



# Use of Media and Social Media in the Prevention of Substance Use

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David B. Buller, Barbara J. Walkosz,  
and W. Gill Woodall

## Introduction

Despite rapid changes over the past three decades, mass media are one of the most potentially influential communication channels in modern societies. Nearly all adults and most children, even from an early age (Rideout, 2013), are connected in some way to mass media and media consumption is increasing. Nielsen estimated in 2014 that the average American household spent nearly 60 h a week consuming media (“The U.S. Digital Consumer Report,” 2014). Messages in the media also reach individuals indirectly through interpersonal communication with acquaintances, friends, and family (sometimes information is received both directly and indirectly). Television remains the single most consumed form of media for adults (“The Total Audience Report: Q1 2016,” 2016; “The U.S. Digital Consumer Report,” 2014), the youngest children aged 0–8 (58% watched daily) and preadolescents aged 8–12 (62% watched daily), and is second only to listening to music among adolescents aged 13–17 (58% watched daily) (GfK Inc., 2015; Rideout, 2013). Radio is consumed by more Americans than any other single medium and is the second largest portion of their daily media mix (“The Total

Audience Report: Q1 2016,” 2016). Print media, while experiencing declines in the past two decades, has been revitalized by the Internet and advent of online news websites.

Several changes have occurred in the past 20 years that have revolutionized the media, derived from the advent of personal computers and digital networking technology. These changes have further expanded media’s reach, broadened individuals’ choice of content, shifted time and location of consumption (“The U.S. Digital Consumer Report,” 2014), and provided the ability for individuals to contribute to the creation and delivery of content. The first change was the birth of the Internet in 1991 (Bryant, 2011). In the 25 years since that time, the media landscape has been transformed by a wide array of digital formats. By 2014, 87% of American adults used the Internet (“Internet User Demographics,” 2014). While use remains lowest among Americans 65 or older, high school graduates, and the least affluent (<\$30,000), a majority of all subgroups currently use the Internet.

With the Internet, the second change was the emergence of new media in which content is available on-demand. It includes but is not limited to social media (e.g., Facebook and Twitter), websites, online advertising, mobile apps, and streaming videos. These new media provide additional channels for prevention interventions that have the ability to positively impact public health and connect hard-to-reach populations (Burke-Garcia

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D. B. Buller (✉) · B. J. Walkosz · W. G. Woodall  
Klein Buendel, Inc., Golden, CO, USA  
e-mail: [dbuller@kleinbuendel.com](mailto:dbuller@kleinbuendel.com);  
[bwalkosz@kleinbuendel.com](mailto:bwalkosz@kleinbuendel.com); [gwoodall@kleinbuendel.com](mailto:gwoodall@kleinbuendel.com)

& Scally, 2014). Social media in particular allows individuals to actively participate in the development and distribution of prevention messages like never before (GfK Inc., 2015). Starting with forums, newsgroups, and blogs, social media are now comprised of a range of online services (e.g., Facebook, Twitter, Instagram, and Pinterest) on which individuals and organizations post, modify, share, and comment upon a variety of digital media content. As of 2015, 65% of American adults were using social networking sites (and most of them used it every day) (“The U.S. Digital Consumer Report,” 2014), with use being highest among younger (90% of 18–29 year old adults use social media) and more educated adults, those with higher incomes, and adults living in suburban and urban areas (Perrin, 2015). Adolescents aged 13–17 are the most enthusiastic users of social media, with 71% using Facebook, 52% Instagram, 41% Snapchat, and 33% Twitter in 2015 and girls being more active on social media than boys (Lenhart, 2015). With its rise in popularity, many of the players in the traditional broadcast and print media have come to embrace the new media, producing a convergence that has blurred the lines between traditional and new media content. For instance, most newspapers now publish content both in hard copy newsprint and online. The major broadcast news and entertainment networks stream video content online, as well as distributing it over the air or on cable systems. Online media routinely re-post content from the traditional media. These practices are quickly rendering the distinction between traditional and new media obsolete.

A third change that has revolutionized the media environment is the introduction of mobile computing. Mobile computing has placed media devices connected to the vast international digital networks in the hands of many individuals, so they are nearly always connected to and engaged with the media wherever they may be, often across several platforms simultaneously (“The U.S. Digital Consumer Report,” 2014). It is estimated that 92% of Americans owned a cell phone in 2015 and by 2016, 81% owned a smartphone and 58% a tablet computer (by comparison 73% owned desktop or laptop computers)

(“Three Technology Revolutions,” 2012; “The Total Audience Report: Q1 2016,” 2016). Teens (aged 13–17) are the most connected generation. Nearly all teens (92%) go online daily and a quarter are almost constantly online (Lenhart, 2015) (spending 9 h daily using digital media) (GfK Inc., 2015). Mobile devices account for 46% of all screen time by teens. Preadolescents (aged 8–12) also spend considerable time with the media (i.e., 6 h a day) and 41% of their screen time is spent on mobile devices (GfK Inc., 2015). Among the millions of mobile apps for these devices are ones provided by major media corporations to deliver content typically delivered over broadcast media (e.g., video streaming services such as from Netflix, Hulu, and CNN) or on paper (e.g., news websites from established newspapers such as the New York Times and Wall Street Journal and from online news services such as Politico, BuzzFeed, and Huffington Post) and those for the most popular (e.g., Facebook and YouTube) and emerging (e.g., Instagram and Snapchat) social media (“The U.S. Digital Consumer Report,” 2014). Streaming video on-demand continues to expand in popularity (“The Total Audience Report: Q1 2016,” 2016) and has changed the times and locations where individuals receive televised media content.

