School Personnel's Responses to School-based Vaping Prevention Program: A Qualitative Study

Hongying Dai, PhD
Athena Ramos, PhD
Niran Tamrakar, MA
Marshall Cheney, PhD
Kaeli Samson, MA, MPH
Brandon Grimm, PhD

Objective: In this qualitative study, we sought to assess 3 topics of interest: (1) current status of vaping and school-based prevention; (2) school personnel's perceptions of vaping; and (3) challenges in implementing school-based vaping prevention programs. **Methods:** We conducted 5 focus groups using a semi-structured interview guide during October through December 2019. School personnel (eg, principals, teachers [N = 32]) from 30 middle and high schools were recruited across diverse regions in Nebraska. **Results:** Eight themes arose from the thematic analysis in 3 topic areas. School personnel attributed student vaping to easy access, low perception of harm, addiction, and proliferation of stealthy products for concealed use. Whereas schools showed strong support for addressing youth vaping on school grounds, few schools had adopted a comprehensive e-cigarette prevention and cessation program. The top challenges to current school-based vaping prevention programs include lack of time, knowledge, and coordinated efforts. Participants also recognized the significance of parental engagement in the prevention effort. **Conclusions:** There is a considerable variation in school policies and actions to address youth vaping. An evidence-based youth vaping program that involves schools, parents, students, and communities needs to be developed and disseminated in school settings.

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Electronic nicotine delivery systems (ENDS), also called e-cigarettes or vapes, are vaping devices that produce an aerosolized mixture containing flavored liquids and nicotine that users inhale. Although the cigarette smoking rate among youth has been declining,[1,2] the prevalence of current e-cigarette use increased dramatically during 2017-2019.[2-4] In 2019, more than 1 in 4 students in 12th grade and more than 1 in 5 students in 10th grade reported using e-cigarettes during the past 30 days.[3] E-cigarette aerosol contains varying levels of nicotine and several potentially toxic substances.[5] Exposure to the secondhand aerosol of e-cigarettes among middle and high school students significantly increased from 25.6% in 2017 to 33.2% in 2018 after being stable from 2015 to 2017.[6] Youth use of e-cigarettes also may serve as a gateway to cigarette smoking, marijuana, and other substance use.[7,8]

School is an important setting to educate youth and prevent substance use since students in the United States (US) typically spend an average of 6.6 hours in school during school days.[9] The

Hongying Dai, Professor, College of Public Health, University of Nebraska Medical Center, Omaha, NE, United States. Athena Ramos, Assistant Professor, College of Public Health, University of Nebraska Medical Center, Omaha, NE, United States. Niran Tamrakar, Graduate Student, College of Public Health, University of Nebraska Medical Center, Omaha, NE, United States. Marshall Cheney, Associate Professor, Department of Health and Exercise Science, University of Oklahoma, Norman, OK, United States. Kaeli Samson, Biostatistician, College of Public Health, University of Nebraska Medical Center, Omaha, NE, United States. Brandon Grimm, Associate Professor, College of Public Health, University of Nebraska Medical Center, Omaha, NE, United States.
Correspondence Dr Dai; daisy.dai@unmc.edu

US Centers for Disease Control and Prevention (CDC) has developed guidelines for school health programs to prevent tobacco use and addiction,[10] and the Substance Abuse and Mental Health Services Administration (SAMHSA) has provided an evidence-based resource guide to reduce vaping among adolescents and young adults.[11] Public health departments and other nonprofits have started to develop vaping prevention programs for youth. A pilot study of an e-cigarette prevention program ("CATCH My Breath") has shown positive effects in improving youth knowledge on vaping and preventing e-cigarette use among Texas middle school students.[12] The US Food and Drug Administration (FDA) has included e-cigarettes in the "The Real Cost" campaign to educate youth that e-cigarettes, just like traditional cigarettes, put them at risk for addiction.[13] The Stanford Tobacco Prevention Toolkit also provides lecture-based materials on e-cigarette use.[14] The Public Health Law Center, along with other collaborators, also developed tobacco-free and vaping-free policies for the K-12 school environment.[15] One study found a positive impact of school policies on curbing student e-cigarette use behaviors among schools with robust policy implementation.[16]

Recently, pod-mod style e-cigarette products, such as JUUL, have gained popularity among youth. These products closely resemble a USB flash drive with high nicotine concentration levels and nicotine salts for a palatable and smooth taste.[17] A national study suggests that students use e-cigarettes in school hallways, bathrooms, staircases, and classrooms.[18] Previous studies have demonstrated the effectiveness of school-based programs in preventing substance abuse among youths. However, several challenges remain in program development and implementation for emerging substance use.[19] There is also little evidence of schools' responses to the surge of vaping among students.[20,21] In this study, we investigated 3 topics related to vaping prevention programs in schools: (1) current status of vaping and school-based prevention; (2) school personnel's perceptions of vaping; and (3) challenges in implementing school-based vaping prevention programs.

METHODS

For this qualitative study, we used focus groups to solicit input about youth vaping and school-based vaping prevention. School principals, health educators, nurses, counselors, and social workers from middle and high schools across diverse regions of Nebraska were invited to participate in the focus group study. We recruited participants via email and invited them to a focus group nearest to their schools. First, we sent 350 invitation and referral emails to a convenience sample of school personnel obtained from the Nebraska Department of Education website. Second, up to 2 email reminders were sent to non-respondents. We used a snowball sampling method to recruit study participants who were most likely to be involved with school-based youth vaping prevention. We further purposively recruited participants to ensure schools with varying characteristics (eg, public vs private, rural vs urban, Table 1). To avoid duplicating responses from the same school, most study participants were from different schools.

