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To cite this article: Adam E. Barry, Danny Valdez, Alisa A. Padon & Alex M. Russell (2018) Alcohol Advertising on Twitter—A Topic Model, *American Journal of Health Education*, 49:4, 256-263, DOI: [10.1080/19325037.2018.1473180](https://doi.org/10.1080/19325037.2018.1473180)

To link to this article: <https://doi.org/10.1080/19325037.2018.1473180>



Published online: 29 Jun 2018.



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Alcohol Advertising on Twitter—A Topic Model

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ABSTRACT

Background: Exposure to alcohol-related advertising is consistently linked to adolescent drinking initiation and alcohol-related consequences. Since the advent of social networking sites, the alcohol industry has adapted its advertising efforts and allocated large portions of advertising budgets and efforts on digital and online media. **Purpose:** This investigation employed a novel, objective content analysis to examine the advertising practices of leading alcohol brands on Twitter. **Methods:** Latent Dirichlet allocation (LDA) was utilized to examine the entire Twitter post history for 13 alcohol brands. **Results:** Very distinct, clear themes emerged for each brand. Each brand had a unique approach to marketing that was representative of the brand itself. Insufficient alcohol brand messaging on Twitter focused on moderation (ie, drink responsibly). **Discussion:** Our analysis of tweets from 2010 to 2017 by 13 distinct alcohol brands echoes previous documenting utilization of content appealing to youth and violation of the alcohol industry's self-developed marketing code. **Translation to Health Education Practice:** Public health practitioners and policymakers should utilize these findings and those of previous peer-reviewed studies to advocate for clear externally monitored advertising regulations and guidelines protecting adolescents from alcohol advertising exposure.

ARTICLE HISTORY

Received 31 January 2018
Accepted 17 April 2018

Background



Exposure to alcohol-related advertising is consistently linked to drinking initiation among adolescents.¹⁵ This dose–response relationship indicates that as youth exposure to alcohol advertising increases, so does likelihood of alcohol use and frequency of consumption.^{3,6,7} Furthermore, alcohol advertising exposure and an adolescent's subsequent affective reaction to the ad not only influence some persons to drink more but are also associated with greater alcohol-related consequences and problems later in adolescence.⁴ Consequently, scholars contend “regulation of alcohol marketing can be justified on the grounds of public health, public safety and human rights.”⁸(p125)

Though no federal guidelines in the United States exist, the alcohol industry has developed a self-regulated advertising control system intended to guide (a) what content can be included in an alcohol advertisement and (b) where advertisements can be placed. Placement of alcohol advertising is contingent on who is expected to be exposed to the promotion; for example, alcohol ads cannot be placed on television programs with more than 28.4% youth audience.^{9–11} Examination of the alcohol industry's adherence and compliance with their advertising codes has tra-

ditionally focused on platforms such as television and magazine promotions. Previous research documents that 35% to 74% of all televised beer advertisements broadcast in national markets between 1999 to 2008 contained content code violations.¹² Another investigation found that content in a sample of beer advertisements “systematically violated the self-regulatory standards for alcohol advertising. . . .”¹³(p602)

Underage adolescents are also disproportionately exposed to alcohol advertisements across media. For example, alcohol brands most popular among underage (12–20 years) drinkers are more likely to appear in magazines with underage readerships.⁷ Nearly 25% of alcohol ads in the largest television markets in the United States had audiences of more than 30% youth,¹⁴ and youth self-report more exposure than adults to alcohol advertising on billboards and the radio as well.¹⁵

As we have progressed into the digital age, the alcohol industry has adapted its advertising efforts. No longer does the alcohol industry predominantly target traditional media outlets, such as television, magazines, billboards, and radio. Instead, alcohol brands now focus large portions of advertising budgets and efforts on digital and online media.¹⁶ This notion is troubling when considering that

