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Digital marketing of smokeless tobacco: A longitudinal analysis of exposure and initiation among young adults

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ABSTRACT

Objectives: This study examines the relationships between recall of exposure to digital marketing of smokeless tobacco, via the internet and social media, and subsequent initiation of smokeless tobacco use at one-year follow-up, among young adult never users of smokeless tobacco in Texas.
Methods: Data were from waves 6 (Spring 2017) and 7 (Spring 2018) of the Marketing and Promotions Across Colleges in Texas Study (Project M-PACT); a longitudinal study of two- and four-year Texas college students. Participants were 2731 young adult never smokeless tobacco users (ages 20–32) with complete data at both assessment periods. A multi-level, multiple logistic regression model was applied, accounting for school clustering, to examine the relationship between recall of exposure to digital marketing of smokeless tobacco at baseline (wave 6) and smokeless tobacco use initiation at one-year follow-up (wave 7). Analyses controlled for important baseline covariates (socio-demographic factors, other marketing exposure, other tobacco product use).
Results: Overall, 14.6% of never smokeless tobacco users reported exposure to smokeless tobacco marketing via digital media. Exposure to digital marketing of smokeless tobacco at baseline was associated with greater odds of smokeless tobacco use initiation among young adult never users (AOR: 2.14; 95%CI: 1.12 – 4.06) at one-year follow-up.
Conclusions: Findings reveal exposure to smokeless tobacco marketing via digital media was common. Further, there appears to be a strong relationship between this exposure and subsequent smokeless tobacco use among young adult never smokeless tobacco users.

1. Introduction

Marketing is a powerful influence in the initiation of tobacco use, and as such, has been restricted in print and broadcast media, at sporting and entertainment events, and in other outdoor venues (Tobacco Control Legal Consortium, 2009). Tobacco marketing via digital media, such as the internet and social media, remains unregulated and has become a prime space for broadly promoting tobacco products to young audiences (Richardson, Ganz, & Vallone, 2015). While the hazards of cigarette, electronic cigarette (e-cigarette), and hookah use have been widely publicized, less attention has been paid to the dangers of smokeless tobacco use. Tobacco companies have capitalized on this by promoting smokeless tobacco, like chewing tobacco, dip, and snuff, as alternative, less harmful ways to indulge in tobacco (Mejia & Ling, 2010; O'Brien et al., 2018). In 2017, smokeless tobacco companies spent $10.5 million on company websites, $523,000 on internet advertising excluding company websites, and $785,000 on social media advertising (Federal Trade Commission [FTC], 2019). The promotion of smokeless tobacco via digital media is prevalent and accessible (Bromberg, Augustson, & Backinger, 2011; Jackler, Li, Cardiff, & Ramamurthi, 2019; O'Brien, Hoffman, Navarro, & Ganz, 2020; O'Brien, Navarro, & Hoffman, 2018; Seidenberg, Rodgers, Rees, & Connolly, 2012). Studies of smokeless tobacco-related YouTube videos found that videos were largely promotional (video blogs and advertisements), portrayed smokeless tobacco use as positive and socially acceptable, contained social themes, referenced flavors, and rarely included references to nicotine or health messaging (Bromberg et al., 2011, Seidenberg et al., 2012). Studies show top smokeless tobacco brands maintain websites and social media

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pages. Popular smokeless tobacco brand websites showcase brand identity (e.g., masculinity), contain images and descriptions of products, including descriptions of taste, display health warnings although many are not easily visible, and commonly offer store locators, coupons, and opportunities to engage and socialize (O'Brien et al., 2018). Many brands also maintain public social media pages, primarily on Instagram, Facebook, and Twitter, and may advertise becoming a promoter or influencer of their brand (Jackler et al., 2019, O'Brien et al., 2020).

Increasingly prevalent digital promotion of smokeless tobacco is concerning since smokeless tobacco use has steadily increased over the last decade (Centers for Disease Control and Prevention [CDC], 2014). In 2017, smokeless tobacco use was most prevalent among young adults in the United States, ages 18–24; 2.9% reported use every day or some days. Smokeless tobacco use had the second highest prevalence of daily use, following cigarettes; nearly 60% of all adult smokeless users were daily users. Males use smokeless tobacco at higher rates than females, 4.0% and 0.2%, respectively (Wang et al., 2018). Smokeless tobacco use leads to nicotine addiction; increases the likelihood of using other tobacco like cigarettes; increases risk of pre-natal health problems and death from heart disease and stroke; and causes cancer of the mouth, esophagus, and pancreas (CDC, 2018, 2014; Piano et al., 2010).

