

Tobacco Imagery on Video-centric User-Generated Content Platforms: Exposure Associated with Greater Intentions to Smoke and Use E-Cigarettes

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Abstract

User-generated content (UGC) platforms like YouTube, TikTok, and Twitch are the most popular media outlets for young people. As a result, content on these platforms provides a key source of social information that can impact important health behaviors such as tobacco use. This study examines young people's recall of exposure to tobacco imagery while watching UGC content and the association between exposure to tobacco imagery and intentions to use tobacco products. U.S. youth and young adults aged 15–24-year-olds (N=1032) were surveyed via Qualtrics. Participants who indicated using at least one of Twitch, YouTube, or TikTok were asked questions to assess how frequently they recalled tobacco use or promotion on each platform. An aggregate dosage of exposure was calculated and modeled as a predictor of intentions to smoke cigarettes and use e-cigarettes. At least 22.4% of platform users recalled exposure to promotion of tobacco products on each platform, while at least 34% recalled exposure to depictions of tobacco product use. Compared to those reporting no exposure to tobacco content, those with moderate exposure had 55% higher odds of e-cigarette use intentions, but not cigarette smoking intentions. Those with high exposure had 196% higher odds of increased e-cigarette use intentions and 119% higher odds of increased smoking intentions. Intervention is needed to reduce the influence of UGC content on tobacco use. Further research is needed to better understand exposure and other unique facets of social media's influence, as well as the distinct influence of UGC on never-users, experimenters, and regular users.

Keywords: tobacco, entertainment media, user-generated content, social media

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Introduction

Commercial tobacco use by youth and young adults poses an enduring challenge to public health, as the potential for lifetime addiction carries an array of physical and psychological health risks, including premature death (Banks et al., 2023; Botteri et al., 2008; Gandini et al., 2008; Lerman et al., 1996; Pan et al., 2019; Peruzzi et al., 2020; Taylor et al.,

2014; Wilson et al., 2022). Cigarette use among youth peaked in 1997, after which widespread adoption of population-wide prevention policies, such as restrictions on tobacco sales and marketing (Lieberman, 2004; Sloan & Trogon, 2004), and effective tobacco prevention education (Farrelly et al., 2005, 2009), beginning with the 1998 Master Settlement Agreement (MSA), dramatically reduced youth smoking. The MSA between

states and tobacco companies included specific restrictions on advertising. These restrictions include prohibiting companies from paying for media depictions of tobacco use in television, movies, music, and video games, prohibiting the use of youth-appealing media figures such as cartoons and sports figures to market tobacco products, and retiring cartoon mascots that modeled tobacco use were key components of the success of these restrictions (Lieberman, 2004; Sloan & Trogon, 2004; Eckhart, 2004). In their 2019 guidance for marketing and promotion of new tobacco products, the U.S. Food and Drug Administration highlighted that youth are “uniquely susceptible to social and environmental influences to use tobacco” such as “celebrities and other cultural icons and adult role models—especially those they perceive to be popular, attractive, and ‘cool,’ and that youth ‘often look to media stars as models of what to wear and do’” (U.S. Food & Drug Administration, 2019). Despite significant restrictions on tobacco advertising, the use of tobacco in entertainment media continues to normalize tobacco use as aspirational, desirable, and “cool” (Bennett et al., 2020; Hassanein et al., 2022; Rath et al., 2020).

Understanding the prevalence and impact of on-screen tobacco use in entertainment media is important to reducing cultural and normative influences that drive youth tobacco use (Hassanein et al., 2022). Nearly fifty years of research has found that dominant themes modeled on-screen influence viewers’ real-world beliefs and behaviors, including tobacco (Hermann et al., 2021). In 2012, the U.S. Surgeon General concluded that exposure to tobacco imagery in films causes youth to start smoking (National Center for Chronic Disease Prevention and Health Promotion Office on Smoking and Health, 2012). However, tobacco use remains one of those dominant themes (Dutta et al., 2017; Rath et al., 2020;

Wakefield et al., 2003), with one content analysis of broadcast and streaming television most popular with U.S. teens between 2015 and 2017 identifying tobacco use in 86% of shows (Rath et al., 2020). In 2021, 60% of the 15 most popular television shows with 18–24-year-olds depicted tobacco use (Truth Initiative, 2024). The prevalence of tobacco use in entertainment media is concerning, given causal evidence from a longitudinal cohort study of youth and young adults showing that exposure to tobacco use led to up to three times greater odds of e-cigarette initiation (Bennett et al., 2020). A noteworthy finding of this study was that exposure to smoking on screen led to greater odds of e-cigarette use rather than smoking, suggesting that normalization of tobacco use in media can motivate an array of tobacco use behaviors beyond direct imitation.

