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Broken Bottles: Understanding The Relationship Between Alcohol Outlet Availability And The Proximity To Alcohol Outlets With Binge Drinking Behaviors In College Fraternity Men At Southeastern Public Universities

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I also have to acknowledge that my passion and interest in this topic has always been fueled by my over 10 years of working in the field of fraternity and sorority life. It was a challenging experience that has left a mark on my life. I could write a novel on the things I saw and experienced, both good and bad. And although I met many amazing

young men who are most likely now amazing fathers and/or leaders in their community, I also saw a culture of alcohol use supported by local businesses that had no regard for the law or the health and safety of their patrons. This observation kept me awake many nights. I saw the horrible impacts from unregulated and glorified alcohol use firsthand. I only hope that in my time working with them, I was able to make a positive impact and steer these young men into a better direction.

Abstract

Alcohol use among fraternity affiliated men presents a concerning trend with harmful consequences (DeSimone, 2009; Hingson et al., 2017; McCreary et al., 2021; Nuwer, 2001; Patrick et al., 2022; Ranker & Lipson, 2022). The availability theory of alcohol-related problems suggests alcohol use could be influenced based on the availability and proximity of alcohol outlets in the environment (Dimova, 2023; Kypri et al., 2008; Scribner et al., 2008; Single, 1984; Weitzmann et al., 2003). However, no existing studies of fraternity-affiliated students have examined the relationship of binge drinking and access to alcohol through alcohol outlet availability or proximity. This study examined the relationship between binge drinking and alcohol outlet availability/proximity with college-aged men affiliated with Interfraternity Council (IFC) chapters at Southeastern Conference (SEC) schools. Measures for availability and proximity impacts were conducted through a Spearman's rank correlation analysis (N = 5,000; n = 14) and a negative binomial regression (N = 1,252). The results indicated a weak inverse relationship between campus mean binge drinking rates and the availability of all types of alcohol outlets within a 2-mile radius of the campuses. However, none of the results were statistically significant. The relationship between individual binge drinking and the proximity to all types of alcohol outlets indicated that if a fraternity affiliated man were to increase his distance from an alcohol outlet by 1 unit or 1 meter, he would decrease his binge drinking behaviors by a factor of 0.99 (1%). When stratified by prior high school drinking, only individuals who indicated drinking alcohol in high

school 4–5 times a week saw a statistically significant relationship, by a factor of 0.99, between their binge drinking rate and their proximity to off-premise alcohol outlets. This study presented mixed findings but established that a harmful relationship exists between binge drinking and the proximity to alcohol outlets for fraternity men in the SEC.

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Chapter 1: Introduction

A substantial body of research and historical anecdotes exist noting the concerning relationship of high-risk alcohol use with college students, including for fraternity affiliated men, the population of interest in this study (Andone, 2017; Capone et al., 2007; DeSimone, 2009; Levenson, 2017; McCreary et al., 2021; Nuwer, 2001; Patrick et al., 2022; Ragsdale et al., 2012; Ranker & Lipson, 2022; Routon & Walker, 2014; Wechsler et al., 2009). College fraternity men's alcohol-use behaviors are typically associated with influences known as selection and socialization (Borsari et al., 2009; Larimer et al., 2000; McCabe et al., 2005, 2018). Selection represents the idea that high-risk individuals self-select into joining groups of organizations, people, and/or environments known to engage in similar behavior (DeSimone, 2009). Socialization relates to encouraged or learned behaviors while in that environment (McCabe et al., 2005). With regard to alcohol-use behaviors, no studies to date have evaluated the impact of environmental design in a college city through alcohol outlet availability or proximity as a potential mediating variable connected to binge drinking behaviors in fraternity and sorority membership.

This study explored the relationship between alcohol outlet availability, number of outlets in a particular location, and proximity (i.e., nearest distance to an alcohol outlet) with binge drinking behaviors in college fraternity men associated with Interfraternity Council (IFC) chapters, also known as North American Interfraternity Conference (NIC) organizations (Ray, 2013). Given that members of IFC organization

are more “engaged in heavy episodic drinking, rather than members of other councils” (Myers & Sasso, 2022, p. 3), they were the group selected as the population of interest in the current study. Consistent with availability theory, the higher propensity for binge drinking in this group creates a research priority given the potential greater alcohol-related harms (Capone et al., 2007; DeSimone, 2009; Dimova, 2023; Hingson et al., 2017; McCabe et al., 2005; McCreary et al., 2021; National Institute on Alcohol Abuse and Alcoholism, 2023e; Nuwer, 2001; Patrick et al., 2022; Ragsdale et al., 2012; Ranker & Lipson, 2022; Routon & Walker, 2014; Sacks et al., 2010; Single, 1984; Trapp et al., 2018; Turrisi et al., 2006). Students affiliated with culturally based Greek organizations do not show the same levels of drinking behaviors (Myers & Sasso, 2022) and were excluded from the current study. Understanding risk factors associated with problematic drinking is critical in furthering the literature connected to this subpopulation and literature on alcohol outlet availability/proximity.

This chapter provides an initial overview of the problem of alcohol use by college students, with a more specific focus on fraternity affiliated men. Additionally, the researcher introduces a mediating variable known as alcohol outlet availability/proximity and incorporates its related theory in connection with alcohol consumption. This chapter highlights key definitions, significance of this research, known limitations, research questions, and an overall structure of the dissertation.

Definitions of Terms

- *Alcohol availability* “refers to the ease or convenience of obtaining alcohol for drinking purposes” (Österberg, 2012, p. 96).

- *Alcohol outlet density* refers to the general density of licensed alcohol businesses in a particular location (Heather & Stockwell, 2003).
- *Alcohol outlet proximity* denotes the measure of distance to the nearest alcohol outlet type (Young et al., 2013).
- *Availability theory of alcohol-related problems* is generally referenced as availability theory and serves as a theoretical framework indicating an increased availability of alcohol leads to increased consumption and increased alcohol-related harms and consequences (Single, 1984).
- The National Institute on Alcohol Abuse and Alcoholism (2023c) provided the following definition of *binge drinking*:

  > [A] pattern of drinking alcohol that brings blood alcohol concentration (BAC) to 0.08%—or 0.08 grams of alcohol per deciliter—or more. This typically happens if a woman has four or more drinks, or a man has five or more drinks, within about 2 hours. (p. 1)

- *Blood alcohol concentration (BAC)* "refers to the percent of alcohol in a person's blood stream" (Stanford University, n.d., p. 1).
- The *North American Interfraternity Conference (NIC)* is "a trade association that represents national and international men's fraternities, including a diverse range of culturally and religious based organizations, on campus in the United States and Canada" (NIC, n.d., p. 1). Student organizations that were historically or are currently associated with this association are referred to as IFC chapters (NIC, n.d.).

- *Off-premise outlets* references businesses where alcohol is purchased but consumed at a different location (Wiser et al., 2015).
- *On-premise outlets* references businesses "where alcohol is purchased and consumed within the building" (Wiser et al., 2015, p. 20).
- *Selection* refers to the "influence of individual characteristics in steering an individual toward certain experiences, organizations or environments" (McCabe et al., 2005, p. 513).
- *Socialization* is the "influence of experiences, organizations or environments on the individual" (McCabe et al., 2005, p. 513).
- *Southeastern Conference (SEC)* is an intercollegiate athletic conference of 14 large higher education institutions located in the southeastern section of the United States (SEC, 2022).

Alcohol Use by College Fraternity Men

To visualize the consequences of unfettered alcohol access and use in college fraternity men connected to southeastern universities, it is helpful to start with two detailed examples: one at the University of South Carolina and the other at Louisiana State University. It was a typical day at the University of South Carolina in the spring of 2015 with the usual movement of campus life and pedestrian traffic surrounding the campus student union. However, this day was about to change drastically for many people and end for one young man. At first, word was traveling around campus that something happened to a fraternity pledge but then, it was confirmed. A Pi Kappa Alpha fraternity pledge, Charlie Terreni, was found dead in the early morning hours at an off-campus house (Mills, 2015). The hours that followed this breaking news included the

start of a law enforcement and university investigations, while attempting to console those in mourning. In a brief follow-up call with the chapter president, a student leader at the campus, campus administrators asked questions about what occurred and led up to this incident. The chapter president, who provided limited answers, had to end the call early, but stated they would call back. However, the chapter president ceased all communications and the next call came from the organization's newly appointed attorney. Shortly thereafter, both the university and their national organization placed the fraternity on a suspension status, pending an investigation (Santaella, 2015).

In a photo taken from outside of the house where the body was found, viewers can see shamrock decorations on the front of the house, remnants of St. Patrick's Day celebrations around the city (Santaella, 2015). The porch and front yard were littered with red solo cups, overflowing trash cans, and painted coolers. The porch also had what appeared to be a small keg near the front door. When the toxicology report came back, the coroner noted Charlie's BAC was .375, "four times the legal limit" (WIS10, 2015, p. 1). BAC measures the "amount of alcohol by weight in a fixed volume of blood" (Brick, 2008, p. 4). BAC can be influenced by numerous things such as body weight, sex, and length of consumption (Stanford University, n.d.). A BAC of .10 to .12 can lead to "significant impairment of motor coordination and loss of judgement" (Stanford University, n.d., p. 1). Any BAC at or above .40 could lead to a coma or "death due to respiratory failure" (Stanford University, n.d., p. 1). The coroner stated this incident was "tragic and totally preventable" (WIS10, 2015, p. 1). Unfortunately, this death was another addition to the statistic of alcohol-related preventable deaths in the United States (National Institute on Alcohol Abuse and Alcoholism, 2023a).

Almost 2 years later, a young freshman male student by the name of Maxwell Gruver was pledging Phi Delta Theta fraternity at Louisiana State University (Nuwer, 2023). This seemingly typical experience for many college-aged men was about to take a horrible turn. Maxwell and his pledge brothers were called to the Phi Delta Theta house late in the evening (Rossman, 2017). As soon as they arrived, their phones were taken and they were led upstairs. At that point, the ridicule and hazing began as they were covered in food condiments and began various physical calisthenic activities, all occurring in a dark and disorienting room. The fraternity brothers began quizzing the pledges on various items; for each incorrect answer, the pledges were forced to consume "three to four pulls of diesel" (Rossman, 2017, p. 1), a liquor beverage with a very high alcohol concentration. Maxwell was described as taking over 10 of these "pulls" (Rossman, 2017, p. 1). About 2 hours later, Maxwell was placed on a couch so he could sleep off his drunkenness, but he never woke up. When Maxwell died, his BAC was 0.495, "six times the legal limit" (Rossman, 2017, p. 1). Maxwell's fraternity brothers faced legal consequences for their involvement with his death. As the legal cases began in Louisiana, fraternity brothers who were facing charges attempted to diffuse their responsibility by describing Max as a "party animal" (Nobles, 2019, p. 1). Max was described as an individual who recreationally engaged in the use of alcohol and other illegal substances. The defense attorney even described Max as only being "sober for maybe 5 out of the 30 days" (Nobles, 2019, p. 1) he was at Louisiana State University. Regardless of the accuracy of the descriptions, these behaviors highlighted the rampant use of alcohol associated with fraternity affiliation (DeSimone, 2009).

Fraternity alcohol-related deaths continued through 2021 at college campuses such as Bowling Green State University, Virginia Commonwealth University, University of Kentucky, and Michigan State University (Nuwer, 2023). Although instances of alcohol-related fraternity deaths are common, there have been a limited number of nationally publicized examples of fraternity alcohol-related deaths since 2021. Even with that recent positive trend of reduced fraternity alcohol-related deaths, alcohol-related deaths of young adults are not the only measure available to highlight the detrimental harms alcohol use can have on college-aged fraternity men. Both short- and long-term psychological and physiological effects can come from heavy episodic drinking (Brick, 2008). Additionally, college-aged adults who consume alcohol increase their risk for legal consequences, injury, suicide, crime victimization, and other health and social consequences (Trapp et al., 2018; Turrisi et al., 2006).

The aforementioned examples describing tragedies at college campuses highlight a small sample of alcohol-related harms with college men, but in the United States, overall alcohol-related deaths are considered the fourth leading cause of preventable death with men accounting for almost 70% of those deaths annually (National Institute on Alcohol Abuse and Alcoholism, 2023a, p. 1). From 2015 to 2019, close to 140,000 people died annually due to “alcohol related causes” (National Institute on Alcohol Abuse and Alcoholism, 2023a, p. 1). These deaths highlight the problematic relationship that exists with heavy episodic drinking. With college-aged adults, the age group of interest for the current study, “the rate per 100,000 of alcohol related poisoning deaths among 18 to 24 year olds more than doubled from 1998 to 2004” (Hingson et al., 2017, p. 546). As of 2014, a conservative estimate of alcohol-related hospitalization rates of this

age group was about 50,050, which—if accounting for the proportion of college students at that time—meant close to half of those hospitalizations were college students (Hingson et al., 2017, p. 545).

Although these incidents impacting fraternity men on college campuses may appear to be isolated examples, they feed into a perpetuated image society has of college and fraternity life (De Oliveira, 2016; Mekouar, 2019; Snyder, 2022). One of the most well-known fraternity themed movies, *Animal House*, glorified the college fraternity experience and presented an image of defiance, conflict with university officials, sexual exploitation of women, alcohol abuse, and various forms of high-risk behaviors by fraternity men (Mekouar, 2019; Snyder, 2022). *Animal House* was a comedy film based on one of the filmmaker's personal experiences with Alpha Delta Phi fraternity at Dartmouth University (Snyder, 2022). Other similar movies, like *Neighbors 2* or *22 Jump Street*, portrayed a college environment rich in fun, alcohol, sex, and debauchery (De Oliveira, 2016). However, in these movies, fraternities are in the forefront of that societal image. A danger with this imagery is dependent on whether it is a reflection or perception of reality. Even if it is only a perception, research has shown students who believe alcohol misuse is widespread tend to engage in high-risk alcohol consumption and binge drinking (Neighbors et al., 2007; Perkins, 2002).

More recently, during the initial stages of the COVID 19 global pandemic, alcohol behaviors only worsened for the general U.S. population (Rabin, 2022). More specifically, individuals aged 25–44 saw the greatest increases in alcohol-related deaths (A. M. White et al., 2022, p. 1704). From 2019 to 2020, alcohol deaths nationwide increased by 25% (Rabin, 2022, p. 1; A. M. White et al., 2022). This increase was likely

due to external stressors and the lack of treatment options available during the pandemic (Rabin, 2022; A. M. White et al., 2022). For adults under the age of 65, deaths related to alcohol outpaced deaths related to the COVID-19 virus in 2020 (Rabin, 2022; A. M. White et al., 2022). Overall, alcohol per volume sales in 2020 saw a 2.9% increase, and this increase was the greatest annual increase in alcohol sales in almost 54 years (Rabin, 2022; A. M. White et al., 2022). Although impacting an older population, these increased rates in consumption followed by greater alcohol-related harms emphasizes the availability theory (Single, 1984), which was the theoretical framework for the current study.

While examining recent trends around alcohol use in college-aged students, other studies have highlighted overall decreases in consumption and binge drinking behaviors (Acuff et al., 2022; Fruehwirth et al., 2021). However, one study showed increases in alcohol use during the COVID-19 global pandemic by individuals who had preexisting high-risk alcohol use (Fruehwirth et al., 2021). This increased use could indicate a potential concern for people who are members of college fraternities given their known behaviors around alcohol use. The general decrease in drinking among college-aged students was likely due to the fact that many students moved home during the pandemic and had fewer peer-to-peer social interactions, providing an additional "protective factor" (H. R. White et al., 2020, p. 725). Additionally, moving home to live with parents may limit access to alcohol and reduce consumption behaviors (H. R. White et al., 2020). This statement is consistent with the theoretical tenants of availability theory and provides an opportunity to review the relationship between college alcohol access and binge drinking behaviors (Single, 1984).

Outside of the measures of death and physical harm caused by alcohol use, the U.S. economic impact for alcohol misuse, mostly connected to binge drinking, equated to around $249 billion in 2010 (National Institute on Alcohol Abuse and Alcoholism, 2023b, p. 1). This number emphasizes the invisible impacts alcohol use can have on society that are not always captured in flashy news articles or research journals. This number also highlights the need to examine different variables that could have an impact on alcohol misuse and create effective interventions that reduce these associated harms. This estimate was calculated by evaluating economic impacts most likely influenced by alcohol use, including costs associated with medical care provided for alcohol-related incidents, law enforcement and criminal justice enforcement programs and measures used to address alcohol use, and property damage costs that come from alcohol-related incidents (Sacks et al., 2010). The data quantify the detrimental impacts of alcohol use impacting everyday U.S. citizens and relate to a common theory that notes increased consumption leads to increased alcohol-related harms (Single, 1984). However, that same theory states increased consumption is associated with increased access or availability of alcohol.

Alcohol Availability and Theory

Availability theory of alcohol-related problems suggests increased access to alcohol leads to increased consumption, and increased individual and community harms (Single, 1988). This theory provides an opportunity to view environmental factors that could influence binge drinking behaviors among some of the highest-risk drinkers, college fraternity men. Availability theory was developed through decades of empirical research conducted by public health experts exploring the relationship of alcohol

availability on consumption rates and alcohol-related outcomes (Chaudron & Wilkinson, 1988). The foundation of this theory was initially introduced in a 1975 World Health Organization (WHO) report and summarized further by Single (Stockwell & Gruenewald, 2004). Availability theory is typically used as a lens and methodological framework in research studies that attempt to correlate a relationship between certain health behaviors and the access, proximity, or density of alcohol outlets in a particular location. Studies will evaluate the "regressing rates of a particular outcome measure (consumption, violence, and other harms) on outlet density" (Livingston et al., 2007, p. 562). A regression or correlational analysis can also be conducted not just based on the availability of alcohol outlets but also by the proximal distance between the individual surveyed and the nearest outlet (Seid et al., 2018). This regression is typically done while controlling various subject variables, such as demographics. The research design for the current study mirrored these methodological approaches because the researcher examined the relationship between availability of alcohol and binge drinking behaviors in college fraternity men. The framework of this study allowed the researcher to review the relationship between binge drinking behaviors and alcohol availability through a count-based measure of the number of outlets in a predefined geographic region and alcohol proximity (i.e., the nearest distance to an alcohol outlet). Additionally, the results of the analysis were reviewed through the theoretical framework of availability theory.

In line with the propositions of availability theory, numerous studies have indicated a relationship between density or alcohol availability in an environment and the propensity for alcohol-related harms such as crimes, injuries, and drinking behaviors (Dimova, 2023; Scribner et al., 2008, 2010; Wiser et al., 2015). In college cities, the

environment of interest, studies have demonstrated various impacts that different types of alcohol outlets have on drinking outcomes (Connor et al., 2010; Kypri et al., 2008; Paschall et al., 2012; Scribner et al., 2008). The current study added to the body of research on outlet type influences by examining the relationship between drinking behavior and each type of alcohol outlet, on premise versus off premise. However, this study explored this relationship with a college subgroup not yet viewed through this methodological approach. The examination between each outlet type provides campus administrators, city officials, and planners with helpful data to understand what types of businesses are greater indicators of harm with high-risk college-aged students affiliated with IFC organizations.

Significance and Limitations

Given the aforementioned harms associated with alcohol use among fraternity affiliated men, more research is needed to understand mediating variables of influence in their alcohol-use behaviors. The research design incorporated a public health approach of studying the influence alcohol access has in the consumption behaviors of college fraternity men, consistent with the theoretical propositions of availability theory (Single, 1984). Similar to the availability theory framework, the current study explored if availability of alcohol, through the number of outlets and the proximity to them, led to increased alcohol consumption in fraternity men and increased alcohol-related harms.

College students already use alcohol actively and in concerning rates (National Institute on Alcohol Abuse and Alcoholism, 2023e). However, fraternity affiliated individuals associated with IFC organizations were the population of interest of the current study due to having some of the highest individual alcohol consumption rates in a

college environment (DeSimone, 2009; Myers & Sasso, 2022; National Institute on Alcohol Abuse and Alcoholism, 2023d). In accordance with availability theory, this use rate indicates the fraternity male population living near a greater density of alcohol outlets is associated with a greater propensity for increased alcohol-related harms and consequences given their existing heavy drinking patterns (Single, 1984). In a study promoted by the National Institute of Health, researchers stated that "persistent high levels of heavy episodic drinking and related problems among emerging adults underscore a need to expand individually oriented interventions, college/community collaborative programs, and evidence-supported policies to reduce their drinking and related problems" (Hingson et al., 2017, p. 540).

This research study added to that evidence base and provided data to support or dismiss potential policy interventions with campus administrators and city and county elected officials. The research was conducted with a subpopulation not yet explored in alcohol outlet literature, providing a window into a population gap in alcohol outlet availability research. Additionally, most Greek life alcohol use studies have examined behaviors, trends, and some broad influences when examining alcohol use. However, none to date have examined the influence alcohol outlets could have with the drinking behaviors of this at-risk population.

Although this study provided critical information for campus and city officials, there are limitations associated with this type of research design. Not every alcohol outlet is the same based on state licensing alone (Livingston et al., 2007). A general alcohol outlet license between two businesses is unable to account for its size, offerings of alcohol, sales, hours of operation, and its popularity in the community, which can impact

overall alcohol sales. Additionally, this study did not include overall alcohol sales with each outlet, which could have better accounted for consumption rates given the potential variability with each outlet type. However, finding data on alcohol sales would have been extremely difficult to obtain from local businesses or wholesalers.

Another known limitation was that because this analysis incorporated numerous states, variability in alcohol license type was common, which created substantial challenges to cleanly label an outlet as either on premise or off premise (Weitzmann et al., 2003). This study was also a cross-sectional analysis and not a true experiment, so it only provided a window into a correlational relationship and did not show a causal relationship of the examined variables in a defined place and time. Additionally, the binge drinking measure from the student survey was dependent on accurate and truthful responses by the group assessed. Depending on the school surveyed, interpretation by the respondent, and general survey implementation, some students may have limited or exaggerated their response.

Given the severity of the problem and urgency to protect some of the most vulnerable young adults during a critical transition in their life, more research is needed to look at the impact availability of alcohol has on college fraternity men's drinking behaviors. Because environmental norms can influence individual behavior, future research needs to look at alcohol access points to determine their relationship to these concerning behaviors. Although recent increases in alcohol use could be associated with other variables, it is important to evaluate each variable because those results can inform public health recommendations and prevention strategies.

Research Questions and Overall Structure

This study examined the following research questions with the proposed hypotheses:

Research Question 1: What is the relationship between binge drinking behaviors and alcohol outlet availability for college fraternity men associated with colleges/universities in the Southeastern Conference? Additionally, what is the relationship between binge drinking behaviors in the same population and the availability of each type of alcohol outlet? For each type of outlet, this includes all collective alcohol outlets, on-premise outlets (i.e., areas where alcohol is consumed onsite), and off-premise outlets (i.e., areas where alcohol is consumed offsite).

Hypothesis 1: Consistent with findings in most availability studies, the researcher hypothesized that increased alcohol outlet availability had a significant and harmful relationship with binge drinking behaviors with college fraternity men. The researcher also hypothesized on-premise outlet availability had a greater relationship than off-premise outlet availability with binge drinking behaviors.

Research Question 2: What is the relationship between binge drinking behaviors and the proximity to alcohol outlets for college fraternity men at colleges/universities in the Southeastern Conference? What is the relationship between binge drinking behaviors in the same population and the proximity of each type of alcohol outlet? For each type of outlet, this includes all collective alcohol outlets, on-premise outlets (i.e., areas where alcohol is consumed onsite), and off-premise outlets (i.e., areas where alcohol is consumed offsite).

Additionally, how might this relationship change when taking prior high school drinking behaviors into account?

Hypothesis 2: Consistent with findings in most availability studies, the researcher hypothesized that increased alcohol outlet proximity had a significant and harmful relationship with binge drinking behaviors with college fraternity men. The researcher hypothesized on-premise outlet proximity had a greater relationship than off-premise outlet proximity with binge drinking behaviors. Additionally, the research hypothesized individuals who engaged in consistent drinking during high school had greater associations between close alcohol outlet proximity and binge drinking behaviors.

Chapter 1 introduced the problems around alcohol use and college fraternity men and detailed an opportunity to explore alcohol use in relation to environmental design. Chapter 2 provides a more thorough overview of the relevant literature surrounding this topic. This review includes alcohol use, substance use behaviors in Greek life, alcohol availability theory, and a background on fraternity and sorority experiences at U.S. college campuses. Chapter 3 provides an overview of the research methodology in line with the theoretical framework. Chapters 4 and 5 present the results of the research and discuss their connections and meanings to existing studies.

Chapter 2: Literature Review

Young adults, who are known to engage in impulsive and risk-taking behavior, can be influenced by their environments (Capone et al., 2007; Casey et al., 2011). These influences are especially concerning among some of the most at-risk individuals when it comes to alcohol use in a college environment (Capone et al., 2007). Outside of understanding individual alcohol-use behaviors, it is critical to understand the degree of influence by environmental variables, and in what ways college fraternity men are impacted. Tied to those behaviors and potential influences, the purpose of this study was to explore the relationship between environmental alcohol outlet availability and the proximity to alcohol outlets with binge drinking behaviors associated with college fraternity men in a campus environment. For context, binge drinking is currently classified as five or more drinks for men and four or more drinks for women in one sitting (Centers for Disease Control and Prevention, 2023).

To lay a foundation regarding the scope of the problem, the researcher explored existing literature surrounding alcohol use in young adults and college fraternity men. In this chapter, the researcher briefly notes the influence of alcohol use in high school on college drinking behaviors. Connected to that alcohol use, the researcher provides additional context on alcohol availability and its relationship with the study's theoretical framework impacting college fraternity men. Finally, the researcher provides a foundation on the role, risk, and reward of the Greek life experience on U.S. college campuses.