Understanding the relationship between smokeless tobacco marketing exposure and smokeless tobacco use is important for disrupting the recent escalation of both digital marketing and smokeless tobacco use. Studies demonstrate important associations between tobacco-related digital media exposure and tobacco use behaviors (Clendennen, Loukas, & et al., 2020; Hébert et al., 2017; Marion et al., 2020; Pokhrel et al., 2018; Soneji et al., 2018; Unger & Bartsch, 2018). Limited research has examined these relationships for smokeless tobacco, specifically. Timberlake (2016) showed that adolescents' ability to identify smokeless tobacco brands was significantly associated with initiating smokeless tobacco use in adolescence and regular use of smokeless tobacco in young adulthood. Pierce et al. (2018) reported receptivity to smokeless tobacco advertisements among adolescents in print, mail, and television was significantly associated with smokeless tobacco use one year later. Mantey et al. (2019) found that 70% of young adults reported exposure to smokeless tobacco advertisements at the point-of-sale, in print media, in bars, clubs, and festivals, and on the internet; this exposure was significantly associated with initiating smokeless tobacco use six-months later. Clendennen, Vandewater, and et al. (2020) showed 8.4% of young adults reported seeing smokeless tobacco advertisements on popular social media during the past 30-days. Soneji et al. (2018) reported adolescents' engagement with digital tobacco marketing was significantly associated with initiation, increased frequency, and poly-use of any tobacco, including smokeless.

Digital media marketing presents unique concerns relative to traditional marketing since it allows for an unprecedented degree of specificity in content and audience. Advertisers are able to target specific profiles of individuals, like young susceptible non-users, based on digital behavioral patterns including search history and social networks (Dunlop, Freeman, & Jones, 2016). This is a sharp contrast to traditional marketing methods which are not customizable to specific profiles and are developed for broad, mass appeal (Anderson, Dewhirst, & Ling, 2006; Banerjee, Shuk, Greene, & Ostroff, 2015; Timberlake, Pechmann, Tran, & Au, 2011). As such, it is critical to not only study the relationship between digital marketing exposure and subsequent use behaviors but also to explore correlates of this exposure, given the potential for highly specified and targeted content. Clendennen, Vandewater, and et al. (2020) showed that racial/ethnic minorities were more likely than their white peers to be exposed to smokeless tobacco advertisements on social media, which may be indicative of companies strategically targeting racial/ethnic minorities. No other studies have explored correlates of this type of exposure.

1.1. Study aims & hypotheses

The purpose of this study was to explore cross-sectional correlates of recall of exposure to digital marketing of smokeless tobacco, and the prospective associations between recall of exposure to digital marketing of smokeless tobacco at baseline and smokeless tobacco use initiation at one-year follow-up, among a cohort of young adults (ages 20–32) in Texas. Specifically, this study examines the longitudinal associations between exposure to smokeless tobacco marketing via digital media at baseline and initiation of smokeless tobacco at one-year follow-up among never smokeless tobacco users at baseline.

We hypothesized that exposure to digital marketing of smokeless tobacco at baseline would be positively associated with smokeless tobacco use initiation among young adult never smokeless tobacco users at one-year follow-up, after controlling for baseline levels of exposure to non-digital smokeless tobacco media, socio-demographic factors, ever use of other tobacco, and sensation seeking. These covariates were selected since they are established predictors of tobacco use behaviors. Young, non-Hispanic white and American Indian or Alaska Native males have historically had the highest rates of smokeless tobacco use (CDC, 2014). Tobacco marketing and risk-taking behaviors like sensation seeking and having experimented with other tobacco products are strongly associated with tobacco use behaviors, including smokeless tobacco (CDC, 2012; Mantey et al., 2019; Pierce et al., 2018).

