EVALUATION OF ENVIRONMENTAL STRATEGIES FOR PREVENTING ALCOHOL PROBLEMS ON UNITED STATES COLLEGE CAMPUSES

by

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ABSTRACT

Objectives: The specific aims of this investigation were 1) to identify school-level characteristics correlated with alcohol and other drug (AOD)-related law violations among college students; 2) to determine whether limiting alcohol sales to six days per week is associated with alcohol consumption, binging, and alcohol-related law violations among college students; and 3) to assess whether the impact of alcohol tax increases on college alcohol-related disciplinary actions are moderated by school-level characteristics.

Methods: In Aim 1, negative binomial regression analyses were used to estimate the relationship between characteristics of Maryland colleges and AOD-related law violations on those campuses. In Aim 2, linear and negative binomial regression analyses were used to estimate relationships between alcohol-related outcomes and three different interpretations of Sunday sales ban legislation. In Aim 3, interrupted time series methods and negative binomial regression analyses were used to estimate the relationship between the 2011 Maryland alcohol tax increase and alcohol-related disciplinary actions on Maryland college campuses, and to explore whether characteristics of those campuses affect said relationship.

Results: AOD-related law violations in Maryland postsecondary institutions were predicted by several of the explored characteristics, especially by campus housing (IRR=328.5; p=<.001). Sunday sales bans on spirits may be modestly associated with increased consumption among drinking students (β= -.4; p=.028), and disciplinary actions on public property (IRR= .4; p=.044). For Aim 3, negative binomial analyses showed that with each year that passed after the tax, alcohol-related disciplinary actions on college campuses decreased by a factor of .91 (p=.050).

Discussion: State-level environmental strategies for preventing alcohol problems may be effective among U.S. college students. There was counterintuitive evidence of increased consumption and alcohol-related disciplinary actions in this state-level analysis of Sunday sales bans. Further analyses at the municipal-level are warranted. There was evidence that the interaction between tax and time was associated with decreased alcohol-related disciplinary actions on college campuses. There was also evidence that school price affected the strength of the association. More deliberate investigation is warranted to examine whether school price is a proxy for student financial resources or for school financial resources.

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Chapter 1: Introduction

1.1 Problem Statement

Among college students, alcohol use is ubiquitous. Numerous studies have outlined the levels of use, the developmental context, and the consequences associated with heavy alcohol use among college youth-- academic, legal, social, and health issues including injury and death (Abbey, 2002; Cooper, 2002; Giancola, 2002; Hingson, et al., 2002; Perkins, 2002; Hingson, et.al, 2005; Johnston et.al., 2004; Wechsler et. al., 1994). Section 1.1 outlines the current estimates of alcohol use and abuse among college students, the current theories of the developmental context of alcohol use among college students, and the consequences and harms of college drinking.

In 2009, the prevalence of 30-day alcohol use was 64% among U.S. college students and 2-week binge drinking was 37% (Johnston, 2011). The supporting evidence is well-documented that alcohol abuse is a significant problem for students on college campuses (Arria, et al., 2008; Caldiera, et al., 2009; Garnier, et al., 2009; Tosevski, et al., 2010). College alcohol problems persist despite the fact that 33% are under the legal drinking age (Davis & Bauman, 2013). For the past three decades, rates of college alcohol use have consistently been higher for college students than their non-college counterparts, by about 5% (Schulenberg & Patrick, 2012). College students in the United States are at greater risk for alcohol use disorders as compared to their non-college attending counterparts (Blanco, et.al, 2008). The Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism stated that over several generations, college students have managed to pass down unhealthy traditions of drinking through alumni

events, sporting events, and customs within sub-groups (e.g. sororities, fraternities, or other student groups). Through passivity, neutrality, or acceptance bordering on promotion, colleges and universities have reached the point where alcohol use and abuse have become a standard rite of passage (NIAAA, 2002).

Alcohol use and abuse patterns are, in many cases, established before the college years begin (Hill, et al., 2006; Swendsen, et al., 2012). By late adolescence (age 17-18), when students are embarking on their college careers, 78.2% have already used alcohol and 15.1% have abused alcohol (Swendsen, et al., 2012). However, binge drinking trajectories likely develop differently depending on age of alcohol use onset (Hill, et al., 2006). Prior research has indicated that binge drinking proves most problematic in adulthood for those who begin binge drinking in late adolescence, and for those who experience increasing binge drinking episode frequency in late adolescence (Hill, et al., 2006). For these reasons, undergraduate years (especially the first year) provide an ideal opportunity for early-intervention of binge drinking, for the prevention of incident binge drinkers, and for reduction of adverse outcomes related to binge drinking (Blanco, et al., 2008; NHTSA, 2009).

During college, students aged 18-25 experience emerging adulthood—a theoretical period of development that bridges adolescence with young adulthood (Arnett, J., 2000). College is often the first time that individuals leave their parents for an extended period, gaining independence and forming identity. It is a time of tremendous emotional, physical, and mental growth, and all of it happens in the stressful context of developing (or worse, not developing) a new social support network (Whiteman, et al., 2013). That social stress is exacerbated by academic demands and family pressures

(Tosevski, et al., 2010). To compound the matter further, college students are facing one or more of these stressors and exposures during a critical period of brain development, specifically cortex executive function development in the frontal lobe (Crews & Boettiger, 2009).

A culture of drinking alcohol as a veritable rite of passage has permeated most college campuses across the United States (NIAAA, 2002). An unintended consequence is that students turn to experimentation with alcohol as a means of coping with their novel stressful circumstances (Arria, et al., 2008; Caldeira, et al., 2009; Garnier, et al., 2009; Schulenberg & Maggs, 2002). Because emerging adults experience less supervision when they leave home and go to college, binging increases significantly as a result (White, et al., 2006). Even intermittent abuse of alcohol can result in significant cognitive effects, and because an estimated 40% of U.S. college students engage in intermittent binge drinking, the resulting cognitive consequences are of major concern (Zeigler, et al., 2005; Hingson, et al., 2005).

Excessive alcohol use is the third leading preventable cause of mortality in the United States (CDC, 2004). It contributes to roughly 80,000 deaths per year, nationally, and yielded an economic burden of $223.5 billion in 2006 (CDC, 2012; Bouchery, et. al., 2006). Alcohol-impaired driving is involved in about 1/3 of all crash fatalities in the United States (CDC, 2004). At least 1,400 college student deaths a year are linked to alcohol (NIAAA, 2002).

Knight and colleagues, in a study conducted in 2002, estimated that as many as a third of college students will meet the criteria for alcohol abuse at some point in their college careers. This is much higher than the same estimate for the general adult

population (6-13%) offered by Kessler and colleagues in 1994. In 1999, Clements estimated that only approximately 4% of students meeting diagnostic criteria for an alcohol use disorder will ever seek treatment during college enrollment.