Alcohol Use and Consequences

To understand the impacts and influences of binge drinking on young adults, it is first helpful to explore alcohol as a drug, what consequences come from its use, and how young adults use and perceive it. Alcohol is a widely popular and accessible central nervous system "depressant" (Fisher & Harrison, 2018, p. 18). The method of administration for this drug is primarily through the process of oral ingestion (Brick, 2008). Different types of alcohol, ranging from beer to liquor, include various percentages or concentrations of alcohol. Some drinks can be anywhere from 3% to 100% of alcohol per volume depending on the strength and type of alcohol consumed (Brick, 2008, p. 6). Once alcohol is ingested, typical absorption into the blood stream can take anywhere from "30 to 90 minutes" (Brick, 2008, p. 3), depending on a number of individual variables. Some of those variables could include the individual's sex and recent food consumption.

Once ingested, alcohol has many impacts to a developing young adult's biological development, outside of the desired intoxication effects (Brick, 2008). Alcohol can have a detrimental impact on a young adult's structural brain and neurological development (Witt, 2010). Glutamate and gamma-aminobutyric acid are the primary neurotransmitters engaged and changed with the introduction of alcohol to the body (Brick, 2008). Consistent use at an early age can lead to the "shrinking of brain mass" (Brick, 2008, p. 143), which could create cognitive deficits that lead to issues around behavior, memory, impulse control, and cravings for alcohol. This finding is especially concerning when connected to an age group with known challenges around impulse control (Casey et al., 2011). Consistent use can also lead to a substance use disorder, which could cause

damage to vital organs, reduced bone mass, and result in a greater risk of injury or death (American Psychiatric Association, 2013). Alcohol also causes changes to "psychomotor and cognitive function" (Brick, 2008, p. 58). These brain changes can lead to "synaptic plasticity" (Mack et al., 2016, p. 8), which leads to alcohol tolerance and withdrawal when not in use. Tolerance is developed with uncontrolled use, which can easily lead to an overdose, potentially causing death (Fisher & Harrison, 2018). Regardless of these problematic physiological outcomes for young adults, there is hope. Abstinence of alcohol can reverse most of the shrinking of brain mass caused by use in just a few months (Brick, 2008). However, abstinence could prove difficult for an at-risk fraternity member who is greatly influenced by their peers and has abundant access to alcohol (Steiker, 2016).

The aforementioned harms highlight the cognitive and physical effects of regular or prolonged alcohol use, but there are more risks than just those when it comes to alcohol use in college men. College-aged students who consume alcohol are at a greater risk for violent crimes, risky sexual behaviors, unwanted sexual encounters, driving while under the influence, legal consequences, academic performance issues, risk of suicide, and injury (Trapp et al., 2018; Turrisi et al., 2006). Additionally, early age alcohol consumption can lead to greater risks of "alcohol related harm problems later in life" (Trapp et al., 2018, p. 3). These factors highlight how dangerous this substance can be in the hands of young adults. Many young adults are exploring freedoms they never had, while still developing who they are and what they value.

Even with all the known risks, reckless alcohol use on college campuses has been socially normed as a rite of passage (Hollmann, 2002; National Institute on Alcohol

Abuse and Alcoholism, 2023d; Nuwer, 2001). In a 2021 National Survey on Drug Use and Health, 8.1 million men aged 18 to 25 reported consuming alcohol in the prior month (National Institute on Alcohol Abuse and Alcoholism, 2023e, p. 1). Men comprised a higher percentage of survey respondents describing they engaged in heavy alcohol use in the prior month. Of the individuals who engaged in heavy drinking, 700,000 were college students (National Institute on Alcohol Abuse and Alcoholism, 2023e, p. 1). A more recent study of college students noted that 10.4% of college-aged respondents engaged in a moderate risk use of alcohol with around 1% who had engaged in high-risk alcohol use (American College Health Association, 2023, p. 8). In that study, almost 26% of all men surveyed reported engaging in some degree of binge drinking (i.e., five or more drinks in one sitting) in the prior 2 weeks (American College Health Association, 2023, p. 10). Of the male respondents who noted drinking alcohol in the prior 2 weeks, 59.6% reported binge drinking behaviors (American College Health Association, 2023, p. 10). This number was 5.4% more when compared to female respondents who noted drinking alcohol in the prior 2 weeks (American College Health Association, 2023, p. 10). These drinking behaviors only continue to emphasize the prevalent issue alcohol has with college-aged men and indicates any regular alcohol use could lead to a greater risk of binge drinking behaviors.

As a sign of progress, since the 1980s, data have pointed to a decrease in the percentage of college students who have consumed alcohol in the prior 30 days (Bellows, 2023). Recently, at the start of the COVID-19 global pandemic, campuses saw a reduction in binge drinking behaviors with students at home; however, those levels somewhat rebounded when students returned to campus. Campuses have conducted

numerous group and individual interventions to treat this issue combined with a more diversified student body that is less likely to drink heavily (Bellows, 2023; Borsari et al., 2009). But even with that progress, alcohol poisoning related deaths remain a primary concern for campus administrators. However, their concern runs contradictory to a recent movement by colleges to start serving alcohol at university athletic events, increasing the availability and access to alcohol (Sallee, 2019).

It is important to understand substance use trends of adolescent youth in high school to provide some context on the drinking norms seen in the college setting. These high school students will eventually matriculate into the college setting and potentially join a fraternity or sorority. They will also bring with them their habits and behaviors around alcohol use. The Centers for Disease Control and Prevention provided helpful data on this topic with the recent 2019 Youth Risk Behavior Survey (Jones et al., 2020). For high school students, 29.2% reported current alcohol use, and 27.1% reported current marijuana use (Centers for Disease Control and Prevention, n.d.; Jones et al., 2020). Alcohol and marijuana were the two largest reported illegal substances used. About 13.7% of high school students reported engaging in binge drinking behaviors (Centers for Disease Control and Prevention, n.d.; Jones et al., 2020). When comparing boys and girls, girls showed a 5.6% higher rate of alcohol use and a 2.1% higher rate of binge drinking behaviors (Centers for Disease Control and Prevention, n.d.; Jones et al., 2020). One positive trend was that from 2009 to 2019, there was a substantial decrease in current alcohol use by high school students; however, 1 in 3 high school students still used alcohol (Centers for Disease Control and Prevention, n.d.; Jones et al., 2020). This

drinking behavior in high school students indicates the prevalence of risky alcohol experimentation in a group still physically and cognitively developing (Brick, 2008).

High school students show an escalating pattern of binge drinking behaviors throughout their progression from freshmen year to senior year (Doumas et al., 2020). For high school seniors, 36% indicated current alcohol use and 18.8% indicated current binge drinking behaviors (Jones et al., 2020). These individuals have the highest rates of alcohol use in high school but are also getting ready to transfer into a college environment where high-risk use is socially normed and abundantly available (Doumas et al., 2020). This progression of concerning behavior only compounds on the risk already identified with the population sampled in this study. Further, "Early initiation of drinking may increase risk of membership in higher- and earlier- use trajectory groups" (Ranker et al., 2023, p. 1740). These studies highlighting trends around early initiation of alcohol consumption would potentially indicate that individuals who engage in alcohol use earlier on may be at greater risk in associating with groups, such as fraternities, who are known to be in risky environments with alcohol use (DeSimone, 2009; Ranker et al., 2023).

There is a continued trend of college-aged men engaging in heavy episodic drinking and numerous protective factors can influence their alcohol-use behaviors (National Institute on Alcohol Abuse and Alcoholism, 2023e). However, in the population of college-aged men, there is a subgroup (i.e., fraternity affiliated men) engaging in greater high-risk behavior that can equate to more alcohol-related harms, in line with this study's theoretical framework.

Substance Use in Greek Life and Consequences

In the subpopulation of college students, college-aged men who join or associate with collegiate fraternal organizations engage in higher-risk drinking behavior than their unaffiliated college peers (DeSimone, 2009). Based on the framework of availability theory, their predisposition to risky behaviors centered around alcohol consumption could lead to an increase of alcohol-related harms in this population of students (Single, 1984). These at-risk young adults, who are impulsive, are placed in environments with low-cost alcohol and variable alcohol availability, which could result in greater alcohol-related harms and consequences (Casey et al., 2011). This section reviews influences and consequences in fraternity men's drinking behaviors, with a particular focus on selection, socialization, and environmental factors to provide better context on this subpopulation and its relationship with alcohol.

In general, studies have pointed to concerning trends in alcohol use with Greek members (Biddix, 2016; Routon & Walker, 2014). Consistent with those trends, Greek membership has been linked to "higher rates of substance use than their college peers who do not join such organizations, as a result of both selection and socialization effects" (McCabe et al., 2018, p. 35). Selection effects relate to individuals with already risky alcohol-use behaviors connecting with peers who consume at equal or higher rates (Capone et al., 2007). Socialization is connected to the influence an environment rich with access to illegal substances, peer influences, and high-risk consumption can have on a young adult.

In relation to selection behaviors, college men who binge drink continue behaviors they already learned and exhibited prior to coming to college (Borsari & Carey,

1999; Capone et al., 2007). For example, men who stated they planned to join a Greek organization typically had higher baseline levels of alcohol consumption and greater increases in alcohol consumption after joining (Capone et al., 2007; McCabe et al., 2018). This prior drinking behavior influences social norms and perceptions placed on their drinking (Borsari & Carey, 1999). This perception can drive drinking behaviors and typically leads to an exaggerated perception of drinking on campus (Neighbors et al., 2007; Perkins, 2002). Fraternity affiliation has also shown an influence on what college students deem as normal consumption behavior at their campus (Perkins, 2002). Researchers have attempted to alter the perception of alcohol use through social norming campaigns, with mixed or low effects (Wechsler et al., 2003). This limited effect highlights that other variables are at play impacting alcohol use in a campus environment.

Another variable of influence centers around socialization effects, which are highlighted through findings of increased alcohol use after joining a Greek organization (McCabe et al., 2018). These studies provide a window into the influence a particular peer group or environment can play in influencing high-risk drinking (Borsari & Carey, 1999; Capone et al., 2007; McCabe et al., 2018; Neighbors et al., 2007; Perkins, 2002; Wechsler et al., 2003). The current study built off the research surrounding selection and socialization factors influencing increased alcohol use in Greek students, but with a different twist. This study reviewed variables that could influence socialization by looking at the physical environment provided in nearby entertainment districts.

With regard to college fraternity men's consequences surrounding alcohol use, there are consistent examples of tragedies across the United States. For example, in 2017, there were three high-profile collegiate deaths in Florida, Pennsylvania, and Louisiana

related to forced or coerced consumption of alcohol in alleged fraternity activities (Nuwer, 2023). Tim Piazza, a new member of Beta Theta Pi fraternity from Pennsylvania State University, was found dead of alcohol poisoning and other physical injuries in May 2017. Maxwell Gruver, a new member of Phi Delta Theta fraternity from Louisiana State University, was found dead of alcohol poisoning in September 2017. Andrew Coffey, a new member of Pi Kappa Phi fraternity from Florida State University, was tragically found dead of alcohol poisoning in November 2017. All of these young men had extremely dangerous blood alcohol levels. From 2017 to 2021, there were 18 widely publicized incidents of alcohol-related deaths in connection to fraternity activities. This list included the tragic death of a 4-year-old boy who was hit by a fraternity pledge who was allegedly forced into consuming alcohol by fraternity brothers before serving as a designated driver for the organization. This incident highlights how alcohol use not only impacts the user, but also harms others in the community. Although these cases could appear isolated, rampant alcohol use and their unintended consequences is prevalent with this population (Biddix, 2016; Routon & Walker, 2014).

Because membership in a fraternity can increase concerning alcohol-use behaviors, changing that environment could have positive effects. A 2008 quasi-experimental study noted individuals who disaffiliated from Greek organizations saw a decrease in high-risk drinking behavior, and the exact opposite when affiliating with Greek organizations (Park et al., 2008). On the opposite end of the spectrum, residence in fraternity owned facilities during college years has been linked to higher binge drinking behaviors (McCabe et al., 2018). These findings point to the influence of the physical environment and social dynamics on binge drinking behavior (Park et al., 2008). If a

student is removed from this environment and sees healthier behaviors, their environment had a substantial but not defined effect on their actions.

Southeastern Conference (SEC) schools have a rich tradition of alcohol excess, Greek life, and athletic popularity (Dodd, 2019; Luckerson, 2013; Wuensch, 2015). In a recent sports article, 11 out of the 14 SEC schools were ranked in the top 25 for college football tailgates (Gates, 2022). The unified identity associated with these campuses shines through when people hear the chants of S-E-C being hurled at opposing teams in athletic competitions (Luckerson, 2013). SEC campuses, regardless of if they are in a small town far away from bustling cities or in the middle of a downtown metropolitan city, draw in a large amount of revenue from ticket sales, merchandise, television ratings, and fan purchases. Tied to that athletic popularity, support in academic admissions, and campus revenue, Greek organizations are also popular and historically interwoven into these campus's social scene (Wuensch, 2015). The images of alcohol excess and unruly behavior with fraternities and college campuses are reflected in popular culture movies like *Animal House* and *Old School* (Fetters, 2014). Scenes in these moves reflect the aforementioned challenges with college fraternities and their relationship with alcohol and the campus as a whole.

Clearly, college-based Greek organizations attract men who are predisposed to high-risk drinking behaviors based on their current behaviors and future desires. This fact is especially true for young men from affluent backgrounds who have the financial means and motivation to engage in alcohol use (Chen et al., 2009; Even & Smith, 2018). However, the direct influence of the socialized environment, centered around the ease of access to alcohol, are variables yet to be fully understood with this specific population.

Alcohol Availability

To explore this mediating variable of alcohol availability and its relationship on alcohol consumption further, this section explores existing research around alcohol availability, types of alcohol outlets, and findings related to their impacts on alcohol-use behaviors. Alcohol outlet availability, or *density*, denotes "the number of physical locations in which alcoholic beverages are available for purchase either per area or per population" (Campbell et al., 2009, p. 556). These physical locations, or outlets, come in two common forms: on-premise outlets and off-premise outlets (Campbell et al., 2009; Scribner et al., 2010).

On-premise outlets, which are common in college towns, are venues where alcohol can be purchased and consumed on site, such as a bar, nightclub, or restaurant (Campbell et al., 2009). Further, "Bar and restaurant density were more closely related to drinking by young people than was off-premise density" (Paschall et al., 2012, p. 664). This variable relationship could be due to the fact on-premise venues create greater access to alcohol and provide an environment with less oversight and supervision of behavior. On-premise venues can also create a perception of socially normed behavior around alcohol use, influencing consumption and behaviors.

Off-premise settings are locations where alcohol can be purchased and taken off site for consumption, such as a gas station or grocery store (Campbell et al., 2009). In a city and college setting, these are locations where patrons purchase alcohol to be consumed at other venues in public and/or private. Although research has varied in its conclusions, some recent findings have indicated a stronger correlation to violent crimes and an increased normalization of drinking at an early age associated with off-premise

alcohol outlets (Trangenstein, 2018; Trapp et al., 2018). Off-premise outlets that sell beer rather than liquor showed associations with increased alcohol consumption; further, off-premise outlets "are more likely to sell alcohol to minors if they have similar outlets nearby" (Chen et al., 2009, p. 588). The additional presence of off-premise outlets creates an opportunity for additional illegal alcohol access and availability, which is a concerning risk given the socialized scene found in college towns. Even with these findings related to on- and off-premise outlets, there is a mixed review on the impact of on-premise outlets versus off-premise outlets on drinking outcomes and behaviors (Campbell et al., 2009; Connor et al., 2010; Dimova, 2023; Halonen et al., 2013; Kuntsche et al., 2008; Paschall et al., 2012; Trangenstein, 2018). The mixed research findings on the impacts of alcohol outlet type availability on drinking outcomes highlights the need to fully understand how each type of outlet can influence consumption in a high-risk population not yet studied in connection to alcohol availability: fraternity men.

In general, higher alcohol outlet availability correlates with increased alcohol-related behaviors, harms, and consequences (Chen et al., 2009; Kuntsche et al., 2008; Kypri et al., 2008; Paschall et al., 2012; Resko et al., 2010; Trapp et al., 2018). Increased access to alcohol, in line with the theoretical framework of this study, can be a risk factor influencing alcohol use in fraternity men (Single, 1984). The potential that alcohol availability could be an exacerbating factor is especially concerning because that subpopulation already consumes alcohol at moderate or high levels, which could increase their experienced harms or consequences (Single, 1984; Steiker, 2016; Stockwell et al., 2012). However, a careful limitation on the correlations and regression analyses identified in alcohol outlet availability studies is that none of these are causal links

(Rowland et al., 2015). It would not be possible to say with 100% certainty that this singular variable caused consumption or behaviors to change alone; however, it is a critical relationship to explore (Rowland et al., 2015). This section reviewed alcohol-related behaviors in college fraternity men through the lens of alcohol availability. However, to understand the connection between the fraternity experience and its influence on alcohol consumption fully, the next section gives an overview of the role Greek life has on the U.S. academic landscape.

Fraternity and Sorority Life

College-associated social fraternities have a long and rich history on U.S. college campuses. The literature in this section provides a brief history of Greek organizations in the United States and the risks, benefits, and general impacts associated with their existence. Greek organizations on U.S. college campuses stretch back before 1825, a time when there were a much smaller volume of colleges and students in the United States, and to whom were typically provided ministry or liberal arts education (Banks & Archibald, 2020; Syrett, 2009). College fraternities provided young, White, aristocratic men an opportunity to build networks, advance their education, create a supportive social group, and engage in a sort of independence and resistance from faculty who oversaw their daily lives (Syrett, 2009). With the ongoing conflict between college students and faculty, these groups provided the additional appeal of selectivity in membership and not being open to the "prying eyes of adults, who might seek to regulate the behaviors of the boys involved" (Syrett, 2009, p. 25).

Fraternal organizations saw their foundations begin at campuses such as Union College and the College of William and Mary, and they quickly expanded through the

Northwest, Midwest, and other stretches of the growing U.S. academic landscape (Rothman, 2016; Syrett, 2009). Consistent with that growth, there were more than 750,000 Greek college students in 2021 at colleges/universities whose memberships touted over 9 million alumni (Barshay, 2021, p. 1). With regard to their relationship on college campuses, fraternities are typically institutionally recognized student organizations depending on the campuses policies and staffing structures (Camputaro, 2017; University of South Carolina, 2020). With that recognition comes a level of expectations or policies that students and student groups are required to follow (Camputaro, 2017; University of South Carolina, 2020). However, history has indicated that adherence to these university expectations or policies has not been consistent.

When reviewing the historical relationship among college fraternities and campuses, a repetitive pattern of campus conflict due to a lack of adherence to expectations or decorum can be seen (Banks & Archibald, 2020; Nuwer, 2001). A myriad of support and guidance exists, but heavy levels of misconduct and distrust by students toward people in authority roles is consistent (Syrett, 2009). An example of this administration versus student friction was seen around 1840 when faculty at the University of Michigan demanded the expulsion of any men who refused to "renounce" (Barber et al., 2015, p. 243) their membership in a fraternity. This friction highlights the rebellious behaviors, distrust, and adversarial relationship associated with Greek organizations and campus administrators (Banks & Archibald, 2020; Flanagan, 2019; Nuwer, 2001). Another example of this strained relationship was seen in the comments made by the president of Washington and Lee in 1857 (Nuwer, 2001). The president described fraternities as groups that were "uncontrollable and violated school prohibition

against drinking festivals" (Nuwer, 2001, p. 119). These comments, when compared to current statements by university presidents surrounding campus incidents, do not sound that different. The 1857 comment from a university president can be compared to an open letter written in 2017 by the president of Penn State College (Baron, 2017; Esposito, 2017). The 2017 president's open letter was sent out following an alcohol-related student death of a college fraternity new member (Baron, 2017; Esposito, 2017). In this letter, the Penn State College president called for the end of Greek life on campus if students and organizations could not abide by the new risk management rules and regulations (Baron, 2017; Esposito, 2017). These risk management rules were put in place to attempt to address an environment that led to the untimely death of a Beta Theta Pi pledge. About 160 years after, the challenges and rhetoric surrounding alcohol and the fraternity experience are still similar from the 1857 Washington and Lee comment.

In another example of alcohol misuse with fraternities, college personnel at multiple institutions in 1933 called for the end of certain practices surrounding hazing and specific alcohol parties with college fraternities (Nuwer, 2001). These groups were accused of engaging in "gross hedonism" (Nuwer, 2001, p. 59) during a time of nationwide prohibition. The abuse of alcohol during a time when alcohol was banned nationwide highlights the rebellious nature of fraternities and the intertwined relationship between alcohol misuse and fraternity membership (Flanagan, 2019; Nuwer, 2001).

As a result of the consistent alcohol misuse associated with fraternity membership, numerous historic examples have highlighted alcohol-related deaths through drownings, alcohol poisoning, hazing rituals/practices, physical fights/altercations, fires, and more (Flanagan, 2019; Nuwer, 2001). Of course, the

enforcement of alcohol laws became much more complicated when states increased the drinking age from 18 to 21, which created a pathway for students to bend or break the law (Nuwer, 2001). Over time, national Greek organizations have attempted to implement stricter risk management policies surrounding hosted social events and substance-free living as an attempt to reduce the number of harms and legal claims filed against them (Flanagan, 2019; Nuwer, 2001). These examples highlight the numerous risks and campus challenges associated with fraternal organizations. However, fraternity and sorority advocates would emphasize there are benefits more closely connected to the fraternity experience rather than the negative outcomes mentioned previously.

Highlighting some of the benefits of joining a fraternity or sorority, some studies have shown higher retention rates (i.e., matriculation from freshmen year to sophomore year and beyond) for Greek-affiliated students and some variations in academic performance, typically higher retention rates and academic performance for sorority women (Bowman & Holmes, 2017; Debard & Sacks, 2010; Routon & Walker, 2014; Yates, 2020). Greek-affiliated students are also more likely to finish college on time, attend graduate school, and participate in service/leadership organizations (Bowman & Holmes, 2017; Routon & Walker, 2014; Yates, 2020). After college, "membership increases the likelihood students earn a graduate degree" (Routon & Walker, 2019, p. 427). Further, Greek members exhibit higher levels of well-being and workplace engagement after college and Greek members are more likely to give philanthropically to their graduating institution and be an active promoter of that college/university (Gallup Education, 2014, 2021). Much of the positive data highlight correlations that make it hard to determine if these influences were primarily a function of their involvement in Greek

life or related to other extraneous variables like income, family education, and additional resources. However, research has highlighted existing problematic behaviors with alcohol and a risk of men engaging in binge drinking behaviors after college (Routon & Walker, 2014, 2019).

Greek organizations still have a strong student interest regardless of their complicated past around alcohol and drug use and calls for abolition by peers, faculty, and staff (Barber et al., 2015; Gillon et al., 2019; Samberg, 2021). Greek groups are supported by numerous advocates and lobbyists focused on the protection of single sex status in Greek organizations, freedom of association on college campuses, arguments of due process in conduct outcomes led by institutions, tax advantageous legislation for Greek housing, and recent hazing awareness federal legislation (The Fraternity and Sorority Political Action Committee, n.d.). With that support, as long as today's student wants the Greek experience, these organizations will continue to exist and have an evolving relationship with academic institutions. However, given the complicated relationship that exists between college fraternity men and alcohol use, a safe educational environment will be a continued concern by campus administrators. In the next chapter, the researcher provides an overview of the research design for the study, including its theoretical underpinnings.

Chapter 3: Methods and Theoretical Framework

This study evaluated the relationship between alcohol outlet availability and proximity to alcohol outlets with binge drinking behaviors among college fraternity men in schools associated with the Southeastern Conference (SEC). This chapter addresses the theoretical framework of availability theory and provides a detailed description of research design, setting, data sources, measures, and analyses used to answer the research questions.

Availability Theory of Alcohol-Related Problems

Because this study evaluated the influence of environmental design on fraternity members' binge drinking behaviors, its findings and methods were viewed through the lens of availability theory of alcohol-related problems. This theory attempts to explain human behavior through external influences (Single, 1988), which coincided with the research questions in the current study. Additionally, this theory assisted in developing the research design and interpreting the data, consistent with other alcohol outlet studies.

Availability theory of alcohol-related problems was first mentioned in a 1980 World Health Organization (WHO) report developed by alcohol researchers (Stockwell & Gruenewald, 2004; WHO, 1980). This report was developed as a review on the ongoing empirical research surrounding alcohol-related harms. The theory proposes that access to alcohol leads to increased consumption, which leads to individual health impacts and other considerable environmental challenges (Stockwell et al., 2012). The public health model indicates increased access to alcohol leads to increased consumption

and to a higher volume of individuals engaging in binge drinking behavior (Single, 1988). Alcohol access, or availability of alcohol, is typically provided through venues where alcohol can be consumed on site, or alcohol that can be purchased and consumed off site (Campbell et al., 2009).

The theoretical model proposes that exposure, or availability, alone is not the only determinate in influencing alcohol-related harms (Chaudron & Wilkinson, 1988). Vulnerability, known through specific demographics that could influence alcohol use, is a factor but one that is more difficult to evaluate and influence through community action (Chaudron & Wilkinson, 1988). This increased drinking behavior would theoretically lead to increased instances of alcohol-related harms such as arrests, vehicular accidents, homicides, physical assaults, injuries, deaths, and other related harms (Single, 1988). Availability theory also contends that an increase in availability will lead to reduced prices of alcohol through retail competition based on their proximity, and lead to increased alcohol consumption and more alcohol-related harms (Trangenstein, 2018). For the population of interest, past studies have shown individual harms related to general college students and alcohol outlet availability (Connor et al., 2010; Kypri et al., 2008). However, no studies to date have looked specifically at the subpopulation of interest in this study.

