

# Hookah and Electronic Inhalant Device Use and Perceptions Among African American Youth and Young Adults: Are We Asking the Right Questions?

Health Education & Behavior  
2020, Vol. 47(3) 391–401  
© 2019 Society for Public  
Health Education  
Article reuse guidelines:  
[sagepub.com/journals-permissions](http://sagepub.com/journals-permissions)  
DOI: 10.1177/1090198119876977  
[journals.sagepub.com/home/heb](http://journals.sagepub.com/home/heb)



**Kari-Lyn K. Sakuma, PhD, MPH<sup>1</sup> , M. Margaret Dolcini, PhD<sup>1</sup>,  
Jessica Seifert, MPH<sup>1</sup>, Maddison M. Bean, MS, RDN<sup>1</sup>,  
Pebbles Fagan, PhD, MPH<sup>2</sup>, Monica Wilson, PhD<sup>3</sup>,  
Jamie Q. Felicitas-Perkins, PhD, MPH<sup>4</sup>, Lyzette Blanco, PhD, MPH<sup>5</sup>,  
and Dennis R. Trinidad, PhD, MPH<sup>6</sup>**

## Abstract

**Objectives.** Survey items used in surveillance systems to assess the use of emerging products like hookah and electronic inhalant devices (EIDs) may not match definitions used by high-risk populations. This qualitative study explored how African American youth and young adults (YYAs) (1) use hookah and EIDs and (2) identify patterns in the ways they describe and organize these products. **Design.** Individual in-person interviews were conducted among a sample of continuation high school and vocational school students in southern California. Participation was limited to those who had ever tried at least one tobacco product, self-identified as African American, and were between the ages of 14 and 26 years ( $n = 28$ ). We conducted a content analysis to identify patterns in perceptions and use of these products. **Results.** African American YYAs recognized and described traditional hookah based on physical attributes, but for EIDs, including e-cigarettes, e-hookah, and vape pens, YYAs focused on reasons for using the product. Three primary categories emerged for reasons YYA used specific products: nicotine content and quitting, social facilitation, and use with marijuana. E-cigarettes were identified as quitting aids and as having nicotine but were not considered addictive. The term *hookah* recalled both the traditional and electronic pen-type products for YYAs. The terms *vapes*, *hookah*, *wax pens*, and others are used in the context of describing product use with marijuana. **Conclusions.** A better understanding of why African American YYAs use these products is needed to develop better measures for accurate rates of use, uncover differences in use between product types, and to develop effective prevention messaging.

## Keywords

adolescent, African American, electronic cigarettes, hookah, nicotine, qualitative, tobacco, vapes, young adults, youth

The rapid expansion of tobacco products in the marketplace, particularly hookah and electronic inhalant devices (EIDs), has prompted the need to monitor the uptake and use by youth and young adults (YYAs; Hsu, Sun, & Zhu, 2018; J. Huang et al., 2019; Y.-H. J. Huang et al., 2015; Marynak et al., 2017; Zhu et al., 2014). Recent surveillance data show that one quarter of young adults have tried hookah (Villanti, Cobb, Cohn, Williams, & Rath, 2015) and in 2014, rates of electronic cigarettes (e-cigarettes) had surpassed that of conventional cigarettes among youth (U.S. Department of Health and Human Services, 2016). The rise in availability of these products coincide with the rise in use among YYAs. These data further highlight the need to accurately monitor use among YYAs for future health consequences and to identify tobacco control needs.

African Americans suffer disproportionately from tobacco-related diseases relative to their European American counterparts (Max, Sung, Tucker, & Stark, 2010; U.S. Department of Health and Human Services, 1998, 2014; Xu,

<sup>1</sup>Oregon State University, Corvallis, OR, USA

<sup>2</sup>University of Arkansas for Medical Sciences, Little Rock, AR, USA

<sup>3</sup>National University, Riverside, CA, USA

<sup>4</sup>Claremont Graduate University, Claremont, CA, USA

<sup>5</sup>Touro University Worldwide, Los Alamitos, CA, USA

<sup>6</sup>University of California, San Diego, La Jolla, CA, USA

## Corresponding Author:

Kari-Lyn K. Sakuma, College of Public Health and Human Sciences, School of Social and Behavioral Health Sciences, Oregon State University, 2250 SW Jefferson Way, 412 Waldo Hall, Corvallis, OR 97331-6406, USA.  
Email: [karilyn.sakuma@oregonstate.edu](mailto:karilyn.sakuma@oregonstate.edu)

Murphy, Kochanek, & Bastian, 2016). Although African Americans smoke fewer cigarettes and initiate at older ages, (Trinidad et al., 2009; Trinidad, Gilpin, Lee, & Pierce, 2004; U.S. Department of Health and Human Services, 1998, 2014) they are at increased risk for poor health outcomes (American Lung Association, 2010; Kochanek, Murphy, Xu, & Tejada-Vera, 2016; U.S. Department of Health and Human Services, 1998). One contributing factor to this tobacco-related disparity is the tobacco industry's deliberate targeting of African American communities (L. A. Alexander et al., 2016; Balbach, Gasior, & Barbeau, 2003; Yerger & Malone, 2002; Yerger, Przewoznik, & Malone, 2007). Extant research shows that African American communities are exposed to more tobacco advertising (Cantrell et al., 2013; Lee, Henriksen, Rose, Moreland-Russell, & Ribisl, 2015; Primack, Bost, Land, & Fine, 2007; Yerger & Malone, 2002), greater tobacco retailer density (Rodriguez, Carlos, Adachi-Mejia, Berke, & Sargent, 2013; Seidenberg, Caughey, Rees, & Connolly, 2010), lower priced products (Cantrell et al., 2013), and greater tobacco sales to minors (Kirchner et al., 2015; Lipperman-Kreda, Grube, & Friend, 2014). Furthermore, the dramatic rise in electronic nicotine product use among youth overall is of grave concern and considering that African American youth generally do not initiate cigarette use until adulthood (Trinidad et al., 2004; Trinidad, Gilpin, White, & Pierce, 2005), this same pattern of delayed initiation could emerge with these newer products. In addition, prevalence rates of product use do not need to approach equality between race/ethnic groups to demonstrate increased harm to African American populations considering that there are higher levels of morbidity and mortality despite lower levels of overall tobacco use (Haiman et al., 2009; U.S. Department of Health and Human Services, 1998). Thus, it is important to consider that African American YYAs may be at increased risk for tobacco-related morbidity and mortality, despite comparable rates of hookah usage (Jamal et al., 2017) and lower rates of EIDs usage relative to European Americans (U.S. Department of Health and Human Services, 2016). Taken together, such evidence prioritizes the need to monitor the impact of the increasing availability of new and emerging tobacco products and ensuring current surveillance efforts are using adequate measures to obtain accurate use rates among priority population.