Even for college students who do not drink, attending a school with a culture of heavy drinking can have adverse consequences (Wechsler, et. al., 1995; Wechsler, et. al., 2002). On college campuses where alcohol use is more common, any student is more likely to fall victim to the increased levels of violence, injury and interpersonal issues that result (Wechsler, et. al., 1995; Wechsler, et. al., 2002).

United States colleges are required to report any alcohol-related consequences that involve a violation of state law as result of the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act. Jeanne Clery was a rape and murder victim, who was nineteen years old in April, 1986 when she was attacked in her Lehigh University dorm room. Her assailant had been binge drinking in the hours before the attack. Distressed by the lack of information provided to students and families about what had been a rapid increase of violent attacks on that campus, her family has successfully lobbied for mandatory warnings to students about incidents like the one that Jeanne Clery experienced. Awareness of a school's alcohol environment provides a basis for families to discuss issues like alcohol-related law violations, and for administrators to put prevention efforts in place.

A landmark college drinking study, "The State Sets the Rate: The Relationship Among State-Specific College Binge Drinking, State Binge Drinking Rates, and Selected State Alcohol Control Policies," was published by Nelson and colleagues in 2005. In this study, six types of alcohol control policies were examined: keg registration laws, illegal

per se laws, laws restricting happy hour, open container laws, laws controlling beer sales in pitchers, and laws regarding billboards and other advertising. The researchers summed the number of laws existing in each state, then split states into two categories—states with stricter alcohol control laws (these states had a sum of four or more), or those states with fewer than four alcohol control laws. They found that binge drinking among college students and young adults, nationally, is correlated with stricter state-level alcohol control policy (Nelson, et. al., 2005). The study relied on survey data from the Harvard College Alcohol Study (CAS) which does not include data from all colleges, nor from all states. Furthermore, this study was conducted using data collected in 1999 – 2001; fourteen years have passed since then.

Nelson and colleagues called for the adoption of effective environmental strategies to prevent alcohol abuse (Nelson, et. al., 2005). Indeed, alcohol-related laws and policies across the nation have been evaluated for their effectiveness among the larger population of adults in the United States, and in an outline of key components to prevent underage drinking compiled by the United States Substance Abuse and Mental Health Services Administration (SAMHSA), three major types of environmental strategies are presented as highly effective strategies in the United States to date:1) taxing to increase the price paid for alcohol purchases, 2) minimizing the legal drinking age to 21, and 3) reducing the commercial and social availability of alcohol (Grover, 1999). The study conducted by Nelson and colleagues did not examine any of these three environmental strategies presented by SAMHSA. The purpose of the proposed research is to better understand how students on United States college campuses, a recognized vulnerable population for alcohol problems, have been impacted by the most heralded

policy interventions to prevent those alcohol problems. The primary research question is simple: Are these interventions that are heralded for their effectiveness in preventing alcohol problems indeed working to prevent alcohol problems in United States college students, and if so, which college characteristics moderate their effectiveness?

Collectively, the literature indicate a great need for urgent attention on college drinking, and an overall lack of information about the effectiveness of major environmental strategies on stemming the problem. College drinking is harmful for drinkers and non-drinkers, alike. Environmental strategies like tax increases and legislation limiting commercial availability have the potential to reduce these harmful effects, but it is unknown to what degree these strategies, as they are currently implemented, impact college drinking and related harms. The current research is designed to clarify whether state-level environmental interventions are associated with reduced alcohol consumption, binge drinking and alcohol-related law violations among college students, and to identify which characteristics indicate that a college is at risk and deserves targeted attention.

1.2. Alcohol and Other Drug (AOD)-Related Law Violations

In 2002, Presley and colleagues set out to determine which college characteristics influence college student drinking, but the open-endedness of the research question combined with complex analysis yielded results that were difficult to interpret (Presley, et al., 2002). Still, the researchers raised important questions and ideas regarding the potential of college characteristics for indicating which schools have students in need of targeted prevention and early intervention. Eight years later, in 2010, Carter and colleagues published a review article focused on factors influencing alcohol consumption

for college students. The articles captured in the review did not analyze direct effects of college characteristics, but the authors suggested that the influence of several college characteristics (e.g. living situation, age, full-time and part-time status, or type of college) may be responsible for the drinking differences between college students and non-college students, even more so than college attendance in of itself (Carter, et. al., 2010). The researchers implied that choices regarding these characteristics are indicative of students' developmental processes and they concluded that future studies of alcohol use in college students should include these characteristics as context. The first aim of this research was to explore nine specific characteristics selected because of their relevance to a student's natural college selection process, prevalence among U.S. colleges, and general acceptance as categories of interest in the field of higher education.

1) Depending on whether a school is a **2-year or 4-year** institution, the students in attendance are different in terms of age and responsibilities outside of academics (Sorrey & Duggan, 2008), which may cause differences in alcohol use and alcohol-related outcomes. 2) Conceptually, the same is true for schools where Associate is the **highest degree offered**, as opposed to schools where Bachelor, Master, or Doctoral degrees are offered. Again, these differences may have bearing on the levels of alcohol use at the schools they attend. 3) Similarly, schools with a private **funding type** likely recruit students with different parental economic demographics than those with public funding, which logically relates to students' available income for purchasing alcohol. 4) Higher school **price** may be indicative of more disposable income for alcohol.

5) Students in a school located in an urban **setting** may have less alcohol outlet density, but also less outlets generally for recreation outside of alcohol use. 6) Schools

offering campus **residential housing** may have a larger proportion of students who experience college without any natural parental monitoring, and therefore indulge in more alcohol use. Perkins and Berkowitz (1986) found that a college residential unit's size is correlated with resident students' perceived norms around drinking. It may be the case that schools with large housing structures, related to larger student population, have students that drink more.

7) Older students are able to purchase alcohol for younger peers, and given that alcohol purchases precede most alcohol consumption, having a large legal alcohol purchaser base at a school likely increases overall consumption at that school. Therefore, the overall **population** of the student body and 8) the percentage of the population who are **undergraduates** might both be related to alcohol consumption. 9) Finally, schools with lower **graduation rates** will have older students, on average, so students at those schools may also show increased consumption.