Availability theory of alcohol-related problems was honed over time through research during a time when only viewing alcoholism and related harms through the disease model was losing its influence among researchers (Chaudron & Wilkinson, 1988). Researchers were looking for prevention tactics and not just individual treatment methods. Alcohol researchers began to take a preventive approach in their research,

leading to this environmental model. Numerous alcohol researchers played a key role in the development of this empirical research. However, the work of Brunn and others started a strong public health foundation with this model, which was once unpopularly labeled as work similar to efforts in the prohibition era (Brunn et al., 1975; Chaudron & Wilkinson, 1988; Room, 1984). Bruun spent a great deal of time researching the effects of alcohol controls, including alcohol availability, on consumption behaviors and related harms (Brunn et al., 1975; Tigerstedt, 1999). Availability theory is driven by other theoretical propositions such as Ledermann and Skog's theories that attempt to look at overall community consumption rates and their impact on alcohol-related harms (Chaudron & Wilkinson, 1988; Ledermann, 1956; Skog, 1985). It is only natural when looking to augment the populations' drinking behaviors, to impact alcohol-related harms, to then explore public health options that result in environmental control.

Single (1984) noted numerous connections with alcohol availability. Figure 3.1 displays some of those characteristics, as noted by Chaudron and Wilkinson (1988).

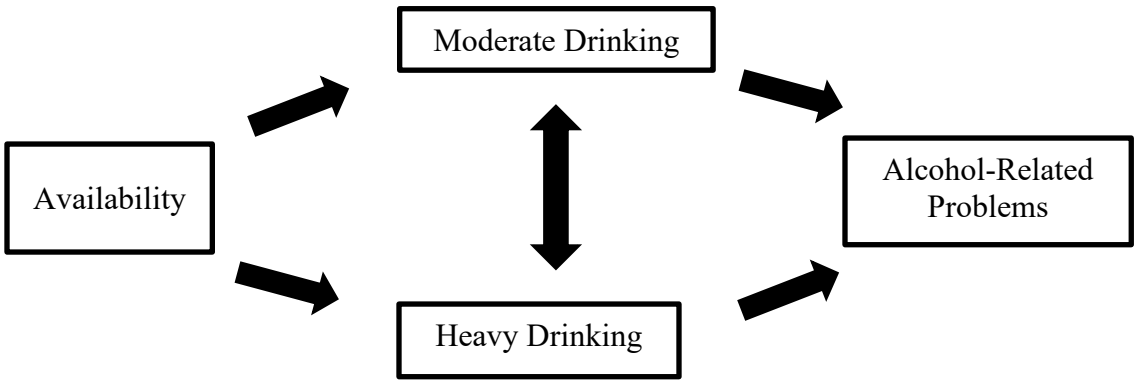

Figure 3.1 Alcohol Availability Model

Note. Adapted from *Theories on alcoholism*, by C. Chaudron and D. Wilkinson (Eds.), 1988. Copyright 1988 by Addiction Research Foundation.

As illustrated in Figure 3.1, availability can lead to moderate drinking, which can lead to heavy drinking and alcohol-related problems (Single, 1984). Availability can lead to moderate drinking, which can lead to alcohol problems. Availability can lead to heavy drinking, which can lead to alcohol problems. Availability can lead to heavy drinking, which can lead to moderate drinking and then to alcohol problems.

Alcohol availability researchers have noted limitations due to the difficulty in showing a causal relationship because of the challenges of conducting a true experiment (Connor et al., 2010). However, availability research has shown existing individual and public health dangers due to the introduction of alcohol in certain environments, such as a college environment (Connor et al., 2010). Much of the research around alcohol outlet density or availability is conducted through "cross-sectional studies, natural experiments, and time series analyses" (Livingston et al., 2007, p. 558). The gaps noted in the research highlight the inability to compare each outlet equally, limited research designs, and other variables not reviewed that could have a relationship with the data (Livingston et al., 2007).

Combining the potential that a correlational relationship exists between the availability and proximity of alcohol outlets and alcohol-related harms in groups comprised of high-risk men, this potential relationship between the previously described variables only highlights the urgency to fully understand how that environment impacts college fraternity men. This vulnerable subpopulation has a concerning pattern of behavior around developing abusive patterns with alcohol consumption that could lead to deadly consequences (Andone, 2017; Borsari & Carey, 1999; Borsari et al., 2009; Capone et al., 2007; DeSimone, 2009; Flanagan, 2019; McCabe et al., 2018; McCreary et

al., 2021; Nuwer, 2023). As researchers and educational professionals, it is important to understand this potential influencing variable given the dire stakes. The theory surrounding alcohol availability attempts to provide a lens to explain the role alcohol access can play in exacerbating high-risk behaviors and outcomes. This study explored that relationship between alcohol availability and high-risk alcohol consumption behaviors (e.g., binge drinking), but more specifically with college fraternity men in the southeastern portion of the United States.

Methodologies and designs in other availability and proximity research studies were similar to the proposed methodology for this research study. However, this study evaluated a subpopulation not yet researched with this type of study method. Additionally, this research added to the varying body of knowledge on outlet type (i.e., on premise versus off premise) influence in the domestic U.S. environment. Availability theory played a large role in developing the methodological framework and type of analyses selected for this study and played a role in evaluating the results to determine the relationship between the variables of interest.

Methods

Through the theoretical framework of the availability theory of alcohol-related problems, this research study answered the following questions:

> **Research Question 1**: What is the relationship between binge drinking behaviors and alcohol outlet availability for college fraternity men associated with colleges/universities in the Southeastern Conference? Additionally, what is the relationship between binge drinking behaviors in the same population and the availability of each type of alcohol outlet? For each type of outlet, this includes all

collective alcohol outlets, on-premise outlets (i.e., areas where alcohol is consumed onsite), and off-premise outlets (i.e., areas where alcohol is consumed offsite).

Hypothesis 1: Consistent with findings in most availability studies, the researcher hypothesized that increased alcohol outlet availability had a significant and harmful relationship with binge drinking behaviors with college fraternity men. The researcher also hypothesized on-premise outlet availability had a greater relationship than off-premise outlet availability with binge drinking behaviors.

Research Question 2: What is the relationship between binge drinking behaviors and the proximity to alcohol outlets for college fraternity men at colleges/universities in the Southeastern Conference? What is the relationship between binge drinking behaviors in the same population and the proximity of each type of alcohol outlet? For each type of outlet, this includes all collective alcohol outlets, on-premise outlets (i.e., areas where alcohol is consumed onsite), and off-premise outlets (i.e., areas where alcohol is consumed offsite). Additionally, how might this relationship change when taking prior high school drinking behaviors into account?

Hypothesis 2: Consistent with findings in most availability studies, the researcher hypothesized that increased alcohol outlet proximity had a significant and harmful relationship with binge drinking behaviors with college fraternity men. The researcher hypothesized on-premise outlet proximity had a greater relationship than off-premise outlet proximity with binge drinking behaviors. Additionally, the research hypothesized individuals who engaged in consistent drinking during high

school had greater associations between close alcohol outlet proximity and binge drinking behaviors.

As referenced in Chapter 1, the researcher hypothesized, based on existing research, that the study would reveal a significant impact on binge drinking behaviors with increased alcohol outlet availability and a closer proximity to alcohol outlets. Additionally, given marketing efforts toward college students and reduced alcohol sales at on-premise outlets, the researcher hypothesized that on-premise outlets would show a greater relationship than off-premise outlets with binge drinking behaviors (Kuo et al., 2003). Finally, the researcher hypothesized that individuals who engaged in consistent drinking in high school would show greater associations with a closer proximity to alcohol outlets.

Setting

Data incorporated in this study came from the following cities and states that hosted an SEC campus:

- Columbia, South Carolina (University of South Carolina);
- Baton Rouge, Louisiana (Louisiana State University);
- Columbia, Missouri (University of Missouri);
- Starkville, Mississippi (Mississippi State University);
- Oxford, Mississippi (University of Mississippi);
- Athens, Georgia (University of Georgia);
- Gainesville, Florida (University of Florida);
- Knoxville, Tennessee (University of Tennessee);
- Nashville, Tennessee (Vanderbilt University);

- Auburn, Alabama (Auburn University);
- Tuscaloosa, Alabama (University of Alabama);
- Lexington, Kentucky (University of Kentucky);
- Fayetteville, Arkansas (University of Arkansas); and
- College Station, Texas (Texas A&M).

Campuses associated with the SEC were the setting of interest due to the fact that these campuses have been associated with popular athletic programs rich in social cultures driven by their athletic popularity (Gates, 2022; Luckerson, 2013). SEC schools are also typically associated with thriving Greek systems, strong student enrollment, Greek housing infrastructure, prominent football/athletic programs, social scenes, and business development catered to that campus population (Baer, 2020; Wuensch, 2015). These social scenes include bars, nightclubs, restaurants, and other types of outlets that serve alcohol, dependent on that state's alcohol laws (Baer, 2020). Although each school may vary in city size and school demographics, all campuses were included in this study to incorporate a larger sample size and due to the influence of SEC culture on each campus. All SEC campuses were included due to their thriving and popular Greek communities on each campus. These cities ranged from a population of 26,430 to 678,561 at the time of the study (U.S. Census Bureau, n.d.). However, when viewed through population per square mile, they ranged from 954 at Oxford, Mississippi to 2,635 at Baton Rouge, Louisiana (U.S. Census Bureau, n.d.). On each of these campuses, Interfraternity Council (IFC) communities ranged from a total of 673 fraternity members to 3,382 fraternity members (Auburn University, 2022; Louisiana State University, 2022; Mississippi State University, n.d.; Texas A&M University, 2021; The University of

Alabama, 2022; University of Florida, 2022; University of Georgia, 2022; University of Kentucky, n.d.; University of Mississippi, 2022; University of Missouri, 2022; University of South Carolina, 2022; University of Tennessee, 2022; Vanderbilt University, 2022). Additionally, the number of IFC fraternity chapters, which were the groups associated with this research population, ranged from 11 chapters to 34 chapters with Vanderbilt as the smallest community/chapter size and Alabama as the largest (Auburn University, 2022; Louisiana State University, 2022; Mississippi State University, n.d.; Texas A&M University, 2021; The University of Alabama, 2022; University of Florida, 2022; University of Georgia, 2022; University of Kentucky, n.d.; University of Mississippi, 2022; University of Missouri, 2022; University of South Carolina, 2022; University of Tennessee, 2022; Vanderbilt University, 2022).

Data Sources

The following sections detail the key data sources used for this research study. This section includes how data were retrieved, augmented, and used in the study.

Alcohol Licensing Records

The researcher requested active records from each state's alcohol licensing agency between 2022 and 2023. In total, 6,694 alcohol outlets were included in the records requested (Alabama Alcoholic Beverage Control Board, n.d.; City of Fayetteville Arkansas, 2023; Florida Department of Business and Professional Regulation, 2023; Georgia Department of Revenue, 2023; Kentucky Alcoholic Beverage Control, 2023; Louisiana Office of Alcohol and Tobacco Control, 2023; Mississippi Department of Revenue, 2023; Missouri Division of Alcohol and Tobacco Control, 2023; South Carolina Department of Revenue, 2023; Tennessee Alcoholic Beverage Commission, 2023; Texas

Alcoholic Beverage Commission, 2023). Alcohol licensing records, at a minimum, included details such as business name, local alcohol licensing type, and local address details. The researcher transcribed records into a CSV file format and reviewed and coded license types as either on premise, off premise, or both based on license definitions provided by each state of business operation. This classification was difficult because states had multiple and inconsistent licenses that were not comparable from state to state. The researcher requested clarity from each state licensing board staff if there was confusion on the license type. Licenses associated with importers, wholesalers, distributers, caterers, and temporary events were removed from the dataset. These outlets were incongruent from permanent physical locations where individuals could purchase alcohol to be consumed off or on site.

If an alcohol outlet had licenses for both types of services, it was classified as both an on- and off-premise outlet. The researcher reviewed license files through Excel conditional formatting to remove duplicate addresses because a business could have multiple licenses that all classify the same type of use relevant to the desired categories for this research. The researcher created CSV files for use in ArcGIS/ArcMAP and *R* Studio software. Files were then geocoded through ArcGIS/ArcMAP software toolbox. This process is explained in more detail in the measures section. These addresses were used to find the availability count used as the independent variable in the Spearman rank analysis and the proximity measure as the independent variable in the regression analysis.

Residential Addresses

The researcher conducted searches using Google Maps and local university and fraternity websites to identify university student union addresses and fraternity chapter

residential addresses associated with respondents in the Dyad survey data. Dyad Strategies provides assessment and analysis tools to higher education clients (Dyad Strategies, n.d.-a). Student union and residential addresses were loaded into a CSV file and then geocoded through ArcGIS/ArcMAP software toolbox. Greater detail on the geocoding process is provided in the measures section.

Dyad Community Survey

The company Dyad Strategies conducted a survey on drinking-related behaviors among fraternity men in the SEC. These data were used as the dependent variable in this study. Dyad Strategies (n.d.-a) is an assessment and educational-based business that works with numerous universities and organizations (i.e., Greek nonprofit organizations) by conducting community or organizational assessment projects. Clients use the independent campus measurement tools and the analysis by Dyad Strategies to develop a baseline on the culture of their group, identify items to address, and track the progress of their strategic efforts through longitudinal data (Dyad Strategies, n.d.-b). All of these assessments and analyses are done with the goal of improving the student experience in their organization.

Dyad Strategies was one of the few companies with existing data for the variables of interest, including the subpopulation of students in the Southeast. Given the researcher's previous professional interactions with the owners of the company and knowing their commitment to providing data that could advance research for the fraternity and sorority experience, they graciously provided access to these data. Both company owners had endowed scholarships and awards with the Association of Fraternity and Sorority Advisors for the dissertation of the year award, highlighting their

commitment to the advancement of research related to the fraternity and sorority experience (Association of Fraternity and Sorority Advisors, 2022).

The Dyad survey is typically conducted with currently enrolled undergraduate fraternity and sorority members across universities throughout the United States and Canada (McCreary & Shutts, 2022). The survey is sent electronically to each unique student based on contact information provided by the host client. The survey could be conducted anytime the host client (i.e., university, college, or Greek organization) requests. This survey could be sent semesterly, yearly, and/or each time new members are brought into the organization. The survey includes hundreds of standard and customizable questions, depending on the needs of the client (Dyad Strategies, n.d.-b). Questions relate to demographics, alumni involvement, characters and values, community, culture, health, housing, outcomes related to their experiences, and more (Dyad Strategies, n.d.-b). This study primarily used survey data responses from the respondents' demographics and the "Health_A_Binge" variable, also known as how many days per week the individual engaged in binge drinking.

The survey dataset in this study represented responses from college fraternity men at all schools in the SEC. Although many of these campuses drastically varied in their physical footprint and business layout, the researcher selected these campuses for an intended purpose of accounting for similar athletic programs and campus Greek culture. Survey data included all responses from those campuses during the 2022 calendar year (i.e., January 2022–January 2023). This timeframe better reflected when national and local operations for colleges and universities were more consistent with normal face-to-face operations prior to the COVID-19 global pandemic and coincided with the timing of

active business operations connected to the alcohol outlet license data requested from each city and state. This timeframe was selected so pandemic-related extraneous variables, such as business closures, state or city ordinances, restrictions on the sale of alcohol, and other public health policy measures did not influence the outcome measures (Jackson et al., 2021). Even with some of those pandemic-related external access restrictions, data from this survey already highlighted an increase in alcohol use and binge-related behaviors with fraternity and sorority members in the beginning of the pandemic (McCreary et al., 2021).

The survey provides numerous data that have been used for numerous published research articles and studies found in the *American Psychological Association–Psychology of Men and Masculinities*, *Research in Higher Education*, *Journal of Cognition and Culture*, and other research (McCready et al., 2022, 2023; McCreary & Schutts, 2015). Studies have used variables in the survey to explore topics such as hazing motivations, openness to diversity, masculinity, and brotherhood and sisterhood (McCready et al., 2022, 2023; McCreary & Schutts, 2015). As the Dyad researchers developed the assessment tool used in this study, they tested and established the reliability and validity of the survey instrument and its questions (McCreary & Schutts, 2015).

Measures

In this study, the researcher calculated alcohol access through two measures: availability and proximity. Additionally, binge drinking behaviors were tabulated through the previously described online Dyad Strategies survey.

Alcohol Availability

This study used geographical information systems (GIS) software through ArcGIS/ArcMAP to identify the number of alcohol outlets, through linear distances, within a 2-mile radius of each university union. The raw count of alcohol outlets surrounding a particular location in each city was an independent variable in the study. Alcohol outlet license records, as described previously, were requested from each city/state and the data were cleaned through a process referenced in the data sources section. Each outlet location or address was then geocoded on the World Street Map in ArcGIS/ArcMAP software through the ArcToolbox/Geocoding Tools/Geocode Addresses. Alcohol outlets were uploaded as three base layers: all outlets, on-premise outlets, and off-premise outlets. Campus student union and residential locations were also geocoded as a separate base layer following the previously described procedure. In the same ArcToolbox, under proximity tools, the Near measure was used to calculate linear distances, in meters, between each specific alcohol outlet and the student union location selected. For this measure, the researcher used a search radius of 2 miles to identify the number of outlets within the desired distance of the campus student union.

Alcohol Outlet Proximity

This study used GIS software through ArcGIS/ArcMAP to identify the linear distance, in meters, between each respondent's residence and the nearest alcohol outlet. These linear distances referenced included alcohol outlet types such as the nearest general alcohol outlet, the nearest on-premise outlet, and the nearest off-premise outlet. Alcohol outlets were geocoded on the World Street Map in ArcGIS/ArcMAP software through the ArcToolbox/Geocoding Tools/Geocode Addresses. Alcohol outlets were uploaded as

three base layers: all alcohol outlets, on-premise outlets, and off-premise outlets. Residential locations for Greek facilities that were associated with the respondents in the survey data were also geocoded as a separate base layer following the previously described procedure. In the same ArcToolbox, using the proximity tools, the Near measure was used to calculate linear distances between on- and off-premise alcohol outlets and the student union residence location, used for on-campus students. For respondents associated with fraternity residents, the Near Table measure under ArcToolbox/proximity tools was used to calculate linear distances between each on- and off-premise alcohol outlet and the student's fraternity residence. Original base layers used a coordinate system that put distances in decimal degrees. To ensure measures were in meters, each original base layer (i.e., student union, fraternity residences, off-premise outlets, and on-premise outlets) was reposted using the project data management tool found in the ArcToolbox. When the base layers were reposted, the output coordinator was updated to include projected coordinate systems/state plane/NAD 1983 (2011). The GIS data for this data projection was updated around 2011 (National Oceanic and Atmospheric Administration, 2012). From that menu, the correct state XY coordinate system was selected depending on the city where the residences were located. The nearest distance or nearest proximity of alcohol outlets to respondents was an independent variable in the study. This measure was represented in meters. It is important to note that the dataset used to compile proximity data only included 13 site locations compared to the 14 site locations used for alcohol availability because one site location provided no responses detailing where the respondent resided.

Binge Drinking

The binge drinking response variable was taken from the Dyad Strategies survey (Dyad Strategies, n.d.-c). The binge drinking measure had a range of 0–7, noting the number of days per week that a respondent consumed five or more alcohol drinks.

Analyses

The researcher conducted analyses in two phases using *R* Studio software and ArcGIS/ArcMAP software. With *R* Studio, any analyses with *p* values less than .05 were categorized as significant findings. *R* Studio is a free statistical software package that allows researchers to load data and run analyses. ArcGIS/ArcMAP is a GIS mapping and analysis software package from the Environmental Systems Research Institute (n.d.) that allows researchers to map relevant geographical data points and measure geographical distances that helped determine variables for alcohol availability and proximity at each university.

The researcher measured the relationship between mean binge drinking at the campus level and alcohol outlet availability within a 2-mile radius of each campus through a Spearman's rank order correlation. This analysis addressed Research Question 1 exploring alcohol outlet availability impacts. Data for this analysis came from alcohol license records requested through public records requests with each city and state and the Dyad Strategies community survey responses connected to those campuses. Data cleaning with survey responses was conducted, removing any responses that had no response for the binge drinking measure. Respondents were inconsistent in completing all demographic questions but all responses that answered the binge drinking measure were included in the dataset. After all alcohol outlets, on-premise outlets, and off-premise

alcohol outlets were geocoded for each campus, the ArcGIS/ArcMAP analysis toolbox was used to generate a Near Table (i.e., linear distances) between each university student union and each corresponding alcohol outlet type (i.e., all outlets, on-premise outlets, and off-premise outlets). All alcohol outlets within a 2-mile linear distance of the student union, also known as a container-based measure (Sack et al., 2020), were tabulated for each campus to be used as the independent variable in the correlational analysis. Container-based measures are easy and cost effective to conduct but have disadvantages in their inability to account for the effect of outlets clustering in certain locations (Sack et al., 2020). Selecting the student union as the center point was due to its proximity to on-campus residences, academic buildings, dining facilities, and where students typically congregate (Rullman et al., 2020). Student unions are usually seen as central hubs for activities, dining, and student engagement (Rullman et al., 2020). A 2-mile radius was selected to incorporate most of the nearby businesses within walking distance from campus.

A breakdown of the variables that were used in the rank order analysis are referenced in Table 3.1. The table provides a description of the dependent and independent variables used in this statistical analysis. The table provides coding language found in the survey results, the general count or numeric scale of the variable, the specific question or questions related to the variable of interest, and the relevant research or source connected to the variables of interest.

Table 3.1 Variables for Spearman's Rank Order Analysis

Coding/variable	Description	Scale	Question	Reference
OUTLET AVAILABILITY	Outlet availability	Total numerical count of outlets for each campus	Total count of outlets with in a 2-mile radius of each campus.	ArcGIS Analysis
HEALTH_A_BINGE	Binge drinking	8-point scale (i.e., 0–7)	During the school year, how many days per week (on average) do you have five or more drinks? Binge drinking variable is analyzed using the mean of binge drinking rate for a campus.	(Wechsler & Austin, 1998)

Equation 1 for this analysis was represented as:

$$r_s = 1 - \frac{6\,\Sigma d^2}{n\,(n^2-1)}. \quad (1)$$

Equation 1 is the general equation for a correlational analysis where r_s is the correlation coefficient, *d* is the difference between the ranks, and *n* is the number of observations or number of campuses in the analytic sample (Astivia & Zumbo, 2017).

These analyses were modeled from similar studies that examined the strength and relationship of alcohol availability and alcohol-related outcomes between college campuses (Kypri et al., 2008; Weitzman et al., 2003). In situations where there were ties in a rank, those variables received the same rank by averaging the ranks had there been no tie for the tied variables (Forthofer et al., 2007). For this statistical analysis, r_s was calculated in *R* Studio *version 2023.03.1+446* using cor.test with the method set as Spearman. This *R* script accounts for ties in the dataset. This statistical analysis was conducted to measure the strength and the direction of the relationship between binge drinking behaviors of all fraternity students connected to that campus, regardless of residential address, and the alcohol outlet availability (i.e., number of outlets) around each college campus. Benefits of using this analysis approach is that it is "unaffected by

the distribution of the population" (Gautheir, 2001, p. 359) and is simple to apply with even a small dataset. Known disadvantages include a "loss of information when the data are converted to ranks and, if the data are normally distributed, it is less powerful than the Pearson correlation coefficient" (Gautheir, 2001, p. 359). The rank order analysis was conducted with all general alcohol outlet counts, on-premise outlet counts, and off-premise outlet counts with the campus mean student drinking data, which became the variable HEALTH_A_BINGE. Once correlation coefficients were calculated, their significance was measured by determining the *t* statistic as noted in Equation 2.

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \tag{2}$$

The *p* value was calculated with a *t* distribution with *n*-2 degrees of freedom (Lumen, n.d.). For this statistical analysis, the *R* script cor.test() was also able to calculate the *p* value for the correlation. Results with *p* values less than .05 were considered statistically significant. This rank order method is consistent with other ecological approaches in the research of outlet availability effects, and based on the data available measured the strength and direction of the relationship between the two variables of interest (Kypri et al., 2008; Weitzman et al., 2003). For context on the previously described models, Equations 3–5 reference the models conducted for the Spearman's rank analysis:

$$r_{availbility\ vs\ all\ outlets} = 1 - \frac{6\,\Sigma d^2}{n\,(n^2-1)} \tag{3}$$

$$r_{availbility\ vs\ on-premise\ outlets} = 1 - \frac{6\,\Sigma d^2}{n\,(n^2-1)} \tag{4}$$

$$r_{availbility\ vs\ off-premise\ outlets} = 1 - \frac{6\,\Sigma d^2}{n\,(n^2-1)} \tag{5}$$

The second analysis measured the relationship of binge drinking and the proximity to the nearest alcohol outlet, which was conducted through a negative binomial regression analysis. The model equation for this regression was best represented as the natural log of the expected value of binge drinking behavior (i.e., quantitative count variable) and a function of the proximity to the nearest alcohol outlet (i.e., quantitative variable). The model for a negative binomial regression is similar to a Poisson regression. However, the negative binomial model assumes the variance in the dependent variable is larger than the mean of the dependent variable, causing an overdispersion (University of California, Los Angeles, n.d.). The researcher chose this analysis method because the dependent variable was considered count data, with a limited range, and a likelihood that it would be overdispersed. During a review of proximity-related alcohol outlet research, the negative binomial regression model was a consistent statistical tool used by researchers (Gmel et al., 2016). The linear model for the negative binomial regression formula was best represented in Equation 6 with the following subscripts: student i, campus j, at time t.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_1 \quad (6)$$

Log(E(Y)) represents the natural log of the expected value of the dependent variable (i.e., binge drinking), β_0 represents the slope intercept, β_1 represents the expected coefficient, and X_1represents the independent variable of proximity to the alcohol outlet. This analysis addressed Research Question 2, which evaluated binge drinking behaviors in relation to the proximity of alcohol outlets. Because survey respondents did not provide a local address with their responses, the researcher was

creative to account for their residential address, which was required to create the proximity value used in the regression analysis.

