

Understanding the spread of prevention and cessation messages on social media for substance use in youth

Prevention
messages for
substance use

Soumik Mandal

*School of Communication and Information, Rutgers University,
New Brunswick, New Jersey, USA*

Chirag Shah

*Information School, University of Washington, Seattle,
Washington, USA*

Stephanie Peña-Alves

Sociology, Rutgers University, New Brunswick, New Jersey, USA

Michael L. Hecht

REAL Prevention, Clifton, New Jersey, USA

Shannon D. Glenn

Rutgers University, New Brunswick, New Jersey, USA

Anne E. Ray

*College of Public Health, University of Kentucky, Lexington,
Kentucky, USA, and*

Kathryn Greene

Communication, Rutgers University, New Brunswick, New Jersey, USA

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Abstract

Purpose – Engagement is a critical metric to the effectiveness of online health messages. This paper explores how people engage in youth-generated prevention messages in social media.

Design/methodology/approach – The data sample consisted of engagement measures of 82 youth-generated messages hosted in a social media channel and a follow-up survey on content creators' motivation for promoting their messages and their dissemination strategies. A comparative analysis of engagement metrics along with qualitative analysis of the message types was performed.

Findings – Two types of messages were considered: stop messages and prevent messages. Our analyses found that people interacted with stop messages on social media more frequently than prevent messages. On analyzing the youth's motivation and promotion strategies, no significant difference was observed between stop message creators and prevent message creators.

Social implications – This work has implications for programs promoting prevention and health information in social media.

Originality/value – This is the first study in social media-based prevention programs the authors are aware of that differentiated between the strategies of youth-produced prevention messages.

Keywords Social dissemination, Substance prevention, Youth, Social media, Facebook

Paper type Research paper



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Introduction

The use of alcohol and other substances is prevalent that result in chronic behavioral health problems in our society that increase the risk for a variety of severe medical conditions [1]. In 2018, National Institute of Health's (NIH's) *Monitoring the Future* survey on drug use and attitudes among 8th, 10th and 12th graders across the USA found declining trends in the use of alcohol, cigarettes and other drugs (except marijuana) among the youth. However, use rates were still at problematic levels. More alarming, this survey reported a significant increase in all forms of vaping, including marijuana vaping observed among youth in the previous year.

Addiction and substance use problems bring an enormous amount of human suffering and cause high attendant costs for society. According to recent statistics from National Institute on Drug Abuse (NIDA), the total cost (related to crime, lost work productivity and healthcare) due to tobacco, alcohol and substance abuse in the USA alone is estimated to be \$740 billion annually. Due to the costs attributable to substance use and addiction, a significant amount of scientific attention has been directed toward developing effective substance use prevention programs.

One concern is differentiating strategies to prevent the onset of substance use, called primary prevention [2], and those urging cessation, called secondary prevention, in these programs. In this study, the distinction between primary and secondary prevention is drawn based on the message's target audience. A prevention message that targets youth who have already initiated use is a secondary prevention type and is labeled a "stop message" in this study. Whereas the message that attempts to convince non-users refraining from future substance use is the primary prevention type and labeled as a "prevent message."

Primary and secondary prevention messages can be seen in the use of emerging technologies and new media. Use of the Internet and social media to fulfill health information need has been on the rise, especially among adolescents and youth (Hausmann *et al.*, 2017). Leveraging this trend, social media-based prevention programs have been designed and studied in the past (Evans *et al.*, 2020).

However, one long-standing concern about individuals using social media for health information is the nature of information (Eysenbach, 2005; Lau *et al.*, 2012). Previous studies on social media use for health communication have suggested the information exchanged in social media to be monitored for quality and reliability (Moorhead *et al.*, 2013). In the past, studies have typically assessed quality of the content via readability scores and a combination of readability with scales that measure factors like the formality of content and the site's design (Zhang *et al.*, 2015). However, in social media, engagement is the key metric to the effectiveness (Peters *et al.*, 2013) of online health messages (Neiger *et al.*, 2012). Therefore, public engagement can be used to evaluate the efficacy of social media-based prevention programs.

The work reported here explores the difference in public engagement of stop messages and prevention messages related to substance use prevention in social media as part of an online media literacy substance prevention program called REAL media (Ray *et al.*, 2019). In other words, the primary and secondary prevention messages required different diffusion strategies for engagement in social media.

