 (3)
Actions principals and assistant principals reported taking when students were seen using e-cigarettes on school grounds <sup>a</sup>	No. = 16 (%)
Confiscated e-cigarette and did not return it	14 (88)
Notified parent or guardian	14 (88)
Assigned out-of-school suspension	14 (88)
Assigned in-school suspension	10 (63)
Gave student verbal warning	3 (19)
Referred to law enforcement	3 (19)
Referred to counseling	3 (19)
Referred to a tobacco use prevention program	2 (13)
Referred to a drug program	1 (6)
Assigned detention	1 (6)

THC, tetrahydrocannabinol.

N (%) unless otherwise noted. N = 514 unless otherwise noted. Frequencies might not add to N = 514 because of missing data. Percentages might not add to 100% because of rounding.

<sup>a</sup>Categories are not mutually exclusive.<sup>b</sup>Does not include administrators (i.e., principals and assistant principals).

school suspension to a mandatory five-day out-of-school suspension: *"There's a protocol for the school, but I think some teachers handle it differently."* Several interviewees noted the ineffectiveness of enforcement and advocated harsher punishments, whereas others reported need for increased student counseling and cessation resources: *"It [current disciplinary action] does not change their behaviors; we know that. So, we're trying to figure out what else we can do."*

Most interviewees reported that their schools' efforts to reduce youth e-cigarette use were insufficient. They believed the constantly changing design (i.e., ability to conceal devices), limited effectiveness of disciplinary actions, and lack of parent support make it difficult to reduce e-cigarette use in schools. Most wanted more information for staff, students, and parents on immediate and long-term health impacts, including information from experts or youth who have suffered health consequences from e-cigarette use. One interviewee stated, *"The kind of thing that in my opinion would make a huge impact on kids, is to hear other kids and what they've gone through, what it has cost them."*

### Product Assessment

In total, 336 e-cigarette products were collected from nine schools (Figure 1). This comprised 176 e-cigarettes, 96 pods or cartridges, 27 e-liquid bottles, and 36 other items (e.g., chargers). Approximately half (48%) of e-cigarettes collected were JUUL brand, 16% were SMOK, and 9% were Suorin. Among 27 e-liquid bottles, only two brands appeared more than once. Based on name, 65% of e-liquid bottles were labeled as sweet or fruit flavored.

### Discussion

Findings from the online survey, in-person interviews, and product assessment suggest that e-cigarette use on school grounds is common in 12 North Carolina schools despite presence of a statewide tobacco-free-schools policy [7]. Overall, school staff felt underresourced to prevent youth e-cigarette use.

The discreet design of pod mods, product novelty, flavors, marketing campaigns that appeal to youth, and ease of access likely contribute to e-cigarette use among students



**TABLE 3.**

**School Staff's Knowledge and Perceptions of Tobacco-Free School Policy, Measures Taken, and Resources Needed to Prevent or Reduce Students' Use of E-cigarettes From 12 High Schools—North Carolina, 2019 (N = 514)**

