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Examining Crowdsourced Social Media Platforms And Their Association With College Students' Alcohol Consumption, Perceived Risk, And Behaviors

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EXAMINING CROWDSOURCED SOCIAL MEDIA PLATFORMS AND THEIR
ASSOCIATION WITH COLLEGE STUDENTS' ALCOHOL CONSUMPTION,
PERCEIVED RISK, AND RISK BEHAVIORS

by

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Submitted in Partial Fulfillment of the Requirements

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DEDICATION

I dedicate this work to my parents and especially my father, who instilled the transformative value of education in me since childhood. I vow to honor the sacrifices you have made which allowed me to make this journey by continually striving to improve the health of others.

To my compassionate, patient, and incredibly loving partner Mike, my gratitude to you is infinite. You have been my best cheerleader throughout every step of this process and always reminded me that I am capable of achieving my goals. You give me the strength to move fearlessly forward.

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ABSTRACT

Introduction: High-risk alcohol use by U.S. college students remains a significant threat to individual health and community well-being. Newly-emerging social media platforms and apps which relay information about alcohol-related law enforcement serve as an intriguing addition to college alcohol-use environments. The purpose of this study was to examine the information delivered to users by the local social media platform @Drinking Ticket (DT), determine which types of information were then relayed to others, and clarify how this information influences alcohol use, perceived risk, and alcohol-related risk behaviors among college students. **Methods:** One year of DT tweets ($n=854$ tweets) were qualitatively coded into themes using the constant comparative method, and a survey of university students ($n=658$) was collected to determine the characteristics of DT users and the influence of DT on students' alcohol use behaviors and perceived risk. **Results:** The majority of tweets described traffic information including the presence of emergency personnel such as police officers, most tweets (79.4%) referenced off-campus locations, and safety alerts were the most commonly retweeted type of message. DT exposure did not moderate the relationship between alcohol consumption and perceived risk of alcohol-related legal consequences. **Discussion:** Given the higher-risk alcohol behaviors of the DT user base, it and similar platforms may present a particularly useful space for presenting alcohol risk reduction messages to college students. Such platforms also provide useful safety-alert messages which can surpass the limitations of university-sanctioned alert systems.

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CHAPTER 1

INTRODUCTION

The opportunity to pursue a postsecondary education remains a privilege in the United States. Among American adults aged 25-64, only 31% have attained a Bachelor's Degree or higher (Lumina Foundation, 2104). Following high school graduation, more young people are enrolling in college than in previous generations, but still only 66% do so (Bureau of Labor Statistics, April 22, 2014). Of those first-time, full-time undergraduate students enrolled at 4-year degree granting institutions, only 59% will go on to earn a Bachelor's Degree (National Center for Education Statistics, 2014). College graduates are more likely to be employed, earn higher wages, endorse greater satisfaction in their work, and have higher occupational status than those without a college degree (Pascarella & Terenzini, 2005). Attainment of a Bachelor's degree is associated with healthier lifestyles including exercising more and being less likely to smoke, be overweight, and have hypertension (Mirowsky & Ross, 2005). Because postsecondary education predicts these occupational and health outcomes, it is important to understand the modifiable factors which can potentially influence a person's chance of achieving a degree.

While there are many barriers to college completion (Bound, Lovenheim, & Turner, 2007), one contributing factor is the deeply-entrenched cultural expectation that the college experience must be closely tied to alcohol (Califano, 2007; Dowdall, 2013; Weiss, 2013). Alcohol misuse among college students is associated with poor physical health, mental illnesses, academic failure, property damage, unprotected sex (resulting in

sexually transmitted disease transmission and unplanned pregnancies), violence, sexual assault, drunk driving crashes, unintentional injuries, and even death (Pascarella, Goodman, Seifert, & Tagliapietra-Nicoli, 2007; VanderVen, 2011; Weiss, 2013). In fact, alcohol is responsible for an estimated 1,825 deaths, 599,000 injuries, 696,000 assaults, and 97,000 cases of sexual abuse in college communities each year (Hingson, Zha, & Weitzman, 2009). Alcohol abuse among college students aged 18-24 is one of the most influential detractors of student success, and because it is also preventable, reducing alcohol abuse on college campuses is a prominent goal for higher education institutions. Notwithstanding the well-documented and extensive negative consequences of alcohol, college campuses provide young adults with access to a setting that enables and even encourages alcohol abuse. Although the majority of students enrolled in institutions of higher education are below the minimum legal drinking age of 21, more than 80% of college students drink alcohol and nearly half report binge drinking at least once in the past two weeks (National Institute on Alcohol Abuse and Alcoholism, 2007). Binge drinking is defined as a pattern of drinking that brings blood alcohol concentration (BAC) levels to 0.08 g/dL. This typically occurs after four drinks for women and five drinks for men within about two hours (National Institute on Alcohol Abuse and Alcoholism, 2015 ; Wechsler & Nelson, 2001). Fifty-four percent of underage students indicate that it is very easy to obtain alcohol, and 40% say that it is easy (Wechsler, Kuo, Lee, & Dowdall, 2000). Furthermore, roughly 20% of college students meet the criteria for an alcohol use disorder in a given year according to clinical diagnostic criteria, with 8% indicating alcohol abuse and 13% indicating alcohol dependence (National Institute on Alcohol Abuse and Alcoholism, 2007).

Despite the fact that significant resources have been allocated to prevent high-risk alcohol use among college students, college drinking rates have remained unchanged over the past 35 years (Gruca, Norberg, & Bierut, 2009; Johnston, O'Malley, Bachman, & Schulenberg, 2011; Nelson, Xuan, Lee, Weitzman, & Wechsler, 2009; Staff et al., 2010; Wechsler et al., 2002). Additional research is needed to identify the complex factors which might influence college students in their decision to drink and engage in alcohol-related risk behaviors. More specifically, how can researchers and practitioners promote positive decision-making in a social and physical environment that rewards high-risk behavior? Deterrence theory (Beccaria, 1963; Cherniak, 1986; Cook, 1980) hypothesizes that when choosing whether or not to engage in prohibited behaviors, individuals consider how likely they are to be punished for committing that behavior, and how swiftly and severely they may be punished. Social media is a source of information for which little is known in terms of what content is displayed. College students interpret this content, and that interpretation may impact their perceived risk of being apprehended for unlawful alcohol use. The goal of the current study was to better understand whether the information relayed by a crowdsourced social media platform was associated with college students' alcohol consumption, risk-taking behavior, and perceived susceptibility to alcohol-related legal consequences.

1.1 Specific Aims

The study is guided by the following **specific aims and research questions**:

SA1: To analyze the information delivered to users by the social media platform Drinking Ticket® and determine which types of information are then relayed to others over a 12 month period.

RQ1: What types of information are displayed by the social media platform Drinking Ticket® to its users?

RQ2: What information on the social media platform Drinking Ticket® do users most frequently relay to others?

RQ3a: Does the frequency of information relayed by Drinking Ticket® vary over time?

RQ3b: Does the frequency of information relayed by Drinking Ticket® users vary over time?

SA2: To determine the influence of Drinking Ticket on alcohol use, perceived risk, and alcohol-related risk behaviors among college students.

RQ4: Are users of Drinking Ticket® significantly different from non-users in terms of:

- a. sociodemographic characteristics?
- b. social media engagement?
- c. alcohol consumption?
- d. alcohol-related illegal behaviors?
- e. alcohol-related consequences experienced?

RQ5: Does perceived risk for alcohol-related legal consequences mediate the relationship between alcohol consumption and alcohol-related illegal behaviors, after controlling for sociodemographic characteristics?

RQ6: Does the dose of Drinking Ticket® exposure influence the relationship between alcohol consumption and perceived risk of alcohol-related legal consequences, after controlling for sociodemographic characteristics?

1.2 Overview of the Dissertation

Following the introduction, Chapter 2 presents a detailed literature review. The methodological approaches for addressing Specific Aims 1 and 2 are outlined in Chapter 3. Two manuscripts submitted to the *Journal of American College Health* are then presented in Chapter 4, along with additional results that went beyond the scope of the manuscripts but still address the specific aims. Finally, Chapter 5 presents a discussion of the overall findings, strengths and limitations, implications of the research, and future directions.

CHAPTER 2

BACKGROUND AND SIGNIFICANCE

2.1 Explanations for College Alcohol Use

Various explanations have been proposed to account for the high alcohol use rates among college students. Some have speculated that heavy alcohol use within this population is related to the fact that most college students are at a developmental stage known as emerging adulthood. Emerging adulthood – defined as the period between 18 and 25 years of age – is characterized by five developmentally distinctive features including identity exploration, instability, self-focus, feeling “in-between,” and numerous possibilities (Arnett, 2005). Consistent with this explanation, emerging adults would be expected to use alcohol with a high frequency irrespective of college enrollment status. However, college students binge drink (Johnston, O'Malley, Bachman, & Schulenberg, 2005; White & Hingson, 2013) and drink heavily (Grant et al., 2004) more often than their same-aged peers who are not enrolled in college. Emerging adults who are enrolled in college are also more likely to have consumed alcohol within the past month and past year than those who are not enrolled in college (O'Malley & Johnston, 2002). These findings suggest that something about the *college environment itself* has created a subculture of excessive drinking that is responsible for the comparatively higher alcohol consumption among college students. These conditions of the college environment can be broadly categorized under three broad areas, which combine and interact to create conditions conducive to excessive drinking: 1) the historical and cultural underpinnings

of college alcohol use, 2) characteristics of the social environment, and 3) features of the physical environment.

The Historical and Cultural Environment

Historically, a pervasive belief exists that college drinking is central to the collegiate experience and is a developmental rite of passage (Presley, Meilman, & Leichliter, 2002). Before entering college, young people may have preconceived notions of what college life is like based on the imagery promoted by the media that they consume. Popular television shows (e.g., Greek) and films (e.g., Animal House, Van Wilder, Old School) depict college as a place where students drink alcohol frequently, heavily, and usually without negative consequences. These media messages promote the idea that alcohol use during college is an exciting and carefree pastime in a way that is similar to what they view on screen. Research has demonstrated that adolescents exposed to drinking in movies are more likely to drink (Dal Cin et al., 2009; Dinani, Wood, & Robbé, 2009; Sargent, Wills, Stoolmiller, Gibson, & Gibbons, 2006). As students arrive on college campuses, some of them will seek opportunities to live out their expectations by engaging in alcohol use.

Many postsecondary institutions have long-standing traditions which involve alcohol consumption and abuse. Schools with large athletic programs tend to encourage drinking while supporting the sports teams, usually by promoting drinking parties and tailgating. The revenue generated by collegiate athletics for the institution often provides an incentive to maintain traditions which allow alcohol abuse and sports spectatorship to coexist (Glassman, Braun, Reindl, & Whewell, 2011; Glassman, Dodd, Sheu, Rienzo, & Wagenaar, 2010; Sperber, 2000). In addition, dangerous amounts of alcohol are

consumed at annual collegiate events such as Slope Day at Cornell University to celebrate the last day of spring undergraduate classes, Palmerfest at Ohio University and State Patty's Day at Pennsylvania State University to celebrate Saint Patrick's Day, and Fall Fest at West Virginia University to mark the beginning of the academic school year (Marchell et al., 2013; Plenke, September 9th, 2014). Although these celebrations have occasionally resulted in riots and significant property damage (Siddiqui, January 17, 2013), they continue due to pressure exerted by students and alumni on the institution's administration to preserve tradition (McMurtrie, 2014). The belief that certain traditions must be maintained makes drinking to intoxication an easily accessible activity for most college students.

The Social Environment

College students also live in a social environment that is favorable toward alcohol use. Underage students often have close social ties to other students above the age of 21 who can provide them with alcohol (Fabian, Toomey, Lenk, & Erickson, 2008; Wechsler, Lee, Nelson, & Kuo, 2002). Socially-normative drinking practices which promote the rapid consumption of alcohol to achieve intoxication (i.e., drinking games and "pregaming", which is consuming alcohol prior to an event or social function with the intention of reaching intoxication) are common in the college party subculture (Beck et al., 2008; Borsari, 2004; Borsari et al., 2007). Social mores of Greek Life (i.e., involvement in fraternities and sororities) have also been well-documented and include an emphasis on alcohol use at social events. This is evidenced by the fact that Greek students consume alcohol more frequently and in greater amounts than students who are not Greek (Barry, 2007; Capone, Wood, Borsari, & Laird, 2007; Danielson,

Taylor, & Hartford, 2001; Fairlie, DeJong, Stevenson, Lavigne, & Wood, 2010). Students are also able to take advantage of their flexible schedules, where much socialization occurs around alcohol use.

The Physical Environment

The physical environment also lends itself to supporting the party subculture on college campuses (Toomey & Wagenaar, 2002). Many university towns and cities are surrounded by a large number of alcohol retailers within walking distance of campus clustered closely together, also referred to as areas of “high alcohol outlet density” (Scribner et al., 2008; Weitzman, Folkman A., Folkman K. L., & Wechsler, 2003). These areas often include bars which sell alcohol on their premises and outlets such as gas stations, convenience stores, and liquor stores where students may purchase alcohol to be consumed elsewhere. Bar districts near college campuses tend to price alcoholic drinks low so that students with limited incomes can easily afford to patronize the establishments. This is problematic because a lower price per alcoholic drink is associated with greater alcohol consumption (Chaloupka & Wechsler, 1996; Wechsler, Kuo, Lee, & Dowdall, 2000; Williams, Chaloupka, & Wechsler, 2005). Those universities located in areas with high alcohol outlet density tend to have higher drinking rates in the student population compared to those with low alcohol outlet density (Scribner et al., 2011; Wechsler, Lee, Hall, Wagenaar, & Hang, 2002; Weitzman et al., 2003). Finally, the presence of student housing surrounding the campus can also serve as a haven for students to hold and attend parties where alcohol is served, oftentimes to underage drinkers (Clapp, Min, Shillington, Reed, & Croff, 2008; Harford, Wechsler, & Muthén, 2002; Harford, Wechsler, & Seibring, 2002).

Taken together, the historical/cultural, social, and physical environments which make up the party subculture exert a powerful influence on individual-level drinking behaviors. It is important to note that not all college students are going to be life-long drinkers; although the conditions of the college environment are conducive to high-risk drinking, the majority of students are able to manage their alcohol consumption responsibly and will go on to live healthy, productive lives. After graduation, most students age out of heavy alcohol use as new demands from their careers, marriage, parenting, and new interests replace time once spent partying (Arria et al., 2013; Bachman et al., 2002; O' Malley, 2004; White, Labouvie, & Papadaratsakis, 2005). However, students who are affected by drinking during college are also subject to a range of serious and often long-lasting negative consequences.

2.2 Harms Associated with Drinking During College

Drinking during college imposes a significant toll on mortality and morbidity and includes a range of both short- and long-term consequences (Weitzman, Nelson, Lee, & Wechsler, 2004). These consequences may be as minor as feeling the physical discomfort of a hangover to the ultimate consequence – death. The spectrum of consequences experienced by students due to drinking has engendered much attention from academic researchers, student affairs professionals, and health promotion and prevention specialists. These harms fall into four broad categories: physical, psychosocial, secondary, and legal.

Physical Consequences

Every year on college campuses, excessive alcohol use is responsible for an estimated 1,825 deaths, 599,000 unintentional injuries, 696,000 violent assaults, and

97,000 cases of sexual abuse (Hingson, Zha, & Weitzman, 2009). It can also result in acute alcohol overdose that could cause death if medical intervention is not received (Barnett et al., 2003; Shook & Hiestand, 2011; Turner & Shu, 2004). Alcohol intoxication also contributes to unplanned and unprotected sex, which increases the chances of unintended pregnancies and transmission of sexually transmitted infections (Brown & Vanable, 2007; Caldeira et al., 2009; Cooper, 2002). Excessive alcohol use is also associated with poor physical health and increased susceptibility to physical illnesses (National Institute on Alcohol Abuse and Alcoholism, 2015), as well as unhealthy weight gain (Anderson, Shapiro, & Lundgren, 2003; Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008).

Psychosocial Consequences

The psychosocial effects of alcohol misuse may be as damaging as the physical consequences. Alcohol can serve as a major detractor from academic success; students may fall behind in coursework, miss classes, perform poorly on tests or projects, and may experience academic failure and dismissal from the institution (Perkins, 2002; Powell, Williams, & Wechsler, 2004; Singleton Jr. & Wolfson, 2009) . It may also prevent students from securing and maintaining extracurricular opportunities through employment, internships, and volunteer activities that improve professional development (Porter & Pryor, 2007). Students may also face financial damage from spending money on alcohol or needing to pay for failed classes for which they have not received academic credit (Martin et al., 2009; Seaman, 2005). Students who violate their institution's alcohol policies may also experience sanctions administered by the conduct system such as monetary fines, probation, attendance at alcohol education courses and possibly

expulsion (Carey, Henson, Carey, & Maisto, 2009; Dumas, McKinley, & Book, 2009). Furthermore, alcohol abuse contributes to the development and exacerbation of mental illnesses common in college students, including anxiety and depression (Griswold, Aronoff, Kernan, & Kahn, 2008; Weitzman, 2004). It is also a risk factor for suicide (Cherpitel, Borges, & Wilcox, 2004; Conner, Bagge, Goldston, & Ilgen, 2014), which is one of the leading causes of death in college students (Brandt-Brown, 2014).

Students who use alcohol also experience more conflict in interpersonal relationships (Institute, 2014). In the age of social media, students who are exposed to unflattering or humiliating photos of their alcohol abuse on social media may sustain damage to their personal reputation, hindering them from professional success (Glassman, 2012; Moreno, Grant, Kacvinsky, Egan, & Fleming, 2012). Finally, individuals with a history of alcohol misuse in college have an increased likelihood of further alcohol abuse and addiction into later adulthood when compared with those who do not (Bingham, Shope, & Tang, 2005; Jackson, Sher, Gotham, & Wood, 2001; Jennison, 2004).

Secondary Consequences

Even those students who choose not to drink can be negatively impacted by the drinking of their peers, a phenomenon known as the secondary harms of college alcohol use. These can include annoyances such as interruptions in sleep and studying, having to take care of a fellow student who is intoxicated, suffering property vandalism, and more severe events such as experiencing sexual violence or being physically assaulted by an individual who has been drinking (Trockel, Wall, Williams, & Reis, 2008; Wechsler et al., 2000; Weitzman et al., 2004). Students who attend schools with higher binge drinking

rates are more likely to suffer from the secondary harms of being pushed, hit, assaulted, or experience unwanted sexual advances or contact than those who attend schools with lower binge drinking rates (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). Students can also be victims of intoxicated drivers. One-third of all traffic-related deaths in the United States are attributed to alcohol-impaired driving crashes, and the largest proportion of fatal crashes due to alcohol impairment (35%) are perpetrated by individuals between the ages of 21 and 24 years (National Highway Traffic Safety Administration, 2009). Thus, it is likely that students in the college environment are exposed to peers who are driving while alcohol impaired more often than individuals in other environments.

Legal Consequences

Finally, irresponsible alcohol use may result in legal consequences for students, which can present both short- and long-term challenges. Common alcohol-related offenses committed by college student drinkers include underage possession of alcohol, public intoxication, driving while alcohol-impaired, attempting to use a fraudulent identification in order to purchase alcohol or enter an establishment only for those above age 21, providing alcohol to minors, and possessing an open container of alcohol in public (Bernat, Lenk, Nelson, Winters, & Toomey, 2014). College drinkers are more likely to sexually and physically assault others, sustain noise violations for loud parties, and damage property while intoxicated (Perkins, 2002). They also drive under the influence of alcohol more than their same-age non-college enrolled peers, even after controlling for demographics and age of drinking onset (Paschall, 2003). Forty-one percent of students report driving after consuming any alcohol, 17% report driving after

five or more alcoholic drinks, and 28% report being a passenger in a vehicle with an intoxicated driver within the past 30 days (Hingson, Heeren, Zakocs, Winter, & Wechsler, 2003). Between 14% and 46% of underage college students are estimated to possess false identification for the purpose of obtaining alcohol (Durkin & Wolfe, 1996; Martinez, Rutledge, & Sher, 2007; Schwartz, Farrow, Banks, & Giesel, 1998; Wagenaar & Toomey, 1996). Such offenses may result in reduced educational and career opportunities for students whose transgressions remain on their permanent record. Legal sanctions may also result in loss of scholarships, financial strain due to legal expenses, or expulsion from the postsecondary institution.

To summarize, the harms of collegiate drinking have been well-documented, and students are educated on the risks that are associated with irresponsible alcohol consumption (Larimer & Cronce, 2007; Paschall, Antin, Ringwalt, & Saltz, 2011). The question remains – why do students continue to drink? For each individual, the decision to drink is influenced by a combination and balance of the perceived rewards that they may experience due to drinking and the perceived likelihood that they will experience harm.

2.3 Deterrence Theory: The “Calculated” Decision to Drink

Despite the well-known risks, decisions to drink are often motivated by the rewards that students expect to receive as a result of drinking. Some of the benefits of drinking endorsed by college drinkers include meeting new people, spending time with friends, releasing stress, being socially outgoing, and pursuing romantic and sexual partners (Gilles, Turk, & Fresco, 2006; Ham & Hope, 2003; Park, 2004; Szmigin et al., 2008). Alcohol use is also linked to expressing personal freedom and celebrating

important occasions (Engineer, 2003). Essentially, students usually expect to have fun, rewarding experiences while consuming alcohol.

The social rewards that students expect from alcohol are also actively reinforced by their peers. Students encourage each other to drink heavily and may engage in drinking competitions in which they value the ability to consume large amounts of alcohol (Weiss, 2013). Social norms concerning alcohol use on college campuses will influence students' perceptions of what drinking practices are acceptable (Mattern & Neighbors, 2004; Perkins, 2002a), and the social context of drinking will then influence an individual's alcohol consumption behaviors (Mora-Rios, Natera, & Juarez, 2005; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007; Wood, Read, Palfai, & Stevenson, 2001). Additionally, many students expect that their enjoyment of social occasions will be enhanced by the "social lubricant" of alcohol consumption, making it easier to interact with others and boosting the social incentive to drink (Read, Wood, Kahler, Maddock, & Palfai, 2003). The personally rewarding and socially-reinforced experience of alcohol consumption can therefore outweigh students' perceptions that something negative may happen to them as a result of their drinking, further enforcing the decision to drink.

One strategy to deter college students from abusing alcohol and violating alcohol-related policies is to better understand the processes through which students decide to risk the consequences that are associated with excessive or unlawful alcohol use. Consistent enforcement of alcohol-related laws and policies in which violations are regularly met with consequences have been shown to reduce underage alcohol consumption and alcohol-related problems (Babor, 2003; Toomey & Wagenaar, 2002; Wagenaar &

Toomey, 2002), as well as reduce injury and death related to alcohol-impaired driving (DeJong & Hingson, 1998; Williams, 2006).

Unfortunately, enforcement efforts for alcohol laws and policies vary widely across college campuses (Toomey et al., 2011). Alcohol misuse is widespread, and students tend to have low chances of being reprimanded for unlawful or reckless alcohol consumption unless they have committed some greater offense such as being a danger to themselves or others (Toomey et al., 2011). Moreover, postsecondary institutions and college communities often lack the resources to consistently enforce the laws and policies and must focus on those incidents which are most severe. One could argue, however, that the decision to engage in unlawful drinking behaviors is not influenced by the actual alcohol-related laws and policies, but rather the student's *perception* that s/he would face negative consequences if caught engaging in these behaviors. Students' perceived susceptibility to being punished for alcohol-related offenses would be determined by the information they receive about the likelihood of being apprehended for their alcohol-related offenses. Thus, understanding the factors which influence risk perception among college students is a critical first step in identifying strategies to reduce the harmful consequences of unlawful alcohol use.

2.4 The Role of Social Media in Information Seeking

Social media is a key source of information for college-aged students. Broadly, social media is defined as mobile and web-based technologies with highly interactive platforms where individuals and communities share, co-create, discuss, and modify user generated content (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). Examples of popular social media platforms include Facebook, Twitter, LinkedIn, Pinterest,

Instagram, Vine, and Tumblr. There are thousands of other platforms available, and the rapid innovation of new social media platforms ensures that social media is constantly evolving. Of the 81% of American adults who use the internet, 71% use one social media site and 52% use two or more social media sites. Young adults ages 18-29 years make up the highest proportion of social media site users (Duggan, Ellison, Lampe, Lenhart, & Madden, 2014) and among college students, social media use is nearly universal (Pempek, Yermolayeva, & Calvert, 2009).

Social Media and College-Aged Students

One reason why social media may be so popular among college students is that it appeals to the interests which characterize the developmental stage of emerging adulthood. Specifically, emerging adults are developing their sense of preferences and personal interests in the world around them (Arnett, 2000; Arnett, 2007). Social media is a place where these individual interests can be expressed (Valkenburg & Peter, 2008). Individuals can attend to those messages that they find compelling and ignore those that they do not like. Unlike other forms of media, social media is customizable and can be tailored to the individual's interests based on what messages he or she shares with and receives from others (Pempek et al., 2009). Social media is also, by nature, socially-constructed, whereby groups of users develop the online communities and conversations in which they would like to engage (Hansen, Schneiderman, & Smith, 2011; Lietsala & Sirkkunen, 2008). Emerging adults are expressing themselves through the personal choices they make and by posting and reviewing messages, which creates an individualized online social space (Pempek et al., 2009).

Social interaction and contribution is possible on all social media platforms but is particularly important for crowdsourced social media platforms. Crowdsourced social media platforms solicit information from large groups of people to fulfill a wide range of goals (Gao, Barbier, & Goolsby, 2011; Lesch, 2014). One example of a crowdsourced social media platform is Waze®, which is a community-based traffic and navigation software application (i.e., an “app”). Users of the app submit reports of traffic accidents and congestion, as well as police traffic law enforcement locations. These reports are then shared with all other users of the app. Through crowdsourcing, the app provides real-time updated maps on the most convenient routes to take when driving from one location to another (Waze, 2015).

Social Media as a Source of Alcohol-Related Information

Another, relatively new genre of crowdsourced social media includes platforms which provide users with specific information about alcohol-related law enforcement. Many of these apps are designed to be used on smartphones so that users can stay informed about enforcement activities while they are traveling. Some of the apps available to download by smartphone users include DUI Dodger, Mr.Checkpoint™, and Sobriety Alerts®. For each of these platforms, users submit alerts to the app about sobriety checkpoints that they have witnessed in their communities. The app then compiles these data and produces a map or list of where the checkpoints are located. Users may also elect to receive direct notifications when a sobriety checkpoint is in place near the user’s location. In 2011, U.S. Senators Reid, Schumer, and Lautenberg wrote letters to Apple, Google, and RIM (organizations which house the apps) to remove the apps from their marketplaces in order to reduce the ability of drivers to use the

information provided by the apps as a way to avoid Driving Under the Influence (DUI) checkpoints and facilitate alcohol-impaired driving (Santo, March 23rd, 2011). No formal legislation was proposed and to date, the apps have not been removed from app stores. Many are advertised by their inventors as alcohol-impaired driving prevention tools which keep communities safer from the hazards imposed by intoxicated drivers (DUI Dodger description, Google Play, 2016).