Focus Group Procedure

Focus groups were held between October and December 2019 with a median size of 6 participants, and each group session lasted 60-90 minutes. Purposive grouping by school level led to 3 focus groups of high school (HS) personnel and 2 groups of personnel from middle schools (MS) or MS/HS combined. Before the focus group, written informed consent was obtained from each participant, and participants were also asked to complete a questionnaire regarding their knowledge of e-cigarettes and information on their schools' e-cigarette programs and policies. All focus groups were led by experienced facilitators using a semi-structured discussion guide. Each focus group began with a warm-up discussion about e-cigarette use among youth. Then, the moderator elicited debates on the issues related to the key constructs of interest (Appendix A). A member of the research team took notes and summarized the key talking points and reflections after every focus group to improve data collection reliability. All focus groups and materials were in English, and participants were compensated with a $25 gift card for their time.

Data Analysis

All focus groups were audio-recorded, transcribed by an independent transcriptionist, and

Table 1
Characteristics of Focus Group Participants

School Personnel Occupation	N (%)
Administrator[a]	9 (28.1%)
Counselor	8 (25.0%)
Nurse	3 (9.4%)
Social worker	5 (15.6%)
Teacher	7 (21.9%)
School Grade Levels	
HS	16 (53.3%)
MS	3 (10.0%)
MS/HS	11 (36.7%)
School Type	
Private	9 (30.0%)
Public	21 (70.0%)
School Locale	
Rural	7 (23.3%)
Urban[b]	23 (76.7%)
	Median (Interquartile range)
School Size (# of students)	376 (273-1045)
Student/Teacher Ratio	14 (12.0-16.2)
Percentage of free lunch provided	27% (23.0-29.3)

Note.
Abbreviations: HS: High School; MS: Middle School.
[a] Administrators include principals, assistant principals, and deans of students.
[b] Schools in urban areas are located in diverse geo graphic regions, including city, suburban, and town.

checked for accuracy. The research team developed an initial codebook. Two coders (DH and NT) read all the transcripts, coded 2 transcripts together, and modified the codebook. Then they coded the remaining coding independently, reviewed and resolved any coding discrepancies. A second coding pass was conducted to incorporate emergent concepts. The dualistic method of inductive and deductive thematic analysis was performed using NVivo 12.[22] Team members independently identified themes and then refined themes through group discussion.[23] The research team then reviewed the transcripts for confirming and disconfirming evidence of themes.[23] Saturation was reached as the last 2 focus groups did not generate substantial new information.[24] Finally, the results were reviewed by another team member (CM) who did not participate in the thematic analysis. We summarized the key themes and divergent points of view by following the Consolidated criteria for reporting qualitative research (COREQ) (Appendix B).[25]

RESULTS

Overall, 32 school personnel with a wide range of occupations attended 5 focus groups, including 7 teachers (21.9%), 9 administrators (28,1%), 3 nurses (9.4%), 8 counselors (25%), and 5 social workers (15.6%). These individuals worked in 30 schools from 20 school districts. A variety of schools, including 3 middle schools, 11 middle/high schools, and 16 high schools, participated this study. As Table 1 shows, 21 schools (70%) were public schools, and 9 (30%) were private schools. Participants were from diverse geographies, with 7 participants (23.3%) from rural areas and 23 (76.7%) from urban areas. The median school size was 376 students.

Thematic analysis of the focus group data revealed 8 themes addressing 3 topics of interest. These topics were used as overarching categories to organize and report themes (Appendix A).

Topic 1: Current Status of Vaping and School-based Prevention

Table 2 presents themes pertained to the first topic and representative quotes.

Theme 1 – youth vaping is prevalent in school. This theme refers to how school personnel perceived the current rise of vaping behavior among students. Focus group participants expressed their concern about the high prevalence of e-cigarette use among students and used the term "epidemic" to describe the current vaping situation in their schools. They discussed some challenges related to youth vaping (eg, "*hard to catch students due to concealed design of e-cigarette devices*") and voiced the urgency to prevent youth vaping ("*right now*").

The bathroom was mentioned by several focus group participants as a common location for students to use e-cigarettes. Due to the stealth design

Table 2
School-based Vaping Prevention and Cessation: Current Situation, Mode of Delivery, and School Policy