Literature review

Several examples of substance use prevention programs exist in the literature. A few of them, focused on affecting small groups as well as larger communities, are discussed here.

School-based drug prevention programs

Due to the risk of exposure to substance use among adolescents, schools are seen as a common site for prevention interventions in most Western countries. Several well-designed experiments studied the effectiveness of school-based interventions, and their efficacy was extensively reviewed (Soole *et al.*, 2008). Some of the most promising interventions include Project

Northland (Perry *et al.*, 1996), the Midwestern Prevention Project (MPP) (Pentz *et al.*, 1990) and *keepin' it REAL* (Gosin *et al.*, 2003). Evidence suggests that such curricula have the potential to reduce drug use among adolescents. However, school-based prevention curricula are not without challenges. In particular, when taken to scale, reproducing such curricula tends to be idiosyncratic rather than grounded in theory (Ringwalt *et al.*, 2002). Modification of programs to fit local conditions results in curricula that are tailored for each school, which is cost-prohibitive. In addition, schools have limited resources in terms of time and implementers. Finally, most interventions target elementary and middle-school-aged youth, neglecting older youth who are more likely to experiment and/or become habituated. These considerations lead to the conclusion that despite widespread use of school-based curricula, there is still a need to explore other contexts and novel social diffusion strategy in which effective prevention can be implemented, especially in community groups.

Social proliferation-based prevention programs

Research on alternate of school-based prevention curricula for youths led to developing prevention curricula based on youth creating their own messages and diffusing through their social peer networks (Greene *et al.*, 2016). Such an approach was found to be useful in developing greater self-efficacy in the prevention and negative alcohol expectancies (Gordon *et al.*, 2018). Studies on social context of substance use among adolescents (Valente *et al.*, 2004) suggested that analyzing peer social networks could be an effective means to understand and prevent substance use behavior. Previous studies found that effective prevention messages were naturally diffused by participants through their informal social peer networks (Shin, 2012; Choi *et al.*, 2017), and this was true for the precursor to REAL media (Banerjee *et al.*, 2015) as well. Other research documented that social network tailored substance use prevention programs using peer-led substance use prevention messages were effective (Valente *et al.*, 2004; Valente *et al.*, 2007). In this study, the dissemination of messages was labeled as “social diffusion” strategies for prevention predicated on the notion that youth-produced and disseminated messages can be an effective intervention (Larkey and Hecht, 2010).

Youths' networks extend beyond school, to home, other public places and also online, through various social networking sites (SNSs) such as Facebook, Twitter, Instagram and YouTube (Duggar and Brenner, 2013). Recent statistics on SNS use among teens suggested that 45% of the population were online on a near-constant basis (Anderson and Jiang, 2018). SNSs such as Facebook and Twitter provide important platforms for dissemination of public information, help researchers to identify prevailing attitudes and convey accurate information on substance use (Grové, 2019). Analyzing social media interactions may provide insights into patterns of use, risk factors and prevention behaviors associated with substance use. Therefore, many recent prevention programs use social media as delivery channels (Evans *et al.*, 2020); for example, the Above the Influence [3] program has a large Facebook presence to create a social community of youths sharing narratives related to the avoidance of marijuana (Evans *et al.*, 2014, 2017). And it is expected that in the coming years, more such social media-based prevention programs will come online.

Content analysis of messages in the prevention programs

From schools to social networks, prevention site is not the only factor influencing the effectiveness of a prevention curriculum. Analyzing the content of prevention messages can help in understanding the message contents, persuasion strategies and production components (Gordon *et al.*, 2018) that are most effective on the targeted audience. Further study of prevention curricula found personal narratives (Miller-Day and Hecht, 2013) to have distinctive capabilities in enhancing motivation to prevention in the targeted population. Studies on discourse analysis of adolescent-generated prevention messages suggested

negative consequences of substance use (Banerjee and Greene, 2013; Krieger *et al.*, 2013), negative-positive consequence comparison (Banerjee *et al.*, 2013) and identity appeals (Krieger *et al.*, 2013) to be the most frequent in message contents used by the adolescents to influence their peers. Persuasion techniques, although sparingly used in prevention messages, were found to be mostly based on sensory (un)appeal, such as “vomit” and “poison” (Gordon *et al.*, 2018). By contrast, production components in messages contained a variety of techniques, such as depicting people, clear setting, different font sizes, multiple colors and object placement (Krieger *et al.*, 2013).