1.3 Limiting Commercial Availability of Alcohol via Sunday Sales Bans

Limiting commercial availability has been shown to be an effective strategy to prevent alcohol use (Gruenewald, 2011; Popova, 2009). Multiple interpretations of Sunday sales ban legislation agree that alcohol sales are prohibited on Sundays in 12 states in the U.S. (DISCUS, 2015; NIAAA, 2015; Erickson, et al., 2014). In 19 states, the reverse is true--alcohol is available 7 days per week, statewide. In 19 other states, there is a mix of commercial availability such that some areas allow alcohol sales seven days per week, and other areas do not. In these mixed states, the areas where alcohol can be purchased seven days per week are determined either by local legislation (i.e., municipalities decide whether alcohol will be available on Sundays) or by state-level

legislation that defines which geographic areas will be permitted to sell alcohol every day.

Historically, only one study has analyzed the impact of limiting commercial alcohol sales availability on college student alcohol consumption and associated outcomes. In 1982, Fillimore and colleagues published a trend study from a natural experiment occurring in California when previously established sales restrictions were pending removal in areas surrounding the University of California Berkeley and University of California Davis campuses (Fillimore & Whittman, 1982). The researchers surveyed over 1000 students in 1979, (4 months after the restrictions were lifted) and then again in 1981 (2 years after restrictions were lifted). Their results showed no change in alcohol consumption, which was likely due to the fact that their "pre-intervention" measurement took place four months after the intervention went into effect (Fillimore & Whittman, 1982).

There is limited research investigating the relationship between limited commercial alcohol availability and adverse alcohol-related outcomes in the general adult population in the United States. Most of the support for limiting sales days has come from international literature, which indicates that increased days of sale may be related to greater alcohol-related adverse outcomes, but findings are inconsistent (Gruenewald, 2010). Additional research regarding United States policy limiting alcohol availability is needed. In the literature that does exist, two studies of alcohol availability legislation in New Mexico are often cited, and both examined the impact of a shift to allow off-premise sales on Sundays (McMillan and Lapham, 2006; McMillan et. al., 2007). They found that one additional day of sales availability caused an estimated excess of ~543 alcohol

related crashes and 42 alcohol-related crash fatalities per year after New Mexico lifted the Sunday sales ban. Furthermore, they found that those municipalities that quickly passed the local option to re-ban Sunday sales avoided this excess mortality and morbidity (McMillan and Lapham, 2006; McMillan et. al., 2007). A subsequent study comparing states nationwide found that these results were highly irregular, and suggested that New Mexico is an outlier (Stehr, 2010). Overall, the current literature on the utility of Sunday sales bans is inconclusive, and additional research is needed, especially regarding its utility for college students.

The second aim of this research was to assess whether students in colleges in states with Sunday sales bans experience lower levels of the following three outcomes: alcohol consumption, binge drinking, and alcohol-related law violations. Students in colleges and universities located in states that allow alcohol purchases 7 days per week certainly experience increased opportunity to purchase alcohol, but it is unknown whether that translates to increased alcohol-related adverse outcomes. If Sunday sales ban laws were effective, one would expect less alcohol-related law-violations and lower binge drinking rates.

1.4 Alcohol Tax Increases

Literature on effects of alcohol tax increases in the U.S. is very limited. On July 1, 2011 Maryland (MD), a state in the mid-Atlantic region of the United States, increased its alcohol sales tax by 50%, from 6% to 9%. Some heralded the tax increase as an important step towards reducing underage drinking and alcohol abuse; others predicted that it would not be effective at lowering consumption, and therefore also not effective at curbing excessive alcohol use or related outcomes. A report published by the Abell Foundation

included a projection analysis that indicated that a 50% alcohol tax increase in MD would save 33 lives, prevent 370 violent acts, and prevent 13,301 cases of alcohol dependence or abuse in the state every year (Jernigan and Waters, 2009).

For the third aim, the present research sought to determine if the 2011 policy change to increase alcohol taxes in Maryland has achieved the intended effect for Maryland's college students. Because college students are a critical sub-population of young adults developing drinking trajectories—effectiveness in reducing heavy alcohol consumption and alcohol-related harms in this group is key. If tax increase legislation were effective, we would expect decreased alcohol-related adverse outcomes in the time after the increase.

1.5 Theoretical Framework and Conceptual Model

There is a lack of a robust theoretical framework guiding undergraduate alcohol use research (Devos-Comby, et al., 2008). The ecological-transactional model can provide a theoretical framework for understanding the influence of environment on students' development of alcohol problems. The foundation of the ecological-transactional model is Bronfenbrenner's ecological model. Thru this model, we recognize that college students exist within several contexts. These contexts (or, ecologies) have varying degrees of influence, depending on their proximity to the students (Bronfenbrenner, 1977, 1986). Bronfenbrenner describes the distal macrosystem (laws, e.g. state-level alcohol policy), the ecosystem (the setting in which development takes place, e.g. the school), and the microsystem (peers, e.g. social networks, clubs, fraternities, or sororities) (Bronfenbrenner, 1977). Outside of the contextual influences, individual-level factors would also influence development of alcohol problems like law

violations or binge drinking (Bronfenbrenner, 1977; Schulenberg & Maggs, 2002).

From the perspective of the ecological model, development of alcohol problems and the law violations that result in college are largely due to the reciprocal relationships between the individual (a student) and his immediate influences (social network), setting (school environment), and the macro-level ecology in which the student and setting operate (relevant policy) as depicted in Figure 1.1. This research proposes to examine the degree to which those macro-level factors actually influence measurable individual-level outcomes. The conceptual framework illustrating how these factors (alcohol-related state legislation, school characteristics, and alcohol-related outcomes) might be related is depicted in Figure 1.2.

1.6 Public Health Significance

Although colleges do bear some responsibility for ensuring that their environments promote health and safety related to alcohol consumption, they have minimal leverage to institute sweeping regulations like tax increases or sales limitations (Chisholm, et.al, 2004; Room, et. al., 2005). Currently, outside of impaired driving literature, there are few published studies available that focus on alcohol-related law violations on college campuses. Alcohol related-law violations are likely the closest available widely-measured proxy for the prevalence of alcohol problems on college campuses. This research seeks to bridge a critical gap in knowledge and heighten the stakes for state-level officials and college administrators to become partners in protecting at-risk college students from the harms of hazardous drinking.

1.7 Specific Aims

The overall objective of this study was to examine how state-level environmental strategies for preventing alcohol problems are associated with college students' alcohol-related adverse outcomes. The study also examined whether college characteristics impact the relationship between state-level environmental strategies and college students' alcohol-related adverse outcomes.

Aim One: To identify school-level characteristics (e.g., number of undergraduates, urban setting, private institution, etc.) associated with reported number of Maryland (MD) college AOD-related law violations in 2011. Information on alcohol-related law violations came from the U.S. Office of Postsecondary Education Campus Safety and Security data system ("Clery Data"). Analyses included a series of negative binomial regressions predicting violations with the target college characteristics as predictor variables. Hypothesis: Because of social and economic factors, there will be smaller numbers of violations among colleges with fewer undergraduates, in rural settings, and at public institutions.