Theme	Code	Example Quotes (F.G. – Focus group)
Youth vaping is prevalent in school.	**High prevalence**	"*And I feel like it's an epidemic We're just slow to catch onto because it's happening-- it's been happening, but it's just getting bigger.*" (F.G. 5) "*In my office that (confiscated vaping products) probably weighs fifty pounds.*" (F.G. 1)
	Challenge and urgency	"*It's just that we haven't been smart enough to catch them.*" (F.G. 5) "*we only have a 3-minute passing period. But I still think that they can do (vape) it.*" (F.G. 5) "*We need to make those changes of nicotine or nicotine delivery devices because right now that'd be a loop-- that'd be kind of a loophole in ours. But this isn't tobacco. This is nicotine.*" (F.G. 5)
	Location of vaping	"*Because we know a lot of them are selling hits off of it, they're going to the bathroom, they're hiding it in their bras, in their underwear, they're selling to another student however so much a hit. It's not like we're a real dirty school but I think it's pretty common.*" (F.G. 2) "*And, as a school, it's, it's hard because they are so easy to hide, so you've got kids doing it in crowds at football and basketball games. You've got a kid who's hiding it in his sleeve and doing it just down the hallway or in class. I mean, it's, yeah. So it's everywhere.*" (F.G. 3)
	Other substances that could be used (eg, THC) in vapes	"*And now that they have the THC oil, "well it's legal in other places it's not harmful'*"" (F.G. 2)
Schools are interested in vaping prevention and cessation, but formal programs are limited.	**Sporadic lectures**	"*We cover it second semester but we do not do any school-wide formalized program.*" (F.G. 2) "*We have a little bit in our health curriculum but it's not enough I mean it's a week unit on marijuana, smoking, everything. It's probably not tailored specifically towards e-cigs.*" (F.G. 1)
	Lack of comprehensive programs	"*As far as an organized program, no. It's pretty much up to me in the curriculum.*" (F.G. 5) "*We really don't have a prevention program. Up until last year, we really didn't have anything. This is only my second year doing health, and I kind of got thrown into it. I found out late July 2 summers ago, "You're teaching health this year." And I was like, "Okay." And I said, "Do I have materials?" And the Principal said, "No, figure it out.*"" (F.G. 5)
	Support from school	*"Anything that I want to bring in such as attending this is very highly supported, I feel very supported in anything that I want to bring in." (F.G. 5)*
	Other substance and behavioral education	"*Our science teachers also address addiction, etc. But it's not specific to tobacco. It's substance abuse in general.*" (F.G. 3) "*And also with different teachers our 7th-grade curriculum in health has kind of moved around, and I don't think they specifically cover the vaping or nicotine use necessarily. A lot of that focus is on the bullying, healthy relationships, those parts of the health curriculum, making good decisions and risk-taking, which would be involved in.*" (F.G. 5)

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Table 2 *(cont)*
School-based Vaping Prevention and Cessation:
Current Situation, Mode of Delivery, and School Policy

Theme	Code	Example Quotes (F.G. – Focus group)
Vaping information is delivered through various channels based on school capacity.	**In-class/invited free speakers**	"*We have different speakers who will come in or different topics of interest. So we talk about vaping. We talk about e-cigarettes. We talk about tobacco use, alcohol use. I mean, we talk about all of that within the health curriculum - 6th, 7th, and 8th grade*" (F.G. 5) "*They have a program in the elementary school they touch on a little bit in fifth and sixth grade through their curriculum as well, but nothing good. I mean it needs to be something better*" (F.G. 2)
	Online/social media	"*We send some pictures of ones that we recently confiscated so parents can kind of have an idea how small they are, what we're facing*" (F.G. 1) "*We send that to kids as well so kids and parents get the email, that's really our mode of communication.*" (F.G. 1)
	Personal conversation	"*I talk to them personally, I talk to them personally a lot. Especially obviously the ones that I know that are doing it or the ones that get caught I mean I personally talk to them*" (F.G. 2) "*And then we should have some maybe one-on-one conversations with parents. At least they would all be there, and that would be a meeting of a forum, to try and get that information out there,*" (F.G. 3)
	Mass presentations	"*So we'd have the whole week so we'd have usually at least 2 sessions. So all the freshmen would come to the auditorium so they'd miss classes for it but it was done well and it had a pretty wide scope.*" (F.G. 1) "*Each year though there was a week where they pull out a class and do visitations about, I feel like it was I don't even remember the order but one was on vaping, one was on marijuana use, one was on other narcotics, one was on alcohol but it was very well thought out and the speakers they brought it were established people,*" (FG 2)
	Posters and signs	"*Our senate group just asked me today if they could put signs up all throughout the bathrooms. You know obviously all the students go so that's part of their effort and as I mentioned earlier we're just starting, we're at the very beginning stages to address.*" (F.G. 2) "*Well, just recently, the local hospital gave us a big poster.... We had it for a week or 2, but I mean, we're talking about a 8-foot-high poster that goes in the library temporarily. And the kids almost couldn't help but look at it. And that's way better than just a brochure they're going to ignore anyway.*" (F.G. 3)
	Student-led initiatives	"*We're just beginning a program with our SADD group. Students Against Destructive Decisions, it's a national group. And we're thinking, we're starting with the students trying to get the message out. As we all know, they listen to their peers much more than they listen to adults. So our students actually this week are starting an anti-vaping push so that's where we are right now*" (F.G. 1) "*I was just thinking about our media group. We have a group of kids that're in media and I think they would fly with this.*" (F.G. 2)
School e-cigarette policies and disciplinary actions are inconsistent.	**Inform parents**	"*You have to call parents sometimes.*" (F.G. 2) "*First offense is take it away, call their parents,*" (F.G. 1) "*....and the second offense, I think it's more parents are notified.*" (F.G. 4)

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School-based Vaping Prevention and Cessation: Current Situation, Mode of Delivery, and School Policy

Theme	Code	Example Quotes (F.G. – Focus group)
School e-cigarette policies and disciplinary actions are inconsistent.	**Light/moderate penalty**	"*We would confiscate it obviously, as they were with smoking.*" (F.G. 2) "*There's a 3 offense step. So the first offense it stays within the counseling department, meaning the other counselors and the parents are notified and we have a meeting, the family handles it as a family issue.*" (F.G. 2) "*There's a fee if you get caught. I don't know what the first is. It can up $75 where a public school doesn't have that option to charge them.*" (F.G. 5)
	Severe penalty	*"Yeah, at our school the first time they're caught, it's a 2-day suspension, out-of-school suspension. If they're caught a second time, it's a 3-day suspension. If they're caught a third time, it's a 5-day suspension."* (F.G. 3) "*Currently it's a drug violation. So there's one violation, this is new this year because we have a new principal this year. It's an immediate violation, the police get involved right away and they are, for our school policy is that they are to go to a drug counselor as well and have proof of going to them.*" (F.G. 2)
	Substance screening	"*We have a health and wellness policy and in that policy we every 2 weeks do a hair sample drug test and so it doesn't necessarily pick up the chemicals that are in the e-cigarettes, unless it would be THC in the cartridge.*" (F.G. 1) "*They do have nicotine tests that they have just developed, this company, it's really expensive right now and so when the cost goes down it will go down to an additional only $2 or $3 per test is my understanding and so then we want to add it when the cost goes down. Because we're already testing for a variety of things and we would like to add this because we know that our kids are using it.*" (F.G. 1)