The media landscape continues to evolve in ways that impact the influence of on-screen tobacco use on youth and young adults. First, the proliferation of smartphones and mobile broadband has freed entertainment media exposure from the constraints of time and place (de Vreese & Neijens, 2016). The result is more frequent, nearly constant engagement with a digital world where tobacco use is both normalized and promoted (Rath et al., 2020; Fulmer et al., 2015; Donaldson et al., 2022; Hébert et al., 2017; Vorderer et al., 2017). Second, the rise in popularity of user-generated content (UGC) platforms where anyone can contribute to an expansive and ever-growing array of videos often tailored to niche interests and targeted through sophisticated recommendation algorithms, poses unique challenges to parents, researchers, and policy makers seeking surveillance and moderation of harmful content (Jhaver et al., 2023; Naab & Sehl, 2017). Recent survey data suggest that UGC platforms such as TikTok and YouTube are among the most popular media

platforms with youth (Gottfried, 2024). Moreover, live streaming platforms like Twitch continue to grow in popularity (Hilvert-Bruce et al., 2018). Pew's 2023 national survey of youth and young adult social media use reported that 67% of teens use TikTok (Vogels & Gelles-Watnick, 2023), with the average user watching 95 minutes of content per day (Ch, 2024). The same survey reported that over 95% of teens have used YouTube, with almost one in five U.S. teens watching "almost constantly" (Vogels & Gelles-Watnick, 2023). Meanwhile, Twitch viewership has also grown over time, with an average of 1.4 million concurrent daily viewers in February of 2020 and nearly doubling to an average of 2.6 million concurrent daily viewers in February of 2024 (*Twitch Statistics & Charts*, n.d.). Twitch users also average more than 90 minutes watching content per day (Ch, 2024).

Although there have been numerous studies highlighting tobacco imagery on YouTube (Albarracin et al., 2018; Huang et al., 2016; Kong et al., 2019), TikTok (Basch et al., 2021; Marynak et al., 2022; Sun et al., 2023), and Twitch (Vassey et al., 2023), and meta-analytic evidence of a relationship between exposure to tobacco content on social media and use in real-life (Donaldson et al., 2022), the specific mechanisms driving this effect remain uncertain (Allem, 2025). Theorizing about communication and technology posits that studying the impact of new mediums is best served by conceptualizing these mediums as a mixture of media attributes rather than discreet mediums (Eveland, 2003). In the case of social media, the most obvious attribute is the potential for depiction of tobacco use and product promotion, for which there is already causal evidence from television and movies (Bennett et al., 2020; National Center for Chronic Disease Prevention and Health Promotion Office on Smoking and Health, 2012). Although social media is more

complex than previous modes of entertainment media with new attributes meriting research attention, what remains unclear is not whether depictions of use and promotion in entertainment media cause behavior, but whether the UGC that dominates the most popular youth-centric platforms portray tobacco use to the same extent as has been found on other mediums, how often young people are exposed to such content, and whether it occurs in sufficient dosage to drive the same associated effects observed for television and film. Thus, we ask:

1. *What percentage of youth and young adults report exposure to tobacco use and promotion on Twitch, YouTube, and TikTok?*
2. *Is exposure to tobacco use and promotion on UGC platforms associated with intentions to smoke cigarettes and use e-cigarettes in the future?*

Methods

Procedure

We used Qualtrics to field an online survey of U.S. youth and young adults between September 21-25, 2023. Participants provided basic demographic and tobacco use information, including prior use and intentions to smoke cigarettes and use e-cigarettes, along with their use of the user-generated content (UGC) platforms Twitch, YouTube, and TikTok. Those who reported use of one to three of these platforms answered questions assessing their recall of tobacco content while using each platform. An aggregate dosage (see *user-generated content platforms section below*) of exposure to pro-tobacco imagery on user-generated content platforms was calculated and modeled as a predictor of intentions to smoke cigarettes and use e-cigarettes.

