



Appealing characteristics of E-cigarette marketing in the retail environment among adolescents

Shivani Mathur Gaiha^{a,b,c,*}, Lauren Kass Lempert^a, Holly Lung^a, Francesca Vescia^a, Bonnie Halpern-Felsher^a

^a Stanford REACH Lab, Division of Adolescent Medicine, Department of Pediatrics, Stanford University, CA, USA

^b Division of Adolescent/Young Adult Medicine, Department of Pediatrics, Boston Children's Hospital, USA

^c Faculty of Pediatrics, Harvard Medical School, USA

ARTICLE INFO

Keywords:

Tobacco
Electronic cigarette (e-cigarette)
Vaping
Adolescent
Marketing
Advertising
Focus group
Tobacco Power Wall
United States
Warning
Prevention
Policy

ABSTRACT

Background: Nearly 3 million U.S. adolescents use e-cigarettes. E-cigarette marketing is associated with adolescent e-cigarette use; however, studies have not asked adolescents their perceptions about whether and which e-cigarette marketing in retail stores influences purchase and use.

Methods: Eleven 90-minute focus groups with 12–19-year-olds (mean age 15.7, 46.6 % female) from 11 U.S. states (n = 58) recruited through Instagram and schools (May 2021–Aug 2022). Photographs of e-cigarette marketing in and around retail stores were used to aid discussion. Thematic analysis identified themes related to appealing marketing characteristics.

Results: Adolescents indicated that e-cigarette marketing in and around retail stores arouses their curiosity, reminds them to buy, and normalizes using e-cigarettes. Adolescents identified specific e-cigarette marketing characteristics that they believed influence their decision to purchase and use e-cigarettes including the Tobacco Power Wall, free samples and flavor smelling samples, price incentives such as discounts and starter-kits, e-cigarette displays near checkout encouraging grab-and-go, displays near food, snacks or candy, and e-cigarette advertising through posters on store windows and stickers at checkout. Adolescents reported combining online and social media strategies to bypass age verification in retail stores (e.g., buying gift cards online and using them in stores). Adolescents suggested adding warning images on negative health effects of e-cigarettes, increasing prominence of minimum-age-of-tobacco-sale signs, and developing marketing education as counter-marketing strategies.

Conclusions: Adolescents indicate that specific e-cigarette marketing characteristics in retail stores influence their purchase and use decisions. Addressing such e-cigarette marketing exposures in retail stores through counter-marketing messages may bolster adolescent e-cigarette prevention efforts.

1. Introduction

Adolescent e-cigarette use remains high, with an estimated 2.8 million adolescents reporting electronic cigarette (e-cigarette) use in the past month and 27.6 % use daily (Birdsey et al., 2023). E-cigarette use has known adverse health effects on the heart, lungs, and blood vessels, and nicotine addiction among adolescent users (Klein, 2018; Kuntic et al., 2019; Wills et al., 2019; Alzahrani et al., 2018), underscoring the need to prevent adolescent e-cigarette use.

E-cigarette marketing greatly appeals to adolescents and is

associated with adolescent e-cigarette initiation (Villanti et al., 2016; Singh et al., 2016; Mantey et al., 2016). E-cigarette marketing in the retail environment comprises marketing inside and around brick-and-mortar stores such as gas stations, vape shops, and convenience stores that includes product displays and placement; location and size of interior and exterior advertisements; and price/promotional incentives such as discounts. As a specific example of e-cigarette marketing at the point-of-sale, the Tobacco Power Wall (TPW) usually shows “hundreds of different brands of cigarettes and other tobacco products; feature branded posters, product slogans, and price placards; and are

Abbreviations: TPW, Tobacco Power Wall.

* Corresponding author at: 1 Autumn Street, 504, Boston, Massachusetts 02215, USA.

E-mail address: Shivani.Gaiha@childrens.harvard.edu (S.M. Gaiha).

<https://doi.org/10.1016/j.pmedr.2024.102769>

Received 13 January 2024; Received in revised form 17 May 2024; Accepted 20 May 2024

Available online 21 May 2024

2211-3355/© 2024 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

prominently placed in retail locations, typically behind the cashier.” (Setodji et al., 2018). Marketing in retail stores is especially concerning given that (1) such marketing is the leading source of all e-cigarette marketing exposure among adolescents (Mantey et al., 2016; Marynak et al., 2018; Singh et al., 2016), (2) exposure to such marketing is directly related to adolescents’ past 30-day use of e-cigarettes (Singh et al., 2016; D’Angelo et al., 2020; Pasch et al., 2017; Trapl et al., 2020), and (3) a significant and increasing number of adolescents purchase e-cigarettes directly from retail stores (Centers for Disease Control and Prevention, 2022; Gaiha et al., 2019; Do et al., 2023; Initiative, 2018; Dai et al., 2020; Mantey et al., 2019). Point-of-sale advertising, promotional allowances to retailers, and price discounts are major spending categories for e-cigarette companies (Federal Trade Commission, 2021). Owing to the clear relationship between e-cigarette marketing to underage people (i.e., under legal age of 21) and adolescent use of e-cigarettes, many e-cigarette companies have received warning letters from FDA, and paid legal settlements for marketing to youth (Barbara et al., 2024; Furlow, 2023).

Despite the impact of e-cigarette-related marketing in the retail environment on adolescents’ use, studies examining the appealing characteristics of marketing in the retail environment have been limited. Studies using experimental marketplaces, eye-tracking, and content analyses of advertising (Jackler and Ramamurthi, 2017; Kim et al., 2019) suggest that tobacco marketing in the retail environment likely attracts adolescents. To our knowledge, no studies have directly asked adolescents to identify appealing characteristics of e-cigarette marketing in the retail environment in the context of their intentions to purchase and use e-cigarettes. Such data are important to inform e-cigarette counter-marketing messaging aimed at reducing adolescent e-cigarette purchase and use as well as inform regulation that might be effective in reducing underage e-cigarette use. The objective of this qualitative study is to examine adolescents’ perceptions of how and which e-cigarette marketing characteristics (e.g., product display, location/size of advertising, and price incentives) in the retail environment influence

adolescents’ intentions to purchase and use e-cigarettes.

2. Methods

This qualitative study was conducted from May 2021 to August 2022 and involved 90-minute focus groups with adolescents. Focus groups were designed to facilitate participants to recall and describe e-cigarette-related marketing characteristics in the retail environment that they find appealing.

2.1. Participants and recruitment

Participants (11–19 years) were recruited using convenience sampling through Instagram and schools (50:50). On Instagram, Stanford REACH Lab’s Youth Action Board (YAB) created advertisements about the study, which were promoted in 30 U.S. cities with the highest tobacco retailer density (ASPIRE Center, 2023). For school-based recruitment, we focused on two mid-sized urban counties each from California and North Carolina (four total) where we had connections with school-based health educators and to allow for geographical variation and different regulatory approaches pertaining to the retail environment. Parental consent and child assent was collected for all participants under 18 years and those above 18 provided consent.