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which keep communities safer from the hazards imposed by intoxicated drivers. (DUI Dodger description, Google Play, 2016)

Social Media as a Source of Emergency Alert Information

While social media is sometimes a source of alcohol-related information, it may also serve as a beneficial, well-trusted source of emergency alert information. During times of emergency and crises, diverse communities have used social media to keep informed of threats to public health. Social media provides a means to immediately share breaking information at little to no cost and when originating from an official source, can quickly dispel rumors (Prevention, 2012). On college campuses, providing the community with accurate information about threats to safety is especially important in light of campus shooter tragedies (Fox & Savage, 2009; Heilbrun, Dvoskin, & Heilbrun, 2009) and the possibility of an array of other emergencies (e.g., natural disasters, power failures, crimes, infectious disease outbreaks).

Most university administrators have supported the development of risk-management strategies to reduce potential harm to the community in the event of an emergency (Gow, McGee, Townsend, Anderson, & Varnhagen, 2009; Janosik & Gregory, 2009). This often takes the form of implementing an alert system which notifies the community of the threat. (Clery Center, 2015) Such alerts are usually delivered via electronic communications such as emails, phone calls, and text messages, as well as verbal or auditory warnings such as announcements on overhead speakers and/or sounding an emergency alarm. (Mastrodicasa, 2008; McGee, 2012)

While these systems can be helpful, they are not without their criticisms. Some systems have not been widely adopted by the student body (Wu, Qu, & Preece, 2008) and

some systems are only able to report confirmed, ongoing threats located on campus (Carolina Alert, 2015). This prevents students from learning about emergencies that are occurring off campus, which is where many students live and spend time working or engaging in recreational activities. Student-led social media platforms have the power to address these limitations. Privately-owned social media platforms that are maintained by students have the benefit of not needing to wait for confirmation of threats and being able to share information about both on- and off-campus threats. These systems may fulfill the need for emergency alerts to be delivered in real time and with information about a more comprehensive college community, which includes everywhere students live, learn, work, and play beyond the boundaries of campus property.

Examination of social media platforms which provide information on alcohol law enforcement and emergency alerts has the potential to reveal insights into the interests and needs of community members who use that platform. Health communication data allows researchers to view the dynamic process of exchanging information among individuals and groups (Rimal & Lapinski, 2009) By analyzing free, publicly available social media content, researchers can observe how members of the community interact with one another, engage in dialogue, and share information about their experiences. (Hartley, 2014; Himelboim, McCreery, & Smith, 2013; Higher Education Center for Alcohol, 2011) Given college students' affinity for social media, a compelling case can be made for conducting a social media analysis which focuses on the content of social media platforms created by and for college students.

2.5 Case Study: Drinking Ticket®

One of the most popular crowdsourced social media platforms in the Columbia, SC area is Drinking Ticket® (DT), which functions primarily through Twitter. Twitter is an online social networking community microblog where users can connect with others who have similar interests in order to send and read 140 character messages called “tweets”. Twitter users write these short messages, which can include pictures and links to websites (e.g., a picture of undercover South Carolina Law Enforcement Division agents entering a bar to arrest underage drinkers), and then send these tweets to the individuals who follow them on Twitter. Followers are individual Twitter users who subscribe to another Twitter user’s posts and see that user’s tweets (Hansen, et al., 2011). The DT Twitter account was developed by a University of South Carolina business student in 2011 to relay information that is relevant to the University of South Carolina and the surrounding city of Columbia, SC. As of March 10th, 2016 the Drinking Ticket Twitter account has 45,700 followers.

The DT Twitter account provides its followers with information about unlawful alcohol use enforcement in Columbia, including sobriety checkpoint locations, undercover police operations in bars, and police disbandment of underage off-campus drinking parties. It also includes information on traffic and safety alerts, bar specials advertising, and speed enforcement locations. In order to do this, the owner of the account first receives messages from one of DT’s followers, such as: “Hey @DrinkingTicket I saw 2 officers breaking up a party at the Stadium Suites student housing complex”. Once the owner verifies that the information is trustworthy based on multiple reports, DT then posts the information for all of the DT Twitter followers to see.

Followers may receive an immediate notification of the tweet if they have enabled this setting on their smartphone, or they may view it when reviewing their Twitter account amongst tweets from other users they follow.

Despite the increasing popularity of platforms like DT as a source of information, it is unclear how college students are actually using the information that they receive. Policy makers have assumed that the reason why users access these apps is to circumvent the law and continue to drive while intoxicated. To date, however, this assumption has not been empirically-tested, nor has the claim that these apps enhance community safety and deter drunk driving. It is also unknown how information on other law enforcement activities (e.g., checking identification to confirm underage drinking) may influence college students' alcohol-related risk behaviors. It is important, then, to investigate whether crowdsourced social media apps that relay alcohol-related information are a helpful ally or challenging adversary in the battle to reduce high-risk alcohol use in college students.

2.6 Study Significance

Although substantial research and resource allocation to preventing high-risk alcohol use among college students, interventions have been largely unsuccessful in ameliorating student drinking, and college drinking rates remain unchanged for the past four decades (Gruza, 2009; Johnston, O'Malley, Bachman, & Schulenberg, 2011; Nelson, Xuan, Lee, Weitzman, & Wechsler, 2009; Staff et al., 2010; Wechsler, Lee, Nelson, & Kuo, 2002). Traditional prevention efforts have focused on educating students on the potential dangers of alcohol use and how to manage their alcohol use safely with harm reduction strategies (Larimer & Cronce, 2007). The emphasis on personal

responsibility in making healthful decisions about alcohol use has failed to address the powerful effect of the alcohol use environment on student's ability to abstain from alcohol or consume responsibly. It is well known in public health that knowledge of healthy choices does not necessarily translate into behavioral change to select healthy choices (Aboud, n.d.). Moreover, traditional interventions to reduce alcohol consumption may not be developmentally-appropriate. As emerging adults, traditional college students are testing boundaries, forming their identities, seeking thrills, placing emphasis on personal freedom and enjoyment, and seeking opportunities for social interaction (Arnett, 2000; Arnett, 2007). Alcohol use provides an attractive outlet to explore those developmental goals (Arnett, 2005; Ham & Hope, 2003; White & Jackson, 2004). Messaging sent to college students about managing alcohol use often fails to consider the propensity of college students to use alcohol in connection with the interests inherent to their developmental stage.

In addition, interventions developed for college student alcohol abuse generally do not meet students where they are in terms of the types of messages with which they regularly and voluntarily interact. Students are often sent alcohol-related messages through required classes, online modules (e.g. AlcoholEdu), and/or informational posters (Paschall et al., 2011; Wechsler et al., 2003). College students are inundated by multiple health-related messages that must compete for their attention, and it is likely that these more "traditional" methods of communication do not capture students' interest or attention. Understanding the role played by modes of communications (social media platforms) that college students have already constructed and are actively engaged with (Roberts, Foehr, & Rideout, 2005) may be more effective.

Crowdsourced social media platforms are a relatively new technology and have not been used in the context of alcohol prevention and control on college campuses. As social media has gained in popularity, health promotion professionals have been utilizing it as a way to spread messages about responsible alcohol use; however, it is doubtful that students would actively engage with social media accounts created outside of their social network (e.g., researchers, student affairs professionals, and peer educators). The U.S. Department of Education's Higher Education Center has discussed the plausible utility of social media for preventing alcohol use, yet the efficacy of using social media to reduce alcohol abuse remains untested (Higher Education Center for Alcohol, 2011). More specifically, no studies to our knowledge have examined the extent to which college students access and alter their behaviors based on crowdsourced information about alcohol-related police enforcement.

It is possible that receiving alerts about alcohol-related law enforcement activities would influence college students' perceived susceptibility to arrest for alcohol-related offenses. In accordance with deterrence theory, this information could actually affect students' overall perception of risk and their consequent decisions to engage in certain risk-taking behaviors. However, it is currently unknown whether the information provided by these social media platforms has changed college students' perceived susceptibility to being arrested for alcohol-related offenses, or whether students are using these platforms to circumvent alcohol-related police enforcement. Given the fact that the college environment is highly conducive to alcohol use and that college students are at the greatest risk for alcohol-related consequences, it is important to understand the role of social media on alcohol-related risk taking among college students. The purpose of this

study was to examine the information delivered to users by the social media platform DT, determine which types of information were then relayed to others, and clarify how this information might influence alcohol use, perceived risk, and alcohol-related risk behaviors among college students. In order to accomplish this, we approached the research using a truly multidisciplinary conceptual framework.

2.7 Conceptual Framework

Figure 2.1, Conceptual Model, illustrates the conceptual model for the study which was developed using Criminal Deterrence Theory (Beccaria, 1963; Cherniak, 1986; Cook, 1980) and existing literature on alcohol use in college populations. It depicts the theorized process through which students make decisions about their alcohol use behaviors and the individual and external factors that influence their decisions.

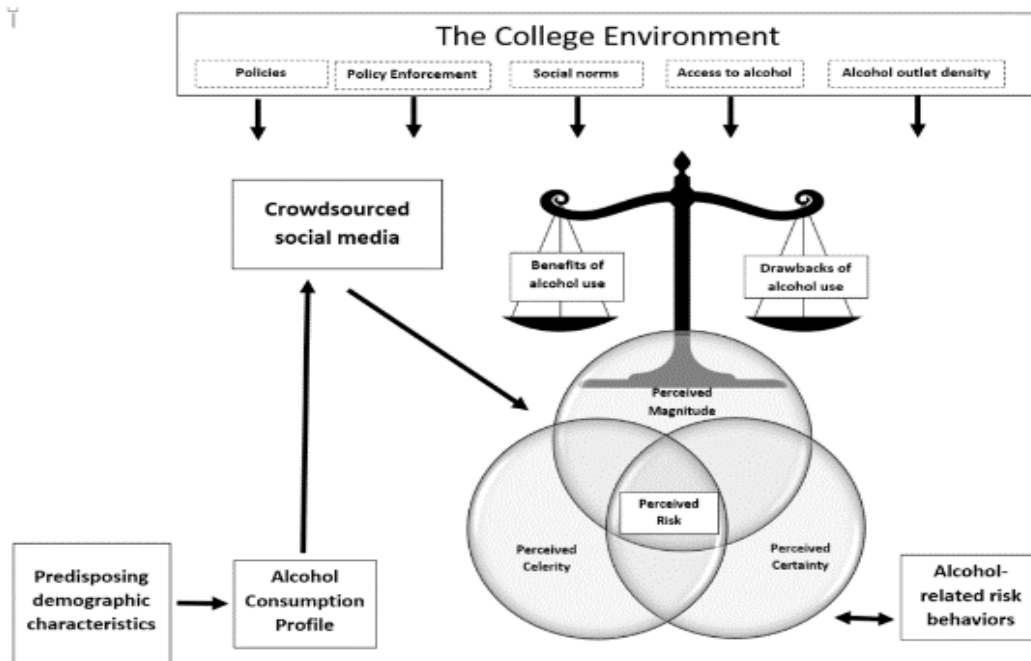


Figure 2.1 Conceptual Model

Predisposing Demographic Characteristics

Students enter college with certain characteristics that make them more or less susceptible to alcohol abuse in college. For example, People of Color and women tend to abuse alcohol less than Caucasians and men (Caetano, Clark, & Tam, 1998; Nolen-Hoeksema, 2004; Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000), and this pattern includes the time spent in the college environment (Paschall, Bersamin, & Flewelling, 2005; Siebert & Wilke, 2007; Wechsler, et al., 2000). College environments provide a powerful influence on individual alcohol-related decision making for students. However, each college community also possesses a range of contributing factors which may influence the dynamic of alcohol use in that community.

The College Environment

Colleges have different policies concerning alcohol use which are intended to guide the behaviors of students. Some institutions may not allow alcohol consumption at all, while others allow students ages 21 and older to use alcohol responsibly. The enforcement norms of these policies will also influence student behavior. Those institutions which actively enforce alcohol policies experience greater compliance from students than those in which policies are seldom or sporadically enforced (Cremeens et al., 2011; Harris, Sherritt, Van Hook, Wechsler, & Knight, 2010). Social norms regarding alcohol use are also influential in producing individual drinking behaviors (Mattern & Neighbors, 2004; Perkins, 2002a; Ward & Gryczynski, 2009). College communities also differ in terms of access to alcohol, where greater access is associated with greater use (Wechsler, et al., 2000). In addition, high alcohol outlet density is associated with greater alcohol consumption and related harms in college communities (Wechsler et al.,

2002; Weitzman, et al., 2003). The combination of these factors, among others, creates a distinctive environment at each postsecondary institution which helps to shape the alcohol use behaviors of students. While the college environment provides a context that makes healthy choices regarding alcohol use more or less difficult, individual-level behavioral characteristics must also be recognized when considering alcohol-related decision making for college students.

Alcohol Consumption Profile

Each individual student has his or her own alcohol consumption profile based on their usual drinking habits. For example, a person might be an occasional drinker, a heavy drinker, or abstain completely. Four commonly defined alcohol consumption profiles include those of non-drinkers, light risk drinkers, binge drinkers, and problematic drinkers. Non-drinkers are those who have not consumed alcohol within the past two weeks (Everfi, 2014) and low risk drinkers are individuals who have consumed no more than three drinks in a single day and no more than seven drinks total per week (National Institute on Alcohol Abuse and Alcoholism, 2015). Binge drinkers are classified as those who have consumed four or more drinks for a woman or five or more drinks for a man within about two hours at least once within the past two weeks (Wechsler & Nelson, 2001). Problematic drinkers are individuals who state that the average number of drinks they consume during a typical drinking occasion is eight or more drinks for a woman or ten or more drinks for a man (Everfi, 2014). Alcohol consumption profiles are pertinent to predicting individuals' enduring alcohol consumption patterns, which the current study argues can also be associated with one's beliefs about the risks associated with alcohol use.

Perceived Risk and Alcohol-Related Risk Behaviors

Certain types of crowdsourced social media can provide information on alcohol-related law enforcement, which may influence a student's perceived certainty that he or she will be punished if the decision is made to engage in unlawful alcohol use.

Subsequently, a student's perceived risk of receiving punishment for unlawful alcohol use can be illustrated through an adaptation of Deterrence Theory. Deterrence Theory (Beccaria, 1963; Cherniak, 1986; Cook, 1980), which originated from the fields of criminology and criminal justice, provides a framework for understanding why college students tend to think of the positive rewards they expect to receive from drinking rather than the negative consequences they may encounter. This theory hypothesizes that before an individual commits an illegal offense, they consider the possible consequences they may face if they perform an act and weigh this against the potential rewards of the act. Essential in this calculation is the perceived certainty that their actions will result in punishment, the perceived severity of the punishment, and that punishment will be swiftly applied (i.e., celerity) (Beccaria, 1963; Cherniak, 1986; Cook, 1980). Research suggests that perceived certainty of punishment deters criminal behavior (Horney & Marshall, 1992; Piquero & Rengert, 1999) and is more impactful in deterring illegal behavior than perceived severity of punishment (Nagin & Pogarsky, 2001; Wright, 2010). To date, Deterrence Theory has not been used to help clarify college students' decisions to consume alcohol and engage in alcohol-related risk behaviors.

The same concepts used in criminal justice can be used to illustrate how students make choices in the context of college alcohol use. Students may be thinking of the benefits they can experience from alcohol use, such as enjoying socialization with

friends, releasing stress, and making new friends (Gilles, et al., 2006; Ham & Hope, 2003; Park, 2004; Szmigin, et al., 2008), as well as the potential drawbacks such as the financial cost of drinking, the risk of getting into trouble with the police or college authorities, and negative physical and psychosocial consequences associated with drinking (Creameens, et al., 2011; Weitzman et al., 2004). These benefits and drawbacks can be factored into a three component equation (magnitude + certainty + celerity) when students consider their chances of receiving punishment for unlawful alcohol use. All of these elements contribute to a student's overall perceived risk that he or she will get into trouble with police or the university if they use alcohol irresponsibly. It is this overall perceived risk, then, which contributes to the decision to engage in alcohol-related risk behaviors. It is also hypothesized that this relationship is bidirectional; habitual practice of alcohol-related risk behaviors without consequences would also likely influence a student's overall perceived risk of being apprehended for unlawful alcohol use (i.e., lowering his or her perception that their behaviors will result in punishment). Based on extensive literature review, it was hypothesized that perceived risk of alcohol-related consequences may serve as an important mediator (M) between alcohol consumption (X) and alcohol-related illegal behaviors (Y), and that this relationship might vary based upon on individual's level of exposure to DT (W). In the current line of research, Deterrence Theory provides a novel theoretical approach to examining college students' motivations to refrain from committing illegal alcohol-related offenses.

CHAPTER 3

RESEARCH METHODS AND DESIGN

3.1 Specific Aim 1 Methods

The first specific aim was to analyze the information delivered to users by the social media platform Drinking Ticket®, determine which types of information are then relayed to others, and understand usage patterns over a 12 month period.

Data Source: Drinking Ticket® (DT)

The data for specific aim 1 were the 854 tweets and their respective retweets posted on DT during one calendar year from 12/20/2013-12/19/2014.

RQ1: What types of information are displayed by the social media platform Drinking Ticket® to its users?

The types of information displayed by DT was operationalized as the content of each individual DT tweet, which was treated as the unit of analysis. DT tweets were defined as brief messages posted by the hosts of the DT account that contain text and sometimes links to pictures to enhance the descriptiveness of the tweet (e.g. a picture of a traffic accident along with text stating the location of the accident). The content of the tweets posted by DT were diverse and contained information about a variety of topics, including sobriety checkpoint locations, traffic updates, safety alerts, and the presence of police and emergency personnel.

RQ2: What information on the social media platform Drinking Ticket® do users most frequently relay to other?

The information most frequently relayed to others was determined by recording the number of retweets for each original DT tweet. A retweet was operationalized as tweets which were forwarded from one user to all of the followers of the user that retweets it. This is similar to forwarding an e-mail to a list of contacts. For example, if Mary retweets a tweet originally posted by DT, all of Mary's followers will see DT's tweet. The more a message is retweeted, the wider the message is spread, even to those users who do not follow DT.

RQ3a: Does the frequency of information relayed by Drinking Ticket® vary over time?

The frequency of information relayed by DT and variations over time was operationalized as the number of retweets for each respective original DT tweet on the days of the week and months of the year. This was measured by calculating the number of tweets posted by DT per month and per day of the week.

RQ3b: Does the frequency of information relayed by Drinking Ticket® users vary over time?

The frequency of information relayed by DT users and variations over time was operationalized by the number of retweets per original tweet per month and per day of the week.

Follow-up analysis 1: What proportion of Drinking Ticket® tweets are about alcohol?

The proportion of tweets that are about alcohol was operationalized as those tweets which contained information that either explicitly or strongly implied information about alcohol use. Those tweets which do not explicitly or strongly imply information about alcohol use were considered not about alcohol.

Follow-up analysis 2: What locations/environments does Drinking Ticket® tweet about most often?

The locations/environments DT tweets about was operationalized as the geographical location explicitly referred to within the tweet. Those tweets which did not explicitly contain information about location were not coded by location.

Follow-up analysis 3: Does Drinking Ticket® tweet more often on high drinking days than on typical days?

High drinking days were operationalized as occasions or holidays which are known to be associated with heavy alcohol use in the University of South Carolina community (e.g. St. Patrick's Day, Carolina Cup). Typical days were operationalized as all other days of the year which were not considered high drinking days. College students are known to consume alcohol with greater intensity on holidays and occasions which traditionally focus on drinking (Borsari & Carey, 2001; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Lefkowitz, Patrick, Morgan, Bezemer, & Vasilenko, 2012; Neighbors et al., 2011; Neighbors et al., 2007; Nelson & Wechsler, 2003; Paschall, Kypri, & Saltz, 2006).

Qualitative Analysis Procedures

QSR NVivo 10 qualitative data analysis software and its corresponding NCapture feature (QSR International, 2015) was used to upload all DT tweets from 12/20/2013-12/19/2014. NCapture is a free web browser add-on which works with NVivo to import and organize social media content from web pages. After navigating to the DT Twitter page and selecting the NCapture button in the web browser, an automatically pre-labeled was generated that included all tweets on the DT web page. This dataset was then

uploaded into the NVivo workspace. The dataset included the following categories for each tweet: tweet ID, tweet text, date of tweet, and number of retweets. (QSR International, 2015) Following uploading the DT tweets, the data were analyzed to answer each research question.

RQ1: What types of information are displayed by the social media platform Drinking Ticket@ to its users?

To answer RQ1, the PI and a second coder analyzed the year of DT tweets compiled by NCapture using an open-coding, constant comparative approach. NVivo allows codes to emerge from the data as they are coded (QSR International, 2015), which is appropriate when there are no *a priori* assumptions about the content (Corbin & Strauss, 2008; Ulin, 2005). First, each tweet was organized into categories in NVivo, defined as the early classification system housing groups of tweets with similar meanings. Some tweets exemplified two or more categories and were therefore coded into multiple categories. While organizing the tweets into categories, themes emerged. Themes were defined as the subsequent classification system which represented unifying and recurring ideas represented in the tweets. While coding, a preliminary codebook was developed based on the coding strategy for each theme. The codebook included the name, definition, and a representative example tweet for each theme. The tweets were then organized into the themes, continually updating the codebook until all coding was completed and no new themes were identified, known as the point of data saturation. (Bowen, 2008; Guest, Bunce, & Johnson, 2006; Morse, 1995)

To establish the study's reproducibility and validity (Krippendorff, 2013; Riffe, 2005), The PI then established fair inter-rater reliability with Dr. Spencer as the second

coder. This process resulted in Cohen's Kappa for inter-rater agreement = 0.42 and percentage agreement = 98.7 (Lombard, Snyder-Duch, & Bracken, 2003) based on an analysis of 25% the total DT tweets (QSR International, 2015). The PI and Dr. Spencer discussed and resolved all differences in coding and together agreed that a small percentage of tweets (11.3%) represented isolated, unrelated concepts not sufficient enough to warrant unique themes. Thus, a separate theme of "other" was developed for these tweets and the codebook was finalized. The PI then returned to the data and recoded any tweets that were initially disagreed upon to be consistent with the revised definitions in the final codebook. The number of references per theme illuminated which themes of information appeared most frequently and were most commonly viewed by DT users.

The PI then assembled the qualitative results into both a frequency table and the user-friendly format of a customized word cloud using the online Word It Out word cloud generator (Word It Out, 2015). This word cloud provided a visual representation of how frequently each theme appeared across the year of DT tweets by displaying each theme at a size proportionate to the number of references contained in that theme. For example, if the theme "humor" contained 100 tweets and "complaints" contained 50 tweets, "humor" would appear twice as large as "complaints" in the word cloud. This word cloud allows viewers to quickly see which themes were represented most and least frequently throughout the year.

RQ2: What information on the social media platform Drinking Ticket® do users most frequently relay to others?

For RQ2, the maximum and minimum number of retweets per original tweet within the 12 month period was recorded. Based on this information, the top 25% most retweeted tweets were identified. These tweets were then organized into the themes which had been developed in the final codebook developed for RQ1. Next, the tweets were assembled into a word cloud and frequency table. Finally the first, second, and third most retweeted tweets within the dataset and their corresponding theme were identified and recorded.

RQ3a: Does the frequency of information relayed by Drinking Ticket® vary over time?

To answer RQ3a, NVivo's built-in capability to graph the number of original DT tweets per month was used. This was accessed by selecting the "chart" function of NVivo. This produced a bar graph which charted the number of tweets per month, with higher bars indicating higher frequencies of DT tweets. To assess whether the average number of tweets per month were statistically significantly different from each other, the months of the year were first dichotomized into those which fall during the academic semester schedule (Jan., Feb., March, April, Aug. Sept., Oct., and Nov.), and those months which fall outside of the academic semester schedule (May, June, July, and Dec). The months were dichotomized this way to reflect times when students are on campus and actively engaged in the community versus those when they are usually away from campus and less involved in campus life. Next, the mean number of DT tweets per month for academic months and non-academic months were calculated. Then, an independent means T-test was estimated to determine if the mean number of tweets during academic

months was statistically significantly different from the mean number of tweets during non-academic months.

To determine the number of DT tweets per day of the week, the numeric format of each day (e.g.10/31/14) in the dataset to names of the day of the week (e.g. Monday) were converted using Microsoft Excel. Then, the total number of tweets per day of the week were calculated and assembled the results into a bar graph. Next, the days of the week were dichotomized into school nights (Sun., Mon., Tues., and Weds.) and non-school nights (Thurs., Fri., and Sat.). College students are known to consume alcohol more heavily on Friday and Saturday nights, and on many college campuses, Thursday night drinking is similar to that of Friday and Saturday nights, especially when Friday classes are limited or non-existent (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Paschall et al., 2006; Wood, Sher, & Rutledge, 2007; Hoeppe et al., 2012). At the University of South Carolina, Thursday nights are busy drinking nights comparable to Fridays and Saturdays. Next, the mean number of tweets for school nights and non-school nights were calculated and an independent means t-test was estimated to determine if the mean number of tweets on school nights was statistically significantly different from the mean number of tweets on non-school nights.

RQ3b: Does the frequency of information relayed by Drinking Ticket® users vary over time?

There is no graphing capability within NVivo to graph the number of retweets per month, so for RQ3b, the number of retweets corresponding to each original tweet were summed for all 12 months and a bar chart was created by graphing the number of retweets per month. The months of the year were then dichotomized into academic

months vs. non-academic months and summed to calculate the total number of retweets for academic months and non-academic months. Using the mean number of retweets for academic months and non-academic months, an independent means t-test was estimated to determine if there was a statistically significant difference in the average number of retweets during academic months vs. non-academic months. The same procedure was completed for days of the week; summing retweets per day of the week, graphing the results, dichotomizing the days of the week into school nights vs. non-school nights, averaging the number of retweets for school nights and non-school nights, and conducting an independent samples t-test to determine if the average number of retweets was statistically different between school nights and non-school nights.

Follow-up analysis 1: What proportion of Drinking Ticket® tweets are about alcohol?

The final codebook was examined to determine which themes were about alcohol and which themes were not about alcohol. The number of tweets about alcohol and the number of tweets not about alcohol were then summed. To determine the proportion of DT tweets that were about alcohol, the number of tweets about alcohol was divided by the total number of tweets within the 12 month period, and to determine the proportion of DT tweets that were not about alcohol, the number of tweets not about alcohol was divided by the total number of DT tweets.

Follow-up analysis 2: What locations/environments does Drinking Ticket® tweet about most often?