2. Methods

2.1. Procedures and participants

Data were from the Marketing and Promotions Across Colleges in Texas Study (Project M-PACT), a multi-wave longitudinal study of two- and four-year Texas college students (n = 5482 at baseline/wave 1). Twenty-four colleges were recruited from metropolitan areas in Texas (Austin, Dallas/Fort Worth, Houston, and San Antonio). Six colleges were selected from each area. Eligible students at participating colleges were recruited between November 2014 and February 2015 to complete the baseline (wave 1) online survey via email invitation. Additional information about Project M-PACT procedures are reported elsewhere (Loukas et al., 2016). The present study uses data from waves 6 (spring 2017) and 7 (spring 2018), since measures of digital marketing exposure were included beginning at wave 6. Only participants who reported never use of smokeless tobacco at wave 6 (baseline) and who had complete data at waves 6 and 7 were eligible for inclusion (n = 2731); this was a retention rate of 93.6%. Hereafter, waves 6 and 7 are referred to as baseline and one-year follow-up, respectively.

2.2. Measures

Prior to receiving questions pertaining to smokeless tobacco, participants were provided the following explanation: "The next questions are about smokeless tobacco, which you put in your mouth and chew, suck, or spit. There are many kinds of smokeless tobacco, such as snus, moist snuff, dip, spit, pouches, and chewing tobacco. Common brands include Skoal, Copenhagen, Grizzly, Camel or Marlboro Snus, Redman, Levi Garrett, and Beechnut. We mean any of these products when we refer to smokeless tobacco." Accompanying this explanation was an image of snus, loose leaf chewing tobacco, and moist snuff. Cognitive interviews were used to refine all assessments in the M-PACT study (Hinds III et al., 2016).

2.2.1. Smokeless tobacco Use.

Initiation of smokeless tobacco was assessed among never smokeless tobacco users via "Have you ever used smokeless tobacco, such as moist snuff, dip, snus, or chewing tobacco?" Those who reported "yes" at one-year follow-up were considered smokeless tobacco use initiators.

2.2.2. Exposure to digital marketing of smokeless Tobacco.

To assess recall of smokeless tobacco marketing via digital media at baseline, participants were asked "During the past 30-days, how often did you see any advertisements for smokeless tobacco on …" Platforms included the seven most popular social media among U.S. young adults: Facebook, YouTube, Instagram, Twitter, Snapchat, Reddit, and Pinterest (Pew Research Center [PRC], 2019). Possible responses included "never," "rarely," "occasionally," "frequently," and "very frequently." Since participants' responses to this question were highly skewed (i.e., 95.4–98.4% of participants responded "never"), we created a dichotomous measure of exposure such that participants who responded anything other than "never" were considered exposed to smokeless tobacco marketing via social media. Dichotomizing this measure was also necessary in order to combine with "internet/online" exposure which was originally binary, described below.

Participants were asked "Where do you remember seeing or hearing advertisements for smokeless tobacco?" There were eight possible selections, of which participants could select all that applied, with one being "internet/online." Participants who selected "internet/online" were considered exposed to smokeless tobacco marketing via internet/online. The remaining seven non-digital media options were subsequently coded as covariates (listed below). A smokeless tobacco digital marketing exposure variable was created such that those who reported exposure via social media and/or internet/online were considered exposed and those who reported zero exposure via both venues were considered not exposed.

2.2.3. Covariates.

This study controlled for several covariates, all assessed at baseline, including recall of exposure to smokeless tobacco marketing via retail outlets and other non-digital media channels, socio-demographics, and use of tobacco products other than smokeless tobacco. As previously stated, participants were asked "Where do you remember seeing or hearing advertisements for smokeless tobacco?" Two possible response were "gas stations, convenience stores, drug stores (such as CVS or Walgreens), or grocery stores" and "liquor stores." Participants who responded "yes" to one or both of these were considered exposed to smokeless tobacco retail marketing.

Participants who reported exposure to smokeless tobacco marketing via one or more non-digital sources (other than internet or retail), were considered exposed to smokeless tobacco marketing via other channels (bars/clubs; music events/festivals; radio/streaming radio; magazines/newspapers; and billboards).

This study also controlled for socio-demographic variables: biological sex, race/ethnicity, and age. Sex is a binary variable; males served as the referent group. Race/ethnicity was categorized into: non-Hispanic white (referent), Hispanic/Latino, Black, Asian, and "other." Those who reported their race/ethnicity as American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or any other race/ethnicity were categorized as "other." Age was coded continuously and ranged from 20 to 32.