2.2. Measures

A pre-focus group survey asked adolescents by sex, gender, race/ethnicity, and e-cigarette user/non-user status to ensure that each focus group included representation from diverse groups. The focus group guide was developed based on the literature on e-cigarette marketing characteristics in the retail environment (Mantey et al., 2016; Marynak et al., 2018; Singh et al., 2016; Bloom, 2001; Lavack and Toth, 2006) and pilot testing with YAB. The final guide included questions about e-cigarette marketing appeals in retail stores and how such marketing

Table 1
Questions and probes used in focus groups.

Questions	Probes
1. Can you describe any vape-related marketing that you have seen...	<ul style="list-style-type: none"> Advertising you can recall? What type of advertising? Description of content/messages, Where? How frequently seen? Where vapes are kept in stores? Anything striking? Would you buy (hypothetically)?
2. From where do people your age prefer to buy their vapes and vaping products? How do they choose from where to buy their vapes?	<ul style="list-style-type: none"> What type of store? Do people have one set place? Does it vary? Can you explain why they make that choice?
3. Please tell me the story of how you or a friend first purchased a vape in a <u>retail store</u> OR If you have never ever purchased a vape in a retail store, please tell me the story of whether you or a friend ever went into a store and looked at the vaping products.	<ul style="list-style-type: none"> Describe the experience of browsing/ purchasing vapes in retail stores. What brought you to go into the shop? “stumbled” in because curious or to take a look/intentionally going in to buy vaping products/ accompany a friend Do you remember why you/your friend went to that store in particular?
4. Generally, what about e-cigarettes in <u>retail</u> stores is attractive? Least attractive?	<ul style="list-style-type: none"> What did you like and dislike about buying vapes in retail stores? (that you visit most often and least often) Advantages/ disadvantages in different types of stores?
5. I am now going to show you some photographs of stores. (Show 1 photograph at a time in random order): <i>Store exterior:</i> E-cigarette advertisement in the parking lot E-cigarette advertisements on store window and door <i>Store interior:</i> Tobacco Power wall behind checkout E-cigarettes displayed on counter-top in a cabinet near checkout E-cigarettes displayed on counter-top in a cabinet E-cigarettes display near candy E-cigarettes displayed on an aisle shelf with price incentives advertised (“low price/limited time offer/starter kit” E-cigarettes displayed in cabinet in a store corner (“redefining the future of smoking”) E-cigarette advertisement posters on a counter (“try me free”) E-cigarette advertisement on a standing carousel (see all 10 images in supplemental material)	<p>After each photo: What do you think about this picture? Where do you think it was taken? Have you seen something similar at stores you go to? Anything you notice or specifically catches your attention? What do you like? Don’t like? Does this picture make you interested in looking at any specific product closer? Does it make you want to buy a vape from this store? Why and how much do these features/ types of displays matter when it comes to browsing e-cigarettes? And purchasing e-cigarettes?</p>
6. Imagine that we had the power to change how vaping products are marketed. Can you suggest steps to discourage young people from entering stores to buy vapes?	Open-ended; no probes

potentially contributes to browsing/purchasing behavior and regular e-cigarette use (see Table 1). With each subsequent focus group, researchers gained insight into additional probes about e-cigarette-related marketing. We also used photo elicitation (Glaw et al., 2017; Richard and Lahman, 2015), whereby participants were shown 10 photographs of common e-cigarette marketing characteristics (e.g., check-out register, Tobacco Power Wall) to help them visualize their retail-store-experience (see supplemental material). Photographs were sourced from Counter-tobacco.org, a free resource of tobacco-related images in the retail environment.

2.3. Data collection

Data were collected both in-person and online when there were school closures due to COVID-19. Focus group discussions were audio-recorded and no video recording was made for any focus groups. This study was approved by Stanford University's Institutional Review Board.

2.4. Data analysis

Thematic analysis was used to develop conceptual categories, themes, and relationships among themes (Braun and Clarke, 2006). We calculated inter-rater reliability with the first set of transcripts, which had low kappas (0.56); as such, we revised and reduced overlapping scope of codes, resulting in a kappa of 0.73. All discrepancies between coders were discussed at the sentence level. NVivo 10 software was used for data management.

3. Results

Our study involved 11 focus groups, which included 58 participants from 11 states, ages 12–19 years (mean age 15.67+/-1.85), and 46.6 %

Table 2
Participant characteristics (N = 58) (11 US states, Data collected from May 2021–August 2022), n (%).

Demographic and Use information	15.67 ± 1.85
<i>Age</i>	
12–14	19 (32.7)
15–17	28 (48.3)
18–19	11 (19.0)
<i>Sex</i>	
Male	31 (53.4)
Female	27 (46.6)
<i>Gender</i>	
Heterosexual	53 (91.4)
LGBTQ+ (Yes)	5 (8.6)
<i>Race/ethnicity</i>	
Asian NH	21 (36.2)
Black NH	15 (25.9)
Hispanic or Latino	5 (8.6)
White NH	10 (17.2)
Other/multi-race NH	5 (8.6)
Prefer not to say	2 (3.4)
<i>E-cigarette ever use</i>	
Yes	14 (24.1)
No	44 (75.9)
<i>U.S. State</i>	
California	25 (43.1)
Colorado	1 (1.7)
Georgia	1 (1.7)
Illinois	3 (5.2)
Massachusetts	1 (1.7)
Michigan	2 (3.5)
Nevada	1 (1.7)
New York	10 (17.2)
North Carolina	11 (19.0)
Oregon	1 (1.7)
Pennsylvania	2 (3.5)

self-identifying as female, 8.6 % as LGBTQ+, 25.9 % as Black/AA Non-Hispanic (NH), and 24.1 % reported having ever-used an e-cigarette (see Table 2). We recruited 29 participants each from Instagram and schools; significantly more participants who had ever used an e-cigarette (13 vs 1) and older participants (mean age 16.8 vs 14.6) were recruited from Instagram compared to schools.

Across all focus groups, participants said that they were familiar with e-cigarette marketing including displays, price or other promotions, and pro-e-cigarette advertising in the retail environment. Here we present a summary of specific e-cigarette marketing characteristics youth identified as appealing, followed by how youth described the role of such e-cigarette marketing on their buying behavior, and recommendations for counter-marketing strategies.