<b>Tobacco-free school policy</b>	<b>No. (%)</b>
Knowledge of location where school policy prohibits use of e-cigarettes by students <sup>a</sup>	
In school buildings (n = 490)	461 (94)
Outside on school grounds (n = 489)	438 (90)
On school buses or other vehicles used to transport students (n = 491)	450 (92)
At off-campus school-sponsored events (n = 490)	380 (78)
Knowledge of location where school policy prohibits use of e-cigarettes by staff and visitors <sup>a</sup>	
In school buildings (n = 490)	449 (92)
Outside on school grounds (n = 490)	422 (86)
On school buses or other vehicles used to transport students (n = 492)	441 (90)
At off-campus school-sponsored events (n = 488)	346 (71)
Confidence that your school effectively enforces the tobacco-free policy for e-cigarettes (n = 489)	
Not confident	50 (10)
Somewhat confident	247 (51)
Very confident	192 (39)
<b>Measures taken to prevent or reduce students' use of e-cigarettes</b>	<b>No. (%)</b>
Measures school has taken in the past 12 months as reported by highest level administrator (n = 11) <sup>a,b</sup>	
Increased hallway or bathroom patrol	5 (45)
Held informational meeting for teachers	5 (45)
Held informational meeting for parents or guardians	4 (36)
Held educational session for students	4 (36)
Sent email or letter to parents or guardians	3 (27)
Installed cameras	3 (27)
Put up educational posters	3 (27)
Installed new Tobacco-Free School signs	1 (9)
Adopted new youth e-cigarette prevention curriculum or program	1 (9)
Installed sensors to detect e-cigarette aerosol	0 (0)
None	1 (9)
Perception that measures are sufficient to reduce students' use of e-cigarettes (n = 481)	
Not sufficient	208 (43)
Somewhat sufficient	248 (52)
Very sufficient	25 (5)
<b>School resources to prevent or reduce students' use of e-cigarettes</b>	<b>No. (%)</b>
Confidence that your school has the resources to prevent use of e-cigarettes in students (n = 484)	
Not confident	164 (34)
Somewhat confident	275 (57)
Very confident	45 (9)
Confidence that your school has the resources to help students who are addicted to using e-cigarettes quit (n = 483)	
Not confident	276 (57)
Somewhat confident	179 (37)
Very confident	28 (6)
Top resources needed to help reduce use of e-cigarettes <sup>a</sup>	
Education for parents	285 (55)
Resources to help students addicted to nicotine	233 (45)
Updated health curriculum	193 (38)
<b>Favorability of potential tobacco laws</b>	<b>No. (%)</b>
In favor of an effective law to raise the minimum legal age to purchase tobacco products in North Carolina from age 18 to age 21 (n = 484)	
Yes	357 (74)
No	79 (16)
Don't know	48 (10)
In favor of a law to ban flavors that are added to tobacco products, such as e-liquids or vaping products, in North Carolina (n = 484)	
Yes	350 (72)
No	72 (15)
Don't know	62 (13)

N (%) unless otherwise noted. N = 514 unless otherwise noted. Frequencies might not add to 514 because of missing data. Percentages might not add to 100% because of rounding.

<sup>a</sup>Categories are not mutually exclusive

<sup>b</sup>Highest level administrator is a principal or assistant principal

[1, 16-18]. The products confiscated consisted of primarily pod mods and flavored e-liquid bottles. Pod mods typically contain nicotine salts, which can be inhaled at higher quantities with less throat irritation than freebase nicotine used in older e-cigarettes [1]. Pod mods are also easily concealable, making them appealing to youth, difficult for teachers to identify, and easier to use in school [19-22].

Surveyed and interviewed respondents stated that increased patrol in hallways and bathrooms and informational meetings for teachers, parents or guardians, and students were the most common measures taken to address student e-cigarette use. Additionally, in-school or out-of-school suspensions were the most frequently reported disciplinary actions; referrals to counseling or tobacco or drug use prevention programs were less common. However, respondents reported that the prevention and disciplinary measures were insufficient deterrents for students to reduce e-cigarette use. Similar to other research, educators in this study reported that the discreet appearance of e-cigarettes makes it difficult to enforce the policy [12]. However, respondents were also confident that their school effectively enforces the policy. This may indicate that the perception of policy success and effective enforcement is influenced by knowledge of emerging e-cigarette products and shifts in use patterns. Moreover, our study reported that school staff perceive that parental knowledge about dangers of e-cigarette use is insufficient. Finally, some respondents believed that suspension failed to address nicotine dependence or addiction. E-cigarettes can deliver high concentrations of nicotine, which is highly addictive [5]. Thus, students with nicotine dependency may benefit from cessation interven-

tions to assist them in quitting e-cigarette use. Furthermore, interviews revealed that knowledge of schoolwide tobacco policy and disciplinary action differed among respondents. Although some respondents expressed need for harsher punishments, others voiced need for counseling or cessation treatment for students who used e-cigarettes.

Approximately one-third of respondents were not confident their school had sufficient resources to prevent e-cigarette use among students. Education for parents was the perceived need most reported by respondents. During interviews, respondents reported that information specifically on immediate and long-term health effects of e-cigarettes is crucial for parents. In a survey of US parents of middle and high-school students, 74% reported receiving no communication from their school regarding e-cigarettes [23]. The Surgeon General concluded that coordinated, multicomponent interventions that combine school-based policies and programs along with other population-based strategies (e.g., price increases, mass media campaigns, and smoke-free policies) are effective in reducing initiation, prevalence, and intensity of smoking among youth; these approaches have also been recommended to address youth e-cigarette use [5]. School staff also reported that highlighting real stories from youth within schools might help reduce and prevent e-cigarette use. In North Carolina, one local teenager who overcame addiction to e-cigarettes has shared his story at multiple North Carolina schools [24-26]. Because parents have also been identified as key allies by the Surgeon General in addressing youth e-cigarette use [5], a promising strategy for schools might be to prioritize distribution of information to parents on harms of e-cigarette use.