After coding the tweets into categories for RQ1, the tweets were then coded into geographic locations based on the content of the tweets. Only those tweets which contained explicit information on the location the tweet was referring to were coded by

geographical location theme. The following geographical locations were identified: off campus, student housing communities, on campus, Five Points, and The Vista. Five points is an entertainment district with high alcohol outlet density east of campus that is frequented by students. The Vista is an entertainment district north of campus with many alcohol outlets that is frequented primarily by older students and young professionals. For those tweets that included information on street locations which were unclear as to whether the location was considered on-or off-campus, the street locations were Google mapped to determine if the location fell inside or outside of campus boundaries. The frequency of references per environmental theme were then assembled into a frequency table, bar graph, and word cloud.

Follow-up analysis 3: Does Drinking Ticket® tweet more often on high drinking days than on typical days?

The term high drinking days was operationalized as those holidays and occasions which are known to be associated with increased alcohol consumption among college students, compared to typical days. First, The PI listed occasions which are known to be high drinking days in the University of South Carolina- Columbia community. The PI then verified and augmented the list based on the suggestions of five current undergraduate students who were knowledgeable about high drinking days in the local college alcohol use culture. Those sixteen days identified were the seven home football game days, Halloween, New Year's Eve, St. Patrick's Day, Carolina Cup (a local horse race which students celebrate by tailgating), Cinco De Mayo, and Independence Day. The tweets on each of these high drinking days were coded into the themes identified in the final codebook.

To represent the frequency of tweets on each high drinking day, the number of tweets per high drinking day were assembled into a frequency table and bar graph. Next, the average number of tweets per high drinking day was calculated. The average number of tweets per day on all days in the history of the DT account was also determined using TweetStats, an online source for generating and graphing the frequency of tweets for individual Twitter accounts ("Tweetstats.com"). Finally, an independent means t-test was estimated to determine if there was a statistically significant difference between the average number of tweets on high drinking days vs. typical days.

Follow-up analysis 4: Does Drinking Ticket® tweet a greater proportion of tweets about alcohol on high drinking days than on typical days?

Using the information established by coding each high drinking day tweet into the final themes for follow-up analysis 3, the number of tweets that were about alcohol during the high drinking days and the number of tweets that were not about alcohol during the high drinking days was calculated. To find the proportion of tweets about alcohol on high drinking days, the number of tweets about alcohol on high drinking days was divided by the total number of tweets across all of the high drinking days. This procedure was repeated to find the proportion of tweets not considered to be about alcohol on high drinking days. These proportions were then compared to those found in follow-up analysis 1 which identified the proportion of tweets about and not about alcohol across the 12 months of DT tweets. A summary of specific aim research methods can be viewed in Table 3.1.

Table 3.1 Specific aim 1 qualitative analysis methods summary

Research Question	Data Source(s)	Analysis Technique	Results Display
RQ1: What types of information are displayed by the social media platform Drinking Ticket® to its users?	Drinking Ticket tweets from 12/20/2013-12/19/2014	coding for categorical themes within NVIVO	Frequency table word cloud for all themes in the codebook
RQ2: What information on the social media platform Drinking Ticket® do users most frequently relay to others?	Drinking Ticket retweets from 12/20/2013-12/19/2014	rank order the retweets based on frequency into quartiles within NVIVO	frequency table word cloud for the themes that are displayed in the fourth quartile of retweets first, second, and third most retweeted tweets
RQ3a: Does the frequency of information relayed by Drinking Ticket® vary over time?	Drinking Ticket tweets from 12/20/2013-12/19/2014	quantifying the number of tweets per month and per day of the week	frequency table bar graphs of number of tweets per month and per day of the week independent means T-test for number of tweets per month and per day of the week

RQ3b: Does the frequency of information relayed by Drinking Ticket® and its users vary over time?	Drinking Ticket retweets from 12/20/2013-12/19/2014	quantifying the number of retweets per month and per day of the week	frequency table bar graphs of number of retweets per month and per day of the week independent means T-test for number of retweets per month and per day of the week
<u>Follow-up analysis 1:</u> What proportion of Drinking Ticket® tweets are about alcohol?	Drinking Ticket tweets from 12/20/2013-12/19/2014	quantifying the number of tweets which can be about alcohol use, and not about alcohol use	frequency table pie chart of tweets about alcohol and not about alcohol
<u>Follow-up analysis 2:</u> What locations/environments does Drinking Ticket® tweet about most often?	Drinking Ticket tweets from 12/20/2013-12/19/2014	coding for categorical themes within NVIVO	frequency table pie chart of locations tweeted about word cloud of locations tweeted about

<p><u>Follow-up analysis 3: Does Drinking Ticket® tweet more often on high drinking days than typical days?</u></p>	<p>Drinking Ticket tweets from 12/20/2013-12/19/2014</p>	<p>coding for categorical themes within NVIVO</p> <p>quantifying the number of tweets per high drinking day</p> <p>calculating the average number of tweets per day for DT</p>	<p>frequency table</p> <p>bar graph of tweets per high drinking day</p> <p>pie chart of number of tweets per high drinking days vs. typical days</p> <p>independent means T-test</p>
<p><u>Follow-up analysis 4: Does Drinking Ticket® tweet a greater proportion of tweets about alcohol on high drinking days than on typical days?</u></p>	<p>Drinking Ticket tweets from 12/20/2013-12/19/2014</p>	<p>coding for categorical themes within NVIVO</p> <p>determining the proportion of tweets which are alcohol use, on high drinking days. Compare this to the proportion of tweets about across the year of DT tweets, identified in follow-up analysis 1.</p>	<p>frequency tables and bar graphs</p>

3.2 Specific Aim 2 Methods

Methods Overview

The purpose of Specific Aim 2 was to determine the influence of DT on alcohol use, perceived risk, and alcohol-related risk behaviors among college students. This was accomplished by analyzing data from a self-report survey administered to undergraduate students at the University of South Carolina during May 2015.

Data Source

Data for specific aim 2 were gathered from a 120-item, publically available, anonymous, self-report online survey. Participants were undergraduate students who met the inclusion criteria of: 1) being currently enrolled as an undergraduate student at the University of South Carolina; 2) being at least 18 years old; and 3) having had consumed alcohol at least once in the past 30 days. Results of an *a priori* power analysis indicated that a sample size of 350 would be sufficient (.95) to detect medium-sized effects at $\alpha=0.05$

Measures

The survey assessed sociodemographic characteristics, crowdsourced social media use habits and perceptions, alcohol consumption behaviors, alcohol-related illegal behaviors, experienced alcohol-related consequences, and perceived risk of legal and university consequences for unlawful alcohol use. Table 3.2 presents a detailed description of the measures included in the survey, and a copy of the survey instrument is presented in Appendix A.

Table 3.2 Description of survey measures

Variable	Scale/Response Format	# of items
Eligibility criteria questions		
Enrollment status	dichotomous item on whether the participant is an undergraduate student enrolled in the University of South Carolina- Columbia	1
Alcohol use \geq 1x past month	dichotomous item on whether the participant has consumed alcohol at least once within the past 30 days	1
Sociodemographics		
Age	continuous item assessing the participant's age	1
Ethnicity	self-identified ethnicity	2
Gender	self-identified gender	1
Class standing	class standing (e.g. freshman, junior)	1
Residence	current housing status (e.g. on-campus residence hall, off-campus housing)	1
Approx. GPA	cumulative grade point average	1
Employment status	whether or not the participant is employed for pay, and approximately how many hours per week spent working	2
Extracurricular participation	whether the participant participates in extracurricular or volunteer activities or not, and approximately how many hours per week are dedicated to extracurricular/volunteer activities	2
Alcohol consumption		
Binge drinking	item adapted from the National College Health Assessment (NCHA) survey (2015) on the number of times the participant binge drank within the past 2 weeks	1
Quantity	items adapted from CORE Institute (2015) survey on average number of standard drinks consumed per week and during a typical drinking occasion	2
Drinker/non-drinker status	Single item adapted from AlcoholEdu (2015) on whether or not the participant consumed alcohol within the past 2 weeks	1
Frequency	single item adapted from the National College Health Assessment (NCHA) (2015) survey on the number of	1

	days the participant consumed alcohol within the past month.	
Alcohol-related illegal behaviors	dichotomous items on alcohol-related risk behaviors the participant has done within the past 12 months (e.g. driving after binge drinking, providing alcohol to minors)	8
Experienced alcohol-related consequences	items from the Rutgers Problem Alcohol Index from Earlywine, (2008) and the CORE drug and alcohol survey (2015) on how many times the participant has experienced alcohol-related harms.	24
Global overall perceived risk for alcohol-related university and legal consequences	items on a 10 point Likert scale from 1 <i>not at all risky</i> to 10 <i>extremely risky</i> rating the riskiness of committing alcohol-related legal offenses (e.g. being intoxicated in public, driving while alcohol-impaired)	10
Perceived certainty of alcohol-related university and legal consequences	items on a 10 point Likert scale from 1 <i>not at all likely</i> to 10 <i>absolutely certain</i> rating the certainty of a college student receiving a legal or university consequence if they were to commit alcohol-related legal offenses (e.g. being intoxicated in public, driving while alcohol-impaired)	10
Perceived magnitude of alcohol-related university and legal consequences	items on a 10 point Likert scale from 1 <i>not at serious</i> to 10 <i>extremely serious</i> rating how serious the legal or university consequence would be for a college student if they received a consequence for an alcohol-related legal offense(e.g. being intoxicated in public, driving while alcohol-impaired)	10
Perceived celerity (swiftness) of alcohol-related university and legal consequences	items on a 10 point Likert scale from 1 <i>in the distant future</i> to 10 <i>immediately</i> rating how quickly the legal or university consequence would happen for a college student if they received a consequence for an alcohol-related legal offense(e.g. being intoxicated in public, driving while alcohol-impaired)	10
Trust in social media	items adapted from Li, Hess, & Valacich (2008) on how much users trust Drinking Ticket in different dimensions from 1 <i>strongly disagree</i> to 5 <i>strongly agree</i>	5
Social media engagement	items adapted from Thompson, 2013 on the frequency of engagement with various social media platforms with categorical responses ranging from <i>never</i> to <i>more than once an hour</i>	10

Specific social media platforms	self-created items on the names of social media platforms the participant has heard of, has ever used, and has used within the past 2 weeks.	3
Drinking Ticket usage patterns	self-created items on user patterns of Drinking Ticket with various categorical responses.	10
Survey conditions	items on how the participant heard about the survey and what electronic device they used to complete the survey	2
	Total # of questionnaire items:	120

Sociodemographics

The sociodemographic information collected included: age, self-identified ethnicity and gender, class standing (e.g. freshman, senior), housing status (e.g. on-campus residence hall, off-campus housing), approximate grade point average, employment status, average number of hours worked per week (if applicable), and participation in and average number of hours spent on extracurricular activities. All sociodemographic characteristics were assessed by questionnaire items with multiple-choice response options.

Alcohol-Related Measures

Alcohol Consumption

Student's alcohol consumption behaviors were assessed using a series of measures commonly asked of students in national college health surveys. Two measures adapted from the CORE Alcohol and Drug Survey (CORE Institute, 2015) included the average number of standard drinks consumed per week and during a typical drinking occasion. Two measures adapted from the National College Health Assessment (NCHA) (National College Health Association, 2015) including: "During the past 30 days, on how many days did you consume alcohol?" and "Think back over the last two weeks. How

many times have you had four or more standard drinks on a single occasion within about 2 hours?” were also included.

From these survey measures, two analytic measures which took into account both the participants’ frequency and quantity of alcohol consumption were created. The first was drinks per month, which was created by multiplying the value of the average number of drinks consumed per drinking occasion by the number of days the participant had consumed alcohol in the past month. The second was amount binged, which was created by multiplying the value of the average number of drinks the participant consumed per drinking occasion by the number of times the participant binge drank within the past two weeks. These two measures were theoretical, proxy representations of participants’ usual alcohol consumption behaviors that included both quantity and frequency of alcohol intake.

Alcohol-Related Illegal Behaviors

Eight dichotomous items based on the literature assessed whether the participant had committed various forms of unlawful alcohol use within the past 30 days (Bernat, Lenk, Nelson, Winters, & Toomey, 2014). Illegal behaviors included driving under the influence of alcohol and while legally intoxicated (blood alcohol content of 0.08), being intoxicated in public, having an open container of alcohol in public, providing alcohol to minors (if the participant was at least 21 years old), and using a false identification to purchase alcohol or gain entry into a bar (if the participant was younger than 21 years old).

Alcohol-Related Consequences Experienced

The number of times the participant had experienced various negative consequences due to their drinking within the past 12 months was assessed with 24 items adapted from the Rutgers Problem Alcohol Index (Earleywine, LaBrie, & Pedersen, 2008) and the CORE drug and alcohol survey (CORE Institute, 2015). Some selected negative consequences included: having withdrawal symptoms; wanting to stop drinking but being unable to; doing something that was later regretted; getting into trouble with the police, residence hall, or other college authorities; having unprotected sex; physically injuring themselves or others; having sex without giving or obtaining consent; being criticized about their drinking; missing class, and performing poorly on a test or project. Response options were: *none, 1-2 times, 3-5 times, and more than 5 times*. The participant's responses were summed to produce a score from 24 to 96, with higher numbers indicating greater consequences due to alcohol.

Perceived Risk Measures

Perceived Risk of Consequences for Unlawful Alcohol Use

Participants were assessed on their perceived risk of receiving a consequence from the police or university authorities for 10 unlawful alcohol use behaviors. Examples of the behaviors included: being intoxicated in public, using a false identification to purchase alcohol, and providing alcohol to minors. These questions were developed based on Deterrence Theory and included one global item and measures for each of the three components of Deterrence Theory (i.e., certainty, magnitude, celerity). First, the participant's global overall perceived risk for being punished for each of the behaviors was measured on a 10-point Likert scale from 1 = *not at all risky* to 10 = *extremely risky*.

Second, perceived certainty for being punished for each of the behaviors was assessed by how likely they believed it is that they would be punished for each of the behaviors on a scale from 1 = *not at all likely* to 10 = *absolutely certain*. Third, perceived magnitude of the punishment for each of the behaviors was assessed by how serious they believed the punishment would be for each of the behaviors on a scale from 1 = *not at all serious* to 10 = *extremely serious*. Fourth, perceived celerity or swiftness of the punishment for each of the behaviors was assessed by how soon they believed the punishment would occur for each of the behaviors on a scale from 1 = *in the distant future* to 10 = *immediately*. Participant's scores were summed for each category (certainty, magnitude, swiftness) and cumulatively across the three categories, with higher scores indicating greater perceived susceptibility to/risk for alcohol-related legal consequences. This resulted in a measure of computed overall risk for illegal alcohol use behaviors based on the three dimensions of criminal deterrence theory, with scores from 30 to 300.

Social Media Measures

Trust in Social Media

Participants' trust in social media was measured with five items adapted from Li, Hess, and Valacich (2008). The items assessed how much users trusted DT on different dimensions, such as "I am comfortable relying on information from Drinking Ticket" and "I believe that Drinking Ticket is employed in my best interest." Response options were provided on a scale from 1 = *strongly disagree* to 5 = *strongly agree*.

Social Media Engagement

A scale adapted from Thompson (2013) examined the extent to which participants actively engage with various social media platforms, such as checking for updates on a

microblogging site or updating their profile on a social network, measured by the frequency that the participant performs each behavior. Categorical response options were provided on an 8-point scale ranging from 1 = *never* to 10 = *more than once an hour*. The instrument was scored by summing the scores on each item, resulting in a range from 10 to 80, with higher values indicating greater social media engagement.

Familiarity and Use of Popular Social Media Platforms

Sixteen popular social media platforms were presented to participants with three items inquiring whether the participant had heard of the platform, ever used the platform, and had used the platform within the past two weeks. Participants selected the boxes that corresponded with their answers for each of the social media platforms.

Drinking Ticket® Usage Patterns

Participants were asked about a variety of characteristics of their DT usage patterns with appropriate categorical response options for each questionnaire item. One example question about usage patterns is: “What times of day do you check Drinking Ticket the most?” with response options A. Morning (6am-12pm), B. Afternoon (12pm-5pm), C. Evening (5pm-9pm), D. Late night (9pm-6am), and E. I don’t check Drinking Ticket more at any particular time of the day. Another example, “How did you hear about Drinking Ticket?” allowed participants to select all of these response options that applied: A. Word of mouth, B. Flyer advertisements, C. Sticker advertisements, D. Flyer advertisements, E. Came across it on Twitter, F. A newspaper, G. Online news sites (e.g. WIS), and H. It was mentioned on another social media app/site (specify name of app/site).

Drinking Ticket® Exposure

Participant's exposure to DT was measured with the question: "Overall, how many of Drinking Ticket's tweets do you think you view?" with response options where higher values indicate greater exposure to DT: 1- *I believe I see none of their tweets* 2- *I believe I see some of their tweets* 3- *I believe I see most of their tweets* and 4- *I believe I see all of their tweets*.

Specific Aim 2 Procedure

Survey Development

Prior to making the survey publicly available, The PI conducted cognitive interviewing and pilot testing of the survey measures with five undergraduate students to reduce potential response error. Each survey item and its set of response options were reviewed to ensure that they were straightforward, comprehensible, and reflective of students' behaviors and diversity. The survey items were improved based on students' feedback.

After finalizing the survey, the questionnaire development platform SoGoSurvey.com was used to create an online survey which could be freely accessed by study participants. SoGoSurvey.com allows researchers to create customized questionnaires with a variety of question types and response formats in a visually attractive format. SoGoSurvey also allows the survey author to define skip patterns so that participants are skipped past questions that do not apply to them, reducing confusion and respondent burden. Participants who had not viewed DT tweets were skipped past DT-specific questions. ("SoGoSurvey," 2015) The survey was hosted online at the link <http://tinyurl.com/Drinkingticketsurvey>. The current study was approved through the

University of South Carolina's Institutional Review Board (IRB) protocol number Pro00042424 and posed minimal risks to participants.

Participant Recruitment

Participants were recruited through multiple strategies occurring simultaneously during April of 2015. The survey was launched on April 4th, 2015, and was closed on May 10th, 2015. The strategies were as follows:

Strategy A: In-classroom recruiting

To ensure that the sample represented a diverse array of demographic characteristics (e.g., gender, age, class standing, academic major, and housing status), the PI recruited student participants from classrooms that represented a range of academic disciplines and levels. Instructors of courses with 50 or more students were asked permission to give a 5-minute presentation in the classroom to promote the study, and, if possible, provide dedicated classroom time for students to complete the survey. Some instructors were not able to accommodate this request, but kindly emailed their class inviting them to participate in the study. For those instructors who allowed class time, The PI instructed students to complete the survey on their smartphones or laptops by following the open-access SoGo survey link. For those instructors who do not allow class time, flyers about the study were distributed in class so that students could take the survey on their preferred electronic device (e.g., computer, smartphone, tablet) away from the classroom at their convenience. A copy of the recruitment flyer is provided in Appendix B.

Strategy B: University Union Tabling

Students were also recruited in-person by setting up a table in front of the university union building, which experiences a high volume of student foot traffic. The PI handed out flyers to passers-by and asked if they would like to participate. Some students agreed to complete the survey at the table and used either their smartphones or the provided laptops to access the public SoGo survey link. Other students took the flyer with them and completed the survey away from the table at their convenience.

Strategy C: Electronic Recruiting

Permission was secured by the hosts of various listservs and student organization communications platforms to send emails and create posts inviting students to participate in the survey. In addition, the owner of the DT platform agreed to tweet the open-access web link on DT, requesting that followers complete the survey for a chance to win a gift certificate. The tweet was posted on DT on April 20, 2015 at 12:14pm.

Specific Aim 2 Data Collection

Eligibility Measures

To determine if the student was eligible to participate in the study, they were presented with dichotomous items about whether or not they were enrolled as an undergraduate student at the University of South Carolina-Columbia, and if they had consumed alcohol at least once within the past month. Those who answered yes to both questions were considered eligible for the survey and were directed to the survey questions.

Survey Conditions

Two questions assessed the conditions under which the participant took the survey. First, students were asked how they heard about the survey, with response options representing each recruitment method used. Second, students specified what type of electronic device they used to complete the survey (i.e., computer, tablet, smartphone).

Informed Consent

Before participating in the study, participants reviewed the informed consent document. The informed consent presented the aims of the study, potential risks and benefits of participating in the current research, informed participants that they may withdraw at any time without penalty, and emphasized that participants' responses would be anonymous and rigorously protected. Participants read and marked their understanding and consent to participate before completing the survey questionnaire, presented in Appendix A.

Incentives

Participants were offered the chance to be entered into a random-draw lottery for 32 available \$25.00 gift certificates to an online retailer. Those who completed the survey were encouraged to promote the study to their social networks for additional chances to win the gift certificate. Those who were referred to the survey by a friend entered the email of the friend who referred them, providing the referrer with an additional chance to win the gift certificate. Following completion of data collection, an online random-number generator was used to select the winners of the gift certificates. Funding for incentives was provided by Department of Health Promotion, Education, and Behavior,

Arnold School of Public Health at the University of South Carolina Provost Funds for Doctoral Research.

Data management

All study data was kept on SoGoSurvey.com, which is protected by an encrypted password that is known only to the PI. A backup of the data was kept on the PI's personal laptop which is also password protected and accessible only to her.

Specific Aim 2 Analysis Procedures

RQ4: Are users of Drinking Ticket® significantly different from non-users in terms of: a.) sociodemographics? b.) social media engagement? c.) alcohol consumption? d.) alcohol-related illegal behaviors and e.) alcohol-related illegal behaviors?

DT users were defined as those who answered “yes” to the question “Have you ever viewed Drinking Ticket tweets on Twitter or visited the Drinking Ticket webpage?,” and DT non-users were defined as those who answered “no” to the question. First, univariate descriptive statistics for the sample were estimated. Next, chi-square tests for categorical variables (e.g. ethnicity, class standing) were performed to determine if there were statistically significant differences between the independent variable DT users and DT non-users on each categorical outcome variable. Next, a series of independent means T-tests were estimated to reveal differences between the independent variable DT users and DT non-users on continuous outcome variables (e.g. age, score on social media engagement scale). Significance levels for all statistical tests were set at .05. These analyses were completed using Stata 14 (StataCorp, 2009).

RQ5: Does perceived risk for alcohol-related legal consequences mediate the relationship between alcohol consumption and alcohol-related illegal behaviors, after controlling for

sociodemographic characteristics? and **RQ6: Does the dose of Drinking Ticket@ exposure influence the relationship between alcohol consumption and perceived risk of alcohol-related legal consequences, after controlling for sociodemographic characteristics?**

The PROCESS macro for SPSS created by Andrew Hayes, (Hayes, 2012) (Hayes, 2013) and statistical approach described by Field (2013) was used to answer research questions five and six. The conceptualization used to answer these research questions is presented in Figure 3.1.

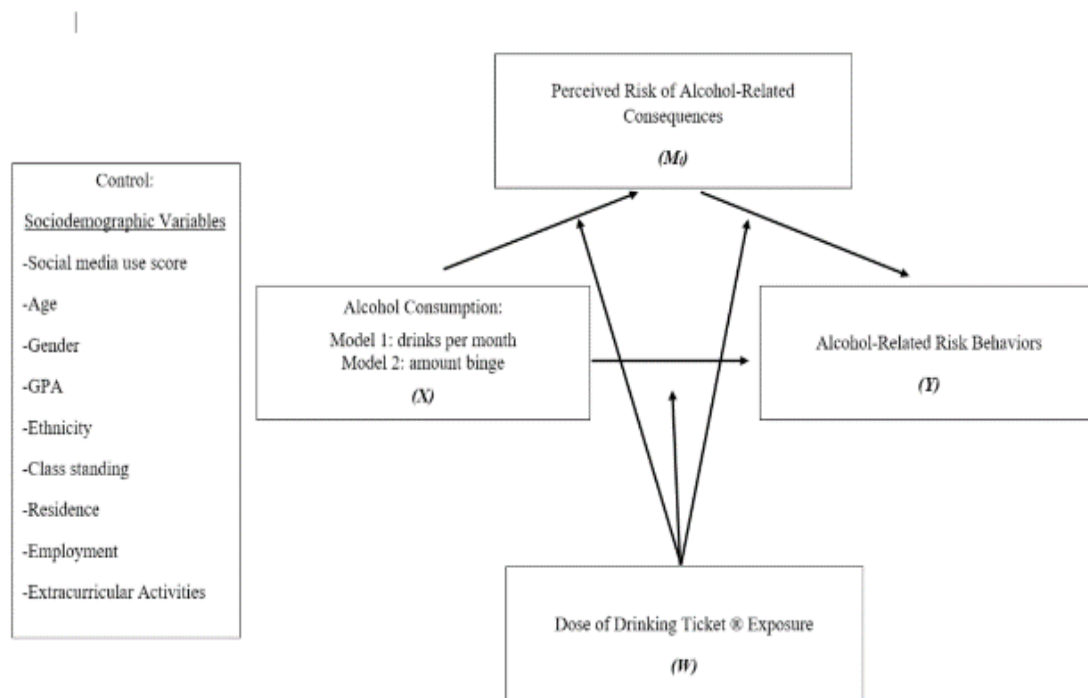


Figure 3.1 Conceptualization of Moderated Mediation Model

PROCESS is a user-written program created specifically for conducting mediation and moderation analyses which can be used in either SPSS or SAS by installing a custom dialog box into the statistical package program. Mediation analyses are undertaken to determine if the relationship between the independent variable (X) and

the dependent variable (Y) is modified by the addition of a third variable, (M) along the casual pathway between X and Y. Moderation analyses are undertaken to determine if the relationship between X and Y varies/ is moderated for different groups (W).

PROCESS is based on the traditional Baron and Kenney approach to model building, which involves testing a succession of increasingly complex models (Baron & Kenny, 1986). The advantage to testing the models with PROCESS rather than with a manual approach is that PROCESS provides bias-corrected estimates to adjust for testing multiple models, which lessens the likelihood of committing both type I and type II errors (Field, 2013). PROCESS also allows both mediator and moderator to be tested in the same model, which is preferable to estimating one separate mediation model and one separate moderation model. When estimated together, the simultaneous influence of the moderator and mediator in the model is taken into account, and the model is most parsimonious.

This approach was followed for the two models, the first with drinks per month as the independent variable, and the second with amount binge as the independent variable. Based on Hayes' discussion of mean centering, the independent and moderating variables were not centered. Each of the independent variables had a meaningful zero (e.g. zero drinks per month is a feasible value, as opposed to a blood pressure reading of zero), making interpretations substantively interpretable, which eliminates the benefit of centering. Centering also does not result in reduced multicollinearity or significant differences in model coefficients and standard errors (Hayes, 2013). Mediation was significant if the 95% bias corrected, bootstrapped confidence intervals for the indirect effect did not contain 0, and Sobel's test for the normal theory test for indirect effect

resulted in a p -value of less than .05. Effect size was calculated from the completely standardized indirect effect value of X (independent variable) on Y (dependent variable). Moderation was significant if the p -value of the interaction between X (independent variable) and W (moderating variable) was less than .05. Table 3.3 presents the statistical approaches used to analyze the quantitative survey data for Specific Aim 2.