The diversity of products and nonstandard terminology present measurement challenges (Grana, Benowitz, & Glantz, 2014; McDonald & Ling, 2015; Wagoner et al., 2016). Current definitions, as set forth by the Food and Drug Administration (FDA) and reflected in most national surveillance surveys (e.g., PATHS; Hyland et al., 2017), describe products largely by their physical attributes. For example, hookah is described as tobacco (also known as waterpipe tobacco, maassel, shisha, narghile, or argileh) burned and smoked through a hookah or waterpipe vessel. Some of the newest products on the market belong to the category of EIDs or electronic nicotine delivery systems. *EID* is the

broader term that includes electronic cigarettes (sometimes shortened to e-cigs, or e-cigarettes), vapes, mods, and hookah pens (or e-hookah). These products are typically described as battery-operated devices that use a liquid (e.g., e-liquid, e-juice) mixture of nicotine, flavors, propylene glycol, glycerin, and other components (FDA, 2016) that are vaporized and inhaled by the user. Despite the careful product delineation and definitions used by the FDA and surveys, treating these devices as a singular product category, namely under the terms *electronic cigarettes* or *e-cig*, may result in overall underreported use and obscure differences in subtype use and related health perceptions (J. P. Alexander et al., 2016; Wagoner et al., 2016).

Studies have identified that users of EIDs refer to them by various names and that specific terms may be associated with distinct perceptions of the products (McDonald & Ling, 2015; Wagoner et al., 2016). For example, in a focus group study of YYAs, at least 15 terms were used to describe EIDs (Wagoner et al., 2016). In the same study, e-hookahs were described as convenient, covert, and novel, while e-cigarettes were described more in terms of economical savings and as quitting aids (Wagoner et al., 2016). Perceptions about product use and purpose may provide critical information needed to develop appropriate assessment tools. Furthermore, although attention has been given to EIDs, there is little mention of how YYAs discern between traditional hookah and electronic hookah devices. This poses a significant issue for measurement because most surveillance surveys refer to the broad EID category as primarily "electronic cigarettes" or "e-cigs" but include electronic hookahs in that category. At the same time, they may also use the term *hookah* in a separate question intended for respondents to consider only traditional combustible hookah. The splitting of the term *hookah* with different definitions being assessed in the same survey without knowledge of how participants categorize products can result in misreported use.

Understanding how YYAs use tobacco products is related to how they interpret survey questions measuring such use. Prior studies show that the prevalence of cigar use was largely underestimated, especially among African Americans (Corey et al., 2014; Rait, Prochaska, & Rubinstein, 2016; Sterling, Majeed, Nyman, & Eriksen, 2017) due to lack of understanding of how cigar products are categorized and used. For example, underreporting of cigar, little cigar, or cigarillo use was most prevalent among older adolescents, African Americans, and current users of various tobacco products (Nasim, Blank, Berry, & Eissenberg, 2012). Using brand names in surveys improved reporting (Rait et al., 2016; Terchek, Larkin, Male, & Frank, 2009) as did taking into account other methods of product use such as blunting (Sterling, Fryer, Pagano, & Fagan, 2016). Changes in assessment of tobacco use and using the language of the participants resulted in more accurate reporting of cigar, little cigars, and cigarillos (Delnevo, Bover-Manderski, & Hrywna, 2011; Terchek et al., 2009). As these new and

emerging tobacco products pervade the marketplace, methods for accurate assessment of product use across vulnerable populations is needed.

The purpose of this qualitative study was to explore how African American YYAs (1) use hookah and EIDs and (2) identify patterns in the ways they describe and organize these products. We focus on African American YYAs because they are at increased risk for polytobacco use (Corral, Landrine, Simms, & Bess, 2013), and studies show that tobacco use among this population has been underestimated (Corey et al., 2014; Nasim et al., 2012). The increasing presence of hookah and EIDs among YYAs not only contributes to descriptive and injunctive norms but paired together with the historical targeted marketing of tobacco products to minority populations, specifically African American communities, behooves public health researchers to better understand the role these products may play in these communities and how to better surveille use in order to institute effective intervention measures. Understanding how African American YYAs identify and use the wide range of tobacco products is critical because of the heightened risk this group disproportionately suffers from tobacco-related morbidity and mortality.

## Method

### *Recruitment and Data Collection*

We used purposive sampling to recruit YYAs from continuation high schools, vocational training centers, and community centers in a metropolitan region in eastern counties of Southern California. The eligibility criteria for study participation were those who were between 14 and 26 years of age, self-identified as African American or Black, and had tried at least one tobacco product in the past. We offered a \$25 incentive for the interview. Using our networks and through in-person meetings with the local community leaders and advocates in the African American community we created partnerships with nonprofit organizations, schools, and centers who assisted with the advertising and recruitment of the study participants. Data were physically collected at an educational and a job training site. We aimed to interview 30 knowledgeable people within our selected sample, which is sufficient to uncover and understand core content (Luborsky & Rubinstein, 1995), given our purposive sampling, limited eligibility criteria, and our recruitment, to provide a demographically homogenous group who had variation in their experiences with tobacco products (Luborsky & Rubinstein, 1995; Roy, Zvonkovic, Goldberg, Sharp, & LaRossa, 2015). The Oregon State University's Institutional Review Board approved all study procedures. The consent processes were conducted just prior to data collection and onsite in a private room at each respective center. Informed consent was thoroughly discussed for both the screening procedures and the interview procedures separately. First, participants were given an informed consent form for the

screener. After discussion of the form and answering any questions from the participant, if they chose to participate they would provide verbal consent and indicated that agreement by continuing with the screening survey. The study was allowed to waive collection of signed consent forms. Once eligibility for the study was confirmed, the informed consent procedure was repeated if participants chose to continue, they gave verbal consent and indicated agreement by continuing with the data collection survey and interview. Of those eligible, all agreed to participate.

## Measures

Participants completed a short questionnaire immediately prior to the interview to capture past tobacco use behaviors, including ever use (i.e., lifetime use of tobacco products) and past 30-day use. Both ever use and past 30-day use were dichotomized as "yes" (any frequency of product used in one's lifetime or in the past 30 days, respectively), or "no" (product never used in one's lifetime or in the past 30 days, respectively). Polytobacco use was also assessed and defined here as use of two or more products. This was dichotomized (yes/no) for polytobacco ever use and past 30-day use. The following demographic information was collected: gender, age, education level (less than high school, high school diploma or equivalent, some college), race/ethnicity.