Aim Two: To compare states with 6-day alcohol sales (i.e. states with legislated Sunday sales bans) to states with 7-day sales (no Sunday sales ban) to determine if students in states with less sales availability experienced lower levels of alcohol consumption, binge drinking, and alcohol-related law violations. Linear and negative binomial regression models were used to determine whether Sunday sales bans are associated with consumption, binge drinking and alcohol-related law violations. Hypothesis: because there is substantial evidence that decreased availability is linked to decreased drinking, students in states with 6-day sales will have lower levels of

consumption, binge drinking, and alcohol-related law violations than students in states with 7-day sales.

Aim Three: To A) Assess whether levels of alcohol consumption, binge drinking, and alcohol-related law violations among MD college students were related to the 2011 MD state alcohol tax increase from 6% to 9%, and B) determine whether school-level factors affect the direction or the magnitude of any relationship detected. The analyses used interrupted time series methods and negative binomial regression models to examine whether there is a statistically significant difference in alcohol-related disciplinary actions). Hypothesis: Given the well-established association between price increases and reduced drinking, I expect that alcohol use among college students will be significantly lower following the alcohol tax increase.

Figure 1.1: Theoretical Framework--Ecological systems of influence on individual-level alcohol-related outcomes

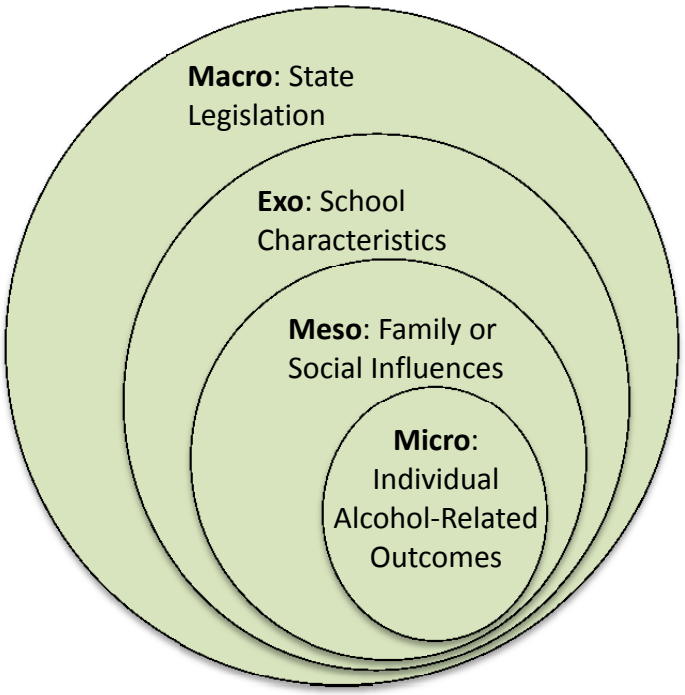
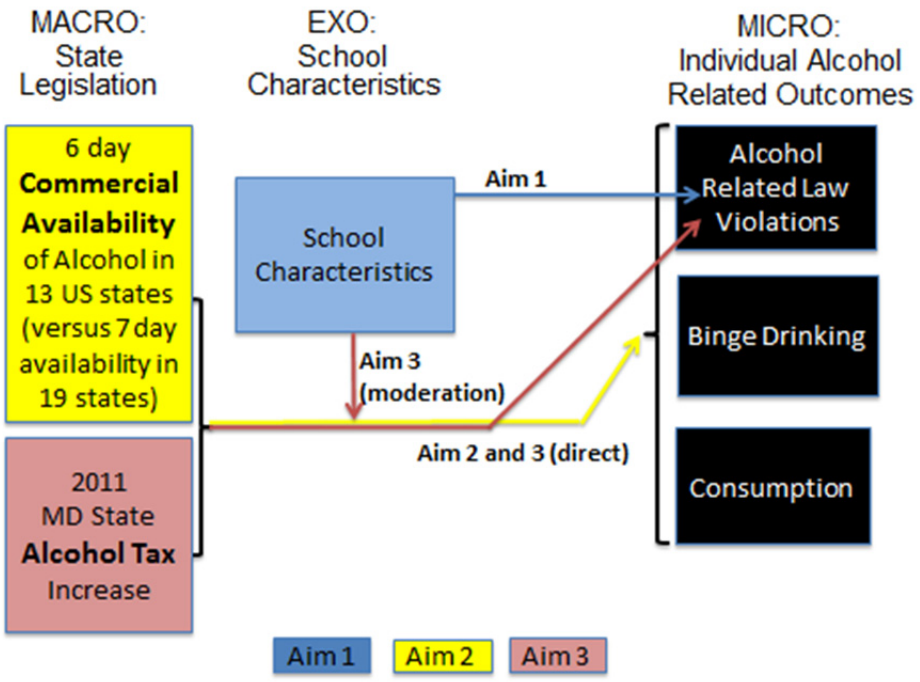


Figure 1.2: Conceptual Model—Alcohol-Related State Legislation and School Characteristics Influence Individual Alcohol-Related Outcomes



Chapter 2: Alcohol and Other Drug Related Law Violations in Maryland Colleges and Universities

2.1 Abstract

Objective: Underage drinking is endemic on college campuses and puts students at risk for a multitude of short- and long-term adverse outcomes. Excessive alcohol use among college students is known to result in injuries, assaults, blackouts, academic underperformance, alcohol poisoning, and death. Even for college students who are non-drinkers, attending institutions with higher rates of drinking raises their "secondhand" risk for these adverse outcomes. The objective of this study is to identify which college-level characteristics are associated with AOD-related law violations in Maryland. The knowledge gained from this work can be used to build risk profiles for schools, which will help to identify those schools that are most in need of preventive interventions. **Methods:** College characteristic data from the United States Department of Education National Center for Education Statistics "College Navigator" were combined with AOD-related law violation outcome data from the National Center for Education Statistics Campus Safety and Security Data Analysis Cutting Tool. Using negative binomial regression analysis, college level characteristics were tested to determine if they predicted the number of AOD-related law violations on each college campus in Maryland. **Results:** Adjusting for population, AOD-related law violations were increased in public schools with 4-year matriculation, offering doctoral degrees, offering campus housing, or with higher prices. As compared to private for profit institutions, there were increased IRRs for private non-profit institutions (IRR=448.3; p=<.001), and publicly funded institutions (IRR=131.8; p=<.001). Schools offering master's degrees had higher IRRs

(IRR=58.5; *p*=.001), as did those offering doctoral degrees (IRR=28.9; *p*=<.001), as compared to schools only offering associate's degrees. School setting did not predict alcohol related law violations. The presence of campus housing was significantly associated with AOD-related law violations (IRR=328.5; *p*=<.001). The percentage of undergraduates at the school (IRR=.1.0; *p*=.261), and did not have an effect, nor did the type of target population for the school (IRR=.9; *p*=.984) Schools priced above $20,000 annually had significantly more alcohol-related law violations than schools priced under $20,000 (IRR=6.3, *p*=.018). **Discussion:** School characteristics hypothesized to be associated with increased AOD problems (i.e.., percentage of undergraduates and rural setting) were not significantly related with the AOD-related law violations at college campuses. This study indicates that a targeted approach to reducing AOD involved law violations would involve starting at higher priced institutions that offer doctoral degrees and on-campus housing, rather than low-cost institutions offering associates degrees to commuters.