of the new generation of vaping products, it was easy for students to conceal these products and use them in the hallway or even in the classroom. When asked where e-cigarettes were used by students, one focus group participant mentioned, ""*everywhere.*" Some participants also brought up the concern about other substances (eg, *THC oil*) that could be used in vaping devices.

Theme 2 – schools are interested in vaping prevention and cessation, but formal programs are limited. This theme refers to the status of vaping prevention in the school and school personnel's attitude towards vaping prevention. Schools did not have a comprehensive vaping prevention and cessation program. Whereas a few schools had pioneered different approaches ("*we have a little bit of everything*"), other schools were thinking about starting vaping prevention efforts ("*I think we would like to have one*"). Vaping prevention education was either embedded in the current substance abuse prevention program (eg, tobacco) or delivered through sporadic lectures. There was generally strong support from schools to address the issue of vaping ("*I feel very supported in anything that I want to bring in.*")

Theme 3 – vaping information is delivered through various channels based on school capacity. This theme refers to an array of approaches used in school to curb youth vaping. Among all 5 focus groups, in-class lectures or invited speakers were the most common way to deliver vaping prevention information. School teachers and administrators were also using online communications (eg, email) or social media to communicate vaping prevention information to both students and parents. Some schoolteachers reported having one-to-one personal conversations with students, especially when they caught students vaping. Some participants also mentioned mass presentations with large audiences (eg, all freshmen assembly) or posters and signs in certain areas of the school (eg, bathroom) to disseminate vaping prevention information. A few schools also had started to launch

Table 3
Perceived Responses from Students and Parents to Vaping, Prevention, and Cessation: Attitude and Social Norms

Theme	Code	Example Quotes (F.G. – Focus Group)
School personnel recognizes complexity in student vaping motivation and responses to prevention initiatives.	**Reasons for vaping**	Sensation Seeking ---"*That's the problem with vaping though. It's so concealable you don't see it, and that's a game that one of my students told me too. They have a game. They will keep track and points. So if you're in class and you vape and you don't get caught, that's a certain amount of points. If you're in the hallway and you vape going past a teacher, that's a certain amount of points. If you vape past an administrator, that's even more points because you don't see it. I mean, they make clothes to conceal it.*" (F.G. 5) Addiction --- "*Ours is the same other than we have the counseling referral, with the counseling we feel like we're fighting an addiction.*" (F.G. 1) Low harm perception --- "*It's harmless. That's been the message that they've gotten, it's harmless. And now that they have the THC oil, "well it's legal in other places it's not harmful".*" (F.G. 2) Social norm ---"*the kids are savvy enough to know that there's many people that are vaping, if they haven't seen somebody harmed by it it's not gonna happened to them.*" (F.G. 1) Peer influence --- "*But when school's not in session and there's no supervision things happen. You know that's where you learn things from your peers.*" (F.G. 1) Marketing influence --- "*I mean, JUUL, really they hired social media people. They made it super cool, and so kids are like, "Oh, this is awesome."*" (F.G. 5)
	Reactions to vaping prevention programs	Positive response --- "*I mean, there's just the videos and the news reports, I think, are-- I show them in my health class because I don't have a lot of information, so I've showed 3 of those videos, and the kids were super impacted by those.*" (F.G. 4) Grateful response --- "*When they're caught with it they respond pretty well. I had a girl the other day thank me because she's in rehab right now.*" (F.G. 2) Negative response --- "*we put these random posters up in the locker rooms and a couple in the hallways and the kids just kind of laughed at them so…*" (F.G. 2) Rebellion response – "*I've had students in my office who we've caught vaping in school. You kind of try to have that conversation about, "Hey, here's some of the side effects," things like that. For the most part, the ones I get back is, "It's my life. I'm going to do what I want.*" (F.G. 3)
Parents' engagement in vaping prevention is limited.	**Lack of participation**	"*We had a parent-family night at the end of last year and we had 3 parents show up total. That was from one family. No kids, it was pretty bleak and then we had another one earlier in the year where we had education about all sorts of different drugs and we had probably fifteen people show up. Really low numbers, really low numbers.*" (F.G. 2) "*You get the parents that know where their kids are all the time and know what they're doing, the ones you don't have to worry about. The other ones you don't get, so…*" (FG 1)
	Unaware of youth vaping	"*It's not a harmless vapor. It's an aerosol. And parents probably don't even know that basic fact.*" (F.G. 4) "*So I send an email, and I attach a picture of a Juul, because some parents are like, "I don't even know what that is." They have no idea that their kids may be charging it in their flash drive on their computer right in front of their face.*" (F.G. 3)

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Table 3 *(cont)*
Perceived Responses from Students and Parents to Vaping, Prevention, and Cessation: Attitude and Social Norms