The questionnaire was immediately followed by a semistructured interview conducted by the first author. Participants were shown images of various tobacco products (i.e., cigarettes, large traditional cigars, little cigars, cigarillos, smokeless nicotine products, hookah, and e-cigarettes/vapes) according to the item convention of the Population Assessment of Tobacco and Health Study (see Figure 1; PATH study; Hyland et al., 2017). These images accompanied all questions in the interview to help participants identify products and ensure that both the participant and the interviewer were discussing the same product. Interview guide topics included tobacco product use, how and why participants use specific products, and health and relative (to cigarette) harm perceptions (The full interview guide is available from the first author.).

## *Data Analysis*

Descriptive statistics were generated for the sample from the screening survey. Fisher's exact test was used to assess differences by gender and level of educational attainment in tobacco use across categorical outcomes. Two-sample *t* test was used to assess differences by gender in mean tobacco product use.

Interviews were audio-recorded and transcribed verbatim. We conducted content analysis (Hsieh & Shannon, 2005) by starting with structural coding to extract items and responses related to use, defining characteristics, and harm perceptions for each product from the complete transcripts. First cycle



**Figure 1.** Images of tobacco products presented to participants.

coding were conducted by three trained coders (KS, JS, MG), who worked independently to code extracted data from three randomly selected transcripts (cases) as the sample for building the codebook. Tentative concept codes were generated using interview guide content as initial categories. Coders then employed an iterative process of honing categories and subcategories (i.e., discussed limitations of code definitions, selected salient codes, formulated new codes until the codebook was finalized) through subcoding and simultaneous coding methods (Saldana, 2016). This iterative process began with one sample case and as the code developed, the team would apply the new set of codes to the next sample case until all three were completed. Remaining cases ( $n = 25$ ) were reviewed and coded according to the final codebook, which included 5 major codes with 13 subcodes. The initial sample cases were recoded and included in the final analytic sample. Any disagreements were resolved through discussion. Second cycle coding methods included pattern and focused coding (Saldana, 2016) to analyze data for patterns in product definitions and conceptual similarity of product perceptions and behavior. Where respondents'

direct quotes are used to illustrate results, quotes are labeled with participant's self-identified gender and age.

## Results

### Sample

We completed 28 interviews ( $N = 33$  screened; 4 ineligible, 1 incomplete). Interviews ranged from 23 to 40 minutes long with an average lasting around 31 minutes. Participants were aged 17 to 25 years ( $M = 19.3$ ,  $SD = 2.1$ ; men,  $M = 20.1$ ,  $SD = 2.3$ ; women,  $M = 18.7$ ,  $SD = 1.7$ ). Slightly over half the sample was women (53.6%), and all participants identified as African American or Black (21.4% reported more than one racial/ethnic category). Participants were enrolled in high school (61.0%), had received a high school diploma or equivalent (39.2%), or had some college experience (7.1%). The data collection sites had about an equal number of participants. There were no statistically significant differences found between genders in age, race/ethnicity, or educational attainment (see Table 1).

**Table 1.** Sample Demographics and Tobacco Product Ever and Past 30-Day Use Prevalence.

	Overall, N = 28	Men <sup>a</sup> , n = 13	Women <sup>a</sup> , n = 15	p <sup>b</sup>
Age (years), M ( $\pm SD$ )	19.3 ( $\pm 2.1$ )	20.1 ( $\pm 2.3$ )	18.7 ( $\pm 1.7$ )	.3836
Race/ethnicity, n (%)				
African American (single category)	28 (100)	13 (46.4)	15 (53.6)	—
African American and other (1+ category)	6 (21.4)	3 (10.7)	3 (10.7)	1.00
Education, n (%)				
Currently in high school	17 (60.7)	7 (25.0)	10 (35.7)	.8364
High school diploma or equivalent	9 (32.1)	5 (17.8)	4 (14.3)	
Some college	2 (7.1)	1 (3.6)	1 (3.6)	
Tobacco product ever use, n (%)				
Cigarettes	17 (60.7)	9 (32.1)	8 (28.6)	.4601
Cigars	6 (21.4)	6 (21.4)	0 (0.0)	<b>.0046</b>
Little cigars/cigarillos	23 (82.1)	12 (42.8)	11 (39.3)	.3333
Smokeless tobacco	2 (7.1) <sup>a</sup>	1 (3.6)	1 (3.6)	1.00
Hookah	25 (89.3)	12 (42.9)	13 (46.4)	1.00
E-cigarettes/vapes	21 (75.0)	11 (39.3)	10 (35.7)	.3955
Multiple tobacco product use	23 (82.1)	12 (42.8)	11 (39.3)	.3333
Past 30-day use, n (%)				
Cigarettes	13 (46.4)	8 (28.6)	5 (17.9)	.2545
Little cigars/cigarillos	19 (67.9)	11 (39.3)	8 (28.6)	.1145
Hookah	13 (46.4)	6 (21.4)	7 (25.0)	1.00
E-cigarettes/vapes	15 (53.6)	7 (25.0)	8 (28.6)	1.00
Multiple product use (2+ products)	18 (64.3)	10 (35.7)	8 (28.6)	.2543

Note. Boldface indicates significant difference between genders.

<sup>a</sup>Rows may not sum to 100% due to rounding. <sup>b</sup>All comparisons were conducted with Fisher's exact test, two-tailed.

### Self-Reported Ever Use of Tobacco Products

We examined ever use of tobacco products and found that approximately 60.7% of participants used cigarettes, 82.1% used little cigars/cigarillos, 89.3% used hookah, 75% used e-cigarettes/vapes, 21.4% used cigars, and 7.1% used smokeless tobacco products. We also found that 82.1% reported ever use of two or more products (see Table 1). Men ( $M = 3.9$ ,  $SD = 1.5$ ) exhibited greater diversity in types of products used than women ( $M = 2.9$ ,  $SD = 1.3$ ), but this mean difference was not statistically significant ( $t$  value =  $-2.0$ ,  $p = .06$ ) nor as the number of individuals who used polytobacco products different by gender (Fisher's exact test,  $p = .33$ )

### Self-Reported Past 30-Day Use of Tobacco Products

We examined past 30-day use of tobacco products and found that approximately 46.4% of participants used cigarettes, 67.9% used little cigars/cigarillos, 46.4% used hookah, 53.6% used e-cigarettes/vapes, and 57.1% used blunts. We also found that 64.3% reported use of two or more products in the past month (see Table 1). Men ( $M = 2.5$ ,  $SD = 1.4$ ) exhibited greater diversity in types of products used in the past month than women ( $M = 1.9$ ,  $SD = 1.5$ ), but this mean difference was not statistically significant ( $t$  value =  $-1.1$ ,  $p = .33$ )

= .29), nor was the number of individuals who used polytobacco products different by gender (Fisher's exact test,  $p = .25$ ).