In this chapter we consider the role of media in efforts to prevent substance use. Our focus is on evaluations of large media interventions and their influence, rather than smaller-scale studies that have explored narrowly focused issues such as short-term effects of alternative message formats. Given the often incremental and deliberate progress in science, it is not surprising that the published literature on the effectiveness of campaigns to prevent substance use in the convergent new media environment has lagged behind the media revolutions. Much of what we know about the role of media in substance use prevention comes from research that has relied on older media, with only limited research available on the potential influence of the newest online, social and mobile media. Thus, we will raise more questions about the influence of new media than provide conclusive answers and consider some of the challenges for conducting

research on effects of large-scale substance use prevention interventions delivered over them. With the expanded role of individuals in the new media environment, we will consider the role of audience activity starting first with concept of audience exposure determined by selective attention, exposure, and retention, processes that have been described for decades in the media effects literature and moving on to discuss user-generated content in the new media.

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## Media Campaigns for Substance Use Prevention

### Nature and Effectiveness of Media Campaigns

Large mass media campaigns have been conducted over the past 15 years aimed at preventing substance use, most often marijuana use, and subjected to careful evaluation primarily among adolescents. In the United States, one of the largest was the National Youth Anti-drug Media Campaign (NYADMC) by the Office of the National Drug Control Policy (ONDCP). Two versions of the campaign were conducted. The first, *My Anti-Drug*, focused on negative consequences of drug use, self-efficacy and normative beliefs about drug use or avoidance, and resistance skills. The second, *Above the Influence*, focused on bolstering resistance skill and autonomy and aspirations of youth as they related to consequences of using or avoiding drugs starting (Hornik & Jacobsohn, 2007; Hornik, Jacobsohn, Orwin, Piesse, & Kalton, 2008; Scheier, Grenard, & Holtz, 2011). The NYADMC campaigns delivered messages over broadcast media, primarily television. However, these campaigns by ONDCP also placed messages in print publications (e.g., magazines), in movie theater advertising, and over the Internet and established partnerships with community and professional groups and appealed to industries (i.e., media, entertainment, and sports) to help distribute the campaign messages (Hornik et al., 2008; Hornik & Jacobsohn, 2007). One similar campaign compared with the NYADMC *Above the Influence*, the *Be Under*

*Your Own Influence* campaign, relied on in-school media and community-based efforts but similarly targeted youth's autonomy and aspirations (Slater, Kelly, Lawrence, Stanley, & Comello, 2011). A few smaller scale campaigns relying on mass media have been evaluated, such as a statewide campaign to prevent use of methamphetamine in Montana (Siebel & Mange, 2009) and a campus campaign to reduce alcohol and drug use in New Mexico (Miller, Toscova, Miller, & Sanchez, 2000). Several of the substance use prevention campaigns created messages based on scientific research on behavior change, communication, and disease prevention such as the Social Cognitive Theory, Theory of Reasoned Action, Self-regulation Theory, Health Belief Model, and the Sensation Seeking Targeting Prevention Approach and some submitted the messages to formative testing prior to launch (Miller et al., 2000; Palmgreen, Donohew, Lorch, Hoyle, & Stephenson, 2001; Scheier et al., 2011; Werb et al., 2011).

The mass media campaigns have been evaluated by two methods, using non-randomized observational designs assessing pre-post change before and after campaign implementation and randomized controlled trials comparing groups of teens who were exposed or not exposed to the campaign (Allara, Ferri, Bo, Gasparrini, & Faggiano, 2015; Werb et al., 2011). Generally speaking, the evaluations of these mass media campaigns have not found that they were broadly effective at altering drug use. Two recent meta-analyses found evidence that mass media campaigns have succeeded in reducing marijuana use only in a few studies and may have had the unintended impact of increasing marijuana use in other studies (Allara et al., 2015; Werb et al., 2011). One of the meta-analyses also showed very little effect of a mass media campaign to reduce the use of methamphetamine but the evaluation methods for this campaign in Montana have been criticized (Erceg-Hurn, 2008). Also, a comparison of methamphetamine use in Montana to use in other states showed no effect of the campaign on use of this drug (Anderson, 2010). Specifically considering the NYADMC campaigns, there was no change in marijuana use