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among 13- to 17-year-olds, approximately 94% go online daily.¹⁷ Moreover, youth usage of social media sites and social networking applications, such as Facebook, Instagram, and Twitter, has become ubiquitous.¹⁷

As alcohol industry promotion practices have shifted, researchers have begun to investigate adolescent exposure and interaction with alcohol promotional material online and on social networking sites. The majority of underage adolescents (aged 15–20) report seeing Internet alcohol marketing, with higher Internet use associated with greater receptivity to Internet alcohol marketing.¹⁸ Compared to adults 21 years and older, adolescents between 13 and 20 years of age are nearly twice as likely to recall exposure to alcohol advertising on the Internet and actively respond to alcohol advertising exposure by liking, sharing, or posting.¹⁵ Previous investigations have documented underage Instagram profiles who followed alcohol brands being bombarded with alcohol advertisements, receiving between 12 and 13 updates daily.¹⁹ Moreover, age-gates intended to restrict access to alcohol advertising and promotional content to those 21 years of age and older on social media and social networking sites are ineffective, because profiles of any age can view, interact, and share alcohol advertising content on sites such as YouTube, Instagram, and Twitter.^{19–21} Similarly, alcohol industry Internet websites do not uniformly require visitors to provide a birthdate, and those that do require birthdates for entry all allow visitors to input different dates multiple times.²²

Though research examining the themes of alcohol advertising on social media and social networking sites is still in its infancy, the evidence to date suggests that self-regulatory code violations are common on the Internet as well.²³ An assessment of regulatory compliance of alcohol advertising on Facebook documented a code violation rate of 82%.²⁴ Nevertheless, this literature has several limitations. First, many assessments limit the time frame in which posts are collected/evaluated, which subsequently limits the number of alcohol advertisements included in the analysis.^{19,24–26} Second, the individuals whom investigations employ to evaluate coding themes/categories in advertisements introduces challenges to objectivity.^{24,25} The perceptions of trained coders, such as adult researchers, have been found to be different from untrained coders' perceptions²⁷ and are very likely different from underage viewers who are the actual at-risk population. Research methods that evaluate the whole of the advertising universe, with less subjectivity, would better capture the extent of alcohol marketing's influence on youth.

Purpose

To account for the subjectivity introduced when researchers themselves perform content analyses and the limited

time frame typically employed to evaluate alcohol advertisements on social networking sites, the current investigation sought to document the Twitter usage by alcohol brands and provide a novel, objective content assessment of alcohol advertising employed by leading U.S.-based alcohol brands on Twitter. Specifically, we employed a common topic modeling technique, latent Dirichlet allocation (LDA), to the most active alcohol brand Twitter accounts.

Methods

Commonly used in fields such as business, the purpose of LDA is to aggregate a large collection of documents (called a corpus) to determine which words are most associated with other words using Bayesian inferencing to compare each word with all other words (w) in all documents (d).²⁸ The outcome of LDA provides a condensed version of the original corpus that is intended to mimic the language patterns of the parent document by grouping language clusters (words most probabilistically associated with other words) together to form latent themes or topics.²⁹ The primary benefit of using LDA to text mine data is the layer of validity it adds to traditional content and systematic types of analyses because of the mathematics used to compute a topic model. Specifically, the LDA model is less subjective, compared to traditionally performed content analyses, due to the elimination of human decision making.³⁰ Moreover, LDA is more time efficient. It would take human beings years to process the amount of data the computer can do in minutes, enabling a more objective, feasible, and comprehensive evaluation.