As evident, the previous studies on content analysis of prevention messages did not always agree on the contents, persuasion strategies and production techniques, or their combinations that were most effective; however, at the very least, this line of research suggests that further work differentiating prevention messages strategies may be fruitful.

Gaps concerning social influence strategies to promote prevention

To extend the work on prevention messages, this study considers gaps remaining in the literature. Although social influence strategies promoting prevention, especially among youth, continue to be investigated (Humphreys *et al.*, 1999; Greene *et al.*, 2016), there is a lack of research on developing programs that differentiate in strategies targeting different audience segments of these programs. Current literature on the content of prevention programs has not clearly elucidated if the influence strategies differ between the content meant for deterring substance users from using substance (secondary prevention), and the content that persuades non-users of substance to maintain non-use (primary prevention). More specifically, it is not known if the secondary prevention messages (stop messages) evoke response that is different in nature than those evoked by the primary prevention messages.

This is particularly problematic in the context of social media for at least two reasons. First, social network sites are increasingly being used as an information source, including information related to risks (Westerman *et al.*, 2014). Therefore, if either type of messages undermines the importance of the other in social media, it may negatively affect the community’s overall substance prevention behavior. Second, social media-based prevention programs are unlikely to be effective if the messages fail to create the desired impact on the initial recipients and may demotivate them from further sharing these messages with their peers.

Therefore, research needs to investigate difference between social media responses to stop messages and prevent messages. Investigating these research gaps will have implications on the design of future social media-based prevention programs and evaluating their suitability in catering to different audiences.

Objectives

To address the gaps in the literature discussed above, the study reported in this article aims to answer the following two research questions.

- RQ1. How do social media responses to stop messages differ from responses to prevent messages?
- RQ2. How does the individual’s motivation and dissemination strategies differ between proliferating stop messages and prevent messages in social media?

Method

Background

The data collected for this study came from an online media literacy substance prevention program called REAL media (Ray *et al.*, 2019). The program was a self-paced, online

curriculum based on the theory of active involvement, which provided a chronological sequence of cognitive changes experienced by participants in active involvement interventions. The sequence was conceptualized as starting when engagement with the intervention (arousal and involvement) produces knowledge gains (immediate outcomes) that lead to reflection (perceived discrepancy) and then other cognitions (expectancies, norms, intentions), with the ultimate outcome being behavior change.

The program was designed to guide the youth about media influence, develop critical thinking and analysis skills such as counter-arguing advertising claims, develop message production skills and then guide youth in developing, producing and disseminating their own substance use prevention messages. The messages were submitted to a social media-based site (i.e. Facebook), and youths then invited others to visit their messages as part of a contest. Further data were obtained from a self-reported survey on difference in motivation and social diffusion strategies between stop messages and prevent messages.

Participation in the contest

Based on theory of active involvement (Greene, 2013), this study asked the participants to plan and develop anti-substance use messages, using a contest to motivate participation and sharing. The production component of the message development occurred offline. The messages were accepted as posters and videos (maximum 30 s). Completed posters and videos were submitted online through the project website and, after internal review for appropriateness, posted to the project's Facebook contest page for dissemination during the contest. Participants were then provided with a unique URL and encouraged to recruit others to visit their message. Contest winners were determined by the number of visits, likes and comments and awarded prizes of \$250, \$100 and \$50.

During the contest period (14 days after the page went live), messages were monitored for inappropriate content in two ways. First, the contest page utilized available filtering from Facebook (e.g. postings with profane words were automatically excluded). Next, project team members monitored the contest page multiple times a day, closely following developed guidelines that included a positive or productive tone that aligned with the values of the community partner 4-H. Based on the established guidelines, only one comment was removed. During the contest period, data on responses to these messages were collected from Facebook. This includes the number of shares, comments, number of replies to comments, likes and other reactions. The contest was run in four cohorts. For each cohort, a new Facebook page was created, which was dedicated to the contest.

At the end of the contest period, data on community engagement with these messages were collected from the contest platform. Facebook's Graph API [4] was used to collect these data. The data collected in this process had a variety of metrics on engagement, described in Table 1.