between 2000 and 2004 during the My Anti-drug campaign (Hornik et al., 2008; Hornik & Jacobsohn, 2007). Moreover, the campaign may have produced positive beliefs about marijuana use, leading to the speculation that it had a boomerang effect (Hornik et al., 2008; Hornik & Jacobsohn, 2007). However, the *Above the Influence* campaign showed favorable effects on adolescents in grades 8–9 in a school-based evaluation, while the effects of the mass media campaign may have overwhelmed any effects of the in-school and community intervention that also targeted messages to adolescents' autonomy and aspirations (both cognitions mediated the impact of the *Above the Influence* campaign) (Slater et al., 2011). An earlier evaluation of the in-school and community intervention was successful during the My Anti-drug mass media campaign, so it appears that the similarity in messaging in the mass media campaign, not the overall campaign per se, swamped the influence of the former (Slater et al., 2006). An evaluation of a campus campaign using print media found only small reductions in alcohol and drug use (Miller et al., 2000).

It is possible that the mass media campaigns have been effective with only certain subgroups of the population (Werb et al., 2011). One analysis suggested that the *Above the Influence* campaign was associated with lower marijuana use by girls in the eighth grade but not boys in eighth grade or adolescents in grades 10 or 12 (Carpenter & Pechmann, 2011). An evaluation of a mass media campaign to prevent methamphetamine use also found a reduction in past-year use among younger (12–17 years old) rather than older (18–24 years old) youth (Allara et al., 2015). Another analysis suggested that the campaign was effective with high sensation seeking adolescents (Palmgreen, Lorch, Stephenson, Hoyle, & Donohew, 2007). High sensation seeking has been associated with greater risk taking and more drug use (Stephenson, 2003), so the NYDAMC campaign targeted them with specific messaging, and use of messages with high sensation value in the campaign appeared to explain the expected positive effect on high sensation seekers (Palmgreen et al., 2007).

Further, the campaign did not reduce marijuana use in low sensation seekers. This replicated an earlier study that supported targeting television campaign messages to high sensation seekers (Palmgreen et al., 2001).

Several explanations have been offered for the inconsistent or lack of effects of mass media campaigns. One possibility is that the theories used to design the campaigns do not take into account the environmental, socio-demographic, and other factors, as well as cognitions and intentions that were targeted by that campaign, that influence the initiation of substance use (Werb et al., 2011). It may be that youth are already exposed to large numbers of messages from the media and other sources (e.g., school-based substance use education; advice from family and friends) arguing that they avoid substance use so the campaign messages lacked novelty (Hornik et al., 2008; Hornik & Jacobsohn, 2007). Communication from others also may mediate the influence of campaigns, potentially in unfavorable ways that produce pro-drug attitudes (David, Cappella, & Fishbein, 2006). It is also possible that messages advocating not to use psychoactive substances such as marijuana produced reactance in teens and holding pro-marijuana attitudes helped them re-establish their freedom of choice (Hornik et al., 2008). Increasing the number of messages related to substance use in the media may also have the unintended effect of creating the perception that many people use these substances and produced pressure to conform to the actions of peers (Hornik et al., 2008; Hornik & Jacobsohn, 2007). Media campaigns may be more effective when they reach teens before they make decisions about whether to use alcohol, tobacco, or other substances, which would explain why some campaigns seemed to have better effects on younger rather than older individuals (Allara et al., 2015; Carpenter & Pechmann, 2011). The emotional climate of puberty may make girls especially receptive to messages that advocate avoidance of substance use by preserving autonomy and supporting their aspirations for the future (Carpenter & Pechmann, 2011). Also, reductions in a campaign budget that result in lower exposure to campaigns could lower effectiveness (Carpenter & Pechmann, 2011).

Finally, some methodological weaknesses of the evaluations have been noted. These include biases in self-reports of marijuana and other substance use, reverse-causality bias recall measures of exposure, where those more interested in substance use at the outset of a campaign led to greater attention to anti-substance use messages, and lack of an untreated control group (Magura, 2012).

## Role of Campaign Exposure

It is well established in decades of media effects research that audience activity determines media influence (Hawkins & Pingree, 1986; Kim & Rubin, 1997; Woodall, 1986). Audience members are selective in their choice of media and content within media (Zillman & Bryant, 1985). Selective exposure to media arises because people have limited capacity to process messages and in today's media environment, choices of media and media content are essentially endless, with messages competing across traditional broadcast and print media, online media, social media, and mobile media. Attention is driven by volitional processes (needs and motivations) and automatic cognitive orienting systems (Lang, 2000), as explained in the Cognitive Mediation Model (Beaudoin & Thorson, 2004; Eveland, 2001). Common motivations are interest, surveillance, and a desire to obtain information for future discussions with others. Exposure provokes attention and elaboration or message involvement and it is these information processing attributes that determine message effectiveness. However, users are selective in their attention to content within media and common behaviors such as scanning rather than carefully reading content can interfere with learning (Eveland & Dunwoody, 2002). Moreover, selective exposure means that people also can choose to avoid messages that do not interest them (Kim & Rubin, 1997). Finally, it is likely that memory for messages is short lived, meaning the effect of messages declines over time, which has been seen in media campaigns for both preventing drug and tobacco use (Carpenter & Pechmann, 2011; Farrelly, Davis, Haviland, Messeri, & Heaton, 2005).