The dataset in the Dyad survey was augmented to only include responses by individuals who stated that they either resided in a residence hall or in the chapter/house facility. This was done to identify the participant's residential address and only incorporate binge drinking responses from that subset. For respondents who identified living in a residence hall, the researcher gave a central on-campus address, primarily because the researcher was not able to determine their exact local address. The residential location used for that group was the campus student union address connected to the student's campus. This central location was consistent with the address used in the rank order analysis and served as a best-fit solution for respondents in that subset of data, although there was a limitation in residential accuracy given the variability of residence hall locations on a typical college campus. For respondents who identified as living in an on or off campus chapter house/facility, the researcher conducted a public records/online search to identify the address of the chapter facility connected to that individual based on the chapter demographic attached to their response. For example, if a survey respondent stated they were a member of x organization at y university, an online review of that university's information was conducted to identify the specific local address of the chapter residential facility. The dataset for this analysis included 13 site locations compared to the 14 site locations used for Spearman's rank analysis because one site location (i.e., Nashville, Tennessee) did not provide responses detailing where the respondents resided. Additional data cleaning was done, removing any respondents who provided no response for the binge drinking measure. Respondents were inconsistent in

completing all demographic questions but all respondents who answered the binge drinking measure were included in the dataset.

Individual addresses were geocoded into ArcGIS/ArcMAP software for each residential location. Each original base layer (i.e., student union, fraternity residences, off-premise outlets, and on-premise outlets) was reposted using the project data management tool found in the ArcToolbox. When the base layers were reposted, the output coordinator was updated to include projected coordinate systems/state plane/NAD 1983 (2011). The GIS data for this data projection was updated around 2011 (National Oceanic and Atmospheric Administration, 2012). From that menu, the correct state XY coordinate system was selected depending on the city where the residences were located. After the residential addresses, alcohol outlets were geocoded for each campus. The ArcGIS/ArcMAP analysis toolbox was used to generate Near and Near Table measures (i.e., linear distances) between each residential location and each alcohol outlet. Through this analysis, the researcher determined the nearest alcohol outlet and its distance to each residential location, providing the independent variable for the regression analysis. Linear distances between locations were calculated in meters. A breakdown of the variables used in the regression analysis are referenced in Table 3.2.

Table 3.2 Variables for Regression Analysis

Coding/variable	Description	Scale	Question	Reference
HEALTH_A_ALCHS	High school alcohol use	1–6 Likert scale	In high school, how often did you have a drink containing alcohol?	USAUDIT Screening
HEALTH_A_BINGE	Binge drinking	8-point count (i.e., 0–7)	During the school year, how many days per week (on average) do you have five or more drinks?	(Wechsler & Austin, 1998)
PROXIMITY	Proximity distance	Distance in Meters	Linear distance from residence address to the nearest alcohol outlet type	ArcGIS Analysis

The negative binomial regression was conducted through three unadjusted models and 18 stratified models based on prior high school drinking. The prior high school drinking categorical variable had a range of 0–6, noting *never*, *less than monthly*, *monthly*, *weekly*, *2–3 times per week*, *4–6 times per week*, and *daily* consumption. The analysis was conducted in *R* Studio through a negative binomial MASS package, noted as "glm.nb," in the *R* Studio software (University of California, Los Angeles, n.d.).

To check for model fit, the model was run as both a Poisson regression and a negative binomial regression. Then, the researcher compared Akaike information criteria (AIC) measures between both models to determine the model of best fit. A breakdown of the models for the negative binomial regression analysis are listed in Equations 7 through 9. The subscripts for the dependent variable represent student i, on campus j, at time t.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (7)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (8)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (9)$$

The researcher ran additional models with a stratified grouping based on prior high school drinking responses.

Students who stated they never drank in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (10)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (11)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (12)$$

Students who stated they drank less than monthly in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (13)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (14)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (15)$$

Students who stated they drank monthly in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (16)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (17)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (18)$$

Students who stated they drank weekly in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (19)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (20)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (21)$$

Students who stated they drank 2–3 times per week in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (22)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (23)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (24)$$

Students who stated they drank 4–6 times per week in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (25)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (26)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (27)$$

Students who stated they drank daily in high school.

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-all\ alcohol\ outlets)} \quad (28)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-on\ premise\ outlets)} \quad (29)$$

$$Log\left(E\left(Y_{ijt}\right)\right) = \beta_0 + \beta_1 X_{1\,(Proximity\ to\ the\ nearest-off\ premise\ outlets)} \quad (30)$$

Once the data referenced in Chapter 3 were compiled and cleaned, the researcher conducted correlational analyses and regression analyses. Chapter 4 provides an overview of site characteristics for each sample connected to the two research questions and detail the findings for each analysis.

Chapter 4: Results

The purpose of this study was to answer two specific research questions through two types of statistical analysis. The first analysis looked at the relationship between binge drinking behaviors and alcohol outlet availability for college fraternity men associated with colleges/universities in the Southeastern Conference (SEC). Additionally, this analysis examined the relationship between binge drinking behaviors in the same population and the availability of each type of alcohol outlet (i.e., on premise, off premise, or all outlets). The second analysis examined the relationship between binge drinking behaviors and the proximity to alcohol outlets with college fraternity men at colleges/universities in the SEC. Additionally, this analysis looked at the relationship between binge drinking behaviors in the same population and the proximity to each type of alcohol outlet (i.e., on premise, off premise, or all outlets).

Research Question 1

Descriptive statistics of the survey respondents used in the Spearman rank correlation were separated into two categories known as SEC West campuses and SEC East campuses. These demographics are referenced in Tables 4.1 and 4.2. As indicated in these tables, there were 5,000 student respondents across 14 college campuses used in the Spearman analysis. On average, there were around 357 respondents per campus with a standard deviation of 161.26. The 5,000 respondents were used to generate the mean binge drinking rates for each campus, which were used in the Spearman's rank analysis. Auburn had the most responses with 659 responses and Nashville had the fewest

responses with only 19 responses. Just over 78% of students surveyed identified as White and the next two highest racial demographics were Hispanic/Latino and two or more races. This large proportion of White men was consistent to what the researcher expected given the general makeup of Interfraternity Council (IFC) organizations. As far as student classification, the dataset was evenly spread. Responses included 27% freshmen, 27% sophomores, 23% juniors, and 18% seniors. About 14% of all campus respondents were new members associated with that campus fraternity.

Table 4.1 Spearman Site Characteristics (SEC West Campuses)

Student characteristics	Auburn (%)	Baton Rouge (%)	College Station (%)	Fayetteville (%)	Oxford (%)	Starkville (%)	Tuscaloosa (%)
Grade level							
Freshmen	25	29	23	32	58	29	31
Sophomore	25	22	29	34	11	25	26
Junior	22	27	21	20	14	23	22
Senior	22	15	22	11	12	19	17
Fifth-year senior	2	4	2	1	0	3	0
Graduate student	2	1	1	0	1	1	0
No response	3	3	2	2	3	1	2
New member	9	4	12	33	53	7	24
Race/ethnicity							
White	82	83	76	83	81	84	78
Asian/Pacific Islander	2	1	3	1	1	1	1
Black/African American	3	2	0	1	1	2	1
Hispanic/Latinx	2	2	5	2	1	3	3
American Indian/First Nation/Alaska Native	1	1	1	2	1	1	1
Two or more races	2	5	8	7	9	2	3
Middle Eastern/North African	0	0	1	0	0	0	0
Indian	1	1	1	0	0	1	0
Other	1	0	0	1	0	1	1
Unknown	0	0	1	0	0	0	0
No response	6	6	4	3	8	5	10
Total respondents	659	195	315	372	125	400	401

Table 4.2 Spearman Site Characteristics (SEC East Campuses)

Student characteristics	Athens (%)	Columbia, SC (%)	Columbia, MO (%)	Gainesville (%)	Knoxville (%)	Lexington (%)	Nashville (%)
Grade level							
Freshmen	19	27	32	18	26	27	0
Sophomore	24	25	34	28	31	28	5
Junior	28	25	20	28	25	25	47
Senior	25	18	11	22	14	19	47
Fifth-year senior	2	0	1	3	1	0	0
Graduate student	1	1	0	2	0	0	0
No response	0	4	1	0	2	1	0
New member	0	9	10	8	23	19	0
Race/ethnicity							
White	78	80	84	53	82	81	53
Asian/Pacific Islander	1	3	2	2	2	1	21
Black/African American	1	1	1	3	0	2	0
Hispanic/Latinx	3	3	3	9	5	2	11
American Indian/First Nation/Alaska Native	0	1	1	0	1	1	0
Two or more races	1	0	0	1	0	1	0
Middle Eastern/North African	1	0	0	0	0	0	0
Indian	12	7	5	26	5	5	0
Total respondents	349	435	515	465	416	334	19

Drinking characteristics for each campus are referenced in Tables 4.3 and 4.4. Of the 14 schools referenced, there was a range of alcohol-related characteristics covered including the number of alcohol outlets within a 2-mile radius of each campus location, and a breakdown of on- and off-premise outlets in that same radius. Characteristics also include the campus mean binge drinking rate at each campus and the closest distance, in meters, to each type of alcohol outlet. Overall, the campus mean binge drinking rate for all respondents was 1.1626 with a standard deviation of 1.294641, which equates to respondents on average consuming five or more drinks (i.e., binge drinking) for just over

1 day per week. The University of Mississippi in Oxford, Mississippi had the greatest binge drinking mean with a score of 1.46, and Mississippi State University in Starkville, Mississippi had the lowest binge drinking mean with a score of 0.942.

Table 4.3 Spearman Drinking Characteristics by Site (SEC East Campuses)

Alcohol-related characteristics	Athens	Columbia, SC	Columbia, MO	Gainesville	Knoxville	Lexington	Nashville
All total alcohol outlets	224	235	153	187	123	262	411
On-premise alcohol outlets	170	184	127	135	111	214	382
Off-premise alcohol outlets	166	56	26	52	15	110	31
Campus mean binge drinking rate	1.24	1.37	1.26	1.27	1.39	1.02	0.737
Closest off-premise outlet (meters)	569.67	343.53	542.49	817.29	379.35	170.84	577.55

Note. Total number of outlets represents the number of outlets in a 2-mile radius of the campus student union.

Table 4.4 Spearman Drinking Characteristics by Site (SEC West Campuses)

Alcohol-related characteristics	Auburn	Baton Rouge	College Station	Fayetteville	Oxford	Starkville	Tuscaloosa
All total alcohol outlets	104	129	180	147	74	44	173
On-premise alcohol outlets	73	87	136	123	62	36	137
Off-premise alcohol outlets	29	42	89	30	14	8	42
Campus mean binge drinking rate	1.09	1.30	1.04	1.10	1.46	0.942	0.853
Closest on-premise outlet (meters)	272.94	527.95	265.52	275.20	398.35	1117.83	437.42
Closest off premise outlet (meters)	547.24	669.53	265.52	1092.44	1071.27	1392.42	658.16

Note. Total number of outlets represents the number of outlets in a 2-mile radius of the campus student union.

The mean number of all alcohol outlets within a 2-mile radius of each campus was 174.7 with a standard deviation of 91.1. Vanderbilt University in Nashville, Tennessee had the greatest number of alcohol outlets with 411 outlets within a 2-mile radius of campus. However, Vanderbilt University also had the lowest response rate for the survey. Mississippi State University had the lowest number of alcohol outlets with 44 outlets within a 2-mile radius of campus. For a specific breakdown of outlet type, the mean number of on-premise alcohol outlets was 141.2 with a standard deviation of 84.3. Similar to the overall alcohol outlets number, Vanderbilt University had the greatest number of on-premise outlets with 382 outlets in a 2-mile radius and Mississippi State University had the lowest number of on-premise outlets with 36 outlets in a 2-mile radius. For off-premise outlets, the mean number was 50.7 with a standard deviation of 43.6. The University of Georgia had the greatest number of off-premise outlets with 166 outlets in a 2-mile radius and Mississippi State University had the lowest number of off-premise outlets with eight outlets in a 2-mile radius.

As it relates to the proximity or nearest distance to an alcohol outlet, the mean nearest distance to an off-premise outlet was 649.8 meters with a standard deviation of 343.2 meters. The University of Kentucky in Lexington, Kentucky had the closest off-premise outlet near campus. The University of Kentucky in Lexington, Kentucky also had the closest on-premise outlet near campus. The mean nearest distance to an on-premise outlet was 414.4 meters with a standard deviation of 243.4 meters. In general, this number indicated that on-premise outlets such as bars, nightclubs, and restaurants were generally the closer of the two types of alcohol outlets in college environments, highlighting how entertainment districts in college towns can be as close as a quarter-mile walk for a typical college student.

Overall, a Spearman's rank analysis revealed no statistically significant relationship between alcohol availability in a 2-mile radius and binge drinking behaviors with the sample population. When reviewing the relationship using all alcohol outlets the data indicated an $r = -0.297$, $p = .302$; with on-premise outlets the data indicated $r = -0.358$, $p = .209$; and with off-premise outlets the data indicated $r = -0.158$, $p = .059$. These results indicated that as alcohol availability increased, binge drinking behaviors would weakly decrease, with the stronger inverse correlation connected to the availability of on-premise outlets. However, with nonsignificant p values, the researcher was unable to reject the null hypothesis that there is no relationship between the two variables. Given the potential that the Vanderbilt/Nashville dataset could be an outlier, correlations were run between the variables providing correlation coefficients ranging from -0.12 to -0.19 with nonsignificant p values. This data removal caused the strength of the relationship between the two variables to weaken but did not improve its statistical significance.

Figures 4.1 through 4.28 illustrate the geocoded mapping in ArcGIS/ArcMAP of alcohol outlets and residential locations connected to the campuses referenced in Tables 4.1 through 4.4. Each image shows residential locations and alcohol outlet types with a separate image showing a clear delineation of on- and off-premise alcohol outlets.

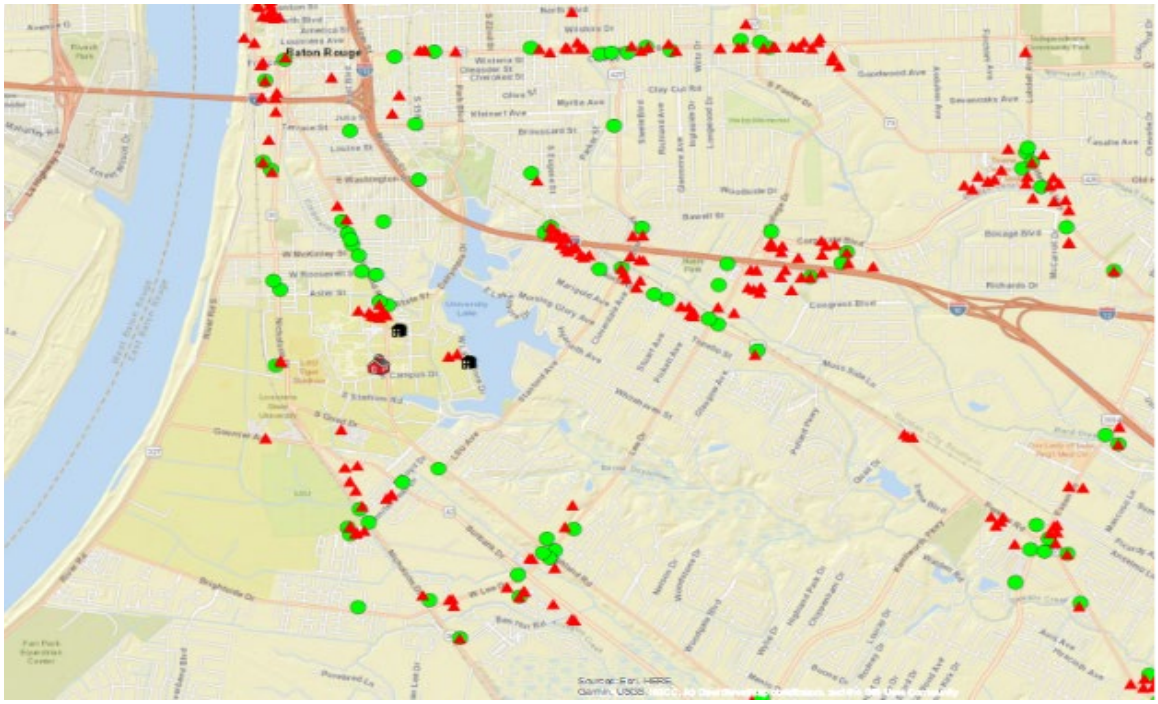

Figure 4.1 Baton Rouge, Louisiana Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

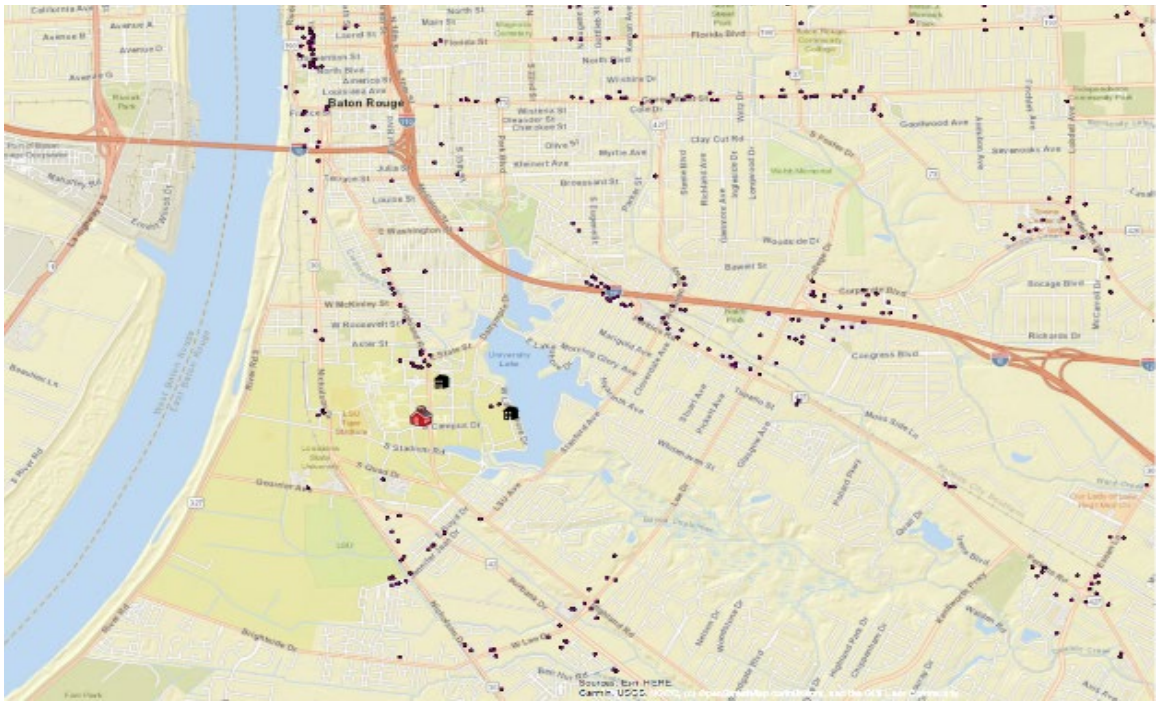

Figure 4.2 Baton Rouge, Louisiana Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

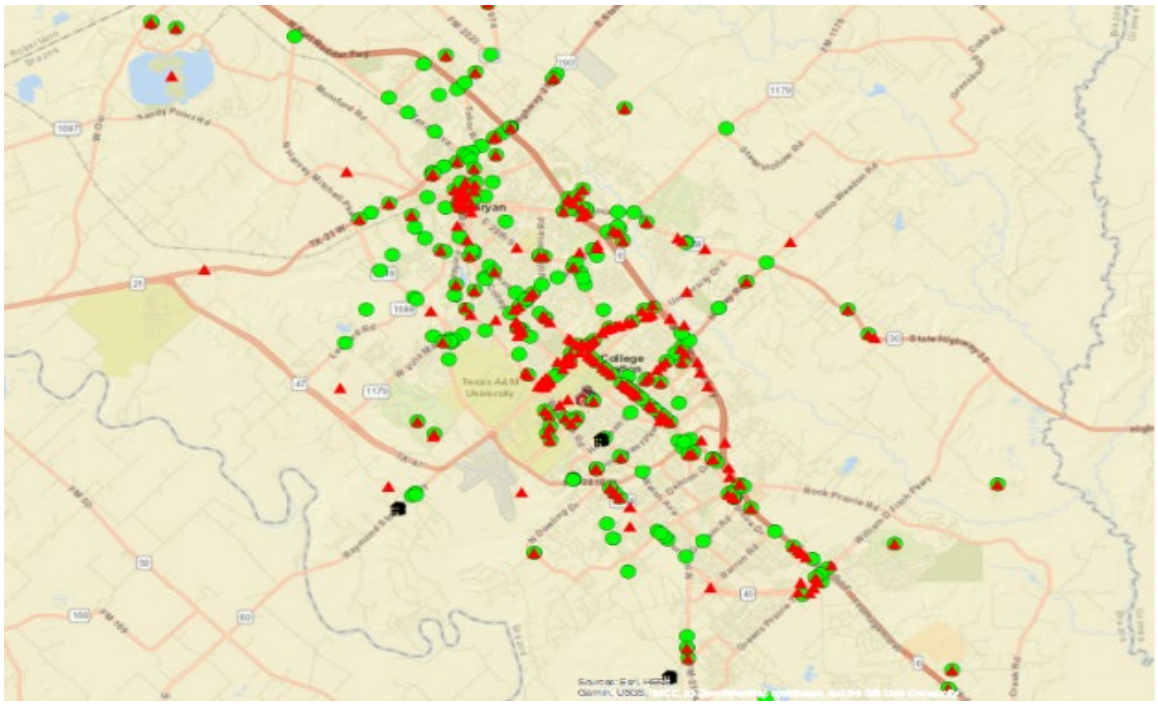

Figure 4.3 College Station, Texas Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

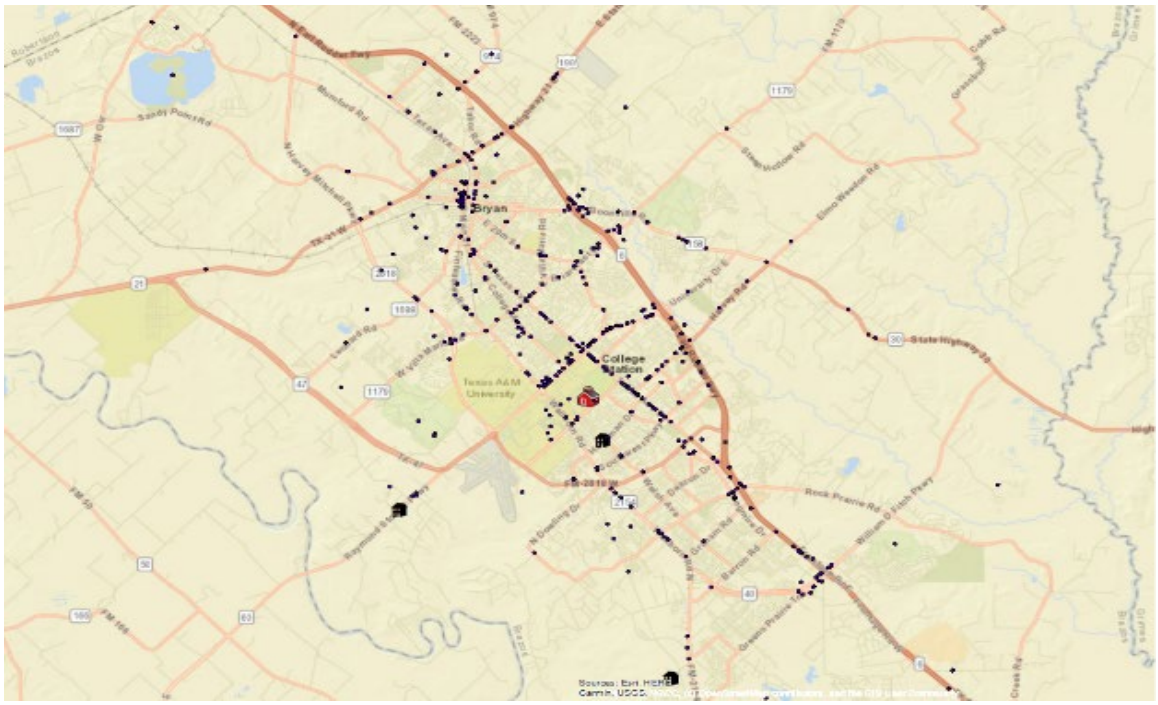

Figure 4.4 College Station, Texas Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