This study controlled for non-smokeless tobacco products (cigarettes, e-cigarettes, cigars, and hookah) ever used. A cumulative variable reflecting the number of non-smokeless tobacco products ever used was computed with possible values ranging from 0 to 4. Additionally, we controlled for sensation seeking behavior, which is an important measure of risk-taking behavior related to tobacco use. Sensation seeking was assessed through four items from the Brief Sensation Seeking Scale (BSSS) (Stephenson et al., 2003). Participants were asked to what degree they agree with four statements (e.g., I like to do frightening things.). Response options ranged from "strongly disagree" to "strongly agree" on a 5-point Likert scale. A mean sensation seeking score was created by summing the responses across the 4 items and dividing by the number of completed items. A higher score (ranging from 1 to 5) indicates greater sensation seeking.

2.3. Statistical analyses

First, a multilevel, multiple logistic regression analysis was conducted to examine cross-sectional, baseline correlates of recall of digital smokeless tobacco marketing exposure among the sample of never smokeless tobacco users. Correlates assessed included all covariates described above (socio-demographics, other marketing exposure, etc.) These correlates served as multiple independent variables and smokeless tobacco marketing exposure served at the dependent variable. Second, a multilevel, multiple logistic regression model was conducted among never smokeless tobacco users at baseline (n = 2731) to examine the association between recall of exposure to smokeless tobacco marketing via digital media at baseline and initiation of smokeless tobacco at one-year follow-up. This analysis controlled for age, sex, race/ethnicity, baseline non-digital smokeless tobacco marketing exposure, ever use of other tobacco, and sensation seeking. Multilevel analyses were conducted for both models to account for nesting of participants within colleges at study enrollment (i.e., college was included as a random effect). All analyses were conducted using Stata 14.2 (College Station, TX).

3. Results

3.1. Descriptive statistics

Overall, 14.6% of participants reported exposure to smokeless tobacco marketing via digital media, 50.7% via retail, and 36.6% via other venues, in bars, festivals, radio, magazines, and billboards (Table 1). Of never smokeless tobacco users (n = 2731), 2.6% initiated smokeless tobacco use from baseline to one-year follow-up. Participants who initiated smokeless tobacco use over the one-year study period, compared to those who did not, had significantly higher prevalence of digital and other marketing exposure, and ever use of other tobacco products. Additional descriptive statistics of the sample of never smokeless tobacco users, are reported in Table 2.

Table 1
Prevalence of Smokeless Tobacco Marketing Exposure by Platform at Baseline (wave 6) Among Never Smokeless Tobacco Users (n = 2731).

	Total	Rarely	Occasionally	Frequently	Very Frequently
Digital Marketing Exposure[a]	14.6%				
Facebook	4.6%	3.4%	1.0%	0.3%	0.0%
YouTube	2.6%	1.7%	0.6%	0.2%	0.2%
Instagram	2.6%	1.8%	0.5%	0.3%	0.04%
Twitter	2.3%	1.7%	0.4%	0.2%	0.04%
Snapchat	1.8%	1.2%	0.4%	0.2%	0.0%
Reddit	1.6%	1.2%	0.3%	0.1%	0.0%
Pinterest	1.6%	1.0%	0.4%	0.2%	0.04%
Internet (other)	11.5%	–	–	–	–
Retail Marketing Exposure[b]					
Yes	50.7%	–	–	–	–
Other Marketing Exposure[c]					
Yes	36.6%	–	–	–	–

a Any exposure to the listed digital platforms.
b Exposure to smokeless tobacco marketing at gas stations, convenience stores, drug stores (such as CVS or Walgreens), grocery stores, or liquor stores.
c Exposure to any other smokeless tobacco marketing from the following categories: (1) Bars/Clubs; (2) Music Events/Festivals; (3) Radio/Internet Radio; (4) Magazines/Newspapers; (5) Billboards.
– Data were not collected.

Table 2
Baseline (wave 6) Descriptive Statistics of Smokeless Tobacco Use Behaviors Among Never Smokeless Tobacco Users (n = 2731).