Large mass media campaigns have been conducted in ways to try to achieve sufficient exposure to affect the target audiences. This was accomplished often with paid placement of campaign messages in broadcast media with a certain level of frequency that should have achieved exposure among the target population. For example the NYADMC's *My Anti-drug* campaign intended to achieve an exposure level at least 2.5 advertisements per week (Hornik et al., 2008; Hornik & Jacobsohn, 2007). Common media metrics of exposure, i.e., gross (or total) rating points of each message (or total rating points) based on advertising buys, as well as recall of messages and logos in surveys of youth, have been used to assess this exposure (Palmgreen et al., 2007). Generally, the national campaigns succeeded in achieving relatively high levels of exposure among the intended audiences. For example, the *Above the Influence* version of the NYADMC exposed teens to approximately 1360 total rating points of advertising in 2006–2008, which translated into reaching all teens with approximately 13.6 messages per month (Carpenter & Pechmann, 2011). An evaluation of the *My Anti-drug* campaign in the NYADMC revealed the 94% of teens aged 9–18 who were nonusers of marijuana at baseline reported exposure to an anti-drug message (Hornik et al., 2008; Hornik & Jacobsohn, 2007). Likewise, the NYADMC *Above the Influence* campaign achieved recall of campaign messages among two-thirds of a sample of 14–16 year olds in mall intercept surveys and memory for the campaign logos among more than half of respondents (73% had definitely seen the campaign in a school-based evaluation) (Scheier et al., 2011; Slater et al., 2011). A time-series analysis found that reported exposure was associated with greater messages placed in the mass media, as indicated by increases in radio and television gross rating points (Palmgreen et al., 2007). Exposure to substance use campaign messages has been associated with a few social factors, including being a female (Scheier et al., 2011), an older teen (Scheier et al., 2011), and White or African American (compared to Hispanics) in some instances (Scheier et al., 2011), but some high exposure campaigns had few gender and age differences (Carpenter & Pechmann, 2011).



Exposure in some studies appeared to influence campaign effectiveness, but not in all studies. In one study, awareness of the *Above the Influence* campaign was associated with lower marijuana use by teens 14–16, mediated through anti-drug beliefs (Scheier et al., 2011) but in an evaluation of the earlier *My Anti-drug* version of the campaign exposure was not related to anti-drug cognitions (Hornik et al., 2008). Further, a time-series analysis assessing high and low sensation seekers also failed to show any relationship between message exposure and substance use (Palmgreen et al., 2007).

Given the fundamental nature of audience activity, it is also not surprising that selective exposure has been demonstrated in new media such as the Internet and social media. Low use of health websites appears common when implemented in community settings and often some immediate need, most commonly a real or potential health problem, seems to motivate this Internet use. Some topics or message formats in the media may be automatically attention getting. For example, website ads containing attributes such as animation and novelty may elicit an involuntary orienting response and improve their effects (Diao & Sundar, 2004; Lang, Borse, Wise, & David, 2002). Leads for online news stories that highlight conflict and agony produced more selective exposure than other frames, perhaps because people inherently orient to danger-conveying signals or empathic sensitivities (Zillman, Chen, Knobloch, & Callison, 2004). Social media messages that contain imagery may achieve more user engagement overall (both liking and sharing) while positive information promotes sharing and negative affect and crowd-sourcing increases commenting (Rus & Cameron, 2016). We previously showed that messages highlighting the presence of new content on a website described as being created especially for the users increased logins (Woodall et al., 2007), which may be evidence that personalizing messages or creating messages with which individuals can identify increases attention to them (Cohen, 2001; Kreuter et al., 2007; McQueen, Kreuter, Kalesan, & Alcaraz, 2011).

Online and social media have added a new dimension to audience activity, namely the ability

to contribute content to these media, often referred to as user-generated content. Also, these media promote interactivity both with the content and among other users. This interactivity has the potential to increase attention and involvement in the media content. Also, social aspects of social media may heighten the sense of individuation. Thus, new media format may produce a much more dynamic and engaging audience experience and elevate the relevance of media messages, and thus alter what it means to be exposed to substance use prevention campaigns.

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## New Media and Substance Use

The use of the Internet for substance use prevention continues to significantly increase with the emergence of new media platforms. These approaches include but are not limited to web- and social media-based interventions, mobile apps, and the dissemination of user-generated content on platforms such as *You Tube* and blogs. However, new media may play an undesirable role that runs counter to prevention. A body of evolving research suggests that new media may promote substance use as evidenced by the links between posted behaviors on social networking sites (Hanson, Cannon, Burton, & Giraud-Carrier, 2013) and substance use, through online industry marketing (e.g., online advertising) that mimics the influential nature of offline marketing, and the ongoing analysis of prevalence data (White et al., 2010) on sites that respectively promote prevention of substance use.