3.1. Specific appealing characteristics in the retail environment

Participants described specific appealing e-cigarette marketing characteristics in the retail environment as a factor encouraging them to purchase and use e-cigarettes (see characteristics and sample quotes in Table 3). Specific appealing e-cigarette marketing characteristics discussed included the Tobacco Power Wall and product placement near drinks/candy/snacks, free product samples and smelling samples, price, and promotional incentives such as starter-kits that convey value for money, and pro-e-cigarette advertising. Most users desired availability of flavors and e-cigarettes and were attracted by retail store ambience and salespersons to a greater extent than those who had not used. Unless otherwise noted, for all themes, appealing marketing characteristics were similar across e-cigarette users and never-users and across states.

3.1.1. Tobacco power wall (TPW)

Participants reported that the Tobacco Power Wall (TPW) made them curious and directly encouraged them to purchase e-cigarettes, although the TPW also had features that could discourage use. First, seeing the TPW was described to have a cumulative effect on intentions and use through a dedicated section, stack of flavors, and colors. Participants described the TPW as a “fruit mix,” which was effective in “showing off” different products. Second, e-cigarettes on the TPW were typically behind the salesperson and in a locked cabinet, which contributed to adolescents perceiving a considerable barrier to purchase. Most adolescents said they would not like to ask the salesperson to give them e-cigarettes from the TPW for fear of being embarrassed if their age was verified or because they felt socially anxious. In contrast, a participant described being more comfortable asking for e-cigarettes at the TPW because the salesperson was more inclined to provide e-cigarettes as they were eager to move on to the next customer:

“I feel like if it's in a gas station, like, I would probably buy it if it's on the wall behind the register (be)cause I feel like if it's in any other place, and if I ask the store manager to get it for me, it feels suspicious. It kind of makes me feel like he's gonna give me, like, second thoughts. If it's behind him, I could be, like, ‘Oh, get me, like,___,’ and he will just get it and be over, like, that hesitation stage, (be) cause he already, like, got over with it.” (14, Female, Asian Non-Hispanic)

Third, participants who had used e-cigarettes observed that since the TPW is a busy display, it was difficult to ascertain whether one's choice of e-cigarettes was available and so they had to determine through trial and error or ask friends beforehand. Several participants suggested that seeing e-cigarettes next to cigarettes on the TPW made e-cigarettes less desirable. In many instances, participants also recalled e-cigarettes placed on top of the checkout counter, which they said encouraged last-minute purchases on their own or by their unsuspecting parents.

3.1.2. Product placement

Participants frequently encountered e-cigarette product displays, particularly in gas stations and convenience stores. They recalled

Table 3
Adolescent-identified appealing e-cigarette marketing characteristics in the retail environment with example quotations.

Type of marketing	Location	Example quotation/s
Flyer	<i>Immediate vicinity of retail stores</i>	"I mean like I go to Kumon and there's like a vape store like right next to it. So, like I guess there are like some signs and stuff." (17, Male, White Non-Hispanic)
Pro -e-cigarette advertising (Posters and sticker)	<i>Store exterior</i> <i>Store windows</i>	"You see the ad and you can just get into the store and take action right away. It's the reminder..." (16, Male, Asian Non-Hispanic) "But if I would see something like that (window ad), I think I will also be enticed, more interest(ed) to buy a vape..." (16, Male, Black/African American, Prefer not to disclose ethnicity) "Participant: When you're supposed to like go in, like the window right outside. They like posted on there... A poster... like medium sized, like an eight by 11, or like maybe a little bigger. Moderator (first author): And you saw this last Friday? Participant: Yeah, because it's right next to my school, so every time I leave school, I see it." (16, Female, Asian Non-Hispanic)
	<i>Store door/entrance</i>	"In like convenience stores, gas stations... they will advertise it with posters on the front of the store, as well, saying that they have this sort of vape in stock, like whatever, because, I don't know, maybe there's a high demand. I really don't know." (13, Male, White Non-Hispanic)
	<i>Store interior near checkout</i>	"It's, like, really cool minimalistic designs – or they be using some type of neon color. Sometimes it be a quote saying, like, vape is cool... Okay, it's like a regular sticker. So, yeah, like a regular-size sticker, so maybe equivalent to a small post-it note." (15, Female, Black/African American Non-Hispanic)
	<i>On top of counter</i>	"Like if it's on the counter, like if I'm not shopping for it, I'm not going to look at it like when I'm waiting in line, I'm more likely to like take a moment and like look at it, and then like because it's like right before checking out, like I'm more likely to grab it I guess." (18, Female, Asian Non-Hispanic)
	<i>Near checkout on a shelf in an aisle</i>	"And the purpose of them being by the counter is deliberate because of marketing, because if you're standing in line you can look around and if the Juul is just there right next to the counter it kind of makes you like, "Might as well. You know, you're at the counter, Juul's right there." (18, Female, Asian Non-Hispanic)
E-cigarette display	<i>Tobacco Power Wall (extensive/big/wall-to-wall product display) behind checkout and salesperson</i>	"If it's a gas store or convenience store usually they'll just be like behind the counter, maybe behind some sort of display window. Like they're there so that the customer is able to see them to know that the store has them but not so that they can readily grab it." (14, Male, White Non-Hispanic) "They're like behind the big glass cabinets and like they're all piled up. Everything like sorts into like different colorful groups. Like a fruit mix showing off everyone." (16, Male, Asian Non-Hispanic) "If I were interested in buying a vape then yeah, probably just because I really do like... how they're kind of displaying a whole array of products." (14, Male, White Non-Hispanic) "Yeah... I would like never ask for anything behind the counter, (be)cause I just don't want to interact with them and I also just don't want to be annoying, like, "Hey, can you give me that? Participant 2: It's social anxiety. Participant 3: It's like the same thing with like my friends all want to buy condoms at like the Walmart so they don't have to ask the person behind the counter to like – (be)cause it's embarrassing..." (18–19, Females, Asian Non-Hispanic)
	<i>Locked cabinet</i>	"...If you are just looking, you wouldn't want to rush into you know, trying to open it. There's a barrier between the person who is now curious and you know the product itself, yeah?" (16, Male, Black/African American Non-Hispanic) "Moderator: I'm just trying to think of what else is locked in stores? Participant 1: Liquor. Participant 2: Makeup... Participant 3: I mean they have like expensive items like – Participant 1: Alcohol, Participant 3: Like video games... virtual reality headsets... Yeah, but they're behind glass and it's locked, so I assume it's something like that because it's either more expensive, they don't want it to get stolen, or it like you need – it's just required by law or something... Participant 1: It's like a luxury item, I mean not like luxury, luxury like a Rolls Royce, but like it's more like for the people who have money to spend." (13–14, Males, White Non-Hispanic and Asian Non-Hispanic)
	<i>Near food/drink/candy</i>	"They tend to put it near the food section 'cause when you're hungry I think you buy more or something... I feel like the stores are very deliberately putting where the vapes are. They're putting it next to the food where kids are attracted to, putting it near like the places where kids tend to go." (16, Male, Asian Non-Hispanic) "Moderator: Why do you think it's near snacks and other things? Participant 1: To make it seem like I guess like a treat I guess, I don't know. Like that kind of thing where you're leaving and buying it, I don't know. Participant 2: That's like not a treat. Participant 1: Well, technically it is... Well, I don't know if putting it near candy is going to make it seem like it's good for you, but, Well, it's if they put it near candy, people might – Participant 3: No, yeah, they're going to make it look appetizing. Participant 1: Yeah, that's – yeah, makes it look better... (13–14, Males, White Non-Hispanic and Asian Non-Hispanic)
Price incentives through discounts, coupons, and deals	<i>Inside retail stores</i>	"If I were looking to vape and I saw \$6.99 I'd be good parking in the parking lot and like \$6.99, huh. That's affordable. 'Cause like, you know, broke teenager. \$7.00 I could do." (18, Female, Asian Non-Hispanic)