KEYWORDS: Alcohol, drugs, college students, law violations

2.2 Introduction

The supporting evidence is well-documented that substance abuse is a significant problem for young adults who spend these important developmental years on college campuses.(Arria, Caldeira et al. 2008, Caldeira, Kasperski et al. 2009, Garnier, Arria et al. 2009, Tosevski, Milovancevic et al. 2010) Even intermittent abuse of alcohol can result in significant cognitive effects, and because an estimated 40% of U.S. college students engage in episodic binge drinking, the resulting cognitive consequences are of major concern.(Zeigler, Wang et al. 2005, Hingson, Zha et al. 2009)

The college environment often provides unique opportunities for young and emerging adults to accelerate established drinking trajectories or initiate alcohol use (Arria, Caldeira et al. 2008). Freshman year in college is often the first time that young adults are away from their parents for an extended period. The lack of parental monitoring and supervision coupled with an environment that often supports episodic binge drinking can have detrimental impacts on young adults' decisions around drinking.(White, McMorris et al. 2006) In addition, college years can be a time of tremendous emotional, physical, and mental growth---and all of it happens within the stressful context of developing (or worse, not developing) a new social support network.(Whiteman, Barry et al. 2013) That social stress is exacerbated by academic demands and family pressures.(Tosevski, Milovancevic et al. 2010) In many cases, students use drugs and/or alcohol as a means of coping with their stressful circumstances.(Caldeira, Kasperski et al. 2009, Arria, Caldeira et al. 2008, Garnier, Arria et al. 2009) This is important because college students are experiencing one or more of

these stressors and exposures during a critical period of brain development, specifically cortex executive function development in the frontal lobe.(Crews, Boettiger 2009)

Much research has shown that long term developmental trajectories differ significantly between students who engage in risky drinking and drug use in college and students who do not (Jennison, et al., 2004; Hingston, et al., 2009; O'Neill, et al., 2001).(Jennison 2004, Hingson, Zha et al. 2009, O'Neill, Parra et al. 2001) While for many students the drinking trajectory is established before the college years (Arria, Caldeira et al. 2008), recent research has indicated that these developmental trajectories diverge very early in the college career. (Johnsson, Leifman et al. 2008, Greenbaum, Del Boca et al. 2005, Cranford, Eisenberg et al. 2009, Chiauzzi, Dasmahapatra et al. 2013) In many instances, students experience one or more of a number of negative consequences such committing alcohol or other drug-related law violations.

Colleges and universities in Maryland and the rest of the United States are observing alarmingly high rates of alcohol use disorders (AUDs) and many of the suggestions in the literature for AUD interventions target young adults in college.(Blanco, Okuda et al. 2008) For the majority of adults in the United States, behaviors relevant to alcohol-impaired driving are established during college years and college students are at increased risk for alcohol use disorders compared to their non-college attending, age-matched counterparts.(Blanco, Okuda et al. 2008) For this reason, colleges administrators and state legislators need information on how legislative interventions and campus-level interventions can work together to reduce risk for this population.

In 2002, Presley and colleagues sought to determine which college characteristics

influence college student drinking, but the open-endedness of the research question combined with complex analysis yielded results that were difficult to interpret.(Presley, Meilman et al. 2002) However, the researchers raised important questions and ideas regarding the potential of college characteristics for indicating which schools have students in need of targeted prevention and early intervention. Eight years later, in 2010, Carter and colleagues published a review article focused on factors influencing alcohol consumption for college students. The articles captured in the review did not analyze direct effects of college characteristics, but the authors suggested that the influence of several college characteristics (living situation, age, full-time and part-time status, or type of college) may be responsible for the drinking differences between college students and non-college students, even more so than college attendance in of itself.(Carter, Brandon et al. 2010) The researchers implied that choices regarding these characteristics are indicative of students' developmental processes and they concluded that future studies of alcohol use in college students should include these characteristics as context.

The Maryland Collaborative to Reduce College Drinking and Related Problems, funded by the Maryland Department of Health and Mental Hygiene, has called Maryland colleges and universities to action. In May 2013, the collaborative hosted a statewide educational conference to engage colleges, universities and other community stakeholders to address the problem of excessive drinking where they made commitments to create environments that support safe and healthy college experiences. The objective of the current research is to identify which college-level characteristics are associated with alcohol and other drug-related law violations in Maryland with the goal of identifying possible targets for future preventive interventions.

2.3 Methods

2.3.1 Data Sources

2.3.1.1 College Characteristic Data

The United States Department of Education's National Center for Education Statistics maintains "College Navigator", a free, public search engine designed to provide relevant information about postsecondary education options to prospective students.(National Center for Education Statistics 2014) Querying College Navigator for two- or four-year institutions offering Associates or Bachelor's degrees in Maryland yielded the 62 institutions fitting our inclusion criteria. Information from these institutions was then exported into Microsoft Excel.

2.3.1.2 AOD-related law violation outcome data

The National Center for Education Statistics data described above were linked with Office of Postsecondary Education (OPE) Campus Safety and Security data on law violations reported by U.S. colleges and universities. Through the free online OPE Campus Safety and Security Data Analysis Cutting Tool, data about AOD-related law violations are accessible for all U.S. postsecondary educational institution that receive federal funding.(Office of Postsecondary Education (OPE) 2013) The Cutting Tool is available online, free-of-charge, to provide public access to reports related to crimes at colleges and universities in the United States.(Office of Postsecondary Education (OPE) 2013) To our knowledge, no 2- or 4-year degree granting colleges and universities were excluded. This is because all Maryland schools meeting our criteria for inclusion receive federal funding. The crime statistics represent incidents that required intervention by campus security and/or municipal law enforcement agencies. Among other data formats,

the Cutting Tool allows users to download information for a group of selected campuses for a selected year as a comma separated values text file.