## Web-Based Interventions

Web-based interventions were among the first to employ the Internet to promote behavior change, including substance use prevention. The benefits of these early interventions were to offer solutions to barriers associated with prevention campaigns such as access to special populations, stigma associated with face-to-face services, cost, anonymity, and real-time availability (Rooke, Copeland, Norberg, Hine, & McCambridge, 2013; Tait, Spijkerman, & Riper, 2013). However, while some success has

been achieved with problematic alcohol use (Rooke et al., 2013) and tobacco cessation (Evans, 2016), web-based programs for substance use prevention remain at the preliminary stages of evaluation (Tait et al., 2013). For example, the Substance Abuse and Mental Health Services Administration (SAMHSA) has supported a number of web-based media campaigns for substance use prevention aimed at a range of targeted audiences (e.g., parents and teens). Only a few of these efforts have been systematically evaluated (Evans, 2016), but they do show promise (Newton, Han, Stewart, Ryan, & Williamson, 2011). A meta-analysis that examined the use of Internet and computer-based programs to reduce cannabis use identified a small but significant overall effect size ( $g = 0.16$ ) with a number-needed-to-treat (NNT) of 11. Even though the effect size was smaller than that found for in-person interventions, the potential reach of Internet interventions could have significant public health impact. In an RCT designed for individuals who wanted to reduce their cannabis use, it was found that when compared to a website education-only program, a web-based intervention based on face-to-face treatment protocols reduced cannabis use frequency with a 43% reduction in smoking days per month, a finding similar to that found in the face-to-face interventions. Other outcomes, such as quantity of cannabis use, lower levels of cannabis dependence, and fewer symptoms of cannabis use, were partially supported (Rooke et al., 2013). Another intervention that tested a web-based counseling program (*Can Reduce*) with and without chat counseling with problematic/heavy users was effective (Schaub et al., 2013). In a family-focused program, Internet-delivered substance use prevention content for early adolescent Asian-American girls focused on improving mother-daughter communication and increasing maternal monitoring was delivered exclusively online, which was effective in lowering risk factors for substance use, enhancing individual skills and familial protective factors, and reducing substance uptake (Fang & Schinke, 2013).

Tobacco cessation and alcohol prevention programs delivered via the Internet have also met with some success. Quitlines, phone-based services that provided evidence-based counseling, have

evolved to now include self-directed web-based counseling programs (45 states) with counseling (64%) (Rudie, 2016). Among ten free state Quitlines, the participants who selected the web-only versus a phone/web cessation program were younger, healthier smokers of higher socio-economic status who interacted more intensely with services in a single session but were less likely to re-engage or access NRT benefits (Nash, Vickerman, Kellogg, & Zbikowski, 2015). Online alcohol interventions have confirmed the acceptability of online screening and intervention providing a forum that far surpasses the reach of face-to-face interventions (Cloud & Peacock, 2001; Cunningham, Humphreys, & Koski-Jännes, 2000). A systematic review of online alcohol interventions in randomized controlled trials suggests that Internet interventions offer a feasible alternative for individuals with alcohol-related problems, especially for women and younger individuals who generally do not access traditional health services (White et al., 2010). The studies under review included those that evaluated the impact of brief personalized feedback and that investigated an online multi-module information/education program. The analysis concluded that regardless of program type the online interventions “appeared to bring about small but meaningful differential reactions in 10-gram alcohol units consumed, blood alcohol concentration levels, and a range of other alcohol-related measures.” The potential for cost-effective delivery of these interventions has been somewhat effective while at the same time requiring more research with diverse populations as well as needing to ensure the transfer of the effective components of face-to-face interventions to technology platforms (White et al., 2010).

## Social Media

Social media interventions have the potential to prevent substance use because they can easily disseminate information (Korda & Itani, 2011; Portnoy, Scott-Sheldon, Johnson, & Carey, 2008) and are now essential channels for engaging large populations, especially populations like young adults. Social media sites share common characteristics that allow each user to create accounts,

connect to other users or groups, and provide the ability to comment and post photographs, videos, and other content (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011), making the design of interventions across platforms feasible.

The selection of social media platforms for substance use programs can vary depending on the intent of the campaign as each type of social media has different suitability for types of interactions. For example, Facebook may be more suited to intermittent posts about health facts and engage more users; Twitter may be more suited to daily external links and news items (Moreno & Whitehill, 2014); and Pinterest and Instagram are suited for photos and visual information. However, it should be noted that the evolution of these different capacities and features across all of these social media sites and applications is ongoing, and that the particular strength in providing messages of different types to different audiences will change over time. Multiple social media platforms can be employed in a campaign, each with its own purpose, but regardless of the platform, social media have transformed audiences into active participants in public communication, as they routinely create and share personal stories and information. The information shared on social media from (perceived) knowledgeable peers can have a powerful impact (Walther, Pingree, Hawkins, & Buller, 2005; Walther, Tong, DeAndrea, Carr, & Van Der Heide, 2011). Medical and other practitioners, while afforded a modicum of credibility, are at times only on par with social media “friends” and sometimes are rated below them (Wang, Walther, Pingree, & Hawkins, 2008). While the accuracy of user-generated content is a concern, social media’s transparency can allow practitioners to identify misinformation and correct it” (Chou, Prestin, Lyons, & Wen, 2013).