Table 3.3 Specific aim 2 quantitative analysis methods summary

Research Question	Data Source	Variables: Independent (IV) Dependent (DV) Mediating (MedV) Moderating (ModV) Control (CV) Level of Measurement: Categorical (Cat.) Continuous (Cont.)	Statistical Analysis Technique
RQ4: Are users of Drinking Ticket significantly different from non-users in terms of: a. sociodemographics? b. social media engagement c. alcohol consumption? d. alcohol-related illegal behaviors? e. alcohol-related consequences experienced?	Survey data	DT user or not (IV) <u>a. Sociodemographic characteristics (DV)-</u> 1. age- (Cont.) 2. ethnicity- (Cat.) 3. gender- (Cat.) 4. class standing-(Cat.) 5. housing status-(Cat.) 6. GPA- (Cat.) 7. employment status-(Cat.) 8. extracurricular participation-(Cat.) <u>b. social media engagement (DV)</u> 1. # of crowdsourced social media platforms used past 2 weeks-(Cont.) 2. social media engagement scale-(Cont.) <u>c. alcohol use behaviors(DV)</u> 1. Drinks per month =average number of drinks per occasion X	Series of t-tests for continuous variables Series of chi squares for categorical variables

		<p># of days consumed alcohol in the past (Cont.)</p> <p>2. amount binge = average number of drinks per occasion X number of times binge drank in the past 2 wks. (Cont.)</p> <p><u>d. alcohol- related illegal behaviors (DV)</u></p> <p>1. # of illegal alc. behaviors performed (Cont.)</p> <p><u>e. alcohol-related consequences experienced (DV)</u></p> <p>1. # of consequences ever exp. past yr.</p>	
<p>RQ5: Does perceived risk for alcohol-related legal consequences mediate the relationship between alcohol consumption and alcohol-related illegal behaviors, after controlling for sociodemographic characteristics?</p>	<p>Survey data</p>	<p><u>alcohol consumption (IV)</u></p> <p>1. Drinks per month = average number of drinks per occasion X # of days consumed alcohol in the past (Cont.)</p> <p>2. amount binge = average number of drinks per occasion X number of times binge drank in the past 2 wks. (Cont.)</p> <p><u># alcohol-related illegal behaviors (DV) (Cont)</u></p> <p><u>computed overall perceived risk for alcohol-related legal consequences (MedV)</u></p> <p>1. composite score perceived likelihood + perceived seriousness + perceived celerity for alcohol-related legal consequences</p> <p><u>sociodemographic characteristics (CV)</u></p> <p>1. age- (Cont.)</p> <p>2. ethnicity- (Cat.)</p> <p>3. gender- (Cat.)</p> <p>4. class standing-(Cat.)</p> <p>5. housing status-(Cat.)</p>	<p>mediation analysis using Andrew Hayes' SPSS PROCESS macro</p>

		6. GPA- (Cat.) 7. employment status-(Cat.) 8. extracurricular participation-(Cat.) 9. social media engagement-(Cont.)	
RQ6: Does the dose of Drinking Ticket exposure influence the relationship between alcohol consumption and perceived risk of alcohol -related legal consequences, after controlling for sociodemographic characteristics?	Survey data	<u>alcohol consumption (IV)</u> 1. Drinks per month =avgnumdrksoccXalcdayspastmonth (Cont.) 2. amount binge =avgnumdrksoccXtimes2wkbinge (Cont.) <u># alcohol-related illegal behaviors (DV) (Cont.)</u> <u>perceived risk for alcohol-related legal consequences (MedV)</u> 1. composite score perceived likelihood + perceived seriousness + perceived celerity for alcohol-related legal consequences (Cont.) <u>Dose of DT exposure (ModV) (Cat.)</u> <u>sociodemographic characteristics (CV)</u> 1. age- (Cont.) 2. ethnicity- (Cat.) 3. gender- (Cat.) 4. class standing-(Cat.) 5. housing status-(Cat.) 6. GPA- (Cat.) 7. employment status-(Cat.) 8. extracurricular participation-(Cat.) 9. social media engagement-(Cont.)	Moderated-mediation analysis using Andrew Hayes' SPSS PROCESS macro

CHAPTER 4

RESULTS

This chapter presents the results of the study in the form of two manuscripts and supplemental results not presented within the manuscript from each specific aim following each manuscript. Manuscript I was submitted to the *Journal of American College Health*, and presents selected analyses gathered from specific aim 1 including results of the content analysis of DT. Manuscript I aimed to present 1) the themes present in the messages relayed by DT, 2) the geographic environments referenced by DT, and 3) the information most widely re-shared themes by users of DT. Manuscript II was also submitted to the *Journal of American College Health* and presents selected analyses from specific aim 2 including differences between DT users and non-users in terms of their alcohol-use behaviors after controlling for sociodemographic characteristics, social media engagement, and perceived risk of legal consequences.

4.1 MANUSCRIPT I: #BEONTHELOOKOUT: HOW AND WHERE COLLEGE STUDENTS USE A LOCAL SOCIAL MEDIA PLATFORM ABOUT ALCOHOL-RELATED LAW ENFORCEMENT AND CAMPUS LIFE¹

¹Gentile, D., Spencer, S.M., Turner-McGrievy, G.M., Robillard, A., and DiNovo, R

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Abstract

Objective: The purpose of this study was to present the results of a content analysis examining a student-driven social media platform which relays information about alcohol-related law enforcement activities and campus life interests at a large, public, southeastern university.

Participants: Content of a publically available, local, crowdsourced Twitter account named @DrinkingTicket (DT) was the focus of the study. No human participants were included.

Methods: One year of DT tweets ($n=854$ tweets) were qualitatively coded into themes using the constant comparative method. Word clouds were assembled to illustrate the frequency of each theme.

Results: The majority of tweets described roadside information, most tweets (79.4%) referenced off-campus locations, and safety alerts were the most retweeted messages.

Conclusion: Information about university community interests appeared more often than alcohol-related information. Postsecondary institutions must acknowledge the utility of student-driven safety alert systems alternative to official university systems, especially those that deliver alerts about off-campus locations.

Key words: social media, law enforcement, college alcohol use, emergency alert systems, content analysis

Social media is a useful platform for researchers and public health professionals to collect and interpret health-related information shared by communities.¹⁻⁴ Adults ages 18-29 represent the highest proportion of social media users,¹ and among college students, social media use is nearly universal.² Social media is especially appealing to people in this age group because it allows individuals to express personal interests.³ Social media is, by nature, socially-constructed, whereby groups of users develop the online community conversations in which they would like to engage.^{4,5} Unlike other forms of media, social media can be individually-tailored based on the messages that are sent to and received by one's social network.² Students' affinity for social media presents a unique opportunity for college health professionals to better understand student-driven discourse about the role of the alcohol-use environment on campus life.

The harms of high-risk alcohol use in college students are well-documented. They include a range of individual consequences, such as the development and exacerbation of mental illnesses,⁶ academic failure,⁷ unintentional injuries⁸, and even death.⁹ Alcohol misuse also produces negative interpersonal consequences such as property damage,¹⁰ unprotected sex (resulting in sexually transmitted disease transmission and unplanned pregnancies),¹¹ violence,¹² sexual assault,^{10,13} and drunk driving crashes.^{14,15} Alcohol is responsible for an estimated 1,825 deaths, 599,000 injuries, 696,000 assaults, and 97,000 cases of sexual abuse in college communities each year.¹⁶ Thus, prevention of high-risk alcohol use among college students remains a top priority for institutions of higher education.^{17,18} To be successful in reducing high-risk alcohol consumption among college students, it will be helpful for public health researchers to understand the discourse on alcohol use and conditions that may encourage risky alcohol use behaviors.

Student-driven crowdsourced social media platforms that discuss alcohol-related law enforcement are appearing on college campuses, yet no studies have systematically examined their content. Given the immersion of college students in social media and the popularity of such platforms, it is possible that student-driven social media is a useful tool for communicating pertinent information about campus life, including content related to alcohol use. Social media is a potential medium that can be used to examine the ways that students communicate with each other and what information they consider to be important as evidenced by posts and shares on social media platforms. Twitter is an online social networking community microblog where users can connect with others in order to send and receive 140 character messages called “tweets,” which can include pictures and links to websites.⁴ Twitter is an especially useful form of social media for monitoring public discourse and has allowed researchers in diverse disciplines to monitor community discussions.¹⁹⁻²⁶ The purpose of the current research was to conduct a qualitative content analysis of the local, student-led social media Twitter account @Drinking Ticket (DT). In order to determine the ways in which college students communicate about alcohol and campus life, the content analysis focused on identifying 1) the themes present in the messages relayed by DT, 2) the geographic environments referenced by DT, and 3) the themes of information most widely re-shared by users of DT.

Methods

Data Source

@Drinking Ticket is a popular student-created Twitter account at a large, urban, public, southeastern university with over 44,600 followers as of January 27, 2016. DT

provides its followers with information about unlawful alcohol use enforcement activities including sobriety checkpoint locations, undercover police operations in bars, and police disbandment of underage off-campus drinking parties. It also includes information on traffic and safety alerts, bar specials advertising, and speed enforcement locations. The owner of the account relies on crowdsourced information from students and community members across all areas of the city to determine what messages are worthy of being tweeted to DT followers. Crowdsourced social media platforms solicit the contributions of information from large groups of people to fulfill a wide range of goals, such as keeping users of the platform informed of traffic patterns based on information submitted by other users travelling on the roadways.²⁷ Community members send DT information such as: “@DrinkingTicket I saw 2 officers breaking up a party at [XX] student housing complex”, which is viewed by the owner of the DT Twitter account. The owner deems information to be trustworthy if multiple reports of personal communication arrive citing the same information while originating from different sources. The owner then tweets information judged to be trustworthy and important to DT followers. The current research focused on DT’s 854 tweets and their respective retweets for one calendar year spanning 12/20/2013 to 12/19/2014. The research was conducted during December of 2014.

NCapture for NVivo 10 Software

QSR NVivo 10 qualitative data analysis software and its corresponding NCapture feature²⁸ were used to download all DT tweets within the specified time period.

NCapture is a free web browser add-on that works with NVivo to import and organize social media content from web pages. After navigating to the DT Twitter page and

selecting the NCapture button in the web browser, an automatically pre-labeled dataset was generated which included all tweets on the DT web page. This dataset was then uploaded into the NVivo workspace. The dataset included the following categories for each tweet: tweet ID, tweet text, date of tweet, and number of retweets.²⁹

Data Analysis

The data gathered by NCapture was then coded using an open-coding, constant comparative approach.^{30,31} NVivo allows codes to emerge from the data as they are coded,²⁹ which is appropriate when there are no *a priori* assumptions about the content.^{32,33} First, the principle investigator (PI) reviewed all of the tweets and developed a preliminary codebook based on emergent themes of information displayed by DT. The codebook included the name, definition, and a representative example tweet for each theme. The PI then organized the tweets into categories that reflected these themes and continually updated the codebook until all coding was completed and no new categories or themes were identified, known as the point of data saturation.³⁴⁻³⁶ Some tweets embodied more than one theme and were therefore coded into multiple categories. To establish the study's reproducibility and validity,^{37,38} the PI established fair inter-rater reliability with a second coder. Cohen's Kappa for inter-rater agreement = 0.42 and percentage agreement was 98.7.³⁹ based on an analysis of 25% of the total DT tweets.⁴⁰ The PI and second coder then discussed and resolved all differences in coding results and produced a final codebook. During this process they agreed that a small percentage (11.3%) of tweets represented isolated, unrelated concepts not sufficient enough to warrant unique themes. Thus, a final category of "other" was developed for these tweets

and the codebook was finalized. The PI then coded all tweets following the final codebook.

Next, the PI coded the tweets into themes by geographic area to determine which locations were tweeted about most. Following the same methodology used to code the tweets into themes, each tweet was coded based on geographical locations which emerged from the data. Each tweet explicitly stating geographical location information was first coded into one of the geographic location themes. Then, to determine which messages users most frequently relayed to others, the PI identified the number of retweets received per tweet. A retweet is an original tweet which has been forwarded from one user to all of the followers of the user. This is similar in concept to forwarding an email to a list of contacts. The more a message is retweeted, the wider the message is distributed and the further the discourse is developed. The top 25% most retweeted tweets were identified and then coded into the same categorical themes identified in the final codebook.

Lastly, the qualitative results were arranged into easily interpretable formats. To depict the information displayed most frequently by DT, the number of references per theme were compiled into word clouds using the online Word It Out word cloud generator.⁴¹ These word clouds provided a visual representation of how frequently each theme appeared across the year of DT tweets by displaying each theme at a size proportionate to the number of references contained in that theme. For example, if the theme “humor” contained 100 tweets and “complaints” contained 50 tweets, “humor” would appear twice as large as “complaints” in the word cloud. The frequency of

references per geographic environment and the most retweeted tweets were also assembled into word clouds.

Results

Drinking Ticket Content

Eighteen themes were identified across the year of DT tweets. Table 4.1 presents the frequencies of tweets per theme, and a word cloud that depicts these themes is presented in Figure 4.1. One example of a theme not about alcohol was “safety alert” defined as “messages to followers informing them of confirmed, reported, or suspected dangerous situations to avoid.” The accompanying example tweet was, “SAFETY ALERT: individual with a gun spotted near 2314 [X street]. Exercise caution and report suspicious activity via 911 immediately.”

Table 4.1 Description, frequency, and proportion of themes of information and geographic themes displayed in DT tweets from 12/20/2013 to 12/19/2014

Categorical content of tweets

Theme	Theme definition	Tweet example	Freq.	%
Police emergency personnel presence	used when the intention of the police or emergency personnel (e.g. fire trucks) on location is not clear or stated	Fire department and EMS south quad	181	17.1
Traffic updates	information on the flow of traffic, including congestion, delays, stops, accidents etc. does NOT include information about DUI checkpoints, speed	Major accident intersection of [X and X avenue] moped v car. Injuries reported. Use detour	180	17.0

	traps, or involvement of police in apprehending drivers or citizens for any reason.			
Speed trap locations	alerts to followers of locations where police will be enforcing only speed limit laws	[XPD] is looking for speeders under the [X St] bridge.	112	10.6
Does not fit	all tweets that do not fit into any of the other categories.	Good luck to the PNMs of [#X18] with their first day of Sorority Recruitment. Remember to keep an open mind and don't stress! #GoGreek	97	9.2
DUI checkpoint location*	information about specific locations of DUI (driving under the influence) police checkpoints only	DUI Checkpoint: [X Blvd] exit as you're coming off [I-X].	95	9.0
Safety alert	messages to followers informing them of confirmed, reported, or suspected dangerous situations to avoid. NOT including information about wanted criminals, which has its own theme.	SAFETY ALERT: individual with a gun spotted near 2314 [X street]. Exercise caution and report suspicious activity via 911 immediately.	86	8.1
Traffic laws enforcement	active police enforcement of traffic laws. Can include specific types of traffic enforcement (e.g. watching stop signs) or	police watching stop signs at [X + X] street intersection	49	4.6

	non-specific types of traffic enforcement (e.g. HEAT units being present) Does NOT include speed traps and DUI checkpoints.			
Community event	notice to followers about community events and gatherings. Includes events that are free to the public and those which require payment for entry. Includes events for entertainment purposes (e.g. a concert) and non-entertainment purposes (supporting a cause) Does NOT include tweets involving bars.	Since [@X] has denied permission for candlelight vigil, it will now be on the north lawn of [X] at 7pm bring a candle.	42	3.9
Illegal parking enforcement	information on towing and ticketing of illegally parked vehicles	They're towing people off the grass and yellow curbs in [X] if you're not in a parking spot you're getting towed.	39	3.7
X alcohol enforcement agency*	X alcohol enforcement agency active enforcement or presence. This is the only agency which can enforce liquor laws in the state.	[X alcohol enforcement agency] is out tonight white Middle age 1 male wearing camo 1 female in black jacket.	34	3.2

Business promotion	promotion of businesses that are not bars	3/4 bedroom apts available in [X] individual leases offered. Call 8036673705 for info. Mention @DrinkingTicket for a great rate.	28	2.7
Bar alcohol specials*	bar (i.e. on-premise alcohol retailers) specials originally tweeted by specific bars and retweeted by Drinking Ticket, and those independently tweeted by Drinking Ticket. May or may not contain the price of alcoholic drinks and kind of alcoholic drinks on special	Congratulations New Graduates of 2014! Tonight [@X] will be doing \$3 jäger bombs and .50 beer until midnight for all new graduates!	28	2.7
Correction of misinformation	corrections of misinformation including previous tweets with false information posted by Drinking Ticket, denouncing rumors, and misinformation presented publicly through non-Drinking Ticket sources	CORRECTION confirmation of injured individual still waiting on verification if he's a student or not. More info as we get it	27	2.6
Wanted criminals	includes descriptions of wanted criminals. includes both those connected with description of crime committed and those	Retweet: WANTED FOR HIT & RUN on two student pedestrians in entertainment district 1 this weekend. [XX	24	2.3

	without a description of the crime. Actively wanted criminals only, not those that have been apprehended.	PLATE: XXX-XXX] If seen call [XPD] – photo attached-		
Attempt to deter crime	tweets asking followers to report information to police on attempted crime and crimes in progress. Also includes information about potential criminals that have been spotted. May or may not include descriptions of the criminals.	They just broke into a car by building 9 in the [X student housing community]. Police on route. If you see this silver sedan or the black males call police.	14	1.3
Disbanding parties by police*	information about police disbanding parties. Includes those which reasons for disbandment are provided and those which reasons are not provided.	Units on foot in [X student housing community] going door to door breaking up apartments with loud music.	10	1.0
Appreciation of service people	expressions of appreciation for all branches of the armed forces and public service employees such as police officers and fire fighters	Happy Veterans Day! Thank you to all of those in the armed forces who have served our country.	10	1.0
Complaints	expressions of dissatisfaction with various situations. Does	Sad as this is, we have armed robberies happening on campus meanwhile two	8	0.8

	not have a humorous undertone.	students were just written J-Walking tickets over by [X building]...		
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Geographic environments referred to in tweets

Theme	Definition	Tweet example	Freq.	%
Off-campus (General)	All areas off-campus that are not specifically the Vista, Five Points, or the student housing communities.	Multiple police cars in the median of [X Drive] going into X town using radar to look for speeders in both directions.	284	41.0
Student housing communities	All apartment-style communities which house mostly students off-campus	[X student housing community]: be on the lookout for a silver sedan with 2-3 black men in it driving around. They have attempted 1 auto break in already	177	25.6
On campus	All areas within the limits of university property.	Firetruck just pulled up to East Quad. Reason unknown.	145	21.0
Entertainment district #1	High alcohol-outlet density entertainment district east of campus which is known as a destination for student drinkers.	[X alcohol enforcement agency]out in [entertainment district one] tonight last seen intersection of [X and X street]	82	11.8

Entertainment district #2	High alcohol-outlet density entertainment district north of campus which is known as a destination for young professionals	Extremely heavy police presence in [entertainment district two]tonight multiple pull overs and HEAT unit is out last spotted near [X street]	4	1.0
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Figure 4.1 Word cloud depiction of information displayed by Drinking Ticket tweets from 12/20/2013 to 12/19/2014

An example of a theme about alcohol was “DUI checkpoint location,” which was defined as “information about specific locations of DUI [driving under the influence] police checkpoints”, and illustrated with the tweet “DUI Checkpoint: [X Blvd] exit as you're coming off [I-XXX].” The most prevalent theme across all DT tweets was “police emergency personnel presence,” followed by “traffic updates” and “speed trap locations.” The themes that were represented least were “disbanding parties by police,” “appreciation of service people,” and “complaints.” Approximately 16% of tweets contained information about alcohol, while 84% did not.

Drinking Ticket Geographic Location

The following five location themes emerged from the data: off-campus, student housing communities, on campus, entertainment district one, and entertainment district two. Entertainment district one is an area with high alcohol outlet density east of campus that is frequented by students. Entertainment district two is another high-alcohol outlet entertainment district north of campus frequented primarily by young professionals. All tweets that contained information about off-campus locations other than the student

housing communities, entertainment district one, and entertainment district two were coded as off-campus. The most frequently referenced geographic location was off-campus (79% of tweets), followed by student housing communities, on campus, entertainment district 1 and entertainment district 2. Figure 4.2 presents the word cloud illustrating the geographic locations referenced by tweets, and the frequency of references per location theme is presented in Table 4.1.



Figure 4.2 Word cloud depiction of geographic locations referenced in Drinking Ticket tweets from 12/20/2013 to 12/19/2014

Drinking Ticket Most Retweeted Information

The most frequently retweeted theme was safety alert, followed by humor and community event. The word cloud and frequencies of the most retweeted information is presented in Figure 4.3.



Figure 4.3 Word cloud depiction of most retweeted themes referenced in Drinking Ticket tweets from 12/20/2013 to 12/19/2014

Comment

Despite the name Drinking Ticket, the vast majority of DT posts did not contain information about alcohol use. Rather, the most frequently occurring tweets pertained to police and emergency personnel presence (e.g., fire trucks, squad cars, and ambulances). Roadside information was also strongly represented. The most frequently referred to geographic location was off-campus and the most retweeted theme was the safety alert. This supports the notion that DT may not be used by students as a source of alcohol-related law enforcement information. Instead, students use DT as a source of broader alert information to keep them safe and avoid traffic inconveniences as they travel across campus and the surrounding community. There are available crowdsourced smartphone apps for traffic information (e.g. Waze, INRIX XD),^{42,43} yet students may prefer DT

because it caters specifically to the areas of the community frequented by students and includes other kinds of information in addition to traffic updates. They may also prefer DT because it is student-centered, posting crowdsourced information shared mostly by (and for) students. Additionally, DT is part of the Twitter social media platform that many students are already familiar with using. While DT does have non-student followers, the primary audience for information displayed on DT appears to be the university population.

The results of the current analysis provide insights into the nature of the needs of postsecondary institutions to deliver real-time emergency alerts to students. In light of ongoing campus tragedies such as mass shootings, it is imperative that colleges are able to swiftly inform students and university personnel about safety threats.^{44,45} During 2015, there were 25 shootings on college campuses, killing 23 people and leaving 30 injured.⁴⁶⁻⁴⁸ Many university administrators have developed forming risk management strategies in response to potentially dangerous events as a way to minimize harm to the community.^{49,50} Thus, most institutions now issue a timely emergency notification to the campus community in the event of an ongoing threat.⁵¹ For most institutions, these alerts are delivered in the form of electronic communications such as emails, phone calls, and text messages as well as verbal or auditory warnings such as an announcement on overhead speakers and/or sounding an emergency alarm.⁵² Social media has proven to be an effective way for individuals to alert each other in crisis and emergency events.⁵³ Considering students' high use of social media, it is in institutions' best interest to employ the most innovative methods of alerting students through their preferred social media platforms.

There is a university-sanctioned alert system in the community served by DT that distributes messages only when there is a confirmed, active threat on campus.⁵⁴ DT, however, is run by private, individual students, who need not wait for threats to be confirmed by police or other emergency personnel before posting a tweet for the community. Unconfirmed, inaccurate threats tweeted by DT have the potential to cause unjustified distress in the community, yet the creators of DT value expediency of information sharing, and have issued corrections in the past regarding tweets which were inaccurate. Multiple criticisms of the university alert system have been presented in the campus newspaper. These include the following: 1) an unacceptable delay between time of occurrence of the emergency and receipt of alert;⁵⁵ in one instance taking nearly 24 hours;⁵⁶ 2) not providing adequate detail about the threat;⁵⁵, and 3) not informing the campus about a wide enough array of potential threats.⁵⁷⁻⁵⁹ As one student author puts it, “The [university alert system] should not just be a resource reserved for the most extreme cases; the system has the power to inform students of all types and levels of emergencies.”⁵⁸

Our results suggest that DT is a platform that is capable of addressing these concerns. During October 2015, the university community served by DT experienced devastating floods. DT diligently reported pertinent news information to its users including evacuation notices, road closures, boil water advisories, university closings, announcements of civil curfews, and flood recovery efforts. During this time, DT gained over 2,000 followers in just 10 days.⁶⁰ Many students trust that DT will break news before the university alert system and other news outlets. Subscription to the university alert system is strongly encouraged by the university, however, following DT is a

voluntary choice made by many students. This may make DT more attractive as a news and emergency alert source for students who already willfully interact with it by sending DT tips and updates. Students also habitually review DT's tweets outside of times of heightened alert.

The results of this study also suggest that DT distributes alert messages referencing the diverse locations where students are likely to be, not solely on campus as in the university alert system. The utility of DT as an emergency alert system is supported by the current findings that the most frequently retweeted theme was "safety alert" and the most frequent geographic location referenced was "off-campus." For all institutions, it is critical to maintain student safety whether the population is on or off-campus. An additional criticism of existing university alert systems is that they generally only report information about on campus locations.⁵⁴ At the university served by DT, 71% of students live off-campus.⁶¹ Nationwide, across all classifications of higher education institutions, only 22% of undergraduate students reside on-campus. At four-year institutions, 54% of students reside on-campus.⁶² At schools where many students live off-campus, it is especially important to adopt methods of informing students of threats which could occur outside of campus property.

Strengths

To the best of our knowledge, this study is the first to examine the content of a student-driven, crowdsourced social media platform which relays information about alcohol-related law enforcement to college students. The rigorous qualitative methodology for conducting the analysis ensured that the data were approached in a systematic manner. The year-long reference period of the tweets controlled for any

historical threats to internal validity, such as fall vs. spring semesters, holiday breaks, and various events like home football games. This study advances the knowledge of content of a case study student-driven social media platforms which may compete with university-sanctioned emergency alert systems.

Limitations

The findings of the current study must be viewed in light of its limitations. The current study evaluates one calendar year of tweets on one specific social media platform at a large, public, urban, southeastern University with a qualitative approach. Therefore, these results may not be appropriate to generalize to other university settings with different characteristics or other student-created social media platforms which relay information about alcohol-related law enforcement or emergency alerts. The findings would have been strengthened by collection of data on students' reasons for using DT and their trust in it, as well as their perceptions on how DT compares to the university alert system.

Conclusions

The current content analysis of the DT platform identified the most frequently presented themes in DT, the geographic environments most frequently referenced, and the most widely re-shared themes by users of DT. Roadside information such as police emergency personnel presence, traffic updates, and speed trap locations were the most frequently tweeted themes of information by DT. The vast majority of tweets concerned off-campus locations, and the most frequently re-shared messages by DT users were safety alerts. This provides evidence that student-driven social media platforms have great potential to quickly distribute emergency alerts to the wider university community

including areas beyond campus boundaries. It would be useful to examine students' trust in student-driven social media platforms for delivering emergency alert messages to determine if such platforms could supplement university-sanctioned alert systems. Further research should include additional content analyses of similar popular social media platforms which distribute information about alcohol-related law enforcement and/or emergency alerts at other postsecondary institutions with diverse characteristics. Additionally, researchers should explore whether viewing social media messages, specifically about alcohol-related law enforcement, has an impact on individual alcohol consumption behaviors. In summary, student-led social media platforms similar to DT that provide students with real-time, freely accessible information regarding all of the environments where they live, learn, work, and play, should be at minimum be monitored and better still, encouraged by universities. As evidenced by this study, analyzing student-led social media platforms such as Twitter has the potential to reveal useful insights into the student-generated discourse about many aspects of university life.