### Physical Descriptions of Products

First, we examined how YYAs described and distinguished among products. Within the hookah category, participants were consistent in describing a traditional hookah. For example, they described physical characteristics such as burning coals, taking time to heat up, smoking through one of many tubes, the use of water, and hearing bubbling sounds. Participants also mentioned electronic hookah, which are more similar to and are classified as EIDs by the FDA. The term *hookah* elicited responses from the participants pertaining to both the traditional and EID products. Participants' descriptions of electronic hookahs were largely focused on its small size and portability. It was clear that there was inconsistency between participants' use of terms and confusion about whether electronic hookah is more closely related to traditional hookah or EIDs, as this quote demonstrates: "Okay, are we also talking about the ones that are just the little hookah pens? Like, the little vapor pens?" (Woman A, age 21 years).

The term *e-cigarettes* and images of the first-generation electronic cigarette that resembles a traditional combustible cigarette (also known as a "cig-alike") product were clearly

distinguished as being most closely associated with traditional cigarettes and participants described them as looking like a cigarette just “upgraded.” One participant described electronic cigarettes as “. . . basically an upgrade of a cigarette; that’s what I think . . . they went from paper to—to technology. It would be like a piece of paper to a computer-wise” (Man A, age 18 years). Pen-like and tank models of EIDs were also familiar to participants but they provided reasons for using the product as a way to differentiate between them.

### Reasons for Product Use

**Nicotine Content and Quitting.** Participants tended to focus on nicotine content and “throat hit” (i.e., sensation felt in throat and lungs when inhaling the product) in describing how they categorize EIDs. This was most clear for e-cigarettes, which participants described as being equivalent to combustible cigarettes because of their perceived nicotine content. Some participants conflated nicotine levels with “strength” of the hit. For example, when asked about the amount of nicotine in the e-liquid they used, instead of answering in terms of milligrams (most are labeled on the packaging), some would describe turning “it” down or up but could not explicitly state what “it” was other than a switch on the device. They then described how strong it felt while inhaling the product.

So they still have tobacco content in it but, uh, what I tend to do is I just turn it down. Like, you can turn down the, I don’t know, turning down something so it’s not as strong as when I’m smoking it. But I know people that will turn it up to like higher contents of tobacco or just have it higher ‘cause they need more of an effect ‘cause they’re still—they still like how cigarettes feel. (Woman A, age 21 years)

In contrast, respondents noted that electronic hookah devices either did not have nicotine or were uncertain of nicotine content. One participant, in response to a direct comparison between a hookah pen and e-cigarette, felt that an e-cigarette had more nicotine. None of the respondents were able to state how much (i.e., milligrams per milliliter) nicotine was in the e-liquid that they typically use.

E-cigarettes were most often viewed as a cigarette alternative or quitting aid. Respondents described the cig-alike versions of e-cigarettes as a replacement for combustible cigarettes. Some perceived the cig-alike to be healthier or not a “real” cigarette, thus believing that it was a better product than combustible cigarettes. Some respondents saw the benefits of using e-cigarettes because it was essentially the same as a cigarette with the purpose of delivering nicotine but without the smoke and the smell. Respondents also considered it a good alternative to cigarettes and a quit aid, because they believe people would not get addicted and it was “supposed to make you quit instead of keep on doing them” (Woman B, age 17 years). One respondent reported visiting a vape shop and hearing a similar message, “We asked what

it was and they was like, ‘It’s an alternative to smoking if you’re trying to quit . . .’” (Man B, age 22 years). Thus, perceptions surrounding the use of e-cigarettes for quitting were related to these products being an alternative to “real” cigarettes, it being used to help people quit, and it being a nonaddictive product. These beliefs appeared independent of their perceptions of nicotine content in e-cigarettes.

**Smoke, Tricks, and Social Connection.** Other product characteristics were also salient to YYAs. For example, hookah, both traditional and electronic versions, were strongly associated with a variety of flavors, a lot of highly visible smoke, and hookah lounges. Primarily, hookah was described as having many fruity flavors and as producing a lot of thick smoke. The quantity and thickness of the smoke appealed to participants as “attractive” and “cool.” Some also mentioned using the smoke to do “tricks” and working toward increasing their skill level. They spoke about learning these tricks from friends and family members and through social media posts and YouTube.

I mean I was never really into cigarettes. Me and cigarettes, I just—started with hookah, honestly. Hookah was my first thing I’ve ever tried. Uh, you know, seeing other people, like, the way the cool tricks—the things they could do with hookah, things like that and I didn’t think it was as bad as a cigarette. So I decided, you know, it was like: oh, it’s not bad. It wouldn’t hurt to try one. (Man A, age 18 years)

Another major distinction for hookah, namely traditional hookah, was the social aspect of use. Participants indicated that their first use and where they typically use hookah were at hookah bars. In describing hookah bars, most noted the environment as “fun,” “cool,” “chill,” and that it was “like a club with music and dancing” and “just a place to hang out with friends.” Furthermore, traditional hookah was viewed as inconvenient to set up if there were no plans to share with others.

**Marijuana Use.** As described earlier, participants often blurred the categorization of electronic hookah products and EIDs. For example, several respondents indicated that vapes and vape pens were considered the “new hookah.” “Now, the new thing that you hear is wax pens, the new hookah, you hear that style” (Man C, age 18 years). This reference to being a new product is not about vape pens or EIDs being new to the marketplace but that vape devices are now for marijuana consumption. A few participants referenced the use of wax in the vape pens. Wax is typically sold as a substrate embedded with varying concentrations of tetrahydrocannabinol (THC), the chemical compound responsible for the euphoric high found in cannabis. Respondents specifically named THC in reference to vaping, like this person described, “Wax is just like THC. Like melted down and you put it in like something like this [pointing to tank-style vape pen]. You put it in there. . . . Put wax in a vapor and let it burn like—like liquid” (Woman C, age 19 years).

Some participants mentioned advantages of using a vape pen with marijuana; that is, vaping THC masks the smell and taste of marijuana with the use of flavored liquid. Mixing flavors with marijuana wax or oil provides a customized, convenient, and covert experience. Additionally, a few experienced users also described the sustained high they get when mixing marijuana and nicotine in these tools.