For our analysis, we analyzed every tweet of the most active alcohol brands beginning with their existence in 2010 through August of 2017 on Twitter. Retweets and mentions of the alcohol brands' posts were excluded from analysis because our interest was the social media approach of the brand itself. Because we were interested in a U.S. audience, international twitter handles related to the brands were also excluded for analysis. A total of 13 alcohol brands were included for analysis based on general activeness of the Twitter handles: Absolut, Bacardi, Budweiser, Captain Morgan, Cuervo, Grey Goose, Heineken, Hennessy, Jack Daniels, Malibu, Patron, SKYY, and Smirnoff. (Though Budweiser and other associated brands such as Bud Light are owned by Anheuser-Busch, only Budweiser was incorporated in the analysis because @Budweiser is used as the primary marketing tool. Others, such as @BudLight, primarily use the handle to communicate with social media users.) Because volume influences the outcome of a topic model, brands that did not have greater than 200 original tweets, despite brand popularity, were excluded from analysis.

All tweets for each of the aforementioned brands were extracted and indexed in Microsoft Excel. These data were subsequently uploaded into statistical software package program R for formal analysis where the data undergo a multistage process to generate a mathematical matrix that contains word-by-word probabilities within each of the Twitter handles/alcohol brands entered for analysis. First, the computer consolidates every tweet into one massive collection of words. Certain words, called *stop words*, were removed by the program due to their redundancy, overuse, and general lack of clarity they give to the topic model (eg, like, and, how, at, as, of, the, among others). A total of 80 nonuseful stop words were eliminated from consideration for the final model. Next, the algorithm removes numbers, excess spaces, and punctuation to guarantee that the only units of analysis are words. The remaining words are then stemmed, where prefix and suffix information is removed, leaving only the root of the written word.

Next, we select the number of topics and number of words per topic a priori, a common element in topic modeling methodology. Determining how many topics per corpus of data and how many words per topic is largely a balance between the level of specificity one seeks and degree of interpretability. Too many topics, for example, will decrease the simplicity of the model and create distracting noise that is not useful in interpreting the data. Conversely, having too few topics and words removes too much important information that would otherwise assist in providing an accurate representation of the corpus.

Like exploratory factor analysis, topic modeling and the extracted topics are constructed purposefully; therefore, correct interpretation is key to understanding the final model. As in exploratory factor analysis, researchers check for validity via interrater agreement when identifying, naming, and interpreting the final model.³¹ For this

investigation, we opted to include 12 topics from the collection of total tweets. We selected 12 topics to test whether the algorithms used in topic modeling could successfully learn the marketing style behind each brand. In other words, would (a) the computer organically learn that 12 brands existed in the corpus of data and (b) each respective brand have distinct words associated with it? To assist in the naming and identification of the topics, we programmed the algorithm to identify the 15 most salient words per topic.

Results

The final sample for this investigation—collected from 2010, when the first alcohol brand started on Twitter, through August 2017—included a total of 19 005 distinct tweets. See Table 1. Collectively, these tweets contained approximately 2 660 700 words. Figure 1 presents the total aggregate number of tweets for each of the included brands from inception of the account to August 2017. Captain Morgan ($n = 2389$), Malibu ($n = 2221$), Jack Daniels ($n = 2216$), and Heineken ($n = 2010$) all tweeted 2000 or more times since their inception.

Table 1. Alcohol brand tweet count.

Absolut	868
Bacardi	776
Budweiser	2389
Captain Morgan	1412
Cuervo	1279
Grey Goose	2216
Heineken	983
Hennessey	2010
Jack Daniels	1876
Malibu	2221
Patron	282
SKYY	1433
Smirnoff	1260
Total tweets	19 005
Estimated word count	2 660 700