**FIGURE 1.**  
E-cigarettes and E-cigarette Products Collected From Nine North Carolina High Schools During the 2018-2019 Academic Year



Source. Tanz LJ.

In addition to the need for school resources to prevent use, approximately half of staff reported needing additional resources to help students quit e-cigarettes. There is limited evidence for effective clinical treatments for youth tobacco cessation, though there are promising interventions, including behavioral interventions [27, 28]. Increasing school staff awareness of cessation resources for youth, including state quitlines and evidence-based school curricula, is also important [29, 30]. Additionally, the high proportion of school staff who supported raising the minimum age to purchase tobacco products from 18 to 21 and favored a law to ban flavored tobacco products indicates substantial support for legal measures that may prevent youth tobacco use.

This study is the first in North Carolina, and among the first nationally, to assess school staff's awareness of students' e-cigarette use, responses, and resources needed by schools to address use. Nonetheless, the study is subject to limitations. First, only 12 public high schools participated, and these schools might not be representative of all North Carolina high schools. However, participating schools were geographically diverse and in urban and rural locations. Second, quantitative surveys were not collected from all staff at participating schools and the number of surveys received differed by school; however, the response rate was 62%, both urban and rural schools submitted a similar number of surveys with a median of 48 surveys, and different staff positions were represented. Third, e-cigarette products collected by schools might not be representative of all devices used by students. However, literature suggests pod mods and flavored products are popular among youth, consistent with products confiscated [2, 20]. Finally, data were not collected from students or parents.

This study underscores the significant burden of e-cigarette use on schools, school staff, and youth. Efforts are warranted to incorporate evidence-based curricula; educate staff, parents, and youth regarding health risks; and help youth quit e-cigarettes. Such efforts may occur as part of a comprehensive approach alongside population-based interventions implemented by local and state health departments. This includes ensuring that smoke-free and tobacco-free policies include e-cigarettes and are enforced; increasing price of all tobacco products; restricting young persons' access to e-cigarettes in retail settings; licensing retailers; developing youth-targeted anti-tobacco public education campaigns that include e-cigarettes; and enforcing policies that raise the minimum age of purchase to 21 [1, 4, 16, 31, 32]. NCMJ

**Lauren J. Tanz, ScD** Epidemic Intelligence Service officer, Epidemic Intelligence Service, Division of Scientific Education and Professional Development, Centers for Disease Control and Prevention, Atlanta, Georgia; Epidemic Intelligence Service officer, Division of Public Health, North Carolina Department of Health and Human Services, Raleigh, North Carolina.

**Courtney Heck, MPH** director of surveillance and evaluation, Division of Public Health, North Carolina Department of Health and Human Services, Raleigh, North Carolina.

**Carolyn T. A. Herzig, PhD** Epidemic Intelligence Service officer, Epidemic

Intelligence Service, Division of Scientific Education and Professional Development, Centers for Disease Control and Prevention, Atlanta, Georgia; Epidemic Intelligence Service officer, Division of Public Health, North Carolina Department of Health and Human Services, Raleigh, North Carolina.

**Leah M. Ranney, PhD** research associate professor, Department of Family Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

**Sally Herndon, MPH** head, Tobacco Prevention and Control Branch, Division of Public Health, North Carolina Department of Health and Human Services, Raleigh, North Carolina.

**Jim Martin, MS** director of policy and programs, Tobacco Prevention and Control Branch, Division of Public Health, North Carolina Department of Health and Human Services, Raleigh, North Carolina.

**Marisa Hast, PhD** epidemiologist, Epidemic Intelligence Service, Division of Scientific Education and Professional Development, Centers for Disease Control and Prevention, Atlanta, Georgia.

**Eileen McGowan, MPA** public health analyst, Center for Surveillance, Epidemiology, and Laboratory Sciences, Centers for Disease Control and Prevention, Atlanta, Georgia.