Theme	Code	Example Quotes (F.G. – Focus Group)
Parents' engagement in vaping prevention is limited.	**Defensive of youth vaping**	"*And sometimes the parents push back because they're using vapes and Juuls and things too, so they're even upset when we're confiscating them.*" (F.G. 3)
		"*but that has to change with some of our parents because they would, "Well he's just smoking a juul that's better than someone else smoking weed or smoking cigarettes" but I think that in time will turn into you know…*" (F.G. 1)
	Supportive of vaping prevention	"*And then you would get the opposite end also of a mom comes in in tears and can't believe that her son is vaping. And, "Let me see what it looks like. I'm going to just confiscate his room.'*"' (F.G. 3)
		"*Well, that's the hard part is reaching the parents who don't show up. The parents that show up are the ones you don't have to necessarily-- those are the ones who care and they want to be there, and they're totally invested in their kids' lives.*" (F.G. 3)

student-led initiatives to address vaping because students "*listen to their peers much more than they listen to adults."*

Theme 4 – school e-cigarette policies and disciplinary actions are inconsistent. This theme refers to school responses when students are caught vaping or breaking any policies related to vaping. Participating schools had a variety of disciplinary actions in response to first or repeated offenses of e-cigarette use on campus. These actions ranged from "inform parents," "light/moderate penalty" (eg, *confiscate it, counseling, or a $75 fine),* to "severe penalty" (eg, *2-day/3-day/5-day suspension*, *drug violation with police involvement*). A few private schools also had implemented substance use screening tests (eg, *hair sample*) or planned to implement nicotine testing for vaping violations. However, there were concerns about the cost and effectiveness of these tests.

Topic 2: School Personnel's Perceptions of Vaping

Table 3 presents 2 themes pertained to the second topic and representative quotes. These themes were identified based on school personnel's response to focus group questions on students' and parents' responses to vaping related behaviors and policies in the school. Neither students nor parents participated in this study.

Theme 5 – school personnel recognizes complexity in student vaping motivation and responses to prevention initiatives. This theme refers to both the school personnel's perception of students' outlook on vaping and the direct observation of students' vaping behavior and response to vaping policies and programs. The top reasons that were cited for students using e-cigarettes included: (1) sensation seeking ("*students played a game to get points when vaping if they do not get caught"*); (2) addiction ("*schools are fighting an addiction"*); (3) low perception of harm (*"they are harmless"*); (4) social norms ("*the kids are savvy enough to know that there's many people that are vaping*"); (5) peer influence ("*you learn things from your peers*"); and (6) marketing influence ("*JUUL made it super cool and so kids responded "they are cool"*).

School personnel also discussed how their students responded differently to vaping prevention programs, with 4 main reactions: (1) positive response ("*the kids were super impacted by the videos and news reports*"); (2) grateful response ("*thank the teacher because the student is in rehab right now");* (3) negative response ("*the kids just kind of laughed at posters");* and (4) rebellion response ("*It's my life. I'm going to do what I want.*").

Theme 6 – parents' engagement in vaping prevention is limited. This theme refers to school personnel's perception about parents' perspec-

Table 4
Facilitators, Barriers, and Resources for School-based Vaping Prevention and Cessation Programs

Theme	Code	Example Quotes (F.G. – Focus Group)
Barriers to implementation	**Lack of time**	"*Time for us is probably the biggest thing, I mean just finding that time. If we're gonna put it in a classroom, finding time for it and being consistent with it across the board.*" (F.G. 2) " *Well and I think what you said too is true about time, is finding the time to squeeze one of these lessons in the day, or the week or the month I mean.*" (F.G. 1)
	Lack of interest	"*So I think you nailed that one because if I go back to our next staff meeting and I say, "Hey, we need to start talking about vaping now," they're going to be like, shut me off, moving on.*" (F.G. 4) "*I've got some schools that don't want to talk about it because they're afraid that the media will pick up and it'll be focused on their school,.*" (F.G. 5)
	Lack of funding	"*And it was a modular system that we had used as a suspension reduction. They now have incorporated a vaping component into it. But if you are outside the State of Colorado, they charge, I think it's like 12 to 15 hundred dollars per school. We just didn't have finances in order to do that and thought that maybe we could develop our own.*" (F.G. 3) "*I'm sure my administration would not have a problem with that [Laughs] but it usually comes down to the cost is the thing.*" (F.G. 1)
	Lack of knowledge	"*It's e-cigs are so new, and I don't know if we're caught up enough on the research what the effects of it are. So not only is it very new, but then you also have to find, like you said, the time, the resources, the money in order to put something in place like that.*" (F.G. 3) "*Look how many decades it took us to get the smoking rate down. I think we were finally doing and now, that took decades and decades to get to that and now we have something totally new.*" (F.G. 5)
	Lack of coordination	"*If you got more schools to have the conversation because every school obviously there's only 4 of us and we do things quite differently in each building and so I think the more conversations you have with more schools I think that that's helpful.*" (F.G. 1) "*I would say the other thing you'd have to get is not only the district itself to look into those things, but then you always have to get the parent buy-in.*" (F.G. 3)
	Outdated material	"*Oh I think things change so fast too just with the products, with whatever the media, the packaging everything changes so fast so by the time that curriculum gets out they're like, they laugh at it because it's like oh yeah, that was 2 years ago.*" (F.G. 1) "*Even when I go online or look for videos or whatnot, I hate to even show anything that's more than 2 years old, which is hard to even find current things so that it's just not me talking all the time to try and find-- I brought in speakers to my class.*" (F.G. 5)
	Easy access and black market	"*Even if they raised the age to 21 like for alcohol, they could still get everything online. It doesn't make a difference if they can't go to a brick-and-mortar store. They have access to it no matter what. And that's a bigger problem that we can't solve. But I think that's almost the crux of it is the availability. They can get it.*" (F.G. 3) "*One of our problems, too, is we have kids that sell them. So they might not even use them, or if they do, they use them, but their big thing is selling them too*" (F.G. 4)