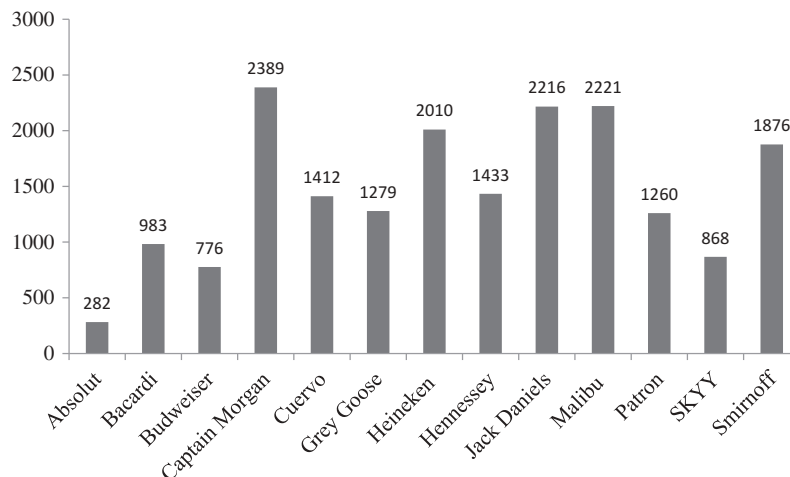


Figure 1. Tweets by alcohol brands from 2010 to August 2017.

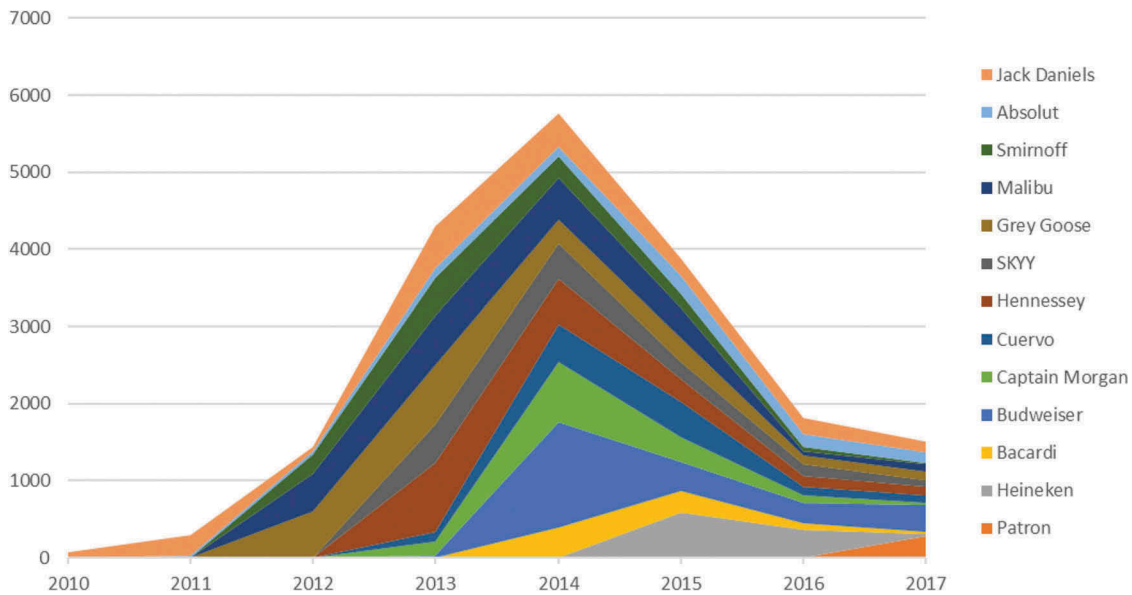


Figure 2. Number of tweets by alcohol brand by year.

Figure 2 depicts the aggregate volume of tweets annually for all brands cumulatively, as well as the year that each Twitter account began. Generally, tweeting by alcohol brands peaked in 2014 and subsequently declined each following year. Patron, which initiated a Twitter presence in 2016, is the only brand that increased their frequency of tweeting between 2016 and 2017. In comparison to other brands, Jack Daniels, Absolut, Budweiser, and Patron presently account for the largest contributors to the 1876 tweets of 2017.