Unfortunately, the benefit of user-generated content and interactivity for health interventions at this time remains understudied (Chou et al., 2013), although by looking at substance use broadly, including alcohol and tobacco, the potential of social media in substance use prevention seems evident. Substance use prevention programs have primarily been implemented on Facebook. In a 2-year study that explored the use of a social net-

working site to change behavior, Facebook and text messages were utilized to reduce the use of alcohol by college students at festive events. The Facebook page, “Auvernight,” employed mostly videos along with posters and slogans from other alcohol prevention campaigns and reminded participants of ways to reduce excessive alcohol consumption. The intervention showed a reduction in the association of alcohol and festive events among college students along with a declared reduction in alcohol consumption while partying (Flaudias et al., 2015) and supported the decision to use social networking to influence behavior.

The assessment of engagement and participation (the expanded nature of exposure in social media) is critical to inform our understanding of how to leverage these new media to facilitate behavior change. For example, the Smokefree Women Facebook page, an open access smoking cessation community, with over 27,000 likes, found that in a 13-month period, there were 875 posts and 4088 comments from approximately 4243 participants and 1088 comments from the moderator. Network visualization that assessed connections between participants and the role of the moderator found that participants interacted with each other in small hubs, with and without the moderator, suggesting that the network was robust to random attack (loss of a participant without regard to their position in the network) but sensitive to selective attack (loss of a specific member who are hubs of the network). However, the moderator emerged as a key to the hub and the network was severely affected by loss of the moderator. It was also clear that participant interaction was driven by posts on Facebook. Super participants or highly connected individuals served as centers of hubs and help to maintain person-to-person interaction (Albert, Jeong, & Barabási, 2000). Highly engaged participants offered support and advice while less engaged participants announced their status and sought cessation strategies. Likewise, more central and connected people appeared to be further along in their journey towards smoke-free status and less central users were at the beginning of their smoke-free journey (Cole-Lewis et al., 2016). Facebook has also been used as one component



of a multimedia tobacco prevention campaign. The *Crush the Crave* (CTC) campaign for tobacco cessation included a Facebook page as part of their overall intervention, with over 100 posts promoting the campaign and smoking cessation. Users posted nearly 300 replies to the program posts, but most frequently to post with smoking cessation information; user engagement was most commonly associated with images. These findings suggest that social networking sites should be considered in substance use prevention campaigns to engage participants and improve exposure to campaign messages.

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### Challenges for Using Social Media in Substance Use Campaigns

The emergence of new media holds promise for future campaigns but also comes with a number of challenges and considerations. First, theories of social media impact are not well developed. To date, most of the research that has been conducted on social media and substance use has been descriptive and observational in nature. Moreno and colleagues have developed a Facebook Influence Model that identified key domains that explain the influence of Facebook on older adolescent users (Moreno, Kota, Schoohs, & Whitehill, 2013). The domains include (a) connection, related to peer influence, (b) comparison, aligned with social norms and modeling behavior, (c) identification that suggests you interact with the media based on who you are at that time and on who you want to be, and (d) the immersive Facebook experience that purports that Facebook has the ability to alter the experience of an individual on any given day, including moods and decisions. Theories of behavior change commonly used in prevention efforts address these domains and could be used to employ social media effectively in substance use campaigns. For example, Diffusion of Innovations Theory (DIT) and social network principles (Rogers, 2003) purport that (a) the elevated audience involvement in social media may increase dissemination and impact and (b) influence involves both delivering carefully crafted content by external change agents (e.g., experts) and