**Guido Baler** undergraduate researcher, Department of Family Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina.

**Mays Shamout, MD** Epidemic Intelligence Service officer, Epidemic Intelligence Service, Division of Scientific Education and Professional Development, Centers for Disease Control and Prevention, Atlanta, Georgia.

**Brian A. King, PhD** director, Center for Tobacco Products, U.S. Food and Drug Administration, Atlanta, Georgia.

**Michael A. Tynan, MPH** policy team lead, Office of Smoking and Health, Centers for Disease Control and Prevention, Atlanta, Georgia.

**Susan M. Kansagra, MD, MBA** state health officer/assistant secretary for public health, Division of Public Health, North Carolina Department of Health and Human Services, Raleigh, North Carolina.

## Acknowledgments

Disclosure of interests. No interests were disclosed.

## References

1. *Surgeon General's Advisory on E-cigarette Use Among Youth*. Published 2018. Accessed January 17, 2021. <https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf>
2. Wang TW, Neff LJ, Park-Lee E, Ren C, Cullen KA, King BA. E-cigarette use among middle and high school students — United States, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(37):1310-1312. doi: <http://dx.doi.org/10.15585/mmwr.mm6937e1>
3. *Evidence-based Tobacco Use Prevention and Cessation Resources for Schools to Address the E-cigarette Epidemic Among Youth*. Tobacco Prevention and Control Branch, North Carolina Department of Health and Human Services. Published 2020. Accessed January 6, 2022. [https://tobaccopreventionandcontrol.dph.ncdhs.gov/youth/Documents/E-cigEpidemic\\_Factsheet-WEB.pdf](https://tobaccopreventionandcontrol.dph.ncdhs.gov/youth/Documents/E-cigEpidemic_Factsheet-WEB.pdf)
4. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. *Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General*. Centers for Disease Control and Prevention; 2012.
5. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. *E-Cigarette Use Among Youth and Young Adults: A Report of the Surgeon General*. Centers for Disease Control and Prevention; 2016.
6. Trivers KF, Phillips E, Gentzke AS, Tynan MA, Neff LJ. Prevalence of cannabis use in electronic cigarettes among US youth. *JAMA Pediatr*. 2018;172(11):1097-1099. doi: 10.1001/jamapediatrics.2018.1920
7. N. C. Stat § 115C-407. Policy prohibiting tobacco use in school buildings, grounds, and at school-sponsored events (2008).
8. Zernike K. 'I Can't Stop': Schools Struggle With Vaping Explosion. *The New York Times*. Published April 2, 2018. Accessed January 17, 2021. <https://www.nytimes.com/2018/04/02/health/vaping-e-cigarettes-addiction-teen.html>
9. Hui TK. Wake has had more than 1000% increase in student e-cig use. What's the response? *The News & Observer*. Published December 3, 2019. Accessed January 17, 2021. <https://www.newsobserver.com>