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Table 4 *(cont)*
Facilitators, Barriers, and Resources for School-based Vaping Prevention and Cessation Programs

Theme	Code	Example Quotes (F.G. – Focus Group)
Resources need for implementation	**Evidence-based vaping prevention program**	"*The infographic would be great because we-- in our district we have weekly and monthly messages that go out to parents, whether they're digital through a newsletter or something that's still mail, and so that would be good.*" (F.G. 5) "(lectures/slides) *10 to 15 minutes is great because my class is 41 minutes long. So could maybe get 2 of them in where so many things are put out there are 60 minutes long. Well, then it's-- or if you want kids to do something on their own, attention timespan is about 10 to 12 minutes.*" (F.G. 5) "*That's why we're really excited for the (vapin prventation) program [laughter].*" (F.G. 3)
	Staff training	"*I think we'd like to see some training for our teachers because I guarantee there's kids in big classes that, 32, 33 classes in the back that are doing it, and they don't even know.*" (F.G. 4) "*And you mentioned the teacher training. I think that's big too just as a staff to know what to look for, to know what to smell for. It's, "I thought he was chewing Juicy Fruit gum." … There's so many ways they sneak stuff in…*" (F.G. 4)
	Community engagement	Family counseling **---** "*When we use counseling we contract with our family counseling, we're working with them to develop a, they have a cessation of addiction program but it's not necessarily tailored to nicotine it's drugs, alcohol those kind of things.*" (F.G. 1) Outside school **---** "*Just for kids to hear that from somebody that's, I think honestly anybody that's outside the school community they listen to more than people within the school so yeah if someone else delivered that information I think it has more of a lasting effect.*" (F.G. 2) Parent engagement **---** "*I think that's when you bring parents more into the conversation too. Like at the end of the year you have some sort of blast that goes out to parents to know where your kids are and know what they're doing all summer long kind of thing.*" (F.G. 1)

tives on vaping and observed parents' response to policies and programs related to vaping or when their children were caught vaping in school. The observed parents' responses to youth vaping fell into 4 categories: (1) lack of participation – few parents attended the parent-family night or educational events related to vaping, and usually parents with kids who were not vaping were the ones who showed up to these events; (2) unaware of youth vaping – some parents lacked the basic facts about vaping and claimed that "*I don't even know what that is*;" (3) defensive of youth vaping, especially among parents who also vaped or smoked ("*You can't do that to my kid*"); and (4) supportive of vaping prevention ("*Our parents were the ones who pushed to have us start to do this policy and so we listened to the parents.*")

Topic 3: Challenges in Implementing School-based Vaping Prevention Programs.

Table 4 summarizes the 2 themes and representative quotes.

Theme 7 – barriers to implementation. This theme refers to any existing or potential barriers to developing and implementing vaping prevention programs in school. Focus group participants described 7 primary barriers related to developing and implementing an effective school-based vaping prevention program, including (1) lack of time – given that there are many other priorities, it is hard to find a time to add additional programming into the established class curriculum; (2) lack of interest – some participants expressed the concern that by promoting a vaping prevention program at their

school, it may look as if the school has a problem, and thus, lead to a bad image for the school; (3) lack of funding – schools may not have the budget to purchase a program or curriculum; (4) lack of knowledge – school personnel may not know the facts about vaping given that these products are relatively new and research is ongoing; due to the lack of knowledge, schools often arranged guest speakers to deliver vaping prevention lectures; 5) lack of coordination – there needs to be coordinated efforts across schools and between schools and parents ("*parents buy-in*"); (6) outdated materials – because of the ever-evolving e-cigarette products, education materials become obsolete after a few years; and (7) easy access and black markets – several focus group participants expressed their concern about students having easy access to vaping products online or through other students selling e-cigarettes in school.

Theme 8 – resources needed for implementation. This theme refers to necessary resources for schools to facilitate the development and implementation of vaping prevention programs. Participants showed a strong interest and support for an evidence-based vaping prevention program ("*That's why we're really excited for the (vaping prevention/ cessation) … program.").* Some focus group participants also voiced the need for ongoing staff training and community engagement, such as family counseling, additional efforts outside of the school, and parent engagement.

DISCUSSION

Our results provide insights of school personnel's view of vaping in schools, possible barriers to preventing vaping on school grounds and further identified resources that are important for schools to facilitate the implementation of school-based prevention programs. For this qualitative study, we chose the focus group data collection method over individual interviews because it has multiple advantages by balancing one-on-one interviews and self-report questionnaires.[26] Our study design allowed participants to self-report the information within their school system and reflect on other schools' prevention strategies.

The US Surgeon General Report on e-cigarette use in youth calls for immediate action to address the issue of youth vaping and reduce the negative impacts of e-cigarette use on adolescent health.[5] In this study, participants voiced concern about vaping behaviors among students in their schools. One of the study participants from a high school brought a box of confiscated vaping products as evidence of students' vaping behavior. Although most participants expressed the necessity of evidence-based strategies to prevent such harmful behaviors, few participating schools had a comprehensive program in place to address vaping prevention and cessation. Surprisingly, few participants mentioned implementing existing vaping prevention programs such as "CATCH My Breath,"[12] or the Stanford Tobacco Prevention Toolkit.[14] This indicates a gap in prevention science between researchers who develop programs and practitioners who deliver such programs. This gap could be due to vaping prevention barriers and lack of resources, as pointed out by study participants.