	No initiation at Follow-up[a]	Initiation at Follow-up[b]
Percent of Sample	97.4%	2.6%
Digital Marketing Exposure[c]	**p = 0.004**	
No	85.7%	73.6%
Yes	14.3%	26.4%
Retail Marketing Exposure[d]	p = 0.335	
No	49.5%	50.5%
Yes	43.7%	56.3%
Other Marketing Exposure[e]	**p = 0.008**	
No	76.9%	63.4%
Yes	23.1%	36.6%
Age	p = 0.585	
Mean (SD)	23.2 (2.1)	22.3 (2.4)
Race	p = 0.055	
Non-Hispanic, white	35.6%	38.0%
Hispanic/Latino	28.9%	36.6%
African American	7.9%	12.7%
Asian ancestry	20.1%	9.9%
Other[e]	7.5%	2.8%
Sex	p = 0.265	
Male	30.5%	36.6%
Female	69.5%	63.4%
Tobacco Products Ever Used[f]	**p < 0.001**	
Mean (SD)	1.7 (1.6)	3.1 (1.0)
Sensation Seeking[g]	P = 0.075	
Mean (SD)	3.1 (0.9)	3.3 (1.0)

a Never smokeless tobacco users who did not initiate smokeless tobacco use at follow-up (wave 7).
b Never smokeless tobacco users who initiated smokeless tobacco use at follow-up (wave 7).
c Exposure to smokeless tobacco marketing at gas stations, convenience stores, drug stores (such as CVS or Walgreens), grocery stores, or liquor stores.
d Exposure to any other smokeless tobacco marketing from the following categories: (1) Bars/Clubs; (2) Music Events/Festivals; (3) Radio/Internet Radio; (4) Magazines/Newspapers; (5) Billboards.
e Participants that reported race/ethnicity of American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or any other race/ethnicity were categorized as "Other."
f Self-reported ever use of any tobacco products, other than smokeless tobacco, at baseline (i.e., wave 6). Products included cigarettes, cigar products, electronic cigarettes, and hookah.
g Mean score ranging from 1 to 5, with higher scores indicating higher sensation seeking.

3.2. Correlates of digital marketing exposure

Shown in Table 3, several factors were concurrently associated with greater odds of reporting exposure to digital marketing of smokeless tobacco at baseline, controlling for other variables in the model. The odds of reporting exposure to digital marketing of smokeless tobacco were significantly greater for participants who reported exposure to smokeless marketing at retail (AOR: 2.92; 95%CI: 2.19–3.90) and other venues (AOR: 7.12; 95%CI: 5.55–9.13). Hispanic/Latinos (AOR: 1.67; 95%CI: 1.24–2.25), Asians (AOR: 1.77; 95%CI: 1.15–2.52), and participants who reported American Indian/Alaska Native, Native Hawaiian/Pacific Islander or other (AOR: 1.69; 95%CI: 1.04–2.72) had greater odds of reporting exposure to digital marketing of smokeless tobacco, relative to non-Hispanic whites (Table 3).

3.3. Longitudinal associations between digital marketing exposure and use

Among never smokeless tobacco users (Table 4), exposure to digital marketing of smokeless tobacco was associated with 2.14 (95%CI: 1.12–4.06) times the odds of smokeless tobacco initiation at one-year follow-up, accounting for strong predictors of smokeless tobacco initiation such as ever use of other tobacco (AOR: 1.78; 95%CI: 1.47–2.16).

Table 3
Concurrent Correlates of Smokeless Tobacco Digital Marketing Exposure at Baseline (wave 6) Among Never Smokeless Tobacco Users (n = 2731).

	Smokeless Tobacco Digital Marketing Exposure
	Adjusted Odds Ratio (95% Confidence Interval)[a]
Retail Marketing Exposure[b]	**2.92 (2.19–3.90)** ***
Other Marketing Exposure[c]	**7.12 (5.55–9.13)** ***
Age	0.95 (0.89–1.01)
Race	
Non-Hispanic, white	1.00 (Ref)
Hispanic/Latino	**1.67 (1.24–2.25)** **
African American	1.48 (0.91–2.41)
Asian ancestry	**1.77 (1.15–2.52)** **
Other[d]	**1.69 (1.04–2.72)** *
Sex	
Female, relative to Males	1.04 (0.80–1.35)
Tobacco Products Ever Used[e]	0.91 (0.84–1.00)
Sensation Seeking[f]	0.93 (0.81–1.08)

a Odds of reporting exposure to digital smokeless tobacco marketing for any given variable, adjusting for all other variables listed in the table.
b Exposure to smokeless tobacco marketing at gas stations, convenience stores, drug stores (such as CVS or Walgreens), grocery stores, or liquor stores
c Exposure to any other smokeless tobacco marketing from the following categories: (1) Bars/Clubs; (2) Music Events/Festivals; (3) Radio/Internet Radio; (4) Magazines/Newspapers; (5) Billboards.
d Participants that reported race/ethnicity of American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or any other race/ethnicity were categorized as "Other"
e Self-reported ever use of any tobacco products, other than smokeless tobacco, at baseline (i.e., wave 6). Products included cigarettes, cigar products, electronic cigarettes, and hookah.
f Mean score ranging from 1 to 5, with higher scores indicating higher sensation seeking.
* $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