- com/news/local/education/article237957469.html
10. Truth Initiative. Nearly 1 in 5 youth say they have seen JUUL used in school. Published May 23, 2018. Accessed January 17, 2021. <https://truthinitiative.org/research-resources/emerging-tobacco-products/nearly-1-5-youth-say-they-have-seen-juul-used-school>
  11. King BA, Gammon DG, Marynak KL, Rogers T. Electronic cigarette sales in the United States, 2013–2017. *JAMA*. 2018;320(13):1379–1380. doi: 10.1001/jama.2018.10488
  12. Schillo BA, Cuccia AF, Patel M, et al. JUUL in school: teacher and administrator awareness and policies of e-cigarettes and JUUL in U.S. middle and high schools. *Health Promot Pract*. 2020;21(1):20–24. doi: 10.1177/1524839919868222
  13. Rural-Urban Commuting Area Codes. U.S. Department of Agriculture, Economic Research Service. Updated March 22, 2023. Accessed January 17, 2021. <https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx>
  14. Cohen J. A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*. 1960;20(1):37–46. <https://doi.org/10.1177/001316446002000104>
  15. Miles MB, Huberman AM. *Qualitative Data Analysis: An Expanded Sourcebook*. 2nd ed. Sage; 1994.
  16. Gentzke AS, Creamer M, Cullen KA, et al. Vital signs: tobacco product use among middle and high school students — United States, 2011–2018. *MMWR Morb Mortal Wkly Rep*. 2019;68(6):157–164. doi: 10.15585/mmwr.mm6806e1
  17. Tsai J, Walton K, Coleman BN, et al. Reasons for electronic cigarette use among middle and high school students—National Youth Tobacco Survey, United States, 2016. *MMWR Morb Mortal Wkly Rep*. 2018;67(6):196–200. doi: 10.15585/mmwr.mm6706a5
  18. 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. *MMWR Morb Mortal Wkly Rep*. 2018;67(10):294–299. doi: 10.15585/mmwr.mm6710a3
  19. Office on Smoking and Health. *E-cigarette, or Vaping, Products Visual Dictionary*. Centers for Disease Control and Prevention. Published 2019. Accessed January 17, 2021. [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/pdfs/ecigarette-or-vaping-products-visual-dictionary-508.pdf](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/pdfs/ecigarette-or-vaping-products-visual-dictionary-508.pdf)
  20. Barrington-Trimis JL, Leventhal AM. Adolescents' use of "pod mod" e-cigarettes - urgent concerns. *N Engl J Med*. 2018;379(12):1099–1102. doi: 10.1056/NEJMp1805758
  21. Galstyan E, Galimov A, Sussman S. Commentary: the emergence of pod mods at vape shops. *Eval Health Prof*. 2019;42(1):118–124. doi: 10.1177/0163278718812976
  22. Kavuluru R, Han S, Hahn EJ. On the popularity of the USB flash drive-shaped electronic cigarette Juul. *Tob Control*. 2019;28(1):110–112. doi: 10.1136/tobaccocontrol-2018-054259
  23. Patel M, Czaplicki L, Perks SN, et al. Parents' awareness and perceptions of JUUL and other e-cigarettes. *Am J Prev Med*. 2019;57(5):695–699. doi: 10.1016/j.amepre.2019.06.012
  24. Kennedy D. IN SESSION: Once-addicted teen shares vaping story in Dare County. 13 News Now. Published February 3, 2020. Accessed January 17, 2021. <https://www.13newsnow.com/article/entertainment/television/programs/daybreak/in-session-once-addicted-teen-shares-vaping-story-in-dare-county/291-04a2a708-ad97-4b63-a871-b1c9ab571cb4>
  25. Hennessey M. High Point 16-year-old turns JUUL addiction into anti-use advocacy. Fox 8. Published June 25, 2019. Accessed January 17, 2021. <https://myfox8.com/news/high-point-16-year-old-turns-juul-addiction-into-anti-use-advocacy/>
  26. Nolan C. North Carolina Teen Spends Nearly 40 Days in Rehab Because of Vaping: 'His Life Was Dependent on It'. Inside Edition. Published September 15, 2019. Accessed January 17, 2021. <https://www.insideedition.com/north-carolina-teen-spends-nearly-40-days-in-rehab-because-of-vaping-his-life-was-dependent-on-it>
  27. US Preventive Services Task Force, Owens DK, Davidson KW, et al. Primary care interventions for prevention and cessation of tobacco use in children and adolescents: US Preventive Services Task Force recommendation statement. *JAMA*. 2020;323(16):1590–1598. doi: 10.1001/jama.2020.4679
  28. Farber HJ, Walley SC, Groner JA, Nelson KE; Section on Tobacco Control. Clinical practice policy to protect children from tobacco, nicotine, and tobacco smoke. *Pediatrics*. 2015;136(5):1008–1017. doi: 10.1542/peds.2015-3108
  29. Cummins SE, Bailey L, Campbell S, Koon-Kirby C, Zhu S-H. Tobacco cessation quitlines in North America: a descriptive study. *Tob Control*. 2007;16(Suppl 1):i9–i15. doi: 10.1136/tc.2007.020370
  30. CATCH Global Foundation. E-Cigarette Prevention. Accessed January 17, 2021. <https://catchinfo.org/modules/e-cigarettes/>
  31. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. Centers for Disease Control and Prevention.
  32. U.S. National Cancer Institute and World Health Organization. *The Economics of Tobacco and Tobacco Control*. National Cancer Institute Tobacco Control Monograph 21. NIH Publication No. 16-CA-8029A. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute; and Geneva, CH: World Health Organization; 2016.