We found that schools had used a variety of communication strategies to inform students and parents. The commonly used delivery modes were lectures, mass presentations, email correspondences, and social media such as Facebook and Twitter. The delivery mode is an essential component of program design and implementation. In the choice of appropriate delivery type, one should consider influencing factors such as the number of the target population, frequency of behavior of interest, settings and social environments, and cost. [27] For example, an in-person mode provides better interaction with participants, whereas an Internet-based approach can reach a larger population. We have witnessed a change in how the school curriculum has been delivered in the current pandemic environment. Therefore, an integrated delivery approach or multi-faceted options for delivery mode might be suitable.

Consistent with previous studies,[28-30] we identified several reasons for students to use e-cigarettes from school personnel's view, such as addiction, low perception of harm, social norms, peer influence, and the influence of marketing. An effective youth vaping program should include these components to educate youth about the harmfulness of vaping and mitigate peer and marketing influence. Students' responses to school policy on vaping varies. Some students were supportive, but others were rebellious and held opposing views. Educating ad-

olescents about the harmful effects of e-cigarette use might be challenging due to a proliferation of misleading harm reduction information on social media and e-cigarette advertisements.

We also advocate for the importance of parent engagement in addressing the vaping issue in school. School personnel reported meager parental attendance in school programs such as parents' night and informational sessions. Parents also had mixed responses to vaping related policies and prevention efforts. Some parents strongly supported vaping prevention, whereas others were defensive or unaware of vaping products confiscated when their children were caught vaping in the school. This shows an inadequate knowledge of the negative impact of vaping on youths from parents. Parents can influence their children's behavior throughout adolescence despite increased autonomy and competing influences from peers and the social environment.[31] Input from parents and their involvement are essential in developing an effective school-based prevention program. They can help curb youth vaping by monitoring behavior, remaining highly involved and supportive, setting smoke, vape, and tobacco-free rules at home, and advocating that there is no tolerance for harmful behavior such as vaping.

A school-based vaping prevention program's implementation success could be affected by school personnel's viewpoints, school organizational context, and the external environment schools.[32] School personnel are a group of individuals who work directly with students and parents, and are responsible for everyday school functions. Therefore, they are likely to have in-depth knowledge of barriers and resources needed to implement evidence-based prevention in school settings. One study has found that school administrators' perception of e-cigarette use can influence the students' vaping behavior in school and the effectiveness of school-based prevention efforts and policies.[16] In our study, participants expressed the lack of time, funding, and knowledge as the top barriers to implementing the school's vaping prevention program. These barriers, including funding, administrative support for the program, and awareness of the issue, have been cited over and over as critical issues in developing, implementing, and sustaining evidence-based school prevention programs.[32-35] At the time when many schools are struggling with budget, the cost of implementation could be burdensome for these schools as funding is necessary to pay for training, equipment, and materials. Participants also expressed the need for training. Teacher training focusing on the theoretical basis of prevention and its implementation could facilitate school-based vaping prevention efforts in the school setting.

Limitations

This study has limitations. First, this study was based on focus groups of schoolteachers, administrators, and other personnel. There might be social desirability bias present because school personnel may have restricted sharing negative aspects of school vaping prevention efforts given their roles and positions. However, multiple strategies were taken to manage such biases; any information obtained during this study that could identify study participants was kept confidential. The facilitator asked study participants to respect other members of the focus group and not share the information from the focus group with the others; study participants were free to withdraw at any time from the focus group discussions.[36] Second, focus groups involve group dynamics,[37] and some participants may have contributed more to the discussions than others though the facilitator tried to involve every participant. Third, this study was conducted in one Midwestern state, and our findings might not be generalizable to other geographic areas. However, our focus group participants had diverse backgrounds, including a wide range of personnel from middle and high schools, public and private schools, and schools in rural and urban areas. Fourth, this study did not examine the difference in the response pattern by the participant characteristics (eg, gender, age, occupation) and the school characteristics (eg, rural vs urban and middle vs high). It is possible that these factors could influence participants' responses to focus group questions, which might be of interest for future studies. Fifth, this study only includes school personnel's perspectives; however, to maximize the effectiveness of school-based prevention program, insights from parents and students are essential and merit future research. Lastly, because the prevalence of vaping was much higher among high school than middle school students,[38] we oversampled high

schools due to the high prevalence of vaping. Given that the median age of first use of e-cigarettes was 14.1 years,[39] it would be beneficial to implement prevention interventions in middle schools. Thus, we also included 3 participants from MS and 11 participants from the MS/HS school districts.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

The World Health Organization recognizes adolescent health as a top priority to achieve health and target sustainable development goals.[40] In the current study, we sought to focus on addressing youth e-cigarette use that poses a severe threat to a new generation of youths' well-being.[5,7] Additionally, we have identified multiple barriers that could hinder the *Healthy People 2030* goal of reducing the current use of e-cigarettes among adolescents.[41] Through prevention, broader community engagement, advocacy efforts, and targeted policy, curbing the rising prevalence of youth e-cigarette use should be a priority for schools, parents, researchers, health professionals, and policymakers.

We propose the following actions:

- Schools should integrate e-cigarette education in their curriculum to raise awareness of its harmful effects and counter misconceptions regarding e-cigarettes.
- School should integrate e-cigarette to its existing tobacco/substance use policy to reduce student e-cigarette use behaviors in the school where e-cigarette use is problematic or perceived as an issue as suggested by participants in the study.
- Researchers and prevention program developers should focus on multi-faceted (school-students-parents-community) evidence-based school vaping prevention programs that can be delivered efficiently and implemented easily with fidelity and sustainability to address barriers highlighted in the study.
- We encourage authorities to increase the oversight of tobacco products and to be strict in enforcing regulations and policies such as tobacco age limit and ban on certain flavored e-cigarettes.
- Policymakers need to extend the existing tobacco marketing restrictions to e-cigarettes and further ban or limit flavored e-cigarette/tobacco products to reduce access to such products by youths.