Coding of messages

Once the contest ended, two trained coders content-analyzed each message. The messages were coded based on the message planning components outlined in the final level of the curriculum: message medium (poster/video), message goals (stop/prevent), target products (alcohol/tobacco/e-cigarettes/chewing tobacco/marijuana/multiple substances) and persuasion strategies (fun with the group/unexpected/style/endorsement). The coders were blind to the study question and coded the messages deductively. The present analyses focused on the coding category of message goal, either to stop current substance use or prevent future use. Intercoder reliability was established using Krippendorff's alpha (Krippendorff, 2004, 2005) and by evaluating acceptable agreement as alpha 0.70 or higher (Lombard *et al.*, 2002). The overall alpha value exceeded acceptable agreement at 0.93, as did

Name of the engagement metric	Description
Lifetime post total impression	The number of times this post (poster or video) entered a person's screen (total count)
Lifetime post total reach	The number of unique users who had seen a post in their screen (unique count)
Lifetime post consumption	The total number of times people have engaged with a post through likes, comments, shares or any other actions (total count)
Lifetime engaged users	The number of unique people who engaged with a post in certain ways, for example, by commenting on, liking, sharing or clicking upon particular elements of the post (unique users)
Share count	The number of times a post has been shared in Facebook (total count)
Comment count	The total number of comments a post has received in Facebook. [This does not include any replies to comments or the comments that were received on the shared posts.]
Like count	The total number of Facebook users who liked a post
Reactions count	The total number of Facebook users who have used the platform's list of emojis to express any reactions (e.g. Love, Haha, Wow, Sad and Angry) other than Like to a post

Table 1.
Engagement data
collected from
Facebook

the individual reliability estimate of 1.00 for the message goal category. See [Figure 1](#) for examples of “Coding of messages,” “Stop” message on the left, “prevent” message on the right.

Post contest survey

The participants also were invited to complete a post-contest survey where they were asked various questions about their motivation and social proliferation strategies. This instrument was designed to collect data on the participants' dissemination of information about the contest, and motivation behind such dissemination ([Table 2](#)). In the instrument, participants'

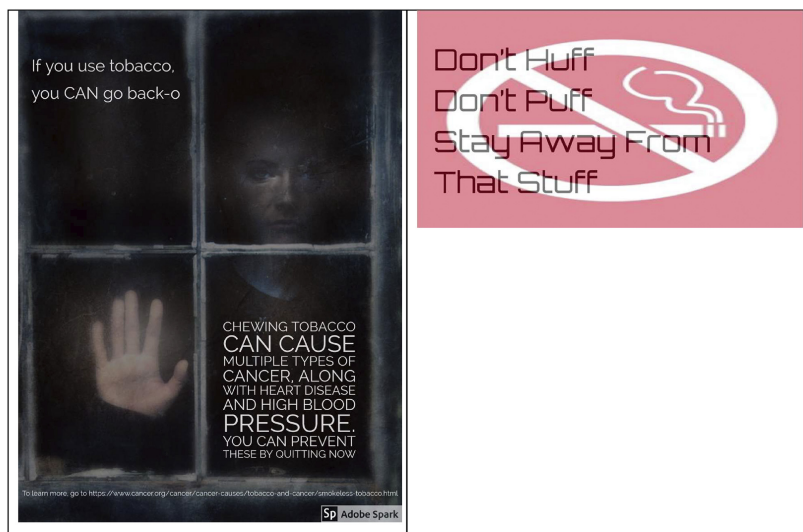


Figure 1.
Coding of messages,
“stop” message on the
left, “prevent” message
on the right

willingness to let others be aware of substance use indicated their intrinsic motivation (Ryan and Deci, 2000a). Whereas their motive to win the contest, to let others see their messages, to do this as part of a project or any other reasons behind their dissemination actions that might lead to a separable outcome, were correspondents of their extrinsic motivations (Ryan and Deci, 2000b).

Sample size

The sample consisted of 95 4-H youth members across nine US states between the ages of 13 and 17 years and between 6th and 12th grades at the time of the study pretest. Participants were recruited from 4-H youth club members in 2018 to participate in this REAL media program. The 4-H clubs are part of a national, United States Department of Agriculture (USDA)-sponsored network of youth organizations using positive development and experiential learning to cultivate youth citizenship, leadership, responsibility and life skills. Previous research shows that 4-H members have risky behavior patterns that mirror the general population despite the protective influence of their club involvement (Lerner and Lerner, 2013).