4. Discussion

Results indicate that recall of exposure to digital marketing of smokeless tobacco predicts subsequent smokeless tobacco use among young adults. Specifically, exposure to digital marketing of smokeless tobacco at baseline increased the odds of initiating smokeless tobacco use among never smokeless tobacco users one-year later. These relationships were observed when adjusting for strong predictors of smokeless tobacco use behaviors. Findings are consistent with previous research showing positive associations between smokeless tobacco marketing in print, mail, television, at the point of sale, at bars and events, and on the internet and subsequent use of smokeless tobacco (Mantey et al., 2019; Pierce et al., 2018; Timberlake, 2016).

Descriptive findings are consistent with contemporary trends in tobacco use; never users initiate smokeless tobacco use during adulthood (Perry et al., 2018). Analytic findings reveal exposure to digital marketing of smokeless tobacco is likely contributing to smokeless tobacco initiation among young adults, although future research might examine whether users are more likely to seek out digital content. However, since the study sample contained only young adults who had never used smokeless tobacco, we were able to determine that these never users recalled having seen smokeless tobacco advertising on the internet and social media despite having never tried smokeless tobacco. It is well established that young people are receptive to marketing of smokeless tobacco products via traditional methods (Mantey et al., 2019; Pierce et al., 2018; Soneji et al., 2018); our findings indicate similar receptivity to smokeless tobacco marketing via digital platforms. The relationships observed in this study are concerning given the public health consequences of smokeless tobacco use (CDC, 2018, 2014; Piano et al., 2010), and are exacerbated by tobacco industry efforts to expand their online marketing presence.

From a regulatory perspective, findings suggest the need to consider incorporating digital marketing into existing restrictions placed on the

Table 4
Longitudinal Association of Digital Marketing Exposure and Initiation of Smokeless Tobacco Use (n = 2731).

	Initiation of Smokeless Tobacco Use
	Adjusted Odds Ratio (95% Confidence Interval)[a]
Digital Marketing Exposure[b]	**2.14 (1.12–4.06)** *
Retail Marketing Exposure[c]	0.74 (0.40–1.25)
Other Marketing Exposure[d]	1.50 (0.83–2.73)
Age	0.96 (0.85–1.08)
Race	
Non-Hispanic, white	1.00 (Ref)
Hispanic/Latino	1.07 (0.61–1.87)
African American	1.68 (0.76–3.72)
Asian ancestry	0.59 (0.25–1.40)
Other[e]	0.33 (0.08–1.43)
Sex	
Female, relative to Males	0.73 (0.43–1.21)
Tobacco Products Ever Used[f]	**1.78 (1.47–2.16)** ***
Sensation Seeking[g]	1.05 (0.78–1.39)

a Odds of initiating smokeless tobacco use for any given variable, adjusting for all other variables listed in the table.
b Any exposure to the listed digital platforms: Facebook, YouTube, Instagram, Twitter, Snapchat, Reddit, Pinterest, or Internet (other)
c Exposure to smokeless tobacco marketing at gas stations, convenience stores, drug stores (such as CVS or Walgreens), grocery stores, or liquor stores
d Exposure to any other smokeless tobacco marketing from the following categories: (1) Bars/Clubs; (2) Music Events/Festivals; (3) Radio/Internet Radio; (4) Magazines/Newspapers; (5) Billboards.
e Participants that reported race/ethnicity of American Indian/Alaska Native, Native Hawaiian/Pacific Islander, or any other race/ethnicity were categorized as "Other"
f Self-reported ever use of any tobacco products, other than smokeless tobacco, at baseline (i.e., Wave 6). Products included cigarettes, cigar products, electronic cigarettes, and hookah.
g Mean score ranging from 1 to 5, with higher scores indicating higher sensation seeking.
* $p \leq 0.05$ ** $p \leq 0.01$ *** $p \leq 0.001$