(continued on next page)

Table 3 (continued)

Type of marketing	Location	Example quotation/s
		<p>“Probably younger people, because they’re more worried about spending money because they don’t really have an easy way to get money.” (12, Male, Other multi-race Hispanic)</p> <p>“I think if someone saw that price and they saw limited time offer it would just pressure them to buy it like quicker or like they’d probably have a higher chance of buying it on the spot.” (14, Female, Asian Non-Hispanic)</p> <p>“I will be more willing to buy some with coupons and with discounts, compared to ones without discounts.” (14, Female, Asian Non-Hispanic)</p> <p>“...it just depends on the level of addiction... If they’re doing disposable ones, they can do one or two a month. But I also know people who get a new one every week and that adds up fast.” (15, Female, White Non-Hispanic)</p>
Price incentives through starter kits	Inside retail stores	<p>“I would go for a starter kit...you have all the products before you start to vape.” (15, Male, Black/African American Non-Hispanic)</p> <p>“Yeah, so I think I think it’s a good idea, because it kind of gives those who are willing to try and kind of starting an opportunity of having to interact with the product, but in a way that’s kind of reduced so by the end of it all, you have that opportunity to use it...” (16, Male, Black/African American Non-Hispanic)</p> <p>“Yeah, the idea of a starter kit seems appealing to somebody who’s probably never done it before.” (14, Female, Other multi-race Hispanic)</p> <p>Moderator (summarizing direct messages received in chat): “What does that wording mean to you? You think it’s like a travel, like a shampoo travel bottle kind of thing? ... Ok. Somebody said that they think it’s not as strong. What do you think is different about a starter kit? Ok. So they think that the vapes don’t have as many chemicals. Ok. So, it’s not just a smaller...”</p>
Free product samples	Mall/inside vape shop/ counter at the back of a store	<p>“... I saw friends sampling it uh in a store, in a store. Actually, there’s this one day when we entered in a store and uh, he asked the retailer, the owner to give him the vape. I can’t recall the brand, the type... actually I saw him – I saw the retailer giving him the exact vape he wanted to use. Next, I saw the, the friend doing it.” (15, Male, Black/African American Non-Hispanic)</p>
Free smelling samples		<p>“Some (salespeople)... had like smelling samples, so they were like, “Oh, come here and try this.”... But also I know that one friend told me she just used to buy with her sibling at a vape shop, just because she doesn’t really trust how the flavors smell online. One time she got like a cotton candy one and it was really bad. Yeah, so she said she would go to the vape shop so that she could smell them, because they generally allow you to smell them before you purchase.” (18, Female, White Non-Hispanic)</p> <p>“Well some (shops allow it), when you ask the vendor they might let you get a smell, but you still have to purchase the product in order to taste it.” (16, Male, Black/African American Non-Hispanic)</p>
Accessories to hide e-cigarettes	Inside vape shops	<p>“Participant 1: They like sell like fake items... I don’t know to say it. Participant 2: Something to try to hide the vape? Participant 1: Yes. Like that – they sell... they’ll like put out fake Pringle things and when you open it there’s like... they’ll sell like it’s like a soda thing and it looks like an actual soda. You can’t drink it ‘cause there’s like acids in the soda, but if you screw the bottom there’s a place to hide stuff in it.” (13, Female, Other multi-race Non-Hispanic)</p>
Merchandise		<p>“You could get a free hoodie or you could get a free book bag on the side. (It) will catch the customer’s eye more and motivate them to buy something” (16, Male, Black/African American Non-Hispanic)</p>

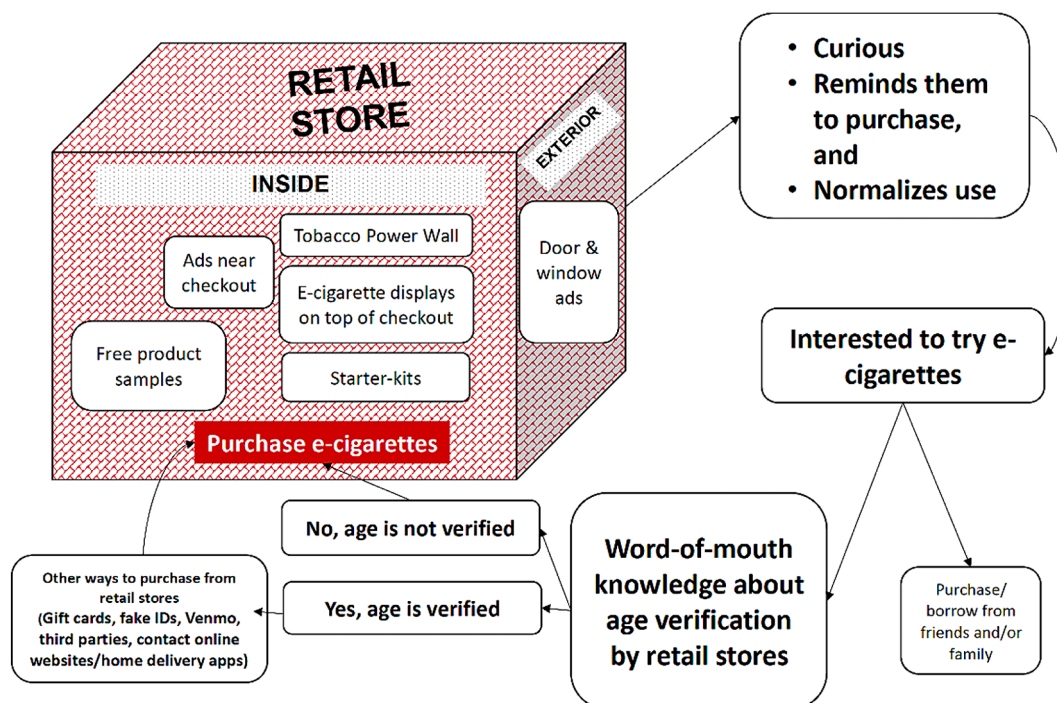


Fig. 1. Role of e-cigarette-related marketing in promoting adolescent curiosity and e-cigarette purchases in retail stores: A Conceptual Framework of findings.