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Human Subjects Approval Statement

This study was approved by the University of Nebraska Medical Center Institutional Review Board.

Conflicts of Interest Disclosure Statement

The authors have no conflicts of interest to disclose.

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Appendix A
Key Topics and Guiding Questions used in Focus Groups

Topics of interest	Guiding Questions
(1) Current status of vaping and school-based prevention.	Does your school have an e-cigarette prevention program? Please specify. What platform does your school use to reach out to students in regards to your e-cigarette prevention program? (eg, in-class lecture, online, social media, newsletter, video, pamphlet)? Does your school have any other tobacco prevention programs? Please specify. What happens if you find a student using an e-cigarette? Is there a standard process for handling e-cigarette use in school or on school property?
(2) School personnel's perceptions of vaping.	How have students responded to the e-cigarette prevention program at your school? Is it important to involve parents or other community members in preventing e-cigarette use by students? Why or why not? How does your school involve parents or guardians in preventing e-cigarette use?
(3) Challenges in implementing school-based vaping prevention programs.	What, if any, barriers exist in addressing the rising e-cigarette use among youth? Does your school need any resources to help prevent youth e-cigarette use? Please specify.

Appendix B
Consolidated Criteria for Reporting Qualitative Studies (COREQ): 32-item Checklist

No. Item	Guide questions/description	Comments
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer / facilitator	Which author/s conducted the interview or focus group?	A.R., B.G., and H.D. conducted focus groups.
2. Credentials	What were the researcher's credentials? eg, PhD, MD	Hongying Dai, PhD, Athena Ramos, PhD, Niran Tamrakar, MA, Marshall Cheney, PhD, Kaeli Samson, MA, MPH, Brandon Grimm, PhD
3. Occupation	What was their occupation at the time of the study?	Hongying Dai (Professor), Athena Ramos (Assistant Professor), Niran Tamrakar (Graduate Student), Marshall Cheney (Associate Professor), Kaeli Samson (Biostatistician), Brandon Grimm (Associate Professor)
4. Gender	Was the researcher male or female?	Hongying Dai (Female), Athena Ramos (Female), Niran Tamrakar (Male), Marshall Cheney (Female), Kaeli Samson (Female), Brandon Grimm (Female)
5. Experience and training	What experience or training did the researcher have?	Hongying Dai (tobacco research and vaping prevention), Athena Ramos (qualitative research and health disparity), Niran Tamrakar (educational psychology), Marshall Cheney (qualitative research), Kaeli Samson (biostatistics), Brandon Grimm (community participatory research)
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	There was no prior relationship between participants and investigators.
7. Participant knowledge of the interviewer	What did the participants know about the researcher? eg, personal goals, reasons for doing the research	Participants were provided with an information sheet and consent form, which outlined the aim of the study.
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? eg, Bias, assumptions, reasons, and interests in the research topic	Participants knew the investigators were researchers with expertise on e-cigarette use and community engagement.
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and theory	What methodological orientation was stated to underpin the study? eg, grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Thematic analysis
Participant selection		
10. Sampling	How were participants selected? eg, purposive, convenience, consecutive, snowball	Snowball sampling.
11. Method of approach	How were participants approached? eg, face-to-face, telephone, mail, email	One email invitation was sent, and up to 2 email reminders were sent to non-respondents.
12. Sample size	How many participants were in the study?	32 participants from 30 different schools.
13. Non-participation	How many people refused to participate or dropped out? Reasons?	No participants dropped out of the study.

cont on next page

Appendix B *(cont)*
Consolidated Criteria for Reporting Qualitative Studies (COREQ): 32-item Checklist

No. Item	Guide questions/description	Comments
Setting		
14. Setting of data collection	Where was the data collected? eg, home, clinic, workplace	Focus groups were conducted in neutral community locations that are close to study participants.
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	No.
16. Description of sample	What are the important characteristics of the sample? eg, demographic data, date	Occupation, school grade level, school type, and location(rural vs urban)
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	A moderator elicited discussions using open-ended questions and clarification probes on issues related to the key constructs of interest described in Table 2. The questions were pilot tested by 2 focus groups.
18. Repeat interviews	Were repeat interviews carried out? If yes, how many?	No
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	Interviews were audio-recorded using a digital recorder.
20. Field notes	Were field notes made during and/or after the interview or focus group?	Yes, a researcher took notes as an observer.
21. Duration	What was the duration of the interviews or focus group?	Ranged from 60 to 90 minutes.
22. Data saturation	Was data saturation discussed?	Yes.
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Yes.
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	2 coders.
25. Description of the coding tree	Did authors provide a description of the coding tree?	Coding under each theme is provided.
26. Derivation of themes	Were themes identified in advance or derived from the data?	Thematic analysis was performed using a hybrid approach of inductive and deductive coding and theme development.
27. Software	What software, if applicable, was used to manage the data?	NVivo 12.
28. Participant checking	Did participants provide feedback on the findings?	No
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? eg, participant number	Yes, participant quotations are provided in Tables 2-4. Each quotation was identified using a focus group number.
30. Data and findings consistent	Was there consistency between the data presented and the findings?	Yes.
31. Clarity of major themes	Were major themes clearly presented in the findings?	Yes. Major themes are presented in the result section.
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	No sub-themes were generated.