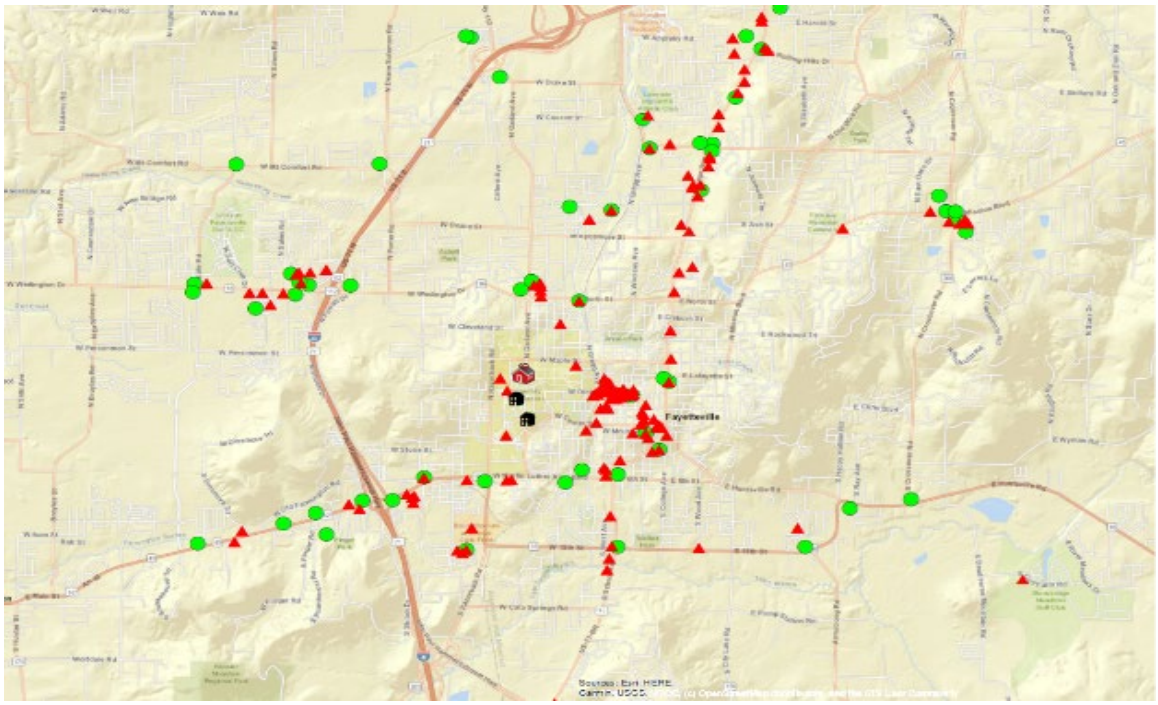

Figure 4.5 Fayetteville, Arkansas Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

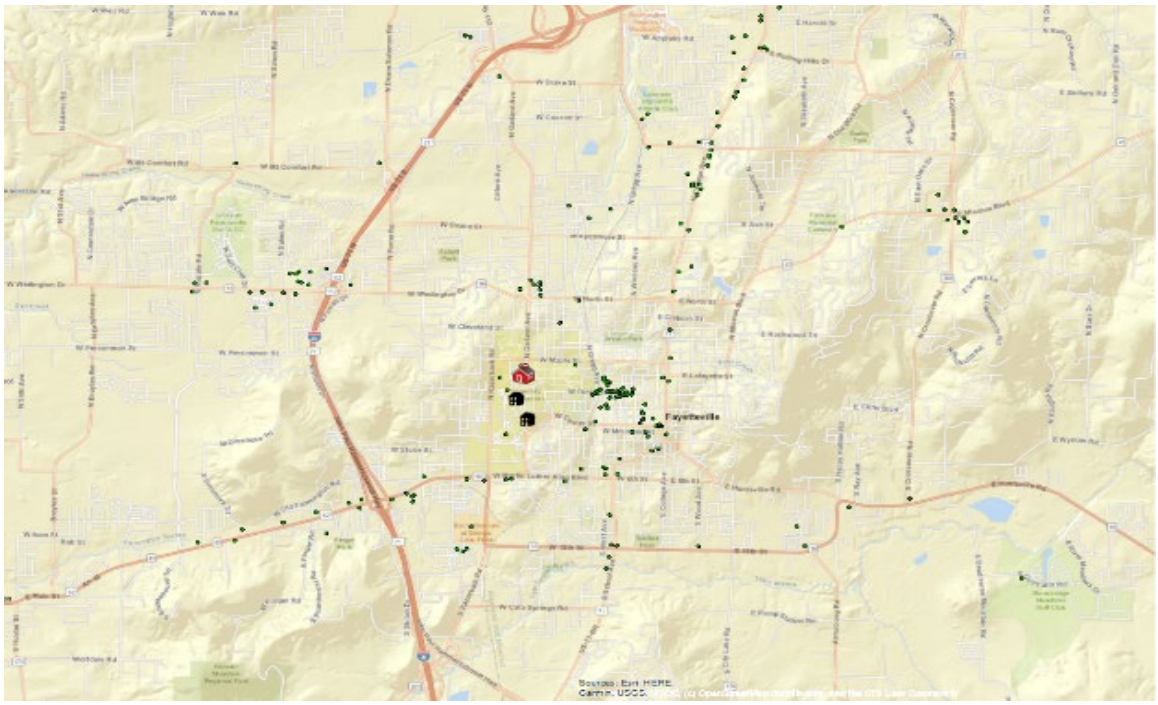

Figure 4.6 Fayetteville, Arkansas Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

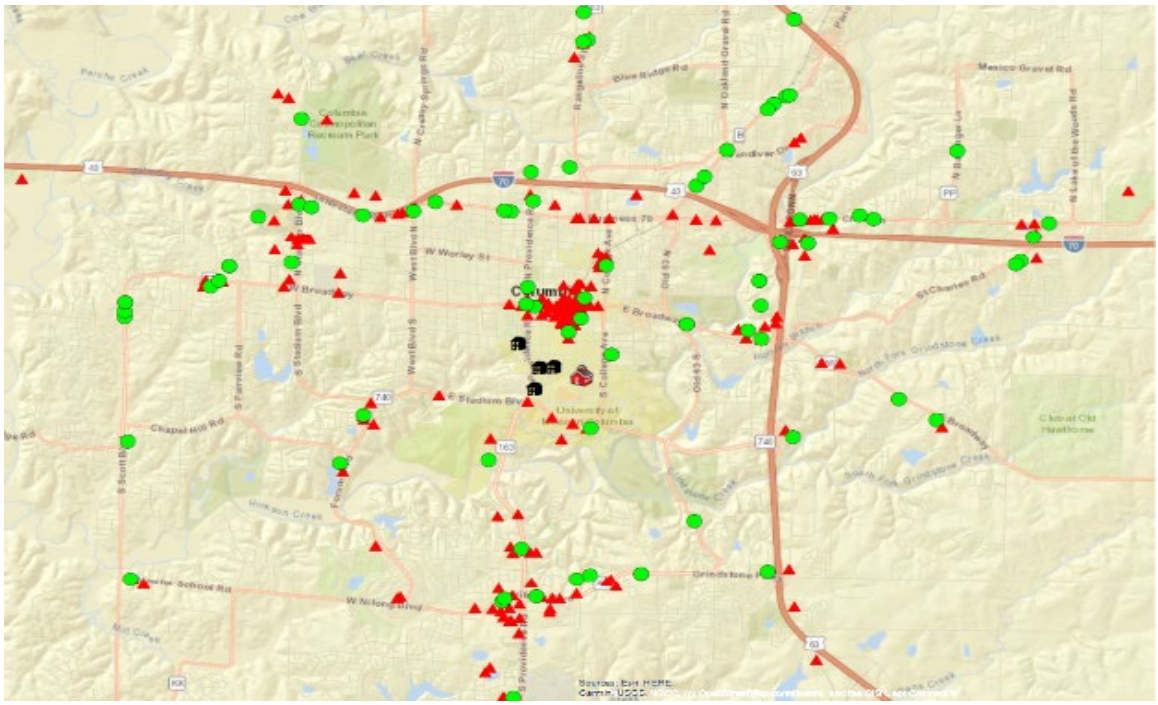

Figure 4.7 Columbia, Missouri Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

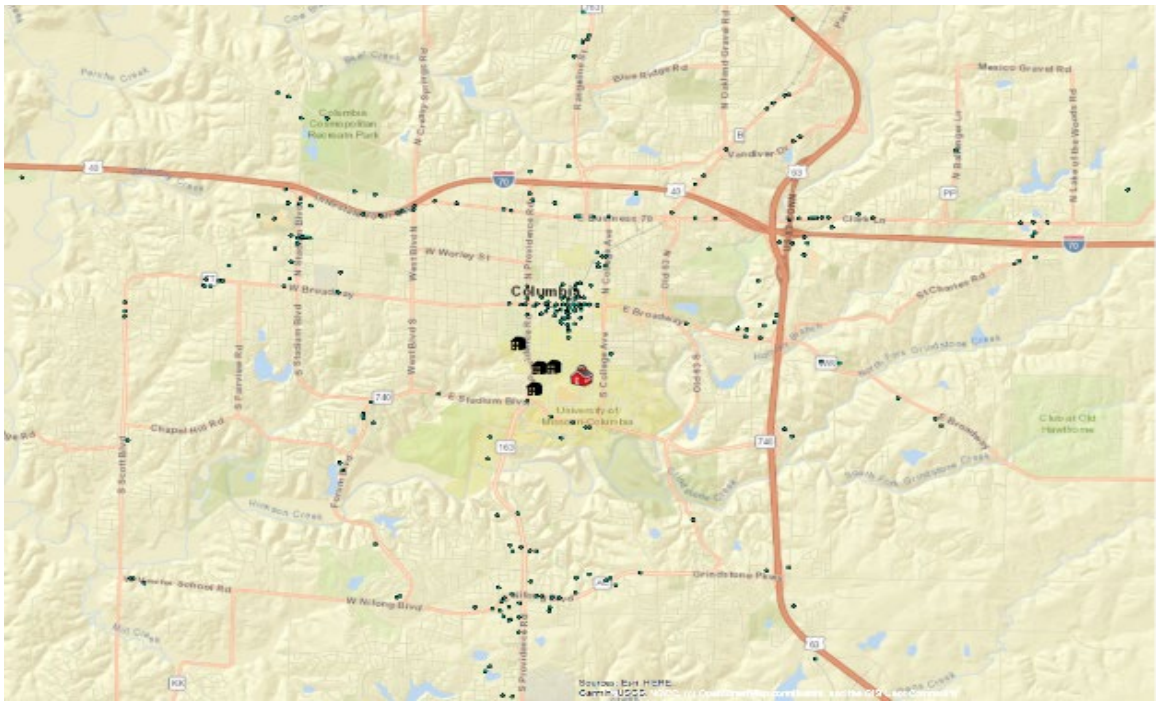

Figure 4.8 Columbia, Missouri Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

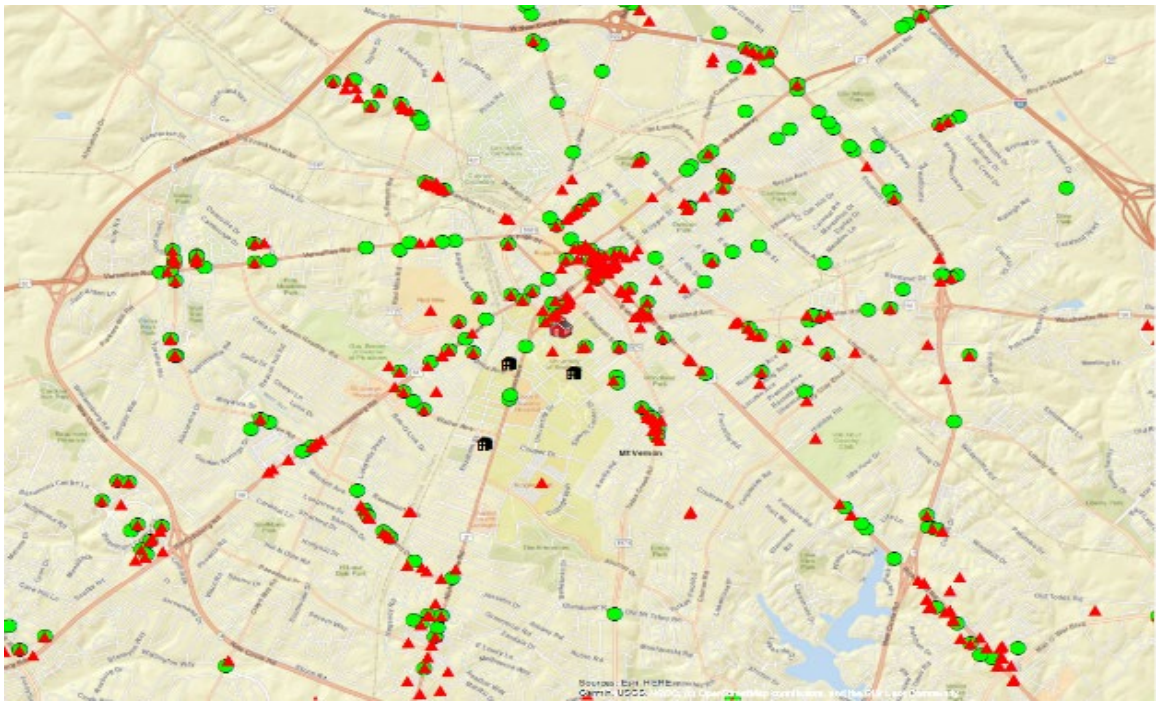

Figure 4.9 Lexington, Kentucky Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

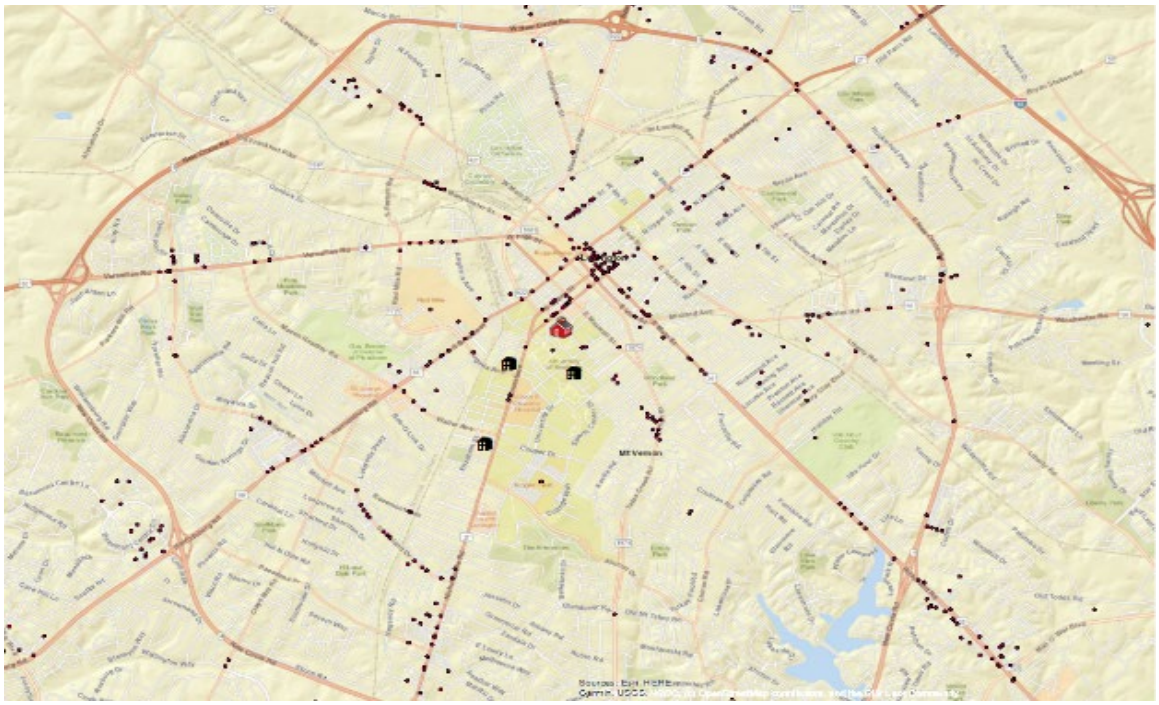

Figure 4.10 Lexington, Kentucky Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

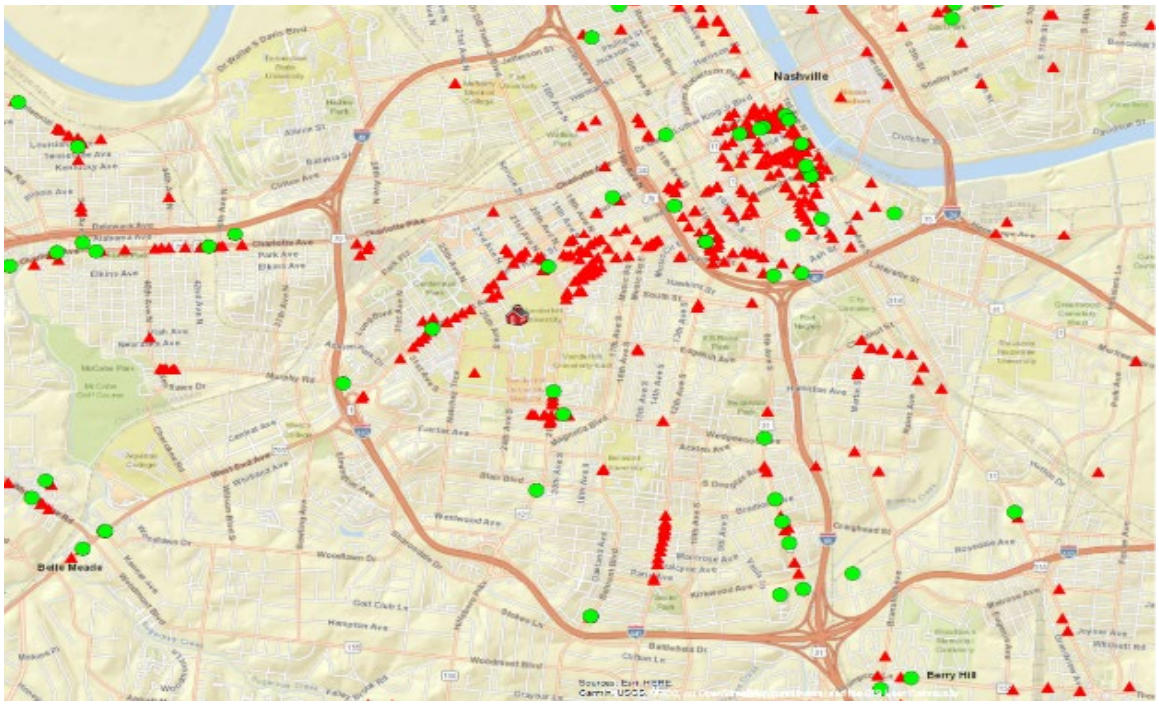

Figure 4.11 Nashville, Tennessee Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

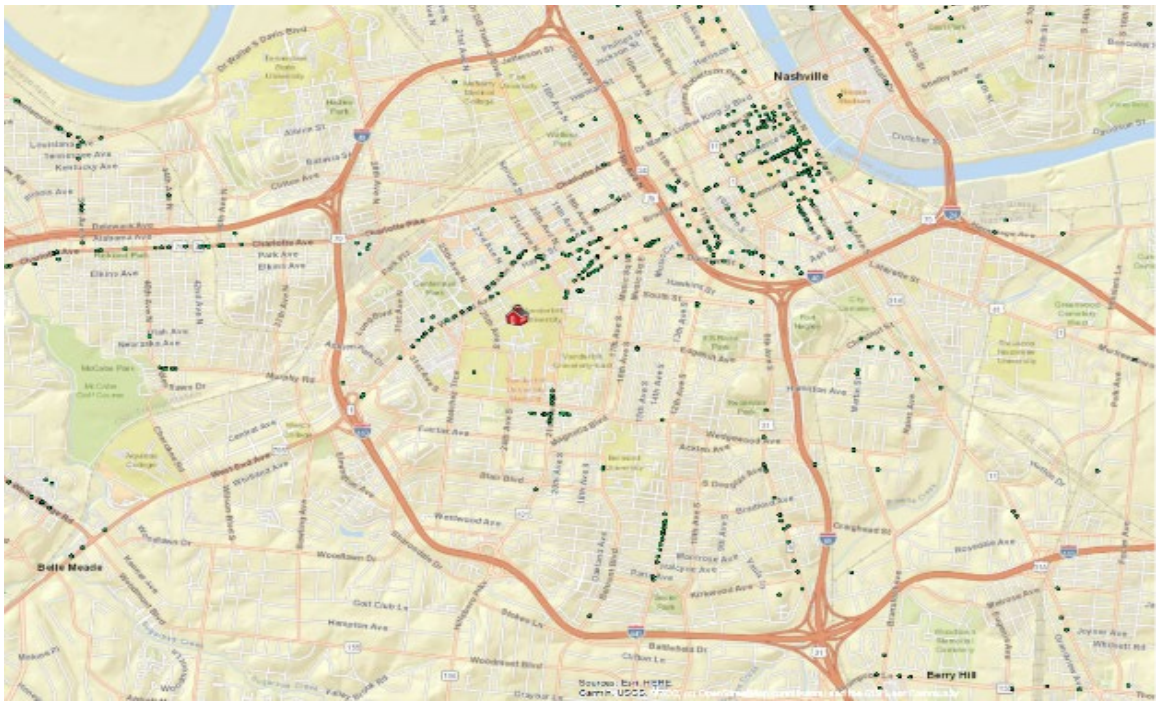

Figure 4.12 Nashville, Tennessee Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

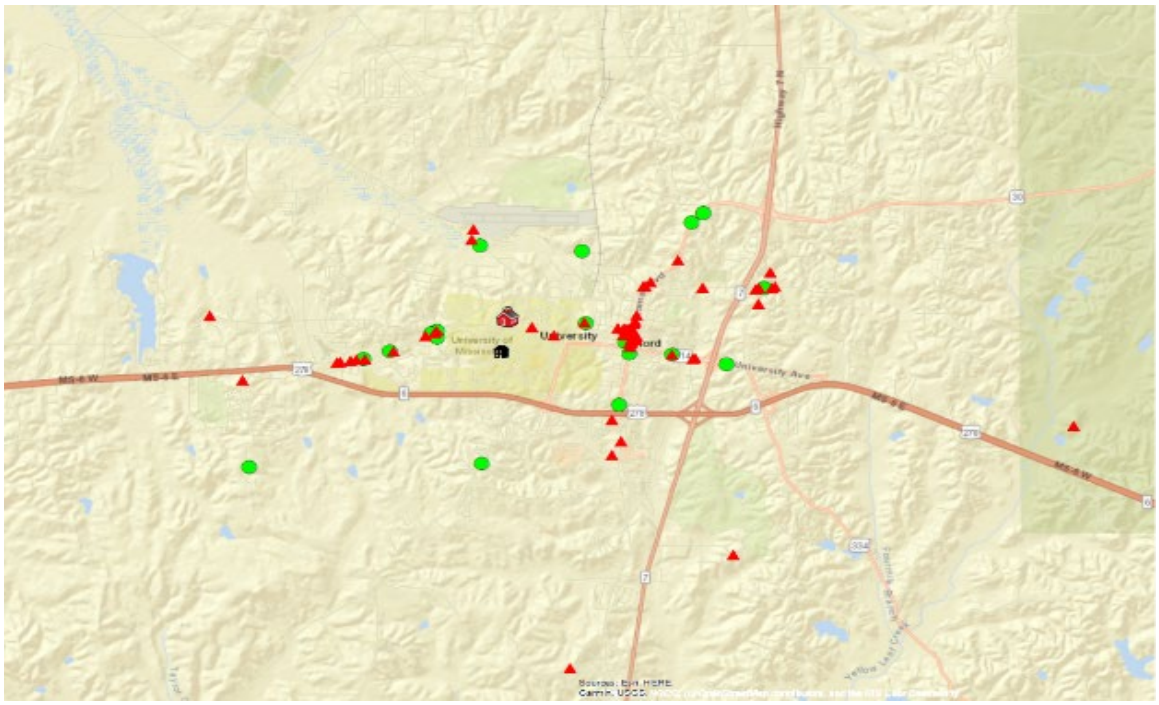

Figure 4.13 Oxford, Mississippi Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

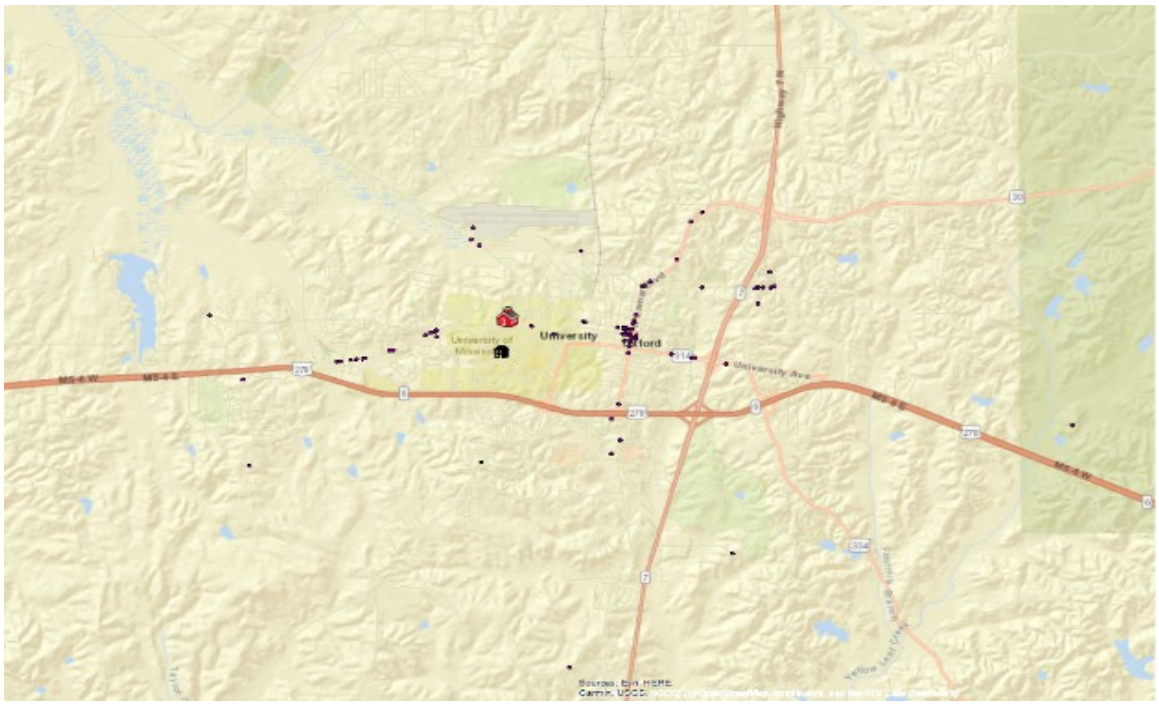

Figure 4.14 Oxford, Mississippi Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