spreading it among community members, especially by opinion leaders (i.e., knowledgeable others who have informal peer influence). Opinion leaders, or super participants (Cole-Lewis et al., 2016), can emerge on social media and stimulate collective action as people depend on them for information (Rogers, 2003), especially on issues that carry risk and uncertainty (Lenz, 1984; Pescosolido, 1992; Reagan & Collins, 1987). Content shared in social media can breed collective action as participants interpret and respond to it through a process of social comparison/identity (Erickson, 1988; Rogers, 2003; Turner, 1982; Turner & Killian, 1992). Users routinely compare themselves with social network members (Suls & Miller, 1977) and conform to avoid uncertainty (Festinger, 1954). They perceive themselves in abstract social categories and roles (e.g., female, friend, parent, healthy person) and create their collective identity in the group, stabilizing behavior changes (Turner, 1982; Turner & Killian, 1992). Likewise, Transportation Theory (TT) and research on persuasive narratives may explain that user-generated content in social media, such as comments or testimonials that often can contain personal stories, can be more powerful than conventional persuasive strategies (Reinhart & Feeley, 2007). TT (Green & Brock, 2000, 2002) holds that people are transported into narratives and often change their beliefs based on information, claims, or events depicted (Green, 2006) that conform to existing cognitive schemas (i.e., framework/concept that helps organize/interpret information) (Petraglia, 2007) that make narratives seem real. Persons identify with characters in a story, which increases social influence (Cohen, 2001; Slater, Buller, Waters, Archibeque, & LeBlanc, 2003). Narratives can shift normative beliefs about risks, including marijuana use (Bellis, Hughes, Dillon, Copeland, & Gates, 2007; Bellis, Hughes, & Lowey, 2002; Bellis, Hughes, Thomson, & Bennett, 2004; Benotsch et al., 2007; Eiser & Ford, 1995; Hughes et al., 2008; Ragsdale, Difranceisco, & Pinkerton, 2006; Tutenges & Hesse, 2008).

A second challenge is the development of effective methodologies to measure and assess the effects of emerging media (Burke-Garcia & Scally, 2014). Reporting standards that define

intervention and participant characteristics need to be developed so that interventions can be compared and approaches that are efficacious and have high success can be determined (Pagoto et al., 2016). Also, research is needed to determine not only how to measure new concepts like engagement (hitting a “like” button, making a comment, or posting original content) but also to decide what qualifies as meaningful engagement that might result in changes in knowledge, behavior, or other key outcomes (Pagoto et al., 2016). The use of social analytics programs to extract data should also be considered as a means of analysis, especially for interventions with large numbers of participants over long periods of time (Pagoto et al., 2016). And determining how specific new media (e.g., Facebook, Twitter, Pinterest, Instagram, Snapchat) influence behavior may require unique assessment tools.

A third challenge for researchers is to determine how commercial online marketing strategies (e.g., digital ads) influence substance use (e.g., alcohol and marijuana) (Bierut, Krauss, Sowles, & Cavazos-Rehg, 2016) and how social marketing approaches can use similar strategies for prevention. In one case, online ad exposure was associated with confirmed visits to the *Tips* 2012 campaign site (TIPS from Former Smokers) and the results suggest that these ads may also cue audiences to seek other smoking cessation-related websites (Kim et al., 2016). Alcohol companies use a number of marketing strategies on Facebook including asking users to “like” their posts and to post content that displays brand use. Perhaps similar approaches could be used by prevention campaigns.

Fourth, research programs need to understand the use of multiple platforms that can be used for promotion. Media campaigns are now delivered across a variety of broadcast, print, and online media. Contents on Facebook, Twitter, Instagram, and YouTube are tailored for the social media site. This approach requires an understanding of both the audience and the

content of unique social media sites. For example, based on recent social media data (“Reach of leading social media and networking sites used by teenagers and young adults in the United States as of February 2016,” 2016), an intervention directed to teens may be more effective on a site like Facebook and Instagram than on Twitter or even Vine. Government organizations, such as the Centers for Disease Control and Prevention, have developed communication strategies that recommend the use of multiple sites in order to encourage engagement and ensure maximum exposure.

A fifth challenge is to determine how to best leverage and encourage user-generated media for substance use interventions. With the proliferation of YouTube, blogs, and personal Facebook and Instagram accounts, individuals are increasingly engaged in the creation of content. While studies have been conducted on how displays of risk-related behavior can influence social norms around that behavior, scant research has been conducted on how user-generated content can be used to promote substance use prevention. The development of interventions that encourage storytelling, hold video contests for intervention content, and invite posts about alternatives to substance use (e.g., other sensation seeking behaviors) is needed to identify effective methods that employ user-generated content.

Finally, the interactive nature of emerging media should be explored more fully (Moreno & Whitehill, 2014). While a few studies have encouraged interaction between participants, a greater understanding of how peers and experts communicate in social media is needed. For example, more research is needed on the content of communication about substance use on social networking sites and if any opportunities exist to confront and intervene on displays of substance use (Moreno & Whitehill, 2014). However, privacy settings must be recognized and respected in such instances and confidentially must be protected.

## Influence of Internet Content on Substance Use

The monitoring of behavior and discourse on the Internet, especially on social media such as Facebook, Twitter, and YouTube, can inform public health practitioners and campaign planners about emerging substance use trends that may warrant prevention efforts and also suggest strategies to create effective campaigns. Infodemiology is a new field of study that examines the determinants and distribution of information on Internet channels, such as social networking sites (Eysenbach, 2009). This information could be used to develop prevention messages for campaigns. For example, messages that underscore the risk of teen use of marijuana such as addiction, cognitive impairments, and the dangers of driving while intoxicated (Cavazos-Rehg, Krauss, Gruzza, & Bierut, 2014) could be employed in campaigns based on substance use information gleaned from social networking sites.