specific locations where e-cigarettes were displayed (e.g., near checkout, “in the back”). Several participants perceived themselves as targets of e-cigarette-marketing, especially when they saw e-cigarettes adjacent to snacks, candy, or drinks in retail stores. By seeing e-cigarettes displayed in a locked cabinet, participants automatically perceived these products as more expensive, more valuable, and superior in quality than if they were displayed in a regular shelf in an aisle within the store. A participant described:

“I think (e-cigarettes in a locked cabinet) it’s more appealing because it kind of gives it a certain distinction, a certain kind of a kind of a level up... because there’s that kind of betterment, they are kind of showing quality.” (16, Male, Black/African American Non-Hispanic)

3.1.3. Free product samples and smelling samples

In vape and smoke shops, participants recalled being offered a free product and/or a smelling sample prior to purchase, as described by a participant below:

“Some of the stores do allow that, especially the vape shops, they do allow us you know try sample different products, and uh you know to try to choose our own favorite...I get to smell it and uh, at times, I get to have a taste of it.” (17, Male, Black/African American Non-Hispanic)

Several participants described a counter at the back of a store which had a few smelling samples laid out for trial. Adolescents suggested that retail stores had a distinct advantage over buying online because they offered smelling samples.

3.1.4. Price incentives offering value for money

Participants perceived e-cigarettes as expensive, particularly because of repeat purchases involved due to the addictive nature of the product and because they may need to purchase multiple parts separately (pods, liquids, devices). For those reasons, participants described e-cigarette marketing portraying e-cigarettes as inexpensive or affordable as highly attractive. Moreover, participants said that discounts, coupons, and starter-kits appealed to them because they wanted to get e-cigarettes

cheaper, quicker, and as an integrated set of items to start vaping. The term “starter-kit” had various meanings for participants – as a pack having lower nicotine strength, lower price, smaller packaging, and/or a bundle of items. Overall, participants agreed that starter-kits were intended for those who are younger and wanting to experiment, with one participant saying:

“For kids to start, a kit for like people who are just starting out...get start(ed) with a vape.” (14, Female, Other multi-race Hispanic)

3.1.5. Continuous trail of pro-e-cigarette advertising

In the immediate vicinity of stores, some participants recalled seeing signage outside other stores of relevance to them (e.g., seeing a flyer for a vape shop outside a math and reading center). Participants described how the exterior of stores selling e-cigarettes have their doors and windows covered in posters and stickers with pro-e-cigarette advertisements. Although dense advertising displays were considered messy and made it difficult for participants to identify specific products, they were all aware that the store offered a range of e-cigarette brands, flavors, and devices. Some key features of advertising on the store exterior that adolescents found appealing included displaying the price in a larger, clear font, and highlighting flavors/colors. Inside stores, at checkout, participants recalled small-sized stickers (“as big as Post-its”) as a reminder to purchase e-cigarettes.

3.2. Role of e-cigarette marketing in adolescents’ self-reported browsing and buying behavior

Adolescents described that e-cigarette marketing in and around retail stores reminded them about e-cigarette products, made them curious, and normalized seeing and using these products. Most participants said they knew specific retail stores where e-cigarettes would be available (e.g., delis, gas stations). Many participants had entered vape shops and smoke shops out of curiosity even if they had never tried e-cigarettes. Participants suggested that younger adolescents were more likely to visit retail stores to decide which e-cigarette to buy. See Fig. 1 for a diagrammatic summary of focus group responses on the role of e-cigarette

Table 4
Counter-marketing strategies suggested by adolescents with example quotations.

Strategy	Example quotation/s
Share images/photographs about negative health effects	<p>“Maybe that like vaping can have the potential to ruin your life with health issues and things. Maybe they should be required to print like images of the aftermath of health issues from vaping like they do with cigarettes in Canada on the cartons.” (14, Male, White Non-Hispanic)</p> <p>“Yeah, it would. Like I think also cigarette boxes, like especially they have like really scary images from like a bad lung or stuff. Like those pictures, they get to me. It’s kind of like, “Oh wow, I’m definitely not going to use that.” (18, Female, Asian Non-Hispanic)</p> <p>“You see like cigarettes are very weirdly marketed, like there are always big signs that say like cancer like specifically cancer, but you don’t see that usually on vapes.” (16, Male, Other multi-race Non-Hispanic)</p>
Increase size of warning labels	<p>“So I feel like, for marketing, they should obviously put the warning signs in big letters. Because I feel like some vaping products, they do have warning signs, but it’s not really noticeable, like, they’re able to – hide it. Because I remember seeing a vaping promoted, and they said nicotine is involved and it’s like an addictive substance. But at the same time, it wasn’t that noticeable, it’s easy to just miss it, you know? So, I would definitely change that and I would say to stop promoting it as like a cool product. Yeah, always promote it as something that has risks.” (15, Female, Black/African American Non-Hispanic)</p>
Display e-cigarettes behind the counter	<p>“You asked if it’s a common experience for it to be at the counter. I agree, I think that’s the only place you find them. And so I think there’s a big difference between being at the counter, where you can pick it up yourself, and being behind the counter because I don’t want to have to ask the person at the Walgreens –‘can you hand me that?’” (18, Female, Asian Non-Hispanic)</p>
Make age-of-sale warning signs more prominent	<p>“Probably putting the age limit or age requirement, or maybe include nicotine more prominently. Because some of the packaging, or advertisers, there weren’t any.” (14, Male, Other multi-race Hispanic)</p> <p>“So, I guess people don’t even talk about the age limit or how old you have to be to get it, ‘cause it just seems so natural for like teenagers to have it. And I don’t really see much people who are 21 actually vaping; I feel like it’s more of a teenager thing too.” (18, Female, Asian Non-Hispanic)</p> <p>“I don’t think there is an age limit, because they target mostly teens.” (13, Male, White, Prefer not to disclose ethnicity)</p>
Reduce stores selling e-cigarettes near schools	<p>“I think that they could put them like farther away from like schools and like just have them in only designated areas so that you can kind of conceal the spread of like nicotine addiction to kids if they’re not so close to (see it) advertise(d) in places that kids would be.” (17, Female, Black/African American Non-Hispanic)</p>
Marketing education	<p>“I feel like they should start teaching about marketing like maybe in elementary school, teach you about how marketing affects the human mind a lot. Because right now in New York they start teaching it, they started it like a couple years ago they started teaching it part of the school curriculum. And how like the human mind works in that way. And you don’t have to wait till college to take psychology and marketing to learn about it... You start to notice all these things after you learn about it and how they play, affect on you and why you would like to do these things? Moderator: And do you think marketing has a role in getting more people to vape or less people to vape? Participant: I think it gets more people to vape.” (16, Male, Asian Non-Hispanic)</p>
E-cigarette and cigarette displays together	<p>“I feel like putting it next to the cigarettes is a bad example of marketing, (be)cause you’re putting it under, like one category. And we all know that cigarettes are bad. It doesn’t really make it seem any better or attractive, unless you’re into cigarettes.” (14, Female, Asian Non-Hispanic)</p>

marketing in the retail environment on adolescent decision-making.