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Note

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4.2 Specific Aim 1 Supplemental Results

In addition to those analyses presented in manuscript1, further research questions and follow-up analyses were completed. Those presented in this results section include **RQ3a**, Does the frequency of information relayed by Drinking Ticket® vary over time?, and **RQ3b**, Does the frequency of information relayed by Drinking Ticket® and its users vary over time?

The top 3 most retweeted tweets of the year, **Follow-up analysis 1**, What proportion of Drinking Ticket® tweets are about alcohol?, **Follow-up analysis 3**, Does Drinking Ticket® tweet more often on high drinking days than typical days?, and **Follow-up analysis 4**, Does Drinking Ticket® tweet a greater proportion of tweets about alcohol on high drinking days than on typical days? presented in Appendix C. A review of all specific aim 1 results is presented in Table 4.X Specific Aim 1 Results Summary. **RQ3a: Does the frequency of information relayed by Drinking Ticket® vary over time?**

There were markedly more tweets during academic months when students were enrolled in classes and presumably residing near the university, and less tweets during non-academic months. The most tweets were posted in April with 111 tweets, followed by September with 98 tweets and August with 95 tweets. These are all academic months. Those months with the fewest tweets were all non-academic months. This included December with 35 tweets and May with 40 tweets. This was closely followed by January with 42 tweets, which was dichotomized as an academic month although classes are held only during the last two weeks of the month. There were a total of 657 tweets during academic months with a mean of 82.1 tweets per month. Conversely, there were a total of 176 tweets per non-academic month, with a mean of 44 tweets per month. An independent means T-test revealed that there was a significant difference between

academic months tweets ($M=82.1$, $SD=23.99$) and non-academic months tweets ($M=44$, $SD=9.42$); $t(10)=3.0041$, $p = 0.0132$. These results are presented in Figure 4.4. The striped bars represent months dichotomized as during the academic semester and the solid bars represent months dichotomized as not during the academic semester.

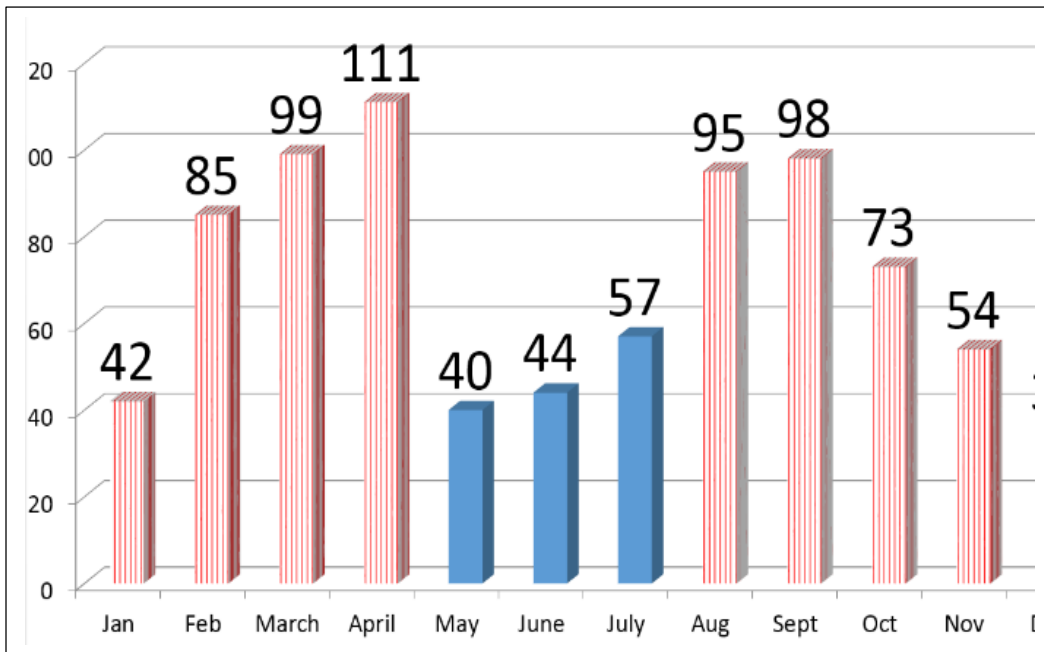


Figure 4.4 Number of tweets by month

There was a clear increase in tweeting during non-school nights compared to school nights. Friday had the most tweets with 170, followed by Saturday with 167 tweets, and Thursday with 120 tweets. These three days are all non-school nights. Those days with the fewest tweets fell on school nights. This included Monday with 82 tweets, and Wednesday with 84 tweets. There were a total of 398 tweets during school nights, with a mean of 99.5. For non-school nights, there was a total of 457 and a mean of 152.33 tweets. An independent means T-test revealed that there was a significant difference between school night tweets ($M=99.5$, $SD=19.14$) and non-school night tweets

($M=152.33$, $SD=28.04$); $t(5)=2.9926$, $p = 0.0304$. These results are presented in Figure 4.5. The striped bars represent those days which are not school nights and the solid bars represent those days which are school nights.

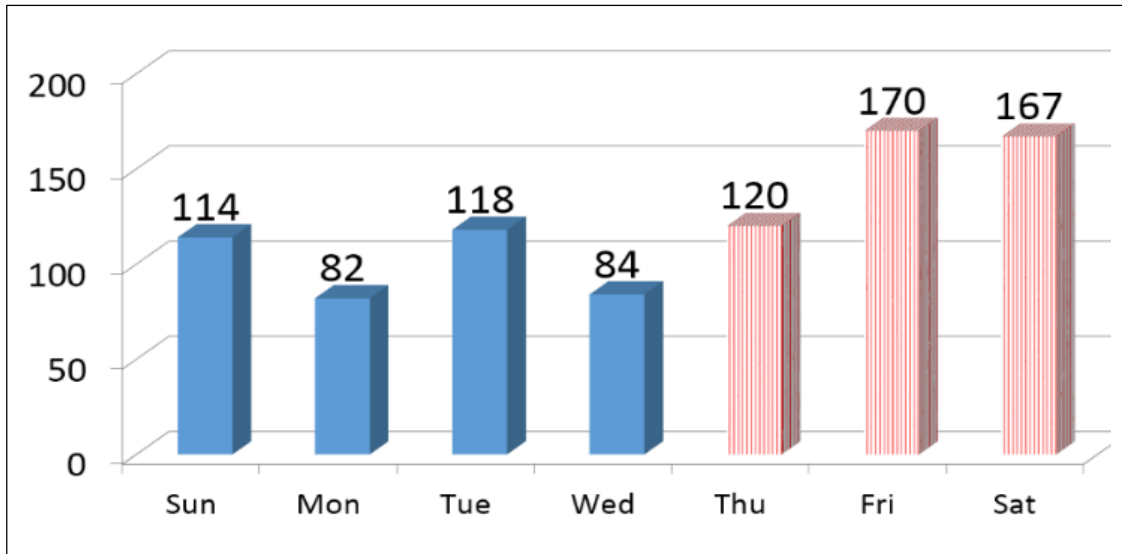


Figure 4.5 Number of tweets by day of the week

RQ3b: Does the frequency of information relayed by Drinking Ticket® users vary over time?

The same trend observed in the number of original tweets was found in the number of retweets by academic months and non-academic months. There were more retweets during academic months when students are on campus and actively engaged in the community compared to months when classes are not in session. September had the most retweets with 6,271, followed by February with 3,635, and November with 3,557. All three of these top- retweeted months fell during academic months. Those months with the fewest tweets were during non- academic months. This included December with 867 retweets, May with 1,102 tweets, and July with 1,651 tweets. There were a total of

26,851 retweets during academic months with a mean of 3356.38 retweets per month. This is compared to 5,845 retweets per month during non- academic months, with a mean of 1,461.25 retweets. An independent means T-test revealed that there was a significant difference between academic month retweets ($M=3,356.38$, $SD=1300.75$) and non-academic month retweets ($M=1461.25$, $SD=6.5.95$); $t(10)=2.72$, $p =.0216$. These results are presented in Figure 4.6. The striped bars represent those months during the academic semester and the solid bars represent the months not during the academic semester.

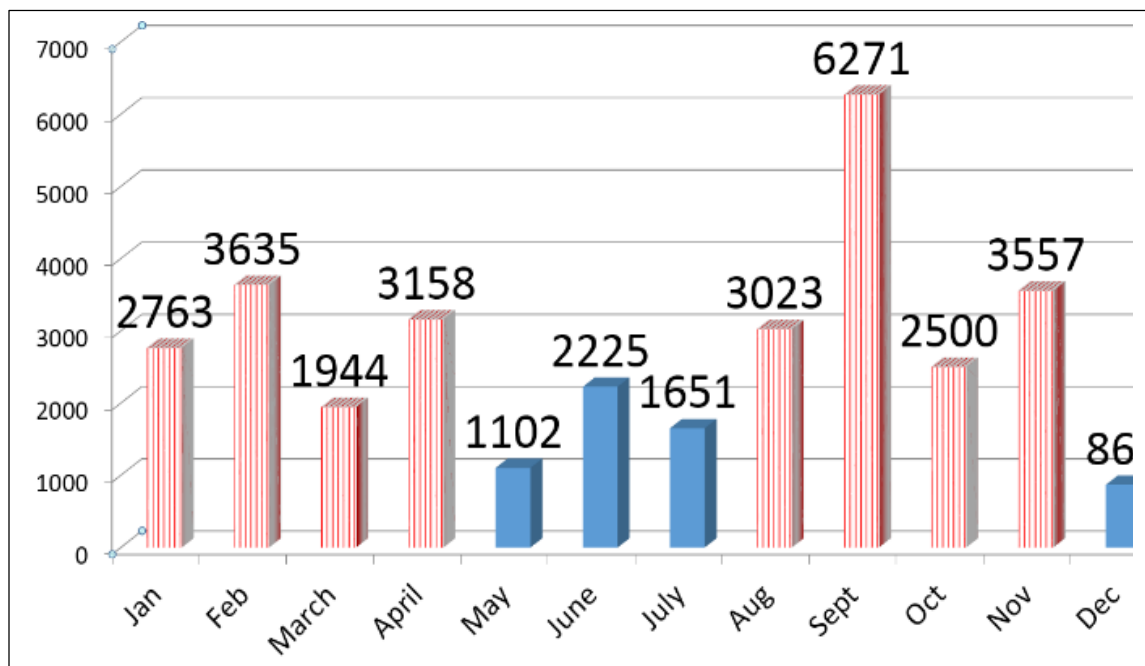


Figure 4.6 Number of retweets by month

The day of the week with the highest number of retweets was Tuesday with 7,542, followed by Thursday with 5,098 retweets and Friday with 4,878 retweets. Those days with the fewest retweets were Wednesday with 3,250, Saturday with 3,832, and Monday with 4,482. There were a total of 19,782 retweets during school nights, with a mean of 4,945.5 retweets per school night. For non-school nights, there was a total of 13,808 and

a mean of 4,602.67 per non-school night. An independent means T-test revealed that there was not a significant difference between school night retweets ($M=4,945.50$, $SD=1,827.82$) and non-school night retweets ($M=4,602.67$, $SD=676.42$); $t(5)=0.3035$, $p=0.7737$. These results are presented in Figure 4.7. The striped bars represent those days dichotomized as non-school nights and the solid bars represent those days dichotomized as school nights.

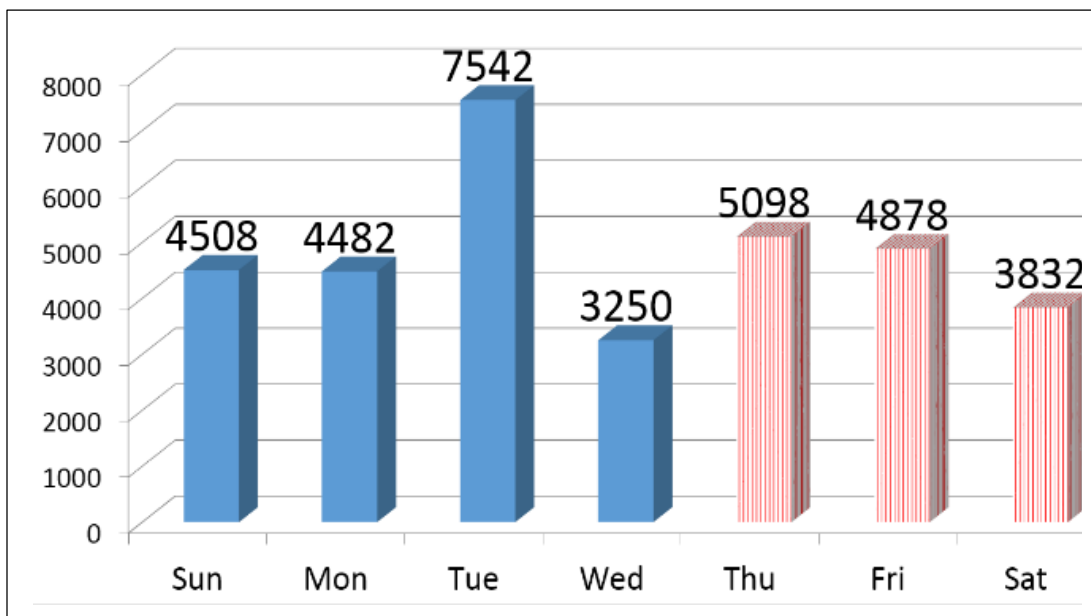


Figure 4.7 Number of retweets by days of the week

Table 4.2 Specific aim 1 results summary

**Detailed
Results
Location**

RQ 1: What types of information are displayed by the social media platform Drinking Ticket® to its users?

Manuscript 1

<u>Theme</u>	<u>Freq.</u>	<u>% or Mean</u>
Police emergency personnel presence	181	17.1
Traffic updates	180	17.0
Speed trap locations	112	10.6
Other	97	9.2
DUI checkpoint location	95	9.0
Safety alert	86	8.1
Traffic laws enforcement	49	4.6
Community event	42	3.9
Illegal parking enforcement	39	3.7
SLED	34	3.2
Business promotion	28	2.7
Alcohol bar specials	28	2.7
Correction of misinformation	27	2.6
Wanted criminals	24	2.3
Attempt to deter crime	14	1.3
Disbanding parties by police	10	1.0
Appreciation of service people	10	1.0
Complaints	8	0.8

RQ 2: What information on the social media platform Drinking Ticket® do users most frequently relay to others?

Manuscript 1

Rank ordered into quartiles of retweets

First Quarter: 0-5 retweets	214	25.4
Second Quarter: 6-12 retweets	230	27.3
Third Quarter: 13-27 retweets	191	22.6
Fourth Quarter: 28-943 retweets	207	24.6

Themes by 4th quartile retweets

Safety alert	25	23.0
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Humor	16	14.7
Community event	11	10.1
Traffic updates	11	10.1
Wanted criminals	10	9.2
Other	8	7.3
Attempt to deter crime	4	3.7
Complaints	4	3.7
Correction of misinformation	3	2.8
Speed trap locations	3	2.8
Appreciation of service people	3	2.8
Alcohol bar specials	2	1.8
Business promotion	2	1.8
DUI checkpoints	2	1.8
SLED	2	1.8
Police emergency personnel presence	2	1.8
Traffic laws enforcement	1	1.0

RQ 3a: Does the frequency of information relayed by Drinking Ticket® vary over time?

Chapter 4 Results

Number of tweets by month

January	42	50.4
February	85	10.2
March	99	11.9
April	111	13.3
May	40	4.8
June	44	5.3
July	57	6.8
August	95	11.4
September	98	11.8
October	73	8.8
November	54	6.5
Dec	35	4.2

Number of tweets during semester months: Jan., Feb., Mar., Apr., Aug., Sept., Oct., Nov.

657 Mean of all months 82.1

Number of tweets not during semester months: May, June, July, Dec.	176	Mean of all months 44
Number of tweets by day of the week		
Monday	114	13.3
Tuesday	82	9.6
Wednesday	118	13.8
Thursday	84	9.8
Friday	120	14.0
Saturday	170	20.0
Sunday	167	19.5
Number of tweets during school nights: Sun., Mon., Tues. Weds.	398	Mean of all school night days of the week: 103.6
Number of tweets not during school nights: Thu., Fri., Sat.	457	Mean of all non-school night days of the week: 168.5

RQ 3b: Does the frequency of information relayed by Drinking Ticket® and its users vary over time?

**Chapter 4
Results**

Number of retweets by month		
January	2,763	8.4
February	3,635	11.1
March	1,944	5.9
April	3,158	9.7
May	1,102	3.4
June	2,225	6.8
July	1,651	5.0
August	3,023	9.2

	September	6,271	19.2
	October	2,500	7.6
	November	3,557	10.9
	Dec	867	2.7
Number of retweets during semester months: Jan., Feb., Mar., Apr., Aug., Sept., Oct., Nov.		26,851	Mean of all during semester months 3,356.4
Number of retweets not during semester months: May, June, July, Dec.		4,978	Mean of all not during semester months 1,461.3
Number of retweets by day of the week			
	Monday	4,508	13.4
	Tuesday	4,482	13.3
	Wednesday	7,542	22.4
	Thursday	3,250	9.7
	Friday	5,098	15.2
	Saturday	4,878	14.5
	Sunday	3,832	11.4
Number of retweets during school nights: Sun., Mon., Tues. Weds.		20,364	Mean of all school nights days of the week: 4,945.5
Number of retweets not during school nights: Thu., Fri., Sat.		13,226	Mean of all non-school nights days of the week: 4,602.7

Follow-up analysis 1: What proportion of Drinking Ticket® tweets are be about alcohol?

Appendix C

About alcohol

DUI checkpoint location	95	56.9
SLED	34	20.4
Alcohol bar specials	28	16.8
Disbanding parties by police	10	6.0
total	167	15.7

Not about alcohol

Police emergency personnel presence	181	20.2
Traffic updates	180	20.1
Speed trap locations	112	12.5
Other	97	10.8
Safety alert	86	9.6
Traffic laws enforcement	49	5.5
Community event	42	4.5
Illegal parking enforcement	39	4.3
Business promotion	28	3.1
Correction of misinformation	27	3.0
Wanted criminals	24	2.7
Attempt to deter crime	14	1.6
Appreciation of service people	10	1.1
Complaints	8	1.0
total	897	84.3

Follow-up analysis 2: What locations/environments does Drinking Ticket® tweet about most often?

Manuscript 1

Off campus	284	41.0
Student housing communities	177	25.6
On campus	145	21.0
Five Points	82	11.8
The Vista	4	1.0

Follow-up analysis 3: Does Drinking Ticket® tweet more often on high drinking days than typical days?

Appendix C

High drinking days

Home football games 8/28/14	3	5.0
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9/6/14	2	3.3
9/13/14	7	11.7
9/27/14	2	3.3
10/18/14	3	5.0
11/1/14	0	0
11/22/14	3	5.0
Halloween 10/31/14	0	0
New Year's Eve 12/31/14	7	11.7
St. Patrick's Day 3/15/14	10	16.7
Carolina Cup 3/29/14	15	25.0
Cinco De Mayo 5/5/14	1	1.7
Independence Day 7/4/14	7	11.7
Average # tweets on high drinking days		4.6
Average # tweets on typical days		4.9

Follow-up analysis 4: Does Drinking Ticket® tweet a greater proportion of tweets about alcohol on high drinking days than on typical days?

Appendix C

High drinking
days by theme
About alcohol

DUI checkpoints	14	51.9
Disbanding parties by police	5	18.5
Alcohol bar specials	4	14.8
SLED	4	14.8
Total about alcohol	27	33.8

Not about
alcohol

Other	17	32.1
Traffic updates	13	24.5
Police emergency personnel presence	9	17.0
Safety alert	5	9.4
Speed trap locations	5	9.4
Correction of misinformation	2	3.8
Illegal parking enforcement	2	3.8
Total not about alcohol	53	66.3

4.3 MANUSCRIPT II: DIFFERENCES IN ALCOHOL CONSUMPTION AND SOCIAL
MEDIA USE AMONG USERS AND NON-USERS OF AN ALCOHOL LAW
ENFORCEMENT-RELATED SOCIAL MEDIA ACCOUNT¹

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Submitted to *The Journal of American College Health*, 3/7/2016

Abstract

Objective: The purpose of this study was to determine if users of a local, student-driven social media platform named @Drinking Ticket (DT) that relays information about alcohol-related law enforcement, differed from non-users in alcohol consumption behaviors after controlling for sociodemographic characteristics and perceived risk of being punished for illegal alcohol use.

Participants: A diverse sample of 648 undergraduate students at a large, public, southeastern university were surveyed regarding their DT use, alcohol use behaviors, and perceived risk.

Methods: Hierarchical linear regression was used to determine if there were differences between DT users and non-users on alcohol outcomes encompassing both frequency and quantity of alcohol consumption.

Results: DT users consumed more alcohol than DT non-users, even after controlling for sociodemographic characteristics and perceived risk.

Conclusions: Given the higher-risk user base of student-driven crowdsourced social media platforms, these platforms may present a particularly useful space for presenting alcohol risk reduction messages.

Key words: social media, college alcohol use, alcohol-related law enforcement

Significant resources have been allocated to prevent high-risk alcohol use among college students, yet college drinking rates have remained largely unchanged over the past 35 years.¹⁻⁴ Alcohol is responsible for an estimated 1,825 deaths, 599,000 injuries, 696,000 assaults, and 97,000 cases of sexual abuse in college communities each year.⁵ Individuals who drink to excess are at increased risk for the development and exacerbation of mental illnesses,⁶ academic failure,⁷ and unintentional injuries.⁸ Alcohol use also damages college community-level well-being by being associated with property damage,⁹ unprotected sex (resulting in sexually transmitted disease transmission and unplanned pregnancies),¹⁰ violence,¹¹ sexual assault,^{9,12} and drunk driving crashes.^{13,14} The high cost of alcohol misuse justifies the concerns of postsecondary institutions to prevent high risk-alcohol use in the college population.^{15,16}

Universities create and enforce laws and policies to restrict access to alcohol, particularly among underage students, as a means to reduce alcohol-related harms on campus. In college communities where alcohol-related laws and policies are consistently enforced, underage alcohol consumption and alcohol-related problems,¹⁷⁻¹⁹ as well as injury and death related to alcohol-impaired driving are reduced.^{20,21} Outside of college communities, increased awareness of alcohol-related law enforcement such as sobriety checkpoints has also been associated with reduced alcohol misuse behaviors.^{22,23} This might suggest that increased knowledge of the presence of alcohol-related law enforcement among college students would translate to lower rates of alcohol misuse and alcohol-related consequences.

Access to information about alcohol-related law enforcement has evolved reflecting advancements in technology, and can reach consumers from a variety of

sources. Many police departments publicize sobriety checkpoint location through news print, online sources, and social media platforms.²⁴ More recently, software applications (i.e., “apps”) and social media platform accounts have been developed to compile information about alcohol law enforcement activities. Many of these apps are designed to be used on smartphones so that users can stay informed about enforcement activities while traveling, such as DUI Dodger, Mr.Checkpoint™, and Sobriety Alerts®. For each of these platforms, users submit alerts about known sobriety checkpoints in their communities. The app then gathers these data and produces a map or list of checkpoint locations. Users may also elect to receive direct notifications when a sobriety checkpoint is occurring near his or her location.

In 2011, U.S. Senators Reid, Schumer, and Lautenberg requested that Apple, Google, and RIM (organizations which distribute apps) remove the apps from their marketplaces²⁵ based on the assumption that increased knowledge of enforcement activities would allow drivers to evade being reprimanded by law enforcement and lead to increased alcohol-impaired driving. However, many are advertised by their creators as alcohol-impaired driving *prevention* tools which keep communities safer from the hazards imposed by intoxicated drivers.^{26,27} To date, no formal legislation against the apps has been proposed, and the apps remain available for download.

Drinking Ticket® (DT) is a popular, local, student-driven Twitter account with 45,700 followers as of March 7, 2016. DT is a crowdsourced social media platform, defined as one that solicits information from large groups of people to fulfill a wide range of goals.^{28,29} The owner of DT relies on crowdsourced information from students and community members across all areas of the city. For example, a DT user might send

information to the owner of DT Twitter account stating “@DrinkingTicket I saw 2 officers breaking up a party at [blinded] student housing complex.” The owner of the DT account would then decide to tweet the information to DT followers if the information is deemed as both relevant to DT users and “trustworthy” (i.e., multiple reports of the same information from different sources). Such information in the past has reflected community interests such as roadside information, information on community events, and safety alerts. As implied by its name, DT also tweets information about alcohol-related law enforcement activities such as sobriety checkpoint locations, presence of alcohol enforcement agencies, and locations where police are disbanding underage drinking parties.³⁰ DT has recently expanded to another university within the state, and its developers plan to expand its services to college campuses nationwide.³¹

To date, it is unclear whether social media platforms such as DT that relay information about alcohol-related law enforcement encourage or prevent high-risk behaviors among college students. It is possible that college students who have access to real-time information on alcohol-related law enforcement when they drink would have a different perceived risk for legal consequences when compared with students who do not have access to this information. Moreover, no studies have systematically examined the characteristics of the user base of these social media platforms, especially regarding alcohol consumption patterns, and how they might differ from non-users. If DT users are found to exhibit higher alcohol-risk behaviors, they may be an essential target for alcohol risk reduction interventions in college communities. The purpose of the current study was to determine if users of the DT platform differ in their alcohol use behaviors compared to DT non-users, and if so, whether these differences persist after controlling for

sociodemographic characteristics, social media engagement, and perceived risk of legal consequences.

Methods

Participants

Data were gathered from 658 undergraduate students who attend the major public university in the area covered by DT. The survey was launched on April 4th, 2015, and was closed on May 10th, 2015. Criteria for inclusion in the current study were those individuals who: 1) were currently enrolled as an undergraduate student at the university; 2) reported being age 18 years or older; and 3) had consumed alcohol at least once in the past 30 days.

Measures

A 120-item online questionnaire was administered that assessed participant characteristics including sociodemographic information, use of DT, social media use, perceived risk for alcohol-related consequences, and alcohol consumption behaviors.

Participant Characteristics

Sociodemographic information collected included: age, self-identified ethnicity, gender, class standing (e.g. freshman, senior), housing status (e.g. on-campus residence hall, off-campus housing), and approximate grade point average. *Drinking Ticket user or non-user status* was determined with the question: “Have you ever viewed Drinking Ticket tweets on Twitter or visited the Drinking Ticket webpage?” Those who answered “yes” were considered DT users, and those who answered “no” were considered DT non-users.

Social Media Use

A scale adapted from Thompson, (2013) ³² examined students' *social media use* by measuring the frequency in which students interact with various platforms on a response scale from 1 = "never" to 8 = "more than once an hour." Examples of interactions include updating their profile on a social network site (e.g. Facebook) and checking updates on a microblogging site (e.g., Twitter). The scale was scored by summing the responses to each of 9 items, resulting in a scale with values ranging from 9 to 72, with higher values indicating greater social media engagement.