sale and promotion of smokeless tobacco. The 2009 Family Smoking Prevention and Tobacco Control Act imposed important restrictions on the promotion of smokeless tobacco including prohibiting brand name sponsorship of events and distributing items with brand logos (hats, t-shirts, etc.) (Husten & Deyton, 2013). One response by the tobacco industry to these regulations has been an expansion in digital marketing of smokeless tobacco (Bromberg et al., 2011; FTC, 2019; O'Brien et al., 2018; Seidenberg et al., 2012). Currently there are no federal or state laws that explicitly restrict tobacco advertising via the internet and social media (Campaign for Tobacco-Free Kids, 2020), and limited, self-imposed polices by private companies, like Facebook, may be under-enforced and ineffective (Jackler et al., 2019). However, there are some regulations on digital marketing for new tobacco products that require premarket authorization from the FDA, including a requirement that tobacco brands track the dissemination of digital tobacco promotion and correct and prevent any marketing to audiences younger than 18 years of age. Importantly, anyone associated with a brand (e.g., social media influencers, other brand ambassadors) is required to label their digital content with the tobacco brand that sponsors them (U.S. Food and Drug Administration, 2020). Although these are important orders for new tobacco product marketing, they are limited, and the large majority of digital tobacco marketing remains unchecked. It is imperative that we do more in this realm to protect public health since findings from this study demonstrate the effectiveness of digital marketing to increase tobacco use initiation.

This study found racial/ethnic minorities reported greater exposure to digital marketing of smokeless tobacco products, despite using these products at significantly lower rates than non-Hispanic whites (Gentzke et al., 2019; Wang et al., 2018). Given that large tobacco companies (e.g., Reynolds America; Altria) have a well-documented history of aggressively targeting racial/ethnic minorities (Acevedo-Garcia et al., 2004; Anderson, 2011; Fellows & Rubin, 2006; Iglesias-Rios & Parascandola, 2013), findings from this study raise concerns about the tobacco industry utilizing an unregulated medium to replicate past marketing tactics. These concerns are notable given the context of the modern tobacco landscape. Between 2007 and 2009, large tobacco companies consolidated much of the smokeless tobacco market in the U.S. (Delnevo et al., 2014; National Cancer Institute, 2014). Marketing expenditures for smokeless tobacco subsequently increased by more than 300% (i.e., $250.8 million in 2006 to $759.3 million in 2016) (FTC, 2019). These changes in the smokeless tobacco market provide context for the study findings, highlight the need for continued monitoring of tobacco marketing tactics, and provide a background for the possible need for future regulatory intervention.

This study has limitations. Findings may not be representative of all ages or geographic regions as the study sample consisted of young adult college students in Texas. All measures of marketing exposure were assessed via self-report; thus, there is the possibility of recall bias. Exposure was assessed via dichotomous measures (i.e., "yes" or "no"), thus, study findings do not address dose–response relationships.

5. Conclusion

Despite limitations, findings have implications for tobacco regulation and public health. Tobacco industry documents suggest marketing has evolved from mass media campaigns to more data-focused tactics (Lewis & Ling, 2016). Digital media, particularly social media, can be utilized to collect unprecedented amounts of detailed data on consumers (Lewis & Ling, 2016). As there currently are no regulatory standards for digital media, these have been deemed the "wild west" of tobacco promotions (Vaipuna et al., 2020). Increasingly more studies have documented the tobacco industry's unchecked use of these platforms to advertise products, including smokeless tobacco, at low costs (Huang, Kornfield, Szczypka, & Emery, 2014; Liang et al., 2015; Sowles, Krauss, Connolly, & Cavazos-Rehg, 2016). By demonstrating that digital marketing exposure predicts the uptake of smokeless tobacco among young adults, a vulnerable population, our study highlights the dangers inherent in the shifting trend towards digital marketing by the smokeless tobacco industry.

6. Author agreement

All authors have seen and approved the final version of the manuscript. The manuscript has not been previously published and is not under consideration for publication elsewhere.

7. Role of funding sources

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Contributors

All authors contributed to the conceptualization and study design. AL and SC oversaw data collection. SC and DM conducted the statistical analysis and wrote the first draft of the manuscript. All authors contributed to the interpretation of results and conclusions made. All authors contributed to and approved the final manuscript.

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Stephanie L. Clendennen: Conceptualization, Data curation, Formal analysis, Writing - original draft, Project administration. **Dale S. Mantey:** Formal analysis, Writing - original draft, Visualization. **Anna V. Wilkinson:** Conceptualization, Supervision, Writing - review & editing. **Cheryl L. Perry:** Conceptualization, Supervision, Funding

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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