Sample

We recruited N=1,032 15-24-year-olds who had not taken a tobacco-related survey

in the past six months. The sample utilized quotas to approximate U.S. demographics. These quotas included age, sex, and race. The survey was approved by Advarra IRB (protocol #:Pro00033267). Participants provided electronic consent/assent.

Measures

Demographics. Participants completed a demographic questionnaire comprised of standardized items from prior research, including sex, race, and rurality (Hair et al., 2023). Race and ethnicity were measured using a “select all that apply” approach from which we computed dummy codes for groups with enough members for analysis. However, these dummy codes were not mutually exclusive (e.g., a Black and Hispanic participant would have a value of one for both dummy variables). Finally, given the higher prevalence of tobacco use among rural populations (Hair et al., 2023), we asked participants whether they lived in “an urban or city area,” “a suburban area next to a city,” or “a small town or rural area.” Responses were dichotomized as rural (1), or other (0) for analysis.

Tobacco use and intentions. Current tobacco use was assessed as a control variable. Participants indicated which of seven different tobacco products they had used in the past 30 days. Products included cigarettes, cigars, little cigars or cigarillos, pipe tobacco, hookah, e-cigarettes, loose tobacco, and oral nicotine products. Those who reported having used at least one were captured by a dummy code indicating past 30-day tobacco use. Our primary dependent variables, intentions to smoke and use e-cigarettes, were assessed by asking participants if they think they will “smoke a cigarette/use an e-cigarette (even one or two puffs) in the next year” on a four-point scale including the options: “definitely not,”

“probably not,” “probably yes,” “definitely yes.”

User-generated content platforms.

Participants were first asked whether they used Twitch, TikTok, and YouTube in the past year. For each platform participants reported using, they were asked to recall, “How often do you see tobacco use (smoking, vaping nicotine, chewing tobacco, oral nicotine products, etc.) of any kind on [platform],” and, “How often do the channels (accounts for TikTok) you watch promote tobacco products on each platform (e.g., mentioning the brands, reviewing products, offering discounts or special deals)?” on an ordinal scale, including “never,” “rarely,” “sometimes,” or “often.” An aggregate sum of overall exposure to pro-tobacco imagery on UGC platforms, ranging between zero (never on any platform for either item) and 18 (often on all three platforms for both items), was calculated to assess the potential dose-response relationship. This continuous measure was then categorized as “no exposure,” “moderate exposure,” and “high exposure.”

Analysis

After examining descriptive statistics, we calculated each participant’s dosage of exposure to pro-tobacco imagery in user-generated content and grouped participants into no exposure, moderate exposure, and high exposure groups. Next, we used STATA v.19 to fit ordinal logistic regression models with intentions to use e-cigarettes and cigarettes as dependent variables, demographics as controls, and the categorized exposure dosage as the independent variable with no exposure as the base category. We also modeled the interaction between past-30-day use and exposure dosage to account for potential differences between participants who have and have not previously used tobacco

products. Robust standard errors were used in all regression analyses. Brant tests were used to test the proportional odds assumption.

Results

Descriptive analysis of our sample (Table 1) was conducted to determine whether quotas resulted in sufficient samples of demographic subgroups for analysis. Although Asian participants were underrepresented by the sample, other racial subgroups (e.g., Black, Hispanic) were represented by about a quarter of the sample.

Pro-tobacco imagery in user-generated content

Table 2 shows the number and percentage of participants who reported using each platform in the past year, recall exposure to tobacco use of any kind, and promotion of tobacco products. Overall, 89% of participants reported using YouTube, 81.3% reported using TikTok, and 30.2% reported using Twitch in the past year. More than 20% of participants recalled ever seeing tobacco products promoted on each platform, with TikTok being the most frequent, followed closely by YouTube and Twitch. More than one in three platform users recalled seeing tobacco use of any kind with the same order across platforms. The aggregate dosage combining promotion and seeing use of any kind had a $Mdn[IQR] = 1[0,3]$. Thus, we categorized exposure groups into no exposure $n(\%) = 430(41.7\%)$, moderate (dosage = 1-3) $n(\%) = 352(34.1\%)$, and high (dosage > 3) $n(\%) = 250(24.2\%)$.