The data were collated using three queries with Cutting Tool "group search" for Maryland postsecondary institutions' disciplinary actions requiring intervention 1) on campus 2) off campus, or 3) on public property in 2011. These queries resulted in three excel spreadsheets containing AOD-related law violation outcome data for all 62 schools. The Cutting Tool's unique identifier (unitid) linked to the College Navigator identifier (ipedsid) and was used to merge the data into one file.

2.3.2 Measures

2.3.2.1 Outcome measure: AOD-related law violations

Six Cutting Tool outcome variables (alcohol-related law violations, and drug related law violations) were extracted from the database: 1) on campus alcohol -related law violations, 2) on campus drug-related law violations, 3) off campus alcohol-related law violations, 4) off campus drug-related law violations, 5) alcohol-related law violations on public property, and 6) drug-related law violations on public property. These six variables were combined to create one summary variable that represented the number of AOD-related law violations of any kind. These data were truncated and right skewed with a large zero violations category (48.4%).

2.3.2.2 Predictor variables:

From College Navigator, several characteristics of Maryland colleges and universities were acquired: the institution name, type (e.g., two-year public, four-year private, etc.), degrees offered: associate's, bachelor's, master's, etc., setting (e.g., rural, suburb, urban), school residential housing (available versus not available), population

(the total student population), percent undergraduates, the reported annual graduation rate, the net price for full time students for the 2010-2011 academic year, and the six digit unique identifier for institutions. Minor transformations were performed in excel to remove other data columns that were inappropriate for analysis (e.g., school website). "Type" was split to create two variables: "year", to indicate two- versus four-year institution, and "type" to indicate public versus private. Eleven columns of data resulted.

Data for three institutional characteristic variables were gleaned from College Navigator's web interface because they were not included in the exported database: single sex (i.e. men's only or women's only), HBCU (historically black colleges and universities), and religious (religious affiliated institutions). These three additional binary variables were generated in Stata and hand-entered. A summary variable was calculated using the sum of the single sex, HBCU, and religious affiliation variables. Altogether, ten characteristics of Maryland colleges and universities were explored for correlation with AOD-related law violations.

2.3.3 Analyses

To estimate potential school variables that might predict AOD-related law violations, bivariate negative binomial regression analysis was performed for each of the nine institution characteristics. Each predictor that had a significant independent effect was retained for use in the subsequent fully adjusted negative binomial regression model. The sample size (62) was relatively small, and these analyses were intended to be largely exploratory. All predictors had a hypothesized relationship to AOD violations, thus those predictors that approached statistical significance (i.e, $p<0.10$) were included in the final

model. However, an alpha level of .05 was used as the criteria for statistical significance in the final adjusted model.

To test for the appropriateness of negative binomial regression models given the large zero-violations category, we used alternative analysis scenarios with zero inflated negative binomial regression analysis. The results remained across both analyses so we reported negative binomial regression results. Incidence rate ratios were estimated to convey the strength of the associations, and significant findings were reported for alpha levels below .05. Marginally significant findings were reported for alpha levels between .05 and .10. Stata 13.0 was used for all analyses (StataCorp, 2013).

2.4 Results

2.4.1 Descriptive Statistics

Characteristics of the postsecondary institutions are shown in Table 1. The institutions are mostly four year (66.1%) public schools (48.4%) in the suburbs (53.2%). Most of the schools offer on campus housing (53.2%). The populations of students have a wide range (11 - 42,713), and an average price at $16,044 per year. Less than 15% of the schools in Maryland target a special interest.

2.4.2 Unadjusted Negative Binomial Regression Models

The results of the negative binomial regression models are displayed in Table 2. Incidence rate ratios for AOD-related law violations was increased for four year institutions (IRR=50.7; p=<.001) as compared to two year institutions. As compared to private for profit institutions, there were increased IRRs for private non-profit institutions (IRR=602.6; p=<.001), and even more increased for publicly funded institutions (IRR=494.3; p=<.001). As compared to schools where students can only earn associates

degrees, schools awarding master's degrees had higher IRRs (IRR=34.5; *p*=.001), and those for schools awarding up thru doctoral degrees were higher as well (IRR=69.4; *p*=<.001). The setting of the school did not predict alcohol related law violations. When compared to urban settings, neither suburban (IRR=1.0; *p*=.992) nor rural (IRR .6; *p*=.690) institutions had significant differences in alcohol-related law violations counts. There were significantly more alcohol related law violations on campuses where campus housing was provided (IRR=257.5; *p*=<.001). The percentage of undergraduates making up the total student population was not associated with (IRR=.9; *p*=.106). Specialty schools (IRR=.6; *p*=.614) also did not have statistically significant differences in the numbers of alcohol-related law violations as compared schools without a specialty. Schools priced above $20,000 did not experience significantly more law violations than schools priced under $20,000 (IRR=1.3, *p*=.741).

2.4.3 Semi-adjusted Negative Binomial Regression Models

When adjusted for school population, the estimates of the relationships between AOD-related law violations in Maryland postsecondary institutions and school characteristics changed. Incidence rate ratios for AOD-related law violations remained increased for four year institutions (IRR=36.4; *p*=<.001) as compared to two year institutions. As compared to schools with private for-profit funding types, there were increased IRRs for private non-profit institutions (IRR=448.3; *p*=<.001), and also for publicly funded institutions (IRR=131.8; *p*=<.001). As compared to schools where students can only earn associates degrees, schools awarding master's degrees had higher IRRs (IRR=58.5; *p*=.001), and those for schools awarding up thru doctoral degrees were higher as well (IRR=28.9; *p*=<.001). The setting of the still school did not predict alcohol

related law violations, and neither suburban (IRR=.78; p=.220) nor rural (IRR 1.0; p=.254) institutions had significant differences when compared to schools in urban settings. There were significantly more alcohol related law violations on campuses where campus housing was provided (IRR=328.5; p=<.001). Again, the percentage of undergraduates making up the total student population did not seem to have an effect (IRR=.1.0; p=.261). Specialty schools (IRR=.9; p=.984) still did not have statistically significant differences in the numbers of alcohol-related law violations as compared schools without a specialty. Schools priced above $20,000 annually had significantly more alcohol-related law violations than schools priced under $20,000 (IRR=6.3, p=.018).

The high incidence rate ratios for funding type, highest degree offered, and housing provided, required further investigation. For example, the IRR of 328.5 for campus housing indicates that schools without campus housing had vastly fewer AOD-related law violations than those schools with campus housing. Stratified by this variable, the descriptive statistics showed that this was the case. Those schools without campus housing had a mean of .58 AOD-related law violations, while the mean number of AOD-related law violations for those schools with campus housing was 150.97. Stratified descriptive statistics for funding type and highest degree offered also showed very low numbers of AOD-related law violations for the reference groups—respectively, private for-profit funding and associates degrees.