## Discussion

The purpose of this study was to explore how African American YYAs use hookah and EIDs and in what ways they describe and organize these products. Interestingly, African American YYAs recognized and described traditional hookah based on physical attributes, but for EIDs, including e-cigarettes, e-hookah, and vape pens, YYAs focused on reasons for using the product. Three primary categories emerged for reasons YYAs used specific products: nicotine content and quitting, social facilitation, and use with marijuana. These categories helped differentiate the products in ways beyond the product category name of hookah or electronic device. Surveillance surveys that rely on these conventional product terms without further description or assessment of how each is used can result in improper categorizations and underreporting of use.

Assessment of tobacco product use has become more complex with the emergence of new products. Tobacco products are a mix of traditional items such as hookah or waterpipe, and new technology such as electronic cigarettes, vaporizers, and other EIDs. We found that African American YYAs perceptions surrounding the names and functions of the products differed from how products are classified and defined by the FDA and scholars. The physical characteristics of the products may help organize types of tobacco, as is currently done by the FDA and surveillance surveys, but the variation in terms and naming conventions found in our study suggest complexities that may affect how we measure use of these products. For example, YYAs recognized the image of a traditional hookah and described the physical properties of traditional hookah along with some descriptions of the social environment in which it would be used. This conventional categorization of traditional hookah is consistent with other literature (J. N. Robinson, Wang, Jackson, Donaldson, & Ryant, 2018). Similarly, the physical characteristics and functions of the cig-alike type of e-cigarette were well defined by this study's sample and perceptions appear to be consistent with other literature (Kistler et al., 2017; U.S. Department of Health and Human Services, 2016; Wagoner et al., 2016). Yet varied terminology used by African American YYAs to name both hookah and EIDs in this study demonstrates the blurring between these two classes of products. Wagoner et al. (2016) had similar findings among their YYA sample where various terminologies were used, but no clear classification system emerged.

We found that the patterns in how the product was used provided an opportunity for identifying a classification system other than the name of the products themselves. Current surveillance methods are ill equipped to adjust to changing terminology of these products, particularly by less represented groups of YYA. The implication for measurement of these products among African American YYAs is that questions may need to focus on how the end-user is defining, describing, and using these products rather than relying solely on names or classes of product. New questions may need to be formulated to assess ways in which YYAs perceive the characteristics, reasons for using different classes of product, and different terms they use to name those products in order to obtain accurate prevalence rates. The images of the various tobacco products used to collect data in current national surveys may not be adequate without follow-up questions utilizing the terms that the participant uses to describe that product and further probing on how they use the product (e.g., with marijuana). One possibility might be to ask participants to first identify an image of a product, followed by whether they use that product with a substance such as marijuana, and then ask for them to name the product as it is known among their group of peers. This will enable researchers to use that name in subsequent questions within the same survey. This will help with within-subject reliability and between-subject comparisons because now the product can be classified by use and by name. As the constellation of products shift and change, surveillance efforts should recognize that they may be using outdated or confusing terminology and continuous reformation of the questions may need to occur, especially for underrepresented subgroups as these products have different uses and these terms may have different meanings from the cultural majority and/or those developing the measurement tools.

Our findings suggest that any measure that relies on YYAs participants to recall nicotine concentrations may not be valid or reliable. Our study illustrates that there remains significant confusion over which products contain nicotine, what the nicotine concentration is within products, and the relationship between nicotine and addiction. Participants easily identified e-cigarettes, specifically cig-alike versions, as being healthier, less addictive, and helping people quit, but simultaneously held the perception that these have more nicotine than other tobacco products. Participants were largely unsure of the presence of nicotine in other EIDs and some believed that e-hookah products have no nicotine and only flavor. We need to better communicate nicotine exposure risks and the health-related consequences of nicotine exposure. More fine-tuned and effective health communications to prevent or reduce hookah and EID use among African American YYAs are needed.

Another area of concern is that some of these products are being adapted and used for marijuana. Surveillance studies currently focus questions about EID to assess nicotine exposure. As our study suggests, not only are African

American YYAs using terminology differently but they may also be using the product differently from the way it is presented and assessed in surveillance studies. This is especially important to discern as marijuana norms shift and states move toward more permissive laws surrounding marijuana use. For African American YYAs, use of tobacco in isolation from marijuana is uncommon, thus, incomplete understanding of how YYA use products may obscure race/ethnic differences in use (Green et al., 2016; Kennedy, Caraballo, Rolle, & Rock, 2016; Kennedy, Patel, Cheh, Hsia, & Rolle, 2016; Montgomery, 2015; Schauer, Rosenberry, & Peters, 2017).

This study contributes toward filling a gap in understanding how and why some African American YYAs use hookah and EID products, particularly in a context of strong anti-cigarette tobacco norms and legalized recreational marijuana use in California. Despite significant health and economic successes of the comprehensive California tobacco control program (Lightwood & Glantz, 2013; Max, Sung, & Lightwood, 2013; Pierce, Messer, White, Kealey, & Cowling, 2010), inequalities continue to exist with African American populations showing higher cigarette prevalence (Trinidad et al., 2005) and continued differential use compared to their European American counter parts (Sakuma et al., 2016; Trinidad et al., 2015). Given these disparities in cigarette use within a restrictive environment, understanding how these other products are being perceived and used by African American YYAs in the absence of product specific regulation will help identify early on the types of policies and messages that would need to be addressed in at-risk populations.

Biochemical verification of nicotine exposure was not conducted; and thus, it is possible that these perceptions of each product may not be as strongly associated with actual past or current use of the product. Despite this, the goal of the study was to assess how African American YYA perceived these products and the reasons for using the various products as a way to understand potential risk factors and messages they may have received that might encourage experimentation or use. Biochemical verification was seen as an additional and unnecessary burden to our participants as it was not directly relevant to the aims of this study. Furthermore, biochemical verification was limited to overall nicotine exposure and at the time of data collection, available tests were unable to identify biomarkers that could differentiate between tobacco products or multiple product use. Thus, this additional test would not have provided clarity to our findings or changed the implications of our results.