Informed consent from parents and youth assent was obtained from/for all study participants prior to participation. A university Institutional Review Board approved the study procedures. The project additionally employed a data and safety monitoring board (DSMB) consisting of three members who reviewed procedures (including for the contest) and monitored compliance.

All the 95 recruits were invited to complete a post-contest survey (discussed below), to which 13 participants did not respond (response rate of 86%). Therefore, rest of the analysis is based on the remaining 82 participants who participated in the entirety of this study.

Sample distribution

Out of the 82 participants from nine states, New Jersey had the largest number of participations (22), whereas Louisiana had the fewest (3). The remaining participants were from Illinois (18), Pennsylvania (14), Washington (6), West Virginia (6), Ohio (9) and Colorado (4). The majority of the participants were White (91%), female (67%) and above 15 years of age (61%). Detailed participant demographics are reported in Table 3.

Out of the 82 submissions received, most (88%) were posters. Only 10 participants (12%) opted to create video messages for the contest. This disparity between number of poster and video submissions may be attributed to the greater labor involved in producing the latter. Out of the 72 posters, 29 (40%) were stop messages and 43 (60%) were prevent messages.

Factors	Questions (variable name)	Participants' responses
Motivations	I wanted them to know about substance use. (<i>MOTIV1</i>)	(1) Not at all (1)
	I wanted to win the contest. (<i>MOTIV2</i>)	(2) Slightly (2)
	I wanted them to see my message. (<i>MOTIV3</i>)	(3) Somewhat (3)
	It was part of the project. (<i>MOTIV4</i>)	(4) Mostly (4)
	Any other reason. (<i>MOTIV5</i>)	(5) A great deal (5)
Dissemination activity	How many people did you talk to about this in person? (<i>PROLIF1</i>)	(1) None
	How many people did you talk to about this via messaging (e.g. email, text, direct messaging via social media) (<i>PROLIF2</i>)	(2) 1–10
	How many people did you talk to about this on the phone? Do not count text messaging. (<i>PROLIF3</i>)	(3) 11–20 (4) 21–30 (5) More than 30

Table 2. Questionnaire on proliferation of information about the contest and motivation behind the propagation

Among the videos, 4 (40%) videos were stop messages, and the remaining 6 (60%) were prevent messages. Thus, at this level, it seemed that the participants showed more eagerness in generating prevent messages than stop messages as the majority submission (60%) was directed at efforts to persuade peers to remain substance-free.

Results

RQ1: Comparing responses between stop and prevent messages

The data on engagement metrics reflected that during the content period, the 82 messages collectively received 591 shares, 1,097 comments, 2,542 likes and 129 other reactions, out of which the majority (108) were “Love” type reaction. Thus, each message was shared on average 7 times, liked 31 times and commented on 13 times in Facebook. Shapiro–Wilk’s normality test was used to assess the distribution of data, which were found to be not normal for all engagement metrics. The difference in engagement between the stop group and prevent group messages was evaluated using a non-parametric test (Friedman’s rank-sum test) that accounted for the effect of the message medium (poster or video). The results are presented in [Table 4](#).

The results suggested that stop and prevent messages differed significantly on all engagement metrics. The mean values of engagement count for individual messages demonstrated that in contrast to prevent messages, stop messages reached (lifetime post total reach) and were consumed (lifetime engaged users) by a larger audience. However, this difference in engagement was noticeably smaller for frequencies of shares, comments, likes or love reaction. Reactions other than love accounted for less than 20% of all reactions combined, and hence are not included in [Table 4](#).

Next, the effect of message type on engagement was evaluated with respect to the participants’ network size (i.e. number of friends on Facebook). Using Shapiro–Wilk test, the distribution of participants’ network size was found to be not-normal ($p < 0.001^{***}$). A generalized linear model was used to analyze the effect of message type (stop or prevent) while considering the normalized value of participant’s network size as a covariate. The result ([Table 5](#)) indicated a significant effect of message type on the following engagement metrics: the number of total impressions ($p = 0.0394^*$), reach ($p = 0.0134^*$), consumption ($p = 0.0446^*$),