Perceived Risk for Alcohol-Related Consequences

Participants were assessed on their *perceived risk* of receiving a consequence from the police or university authorities for 10 unlawful alcohol use behaviors (e.g., being intoxicated in public, using a false identification to purchase alcohol, and providing alcohol to minors). Their perceived risk was measured using a self-developed instrument measuring three dimensions of perceived risk: 1) certainty 2) magnitude, and 3) swiftness. Perceived certainty for being punished was assessed by how likely the participants believed it is that they would be punished for each of the behaviors on a scale from 1 = "not at all likely" to 10 = "absolutely certain." Perceived magnitude of the punishment was defined as how serious participants believed the punishment would be for each of the behaviors on a scale from 1 = "not at all serious" to 10 = "extremely serious." Perceived swiftness of the punishment was assessed by how soon they believed the punishment would occur for each of the behaviors on a scale from 1 = "in the distant future" to 10 = "immediately." Scores were summed for each category (certainty, magnitude, and swiftness) and cumulatively across the three categories, with higher

scores indicating greater perceived risk for alcohol-related consequences (range = 30 – 300).

Alcohol Consumption

Two measures of students' *alcohol consumption* (defined as “drinks per month” and “amount binged”) were assessed using a combination of questions typically asked of students in national college health surveys. One question was adapted from the CORE Alcohol and Drug Survey,³³ which inquired about the average number of standard drinks the participant consumes during a typical drinking occasion. Standard drinks were presented with an image of the measure of one standard drink for different types of alcohol (i.e., 12oz. regular beer = 8-9 oz. malt liquor =5 oz. table wine =1.5 oz. 80 proof spirits). Two questions were adapted from the National College Health Assessment (NCHA)³⁴ including during how many of the past 30 days the participant drank alcohol and the number of times the participant binge drank within the past two weeks.

From these survey questions, two measures were created to provide a representation of participants' overall alcohol consumption that included both frequency and quantity of alcohol intake. The first was “drinks per month,” which was created by multiplying the average number of drinks consumed per drinking occasion by the number of days the participant consumed alcohol in the past month. The second was “amount binged,” created by multiplying the average number of drinks consumed per drinking occasion by the number of times the participant binge drank within the past two weeks.

Procedure

Prior to making the survey publicly available, the PI conducted cognitive interviewing and pilot testing of the survey measures with five undergraduate students to reduce potential response error. Each survey item and its set of response options were

reviewed to ensure that they were straightforward, comprehensible, and reflective of students' behaviors and diversity. The survey items were improved based on students' feedback. The questionnaire development platform SoGoSurvey.com was used to create the study questionnaire. SoGoSurvey allows the survey author to define skip patterns so that participants are skipped past questions that do not apply to them, reducing confusion and respondent burden. After finalizing the survey, it was made freely accessible online for study participants. Participants were recruited at the university union, by classroom announcements, through listserv notifications, during student organization communications, and through a tweet posted on DT. Students were informed of the purpose and nature of the study, their rights as a research participant and the anonymity of their responses. Students who provided informed consent were redirected to an anonymous, self-report online survey. The survey took approximately fifteen minutes to complete. To encourage participation, incentives in the form of entry into a lottery for gift certificates to an online retailer were provided. Institutional review board approval for the study was obtained from the university prior to data collection.

Statistical Analyses

First, descriptive statistics were reported for all variables. To examine differences between DT users and DT non-users, a series of independent samples T-tests were estimated for continuous variables social media engagement, drinks per month, amount binged, perceived risk, and age. Chi-square tests were used to examine differences in categorical demographic variables by gender, ethnicity, class standing, residential status, and GPA. Finally, a three-step hierarchical linear regression model was used to reveal differences between DT users and non-users on the two alcohol consumption measures:

drinks per month and amount binged. These models were fitted for each of the two outcomes using the following approach: (a) DT use only (b) DT use + social media engagement and sociodemographic variables (c) DT use + social media engagement and sociodemographic variables + perceived risk. Significance levels for all statistical tests were set at $\alpha = .05$. All analyses were performed using Stata 14 software.³⁵

Results

Sample Characteristics

Summaries of demographic characteristics of the sample, stratified by DT user status, are presented in Table 1. Participants age 29 and older were omitted from the sample because they were not considered likely to experience the college alcohol use environment in ways similar to traditional college students. Older, nontraditional students are more likely to have dependent children, work full time, and not attend college full time.^{36,37} These social responsibilities are associated with decreased alcohol use.^{38,39} Removing these students led to a loss of 8 participants, representing 1.23% of the overall sample size. An additional 33 participants (5.09% of the sample) who did not meet the inclusion criteria but were able to access the survey due to software limitations were also omitted from the sample. The majority of students were DT users (521 participants amounting to 85.83% of the sample), and eighty-six participants (14.17%) were DT non-users. Sixty-nine percent of participants were female and 81.55 % were white. Consistent with university demographics, the majority of students (72.65%) lived off campus. There was adequate representation of students of all class standings (i.e. 19.77% freshmen, 24.71% sophomores, 30.48% juniors, 20.59% seniors, and 4.12% fifth year or greater students). As shown in Table 4.3, groups differed on all variables except gender. A greater

percentage of students were white, juniors, living off campus, and reported a GPA of 3.5 to 4.0. The sample was sufficiently powered although there was a larger amount of DT users (n=521) compared to DT non-users (n=86).

Table 4.3 Chi-square tests on sociodemographic dependent variables by Drinking Ticket® user status

Variable	Total	DT Users	DT Non-users	X^2	p
	n (%)	(n =521) n (%)	(n =86) n (%)		
Gender					
Male	188 (31.97)	156 (82.98)	32 (17.02)	1.82	0.18
Female	419 (69.03)	365 (87.11)	54 (12.88)		
Ethnicity					
White	495 (81.55)	449 (90.71)	46 (9.29)	55.82	≤.01*
Black	49 (8.07)	29 (59.18)	20 (40.82)		
Hispanic	24 (3.95)	17 (70.8)	7 (29.1)		
Asian	18 (2.97)	11 (61.11)	7 (38.88)		
Other	20 (3.29)	14 (70.00)	6 (30.00)		
Class standing					
Freshman	120 (19.77)	109 (90.83)	11 (9.16)	25.13	≤.01*
Sophomore	150 (24.71)	140 (9.33)	10 (6.66)		
Junior	185 (30.48)	159 (85.95)	26 (14.05)		
Senior	125 (20.59)	94 (75.20)	31 (24.80)		
5 th year +	25 (4.12)	18 (72.00)	7 (28.00)		
Residence					
On campus	166 (27.35)	150 (90.40)	16 (9.60)	3.56	0.05*
Off campus	441 (72.65)	371 (84.12)	70 (15.87)		
GPA					
3.5-4.0	303 (49.92)	272 (89.76)	31 (10.23)	15.43	≤.01*
3.0-3.49	223 (36.74)	189 (84.85)	34 (15.20)		
2.5-2.99	70 (11.32)	53 (75.71)	17 (24.29)		
2.0-2.49	10 (1.64)	6 (60.00)	4 (40.00)		

Notes: *= $p \leq 0.05$

n = sample size

X^2 =chi square test statistic

totals may not sum to 100% due to missing responses

Independent means t-tests were estimated to reveal differences between DT users and non-users on the continuous dependent variables of age, social media engagement, drinks per month, amount binged, and perceived risk (Table 4.4). DT users were significantly younger ($M=20.2$ years old, $SD=1.4$) than DT non-users (21.3 years old, $SD=1.8$). They also scored significantly higher on the social media engagement scale ($M=48.4$, $SD=8.7$) compared to DT non-users ($M=40.6$, $SD=10.5$). DT users consumed statistically significantly more alcohol than DT non-users; DT users drank an average of 45.3 ($SD=47.4$) drinks per month compared with DT non-users, who drank 24.5 ($SD=38.3$) drinks per month. DT users drank an average of 16.05 drinks ($SD=14.7$) during binge drinking episodes within the past two weeks compared to an average of 8.8 drinks ($SD=10.0$) for DT non-users. They also perceived significantly less risk of alcohol-related legal consequences ($M=201.2$, $SD=52.0$) than DT non-users ($M=215.5$, $SD=52.9$)

Table 4.4 Independent means T-tests on selected dependent variables by Drinking Ticket® user status

Variable	n	DT Users	DT Non-users	t	p
		M (SD)	M (SD)		
Socialmedia engagement	607	48.4 (8.7)	40.6 (10.5)	7.48	≤.01
Drinks per month	595	45.3 (47.4)	24.5 (38.3)	3.83	≤.01*
Amount binged	597	16.05 (14.7)	8.8 (10.0)	10.69	≤.01
Perceived Risk	607	201.2 (52.0)	215.5 (52.9)	2.36	0.02
Age	561	20.2 (1.4)	21.3 (1.8)	6.92	≤.01

Notes: * = $p \leq 0.05$

M=mean

SD= standard deviation

totals may not sum to total sample size of 607 due to missing responses

Alcohol Consumption

The first hierarchical regression was calculated to determine the contribution of DT user status to drinks per month while controlling for age, gender, ethnicity, class standing, residential status, GPA, social media engagement, and perceived risk. At step 1, DT user status was regressed onto drinks per month without controlling for any other variables. This resulted in DT user status significantly predicting drinks per month ($\beta = 0.18, p \leq .01$), where being a DT user was positively associated with a greater number of drinks per month. Next, at step 2, sociodemographic variables (age, gender, ethnicity, class standing, residential status, and GPA) and social media engagement were simultaneously added to the model. After controlling for these sociodemographic variables, DT user status remained a significant predictor of drinks per month ($\beta = .16, p \leq .01$), and gender and social media engagement emerged as significant predictors. Female gender ($\beta = -.32, p = 0.00$) was negatively associated with drinks per month, and high social media engagement ($\beta = .14, p \leq .01$) was positively associated with drinks per month. The sociodemographic variables contributed unique explained variance ($R^2 \Delta = .12, p \leq .01$) in drinks per month compared to the unadjusted model. Finally, perceived risk was added at step 3 to create a final, fully-adjusted model. In this final model, DT user status once more significantly predicted drinks per month after controlling for sociodemographic variables, social media engagement, and perceived risk ($\beta = .15, p = 0.001$). Female gender ($\beta = -.28, p \leq .01$) remained negatively associated with drinks per month, high social media engagement ($\beta = .13, p \leq .01$) remained positively associated with drinks per month, and high perceived risk ($\beta = -.17, p \leq .01$) emerged as being negatively associated with drinks per month. The addition of perceived risk to the model

further contributed to the variance ($R^2\Delta=.02, p =0.00$) in drinks per month. This full model in step 3 accounted for 15 % of the variance in drinks per month. These results are presented in Table 4.5.

Table 4.5 Summary of hierarchical regression analyses for drinks per month

Variable	Step 1			Step 2			Step 3		
	<i>B</i>	<i>SE (B)</i>	β	<i>B</i>	<i>SE (B)</i>	β	<i>B</i>	<i>SE (B)</i>	β
DT user status	22.58	5.41	.18*	20.91	5.80	.16*	18.73	5.75	.15*
Age				.06	2.26	.00	.175	2.23	.01
Gender				-	4.16	-.32*	-27.17	4.25	-.28*
Social-media engagement				.70	.22	.14*	.674	.217	.13*
Ethnicity									
White				-referent-					
Black				-3.34	9.03	-.02	1.43	7.10	.01
Hispanic				-3.34	9.03	-.02	-5.5	8.93	-.03
Asian				2.21	10.6	.01	-.24	10.5	-.00
Other				-	10.7	-.05	-10.98	10.5	-.04
Class standing									
Freshman				-referent-					
Sophomore				1.55	4.01	.03	.88	3.96	.02
Junior				1.39	5.73	.01	1.38	5.66	.01
Senior				8.56	7.07	.08	7.73	6.98	.07
Fifth year +				.98	13.1	.00	-.39	12.9	-.00
Residential									
On-campus				-referent-					
Off-campus				-3.44	5.29	-.03	-2.11	5.23	-.02
GPA									
2.5-2.99				-referent-					
3.0-3.49				1.60	6.24	.02	2.02	6.16	.02
3.5-4.0				-.93	6.30	-.01	-.47	6.21	-.01
Perceived risk							-.15	.04	-.17*
R^2		.03			.13			.15	
ΔR^2		-			.12*			.02*	

Notes: * $p \leq .05$

B = unstandardized beta coefficient

SE = standard error

β = standardized beta coefficient

R^2 = effect size

ΔR^2 = change in effect size

Step 1 = DT user status on drinks per month $F(1,549) = .18, p \leq .01; R^2 = .03$;

Step 2 = Step 1 + sociodemographic variables $F(13,536) = .39, p \leq .01; R^2 = .13$;

Step 3 = Step 2 + perceived risk $F(1,535) = .17, p \leq .01; R^2 = .15$;

The second hierarchical regression for amount binged was calculated using the same approach followed in the previous model. Similar to drinks per month, DT user status significantly predicted amount binged in the unadjusted model ($\beta = 0.18, p \leq .01$). After sociodemographic variables and social media engagement were added at step 2, DT user status remained a significant predictor of amount binged ($\beta = .15, p \leq .01$), and gender and social media engagement emerged as significant predictors ($R^2\Delta = .15, p \leq .01$). Female gender ($\beta = -.35, p \leq .01$) was negatively associated with amount binged, and high social media engagement ($\beta = .16, p \leq .01$) was positively associated with amount binged. The sociodemographic variables contributed unique explained variance ($R^2\Delta = .15, p \leq .01$) compared to the unadjusted model. Finally, in the fully-adjusted model (step 3), DT user status once more significantly predicted amount binged after controlling for sociodemographic variables, social media engagement, and perceived risk ($\beta = .13, p \leq .01$). Female gender ($\beta = -.31, p \leq .01$) remained negatively associated with amount binged, high social media engagement ($\beta = .16, p \leq .01$) remained positively associated with amount binged, and high perceived risk ($\beta = -.16, p \leq .01$) emerged as being negatively associated with amount binged. The addition of perceived risk to the model further contributed to unique variance ($R^2\Delta = .02, p \leq .01$) and the fully-adjusted model accounted for 18% of the variance in amount binged (Table 4.6)

Table 4.6 Summary of hierarchical regression analyses for amount binged

Variable	<u>Step 1</u>			<u>Step 2</u>			<u>Step 3</u>		
	<i>B</i>	<i>SE (B)</i>	β	<i>B</i>	<i>SE (B)</i>	β	<i>B</i>	<i>SE (B)</i>	β
DT user status	7.28	1.72	.18*	6.03	1.81	.15*	5.37	1.80	.13
Age				-.46	.71	-.05	-.43	.70	-.04
Gender				10.80	1.29	-.35*	-9.46	1.32	-
Social-media engagement				.27	.07	.16*	.26	.07	.16*
Ethnicity									
White				-referent-					
Black				-1.67	2.24	-.03	-.92	2.21	-.02
Hispanic				-.95	2.82	-.01	-1.6	2.79	-.02
Asian				1.50	3.33	.02	.75	3.29	.01
Other				-2.43	3.34	-.03	-2.18	3.30	-.03
Class standing									
Freshman				-referent-					-
Junior				-.52	1.25	-.03	-.72	1.24	-.04
Senior				.02	1.79	.00	.03	1.77	.00
Fifth year				1.78	2.20	.05	1.57	2.17	.04
+ Residential status									
On-campus				-referent-					
Off-campus				-1.08	1.65	-.03	-.67	1.63	-.02
GPA									
2.5-2.99				-referent-					
3.0-3.49				2.20	1.95	-.07	-2.05	1.92	-.07
3.5-4.0				-3.11	1.97	-.11	-2.96	1.94	-.10
Perceived risk							-.04	.012	-
R^2		.030			.155			.177	
ΔR^2					.145			.022	

Notes: * $p \leq .05$

B = unstandardized beta coefficient

SE = standard error

β = standardized beta coefficient

R^2 = effect size

ΔR^2 = change in effect size

Step 1 = DT user status on amount binged $F(1,551) = .18, p \leq .01; R^2 = .03$;

Step 2 = Step 1 + sociodemographic variables $F(13,538) = .42, p \leq .01; R^2 = .16$;

Step 3 = Step 2 + perceived risk $F(1,537) = .45, p \leq .01; R^2 = .18$;

Comment

Results revealed that a greater proportion of DT users were white, juniors, living off campus, and achieving a GPA of 3.5-4.0 compared to DT non-users. DT users and non-users did not significantly differ by gender. DT users were also found to be significantly younger, more engaged with social media, and perceive less risk of alcohol-related legal consequences. In terms of alcohol consumption, DT users reported consuming significantly more drinks per month and more drinks during binge drinking than DT non-users after controlling for sociodemographic variables, social media engagement, and perceived risk. These results suggest that differences in sociodemographic characteristics and perception of risk for alcohol-related consequences do not fully explain the higher alcohol consumption among DT users.

It is possible that DT attracts students who tend to participate more in the pervasive alcohol use culture⁴⁰ that characterizes student life at a many institutions of higher education. DT users report heavier and more frequent alcohol use, and are more likely to have a greater personal interest in avoiding legal consequences related to their drinking such as accruing tickets, fines, or conduct violations from police and/or university personnel. Additionally, students who participate in illegal alcohol use (e.g., underage alcohol consumption, driving while intoxicated, possessing false identification

to purchase alcohol etc.) would potentially be interested in knowing when and where alcohol-related law enforcement will be occurring. DT's popularity may also be due in part to it being on the Twitter platform, which is already widely used by college students.

⁴¹ Students may value the convenience of not needing to download a separate app to receive alcohol-related enforcement information and appreciate coming across DT posts when viewing their Twitter feed, rather than needing to directly access a separate platform.

College students are often sent alcohol-related prevention messages through required classes, online modules (e.g. AlcoholEdu), and/or informational posters,^{42,43} and are further inundated by multiple health-related messages that must compete for their attention. Thus, it is likely that more “traditional” methods of health communication such as billboards, newspaper advertisements, and radio ads do not capture students’ interest or attention. Understanding the role of social media platforms that college students have already constructed and are actively engaged with ⁴⁴ may be a more effective prevention delivery route.

Along with social media being an attractive information source for college students, the student-driven nature of DT and social media platforms similar to it may make risk reduction messages posted on DT perceived to be more trustworthy and accepted by students. Peer health educators have been successful in providing fellow college students with the information and skills necessary to use alcohol in a less risky manner.⁴⁵ Students’ affinity for social media and value of their peers’ opinions provides a strong case for utilizing social media platforms similar to DT to inform college students of strategies they can implement to reduce their risk of negative alcohol-related

consequences. DT already posts messages discouraging its followers from driving after drinking (e.g. “When the bars close at 2am tonight don't drink and drive it kills people. Don't risk your life and others. A DUI is not worth it”). The distribution of DUI prevention messages that highlight police enforcement have effectively reduced intoxicated driving in larger populations,²³ and among college students.⁴⁶ Given that DT users exhibit higher risk alcohol consumption behaviors, DT and similar platforms may provide a particularly effective, low-cost, and convenient method for reaching high-risk student drinkers with alcohol prevention messages.

In the future, college health professionals should build partnerships with students who manage such platforms to increase the number of alcohol harm reduction messages posted on the platforms. This may prove to be a more effective way to communicate with students rather than relying on official university-driven social media accounts (e.g. the college alcohol prevention office) that are less attractive to students. Harnessing the potential of student-driven platforms to deliver alcohol harm reduction messages may be the next frontier in promotion of responsible drinking for the current digital native generation of college students.

Strengths

Crowdsourced social media platforms that relay information about alcohol-related law enforcement are still very new, and the current study provides the first empirical insights into the user base characteristics of these platforms within a college setting. Platforms similar to DT may already exist on other college campuses and have the potential to appear on more campuses in the future. In addition, the potential of student-driven social media platforms to reach students with alcohol harm reduction messages

meets students where they are by making use of their interest in social media.

Furthermore, college students may also be using more widely-known, national apps that provide information on alcohol-related law enforcement, such as Mr. Checkpoint™. The results of this study suggest that those who also use national apps are also more likely to be social media savvy and consume alcohol more heavily. In addition, the fact that similar patterns were found across multiple measures of alcohol consumption strengthen the overall confidence in the study results.

Limitations

The findings of the current study must be considered in light of its limitations. One limitation of the study is its generalizability to other college campus contexts. The study utilized a non-probability sampling technique and was conducted at one large, public, urban, southeastern university with one local crowdsourced social media platform. Thus, its results may not be applicable to students at other universities. The study would have also benefitted from the inclusion of more DT non-users in the sample. However, due to the popularity of DT, it was difficult to locate and recruit DT non-users. The data were self-reported, and more objective measures of alcohol use behaviors would have been beneficial. The study's quantitative nature was not designed for gathering qualitative data on student's perspectives concerning whether they think DT might influence individual and peer alcohol consumption behaviors, and if so, in which ways. It would also be helpful to ask students if they routinely use the information transmitted across the platform to circumvent alcohol-related law enforcement or consider committing illegal alcohol-related behaviors to be more or less risky based on the information they gather from DT.

Conclusions

The current study revealed that in general, DT users were more social media savvy and tended to consume more alcohol than DT non-users. Future research should include examination of the user base of similar social media platforms at additional postsecondary institutions. It would also be useful to extend this research to include college students' use of nationally available apps such as Mr.Checkpoint™. Furthermore, future research should determine if exposure to such platforms influences students' risky alcohol-use behaviors, including driving under the influence of alcohol. This research revealed that students who use platforms which relay messages about alcohol-related enforcement are at risk for alcohol-related harms due to their heavier alcohol consumption. This supports the notion that peer authored alcohol-risk reduction messages delivered through social media may be a remarkable opportunity for meeting institutions' goals of reducing alcohol-related harms by capitalizing on students' interest in social media.

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Conflict of Interest Disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States and received approval from the Institutional Review Board at the University of South Carolina.

Note

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4.4 Specific Aim 2 Supplemental Results

In addition to those analyses presented in manuscript 2, further research questions within the second specific aim were completed. These included comprehensive descriptive statistics for all of the questions presented within the survey, **RQ5**, Does perceived risk for alcohol-related legal consequences mediate the relationship between alcohol consumption and alcohol-related illegal behaviors, after controlling for sociodemographic characteristics? and **RQ6**, Does the dose of DT exposure influence the relationship between alcohol consumption and perceived risk of alcohol -related legal consequences, after controlling for sociodemographic characteristics? Both of these research questions were answered using PROCESS for both created alcohol outcomes: drinks per month and amount binged.

Descriptive statistics for all variables included in the survey were calculated to better understand the sample's characteristics. Thirty-two participants who did not drink within the past 30 days and eight students who were not undergraduates were omitted from the sample due to not meeting the inclusion criteria. Three participants were removed from the sample due to outlier values and eight participants age 29 and older were also omitted from the sample because they were not considered likely to experience the college alcohol use environment in a ways similar to traditional college students. Nontraditional students are more likely to have dependent children, work full time, and not attend college full time (Deil-Amen, 2015; National Center for Education Statistics, 2016). These social responsibilities are associated with decreased alcohol use (Arria et al., 2013; Bachman et al., 2002). These omissions resulted in a final analytic sample size of 607. Participants were not dropped from the sample for missing responses on

questionnaire items, instead opting for available case analysis (Pigott, 2001), given that very few participants were missing responses, and no participant was missing on more than three questions.

Sociodemographics

Student participants were an average of 20.34 years old, were mostly female (69%), and primarily Caucasian (81.68%). The highest percentage of the sample's class standing status were juniors (30.58%), although there was adequate representation of all other class standing statuses. Consistent with characteristics of the wider University of South Carolina undergraduate population, the largest percentage of students lived in off-campus student housing communities (38.88%). Fifty percent of students reported that their GPA was between a 3.5 and 4.0, and 36.8% reported that their GPA was between 3.0 and 3.49. A vast majority (82.51%) of students participated in extracurricular activities, spending an average of nearly eight (7.81) hours per week on them. The majority of students were currently employed (56.67%), and spent an average of 17.54 hours per week working.

Alcohol Consumption Characteristics

The majority of students (72.62) had binge drank at least once in the past 30 days, and consumed alcohol at least once within the past two weeks. On average, students consumed alcohol an average of 7.47 days per week in the past month, drank an average of 9.01 standard drinks per week, and consumed an average of 4.94 standard drinks during a typical drinking occasion. The highest percentage of students (27.35%) did not binge drink within the past two weeks, and the next highest percentage (23.89%) of

students binge drank once within the past two weeks. Students scored an average of 33.73 points on the Rutgers Alcohol Problem Index, for which scores ranged from 24 to 98.

Perceived Susceptibility to Alcohol-Related Consequences

On the global overall perceived risk for alcohol-related consequences index where scores ranged from ten to 100 with higher scores indicating greater perceived susceptibility, students scored an average of 76.81. For perceived certainty, celerity, and magnitude, which all were also scored from ten to 100, students scored an average of 63.43, 71.04, and 69.32, respectively. The computed overall perceived risk index ranged from thirty to three hundred, and students scored an average of 203.22

Drinking Ticket Usage Patterns

Only 17.19 percent of students were DT non-users, and 82.81% of students were classified as DT users. The highest percentage of students (31.57%) said they see most of DT's tweets. The top cited reason for checking DT was "to avoid alcohol-related consequences" (27.51%), followed by "To be informed about public safety concerns" (19.60%). The highest percentage of students (36.73%) of students indicated that the time of day when they check DT the most is during the late night hours from 9:00pm to 6:00am. On the DT trust scale, which ranged from six to thirty with higher scores indicating greater trust in DT, students scored an average of 24.66.

Social Media Engagement

On the social media engagement scale, where higher scores indicate greater social media engagement with a range from nine to seventy-two, students scored an average of 47.28. Out of sixteen currently popular social media platforms, students had heard of an average of 12.94 platforms, had ever used an average of 8.34 platforms, and used an

average of 5.53 platforms within the past two weeks. All descriptive statistics are presented in Table 4.7.