The study sample was purposively selected for demographic homogeneity with a wide range of experiences with tobacco products and the data collected were rich (O. C. Robinson, 2014). We did reach saturation during the course of the interviews, indicating that our sample size was adequate to uncover the phenomenon of interest (e.g., perceptions of the tobacco products) (Guest, Bunce, & Johnson, 2006; Saldana, 2016; Saunders et al., 2018), and we are

confident that, through the rigor of our analyses, the patterns identified from these interviews are valid (Roy et al., 2015; Saldana, 2016). The sample was limited to those with prior tobacco product experience; and thus, other studies investigating naïve YYA around initiation and experimentation with these products are warranted. Future studies should investigate whether these patterns could be generalizable to a greater population of African American YYAs and whether these same definitions and uses are similar among other race/ethnic YYAs groups or other priority populations who have tobacco use disparities or tobacco-related health disparity outcomes. Future studies should also focus on survey construction and validity to help ensure precision and bring concordance between researchers and YYAs definitions of products, with special attention to underrepresented groups. The rich data collected and analyzed here offer areas of clarity and significant depth as well as introduce ideas to be considered as we move forward in surveillance and regulatory policies.

## Conclusion

Definitions of new and emerging tobacco products are categorized based on physical properties of the device by the FDA and operationalized in research assessments and surveillance studies. The current generation of African American YYAs may use similar product names and terminology but may be referring to different classes of products from conventional categories. This incongruity may contribute to misinformed or uninformed young people about the health effects of these products and introduce challenges to tobacco control and surveillance. Our findings suggest that researchers should consider how large-scale surveillance studies may be underreporting or misreporting certain types of product use by underrepresented minority populations. Furthermore, a better understanding of how the products are being used and perceived by this high-risk population can help lead to more accurate assessment of exposure and use, more effective prevention and intervention programs, and better informed regulations. The implications of this shifting landscape of product names, definitions, and perceptions will make tobacco control regulation much more complex and challenging but especially important to address current tobacco-related health inequity.

## Acknowledgments

Authors would like to thank all of our community partners and participants in contributing to this important work. We would like to thank especially Maggie Hawkins, Dr. Yvette Thomas, Dr. Keosha Partlow, Alicia Berridge, Benny Ortiz, Mike Braby, and Jerry Trotter for their dedication and support.

## Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the National Cancer Institute (NCI) of the National Institutes of Health (NIH) and the Food and Drug Administration (FDA) Center for Tobacco Products (CTP) under Award No. R03CA180945 to KKS. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the FDA.

## ORCID iD

Kari-Lyn K. Sakuma  <https://orcid.org/0000-0002-4722-1041>

## References

Alexander, J. P., Coleman, B. N., Johnson, S. E., Tessman, G. K., Tworek, C., & Dickinson, D. M. (2016). Smoke and vapor: Exploring the terminology landscape among electronic cigarette users. *Tobacco Regulatory Science*, 2, 204-213. doi:10.18001/TRS.2.3.1

Alexander, L. A., Trinidad, D. R., Sakuma, K.-L. K., Pokhrel, P., Herzog, T. A., Clanton, M. S., . . . Fagan, P. (2016). Why we must continue to investigate menthol's role in the African American smoking paradox. *Nicotine & Tobacco Research*, 18(Suppl. 1), S91-S101. doi:10.1093/ntr/ntv209

American Lung Association. (2010). *Too many cases, too many deaths: Lung cancer in African Americans*. Retrieved from <http://www.lung.org/our-initiatives/research/lung-health-disparities/lung-cancer-in-african-americans.html>

Balbach, E. D., Gasior, R. J., & Barbeau, E. M. (2003). R.J. Reynolds' targeting of African Americans: 1988–2000. *American Journal of Public Health*, 93, 822-827.

Cantrell, J., Kreslake, J. M., Ganz, O., Pearson, J. L., Vallone, D., Anesetti-Rothermel, A., . . . Kirchner, T. R. (2013). Marketing little cigars and cigarillos: Advertising, price, and associations with neighborhood demographics. *American Journal of Public Health*, 103, 1902-1909. doi:10.2105/AJPH.2013.301362

Corey, C. G., Dube, S. R., Ambrose, B. K., King, B. A., Apelberg, B. J., & Husten, C. G. (2014). Cigar smoking among U.S. students: Reported use after adding brands to survey items. *American Journal of Preventive Medicine*, 47(2 Suppl. 1), S28-S35. doi:10.1016/j.amepre.2014.05.004

Corral, I., Landrine, H., Simms, D. A., & Bess, J. J. (2013). Polytobacco use and multiple-product smoking among a random community sample of African-American adults. *BMJ Open*, 3(12), e003606. doi:10.1136/bmjopen-2013-003606

Delnevo, C. D., Bover-Manderski, M. T., & Hrywna, M. (2011). Cigar, marijuana, and blunt use among US adolescents: Are we accurately estimating the prevalence of cigar smoking among youth? *Preventive Medicine*, 52, 475-476. doi:10.1016/j.ypmed.2011.03.014

Food and Drug Administration. (2016). *Federal Register: Deeming tobacco products to be subject to the federal food, drug, and cosmetic act, as amended by the Family Smoking Prevention and Tobacco Control Act; restrictions on the sale and distribution of tobacco products and required warning statements for tobacco products*. Retrieved from [www.federalregister.gov/documents/2016/05/10/2016-10685/deeming-tobacco-products-to-be-subject-to-the-federal-food-drug-and-cosmetic-act-as-amended-by-the-family-smoking-prevention-and-tobacco-control-act](http://www.federalregister.gov/documents/2016/05/10/2016-10685/deeming-tobacco-products-to-be-subject-to-the-federal-food-drug-and-cosmetic-act-as-amended-by-the-family-smoking-prevention-and-tobacco-control-act)

Grana, R., Benowitz, N., & Glantz, S. A. (2014). E-cigarettes: a scientific review. *Circulation*, 129, 1972-1986. doi:10.1161/CIRCULATIONAHA.114.007667

Green, K. M., Johnson, R. M., Milam, A. J., Furr-Holden, D., Ialongo, N. S., & Reboussin, B. A. (2016). Racial differences and the role of neighborhood in the sequencing of marijuana and tobacco initiation among urban youth. *Substance Abuse*, 37, 507-510. doi:10.1080/08897077.2016.1178680

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59-82. doi:10.1177/1525822X05279903

Haiman, C. A., Stram, D. O., Wilkens, L. R., Pike, M. C., Kolonel, L. N., Henderson, B. E., & Le Marchand, L. (2009). Ethnic and racial differences in the smoking-related risk of lung cancer. *New England Journal of Medicine*, 354, 333-342. doi:10.1056/NEJMoa03325

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15, 1277-1288. doi:10.1177/1049732305276687

Hsu, G., Sun, J. Y., & Zhu, S.-H. (2018). Evolution of electronic cigarette brands from 2013-2014 to 2016-2017: Analysis of brand websites. *Journal of Medical Internet Research*, 20(3), e80. doi:10.2196/jmir.8550