User-generated content tobacco imagery predicting tobacco use intentions

Models predicting increased intentions to use e-cigarettes and increased intentions to smoke cigarettes controlled for the same individual differences reported above. Table 3 provides odds ratios and 95% confidence

intervals for all model variables. Female participants had 58% higher odds of reporting increased intentions to use e-cigarettes and 39% higher odds of increased intentions to smoke. Past 30-day tobacco use was strongly associated with intentions to use both e-cigarettes ($OR=18.7$) and cigarettes ($OR=6.3$) in the future. We found evidence of a dose-response relationship wherein moderate exposure to tobacco use and promotion in UGC content was associated with 55% higher odds of increased e-cigarette intentions compared to those with no exposure, while high exposure predicted 196% higher odds of increased e-cigarette use intentions. Although the odds ratio for the association between moderate exposure and increased smoking intentions failed to reach significance, high exposure was associated with 119% higher odds of increased smoking intentions compared to those with no exposure. Finally, interaction terms for both moderate and high UGC dosage failed to reach significance for both e-cigarette and cigarette use intentions. Brant tests indicate that the proportional odds assumption was violated for rural in the model predicting smoking intentions, but not for any other variables, including the exposure measure of interest.

Discussion

In 2012, the Surgeon General declared the relationship between smoking in films and smoking initiation among youth to be causal (National Center for Chronic Disease Prevention and Health Promotion Office on Smoking and Health, 2012). In 2020, a causal link between exposure to tobacco use on popular television streaming platforms and tobacco initiation among youth and young adults was demonstrated (Bennett et al., 2020). The current study shows that a substantial portion of young people are exposed to the same depictions of tobacco

Table 1

*Youth and young adults 15-24 online survey sample characteristics, 2023**

	<i>n</i>	<i>(%)</i>
Female	525	(50.87%)
Hispanic	263	(25.48%)
Black	255	(24.71%)
Asian	46	(4.46%)
Rural residence	267	(25.87%)
Past 30-day tobacco use ^a	328	(31.78%)
	<i>M</i>	<i>(SD)</i>
Age	20.9	(0.1)

Note. * *n* = 73(7%) participants reported more than one race or ethnicity; ^a includes past 30-day usage of cigarettes, e-cigarettes or vapes, cigars, little cigars/cigarillos, loose tobacco, oral nicotine products, pipe tobacco, hookah. ^b Composite variable averaging hours spent using social media, watching videos or streaming, and using the internet for purposes other than email.

Table 2*Frequency of self-reported exposure to pro-tobacco imagery among 15-24 year old platform users, 2023*

	Twitch (n = 312)		YouTube (n = 922)		TikTok (n = 839)	
	Ever		Sometimes or Often		Ever	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Promotion of specific products	70 (22.4%)	19 (6.1%)	262 (28.4%)	94 (10.2%)	252 (30.0%)	113 (13.5%)
Tobacco use of any kind	106 (34.0%)	49 (15.7%)	373 (40.5%)	188 (20.4%)	347 (41.4%)	211 (25.1%)

Note. Percentages use the number of participants who reported using the platform in the past year as the denominator.

Table 3*Ordinal Logistic Regression predicting behavioral intentions (N=1032)*

	E-cigarette Intentions			Smoking Intentions		
	OR	95% CI		OR	95% CI	
Age	1.00	0.94	1.06	1.03	0.97	1.09
Female	1.58	1.18	2.11**	1.39	1.02	1.88*
Black	0.78	0.55	1.09	0.83	0.59	1.16
Hispanic	0.97	0.71	1.32	1.00	0.72	1.38
Asian	0.71	0.42	1.20	1.33	0.83	2.14
Rural	1.10	0.82	1.47	1.15	0.85	1.56
Past 30-day tobacco use	18.68	11.43	30.55***	6.33	3.85	10.40***
Moderate UGC dosage ^a	1.55	1.04	2.31**	1.23	0.82	1.83
High UGC dosage ^a	2.96	1.94	4.51***	2.19	1.43	3.35***
Past 30-day tobacco use x moderate UGC dosage ^b	0.69	0.36	1.33	0.97	0.50	1.88
Past 30-day tobacco use x high UGC dosage ^b	0.73	0.38	1.40	0.84	0.41	1.71
Model fit X ² (df)	363.62(11)***			202.36(11)***		