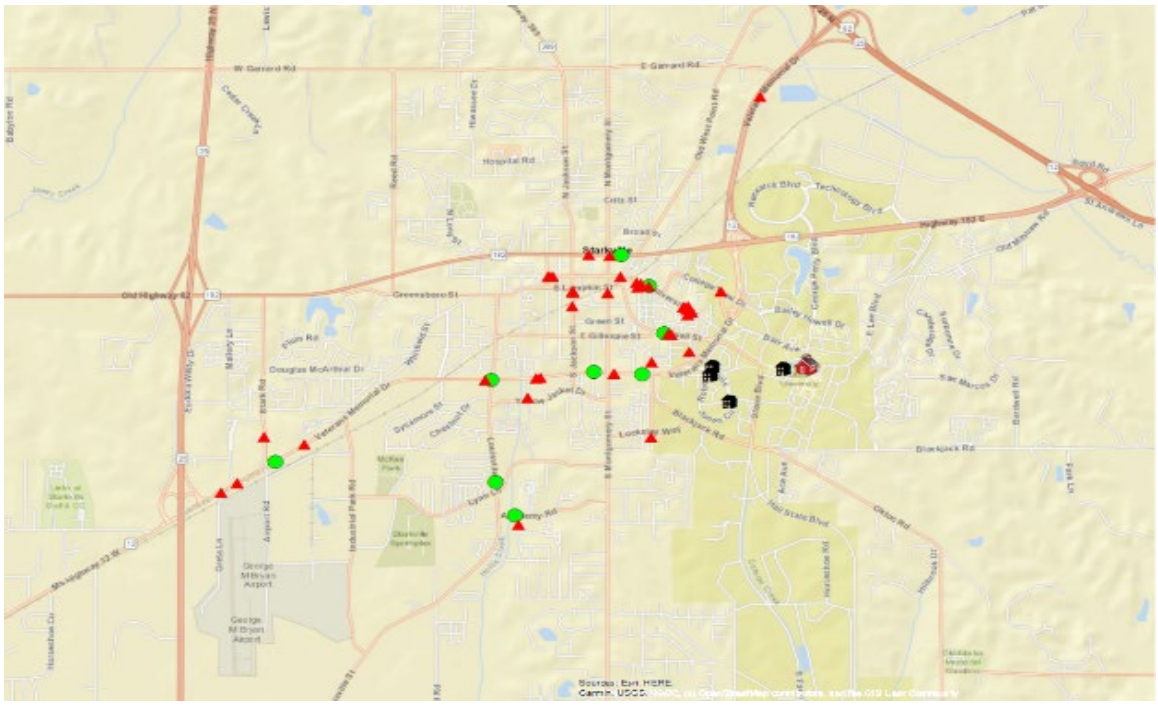

Figure 4.15 Starkville, Mississippi Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

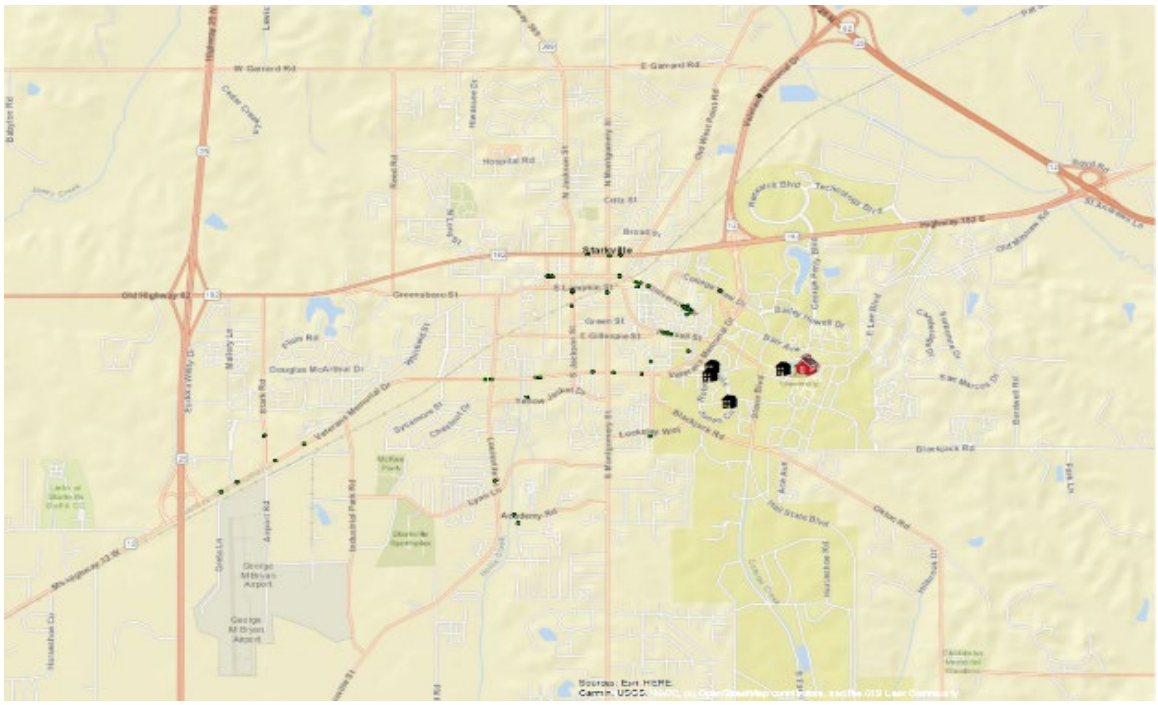

Figure 4.16 Starkville, Mississippi Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

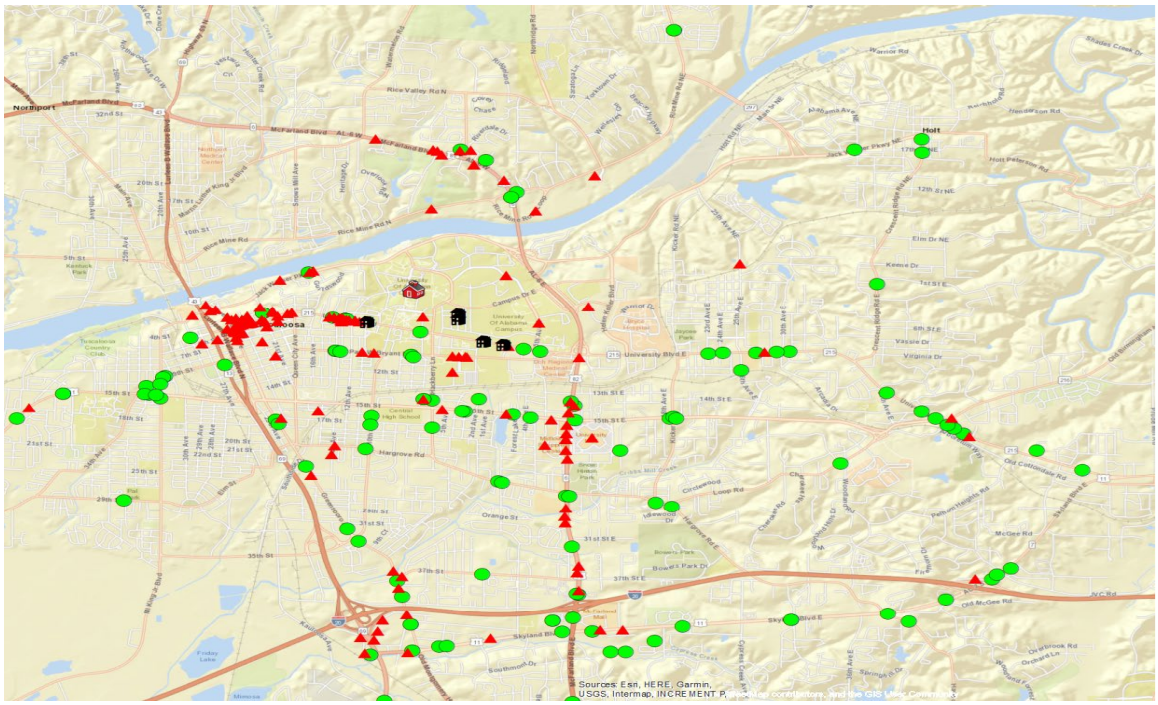

Figure 4.17 Tuscaloosa, Alabama Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

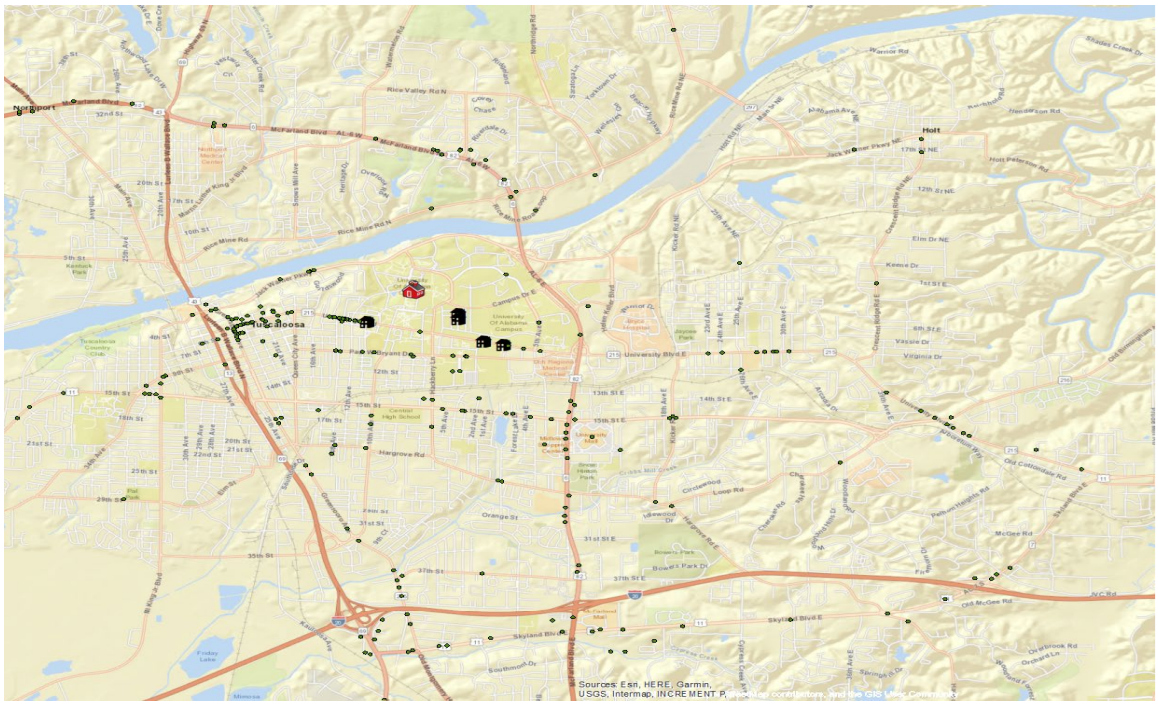

Figure 4.18 Tuscaloosa, Alabama Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residence.

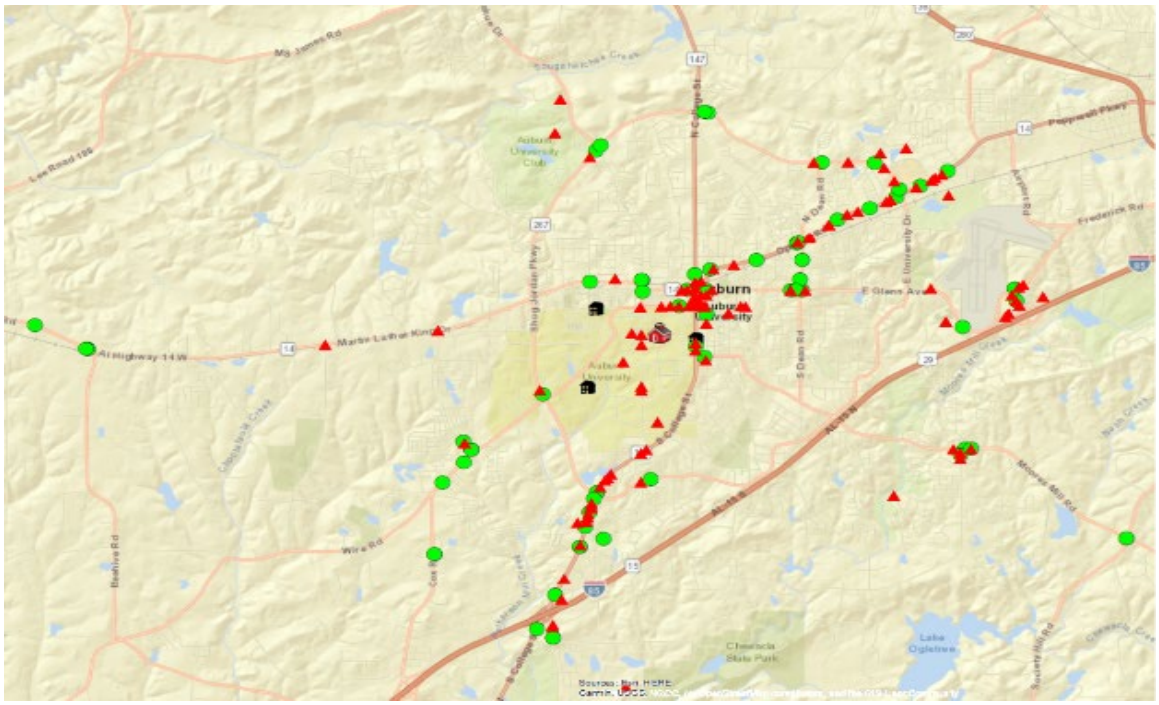

Figure 4.19 Auburn, Alabama Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

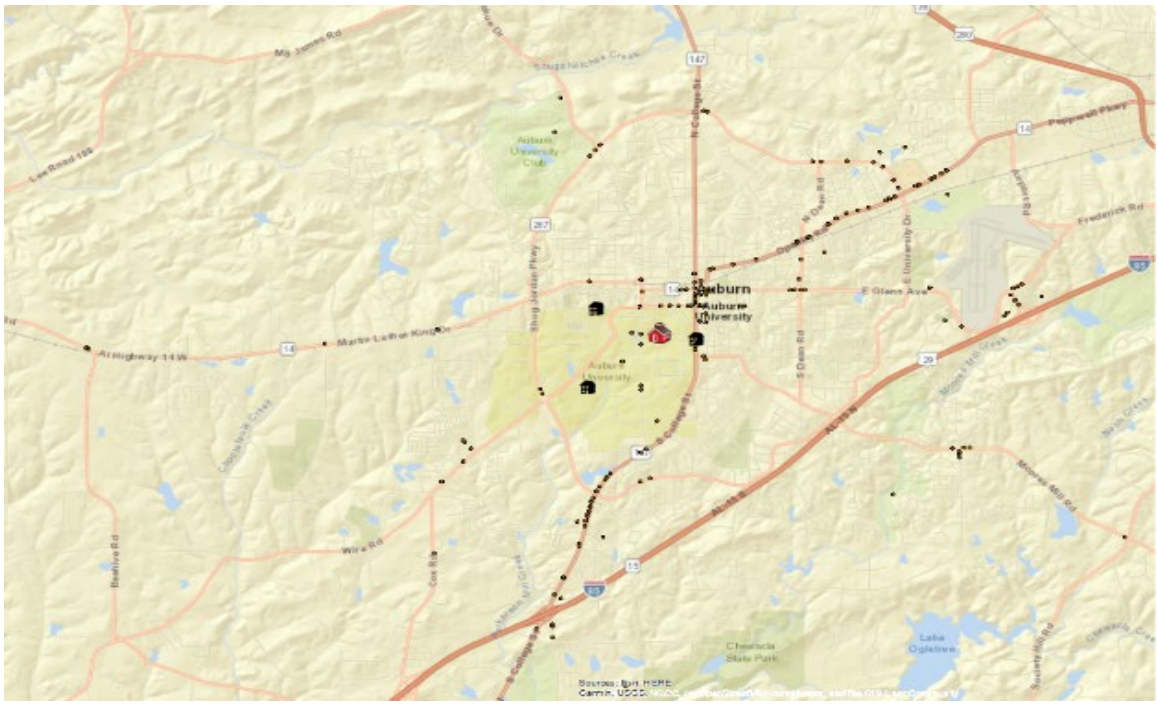

Figure 4.20 Auburn, Alabama Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

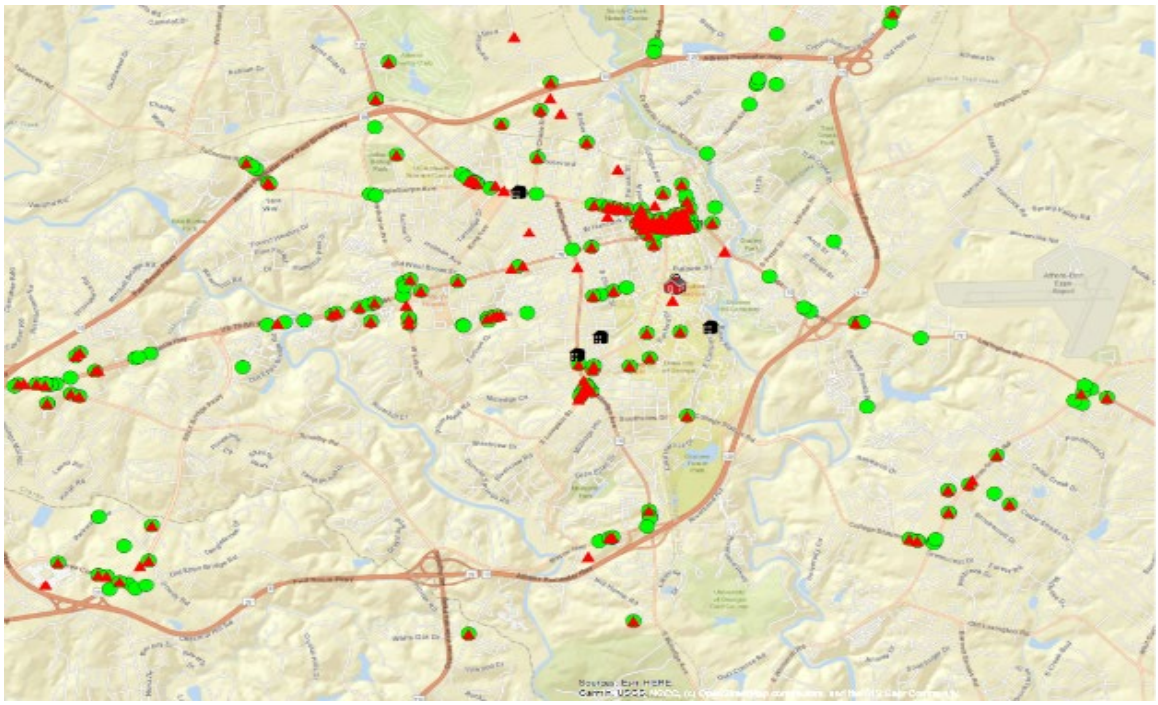

Figure 4.21 Athens, Georgia Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

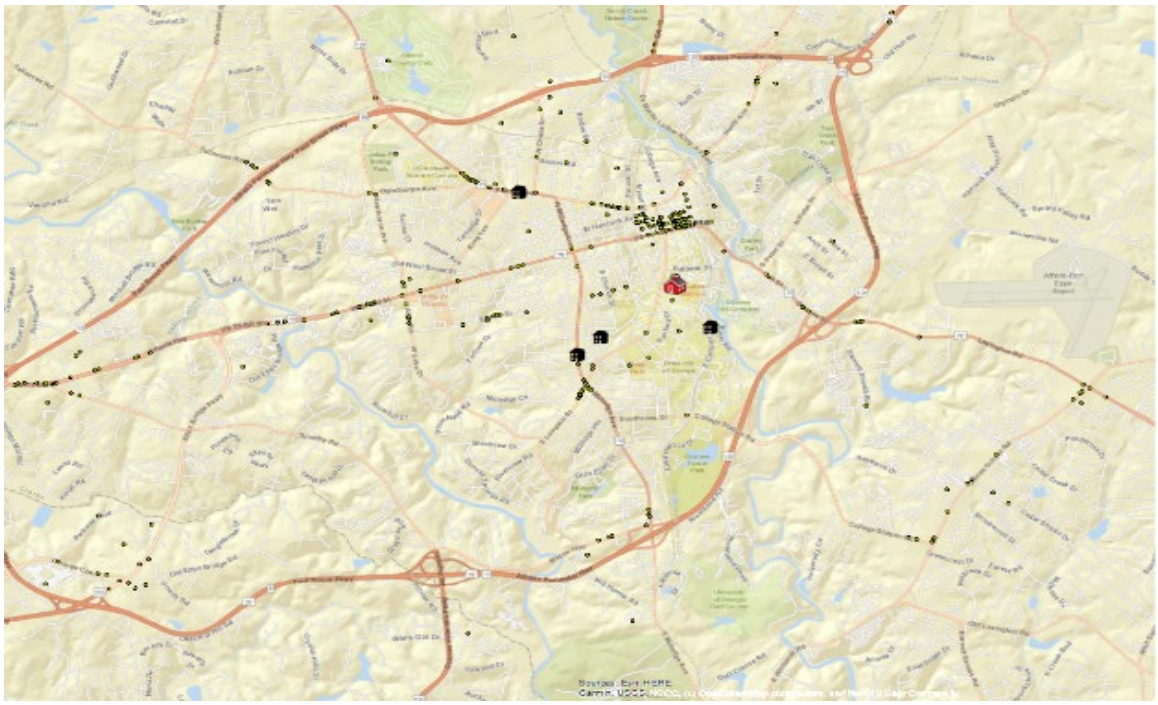

Figure 4.22 Athens, Georgia Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

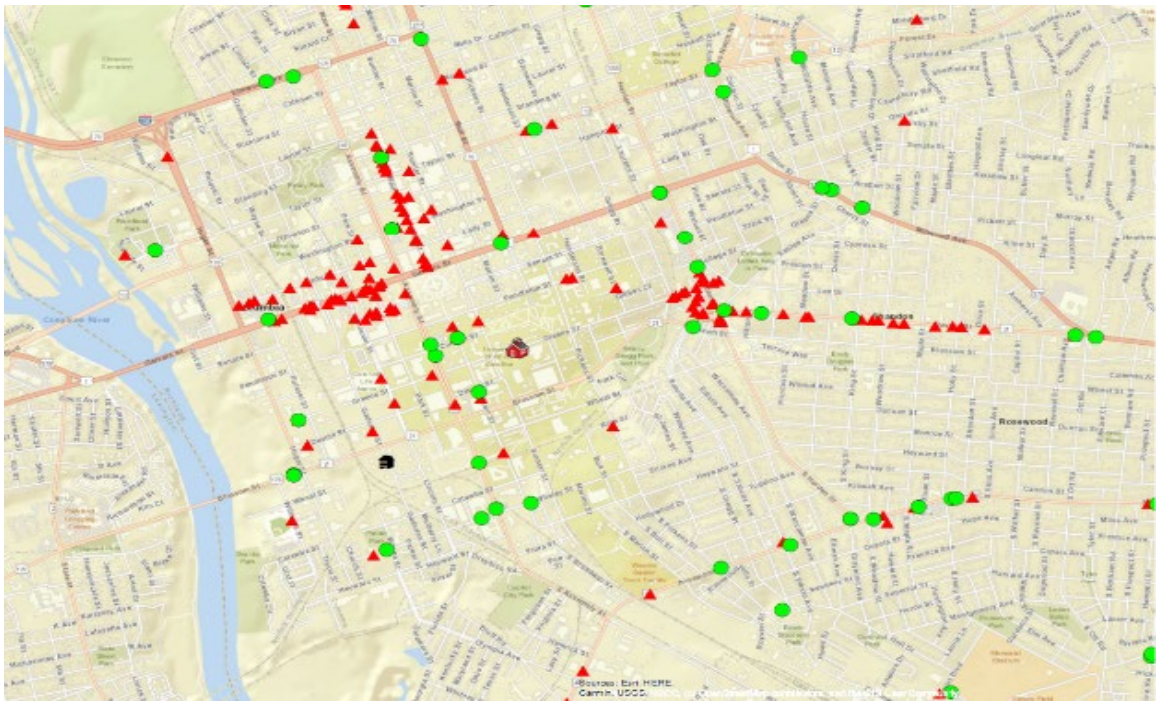

Figure 4.23 Columbia, South Carolina Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