Huang, J., Duan, Z., Kwok, J., Binns, S., Vera, L. E., Kim, Y., . . . Emery, S. L. (2019). Vaping versus JUULing: How the extraordinary growth and marketing of JUUL transformed the US retail e-cigarette market. *Tobacco Control*, 28, 146-151. doi:10.1136/tobaccocontrol-2018-054382

Huang, Y.-H. J., Zhang, Z.-F., Tashkin, D. P., Feng, B., Straif, K., & Hashibe, M. (2015). An epidemiologic review of marijuana and cancer: An update. *Cancer Epidemiology, Biomarkers & Prevention*, 24, 15-31. doi:10.1158/1055-9965.EPI-14-1026

Hyland, A., Ambrose, B. K., Conway, K. P., Borek, N., Lambert, E., Carusi, C., . . . Compton, W. M. (2017). Design and methods of the Population Assessment of Tobacco and Health (PATH) study. *Tobacco Control*, 26, 371-378. doi:10.1136/tobaccocontrol-2016-052934

Jamal, A., Gentzke, A., Hu, S. S., Cullen, K. A., Apelberg, B. J., Homa, D. M., & King, B. A. (2017). Tobacco use among middle and high school students: United States, 2011–2016. *MMWR Morbidity and Mortality Weekly Report*, 66, 597-603. doi:10.15585/mmwr.mm6623a1

Kennedy, S. M., Caraballo, R. S., Rolle, I. V., & Rock, V. J. (2016). Not just cigarettes: A more comprehensive look at marijuana and tobacco use among African American and White youth and young adults. *Nicotine & Tobacco Research*, 18(Suppl. 1), S65-S72. doi:10.1093/ntr/ntv202

Kennedy, S. M., Patel, R. P., Cheh, P., Hsia, J., & Rolle, I. V. (2016). Tobacco and marijuana initiation among African American and White young adults. *Nicotine & Tobacco Research*, 18(Suppl. 1), S57-S64. doi:10.1093/ntr/ntv194

Kirchner, T. R., Villanti, A. C., Cantrell, J., Anesetti-Rothermel, A., Ganz, O., Conway, K. P., . . . Abrams, D. B. (2015). Tobacco retail outlet advertising practices and proximity to schools, parks and public housing affect Synar underage sales violations in Washington, DC. *Tobacco Control*, 24, e52-e58. doi:10.1136/tobaccocontrol-2013-051239

Kistler, C. E., Crutchfield, T. M., Sutfin, E. L., Ranney, L. M., Berman, M. L., Zarkin, G. A., & Goldstein, A. O. (2017). Consumers' preferences for electronic nicotine delivery system product features: A structured content analysis. *International Journal of Environmental Research and Public Health*, 14(6), E613. doi:10.3390/ijerph14060613

Kochanek, K. D., Murphy, S. L., Xu, J., & Tejada-Vera, B. (2016). Deaths: Final data for 2014. *National Vital Statistics Reports*, 65, 1-122.

Lee, J. G. L., Henriksen, L., Rose, S. W., Moreland-Russell, S., & Ribisl, K. M. (2015). A systematic review of neighborhood disparities in point-of-sale tobacco marketing. *American Journal of Public Health*, 105, e8-e18. doi:10.2105/AJPH.2015.302777

Lightwood, J., & Glantz, S. A. (2013). The effect of the California tobacco control program on smoking prevalence, cigarette consumption, and healthcare costs: 1989-2008. *PLoS One*, 8, e47145. doi:10.1371/journal.pone.0047145

Lipperman-Kreda, S., Grube, J. W., & Friend, K. B. (2014). Contextual and community factors associated with youth access to cigarettes through commercial sources. *Tobacco Control*, 23, 39-44. doi:10.1136/tobaccocontrol-2012-050473

Luborsky, M. R., & Rubinstein, R. L. (1995). Sampling in qualitative research: Rationale, issues, and methods. *Research on Aging*, 17, 89-113. doi:10.1177/0164027595171005

Marynak, K. L., Gammon, D. G., King, B. A., Loomis, B. R., Fulmer, E. B., Wang, T. W., & Rogers, T. (2017). National and state trends in sales of cigarettes and e-cigarettes, U.S., 2011-2015. *American Journal of Preventive Medicine*, 53, 96-101. doi:10.1016/j.amepre.2017.01.016

Max, W., Sung, H.-Y., & Lightwood, J. (2013). The impact of changes in tobacco control funding on healthcare expenditures in California, 2012-2016. *Tobacco Control*, 22(e1), e10-e15. doi:10.1136/tobaccocontrol-2011-050130

Max, W., Sung, H.-Y., Tucker, L.-Y., & Stark, B. (2010). The disproportionate cost of smoking for African Americans in California. *American Journal of Public Health*, 100, 152-158. doi:10.2105/AJPH.2008.149542

McDonald, E. A., & Ling, P. M. (2015). One of several "toys" for smoking: young adult experiences with electronic cigarettes in New York City. *Tobacco Control*, 24, 588-593. doi:10.1136/tobaccocontrol-2014-051743

Montgomery, L. (2015). Marijuana and tobacco use and co-use among African Americans: Results from the 2013, National Survey on Drug Use and Health. *Addictive Behaviors*, 51, 18-23. doi:10.1016/j.addbeh.2015.06.046

Nasim, A., Blank, M. D., Berry, B. M., & Eissenberg, T. (2012). Cigar use misreporting among youth: Data from the 2009 Youth Tobacco Survey, Virginia. *Preventing Chronic Disease*, 9.

Pierce, J. P., Messer, K., White, M. M., Kealey, S., & Cowling, D. W. (2010). Forty years of faster decline in cigarette smoking in California explains current lower lung cancer rates. *Cancer Epidemiology, Biomarkers & Prevention*, 19, 2801-2810. doi:10.1158/1055-9965.EPI-10-0563

Primack, B. A., Bost, J. E., Land, S. R., & Fine, M. J. (2007). Volume of tobacco advertising in African American markets: Systematic review and meta-analysis. *Public Health Reports*, 122, 607-615.