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; ^a base category is 0 reported exposure to tobacco use of any kind on user generated content platforms. Moderate exposure included the median of 1 through 75th percentile 1-3; high exposure was above 3. ^b the interaction terms between dosage and past 30-day tobacco use tests the significance of past 30-day tobacco use as a moderator of the relationship between exposure to tobacco content on UGC platforms and tobacco use intentions.

use and product promotion on UGC platforms, such as Twitch, YouTube, and TikTok, that have been causally linked to tobacco initiation in real-life. Unsurprisingly, we find a robust dose-response relationship between self-reported exposure to this content and intentions to smoke and use e-cigarettes in the future. In addition to identifying which sorts of content drive which behaviors (Allem, 2025), our study underlines the remaining challenge of designing robust measures of exposure to more effectively investigate who and under what circumstances people are exposed to tobacco content in a far more diverse and expansive UGC media environment.

Assessing exposure to tobacco imagery within UGC is complicated because current standardized methodologies for studying the impact of programming from television and streaming involve identifying top programs, using a validated approach (Rath et al., 2023; Tynan et al., 2019) to code the content of interest (i.e., tobacco use on screen) in those programs, and correlating exposure to those programs with the outcome of interest (tobacco use in real life) (Morgan et al., 2012). The extraordinary amount of content already in circulation and created every day on UGC platforms makes it nearly impossible to utilize this standardized method for television and film for platforms like Twitch, YouTube, and TikTok. For example, in contrast to traditional media like television and film, where a finite sampling pool of content can be identified and content analyzed, at the beginning of 2024, Twitch had over 65,000 monetized content creators with a median of more than 25,000 viewers each and a minimum of 25 hours of content (*Twitch Statistics & Charts*, n.d.). Also, in 2024, YouTube had over 3.9 billion videos with 2.4 million uploaded every day (*YouTube*, n.d.). As of January 2024, TikTok had an estimated 34 million videos posted each day (Ch, 2024).

More than one-third of study participants recalled exposure to some kind of pro-tobacco imagery on UGC platforms, with the highest exposure reported on TikTok, followed closely by YouTube and Twitch. With a December 2023 Pew report finding that about one in five teens reported using YouTube and TikTok “almost constantly” (Anderson et al., 2023), these findings highlight the potential risk for exposure to tobacco imagery on these platforms to a generation increasingly described as permanently online and permanently connected (Vorderer et al., 2017). However, while the relationship between social media use and risky behaviors like tobacco use is strongly supported (Donaldson et al., 2022), the directionality of the risks posed by social media use remain unclear. The relationships observed in our study could be equally explained by those who intend to use tobacco products deliberately seeking such content out, potentially being recommended content, or gaining access to previously inaccessible tobacco products through channels enabled by social media. Our findings do not preclude these other pathways. Rather, we demonstrate that the known pathway for entertainment media, for which there is causal evidence, remains robust.

Ultimately, this analysis raises more questions than answers. The modern media environment is defined, in part, by its complexity. These platforms may drive health behaviors through the same pathways as traditional entertainment media. However, the “social” attributes of social media introduce digital peer networks (Montgomery et al., 2020), access to illicit markets (Dobbs et al., 2025; Pearson et al., 2025a), influence from industry actors (Silver et al., 2022; Silver et al., 2025), algorithm-based recommendation feeds (Pearson et al., 2025b), and other unique features that may interact with the known influence of entertainment content. We echo

suggestions by other researchers in this area that a greater focus on what specific content drives which specific effects is needed (Allem, 2025). Experimental research can examine how specific content drives norms and outcome expectancies, while research aimed at examining the broader influence of social media on health behaviors requires more sophisticated measures of exposure geared toward understanding how unique attributes of social media drive users to harmful content.