Adolescents described that they would likely purchase e-cigarettes from retail stores when they did not want to be found asking friends or family for e-cigarettes. If stores verified age, participants reported combining online and social media strategies to purchase in retail stores. For example, adolescents could acquire gift cards online and use them to purchase e-cigarettes in a retail store accepting gift cards or ask a contact on social media to purchase on their behalf in store. In-store purchases were reported to be easier through smartphone-based cash applications (e.g., Venmo). Additionally, adolescents reported accessing e-cigarettes in retail stores by asking strangers, through bulk/trunk sales, or contacting overseas sellers online or vape shops that are wholesalers/distributors.

3.3. Counter-marketing strategies

Participants were asked whether they would like to prevent those younger than them from starting to use e-cigarettes. Generally, participants agreed and noted the need for some intervention. Most commonly, participants suggested adding warning images about health effects of e-cigarettes. Inside retail stores, a common strategy suggested by participants was to always display e-cigarettes behind the counter instead of on top of the counter or on the way to checkout. A participant suggested giving more prominence to signs about the minimum age at which e-cigarette sales were permitted and another participant proposed reducing the number of stores selling e-cigarettes near schools. A suggested strategy was sensitizing and educating other youth about the pervasiveness and specific characteristics of e-cigarette-related marketing in retail stores, which would help youth understand why such marketing relied on them as targets, improve how they interpreted the full range of marketing tools employed to sell e-cigarettes, and

ultimately mitigate their appeal. See Table 4 for suggested strategies and example quotations.

4. Discussion

Identifying e-cigarette-related marketing characteristics that are appealing to adolescents can inform prevention efforts and policy solutions to curtail adolescent e-cigarette use. To the best of our knowledge, this is the first study of adolescents from multiple states to directly ask adolescents about appealing e-cigarette marketing characteristics in and around retail stores which they perceive as encouraging their purchase and use of e-cigarettes. Adolescents reported several marketing characteristics that made e-cigarettes more appealing. First, the Tobacco Power Wall (TPW) is appealing, resonating with another study showing that exposure to the TPW increases adolescent susceptibility to initiating e-cigarettes (Dunbar et al., 2018) and normalizes use (Chopel et al., 2019). Next, adolescents found e-cigarette displays near snacks/candy/drinks and price and promotional incentives appealing, echoing tobacco industry monitoring literature on cigarette promotions at the point-of-sale (Brown et al., 2023; Initiative, 2017). Adolescents reporting grab-and-go from e-cigarettes on top of the checkout counter is supported by store assessments in North Carolina showing that only 1 in 3 convenience stores placed e-cigarettes exclusively behind the counter (Wagoner et al., 2018). Starter-kit labels conveyed to adolescents that the products were a better value for their money and targeted new users to start. Adolescents explained how these characteristics made them curious to look at e-cigarettes and often promoted purchases. This study also highlights four additional phenomena inside retail stores that encourage direct purchase of e-cigarettes: 1) distributing free e-cigarettes, 2) offering free smelling samples, 3) allowing bulk purchases, and 4) allowing gift cards and smartphone-based cash applications.

Our findings identifying specific e-cigarette marketing characteristics in the retail environment appealing to adolescents offer important implications in the following areas.

4.1. Limiting self-service and appeal of the tobacco power wall

Although FDA regulates self-service e-cigarette kiosks to prevent grab-and-go (except in adult-only stores) (Food and Drug Administration, 2023a), adolescents reported purchasing e-cigarettes from displays on top of or near checkout in retail stores such as gas stations. Adolescents found the Tobacco Power Wall (TPW) less appealing when it is behind the salesperson and in a locked cabinet, suggesting that FDA should consider regulation that restricts the sale of e-cigarettes from easily accessible counter-tops or shelves to prevent underage youth from grab-and-go purchases. Additionally, policies that promote display of cigarettes next to e-cigarettes, locating the TPW elsewhere in the retail store, and marketing education will likely reduce the appeal of e-cigarette marketing and ultimately reduce use among adolescents (Martino et al., 2019).

4.2. Provision of free samples

Despite clear FDA regulation prohibiting provision of free samples of e-cigarettes and e-liquids, including any of their components or parts (Food and Drug Administration, 2023b), retailers provide free samples to adolescents, suggesting that communication about and enforcement of this regulation should be improved. Further, the definition of “free samples” under current regulation should be revised to explicitly include smelling samples to help prevent underage youth from trying e-cigarettes.

4.3. Explanation of starter-kit labels

Underage adolescents report being attracted to “starter-kits” used in e-cigarette marketing. However, because they reported perceiving starter-kits to have lower nicotine strength, these products are likely perceived to be lower in risk, although the FDA has not unauthorized such reduced risk messaging in e-cigarettes. These results suggest that the FDA should require e-cigarette manufacturers to clarify what they mean by “starter-kit” on their packaging and clarify that they are not lower nicotine or reduced-risk and not intended for those under 21 years.

4.4. Develop technology-based solutions

Technology to protect against underage purchases for e-cigarettes and/or other drugs via smartphone-based money-transfer applications should be developed. For example, on Venmo, accounts can be set up through peer transfers and without a linked bank account and Teen Accounts allow adolescents under 18 to pay through their parents’ bank accounts. All tobacco-related transactions could indicate the item that was purchased and/or send a notification to the bank account holder. Regulatory solutions to track and counter bulk purchases and shipping from distributors, especially vape shops and overseas vendors, are needed since adolescents in this study reported accessing products through these channels.

4.5. Reducing the appeal of e-cigarette advertising and displays

In addition to FDA, states and localities can enact regulations similar to San Francisco’s policy which prohibits or restricts the size of tobacco posters on store windows (Police Code Article, 2004). Our data suggest that such regulation may lower the appeal of e-cigarette advertising among adolescents. States/localities may also require e-cigarettes and cigarettes be placed next to one another since adolescents’ report being less attracted to displays that associate e-cigarettes with cigarettes.

Placement of e-cigarette displays near sugary or alcoholic beverages or snacks, which adolescents find attractive (Brown et al., 2023; Initiative, 2017), should be restricted by states and localities.