2.4.3 Fully-adjusted Negative Binomial Regression Model

Population, although insignificant in the prior two models, was held in the final fully-adjusted model to control for the school size. The best and final model, reached

after eliminating collinear and insignificant variables, included campus housing and graduation rate. Neither the population (IRR=1.00, p=.007) nor the graduation rate (IRR=1.02, p=.047) were highly predictive of alcohol related law violations, but they did contribute to the final model. Campus housing was highly predictive (IRR=102.8, p<.001).

2.5 Discussion

This exploratory analysis has provided novel information about the school-level environmental correlates of AOD-related law violations in and/or near postsecondary institutions in Maryland. It supports a priori beliefs that there are environmental characteristics of schools that influence college student drinking and the problems that result from drinking. It also supports prior evidence that indicated that living situation is a critical factor influencing drinking differences (Carter, et. al., 2010). This is the only existing study to the authors' knowledge that focuses explicitly on the correlations between school characteristics and AOD-related law violations.

This study indicates that a targeted approach to reducing AOD involved law violations would involve starting at higher priced institutions that offer doctoral degrees and on-campus housing, rather than low-cost institutions offering associates degrees to commuters. In deciding on funds allocation to prevent college drinking, this is an important consideration. Also, the result that setting (city, suburb, rural) had no association with AOD-related violations was surprising. The thinking that students at institutions in rural locations drink more "because they have nothing else nearby to do" may or may not be true, but it seems that the legal problems associated with drinking do not plague rural institutions any more or less. Similarly, because of their relative

immaturity, it seems counterintuitive that campuses with heavier undergraduate populations would not have more AOD-related law violations, but this was not found to be the case.

The numbers of AOD-related law violations in institutions without campus housing, with for-profit funding, and offering associates as the highest-level degrees are unexpectedly low. It is possible that the students in these types of schools consume less alcohol, and therefore experience less AOD-related law violations. An alternative explanation is that there may be a lack of uniform reporting standards across schools. In addition, these schools may lack adequate monitoring structures for detecting AOD-related law violations among their students. Schools with campus housing have built-in natural monitoring of students staying in residence, which provides more opportunity for detection, and subsequent reporting.

One limitation of these data is the inherent conflict of interest in self-reporting statistics that could prove embarrassing or harmful to the institution or the prospect of future enrollments. However, there is no other source from which these data could be reported. Only the administrators at each institution know when intervention from campus or municipal officers is required, so this data must be trusted as the best available.

A second possible limitation of these data is the exclusion of schools that do not have the mandatory reporting requirement because none of their students receive federal financial aid. A College Navigator search of colleges and universities and Maryland did not reveal any schools that were not included in these analyses. One potential policy remedy to this problem would be that states could require those colleges that do not

receive federal funding to report these data to the state so the data could be merged with the federal data. Despite these limitations, these data represent the best comprehensive reports of alcohol and other drug violations on college campuses.

Future research on alcohol problems in college students should turn attention to the characteristics revealed as predictive in this study to generate a risk profile for schools. The schools that appear to be low risk should be checked to ensure monitoring and reporting are adequate. The schools that appear to be highest risk could be selected for targeted risk mitigation through individual-level or campus-level interventions that limit alcohol access to this vulnerable population.

While the characteristics outlined are important for generating a profile of risk, college drinking happens in a larger context external to the university. In an outline of underage drinking prevention compiled by the National Institute of Alcohol Abuse and Alcoholism, three major types of policy/community-level strategies are presented: taxing to increase the price paid for alcohol purchases, minimizing the legal drinking age, and reducing the commercial and social availability of alcohol. In deciding whether these strategies are effective for college students, the potential moderation of school characteristics predicting alcohol problems should be explored.

With the purpose of decreasing alcohol consumption, on July 1, 2011 MD's state legislators increased the MD state alcohol sales tax by 50%, from 6% to 9%. There was debate regarding whether the tax increase would impact consumption (and associated morbidity and mortality). In anticipation of the tax increase; a projection analysis which indicated that the tax increase would save lives, prevent violent acts, and prevent cases of alcohol dependence or abuse in the state every year (Jernigan & Waters, 2009). If this tax

increase was effective for the college student population, future research could measure whether it is the case that at four year institutions offering housing and advanced degrees, the number of alcohol associated law violations at MD colleges decreased after the law went into effect.

Table 2.1: Distribution of Characteristics of Maryland Postsecondary Education Institutions

Characteristics		total sample (n=62)	
AOD-Related Law Violations		Mean (sd)	80.6 (199.9)
Expected Years of Enrollment		2-year school	21 (33.9%)
		4-year school	41 (66.1%)
Profit Status Type		Private for profit	11 (17.7%)
		Private nonprofit	21 (33.9%)
		Public	30 (48.4%)
Degrees Awarded		Associate's	21 (33.9%)
		Bachelor's	7 (11.3%)
		Master's	15 (24.2%)
		Doctor's	19 (30.7%)
Geographic Setting		City	19 (30.7%)
		Suburb	34 (54.8%)
		Rural	9 (14.5%)
Campus Housing		No	29 (46.8%)
		Yes	33 (53.3%)
Population		Mean (sd)	6296 (8884)
Undergraduates		Mean (sd)	5113 (7088.39)
Graduation Rate		Mean (sd)	.43 (.27)
Price		No	35 (56.5%)
		Yes	27 (44.5%)
Specialty			
	Single sex	No	59 (95.2%)
		Yes	3 (4.8%)
	HBCU	No	58 (93.6%)
		Yes	4 (6.5%)
	Religious	No	53 (85.5%)
		Yes	9 (14.5%)

Table 2.2: Results of Negative Binomial Regression Analyses Exploring School Characteristics' Association with AOD-Related Law Violations

	Unadjusted		Semi adjusted[1]		Fully adjusted	
Predictor (reference) vs characteristic of interest	IRR	*P*	IRR	*P*	IRR	*p*
Year (2-yr.) vs 4-yr.	50.7	<.001	36.4	<.001	n.a	n.a
Type(Private for profit)					n.a	n.a
vs Private nonprofit	602.6	<.001	448.3	<.001		
vs Public	494.3	<.001	131.8	<.001		
Awards (Associate's)					n.a	n.a
vs Bachelor's	--	--	--	--		
vs Master's	34.5	<.001	58.5	<.001		
vs Doctorate	69.4	<.001	28.9	<.001		
Setting (City)					n.a	n.a
vs Suburb	1.0	.992	.78	.220		
vs Rural	.6	.690	1.0	.254		
Campus housing available	257.5	<.001	328.5	<.001	102.80	<.001
Population/1000	1.0	.119	1.0	.119	1.00	.007
Graduation rate	1.1	<.001	1.07	<.001	1.02	.047
Price	1.3	.741	6.3	.018	n.a	n.a
Specialty[2]	.6	.614	.9	.984	n.a	n.a
Percent Undergrads	.9	.106	1.0	.261	n.a	n.a

[1] Analyses were adjusted for population

[2] Specialty schools include HBCUs, single sex schools, and schools religious affiliation

Chapter 3: Impact of Sunday Alcohol Sales Bans on U.S. College Students' Alcohol-Related Outcomes

3.1 Abstract

Objective: The utility of Sunday sales bans on alcohol as an effective strategy to prevent alcohol consumption and adverse alcohol-related outcomes in the general adult population is still unclear in scientific literature. There is only limited scientific research investigating this strategy for young adults in college, This research explored the association between Sunday sales bans and alcohol consumption, binge drinking, and alcohol-related law violations among U.S. college students.