It is noteworthy that past 30-day tobacco use did not moderate the relationship between exposure to tobacco content on UGC platforms and intentions to use cigarettes or e-cigarettes. The implication is that exposure to tobacco content may play a role in both initiation and reinforcement of tobacco use, potentially leading to progression to daily use or undermining cessation intentions. However, these data are not sufficient to make these conclusions. As a result, future research could examine unique roles of UGC content among those who are nicotine naïve and currently use tobacco products.

Opportunities exist for future research to address key limitations of this study's findings. First, although online opt-in panels are a reliable data source for establishing a relationship between UGC platform usage and tobacco use intentions, more generalizable samples are needed to accurately assess population parameters (Bruggen et al., 2016). Second, use intentions are an imperfect predictor of tobacco use behavior as adolescents in particular are often influenced by factors beyond what they intend to do (Rhodes & Ewoldsen, 2009). Our reliance on self-reported exposure is a limitation driven by the infeasibility of coding billions of potential videos. Moreover, our exposure dosage measure is quite blunt, potentially equating someone who rarely sees promotional content across

all three platforms (dosage of three) with someone who often sees promotional content on just one platform, but not on any others (also a dosage of three). Unobtrusive measures of exposure, such as data donation, can provide more objective measures of exposure (Fitzgerald et al., 2024), while big data methods, such as computer vision, are needed to accurately classify the extraordinary amount of content identified by these methodologies (Vassey et al., 2023). Finally, the bluntness of our binary rurality measure likely led to this variable violating the proportional odds assumption. The relationship between rurality and smoking is well-established in the literature (Bolin et al., 2015; Villanti et al., 2021), and our findings should not be interpreted as evidence to the contrary. Future research could include both longitudinal designs to examine the directionality of the relationships we observe, as well as experimental designs to better understand how unique characteristics of UGC content, such as the ability to interact with creators, moderate observed relationships between exposure to tobacco use and behavior.

As the definition of “screens” expands from films to streaming shows to music videos and now user-generated content, so does the potential for youth and young adults to be exposed to tobacco imagery. This exposure to tobacco imagery may perpetuate the normalization and glamorization of tobacco use and put younger generations at risk (National Center for Chronic Disease Prevention and Health Promotion Office on Smoking and Health, 2012). The finding that at least a third of young people reported exposure to tobacco imagery on user-generated content platforms that are popular with young people is of public health concern. Opportunities exist to educate parents, educators, health care providers, and media content creators – including those on user-generated content platforms – on how

millions of young people are exposed to tobacco imagery on screens and how such exposure can lead to tobacco initiation and use. Additionally, content platforms have a choice to eliminate incidents of tobacco imagery among youth and young adults who use their platforms. For example, platforms can establish policies that prohibit any tobacco product use of or promotion of tobacco products in all user-generated content on platforms that allow youth/young adult users. Overall, any solution aimed at reducing youth and young adult exposure to tobacco imagery in media is most effective when it is comprehensive, addressing multiple channels and coordinating with other counter-marketing efforts and policy strategies that have been shown to prevent and reduce youth tobacco use.

Implications for Health Behavior Research

The social media landscape changes rapidly with an ever-evolving array of platforms capitalizing on new features driven by new technologies. As a result, research examining the impact of key features across platforms is needed to characterize the effect of evolving communication technology on health behavior. These findings highlight the likely influence of user-generated content on youth and young adult substance abuse. Understanding the unique influence of user-generated content is critical to understanding the broader influence of social media on health behaviors of vulnerable populations. Moreover, disentangling the effects of unique social media attributes from the known effects of traditional entertainment media is crucial to better understand the impact of these mediums on health behavior. Research aimed at understanding the unique characteristics of the social media landscape, including how new technologies and content formats impact exposure, and what effects are needed to inform comprehensive

strategies to counter pro-tobacco imagery and other deleterious influences.

Discussion Questions

Are there fundamental differences in exposure to harmful content in traditional media, such as television, and new media, such as social media platforms?

Given the rapid growth in user-generated content, how can future research capture exposure to tobacco content and other harmful influences on platforms with billions of videos?

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Data availability: Data is available upon request.

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