Table 2 presents a probability of similarity matrix that outlines intersection among tweets across each brand. Given the relatively low correlations (≤ 0.4) across brands, it is clear that brands uniquely presented themselves through the language they used on Twitter. Moreover, despite analyzing all tweets simultaneously, very distinct, clear themes for each brand emerged. Each brand had a unique approach to marketing that is representative of the brand itself. For example, Jack Daniels epitomizes a

rock-and-roll lifestyle with words like *music*, *rock*, *night*, and *#motelno*. Bacardi attached their promotions to parties and celebrations, using frequent language such as *chance*, *party*, *live*, and *untamed*. Hennessy clearly linked their promotions to sports and fandom, using terms such as *game*, *final*, *match*, and *play*. Malibu focused on beach-related themes, and Grey Goose focused on luxury, relying on language such as *extraordinary*, *perfect*, *craft*, *toast*, and *celebrate*. Of the 12 topics that the model was limited to, 11 were dedicated to a specific brand.

Moderation messages appeared in only three instances in the entire model: Captain Morgan (#alwaysinmoderation), Hennessy (#drinkresponsibly), and Absolut (limit). Along these lines, all brands commonly utilized hashtags (#) to distribute their message faster and make it accessible to other outlets that are non-alcohol related. Simply put, hashtags are a word or phrase preceded by the (#) symbol used to classify or categorize text. By following, or clicking, #YouTube, a social media user would see all tweets that

Table 2. Probability of similarity of Twitter messages: Correlations of tweets by alcohol brands from 2010 to august 2017.

	Absolut	Bacardi	Budweiser	Captain Morgan	Curevo	Grey Goose	Heineken	Hennessy	Jack Daniels	Malibu	Patron	SKYY	Smirnoff
Absolut	1	0.29	0.25	0.28	0.27	0.29	0.07	0.24	0.22	0.29	0.27	0.30	0.38
Bacardi	0.29	1	0.29	0.31	0.28	0.30	0.10	0.27	0.24	0.34	0.30	0.29	0.43
Budweiser	0.25	0.29	1	0.29	0.29	0.24	0.12	0.25	0.24	0.25	0.24	0.25	0.40
Captain Morgan	0.28	0.31	0.29	1	0.32	0.21	0.11	0.22	0.23	0.29	0.20	0.25	0.39
Cuervo	0.27	0.28	0.29	0.32	1	0.20	0.10	0.22	0.23	0.27	0.30	0.24	0.39
GreyGoose	0.29	0.30	0.24	0.21	0.20	1	0.07	0.23	0.18	0.30	0.41	0.35	0.31
Heineken	0.07	0.10	0.12	0.11	0.10	0.07	1	0.08	0.09	0.08	0.07	0.09	0.12
Hennessy	0.24	0.27	0.25	0.22	0.22	0.23	0.08	1	0.21	0.21	0.22	0.21	0.27
Jack Daniels	0.22	0.24	0.24	0.23	0.23	0.18	0.09	0.21	1	0.21	0.17	0.21	0.27
Malibu	0.29	0.34	0.25	0.29	0.27	0.30	0.08	0.21	0.21	1	0.32	0.29	0.39
Patron	0.27	0.30	0.24	0.20	0.30	0.41	0.07	0.22	0.17	0.32	1	0.32	0.32
SKYY	0.30	0.29	0.25	0.25	0.24	0.35	0.09	0.21	0.21	0.29	0.32	1	0.34
Smirnoff	0.38	0.43	0.40	0.39	0.39	0.31	0.12	0.27	0.27	0.39	0.32	0.34	1

used the hashtag regardless of content—including tweets used by Absolut Vodka. Thus, by marketing Absolut through broad hashtags, the scope of the tweet increases because it is no longer bound by alcohol-related content.

Only one of the 12 themes emerging was not brand specific. The words within this topic (eg, *time*, *celebrate*, *party*, *friend*, *weekend*) both highlighted the social side of alcohol consumption and linked drinking to socialization and partying. In other words, all brands, to varying extents, portrayed alcohol in a social light. Thus, though associated with certain brands, the words in the “all brands” topic were likely highly correlated with each other.