Exposure to information and making connections on social media may be important determinants of how behavior displayed online can provide modeling cues and influence social norms for substance use (Cabrera-Nguyen, Cavazos-Rehg, Krauss, Bierut, & Moreno, 2016). For example, teens using social networking sites were two times more likely to use marijuana, three times more likely to use alcohol, and five more times more likely to use tobacco (Casacolumbia, 2011). In one case, simply seeing a photo of someone using drugs on a social media site was associated with increased marijuana use (Casacolumbia, 2012).

The monitoring of social networks can identify trends among participants. A study of the social circles of those who misuse prescription medications on Twitter found that connections consisted mainly of other Twitter users who also discussed the misuse of prescription medications (Hanson et al., 2013). These connections have the potential to reinforce this negative behavior and normalize the misuse of prescription medications. In another case, the online reaction of drug users to the reformulation of OxyContin that was intended to present obstacles to use by non-oral routes of administration was

reviewed (McNaughton et al., 2014). A systematic monitoring of nearly 20,000 posts to message boards suggested that the reformulation had an impact on the online discussions among drug users, resulting in reduced sentiment for the drug and emergence of manipulation-attempt recipes (e.g., oral, snorting, injecting, smoking, and rectal). The study demonstrated that an analysis of Internet-based discussions can inform the impact of reformulation on the substance use community and potentially identify a use-deterrent effect, such as a tamper resistant opioid formulation (McNaughton et al., 2014).

Marijuana use is promoted on social networking sites. Displays of dabbing, the extraction of oil from marijuana leaves and flowers, are easily found and accessed on YouTube. An analysis of 116 videos of persons dabbing had a total of 9,535,482 views, with 89% of the videos showing at least one person dabbing. Product reviews, instructions, and some cautionary messages were also provided. The popularity of these videos could potentially increase and normalize this potent form of marijuana use. Another study hypothesized that an understanding of the discourse on Twitter that encouraged marijuana use could inform the development of prevention messages. The study conducted a content analysis of tweets (over 2500 in more than 6 months) and the demographics of a pro-marijuana Twitter handle. The overwhelming majority of tweets were positive about marijuana and the majority of the followers were 19 years of age or younger (Cavazos-Rehg et al., 2014). An analysis of marijuana posts on Instagram identified over 2100 posts related to cannabis with the most common imagers being that of marijuana plants (e.g., buds/leaves), with less common images depicting concentrates, dabbing, and marijuana display ads.

The Internet is a source of information for use of other substances, too. Displays of alcohol use include but are not limited to texts, photographs, and videos talking about or displaying alcohol consumption as well as links to alcohol-related groups or companies (Egan & Moreno, 2011). An analysis of 70 YouTube videos related to alcohol intoxication had been viewed about a third of a billion times. Even though 86% of videos portrayed active intoxication, only 7% contained

references to alcohol dependence, with videos that showed humor, games, attractiveness, and no intoxication or injury were rated most positively. Young adults exposure to peer behavior and alcohol advertising on social media are often associated with alcohol use (Jernigan & Rushman, 2014; Mundt, 2011) and a summary of this literature found significant associations between exposure to Internet-based alcohol-related content and intentions to drink and positive attitudes towards alcohol drinking among young adults (Gupta, Pettigrew, Lam, & Tait, 2016; Tait et al., 2015). Likewise, online marketing of alcohol includes advertisements, contests, promotion of branded events, interactive games, and invitations to drink (Nicholls, 2012). Alcohol-related sites do not verify age of users (Barry et al., 2015) and one study found that using fictitious underage profiles, users were able to successfully subscribe to 16 official YouTube channels sponsored by alcohol and beer companies demonstrating that their self-imposed restrictions for online advertising to minors were not being followed (Barry et al., 2015). Finally, one study (Huang, Kornfield, & Emery, 2016) found over 28,000 videos of e-cigarettes had been viewed over 100 million times, rated more than 380,000 times, and commented on more than 280,000 times. The use of these videos included brand marketing and the promotion of e-cigarettes as smoking cessation tools.

## Conclusions

Unfortunately, mass media campaigns have not been very effective at impacting substance use. At best, the results of the largest campaigns have been mixed and there is some concern that the large NYADMC had a boomerang effect of increasing marijuana use. A number of concerns have been raised about the quality of the evaluations of campaigns (Scheier et al., 2011). However, there are also concerns that the theories underlying these campaigns were not capable of designing effective campaign messages or the campaigns did not reach individuals at young enough ages to influence substance use decisions before use began. The media environment has

changed radically over the past 25 years such that any campaign conducted today will need to rely not only on traditional broadcast and print media but also on the new media, especially the social media that has come to dominate the media world of many adolescents and young adults. There are numerous challenges to deploying the social media in substance use campaigns that need future research to integrate behavioral theories with what we know about how individuals use and interact with media today. But, those challenges also represent tremendous opportunities both to better understand and more effectively impact many different groups and populations for the improvement of their health.

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