Rait, M. A., Prochaska, J. J., & Rubinstein, M. L. (2016). Reporting of cigar use among adolescent tobacco smokers. *Addictive Behaviors*, 53, 206-209. doi:10.1016/j.addbeh.2015.06.035

Robinson, J. N., Wang, B., Jackson, K. J., Donaldson, E. A., & Ryant, C. A. (2018). Characteristics of hookah tobacco smoking sessions and correlates of use frequency among US adults: Findings from Wave 1 of the Population Assessment of Tobacco and Health (PATH) study. *Nicotine & Tobacco Research*, 20, 731-740. doi:10.1093/ntr/ntx060

Robinson, O. C. (2014). Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative Research in Psychology*, 11, 25-41. doi:10.1080/14780887.2013.801543

Rodriguez, D., Carlos, H. A., Adachi-Mejia, A. M., Berke, E. M., & Sargent, J. D. (2013). Predictors of tobacco outlet density nationwide: A geographic analysis. *Tobacco Control*, 22, 349-355. doi:10.1136/tobaccocontrol-2011-050120

Roy, K., Zvonkovic, A., Goldberg, A., Sharp, E., & LaRossa, R. (2015). Sampling richness and qualitative integrity: Challenges for research with families. *Journal of Marriage and Family*, 77, 243-260. doi:10.1111/jomf.12147

Sakuma, K.-L. K., Felicitas-Perkins, J. Q., Blanco, L., Fagan, P., Pérez-Stable, E. J., Pulvers, K., . . . Trinidad, D. R. (2016). Tobacco use disparities by racial/ethnic groups: California compared to the United States. *Preventive Medicine*, 91, 224-232. doi:10.1016/j.ypmed.2016.08.035

Saldana, J. (2016). *The coding manual for qualitative researchers* (3rd ed.). Thousand Oaks, CA: Sage.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., . . . Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*, 52, 1893-1907. doi:10.1007/s11135-017-0574-8

Schauer, G. L., Rosenberry, Z. R., & Peters, E. N. (2017). Marijuana and tobacco co-administration in blunts, spliffs, and mulled cigarettes: A systematic literature review. *Addictive Behaviors*, 64, 200-211. doi:10.1016/j.addbeh.2016.09.001

Seidenberg, A. B., Caughey, R. W., Rees, V. W., & Connolly, G. N. (2010). Storefront cigarette advertising differs by community demographic profile. *American Journal of Health Promotion*, 24, e26-e31. doi:10.4278/ajhp.090618-QUAN-196

Sterling, K. L., Fryer, C. S., Pagano, I., & Fagan, P. (2016). Little cigars and cigarillos use among young adult cigarette smokers in the United States: Understanding risk of concomitant use subtypes. *Nicotine & Tobacco Research*, 18, 2234-2242. doi:10.1093/ntr/ntw170

Sterling, K. L., Majeed, B. A., Nyman, A., & Eriksen, M. (2017). Risk perceptions of little cigar and cigarillo smoking among adult current cigarette smokers. *Nicotine & Tobacco Research*, 19, 1351-1358. doi:10.1093/ntr/ntw244

Terchek, J. J., Larkin, E. M. G., Male, M. L., & Frank, S. H. (2009). Measuring cigar use in adolescents: Inclusion of a brand-specific item. *Nicotine & Tobacco Research*, 11, 842-846. doi:10.1093/ntr/ntp074

Trinidad, D. R., Gilpin, E. A., Lee, L., & Pierce, J. P. (2004). Has there been a delay in the age of regular smoking onset among African Americans? *Annals of Behavioral Medicine*, 28, 152-157. doi:10.1207/s15324796abm2803\_2

Trinidad, D. R., Gilpin, E. A., White, M. M., & Pierce, J. P. (2005). Why does adult African-American smoking prevalence in California remain higher than for non-Hispanic Whites? *Ethnicity & Disease*, 15, 505-511.

Trinidad, D. R., Pérez-Stable, E. J., Emery, S. L., White, M. M., Grana, R. A., & Messer, K. S. (2009). Intermittent and light daily

smoking across racial/ethnic groups in the United States. *Nicotine & Tobacco Research*, 11, 203-210. doi:10.1093/ntr/ntn018

Trinidad, D. R., Xie, B., Fagan, P., Pulvers, K., Romero, D. R., Blanco, L., & Sakuma, K.-L. K. (2015). Disparities in the population distribution of African American and non-Hispanic White smokers along the quitting continuum. *Health Education & Behavior*, 42, 742-751. doi:10.1177/1090198115577376

U.S. Department of Health and Human Services. (1998). *Tobacco use among US racial/ethnic minority groups—African Americans, American Indians and Alaska Natives, Asian Americans and Pacific Islanders, and Hispanics: A report of the surgeon general*. Retrieved from [https://www.cdc.gov/tobacco/data\\_statistics/sgr/1998/complete\\_report/pdfs/complete\\_report.pdf](https://www.cdc.gov/tobacco/data_statistics/sgr/1998/complete_report/pdfs/complete_report.pdf)

U.S. Department of Health and Human Services. (2014). *The health consequences of smoking—50 years of progress: A report of the surgeon general*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

U.S. Department of Health and Human Services. (2016). *E-cigarette use among youth and young adults: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Villanti, A. C., Cobb, C. O., Cohn, A. M., Williams, V. F., & Rath, J. M. (2015). Correlates of hookah use and predictors of hookah trial in U.S. young adults. *American Journal of Preventive Medicine*, 48, 742-746. doi:10.1016/j.amepre.2015.01.010

Wagoner, K. G., Cornacchione, J., Wiseman, K. D., Teal, R., Moracco, K. E., & Sutfin, E. L. (2016). E-cigarettes, hookah pens and vapes: Adolescent and young adult perceptions of electronic nicotine delivery systems. *Nicotine & Tobacco Research*, 18, 2006-2012. doi:10.1093/ntr/ntw095

Xu, J., Murphy, S., Kochanek, K., & Bastian, B. (2016). Deaths: Final data for 2013. *National Vital Statistics Reports*, 64(2), 1-119.

Yerger, V. B., & Malone, R. E. (2002). African American leadership groups: Smoking with the enemy. *Tobacco Control*, 11, 336-345. doi:10.1136/tc.11.4.336

Yerger, V. B., Przewoznik, J., & Malone, R. E. (2007). Racialized geography, corporate activity, and health disparities: Tobacco industry targeting of inner cities. *Journal of Health Care for the Poor and Underserved*, 18(4 Suppl.), 10-38. doi:10.1353/hpu.2007.0120

Zhu, S.-H., Sun, J. Y., Bonnevie, E., Cummins, S. E., Gamst, A., Yin, L., & Lee, M. (2014). Four hundred and sixty brands of e-cigarettes and counting: implications for product regulation. *Tobacco Control*, 23(Suppl. 3), iii3-iii9. doi:10.1136/tobacco-control-2014-051670