Of similar note is the Patron/Cuervo topic. Out of all the other topics in the topic model, Patron Cuervo is the only topic to include two brands in one topic. This indicates two things. First, Patron and Cuervo are both tequilas and likely have a similar marketing strategy to sell their brand (#tequila, Cinco, Cinco de Mayo, agave). Second, the similarity across tequila brands is different than that of other liquors. Despite having several vodka spirits included, no two vodka brands were associated with the other, indicating that the marketing approaches used by each vodka brand is larger in scope and that they are systematically different from each other.

Discussion

Alcohol brands have embraced social media and social networking sites as a mode of advertising their products and expanding brand reach. Our analysis of tweets from 2010 to August 2017 by 13 distinct alcohol brands supports the previous literature that found code violations, content appealing to youth, and negligent messaging on moderation and drinking responsibly.^{15,18,23,24,32} The distinctive tweets between brands demonstrate the value given by advertisers to crafting brand appeal. Marketing campaigns aim to maintain consistency in brand message to create a brand personality,³³ and that brand personality is designed for audience members to identify with and thus develop loyalty for the brand.³⁴

The emerging theme not attributed to any one specific brand (ie, most common across all 19 005 tweets) in our sample was the consistent use of language linking their products to partying and other similar group activities. As outlined in Table 3, this theme included words such as *drink*, *tonight*, *time*, *celebrate*, *best*, and *party*. Linkages between drinking alcohol and socialization and parties are particularly insidious for adolescents given that they are especially preoccupied with their social standing and peer acceptance, experiencing higher levels of self-doubt and anxiety in social situations than adults.³⁵ Youth are

consequently highly receptive to suggestions that drinking will help them make friends and fit in.³⁵ Similarly, there is a high prevalence of party and friendship themes in alcohol advertising on Facebook.²⁴

Linking alcohol products to socialization and partying is a practice with a long history prior to digital marketing. In examining beer marketing during U.S. NCAA Men's and Women's basketball tournaments from 1999 to 2008, themes such as sensation-seeking, sociability, and special occasion were identified as “content areas positively associated with code violations.”³⁶(p1076) In long-term assessments of beer advertisements in national markets (1999–2008), the most common violations include linking beer drinking with social success and the use of content appealing to persons younger than 21 years of age.¹² A latent class analysis of 581 unique alcohol advertisements from the top 20 U.S. beer and spirit brands aired on TV between 2009 and 2011 identified five content classes: partying, quality, sports, manliness, and relaxation. The party-related content, which included ads centered on love, sex, and partying, comprised 42% of all advertisements and represented the most dominant theme.³⁷

An examination of the marketing practices of the most popular alcohol brands (aged 13–20), airing on the most popular adolescent TV shows in 2010–2011, also showed prevalent use of promises of happiness, friendship, and social status.³⁸ That partying and group activities are such prominent themes in advertising can create an expectation among relatively inexperienced youth that any party should involve alcohol, as well as that everybody drinks. The effect of such advertising may be observed in the finding that exposure to alcohol advertising has been shown to increase both the frequency and quantity of underage drinking^{38,39} and that studies on perceived norms of drinking have found that the majority of students overestimate how much their peers drink,⁴⁰ a dangerous misperception to reinforce in the media given the strength of peer influence on adolescents.

Translation to Health Education Practice

Efforts to limit youth exposure to alcohol advertising are ineffective or are simply being ignored.¹⁴ Even when the alcohol industry consistently followed existing codes and regulations in terms of content, their promotions “do not adequately protect against content that promotes unhealthy and irresponsible consumption and degrades potentially vulnerable populations in its depictions.”⁴¹(p1901) The alcohol industry's self-regulatory codes also omit many advertising content features shown to be particularly appealing to youth,⁴² and alcohol ads that aired on popular TV shows among youth were found to have used such content.⁴³ Of particular note in our findings is the limited

Table 3. Emerging themes.