Demographics variable	Number of participants (percentage)
<i>Gender</i>	
(1) Male	(1) 27 (33%)
(2) Female	(2) 55 (67%)
<i>Ethnicity</i>	
(1) Hispanic or Latino	(1) 5 (7%)
(2) Not Hispanic or Latino	(2) 76 (92%)
(3) Unknown	(3) 1 (1%)
<i>Age (at the time of participation)</i>	
(1) Below 15 years (13 years \geq age \geq 15 years)	(1) 32 (39%)
(2) Above 15 years (15 years $>$ age $>$ 18 years)	(2) 50 (61%)
<i>Race (more than one category applicable)</i>	
(1) American Indian/Alaskan Native	(1) 2 (2%)
(2) Asian	(2) 6 (7%)
(3) Black or African American	(3) 3 (4%)
(4) Native Hawaiian or other Pacific Islander	(4) 0 (0%)
(5) White	(5) 75 (91%)
(6) Other	(6) 0 (0%)

Table 3.
Participants’
demographics table

engaged users ($p = 0.0435^*$) and number of likes ($p = 0.0494^*$). However, no such effects were observed in the number of shares or comments. Similarly, no such effect of the message medium or the participants' network size was observed for any engagement metrics (see Table 6).

RQ2: Comparing proliferation strategies between stop and prevent messages

The previous section analyzed the difference in the social media responses between stop and prevent messages. The next question that arises then is if the content creators' motivation differed when generating stop messages and prevent messages. This difference may occur due to various reasons such as seriousness about the contest, perceived urgency of the message or some external motivations (participation is part of a project). The difference in proliferation strategy may signify if the participants feel the need to use different proliferation strategies for stop and prevent messages.

As for RQ1, using the Shapiro–Wilk test, data distributions in dissemination strategies and factors for motivation were found to be not normal. A Wilcoxon ranks sum test indicated that none of the motivations or dissemination activities was found to be significantly different between the two message groups. Nonetheless, the data suggested that participants who opted for stop messages depicted higher intrinsic motivation in dissemination than their prevent message-developing counterparts. The stop group also responded to having higher motivation for all extrinsic indicators except the purpose of winning the contest than prevent group participants.

Discussions and conclusions

This study makes several contributions to our understanding of prevention messages in online social platforms. On the message creators' side, an overwhelming majority of message

Facebook engagement metrics	Stop messages		Prevent messages		Difference between stop and prevent messages		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	Chi-squared	df	<i>p</i> -value
Lifetime post total impression	1,595	2,236	1,042	1,042	108	2	2.2e-16***
Lifetime post total reach	763	1,092	480	708	112	2	2.2e-16***
Lifetime post consumption	96	137	91	179	73	2	2.2e-16***
Lifetime engaged users	63	96	47	81	95	2	2.2e-16***
Share count	8	11	7	12	16	2	0.0003***
Comment count	13	45	14	35	22	2	1.51e-05***
Like count	25	37	35	101	36	2	1.68e-08***
Love count	1	5	1	5	92	2	2.2e-16***

Note(s): $p < 0.05^*$, $p < 0.01^{**}$, $p < 0.001^{***}$ *M*: mean, *SD*: standard deviation

Table 4. Comparison of engagement between the stop group and prevent group

Engagement metrics	Goal (stop or prevention)		Medium (poster or video)		Size of the network (number of friends)	
	<i>t</i> -statistics	(Pr > <i>t</i>)	<i>t</i> -statistics	(Pr > <i>t</i>)	<i>t</i> -statistics	(Pr > <i>t</i>)
Lifetime post total impression	-2.189	0.0394*	-1.131	0.2702	0.129	0.8982
Lifetime post total reach	-2.689	0.0134*	-1.241	0.2278	0.286	0.7772
Lifetime post consumption	-2.129	0.0446*	-1.211	0.2387	-0.187	0.8533
Lifetime engaged users	-2.142	0.0435*	-1.189	0.2470	-0.286	0.7773
Share count	-1.825	0.0816	-1.416	0.1707	-0.560	0.5811
Comment count	-0.942	0.3564	-0.798	0.4335	-0.108	0.9150
Like count	-2.079	0.0494*	-1.299	0.2073	-0.291	0.7735

Table 5. Post-hoc analysis (one-way ANCOVA) on the effect of medium and goal on engagement metrics

submitters preferred the poster as the mode of message over videos on substance use. This behavior can be posited to the higher labor involved in the latter production as no evidence was found of any difference in motivation between the two modes of content developers.