Table 4.7 Sample characteristics of respondents n=607

	<u>% or Mean (SE)</u>
Sociodemographics	
Age (years)	20.34 (1.48)
<u>Gender</u>	
Male	30.97
Female	69.03
<u>Race/Ethnicity</u>	
Caucasian/White	81.68
African American/Black	8.29
Hispanic or Latino	3.96
Asian	2.96
American Indian/ Alaska Native	0.17
Multiracial	1.49
Other/Prefer not to say	1.66
<u>Class Standing</u>	
Freshman	19.83
Sophomore	24.79
Junior	30.58
Senior	20.66
Fifth year or more	4.13
<u>Residence</u>	
On campus res halls	23.89
Greek housing	3.46
With family/guardians off campus	6.10
Off-campus student housing community	38.88
Other off campus	26.19
Other	1.48
<u>Approximate cumulative GPA</u>	
3.5-4.0	50
3.0-3.49	36.8
2.5-2.99	11.55
2.0-2.49	1.65
<u>Participate in Extracurricular Activities</u>	
Yes	82.51
No	17.49
Hours per week spent on extracurricular activities	7.81 (7.32)

Currently employed	
Yes	56.67
No	43.33
Hours per week spent working	17.54 (9.95)
Alcohol Consumption Characteristics	
<hr/>	
Binge Drinking	
Has binge drank at least once in the past 30 days	72.62
Did not binge drink in the past 30 days	27.39
Consumed Alcohol at least once/ past 2 weeks	
Yes	92.41
No	7.59
How many days past month consumed alcohol	7.47 (5.64)
Average # standard drinks/week	9.01 (11.12)
Average # standard drinks/typical drinking occasion	4.94 (2.89)
# times binge drank past 2 weeks	
None	27.35
Once	23.89
Twice	19.28
3-5 times	22.24
6-9 times	4.61
10 or more times	2.47
Rutgers Alcohol Problem Index: (scores 24-98) higher scores=more frequent negative alcohol-related consequences	33.73(9.60)
Perceived Susceptibility to Alcohol-Related Consequences	
<hr/>	
Global overall perceived risk: (scores 10-100) higher scores=greater	76.81 (16.45)
Perceived certainty: (scores 10-100) higher scores=greater certainty	63.43 (20.82)
Perceived celerity: (scores 10-100) higher scores=greater celerity	71.04 (21.04)
Perceived magnitude: (scores 10-100) higher scores=greater magnitude	69.32 (19.52)
Computed overall perceived risk(scores 30-300) higher scores=greater perceived risk	203.22 (52.30)
Drinking Ticket Usage Patterns	
<hr/>	
DT Dose	
Non-DT user	17.19
Sees some DT tweets	26.61
Sees most DT tweets	31.57
Sees all DT tweets	24.63

Primary reason for checking DT

To avoid traffic violations	10.54
For entertainment	4.94
To avoid alcohol-related legal consequences	27.51
To be informed about public safety concerns	19.60
To stay aware of current events	16.97
For traffic updates	4.94
For alcoholic drink specials	0.99

Time of day check DT the most

Morning (6am-12pm)	0.8
Afternoon (12pm-5pm)	4.42
Evening (5pm-9pm)	14.81
Late night (9pm-6am)	36.73
No certain time more than others	43.65

DT trust scale: (scores 6 -30), higher scores=greater trust 24.66 (4.66)

Social Media Engagement

Social Media Engagement index: (scores 9-72), higher scores=greater engagement 47.28 (9.35)

of social media platforms heard of (scores 0-16) 12.94 (2.40)

of social media platforms ever used (scores 0-16) 8.34 (2.60)

of social media platforms used within the past 2 weeks (scores 0-16) 5.53 (2.09)

Note: means and standard deviations are presented for continuous variables, percentages are shown for categorical measures. All percentages may not sum to 100% due to rounding and missing responses.

RQ5 Does perceived risk for alcohol-related legal consequences mediate the relationship between alcohol consumption and alcohol-related illegal behaviors, after controlling for sociodemographic characteristics?

When the model was estimated using independent variable drinks per month, there was a significant indirect effect of drinks per month on alcohol-related illegal behaviors through perceived risk of alcohol-related legal consequences, $b=0.0070$, BCa CI [0.002, 0.0016]. This represents a relatively very small effect, with 0.7% of the relationship between drinks per month and alcohol-related illegal behaviors being

explained by perceived risk of alcohol-related legal consequences ($\kappa^2=0.0070$, BCa CI [0.0021, 0.0164]). These results are depicted in Figure 4.8.

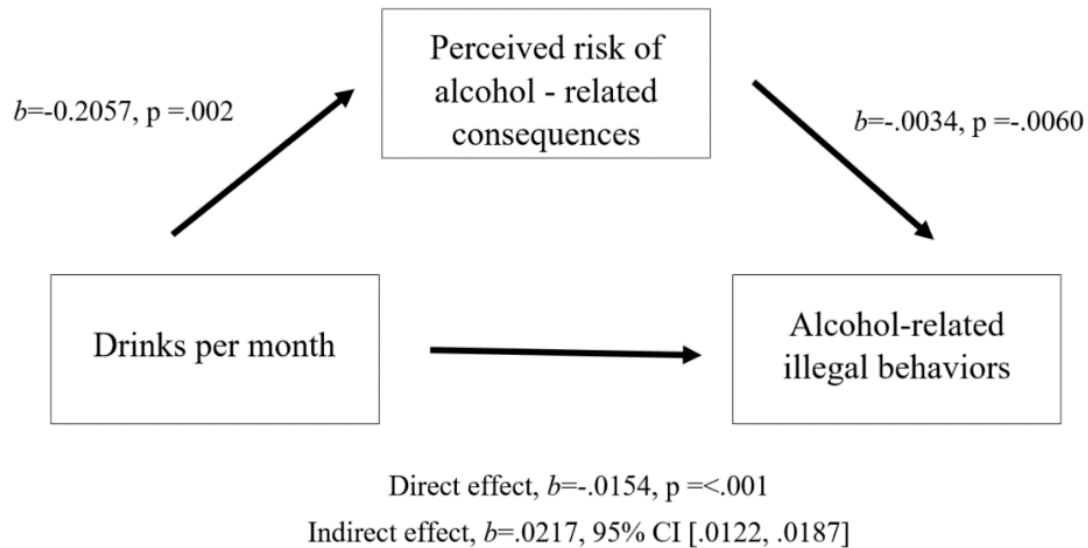


Figure 4.8 Mediation results for drinks per month

When the model was estimated using the independent variable amount binged, there was a significant indirect effect of amount binged on alcohol-related illegal behaviors through perceived risk of alcohol-related legal consequences, $b=0.0023$, BCa CI [0.006, 0.0051]. This represents a relatively very small effect, where 0.69% of the relationship between amount binged and alcohol-related illegal behaviors was explained by perceived risk of alcohol-related legal consequences ($\kappa^2=0.0069$, BCa CI [0.0020, 0.0157]). These results are depicted in Figure 4.9.

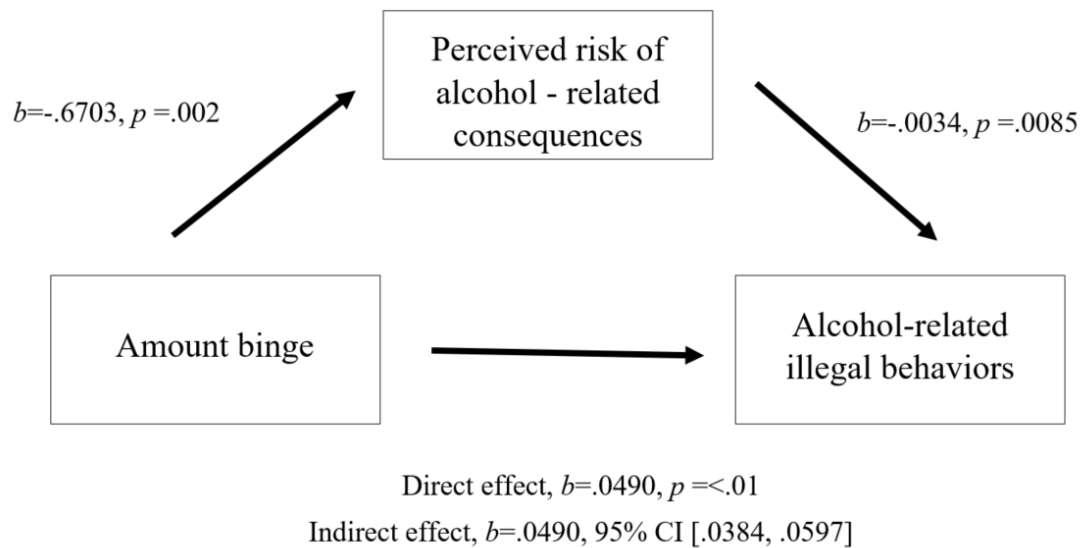


Figure 4.9 Mediation results for amount binged

RQ6. Does the dose of DT exposure influence the relationship between alcohol consumption and perceived risk of alcohol -related legal consequences, after controlling for sociodemographic characteristics?

When the model was estimated using the independent variable drinks per month, results indicated that lower drinks per month was significantly, positively related to perceived risk for alcohol-related consequences ($b = .02, SE b = .01, t = 3.61, p \leq .01$.) However, greater DT exposure ($b = -.00, SE b = .09, t = -.04, p = .97$) was not significantly related to perceived risk for alcohol-related consequences. The interaction between drinks per month and DT exposure was non-significant ($b = -.00, SE b = .00, t = -1.28, p = .20$), suggesting that perceived risk of alcohol-related consequences does not depend on the level of DT exposure. Table 4.8 presents the results of the moderation analysis for drinks per month.

Table 4.8 PROCESS moderation results for drinks per month

	<i>b</i>	<i>SE B</i>	<i>t</i>	<i>p</i>
Constant	-3.45	1.63	-2.11	.04
Moderating Var. -DT exposure (not centered)	-.00	.09	-.04	.97
Independent Var. -Drinks per month (not centered)	.02	.01	3.61	.00*
Dependent Var. -Perceived risk alcohol-related consequences	-.00	.00	-2.59	.01*
Drinks per month *DT exposure	-.00	.00	-1.28	.20

Notes: * = $p \leq 0.05$

b = beta coefficient

SE B = standard errors for betas

t = *t* statistic

When the model was estimated using the independent variable amount binged, results indicated that lower amount binged was significantly, positively related to perceived risk for alcohol-related consequences ($b = .05$, $SE b = .09$, $t = .38$, $p < .01$). Again, greater DT exposure ($b = -.35$, $SE b = .08$, $t = -1.03$, $p = .30$) was not significantly related to perceived risk for alcohol-related consequences. The interaction between amount binged and DT exposure was non-significant ($b = -.01$, $SE b = .01$, $t = -1.37$, $p = .17$), suggesting that perceived risk of alcohol-related consequences does not depend on the level of DT exposure. Table 4.9 presents the results of the moderation analysis for amount binged.

Table 4.9 PROCESS moderation results for amount binge

	<i>b</i>	<i>SE B</i>	<i>t</i>	<i>p</i>
Constant	-4.27	1.59	-2.68	.01*
Moderating Var. -DT exposure (not centered)	-.35	.08	-1.03	.30
Independent Var. -Amount binge (not centered)	.05	.09	.38	<.01*
Dependent Var. -Perceived risk alcohol-related consequences	-.00	.00	-2.64	<.01*
Amount binge *DT exposure	-.01	.01	-1.37	.17

Notes: * = $p \leq 0.05$

b = beta coefficient

SE B = standard errors for betas

t = *t* statistic

CHAPTER 5

DISCUSSION

This chapter first summarizes the overall findings of the entire dissertation project, organized by specific aim. Next, the findings from the first and second specific aim are synthesized and discussed in the context of current research. The chapter concludes with study limitations, strengths, and implications for future research.

5.1 Summary of Findings

Specific Aim 1: To analyze the information delivered to users by the social media platform Drinking Ticket® and determine which types of information are then relayed to others over a 12 month period.

The most frequent information displayed by DT pertained to the presence of police and emergency personnel such as fire trucks, police squad cars, and ambulances. Roadside information was also strongly represented, being the second most represented theme. The third most frequently occurring theme was related to information on speed trap locations where police officers were enforcing speed limit laws. The most frequently retweeted information related to safety alerts, humor, and community events.

In terms of variations over time, significantly more tweets and retweets occurred during academic months than non-academic months; April was the month with the highest number of tweets, and September was the month with the highest level of retweets. Significantly more tweets occurred on non-school nights, with Friday being the

day of the week with the most tweets, but there was not a significant difference in the number of retweets on school nights vs. non-school nights.

Specific Aim 2: To determine the influence of Drinking Ticket on alcohol use, perceived risk, and alcohol-related risk behaviors among college students.

When DT users were compared to DT non-users, a greater proportion were white, juniors, living off campus, and achieving a GPA of 3.5-4.0. Gender did not significantly differ by DT user status. DT users were also younger and more engaged with social media when compared with non-users. In terms of alcohol consumption, DT users reported consuming significantly more drinks per month and more drinks during binge drinking than DT non-users. DT users also committed significantly more alcohol-related illegal behaviors and experienced significantly more alcohol-related consequences than non-users.

Perceived risk for alcohol-related consequences mediated the relationship between alcohol consumption – as measured by both drinks per month and amount binged – and alcohol-related illegal behaviors after controlling for sociodemographic variables. The dose of DT exposure did not influence the relationship between either measure of alcohol consumption and perceived risk of alcohol-related legal consequences, after controlling for sociodemographic characteristics.

5.2 Synthesis of Qualitative and Quantitative Findings

The first specific aim revealed that DT tweeted many more messages concerning various community interests than those about alcohol-related law enforcement. In fact, the majority of DT messages did not concern alcohol at all. DT users show their endorsement of the information they think is most important by retweeting DT's posts to

their own social networks. It was discovered that alcohol-related law enforcement tips were not highly retweeted by students. Instead, the most retweeted messages were about emergency alerts. This suggests that students care most about keeping each other safe from harm and informed about how to avoid threats to safety. This notion is supported by prior research which suggests that college students are adept at using social media to quickly alert each other about crises occurring on campus (Gow, McGee, Townsend, Anderson, & Varnhagen, 2009; Mastrodicasa, 2008). Social media has also been found to be a low cost, effective, and fast mechanism for distributing information about emergency situations within larger communities (Centers for Disease Control and Prevention, 2012). DT posted more tweets during academic months when students were enrolled in classes and presumably more active in campus community activities. DT also posted with greater frequency on non-school nights when students were more likely to be engaging in social activities with friends and moving about the community. Students are known to consume alcohol more heavily on weekend evenings (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005) and during holidays which are known for alcohol consumption such as St. Patrick's Day (Lefkowitz, Patrick, Morgan, Bezemer, & Vasilenko, 2012), as well as during occasions local to the campus's tradition Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Lefkowitz, Patrick, Morgan, Bezemer, & Vasilenko, 2012) such as Slope Day at Cornell University where many students drink heavily to celebrate the end of Spring semester classes (Marchell et al., 2013).

The DT messages students were exposed to were not primarily about alcohol-related law enforcement, but rather a variety of other topics. Thus, it makes sense that DT

exposure wouldn't have much impact on how a student perceives their risk for being punished for unlawful alcohol use. This study also advances knowledge of college students' perceived susceptibility to alcohol-related legal and university consequences by introducing the novel approach of applying criminal deterrence theory to the public health study of college alcohol use. Criminal Deterrence Theory (Beccaria, 1963; Cherniak, 1986; Cook, 1980) posits that an individual's perception of risk for being punished is related to their expression of illegal behaviors, and encompasses three components of perceived susceptibility for being reprimanded for an illegal behavior. This includes perceived certainty, or how certain an individual is that they will be punished for an illegal behavior; perceived celerity or swiftness of how quickly they will be punished; and perceived magnitude of the severity of the punishment. Taken together, these three components were summed to provide a comprehensive, well-constructed measure of how susceptible college students feel to being punished for unlawful alcohol use. Those who think they will not be punished for their illegal actions are more likely to offend, while those who perceive high risk for being punished for an illegal action are deterred from performing it. Deterrence Theory proved to be supported within this research examining unlawful college alcohol use because perceived risk for alcohol-related legal consequences significantly partially mediated the relationship between alcohol consumption and alcohol-related illegal behaviors after controlling for sociodemographic characteristics.

While lawmakers have speculated that national platforms such as DUI Dodger and others may allow individuals to avoid legal consequences for driving under the influence of alcohol (National Highway Traffic Safety Administration, 2009; Santo,

March 23rd, 2011), the current study found that DT users did not report performing more unlawful alcohol use behaviors compared to those who were not DT users. Worthy of noting, however, is that DT users were found to consume more alcohol and experience more negative alcohol-related consequences than DT non-users. This presents an opportunity to discover ways to harness the popularity of DT to prevent alcohol-related harms among its high-risk student drinker audience. DT already distributes messages during weekend late-night hours when students are partying that discourages followers from driving after drinking (e.g. “@SCDPS_PIO reminds you not to drink and drive. Get @Uber and your first ride is free using the promo link below! <https://t.co/ppBYhlnwCx>”). Those followers who view these messages may be less likely to drive after drinking, as evidenced by previous studies which demonstrate that distributing messages about alcohol-impaired driving law enforcement is associated with reduced driving after drinking in both the general population (Holder et al., 2000; SAMHSA, 2008) and in college communities (Wechsler, Lee, Nelson, & Lee, 2003).

Students may also be more likely to welcome and internalize alcohol harm reduction messages that come from a peer source rather than an official source such as a law enforcement agency or university. Alcohol-focused peer health education has been successful in empowering college students to make healthy choices about alcohol use (Hunter, 2004; White, Park, Israel, & Cordero, 2009), and if platforms such as DT transmit messages about consuming alcohol in a safe manor, this may increase individual students’ capacity to reduce the harms they experience as a result of drinking. Furthermore, peers may be adept at crafting attractive alcohol harm reduction messages for the college population by being able to “speak the language” of students. Alcohol

prevention professionals have begun to use social media platforms to send messages to students about safe alcohol use (Higher Education Center for Alcohol, 2011) , yet these strategies may be less successful than utilizing platforms that students voluntarily interact with and trust.

The current study also revealed positive potential for student-driven platforms to relay emergency alert information. While there is a university-sanctioned alert system at the university served by DT, multiple criticisms of the system have been expressed. These include: 1) an unacceptable delay between time of occurrence of the emergency and receipt of alert; ("In Our Opinion: Carolina Alerts helpful, but not yet perfect," 09/24/13) in one instance taking nearly 24 hours; ("Delays in notifications about campus crime unacceptable," 02/20/13) not providing adequate detail about the threat; ("In Our Opinion: Carolina Alerts helpful, but not yet perfect," 09/24/13), and 2) not informing the campus about a wide enough array of potential threats. ("In our opinion: Carolina Alert proves inadequate once more," 03/02/12; "In Our Opinion: USC officials must rethink Carolina Alert," 01/25/12). DT is able to address these limitations by not being subject to the same guidelines in place for the university system. Before notifying subscribers of the university alert system, the threat to safety must meet the criteria of being ongoing, on campus, and confirmed by law enforcement officials (Carolina Alert, 2015). DT is run by private individuals who need not wait for confirmation, and are able to report on emergencies which occur in the areas surrounding campus where students spend time in addition to on-campus locations. Although reporting inaccurate information has the potential to incite unfounded panic, DT places greater value on expediently disseminating alerts, and has issued corrections in the past when tweets contained misinformation. The

utility of DT as an emergency alert system is supported by the current findings that the most frequently retweeted theme was “safety alert” and the most frequent geographic location referenced was “off-campus.”

5.3 Study Limitations

The findings of the current study must be considered in light of its limitations. The qualitative content analysis portion of the study was limited to an analysis of one calendar year (12/20/2013-12/19/2014) of DT tweets, and thus its conclusions are applicable to DT only within that time period. Anecdotally, DT tweets before and since the inclusion dates seem to be highly comparable. One limitation of the quantitative survey portion of the study is its non-probability, cross-sectional sampling technique which doesn't allow for establishing causal inferences. Also, the study was conducted with University of South Carolina students on only one crowdsourced social media platform (DT); therefore, the results may not be generalizable to other higher education institutions or other student-driven crowdsourced social media platforms which relay information about alcohol-related law enforcement or emergency alerts. In terms of the representativeness of the sample, the study would have benefitted from the inclusion of additional males in the sample to more closely reflect the University of South Carolina enrollment demographic characteristics. The study also relies on non-objective, self-report measures of students' alcohol use behaviors, which may not precisely represent students' drinking behaviors. In retrospect, collecting information on students' level of trust in and perceptions of DT compared to the local university alert system Carolina Alert would have allowed the research team to better assess the feasibility of using platforms like DT for sending emergency alert information to students. Finally, it would have been beneficial to have conducted further qualitative research to ask students if they

think DT might influence individual and peer alcohol consumption behaviors and illegal alcohol-use behaviors, and if so, how.

5.4 Study Strengths

One strength of this study is its novelty in being the first to examine how interaction with a specific crowdsourced social media platform is associated with alcohol consumption and risk behaviors. Although recent studies have acknowledged the potential influence of social media on alcohol consumption (Hoffman, Pinkleton, Weintraub Austin, & Reyes-Velázquez, 2014; Moreno, Christakis, Egan, Brockman, & Becker, 2012), none have focused on student-driven social media platforms which share information about alcohol law enforcement activities. The current study makes a key contribution to both health communication and public health research by delineating how contemporary college students' social media use is connected with their perceived risk of being reprimanded for illegal alcohol use by legal or university authorities.

Another strength of this study is the focus on DT. The large followership of DT speaks to its popularity among students. When this study was proposed during March of 2015, DT had 33,600 followers. In the span of approximately one year, as of March 11, 2016, DT had 45,700 followers, and is consistently gaining more. The majority of students in the sample (67.6%) had heard about DT by halfway through their first semester at the university, and by their second semester, 91.3% of them had heard about DT. Studying such a popular social media platform provided a rich opportunity for understanding how current college students perceived and interacted with a new feature of the college alcohol environment. Thus, using DT in the current project was essential in order to keep current with the evolving, lived experiences of student alcohol use in this particular college setting.

The study is also strengthened by employing multi-dimensional measures of alcohol consumption. In the extant alcohol use literature, there is no one standard convention for measuring individuals' alcohol consumption behaviors. The "five/four measure" of binge drinking (5 standard drinks for men and 4 standard drinks for women in about 2 hours, enough to raise blood alcohol content to 0.08g/dL) (Wechsler & Austin, 1998) has emerged as an important measure for assessing alcohol intake among college students, because students who drink at the binge level or more are at the greatest risk for alcohol-related harms (e.g. unintentional injury, legal consequences, etc.) (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994; Weitzman, Nelson, Lee, & Wechsler, 2004) Frequency of drinking occasions is also important to capture in order to describe an individual's alcohol use behaviors (Parra, Krull, Sher, & Jackson, 2007; Stockwell et al., 2004). The current study used two outcome measures – amount binged and drinks per month – which take into account both quantity and frequency of alcohol use. These two measures were highly, significantly correlated ($r=.84, p<.01$) and produced the same pattern of results in the final, moderated mediation analyses. This suggests convergent construct validity (Bagozzi & Phillips, 1991) meaning that both independent variables were reliably representing students' alcohol consumption habits.

A final, noteworthy strength of the study was the large sample size, which was the direct result of buy-in of the DT developer/current account owner and student interest in the topic. The owner was able to provide valuable insight for the project; he explained how the account is managed and how decisions were made about the validity of information. Buy-in from the developer was also beneficial in providing an exemplary method to recruit participants through a tweet posted on DT advertising the study. In

terms of student interest, five undergraduate students were happy to share their experiences using and perceptions of DT, which were instrumental in developing the study questionnaire. These students also participated in cognitive interviewing to ensure that the questionnaire was appropriate and clear. Partially due to students' interest in DT, (and simultaneous diverse recruitment strategies), a large sample size was achieved in a brief period of data collection. Students were eager to participate in research which matched their interests.

5.5 Future Directions

Future studies should address key limitations of the current study. Additional research is needed regarding similar student-driven social media platforms that relay information about either or both alcohol-related law enforcement and emergency alerts on other college campuses. The content of these platforms should be systematically analyzed as in specific aim one of this study to draw conclusions about how DT differs from and is similar to them. Researchers should explore students' trust in these platforms, and if they think these platforms are useful for distributing emergency alert information. Qualitative methods research should also be conducted to ask students if they think platforms which relay information about alcohol-related law enforcement can influence individual alcohol use behaviors and perceptions of risk for consequences, and if so, through what mechanisms. Student's own accounts of behavior changes they've made after viewing alcohol-related law enforcement location information would be particularly interesting. It would also be fascinating to explore if DT users differ from DT non-users on their perceptions regarding their peers' alcohol consumption habits. Social norms theory has concluded that college students often misperceive their peers' alcohol

consumption patterns by incorrectly assuming that their peers drink much more than they actually do (Perkins, 2002; Perkins, Meilman, Leichliter, Cashin, & Presley, 1999).

It would be interesting to determine if students who use DT perceive the alcohol consumption patterns of their peers differently than those who do not use DT. It is interesting that early tweets during the inception of DT focus primarily on alerting the followership of alcohol enforcement activities, yet currently DT does not focus primarily of alcohol-related messages. This evolution of DT could be further studied, and it would be stimulating to interview the founder of DT and students about their opinions and observations about how the focus of DT content has changed over time, and their predictions for how DT may further evolve in the future. The high frequency of retweets on Tuesdays is a curious finding, and one that requires further exploration into why Tuesdays may be a popular day of the week for social media use. AlcoholEdu results indicate an increase in alcohol consumption on Tuesdays, which may be associated with the many retweets on Tuesdays. Perhaps Tuesdays operate more similarly to a non-school night than other school nights during the week. Focus groups which ask students for reasons why Tuesdays are associated with increased alcohol use would be valuable. Alcohol harm reduction messages and alcohol-free social events on Tuesdays may be valuable in reducing alcohol-related harms in the college community. Further research is also needed on national apps which distribute alcohol-related enforcement information. Such apps should be examined for an in-depth content analysis to determine the intensity of alcohol-related information present on the app. Similar to the current study, it would be useful to determine if those who use these apps commit more illegal alcohol-related behaviors than those who do not.

Dissemination

Upon the successful defense of the dissertation, all study findings will be shared with the developers of DT. Considering that DT already distributes messages warning their followers not to drive after drinking, it is possible that the developers would be open to increasing the number of alcohol harm reduction messages submitted across the platform during targeted times during weekend late night hours when students are likely to be drinking. It would be impactful to speak with developers about the possibility of also transmitting other alcohol harm reduction messages beyond alcohol-impaired driving prevention. For example, if the goal was to provide strategies to limit the rate at which one becomes intoxicated, tips could be tweeted to followers that might include encouragement to consume a meal before drinking, to make an effort to eat during drinking episodes, or avoid drinking games which encourage rapid and heavy alcohol consumption. DT could also transmit messages encouraging alternating alcoholic drinks with non-alcoholic drinks, or provide more life-saving information on the signs of alcohol poisoning and what to do if one suspects a friend is in need of medical attention due to overconsumption. The PI will recommend that DT begin tweeting harm reduction messages during times when college students are likely to be consuming alcohol in a risky manner, such as high-alcohol days. The founder of DT will be asked about his opinion on the acceptability of these messages by the DT followership. It is also important to speak with developers about their experiences collecting information from followers about safety threats to inform future research efforts on student-driven social media platforms as supplements to university-sanctioned alert systems.