	All brands	Captain Morgan	SKYY	Jack Daniels
1	make	captain	skyy	jack
2	day	rum	skyyvodka	#jacklive
3	night	#captainmorgan	cocktail	daniel
4	new	smirnoff	#skyyvodka	#motelno
5	drink	morgan	skyy stream	jacklives
6	tonight	#lifeloveloot	be part of the art	whiskey
7	time	drink	fan	#jackliveshere
8	celebrate	#alwaysinmoderation	infuse	#jackdaniels
9	best	delicious	#skyy	jack daniel
10	party	adventure	vodka	jdsn
11	good	#fullcaptain	skyyandsea	music
12	weekend	shot	#vodka	rock
13	start	#newcaptain	boiler room tv	night
14	thank	cannonblast	moscato	friend
15	friend	spice	toast to marriage	barrel
	Hennessy	Heineken	Bacardi	Budweiser
1	hennessy	championthetmatch	#bacardi	beer
2	wild rabbit	ucl	bacardi	water
3	chase	#ucl	#bacardihouseparty	brew
4	never	#heineken	chance	budweis
5	#hennesseyusa	itsyourcal	party	brewery
6	#teamhen	game	untamed	#brewdemocracy
7	event	rwcl	win	hop
8	hennessy	#itsyourcall	flavor	#seedtosip
9	recipe	time	superior	emerg
10	stop	#championthetmatch	live	home
11	celebrate	play	ebcruckerpark	safe
12	bottle	heineken	cuban	america
13	limit	final	rum	cheer
14	#drinkresponsibly	#rwcl	part	barley
15	cognac	match	#flavorattheruck	clydesdale
	Malibu	Grey Goose	Absolut	Patron/Cuervo
1	malibu	cocktail	absolut	cuervo
2	summer	grey	#absolutnights	tequila
3	malibu um	goose	absolute night	margarita
4	#malibubse	#flybeyond	#absolut	shot
5	beach	grey goose	vodka	#jose
6	cocktail	extraordinary	cocktail	#tequila
7	best summer	perfect	via	#patron
8	party	craft	#youtube	#patrontequ
9	#becausesummer	fresh	art	cinco
10	sun	toast	create	cinco de mayo
11	#bestsummerever	celebr	#drink	spirit
12	music	vodka	limit	patron
13	Emaliburum	cherry noir	know	perfect
14	coconut	#cocktail	swedish	simply perfect
15	love	flavor	martini	agave

presence of “drink responsibly” messaging. Of the 180 themes that arose, 3 moderation messages are merely a drop in the bucket.

The research herein adds to a long list of independent examinations of alcohol advertising practices and adds to a growing body of work that specifically highlights alcohol product promotions via online and digital platforms. In all of this work, it is clear that the alcohol industry’s self-regulation practices are ineffective and a significant public health concern. Certified Health Education Specialists, public health practitioners and policymakers should utilize these findings and those of previous peer-reviewed studies to advocate for clear externally monitored advertising regulations and guidelines protecting adolescents from alcohol advertising exposure. Health Educators should engage in advocacy efforts at the national level to enlighten policymakers

about alcohol industry advertising practices that target underage youth and the impact of advertising on the drinking behaviors of youth. Given that the likelihood of alcohol dependence significantly increases the earlier someone initiates alcohol use,⁴⁴ it is a public health priority to engage in efforts discouraging alcohol use and preventing exposure to content and messages that encourage alcohol consumption either directly or indirectly. Moreover, Health Educators should take note of the success that counteradvertising (eg, Truth Campaign) has had on tobacco smoking rates among adolescents and work toward rigorously developing, implementing, and evaluating an alcohol-focused counter-messaging campaign. Exposure to alcohol counter-advertising eliciting negative affect (displeasure) has been linked to lower urges to drink alcohol.⁴⁵ Nevertheless, the impact of alcohol counteradvertising

on actual drinking behavior has yet to be extensively studied. Health Educators are well equipped to contribute to this public health problem through the design and testing of novel messaging campaigns.

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