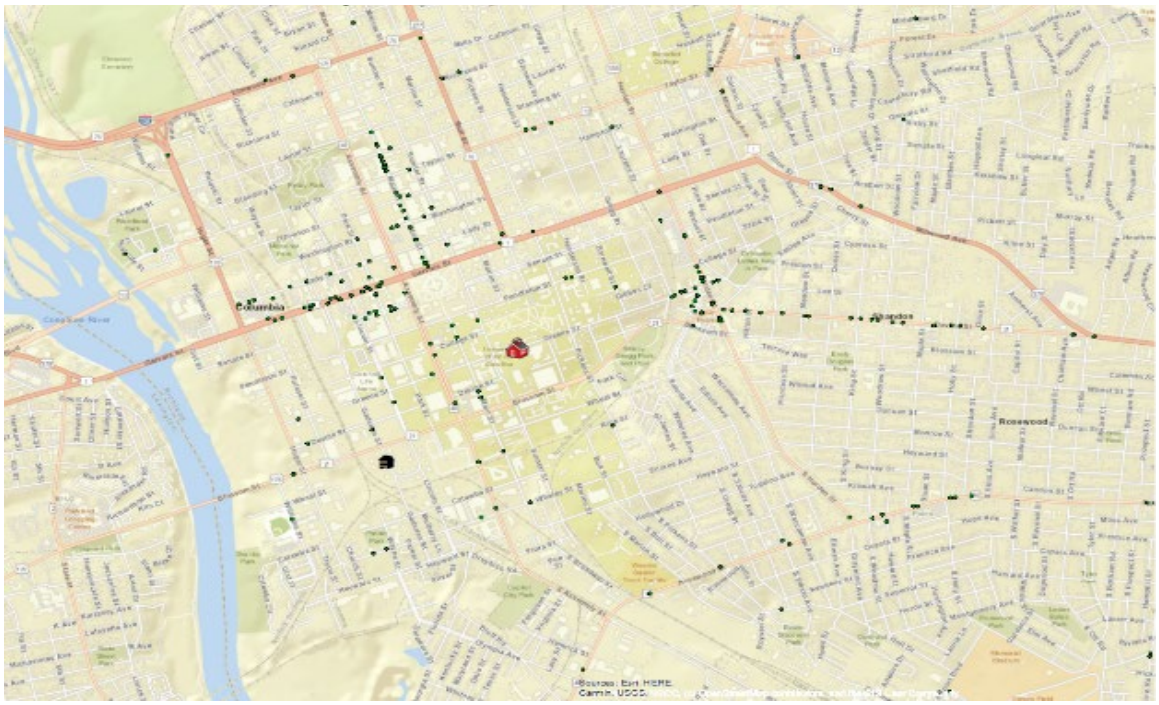

Figure 4.24 Columbia, South Carolina Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

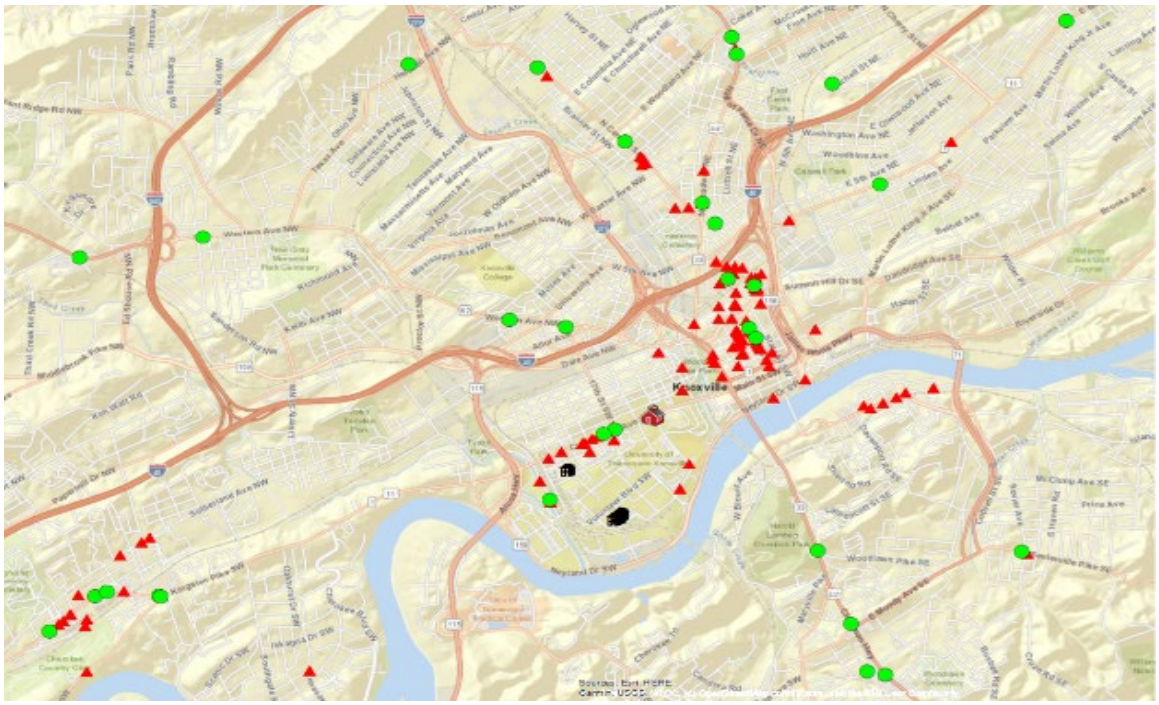

Figure 4.25 Knoxville, Tennessee Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

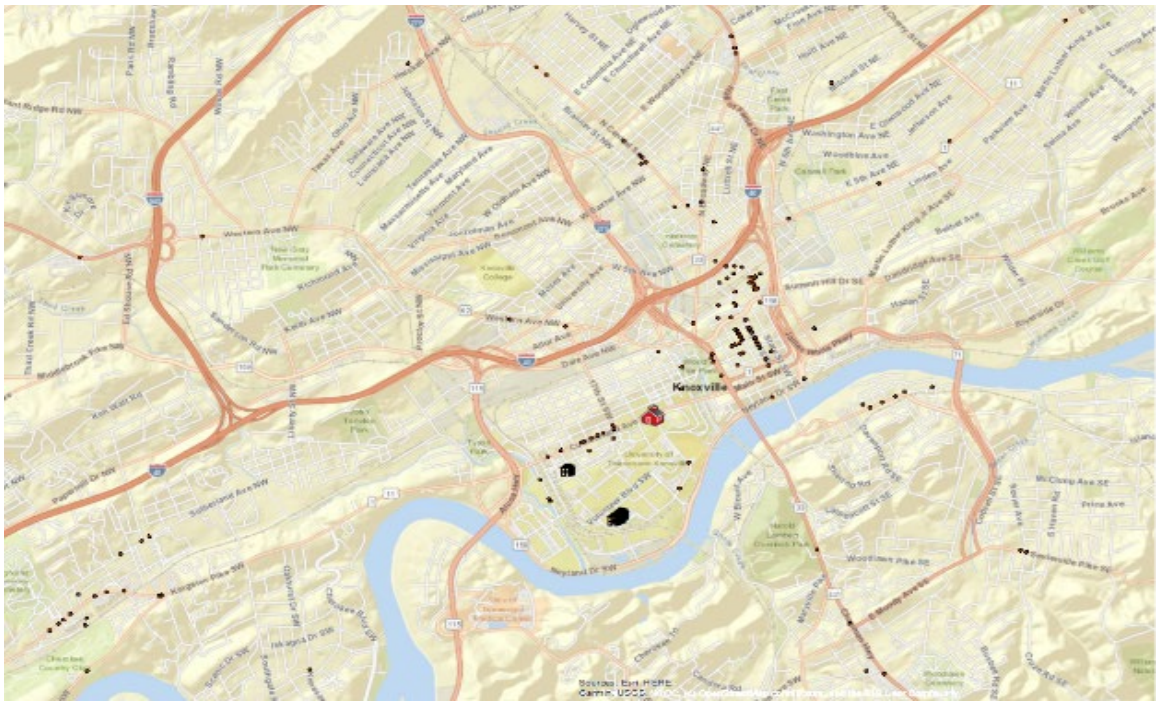

Figure 4.26 Knoxville, Tennessee Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

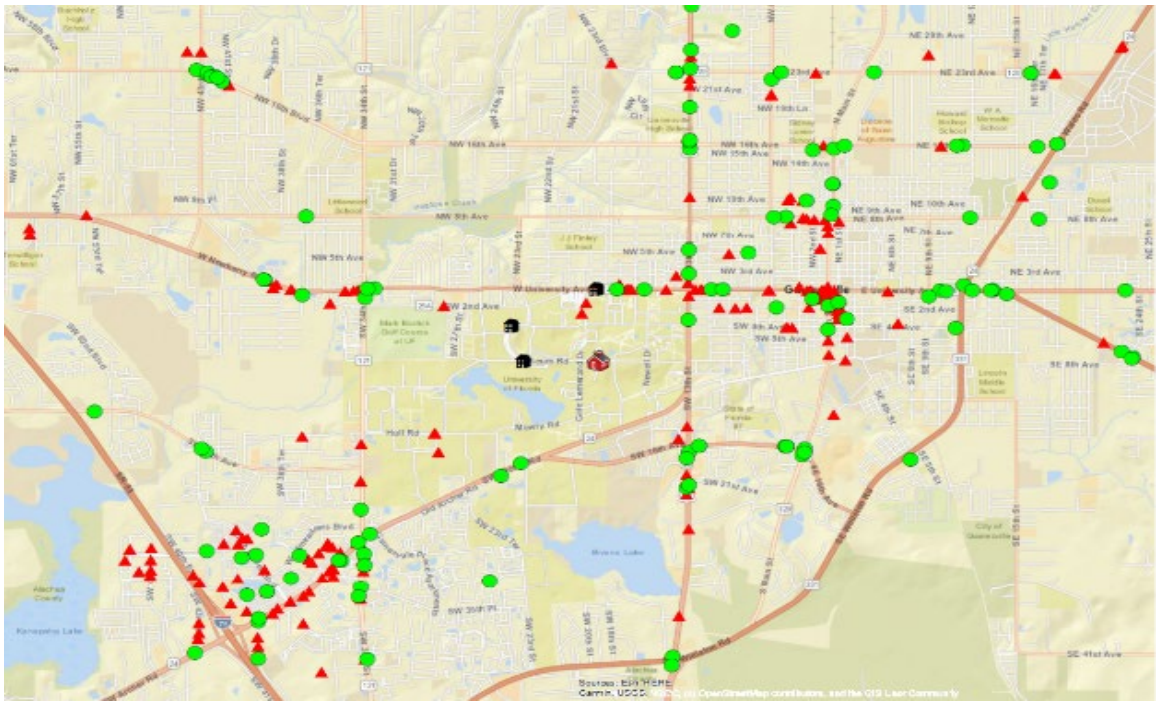

Figure 4.27 Gainesville, Florida Community Outlets (On Premise and Off Premise)

Note. The red triangles represent on-premise outlets and the green circles represent off-premise outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

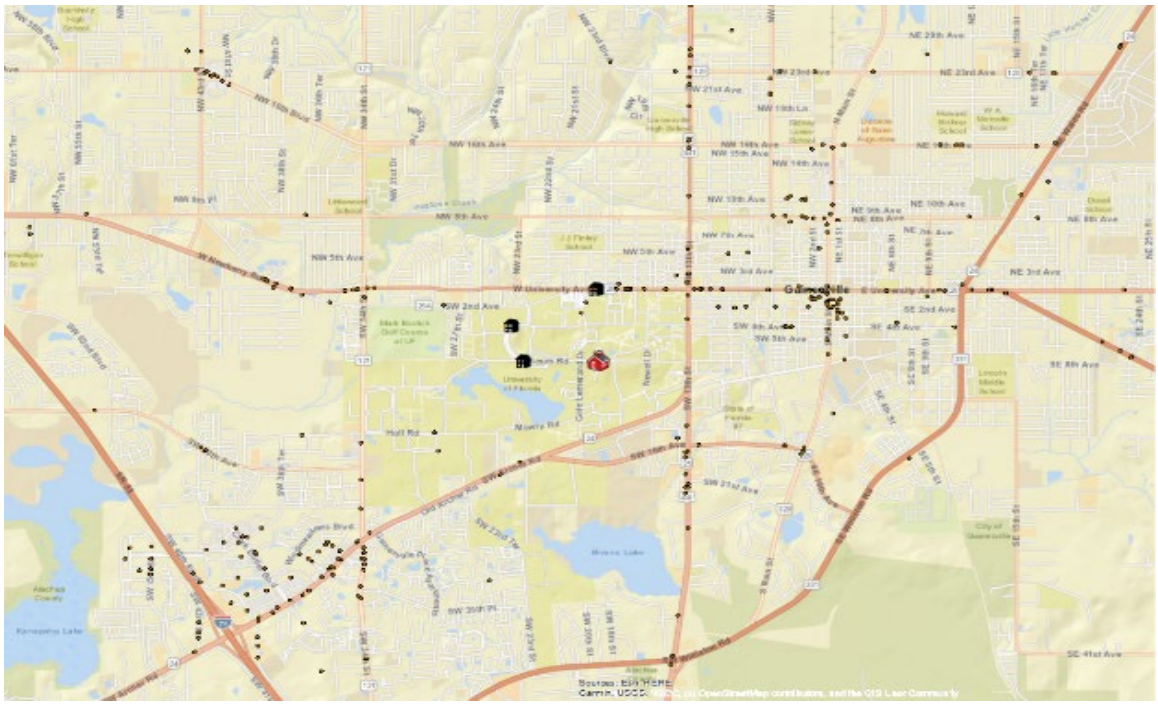

Figure 4.28 Gainesville, Florida Community Outlets (All Outlets)

Note. The dark dots represent all alcohol outlets. The red schoolhouse reflects the location of the campus student union and small black houses represent fraternity residences.

Figures 4.1 through 4.28 illustrated the variability of alcohol outlet availability and proximity at each site campuses. The figures highlight the clustering of alcohol outlets that are typical of entertainment districts in college towns but show great variance because each city is influenced by their local ordinances, state laws, city population, and business development. Additionally, these images may highlight more on-premises licenses than noted in the past due to universities starting to license and sell alcohol at university athletic events.

Research Question 2

Tables 4.5 and 4.6 provide site characteristics for the 1,252 respondents used in the proximity based negative binomial regression analysis. This dataset incorporated any

respondent that noted they lived in a chapter facility or in an on-campus residence hall, providing a potential geographic point to use in the analysis. All campuses but Vanderbilt University were included in the dataset because the limited Vanderbilt respondents did not identify as either living on campus or in a chapter facility. Overall, this dataset represented a much younger sample when compared to the Spearman dataset, with around 77% of respondents being either a freshmen or sophomore. Only 6% of the dataset identified as being a new member in their fraternity and around 81% of all respondents used in the regression dataset identified as being White. Around 55% of all respondents identified as living in an on-campus residence hall and around 45% of all respondents identified as living in their chapter's facility. The mean binge drinking rate for this group was 1.09 with a standard deviation of 1.24. The campus with the largest set of survey responses was the University of Missouri–Columbia with 238 respondents. The campus with the smallest set of responses was Texas A&M University–College Station with only 18 respondents. Proximity measurements incorporated the closest alcohol outlet, through geographical information systems linear distance, to the respondent's residential address, depending on their residential grouping. Overall, the mean distance between a respondent's address and an off-premise outlets was 618.11 meters. The mean distance between a respondent's address and an on-premise outlets was 439.87 meters.

Table 4.5 Negative Binomial Regression Site Characteristics (SEC West Campuses)

Student characteristics	Auburn (%)	Baton Rouge (%)	College Station (%)	Fayetteville (%)	Oxford (%)	Starkville (%)	Tuscaloosa (%)
Number of total respondents	94	76	18	26	24	171	104
Freshmen	29	62	55	8	71	53	56
Sophomore	11	2	16	88	8	30	11
Junior	29	20	11	4	13	12	10
Senior	29	13	13	N/A	8	4	23
5th year senior	1	1	N/A	N/A	N/A	0.5	N/A
Graduate student	1	N/A	N/A	N/A	N/A	0.5	1
No Response	N/A	N/A	N/A	N/A	N/A	N/A	N/A
New Member	N/A	N/A	N/A	4	21	1	10
White	78	87	72	96	83	84	78
Asian/Pacific Islander	1	1	5	N/A	N/A	1	N/A
Black/African American	4	3	N/A	N/A	N/A	4	2
Hispanic/Latinx	3	N/A	5	N/A	N/A	2	2
American Indian/First Nation/Alaska Native	3	1	N/A	N/A	4	2	1
Two or more races	N/A	2	5	N/A	13	1	1
Middle Eastern/North African	N/A	N/A	5	N/A	N/A	N/A	N/A
Indian	3	1	N/A	N/A	N/A	0.5	1
Other	2	N/A	5	N/A	N/A	N/A	1
Unknown	1	N/A	N/A	N/A	N/A	0.5	1
No response	3	3	N/A	4	N/A	N/A	1

Table 4.6 Negative Binomial Regression Site Characteristics (SEC East Campuses)

Student characteristics	Athens (%)	Columbia, SC (%)	Columbia, MO (%)	Gainesville (%)	Knoxville (%)	Lexington (%)
Number of total respondents	130	107	238	109	77	78
Freshmen	49	87	45	40	48	61
Sophomore	28	6	42	22	31	35
Junior	10	4	12	27	12	1
Senior	11	3	1	8	5	3
5th year senior	1	N/A	N/A	2	3	N/A
Graduate student	1	N/A	N/A	1	1	N/A
No Response	N/A	N/A	N/A	N/A	N/A	N/A
New Member	N/A	10	6	13	8	26
White	80	83	88	49	91	86
Asian/Pacific Islander	1	N/A	N/A	1	N/A	1
Black/African American	N/A	1	1	5	N/A	2
Hispanic/Latinx	4	5	3	11	4	2
American Indian/First Nation/Alaska Native	N/A	1	N/A	N/A	3	1
Two or more races	1	7	3	4	N/A	5
Middle Eastern/North African	1	N/A	1	N/A	N/A	N/A
Indian	N/A	N/A	1	3	N/A	1
Other	2	1	N/A	1	N/A	N/A
Unknown	2	N/A	1	N/A	N/A	N/A
No Response	2	1	3	6	N/A	N/A

The data in Tables 4.7 and 4.8 illustrate the site characteristics of respondents for each campus stratified by each scale of the high school alcohol use question. Respondents who identified as living on campus or in a fraternity facility in these stratified groups were pulled to analyze negative binomial regression relationships between binge drinking and proximity to the nearest alcohol outlet. Fourteen respondents in the dataset did not provide a response. About 25% of respondents never drank in high school, 18% drank less than monthly, 25% drank monthly, 22% drank weekly, 7% drank 2–3 times per week, less than 1% drank 4–6 times per week, and just over 1% drank daily. This spread of responses highlighted that alcohol use was common, with a varying degree of consistency, with around 75% of the fraternity members in this dataset. Of that group,

31% drank alcohol at least weekly or more. This statistic was consistent with the literature connecting fraternity membership and individuals with historical patterns of alcohol use seeking out similar groups of peers with which to associate (Borsari et al., 2009; Larimer et al., 2000; McCabe et al., 2005, 2018).

Table 4.7 Negative Binomial High School Drinking by Site (SEC West Campuses)

High school alcohol use	Auburn	Baton Rouge	College Station	Fayetteville	Oxford	Starkville	Tuscaloosa
Never	29 (0.55)	5 (0.20)	3 (0.33)	7 (0.29)	3 (0.33)	66 (0.32)	25 (0.00)
Less than monthly	13 (0.85)	10 (1.00)	3 (0.33)	2 (1.00)	7 (0.71)	32 (0.94)	16 (0.81)
Monthly	22 (1.00)	17 (1.06)	5 (2.00)	7 (1.28)	3 (1.00)	39 (0.64)	29 (1.31)
Weekly	14 (1.57)	37 (1.78)	5 (2.00)	6 (1.00)	6 (1.17)	23 (1.13)	27 (1.44)
2–3 times per week	10 (1.90)	3 (1.67)	2 (2.00)	2 (2.00)	3 (1.67)	5 (2.60)	5 (2.20)
4–6 times per week	1 (2.00)	N/A	N/A	1 (0.00)	N/A	1 (0)	N/A
Daily	5 (3.20)	1 (1.00)	N/A	N/A	1 (4.00)	3 (3.00)	2 (3.50)

Note. The first number represents the number of students who selected high school drinking behavior and the number in parentheses represents the mean binge drinking score for that stratified grouping.

Table 4.8 Negative Binomial High School Drinking by Site (SEC East Campuses)

High school alcohol use	Athens	Columbia, SC	Columbia, MO	Gainesville	Knoxville	Lexington
Never	29 (0.28)	13 (0.54)	52 (0.29)	39 (0.31)	24 (0.42)	17 (0.06)
Less than monthly	31 (0.81)	15 (0.60)	42 (0.79)	21 (1.52)	12 (0.83)	18 (1.06)
Monthly	16 (1.44)	32 (1.00)	67 (1.21)	29 (1.45)	20 (0.90)	22 (0.68)
Weekly	30 (2.30)	32 (1.66)	50 (1.74)	17 (1.59)	11 (2.00)	17 (1.12)
2–3 times per week	9 (2.67)	14 (2.00)	24 (1.96)	1 (4.00)	8 (2.25)	4 (1.75)
4–6 times per week	6 (2.67)	N/A	1 (0.00)	N/A	1 (3.00)	N/A
Daily	3 (3.00)	1 (0.00)	1 (2.00)	2 (2.50)	1 (5.00)	N/A

Note. The first number represents the number of students who selected prior high school drinking behavior and the number in parentheses represents the mean binge drinking score for that stratified grouping. Not all respondents provided a response to the prior high school drinking question.

Not all respondents in the regression dataset provided an answer for prior high school drinking behaviors so some site characteristic discrepancies exist in Tables 4.7 and 4.8. As reflected in Table 4.9, which denotes the negative binomial regression analysis results for the effects of proximity to an alcohol outlet on binge drinking, if a fraternity affiliated man were to increase his distance from an alcohol outlet by 1 unit, he would decrease his binge drinking behaviors by a factor of 0.99 (1%). The expected log count decrease of the binge drinking rate with a 1-unit increase in distance was consistent between on- and off-premise outlets. All three coefficients were statistically significant with a *p* value below .05.

Table 4.9 Negative Binomial Regression Models Proximity Effects on Drinking

Alcohol outlets	*β*	*p*	IRR
All outlets	-0.0002583*	.03699	0.997417
On-premise outlets	-0.0002736*	.02513	0.999726
Off-premise outlets	-0.0002231*	.01997	0.999777

Note. A * denotes a *p* value less than .05.

Although Table 4.9 reflects the negative binomial regression analysis for all respondents, the data in Table 4.10 reflect the effects of the proximity to alcohol outlets on binge drinking behaviors stratified by their identified high school alcohol-use behaviors. That grouping included individuals who stated they never drank in high school, drank less than monthly in high school, drank monthly in high school, drank weekly in high school, drank 2–3 times per week in high school, drank 4–6 times per week in high school, or drank daily in high school. Table 4.10 highlights a range of coefficients. However, only one stratified grouping and outlet relationship was

statistically significant with a *p* value less than .05. Individuals who identified as drinking 4–6 times per week had a statistically significant relationship with the proximity to off-premise alcohol outlets. If a fraternity affiliated man who consumed alcohol in high school 4–6 times a week were to increase his distance from an off-premise alcohol outlet by 1 unit, he would decrease his binge drinking behaviors by a factor of 0.99 (1%). Although this relationship appears to show statistical significance, this stratified grouping only represented less than 1% of the regression dataset. The results in Table 4.10 highlight the relationship between binge drinking and proximity to alcohol outlets, and only show one statistically significant relationship with a grouping of individuals who have a history of problematic drinking. This particular finding was consistent to expectations of this type of population and availability theory but, interestingly enough, there were no other significant associations as expected (Borsari et al., 2009; Capone et al., 2007; DeSimone, 2009; Dimova, 2023; Doumas et al., 2020; Hingson et al., 2017; Jones et al., 2020; Larimer et al., 2000; McCabe et al., 2005, 2018; McCreary et al., 2021; National Institute on Alcohol Abuse and Alcoholism, 2023d; Nuwer, 2001; Patrick et al., 2022; Ragsdale et al., 2012; Ranker & Lipson, 2022; Routon & Walker, 2014; Sacks et al., 2010; Single, 1984; Trapp et al., 2018; Turrisi et al., 2006).

Table 4.10 Negative Binomial Regression Models Stratified (Prior HS Drinking)

High school alcohol use	All outlets		On premise		Off premise	
	β	*p* value	*β*	*p* value	*β*	*p* value
Never	0.000049	.926	0.000010	.984	-0.000090	.836
Less than monthly	0.000268	.344	0.002010	.478	0.002916	.177
Monthly	-0.000074	.716	-0.000323	.115	-0.000265	.096
Weekly	-0.000351	.096	-0.000323	.115	-0.000265	.096
2–3 times per week	0.000266	.492	0.000223	.539	0.000191	.505
4–6 times per week	-0.001849	.163	-0.001902	.142	-0.001922*	.037
Daily	-0.000227	.763	-0.000236	.752	-0.000118	.845

Note. Data used in the proximity analysis were stratified based on prior high school alcohol use. A * denotes a *p* value less than .05.