The study used a novel approach to compare dissemination of youth-generated primary and secondary prevention messages in social media. This is the first study in social media-based prevention programs the authors are aware of that differentiates between the strategies of youth-produced prevention messages. The audience's response to the stop messages was found to be different from prevent messages on social media engagement metrics despite no apparent differences in message producers' motivations or dissemination strategies.

The results further indicated that messages on maintaining non-use of substance by non-users might be confined within smaller networks. In comparison, the messages seeking to persuade those already using substances to cease further use might reach a significantly larger community in the network. Additionally, when exposed to content on substance use prevention in social media, people are more likely to engage actively (e.g. through likes, comments) with stop messages that urged current substance users to quit substance use than with prevent messages, which emphasized non-users refraining from use of substance in future. The evidence suggests that individuals' information behavior around primary and secondary prevention messages might differ in social media. Given the result, future social media-based prevention curricula may benefit by adopting different dissemination strategies for primary and secondary prevention messages to increase the messages' reach and engagement.

The study findings also were able to rule out network size as a factor. The message creator's own network size did not have any significant impact on the engagement of the content received in the social media. This suggests that even users with smaller networks can reach a wide audience on social network sites by developing the right content. Further analysis of the data should accommodate other qualitative aspects of the messages that may affect how the messages are received in social media.

This study is not without its limitations. As mentioned in the previous paragraph, beyond the goal of the message, this study did not consider any qualitative aspects of the messages. Previous research on the quality of health information in social media highlighted the need to examine the quality of user-generated content (Zhang *et al.*, 2015). Furthermore, the contest also had a small sample size of video message submissions. This may have affected any interaction between the mode of the messages (poster or video) and the responses to the messages in our model. Moreover, the overall perceptions of the platform and social media in general of people in participants' network may have effect on their propensity for engaging with the messages.

Motivation and proliferation factors	Stop messages		Prevent messages		Difference between stop and prevent messages	
	<i>M</i>	SD	<i>M</i>	SD	<i>z</i> -score	<i>p</i> -value (Pr > <i>z</i>)
MOTIV1	3.92	0.98	3.28	1.22	-1.86	0.0623
MOTIV2	3.5	1.10	3.7	1.25	1.50	0.1331
MOTIV3	4.04	1.00	3.96	0.82	-0.17	0.8627
MOTIV4	3.61	0.90	3.66	1.04	-1.44	0.1488
MOTIV5	1.7	1.16	1.62	1.50	0.85	0.3949
PROLIF1	2.36	0.74	2.52	0.93	1.52	0.1274
PROLIF2	2.79	1.38	2.39	1.22	-1.57	0.1156
PROLIF3	2.25	1.89	2.2	0.45	0.88	0.3817

Note(s): *M*: mean, SD: standard deviation

Table 6. Comparison of motivation and dissemination activities between the stop group and prevent group

Future work

Future research can address a number of unanswered questions based on this study. As mentioned in the previous section, future analysis of these data can accommodate content analyses of messages beyond the prevention goal and examine other qualitative aspects of messages, such as appeal of the content and quality of the message production.

Combining such analysis with social proliferation data can lead to developing better contents and dissemination strategies, most effective in peer networks. Previous work has suggested social proliferation and contest (Greene *et al.*, 2016) lead to greater overall engagement in media literacy interventions; however, the effects of such activities are little explored. Future study can investigate the effect of message creation and contest on substance use behaviors by analyzing these outcomes between those who participate in this contest and those who choose not to participate in such activities.

Notes

1. <https://www.drugabuse.gov/related-topics/health-consequences-drug-misuse>.
2. https://www.cdc.gov/pictureofamerica/pdfs/picture_of_america_prevention.pdf.
3. <https://abovetheinfluence.com/>.
4. <https://developers.facebook.com/docs/graph-api/>.

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Further reading

Peña-Alves, S., Greene, K., Ray, A.E., Glenn, S.D., Hecht, M.L. and Banerjee, S.C. (2019), ““Choose Today, Live Tomorrow”: a content analysis of anti-substance use messages produced by adolescents”, *Journal of Health Communication*, Vol. 24 No. 6, pp. 592-602, doi: [10.1080/10810730.2019.1639858](https://doi.org/10.1080/10810730.2019.1639858).

Corresponding author

Soumik Mandal can be contacted at: soumik.mandal@rutgers.edu

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