This research should also be shared with officials of higher education institutions to inform them about the utility of student-driven social media platforms to quickly and cost-effectively send emergency alert information to the student body. At minimum, colleges should be aware that such platforms are in use and have the ability to distribute information about both on- and off-campus location concerns. University officials and student social media platform managers would benefit from meeting to discuss how best to support each other's efforts in keeping the campus community safe. Considering students' high use of social media, it is in a university's best interest to employ the most innovative methods of alerting students through their preferred social media platforms. Upon completion of this project, the PI will share her recommendations with the administrators of Carolina Alert that the system should cover off-campus locations as thoroughly as on-campus locations. Many students live, work, and seek recreation away from campus, and should be alerted if there is a threat to their safety which occurs off-campus.

5.6 Conclusion

This contemporary, innovative research capitalizes on college students' interest in community connection through social media by examining the popular and influential DT platform. Results of the first specific aim revealed that DT does not primarily focus on distributing alcohol-related messages, but instead was found to be useful in overcoming the limitations of the university-sanctioned emergency alert system. The high volume of retweets of emergency alerts posted by DT reflects students' endorsement of the platform to quickly distribute messages to the broader campus community. Institutions of higher education should become aware of how similar social media platforms can enhance

emergency communication. Results of the second specific aim represent a critical step in understanding the influences of social media platforms which relay information about alcohol-related law enforcement on alcohol use behaviors and perceptions of risk in college students. While dose of exposure to DT did not significantly moderate the relationship between alcohol consumption and perceived risk of alcohol-related legal consequences, perceived risk for alcohol-related legal consequences was found to mediate the relationship between alcohol consumption and alcohol-related illegal behaviors. This finding provides evidence for the application of Deterrence Theory to high-risk college alcohol use research. Student users of DT were found to consume more alcohol than DT nonusers, which provides evidence that DT, and platforms like it which attract a self-selected sample of heavier drinkers, may be an excellent mechanism for sending alcohol harm reduction messages to those who need it most.

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APPENDIX A – SURVEY INSTRUMENT

Introduction to the study

About the survey-Examining Crowdsourced Social Media Platforms and Their Association with College Students' Alcohol Consumption, Perceived Risk, and Risk Behaviors:

My name is Danielle Gentile and I am a PhD candidate in the department of Health Promotion, Education, and Behavior in the Arnold School of Public Health. I am inviting you to participate in a study which will help me to fulfil the requirements of my degree program by conducting dissertation research. I am studying the relationship between use of crowdsourced social media and alcohol use, risk behaviors, and perception of risk in college students. This study is funded by the HPEB Provost funds for Doctoral Research.

To be eligible for this survey, you must have drunk alcohol at least once in the past month, be at least 18 years old, and be a currently enrolled undergraduate student at the University of South Carolina-Columbia. You will only be eligible to receive an incentive if you are eligible to take the survey.

During this study, you will be asked to complete a one-time online survey that will take approximately 15 minutes. You will be asked about your social media habits and perceptions, your alcohol consumption behaviors and consequences, and your perspectives on law enforcement.

You will not be asked to include your name or any other personally-identifying information that could be linked to your survey responses, which will maintain your anonymity. Your responses are strictly confidential, and will never be attributed to you. Your responses will be grouped together with other students' answers, and no one will ever be able to connect you to your responses.

Privacy will also be enhanced by the online survey design. You will be able to complete the survey privately without anyone seeing your responses as you complete the survey. All of your responses will kept completely confidential. Your agreeing to informed consent will not be connected with survey responses in order to protect your anonymity. Furthermore, the data resulting from this survey will be kept on a password-protected computer in a locked office at all times, and only the PI will have direct access to the data.

In exchange for your time, you will be eligible to be entered into a random lottery to receive a \$25 gift certificate to Amazon.com. Your chances of being awarded the gift

certificate is approximately 1 in 9. If you would like to be entered to win, please include your email address in the last question of the survey. If you win a gift certificate, you will be contacted via the email address that you have entered in the survey. You are eligible to enter the lottery whether you complete the survey or not.

Taking part in the study is your decision. You do not have to be in this study if you do not want to. You may also quit being in the study at any time or decide not to answer any question you are not comfortable answering. Participation, non-participation or withdrawal will not affect your grades in any way. You may withdraw at any time without penalty. If you would like, you can promote the study on your social media profile (Facebook, Twitter) to help the researcher recruit more participants. You are under no obligation to do this. If a friend that you have referred to the study enters your email address at the end of the questionnaire, you will be entered to win again, giving you 2 chances to win one of the gift certificates. There is no limit to the number of times you can be entered to win. If you win, you will be contacted by me at the email address you have provided.

For more information or questions concerning this research, you may contact the principal investigator, Danielle Gentile, at (716) 969-5386 or by email at gentile2@email.sc.edu. You may also contact Dr. Mindi Spencer at (803) 777-4371, or by email at m Spencer@mailbox.sc.edu. If you have any questions about your rights as a research participant, you may contact the Office of Research Compliance at the University of South Carolina at 803-777-7095.

Thank you for your consideration. If you would like to participate, please respond “yes” that you understand and accept the conditions of the survey. Please only participate in this survey once.

With kind regards,
Danielle Gentile
915 Greene Street, Columbia, SC. (Select one option)

- Yes, I understand the conditions of the survey and wish to participate

Prompt: First, please answer a few questions to confirm that you're eligible to take this survey.

Inclusion Criteria Questions

1. Are you an undergraduate student enrolled in classes at the University of South Carolina- Columbia?

- Yes
 No

2. What is your age in years? (e.g. 19)

Enter whole number _____

3. Have you consumed alcohol at least once within the past 30 days?

- Yes
 No

Prompt: Next, we would like to ask you some questions about your social media use habits and perceptions

Social media engagement

4. Please estimate how often, on average, you do the following (using the scale below)

	Never	Up to once a month	Up to about once a week	A few times a week	About once a day	Several times a day	About once an hour	More than once an hour
(a) Send a text message on a cell phone								
(b) Use a cell phone to make or receive a voice call								
(c) Check for updates on a social networking site (e.g. Facebook, Instagram)								
(d) "Like" or comment on a friend's post on a social networking site (e.g. Facebook, Instagram)								
(e) Update your own profile on a social								

networking site (e.g. Facebook, Instagram)								
(f) Play social games (e.g. Trivia Crack, Candy Crush, Words With Friends, Farmville)								
(g) Check for updates on a microblogging site (e.g. Twitter)								
(h) Update/ post on a microblogging site (e.g. Twitter)								
(i) Use two or more technologies (other than listening to music) at the same time (e.g. text friends or watch TV while working on the computer, etc.)								

Crowdsourced Social media

5. Which of the following social media platforms have you **heard of**?

- Drinking Ticket (Twitter account)
- Facebook
- Flickr
- Google +
- Grindr
- Instagram
- LinkedIn
- Pinterest
- Tinder
- Snapchat

- Streetchat
- Tumblr
- Twitter
- Vine
- Waze
- Yik Yak
- I have not heard of any of these
- I know of a different social media platform called _____

6. Which of the following social media platforms have you **ever used**?

- Drinking Ticket (Twitter account)
- Facebook
- Flickr
- Google +
- Grindr
- Instagram
- LinkedIn
- Pinterest
- Snapchat
- Streetchat
- Tinder
- Tumblr
- Twitter
- Vine
- Waze
- Yik Yak
- I have not heard of any of these
- I have used a different social media platform called _____

7. Which of the following social media platforms have you used at least once **within the past 2 weeks**?

- Drinking Ticket (Twitter account)
- Facebook
- Flickr
- Google +
- Grindr
- Instagram
- LinkedIn
- Pinterest
- Snapchat
- Streetchat
- Tinder
- Tumblr
- Twitter

- Vine
- Waze
- Yik Yak
- I have not heard of any of these
- I use a different social media platform called _____

Drinking Ticket Usage Patterns

8. Have you ever viewed Drinking Ticket tweets on Twitter or visited the Drinking Ticket webpage?

- Yes
- No

9. How familiar would you say you are with Drinking Ticket?

- Not at all familiar
- Slightly familiar
- Somewhat familiar
- Moderately familiar
- Extremely familiar

10. **When** did you first hear about Drinking Ticket?

- Before I became a USC student
- Before halfway through my first semester at USC
- More than halfway through my first semester at USC
- During my second semester at USC
- During my third semester at USC
- During my fourth semester at USC
- During my fifth semester or later at USC

11. **How** did you hear about Drinking Ticket?

- Word of mouth
- Flyer advertisements
- Sticker advertisements
- Came across it on Twitter
- A newspaper
- Online news sites (e.g. WIS)
- It was mentioned on another social media app/site
specify name of app/site _____

12. Overall, **how many** of Drinking Ticket's tweets do you think you view?

- I believe I see all of their tweets
- I believe I see most of their tweets

- I believe I see some of their tweets
- I believe I see none of their tweets

13. On average, how often do you directly visit Drinking Ticket's Twitter page?

- Never
- Less than every other month
- About once every other month
- Up to once a month
- Up to about once a week
- A few times a week
- About once a day
- Several times a day
- About once an hour
- More than once an hour

14. On average, how often do you visit Drinkingticket.com? (this is not the Twitter account, but a separate webpage)

- Never
- Less than every other month
- About once every other month
- Up to once a month
- Up to about once a week
- A few times a week
- About once a day
- Several times a day
- About once an hour
- More than once an hour

15. What **times of day** do you check Drinking Ticket the most?

- Morning (6am-12pm)
- Afternoon (12pm-5pm)
- Evening (5pm-9pm)
- Late night (9pm-6am)
- I don't check Drinking Ticket more at any particular time of the day

16. What **days of the week** do you check Drinking Ticket the most? Check all that apply.

- Mondays
- Tuesdays
- Wednesdays
- Thursdays
- Fridays
- Saturdays
- Sundays
- I don't check Drinking Ticket more on certain days of the week than others

17. Are there **certain occasions** when you check Drinking Ticket more frequently than usual? If yes, check the box(es) next to those occasions which apply.

- Before I'm going out with friends
- During when I'm going out with friends
- On my way home from going out with friends
- After I get home from going out with friends
- Before I will be driving somewhere
- During will I am driving somewhere
- During special events (e.g. tailgating, the Carolina Cup, St. Patrick's Day)
- When there's a public safety concern (e.g. school shooting)
- more response options from student interviews
- I don't check Drinking Ticket more on certain occasions than others

18. What is the abbreviation for South Carolina?

- SC
- NM
- TX
- AL

19. Do you subscribe to "push notifications" (instant notifications/alerts sent directly to your phone) from Drinking Ticket?

- Yes
- No

20. What is the **primary reason** why you check Drinking Ticket? Select only one.

- To avoid traffic violations (e.g. speeding, parking tickets)
- For entertainment
- To avoid getting into trouble for alcohol (e.g. MIP, DUI, fake ID)
- To be informed about public safety concerns (e.g. school shooting)
- To be kept up on current events
- For traffic updates
- For drink specials

Trust in Drinking Ticket

21. Please indicate how much you agree or disagree with the following statements (using the scale below)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
(a) I believe that Drinking Ticket is employed in my best interest					

(b) I believe that Drinking Ticket is capable of meeting its users' needs					
(c) In general, Drinking Ticket is effectively sharing important information					
(d) I am comfortable relying on information from Drinking Ticket					
(e) I feel fine using information from Drinking Ticket					
(f) the information presented by Drinking Ticket is generally accurate					

22. Is there any other social media app besides Drinking Ticket that you use to get information about alcohol law enforcement? If yes, enter the name of that app. You may enter the names of multiple apps. If not, leave blank.

23. Have you ever submitted a tip or tweeted directly to Drinking Ticket?

- Yes
 No

24. If you have submitted a tip or tweeted directly to Drinking Ticket before, approximately how many times have you done so?

Enter # of tweets you've submitted _____

25. Have you ever retweeted a Drinking Ticket tweet?

- Yes
 No

26. If you have retweeted Drinking Ticket before, approximately how many times have you done so?

Enter # of tweets you've retweeted _____

Prompt: Finally, we would like to ask you some questions about alcohol use habits and perceptions. Your responses are completely anonymous and will never be linked to you. There is no possibility of getting into trouble for your responses, so please feel free to answer honestly. This information is strictly for statistical purposes.

Alcohol Consumption

Establishing Drinker/Non-Drinker status

27. Have you consumed alcohol **at least once** within the **past 2 weeks**?

- Yes
- No

Frequency of alcohol consumption

28. During the past 30 days, on **how many days** did you consume alcohol? (0-30 days)

- Enter number of days _____

Quantity of alcohol consumption

29. What is the average **number** of standard drinks you drink **per week**? One standard drink is 12oz of beer (a can or bottle), 5 oz. of wine, and 1 oz. of liquor whether as a shot or in a mixed drink.

- Enter number of drinks _____

30. What is the average number of standard drinks you consume **during a typical occasion** when you are drinking alcohol? (one standard drink is 12oz of beer (a can or bottle), 5 oz. of wine, and 1 oz. of liquor whether as a shot or in a mixed drink.)

- Enter number of drinks _____

Binge drinking

31. Think back over the last **two weeks**. How many times have you had four or more standard drinks on a single occasion within about 2 hours? One standard drink is 12oz of beer (a can or bottle), 5 oz. of wine, and 1 oz. of liquor whether as a shot or in a mixed drink.

- None
- Once
- Twice
- 3-5 times
- 6-9 times
- 10+ times

Overall Perceived Risk of Illegal Alcohol Behaviors

32. How risky do you think the following behaviors are on a scale from 1 (not at all risky) to 10 (extremely risky)?

	1. Not at All Risky	2 .	3 .	4	5 .	6 .	7 .	8 .	9 .	10.Extr -emely Risky
(a) being intoxicated in public										
(b) being in possession of alcohol while underage										
(c) attempting to get into a bar with a fake ID										
(d) providing alcohol to someone younger than 21 years old										
(e) In general, attempting to buy alcohol with a fake ID										
(f) having an open container of alcohol in public										
(g) hosting a very loud party										
(h) driving after drinking any alcohol at all										
(i) driving after drinking 2-3 drinks within one hour? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink.										
(j) driving after consuming 4 or more drinks? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink										

Brief Rutgers Alcohol Problem Index

33. How many times have the following happened to you while you were drinking or because of your drinking during the last year?

	None	1-2 times	3-5 times	More than 5 times
(a) Not able to do your homework or study for a test				
(b) Got into fights with other people (friends, relatives, strangers)				
(c) Caused shame or embarrassment to someone				
(d) Neglected your responsibilities				
(e) Relatives avoided you				
(f) Felt that you needed more alcohol than you used to in order to get the same effect				
(g) Missed a day (or part of a day) of school or work				
(h) Tried to control your drinking (tried to drink only at certain times of the day or in certain places, that is, tried to change your pattern of drinking)				
(i) Had withdrawal symptoms, that is, felt sick because you stopped or cut down on drinking				
(j) Felt that you had a problem with alcohol				
(k) Wanted to stop drinking but couldn't				
(l) Suddenly found yourself in a place that you could not remember getting to				
(m) Felt you were going crazy				
(n) Had a bad time				
(o) Felt physically or psychologically dependent on alcohol				
(p) Was told by a friend, neighbor or relative to stop or cut down drinking				
(q) Forgot what you did				
(r) Did something you later regretted				
(s) Missed a class				
(t) Performed poorly on a test or important project				
(u) Physically injured yourself				
(v) Physically injured someone else				

(w) Got in trouble with the police, residence hall, or other college authorities				
(x) Had sex with someone without giving your consent				
(y) Had sex with someone without getting their consent				

Alcohol- related illegal behaviors

34. Within the last thirty days, have you had an open container of alcohol in public?

- Yes
 No

35. Within the last thirty days, did you drive after drinking any alcohol at all?

- Yes
 No

36. Within the last thirty days, did you drive after consuming 2-3 drinks within one hour? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink.

- Yes
 No

37. Within the last thirty days, did you drive after having 4 or more drinks? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink

- Yes
 No

38. Is the University of South Carolina-Columbia located in Columbia, SC?

- Yes
 No

39. Within the last thirty days, have you been intoxicated in public?

- Yes
 No

40. (only if you are younger than 21) Within the last thirty days, have you used a fake ID to get into a bar?

- Doesn't apply, I am 21 years old or older
- Yes
- No

41. (only if you are 21 or older) Within the last thirty days, have you provided alcohol to someone younger than 21 years old?

- Doesn't apply, I am younger than 21 years old
- Yes
- No

42. (only if you are younger than 21) Within the last thirty days, have you used a fake ID to buy alcohol?

- Doesn't apply, I am 21 years old or older
- Yes
- No

Perceived susceptibility to alcohol-related legal and university consequences for unlawful alcohol use

Certainty

43. In college, students do certain things while they are drinking alcohol. Some of these behaviors could potentially get students in trouble with the police (like getting a ticket or arrest) or the university (like getting in trouble with your resident mentor in the dorms or university staff elsewhere on campus), while others don't. How likely is it, on a scale from 1(not at all likely) to 10 (absolutely certain) that each of the following behaviors **would result in getting in trouble from the police and/or the university** if the average college student were to do them?

	1. Not at all likely	2.	3.	4	5 .	6 .	7 .	8 .	9 .	10.Ab solutel y Certai n
(a) being intoxicated in public?										
(b) being in possession of alcohol while underage on campus ?										
(c) being in possession of alcohol while underage off campus ?										
(d) attempting to get into a bar with a fake ID?										

(e) providing alcohol to someone younger than 21 years old?										
(f) attempting to buy alcohol with a fake ID?										
(g) having an open container of alcohol in public?										
(h) hosting a very loud party?										
(i) driving after drinking 2-3 drinks within one hour? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink.										
(j) driving after consuming 4 or more drinks? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink										

Magnitude

44. If a college student were to get in trouble with the police and/or the university for doing the following behaviors, **how serious/severe** would that consequence be on a scale from 1 (not at all serious) to 10 (extremely serious)

	1. Not at all serious	2.	3.	4	5 .	6 .	7 .	8 .	9 .	10.extr e-mely serious
(a) being intoxicated in public?										
(b) being in possession of alcohol while underage on campus ?										
(c) being in possession of alcohol while underage off campus ?										
(d) attempting to get into a bar with a fake ID?										
(e) providing alcohol to someone younger than 21 years old?										
(f) attempting to buy alcohol with a fake ID?										
(g) having an open container of alcohol in public?										

(h) hosting a very loud party?										
(i) driving after drinking 2-3 drinks within one hour? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink.										
(j) driving after consuming 4 or more drinks? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink										

Celerity (swiftness)

45. If a college student were to get in trouble from the police and/or the university for doing the following behaviors, **how quickly** would that consequence happen to the student on a scale from 1(in the distant future) to 10 (immediately)?

	1. In the distant future	2	3	4	5	6	7	8	9.	10.Immediately
(a) being intoxicated in public?										
(b) being in possession of alcohol while underage on campus ?										
(c) being in possession of alcohol while underage off campus ?										
(d) attempting to get into a bar with a fake ID?										
(e) providing alcohol to someone younger than 21 years old?										
(f) attempting to buy alcohol with a fake ID?										
(g) having an open container of alcohol in public?										
(h) hosting a very loud party?										
(i) driving after drinking 2-3 drinks within one hour? One drink is equivalent to a 12 oz. bottle or can of										

beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink.										
(j) driving after consuming 4 or more drinks? One drink is equivalent to a 12 oz. bottle or can of beer, 5 oz. of wine, and 1 oz. of liquor either as a shot or in a mixed drink										

Demographics

46. What is your gender?

- Male
- Female
- Transgender
- Prefer not to say

47. Are you Hispanic or Latino?

- Yes
- No

48. What ethnicity do you most closely identify with?

- African American or Black
- American Indian or Alaska Native
- Asian or Pacific Islander, Native Hawaiian
- Caucasian or White
- Multiracial
- Other (please specify) _____
- Prefer not to say

49. What is your class standing?

- Freshman/1st year
- Sophomore/2nd year
- Junior/3rd year
- Senior/4th year
- 5th year or more

50. Where do you currently live?

- On-campus residence hall
- Fraternity or sorority housing
- Off-campus with family members or guardians
- Off-campus student housing community (e.g, the Woodlands, the Retreat)
- Other off-campus housing
- Other

51. What is your approximate cumulative GPA?

- 3.50-4.00
- 3.00-3.49
- 2.50-2.99
- 2.00-2.49
- 0.00-1.99

52. What are the University of South Carolina's school colors?

- Green & Gold
- Blue & Purple
- Garnet & Black
- Blue & White

53. During the past 12 months, have you participated in extracurricular or volunteer activities (e.g. intramural sports, Greek life, academic clubs, service organizations, religious groups)

- Yes
- No

54. If yes, about how many hours per week do you spend on participating in extracurricular and volunteer activities?

Enter whole number of hours per week _____

55. Are you currently employed working for pay or working on something you consider work like interning or student teaching?

- Yes
- No

56. If yes, approximately how many hours per week do you usually work for pay and/or devoting to your internship/student teaching?

Enter whole number of hours per week _____

57..How did you hear about this survey?

- Table on Greene Street
- A Flyer
- An online post
- In my classroom when offered credit by my course instructor
- In my classroom during the CORE survey
- Word of mouth

58. What electronic device did you use to complete this survey?

- Smart phone (cell phone)
- Computer
- Tablet (e.g. iPad, iPod touch, Samsung Galaxy Note, Microsoft Note)

APPENDIX B- RECRUITMENT FLYER

Want to share your opinions about



Did you drink alcohol at least once
this month?

If the answers are yes, take an online
15 minute survey

Follow the online survey link:

<http://tinyurl.com/Drinkingticketsurvey>

for

Arnold School of Public Health
Doctoral Dissertation Research

You will receive a chance to win a
\$25.00 Amazon.com gift certificate

Questions?
Contact: Danielle Gentile
Gentile2@email.sc.edu
716-969-5386



Scan with QR code scanner to
[go](#) directly to survey link

APPENDIX C- SPECIFIC AIM 1 FOLLOW-UP RESULTS

Top 3 most retweeted tweets of the year

The most retweeted tweet of the year was posted on Friday, April 25, 2014 at 12:26 pm and received 943 retweets. The text of the tweet was: “a visiting family has decided to take a tour of @UofSC Horseshoe.....In their car.” It was coded as humor because it depicts a family driving a vehicle in a historical part of campus where no vehicular traffic is allowed. The tweet and accompanying photograph is presented in Figure C.1.



Figure C.1 Most retweeted tweet of the year

The second most retweeted tweet of the year posted on Monday, November 24, 2014 at 11:33am received 680 retweets. The text stated: “The great part about being a Clemson fan is your prison uniform shows your school spirit! #ClemsonHateWeek.” This tweet was coded as humor because the prisoner in the photograph ironically has a tattooed symbol of Clemson University, and is wearing orange, which is the school color of Clemson University, a sports rival of the University of South Carolina. This tweet is presented in Figure C.2



Figure C.2 Second most retweeted tweet of the year

The third most retweeted tweet occurred on Saturday, December 13th, 2014 at 7:34pm and received 627 retweets. The text declared, “CONFIRMED: NO SCHOOL TOMORROW! (FRIDAY) HAPPY 3RD SNOW DAY.” It was coded as other because it did not conform to the operative definitions of the other identified themes in the final codebook. There was no accompanying photograph with the tweet.

Follow-up analysis 1: What proportion of Drinking Ticket® tweets are about alcohol?

Throughout the year of DT Tweets, 167 tweets were about alcohol, and 897 Tweets were not about alcohol. This resulted in 15.7 percent of tweets being about alcohol, and 84.3 percent of tweets not about alcohol. The largest amount of tweets about alcohol were concerned with DUI checkpoint locations with 95 tweets, followed by SLED/ X alcohol enforcement agency with 34, alcohol bar specials with 28, and disbanding parties by police with 10. These frequencies are presented in Table 4.2

Follow-up analysis 3: Does Drinking Ticket® tweet more often on high drinking days than typical days?

Carolina Cup was the high drinking day with the most tweets, at 15 tweets. The second highest number of tweets per drinking day was on Saint Patrick’s Day with 10. Home football game 9/13/14, New Year’s Eve, and Independence Day were all had the third most tweets with 7. The average number of tweets for a high drinking day during the year was 4.61, while the average number of tweets on typical days for the duration of the existence of the DT platform was 4.9 (Tweetstats.com) Figure C.3 presents the number of tweets on each high drinking day identified in the year of DT tweets.

Follow-up analysis 4: Does Drinking Ticket® tweet a greater proportion of tweets about alcohol on high drinking days than on typical days?

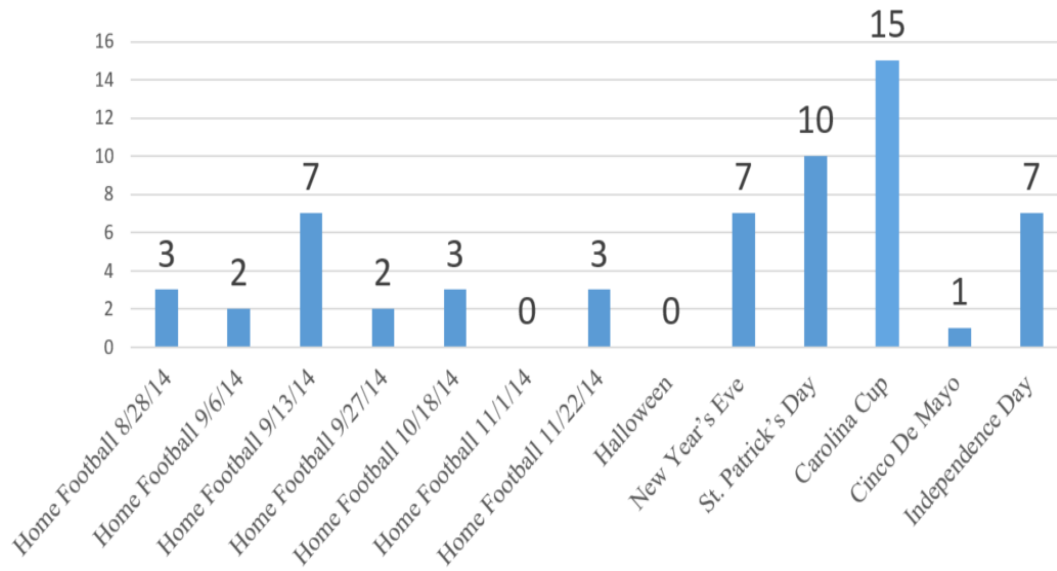


Figure C.3 Number of tweets during high drinking days

There were 27 tweets posted that were about alcohol during high drinking days, and 53 tweets that were not about alcohol on high drinking days. This amounted to 33.8 percent of the tweets on high drinking days being about alcohol and 66.3 percent of the tweets not about alcohol. Not all themes included in the final codebook were represented in the content of tweets on high drinking days. The most strongly represented theme about alcohol was DUI checkpoints, with 14 tweets. This was followed by disbanding parties by police with 5, and alcohol bar specials and SLED both with 4 tweets. The highest number of references that were not about alcohol were 17 tweets coded as other, followed by 13 tweets coded as traffic updates and 9 tweets coded as police emergency

personnel presence. These results are presented in Table 4.2. The results can also be viewed pictorially in Figure C.4.



Figure C.4 Word cloud of types of information displayed on DT during high drinking days