Our findings underscore vital opportunities for preventing adolescents from directly purchasing e-cigarettes in retail stores. First, FDA should improve enforcement of age verification by retailers, especially since asking age/ID by retailers is associated with lower tobacco sales (Landrine et al., 1996). Second, the FDA as well as state and local departments of public health should create campaigns educating adolescents, parents, educators, retailers, law enforcement, and others that e-cigarette sales to anyone under age 21 are prohibited and that age will be verified in retail stores. Since state-mandated age-of-sale signs posted outside retail stores have varied text and images, future studies should examine whether and what signage is most effective in preventing adolescent purchase and use. Shoulder-tapping programs and stakeouts can also be helpful. Additionally, posters at retail store entrances should state that no person should provide a tobacco product to underage youth, similar to Massachusetts law (Massachusetts Law Regarding the Sale of Tobacco, 2023). Third, e-cigarette education could include counter-marketing messages about adolescent targeting in retail stores by focusing on the behavioral context, i.e., what adolescents see when they purchase e-cigarettes (Kreuter and Wray, 2003).

4.6. Study strengths and limitations

Participants in this study were a diverse group, including e-cigarette users, underrepresented racial/ethnic groups, and genders, and from across states, although the study included few adolescents identifying as Hispanic. Study limitations include difficulty ascertaining reasons behind use-decisions because focus groups included a mix of participants who had and had not used e-cigarettes and only two focus groups were exclusively for those who had used e-cigarettes. In some focus groups, adolescents who had previously provided consent did not log on and we do not know whether findings would be different if they had joined.

5. Conclusion

Adolescents indicate that specific e-cigarette marketing characteristics in retail stores influence their purchase and use decisions, including the Tobacco Power Wall, price incentives such as discounts, deals, and starter-kits, e-cigarette displays near snacks/candy/drinks posters, posters, and stickers with e-cigarette advertising on store windows and at checkout inside retail stores. The FDA and states and localities should take steps to reduce adolescent e-cigarette purchase and use including regulating e-cigarette displays on top of checkout and requiring locked cabinets to restrict grab-and-go, improving enforcement of age-verification in retail stores, using updated technology to prevent underage purchases, and including effective packaging and minimum age-of-sales warning signs. Addressing such e-cigarette marketing exposures in retail stores through counter-marketing messages may bolster adolescent e-cigarette prevention efforts.

Sources of funding

The research reported in this publication was supported by the National Cancer Institute of the National Institutes of Health under Award Number K99CA267477, ASPiRE D&I Pilot Grant, and the Stanford Maternal and Child Health Research Institute to Shivani Mathur Gaiha. Additional support was from the Taube Research Faculty Scholar Endowment to Bonnie Halpern-Felsher and by the grant U54 HL147127 from the National Heart, Lung, and Blood Institute (NHLBI) and the Food and Drug Administration Center for Tobacco Products (Bonnie Halpern-Felsher, Co-PI). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or the Food and Drug Administration.

CRediT authorship contribution statement

Shivani Mathur Gaiha: Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Lauren Kass Lempert:** Writing – review & editing, Formal analysis. **Holly Lung:** Writing – review & editing, Investigation, Formal analysis. **Francesca Vescia:** Writing – review & editing, Investigation, Formal analysis. **Bonnie Halpern-Felsher:** Writing – review & editing, Supervision, Methodology.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Dr. Bonnie Halpern-Felsher is a paid expert scientist in some litigation against the e-cigarette industry and an unpaid scientific advisor and expert regarding some tobacco-related policies. No other authors have any conflicts to disclose.

Data availability

The data that has been used is confidential.

Acknowledgements

We thank Dr. Marcia Zorrilla, Director of Positive Youth Development, REACH Lab for her help facilitating social-media-based recruitment and piloting focus groups with members of the Lab's Youth Action Board.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2024.102769>.