As stated previously, the negative binomial regression model was used because the dependent variable was count data and its mean was not likely equal to its variance. This holds true because the mean for binge drinking was 1.09 and the standard deviation was 1.24. To check for model fit, an alternative model incorporating all outlets was run using a Poisson regression to compare the reported Akaike information criteria (AIC) measures. The AIC measure for the Poisson regression was 3630 and 3561 for the negative binomial regression. Given the negative binomial regression has the smaller AIC measure, it served as the better model fit.

Overall, the results indicated mixed findings. The Spearman's rank analysis indicated weak but inverse relationships between alcohol availability and binge drinking with the sample population. However, none of those correlation coefficients were statistically significant. The negative binomial regression analysis identified a signification relationship between alcohol outlet proximity and binge drinking behaviors for all types of outlets and, when stratified by prior high school drinking, it only identified a significant relationship between students who drank 4–6 times per week in high school and their proximity to off-premise outlets. Chapter 5 discusses the results of

this study in comparison to literature and existing research, including an analysis of each research question and recommendations for future research.

Chapter 5: Conclusion

Alcohol outlet availability can be a problematic influence on alcohol consumption behaviors in a local population (Connor et al., 2010; Dimova, 2023; Kypri et al., 2008; Paschall et al., 2012; Scribner et al., 2008; Stockwell et al., 2012). This influence can be equally problematic in college campus environments where alcohol misuse is a social norm (Dimova, 2023; Hollmann, 2002; Nuwer, 2001). However, this research study provided mixed findings on that association with a specific subpopulation: college fraternity men in Interfraternity Council (IFC) organizations. Given the literature on the population of fraternity men and the theoretical influence of alcohol availability on drinking harms, the researcher expected stronger associations than the ones found in this research study. However, the results of this study provided greater insight on the influence alcohol access may or may not have with certain populations and provides opportunities for future research with other subpopulations in the Greek system and in college campuses. The negligible findings possibly indicated that with fraternity men at Southeastern Conference (SEC) schools, their problematic drinking may have started before they arrived to the college campus. The limited association between alcohol access and binge drinking and the typical history of problematic drinking in fraternity men could be an indication that environment may only have so much of an influence, especially if the individual already drinks at concerning levels. It may be difficult to see an increase in drinking behaviors when they are already so high with this subpopulation, as indicated in

selection influences with fraternity membership and drinking behaviors (Borsari et al., 2009; Larimer et al., 2000; McCabe et al., 2005, 2018).

This study explored the relationship alcohol outlet availability and alcohol outlet proximity had with binge drinking behaviors in college fraternity men associated with SEC campuses. These associations and their hypothesized outcome were viewed in tandem with the theoretical tenets of availability theory of alcohol-related problems. Related to that theoretical model, at the start of the study, the researcher believed increased alcohol outlet access through availability and proximity would lead to increased heavy drinking (Single, 1984). The researcher hypothesized a significant relationship between environmental alcohol outlet availability and binge drinking behaviors. The researcher also hypothesized a significant relationship between alcohol outlet proximity and binge drinking behaviors. The researcher hypothesized on-premise outlets would show a greater relationship than off-premise outlets with binge drinking behaviors in this specific population. Finally, the researcher hypothesized that individuals who engaged in consistent drinking during high school would show greater associations between close proximity to outlets and binge drinking.

The results provided mixed answers to the research questions and hypotheses. To better understand the findings, this chapter covers the results and examines each research question and hypothesis, how the results compared to previous studies, limitations of the study, future research recommendations, and a general overview of other types of public health approaches in managing alcohol-related harms and consumption behaviors. In general, the study found weak and not significant associations between alcohol

availability and binge drinking but it did find significant but weak associations between the proximity to alcohol outlets and binge drinking behaviors.

Research Question 1

The following Research Question 1 connected to alcohol outlet availability and binge drinking behaviors: What is the relationship between binge drinking behaviors and alcohol outlet availability for college fraternity men associated with colleges/universities in the Southeastern Conference? Additionally, what is the relationship between binge drinking behaviors in the same population and the availability of each type of alcohol outlet? For each type of outlet, this includes all collective alcohol outlets, on-premise outlets (i.e., areas where alcohol is consumed onsite), and off-premise outlets (i.e., areas where alcohol is consumed offsite).

The study found no statistically significant relationships between the two variables. In general, the correlation coefficients were weak, indicating that as outlet availability increases, binge drinking decreases. This finding contradicts the tenets of the study's theoretical model. However, the dataset from Nashville appeared to be an outlier with only 19 responses. It was the smallest response rate for any campus and the highest volume of alcohol outlets compared to other campuses, which impacted the correlation coefficient. By cleaning the data and removing Nashville from the Spearman rank analysis, there was a weaker strength of association with correlation coefficients (r = -.12 to -.19). These numbers indicated a weak association. As outlet numbers increased, binge drinking decreased. However, none of the coefficients were statistically significant (p = .51–.69). This finding led to a rejection of the researcher's initial hypothesis that alcohol availability would have a significant influence on binge drinking behaviors with college

fraternity men in the SEC. This finding also led to another hypothesis rejection because there was no greater statistically significant influence with on-premise outlets when looking at the availability of alcohol in a campus environment.

Previous studies have shown no significant association between the availability or the density of alcohol outlets and consumption behaviors (Connor et al., 2010; Kypri et al., 2008). However, these results are surprising given their comparison to findings from a similarly modeled 2003 study of eight college campuses (Weitzmann et al., 2003). In that study, there were moderate to strong correlations between outlet availability and various types of drinking behaviors, including binge drinking, and the sample size of campuses used was smaller than the sample size used in the current study (Weitzmann et al., 2003). However, in Weitzmann et al.'s (2003) study, the population was general college students including additional demographics, and their binge drinking measures were accounted for differently based on the survey measure. In the current study, the researcher explored the relationship between alcohol availability and binge drinking in a more narrow population known for concerning levels of drinking patterns (Borsari et al., 2009; Larimer et al., 2000; McCabe et al., 2005, 2018). This demographic shift could be an explanation for the weak and nonsignificant findings with fraternity men. However, there were numerous limitations in this study, addressed later in the chapter, that could have influenced the identified correlations.

Kypri et al. (2008) conducted a similar availability rank analysis and identified a few significant correlations. However, when all respondents were incorporated into the dataset, regardless of where they lived, they saw a weaker and less significant relationship. In the current study, all respondents, regardless of their residential location,

were incorporated into the dataset because the survey respondents did not provide their specific local address in the survey answers. This finding in Kypri et al. could indicate that if the dataset in the current study only included respondents who lived within the 2-mile alcohol outlet radius, rather than individuals who could live at any distance, the researcher may have seen a more revealing correlation of the relationship between alcohol availability and binge drinking behaviors. Similar to findings in other studies, the limited number of campuses incorporated in the rank analysis impacted the researcher's ability to "make strong inferences about associations" (Kypri et al., 2008, p. 1136).

Research Question 2

The following Research Question 2 connected to alcohol outlet proximity and binge drinking behaviors: What is the relationship between binge drinking behaviors and the proximity to alcohol outlets for college fraternity men at colleges/universities in the Southeastern Conference? What is the relationship between binge drinking behaviors in the same population and the proximity of each type of alcohol outlet? For each type of outlet, this includes all collective alcohol outlets, on-premise outlets (i.e., areas where alcohol is consumed onsite), and off-premise outlets (i.e., areas where alcohol is consumed offsite). Additionally, how might this relationship change when taking prior high school drinking behaviors into account?

The study found statistically significant relationships between the two variables. The findings were equally true when breaking down the independent variable to just on- and off-premise outlets versus all alcohol outlets. The study indicated that if a fraternity affiliated man were to increase his distance from an alcohol outlet by 1 unit, he would decrease his binge drinking behaviors by a factor of 0.99, equating to a 1% decrease in

binge drinking for every unit increase in proximity from an alcohol outlet. The *p* values for all alcohol outlet types, on-premise outlets, and off-premise outlets were less than .05, indicating the researcher did not reject their initial hypothesis that the proximity, or distance, to an alcohol outlet had a relationship with binge drinking behaviors. Additionally, this finding indicated alcohol outlet proximity was associated with binge drinking behaviors in college fraternity men in the SEC.

Even with this statistically significant finding, it is important to note the dataset used for the negative binomial regression was taken from the original dataset, but augmented so it only included individuals who stated they lived on campus or in a fraternity facility. This data alteration resulted in a change of respondent demographics. First, the overall mean binge drinking rate was smaller for the regression dataset: 1.09 versus 1.29 in the Spearman dataset. Racial dynamics were somewhat similar between both datasets, although the regression dataset incorporated a slightly larger White male demographic. Outside of a smaller binge drinking mean, the only other notable change in the respondent's characteristics was the student classification. Overall, the regression dataset included a much younger grouping of fraternity men. The regression dataset included a 23% larger inclusion of freshmen and sophomore fraternity men compared to the Spearman dataset.

In a somewhat similar 2018 study, which examined proximity in relation to a range of alcohol-related harms including consumption, the current study's findings contradicted those of Seid et al. (2018). In the current research study, the primary demographic was men; in Seid et al.'s study, men and women were included. Seid et al. only noted significant results in the relationship between proximity and alcohol harms

with women. However, Seid et al. found no associations between the proximity to outlets and consumption behaviors, including risky drinking. Although the current study identified statistically significant relationships between the two variables in men, Seid et al.'s study emphasized the importance of incorporating sorority women in future studies to see if it alters the findings. As noted previously, some studies have found significant results with one gender demographic over another (Halonen et al., 2013; Seid et al., 2018); whereas, the current study showed some significant associations with a gender demographic not seen in other studies. Other studies have also examined the relationship between alcohol outlet proximity and drinking behaviors through different statistical analyses and found the same results of no significant association between proximity and consumption behaviors (McKinney et al., 2012; Tanumihardjo et al., 2015). One interesting point from a 2015 study was that "proximity was not associated with binge drinking frequency, but excessive binge drinkers lived in areas with a higher density of alcohol outlets compared to those with non-binge drinkers" (Tanumihardjo et al., 2015, p. 146). This point brings up the question whether the association found in the study's findings were a function of the proximity of the nearest outlet or whether individuals with high-risk consumption behaviors were moving to locations with easy access to alcohol.

Research Question 2 Stratified

When stratifying the regression analysis of proximity and binge drinking behaviors, based on high school alcohol-use behaviors, a range of positive and negative regression coefficients resulted. Overall mean binge drinking rates increased in each stratified high school alcohol use group from the never drinking group to the daily drinking group. If the respondent noted limited or concerning preexisting drinking

behaviors prior to coming to college, their binge drinking behaviors would likely remain consistent or worsen as they transition to college fraternity life. However, the only statistically significant finding in relation to proximity to outlets and binge drinking behaviors was related to respondents who drank 4–6 times per week in high school. The beta value for that stratified grouping was -0.001922 with a *p* value of .037. Although this grouping showed a significant finding, it is important to note this group had a small sample size in comparison to the other stratified groups.

In general, the mixed results of this research supported significant but small associations with proximity and binge drinking, and none when factoring in alcohol availability. These findings, through the variable of proximity only, supported some of the tenets associated with the availability theory of alcohol-related problems when looking at impacts around consumption behaviors. These findings, similar to other studies examining proximal effects of alcohol access, indicated that a greater interest may need to be placed around addressing the proximity of alcohol outlets to areas near individuals who engage in high-risk alcohol use (Halonen et al., 2013). However, as seen in other studies, results can be complex and vary on factors like the design of the city and how citizens gain access to alcohol through their travel patterns (Schonlau et al., 2008). Academic environments have a town–gown relationship with the city and local businesses and can advocate for policies and business practices that are in the best interest of their community. Availability of alcohol or the density of alcohol outlets in an area surrounding college campuses may play a factor in alcohol-related harms but additional research is needed to explore that question with this subpopulation. Before the exploration of additional research recommendations, it is critical to expand upon the

limitations of this study. Understanding these limitations may aid in similar future studies.

Limitations and Recommendations for Future Research

As with any research study, there were several limitations impacting the results of the current study that create opportunities for future research. These limitations and opportunities included the demographics and locations of the sample population, environmental impacts not accounted for, different dependent variables that could be used, and incomplete data. As noted previously, this study's population only included college-aged fraternity men. Given the potential variability in the results across genders for Halonen et al. (2013) and Seid et al. (2018), it would be recommended to include sorority women in future studies to see if the results are different between the sexes of this subpopulation. Another potential limitation and opportunity was the grouping of campuses selected for the research study. As represented in Tables 4.3 and 4.4, there was a broad range of alcohol outlet volumes across each city, likely influenced by their unique city dynamics. Additionally, their populations and campus demographics were quite different across each city. For example, comparing site demographics of Nashville, Tennessee to Starkville, Mississippi is an unrealistic comparison. Given this heterogeneous mixing of cities, done to account for all SEC institutions, future research could work to incorporate a more homogenous model of campuses and cities when conducting this analysis.

Another limitation and opportunity, common in alcohol outlet studies, is that when conducting both analyses, the data did not account for the clustering of alcohol outlets in particular locations, the popularity of a particular outlet, or the fact that not all

outlets or alcohol licenses could be compared equally (Centers for Disease Control and Prevention, 2017; Sacks et al., 2020). As previously noted, the measurement approach for the availability research question was a container-based measure, which is an easier and low-cost method to measure the variable effects. However, this approach lacks in its ability to account for the clustering of outlets in popular avenues like entertainment districts and lacks in its ability to account for local population size (Centers for Disease Control and Prevention, 2017). The research approach for the current study measuring proximity effects had similar strengths and limitations. To account for clustering of alcohol outlets, future research should include spatial access-based measurements (Sacks et al., 2020).

Another challenge with comparing alcohol outlets was that not all licenses for each state were similar and not all were popular venues, influencing consumption and other related harms (Livingston et al., 2007). For example, during the data collection portion of this study, determining whether a licensed outlet was an on- versus off-premise outlet was difficult due to fluctuating license definitions with each state. There were numerous examples where liquor stores or typical off-premise venues also had an on-premise outlet license so they could conduct tasting events and samples on premises. Although this scenario could have been considered on-premises consumption, this type of venue did not have the same type of characteristics of typical on-premise venues such as a bar or restaurant. Additionally, not all venues attract the same level of business. Some businesses, or outlets, are huge drivers of traffic and alcohol consumption based off their popularity and business practices. Additionally, some businesses make most of their revenue from food sales rather than alcohol sales, which could impact their effect on

community consumption rates. If possible, future research in college towns should incorporate outlet alcohol sales as an additional variable. These data may be difficult to obtain depending on the state and location. This type of variable would help the researcher identify hot spot locations when it comes to alcohol sales that could influence consumption and alcohol-related harms.

Another limitation was this study was an observational study of preexisting data, meaning a causal link between any of the results could not be proposed, but associations between variables of interest could be noted (Schonlau et al., 2008). However, creating a true experiment in this type of study would have proved difficult. A researcher cannot easily change the number of alcohol outlets that exist in a particular location or their distance to certain respondents. Those types of changes can be unpredictable and usually occur because of various environmental factors. Increasing the sample size of the study, especially with the Spearman's rank analysis, and conducting a longitudinal assessment would benefit future research and findings.

Another potential recommendation for future research would be to explore other alcohol-related behaviors and harms in relationship to the same dependent variable. The current study looked only at self-reported binge drinking behavior each week, which has its own reliability challenges (Schonlau et al., 2008). Numerous other studies have explored other types of alcohol consumption behaviors that may be of interest (Livingston et al., 2007). Although the current study examined consumption behaviors, future research could explore self-reported harms that come from drinking behaviors such as academic impacts, physical and psychological injuries, relationship issues, sexually

transmitted diseases, drinking and driving arrests and incidents, assaults, and motor vehicle accidents (Livingston et al., 2007).

Another limitation and opportunity with regard to the regression analysis dataset was that because the researcher did not have local residential address data for each student, the sample size was dramatically decreased and individuals who stated they lived in a residence hall on campus were all given an estimated centralized location. Providing this location for some of the respondents was an attempt to include more responses in the regression analysis. However, the variance of where a student could live on campus created a challenge with this approach. Future studies could include individual residential addresses in the demographic questions.

Attempts to Regulate Availability

Although this study showed some small associations between the proximity to alcohol outlets and binge drinking and provided opportunities for future research, it is important to understand some of the attempts made by public health researchers in regulating the access to alcohol to improve health-related outcomes. Measures reviewed in this section include minimum pricing, days of operation and promotional sales, and density reduction of outlet availability.

Minimum Pricing

In an attempt to implement policy and practice regulations, researchers have found that "increased outlet density leads to an increasingly competitive alcohol market-place, possibly resulting in lower prices" (Livingston et al., 2007, p. 563). This finding highlights the public policy option of regulating alcohol pricing, also known as minimum pricing (Stockwell et al., 2012). This method is done to inhibit an environment where a

large volume of cheap alcohol is available, leading to potential community behaviors and harms. Cheap alcohol is seen as an attractive option to high-risk drinkers (Stockwell et al., 2012). Even increasing the minimum price of alcohol by 10% could reduce alcohol consumption by 3.4% (Stockwell et al., 2012, p. 912). However, many local ordinances around minimum pricing can be insufficient or outdated. For example, at the University of Georgia, increased alcohol outlet availability led to increased competition between alcohol outlets, which led to reduced-cost liquor drinks for $2–$3 per drink in the late evening (Fischer & Hoover, 2014, p. 15). These reduced costs increased the alcohol outlets, volume of customers, and students' overall consumption of cheap alcohol. At that time, the city's minimum pricing ordinance was only set at $1 for an alcoholic beverage (Fischer & Hoover, 2014, p. 15). Given the extremely low bar of $1 for a set minimum pricing ordinance, this ordinance was doing nothing to curb high-risk alcohol consumption; in fact, it likely exacerbated the issue around alcohol use. If used correctly and set high enough, minimum pricing has been shown as a very effective tool to reduce alcohol consumption, alcohol-related harms, and access to cheap alcohol (Stockwell et al., 2012).

Other studies have even projected that if the United States were to double its tax on alcohol, it could likely see "35% fewer alcohol-related deaths overall, 11% fewer traffic crash deaths, 6% fewer sexually transmitted diseases and a 2% reduction in violence" (Stockwell et al., 2012, p. 129). Although this public health tax strategy has been shown to be effective, it can be hard to garner public support for action from local governments given the perception that it is antibusiness (Stockwell et al., 2012). Much of the public is supportive of certain educational policies surrounding alcohol, including

warnings; however, support varies drastically when state officials start exploring measures that regulate the sale and distribution of alcohol (Wagenaar et al., 2000). It would take a considerable level of pressure and near-perfect timing to get local lawmakers to support this type of measure given public opinion.

Days of Operation and Promotional Sales

Outside of looking at alcohol pricing, even reducing the number of days an outlet can sell alcohol can reduce some alcohol-related harms (Ligon & Thyer, 1993). This finding is highlighted in an older study out of Athens, Georgia that showed a decrease in driving under the influence charges or incidents as a result of banning the sale of alcohol on Sundays (Ligon & Thyer, 1993). These blue laws can be controversial; however, Ligon and Thyer's (1993) study showed how reducing access to alcohol on particular days of the week, in a college town, showed positive impacts in decreasing risky behavior with alcohol.

Another public health approach has been the restriction of certain types of promotional sales conducted by alcohol outlets (Smart & Adlaf, 1986). An example of this type of promotion is a happy hour sale. During happy hours, certain types of alcohol are sold at very reduced rates at a specific time during the day or week. This strategy is a marketing approach to attract customers. The unfortunate consequence is this type of approach encourages binge drinking and provides access to cheap alcohol. Smart and Adlaf (1986) attempted to look at the impact of banning happy hour sales on alcohol consumption and alcohol-related harms, with mixed results. Although the researchers found a correlation to the ban and a reduction in driving-under-the-influence charges, there were no significant changes in alcohol sales or consumption. This finding may lend

more credence to the public health approach of addressing alcohol availability through outlet density rather than just the promotional practices of those outlets.

Outlet Availability

In the scope of this research study, implementing a public policy approach that can reduce the density of alcohol outlets in a particular location and increase the distance between these outlets could have a positive effect on reducing alcohol consumption, especially among adolescent youth (Young et al., 2013). Studies and public health experts have advocated for changes in zoning ordinances and local liquor licensing to reduce the density of alcohol outlets in identified locations and control the days and times these outlets are permitted to sell alcohol to the public (Gruenewald & Millar, 1996).

In a study facilitated by the University of South Carolina in 2015, researchers examined numerous risk factors influencing their local entertainment districts (Wiser et al., 2015). Although Wiser et al. (2015) looked at numerous theoretical frameworks and suggestions to improve the entertainment district, one of those recommendations was the influence alcohol outlet density had on the negative outcomes they saw in the community. In their recommendations, Wiser et al. noted the need to reduce density, through city authority, in areas extremely dense with alcohol venues. They also noted how those recommendations connect to crime prevention through environmental design's approach to "reduce opportunities for crime by changing environmental conditions" (Wiser et al., 2015, p. 16).

These public health approaches show the numerous tools available to address community consumption levels and alcohol-related harms. However, the findings in this study create an opportunity for city leaders in towns with large universities to explore

business locations, policies, and practices that could reduce access to alcohol outlets and increase their proximity to high-risk populations. These measures may be able to prevent high-risk alcohol consumption, which could lead to preventable alcohol-related harms, especially with higher-risk populations.

Future Opportunities

Taking the result of this current study into account, in conjunction with all other attempts to address high-risk societal alcohol consumption, they provide insight on the need to address alcohol outlet availability and proximity in college environments. The mixed results of this study have shown concerning associations between binge drinking and alcohol outlet proximity at SEC schools. To address this environmental concern, public health experts have numerous tools to address alcohol use on a community scale. The substance abuse and mental health services administration strategic prevention framework provides a useful guide in addressing the problems of substance use by giving a framework for community-based prevention strategies (Substance Abuse and Mental Health Services Administration [SAMHSA], 2019). This framework takes the approach of assessment (i.e., identify the specific issues/needs), capacity building (i.e., collecting resources), planning (i.e., building a game plan), implementation (i.e., using evidence-based programs), and evaluation (i.e., constantly assessing the efficacy of your efforts).

One known evidence-based tool calls for advocacy in influencing local policies and ordinances that could create safer and healthier environments for the general public (SAMHSA, 2019). An example of such a policy approach is the restriction on the availability and density of alcohol sales in various commercial locations (Campbell et al., 2009). This is also known as a reduction in alcohol outlet density, or a reduction in the

number of venues that can serve alcohol to the public (Campbell et al., 2009). The World Health Organization (WHO) identified "outlet density control as an effective method for reducing alcohol-related harms" (Campbell et al., 2009, p. 557).

Given the findings in the current study associated with the relationship between proximity to alcohol outlets and binge drinking behaviors, college campuses have the imperative to advocate for limited alcohol outlet licensing in close proximity to their physical footprint. Given the concerns associated with college fraternity students and general college students, limiting their access to alcohol in close proximity to campus could address a risk factor known to exacerbate concerning levels of alcohol consumption.

Conclusion

Overall, this research study found weak associations with binge drinking behaviors when accounting for alcohol availability within a 2-mile radius. These initial findings indicated that as alcohol outlet availability increases, binge drinking rates slightly decrease. However, none of the correlations were statistically significant and one specific site location served as a data outlier influencing the overall strength of the correlation. This study did find a small and statistically significant relationship associated with binge drinking and the proximity to alcohol outlets from a person's residence. These mixed findings reinforce the variability of associations between alcohol outlet availability/proximity and drinking behaviors found in the research (Chen et al., 2010; Kuntsche et al., 2008; Truong & Sturm, 2009). These research findings could indicate validity to concerns, albeit weakly associated, with harmful health behaviors and nearby access to alcohol, especially with college students known to engage in high-risk alcohol

use (Capone et al., 2007; DeSimone, 2009; McCreary et al., 2021; Nuwer, 2001; Patrick et al., 2022; Ragsdale et al., 2012; Ranker & Lipson, 2022; Routon & Walker, 2014).

The findings from the availability analysis in this study, compared to other similar studies, could lead to the conclusion that fraternity affiliated men's binge drinking may not be as strongly associated with environmental alcohol availability as their college peers. However, greater alcohol outlet availability "may be particularly risky for young people whose drinking does not reflect entrenched high-risk patterns" (Weitzmann et al., 2003, p. 5). Fraternity affiliated men already reflect those high-risk patterns around alcohol use, which could indicate a potential explanation for the outcome of the rank analysis.

The researcher provided numerous implications that may open the door to an additional understanding of environmental alcohol access and college students predisposed to risky alcohol use. Future research studies could incorporate sorority women to inspect and reflect potential gender dynamics with this variable relationship. Future research could incorporate a larger sample size with local address demographics. Future research could also include additional alcohol-related harm variables that could expand understanding of which harms or consumption behaviors hold a greater relationship with the independent variable. Finally, future research could better account for the clustering in popular entertainment districts near college campuses.

Access to alcohol plays an influence on drinking behaviors but the degree of that relationship can vary based on numerous variables. More research is needed to fully understand this impact in young adults who are the most at risk for severe alcohol-related behaviors, harms, and consequences. Many young adult groups could be incorporated in

this type of study, but Greek-affiliated students provide a group with historically concerning relationships with alcohol and other drugs (Capone et al., 2007; DeSimone, 2009; McCreary et al., 2021; Nuwer, 2001; Patrick et al., 2022; Ragsdale et al., 2012; Ranker & Lipson, 2022; Routon & Walker, 2014). This research study provided a foundation for that opportunity for future research associated with students affiliated in Greek life at colleges and universities.

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