References

- Alzahrani, T., Pena, I., Temesgen, N., Glantz, S.A., 2018. Association between electronic cigarette use and myocardial infarction. *Am. J. Prev. Med.* 455–461.
- ASPIRE Center. Tobacco Retailers. <https://aspirecenter.org/tobaccoretailers/>. Accessed December 14, 2023.
- Barbara, A.S., Adrian, B., Jodie, B., Elexis, C.K., Nathan, A.S., Stephanie, N.Y., et al., 2024. Analysis of e-cigarette warning letters issued by the Food and Drug Administration in 2020 and 2021. *Tob. Control* 33 (2), 247.
- Birdsey, J., Cornelius, M., Jamal, A., Park-Lee, E., Cooper, M.R., Wang, J., et al. Tobacco product use among U.S. middle and high school students - national youth tobacco survey, 2023. *MMWR Morb Mortal Wkly Rep.* 2023;72(44):1173-1182.
- Bloom, P.N., 2001. Role of slotting fees and trade promotions in shaping how tobacco is marketed in retail stores. *Tob. Control* 340–344.
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qual. Res. Psychol.* 3 (2), 77–101.
- Brown, J.L., Rosen, D., Carmona, M.G., Parra, N., Hurley, M., Cohen, J.E., 2023. Spinning a global web: tactics used by Big Tobacco to attract children at tobacco points-of-sale. *Tob. Control* 32 (5), 645–651.
- Centers for Disease Control and Prevention. Historical NYTS Data and Documentation: Survey Data (2022). https://www.cdc.gov/tobacco/data_statistics/surveys/nyts/data/index.html. Accessed March 9, 2023.
- Chopel, A., Lee, R.E., Ortiz-Matute, E., Peoples, N., Homer Vagadori, K., Curtis, A., et al., 2019. The META-Oak project: using photovoice to investigate youth perspectives on tobacco companies' marketing of E-cigarettes toward adolescents in Oakland. *SAGE Open* 9 (3), 2158244019857420.
- Dai, H., Hao, J., Catley, D., 2020. Retail violations of sales to minors on e-cigarettes and cigars. *Public Health* 187, 36–40.
- D'Angelo, H., Patel, M., Rose, S.W., 2020. Convenience store access and E-cigarette advertising exposure is associated with future E-cigarette initiation among tobacco-naïve youth in the PATH study (2013–2016). *J. Adolesc. Health.*, e2020
- Do, E.K., Aarvig, K., Donovan, E.M., Schillo, B.A., Vallone, D.M., Hair, E.C., 2023. Underage youth continue to obtain E-cigarettes from retail sources in 2022: evidence from the truth continuous tracking survey. *Int. J. Environ. Res. Public Health.* 20 (2).
- Dunbar, M.S., Martino, S.C., Setodji, C.M., Shadel, W.G., 2018. Exposure to the tobacco power wall increases adolescents' willingness to use E-cigarettes in the future. *Nicotine Tob. Res.* 1429–1433.
- Federal Trade Commission. E-Cigarette Report for 2021.
- Food and Drug Administration. Title 21, Subchapter K, Part 1140—Cigarettes, smokeless tobacco, and covered tobacco products, Subpart B—Prohibition of Sale and Distribution to Persons Younger Than 18 Years of Age, Conditions of manufacture, sale, and distribution (21 CFR 1140.16). <https://www.ecfr.gov/current/title-21/chapter-I/subchapter-K/part-1140>.
- Food and Drug Administration. Rules for Sales of E-Cigarettes, E-liquids, and Other Electronic Nicotine Delivery Systems (ENDS). <https://www.fda.gov/tobacco-products/retail-sales-tobacco-products/selling-tobacco-products-retail-stores#references>. Accessed September 28, 2023.
- Furlow, B., 2023. Juul settles youth e-cigarette marketing lawsuits. *Lancet Respir Med.* 11 (6), e56.
- Gaiha, S.M., Lempert, L.K., Halpern-Felsher, B., 2019. Underage Youth and young adult e-cigarette use and access before and during the coronavirus disease 2019 pandemic. *JAMA Netw. Open* 2020, e2027572.
- Glaw, X., Inder, K., Kable, A., Hazelton, M., 2017. Visual Methodologies in Qualitative research: autophotography and photo elicitation applied to mental health research. *Int. J. Qual. Methods* 16 (1), 1609406917748215.
- Truth Initiative. The truth about tobacco industry retail practices. https://truthinitiative.org/sites/default/files/media/files/2019/03/Point-of-Sale-2017_0.pdf. Published 2017. Accessed January 18, 2021.
- Truth Initiative. Where are kids getting JUUL? <https://truthinitiative.org/news/where-are-kids-getting-juul>. Published 2018. Updated May 29, 2018. Accessed June 12, 2020.
- Jackler, R.K., Ramamurthi, D. Unicorns cartoons: marketing sweet and creamy e-juice to youth. *Tobacco control*, 2017. p. 471-475.
- Kim, M., Popova, L., Halpern-Felsher, B., Ling, P.M. Effects of e-cigarette advertisements on adolescents' perceptions of cigarettes. *Health communication*, 2019. p. 290-297.
- Klein, J.D., 2018. E-cigarettes: a 1-way street to traditional smoking and nicotine addiction for youth. *Pediatrics*, e20172850.
- Kreuter, M.W., Wray, R.J., 2003. Tailored and targeted health communication: strategies for enhancing information relevance. *Am. J. Health Behav.* 27 (Suppl 3), S227–S232.
- Kuntic, M., Oelze, M., Steven, S., Kröllner-Schön, S., Stamm, P., Kalinovic, S., et al., 2019. Short-term e-cigarette vapour exposure causes vascular oxidative stress and dysfunction: evidence for a close connection to brain damage and a key role of the phagocytic NADPH oxidase (NOX-2). *Eur. Heart J.* 2472–2483.
- Landrine, H., Klonoff, E.A., Alcaraz, R., 1996. Asking age and identification may decrease minors' access to tobacco. *Prev. Med.* 25 (3), 301–306.
- Lavack, A.M., Toth, G. Tobacco point-of-purchase promotion: examining tobacco industry documents. *Tobacco control*, 2006. p. 377-384.
- Mantey, D.S., Cooper, M.R., Clendennen, S.L., Pasch, K.E., Perry, C.L., 2016. E-cigarette marketing exposure is associated with e-cigarette use among US youth. *J. Adolesc. Health* 686–690.
- Mantey, D.S., Barroso, C.S., Kelder, B.T., Kelder, S.H., 2019. Retail access to E-cigarettes and frequency of E-cigarette use in high school students. *Am. J. Health Behav.* 43 (3), 280–290.
- Martino, S.C., Setodji, C.M., Dunbar, M.S., Shadel, W.G., 2019. Increased attention to the tobacco power wall predicts increased smoking risk among adolescents. *Addict Behav.* 88, 1–5.
- Marynak, K., Gentzke, A., Wang, T.W., Neff, L., King, B.A. Exposure to electronic cigarette advertising among middle and high school students—United States, 2014–2016. *Morbidity and Mortality Weekly Report* 2018. p. 294.
- Massachusetts Law Regarding the Sale of Tobacco, MGL, ch. 270, section 6: Sale or provision of tobacco product to person under 21 years of age (a). <https://www.mass.gov/doc/state-law-sign-mgl-ch-270-sections-6-and-6a/download>. Accessed August 16, 2023.
- Pasch, K.E., Nicksic, N.E., Opara, S.C., Jackson, C., Harrell, M.B., Perry, C.L., 2017. Recall of point-of-sale marketing predicts cigar and e-cigarette use among Texas youth. *Nicotine Tob. Res.* 962–969.
- SF Police Code Article 10, Sec. 674 (2004). <https://sanfranciscotobaccofreeproject.org/wp-content/uploads/SF-Police-Code-Article-10-Sec-674-2004.pdf>. Accessed November 13, 2023.
- Richard, V.M., Lahman, M.K.E., 2015. Photo-elicitation: reflexivity on method, analysis, and graphic portraits. *Int. J. Res. Method in Education* 38 (1), 3–22.
- Setodji, C.M., Martino, S.C., Gong, M., Dunbar, M.S., Kusuke, D., Sicker, A., et al., 2018. How do tobacco power walls influence adolescents? a study of mediating mechanisms. *Health Psychol.* 37 (2), 188–193.
- Singh, T., Agaku, I.T., Arrazola, R.A., Marynak, K.L., Neff, L.J., Rolle, I.T., et al., 2016. Exposure to advertisements and electronic cigarette use among US middle and high school students. *Pediatrics* 137 (5).
- Singh, T., Marynak, K., Arrazola, R.A., Cox, S., Rolle, I.V., King, B.A., 2016. Vital signs: exposure to electronic cigarette advertising among middle school and high school students - United States, 2014. *MMWR Morb. Mortal Wkly Rep.* 64 (52), 1403–1408.
- Trapl, E., Anesetti-Rothermel, A., Pike Moore, S., Gittleman, H., 2020. Association between school-based tobacco retailer exposures and young adolescent cigarette, cigar and e-cigarette use. *Tob. Control.*, e2020
- Villanti, A.C., Rath, J.M., Williams, V.F., Pearson, J.L., Richardson, A., Abrams, D.B., et al., 2016. Impact of exposure to electronic cigarette advertising on susceptibility and trial of electronic cigarettes and cigarettes in US young adults: a randomized controlled trial. *Nicotine Tob. Res.* 18 (5), 1331–1339.
- Wagoner, K.G., Song, E.Y., King, J.L., Egan, K.L., Debinski, B., Wolfson, M., et al., 2018. Availability and placement of electronic nicotine delivery systems at the point-of-sale. *Nicotine Tob. Res.* 20 (8), 1020–1024.
- Wills, T.A., Pagano, I., Williams, R.J., Tam, E. E-cigarette use and respiratory disorder in an adult sample. *Drug and alcohol dependence* 2019. p. 363-370.