Method: Sunday alcohol sales ban data were sourced from three locations. Two (Erickson and APIS) focused on sales bans on all types of alcohol, and the third (DISCUS) focused on bans on spirits sales. Definitions from each of these sources were used to create three dichotomous predictor variables denoting whether a state allowed or disallowed alcohol sales on Sundays. Behavioral Risk Factor Surveillance Survey data were used to obtain outcomes of binge drinking and consumption for each of the states in the United States. Linear regressions were used to determine the association for these outcomes, and beta coefficients were used to convey the strength of the associations. The U.S. Office of Postsecondary Education Security Cutting Tool data were used to obtain six outcomes related to alcohol-involved law violations. Negative binomial regression models were used to determine whether Sunday sales bans were associated with law violations, and Incidence Rate Ratios (IRR) used to convey the strength of the associations. Statistical significance was reported using an alpha level of .05.

Results: Counterintuitively, the DISCUS ban (a ban on spirits, only) was moderately associated with increased consumption among drinking students (β= -.4; *p*=.028). None of the Sunday sales bans showed evidence of association with binging among student drinkers. Also counterintuitively, the expected log count of disciplinary actions on public property was significantly lower for states allowing Sunday sales, as compared to states that limit Sunday sales of alcohol, using (IRR=.4; *p*=.044).

Discussion: These results showed preliminary evidence that Sunday sales bans may actually be associated with increased overall alcohol consumption and alcohol-related disciplinary actions among college students. Further analyses with smaller geographic units are warranted, as many states have bans at the jurisdictional-level and not the state-level. This research also served as a quasi-comparative analysis of policy interpretation. In this research, three categorizations of Sunday sales bans were tested and the results differed from one another. This indicates that the approach practitioners and researchers use to categorize policy and legislation will impact the results of research using those categorizations. A standardized and sensitive categorization of Sunday sales bans legislation is needed for future research.

KEYWORDS: alcohol, policy, college, Sunday sales ban, young adult, emerging adult

3.2 Introduction

Alcohol problems include excessive consumption as well as the harmful consequences associated with consumption (e.g. law violations, or vehicular crashes) (Hurlbut, et al, 1992; Maddock, et al, 2001; Perkins, 2002). Limiting commercial alcohol sales availability is often indicated as a primary strategy for preventing alcohol problems, but there are actually very few U.S. based studies with results that substantiate this strategy's impact, especially the impact for young adults (Gruenewald, 2011). In New Mexico, an examination of the shift towards allowing off-premise sales on Sundays showed that adverse alcohol related outcomes, including vehicular crashes and crash fatalities, increased with additional sales (McMillan and Lapham, 2006; McMillan et. al., 2007). They found that one additional day of sales caused an estimated excess of approximately 543 alcohol related crashes and 42 alcohol-related crash fatalities per year (McMillan and Lapham, 2006; McMillan et. al., 2007). Heaton did an analysis of the effect of Sunday alcohol sale restrictions on crime in one U.S. state (Virginia) in its transition from restricting Sunday sales to phased liberalization of this policy in 2004 (Heaton, 2012). The findings were that the liberalization increased minor crime by 5% and alcohol-involved serious crime by 10% (Heaton, 2012). This was analysis of one state, and at the time it was unknown whether Sunday sales bans in other states had similar effects.

In 2014, Yörük published analysis of the difference-in-difference of alcohol sales in five states that had recently removed Sunday sales restrictions: Rhode Island, Massachusetts, Delaware, Pennsylvania and New Mexico. The analysis included twelve control states where alcohol sales laws had been retained. The results were mixed.

Analysis for two states (Rhode Island and Massachusetts) showed no change in overall sales of alcohol. In three states (Delaware, Pennsylvania, and New Mexico) there were significantly more alcohol sales after the Sunday sales bans were repealed (Yörük, 2014). Yörük cited that the primary limitation in his research was that it focused solely on sales (a proxy for consumption) (Yörük, 2014). Neither alcohol consumption nor any negative consequence of consumption (e.g., alcohol-involved vehicular crashes, binge drinking or alcohol-involved crime) was investigated in this research.

In 2014, Lee and Yörük found that Sunday sales ban repeals were associated with significant increases of 13-20% in total violent and property crimes committed on Sundays. However, there was no detectable impact of Sunday sales bans on total aggregated crimes committed across the week. The authors submitted that this was "due to either positive or statistically insignificant spillover effects of the repeal of Sunday alcohol sales bans on crimes committed on Mondays through Saturdays" (Lee and Yörük, 2014, page 13). Essentially, this was evidence that Sunday sales bans may result in decreased alcohol problems on Sundays and increased alcohol problems on other days of the week.

Lovenheim and Steefel did a similar analysis of all fatal vehicle accidents in the U.S. between 1990 and 2009. In an age and sex stratified analysis of the impact of state repeals of Sunday sales bans, they found that restricting alcohol sales on Sunday had very little effect, but detected a small association with reduced fatal accident rates in underage men. Another study did draw upon data from the 48 contiguous states from the Fatality Analysis Reporting System (FARS) and found that repealing Sunday sales bans was only associated with increased fatalities in one state (New Mexico), but they did not examine

effects specific to young adults (Stehr, 2010). Overall, there is very little extant literature describing how Sunday alcohol sales bans impact adverse alcohol-related outcomes among young adults, and none examining the nationwide impacts on college students.

Alcohol availability to college students, in terms of geographic distance, was analyzed by Fillimore and colleagues in 1982. Their trend study tracked the removal of alcohol sales restrictions around two University of California campuses (Fillimore & Whittman, 1982). Their results showed no change in alcohol consumption, which was questionable because of the flawed methods employed. For pre-intervention data, the researchers surveyed students in 1979, approximately four months after the restrictions were lifted (Fillimore & Whittman, 1982). They collected post-intervention data in 1981, approximately two years after restrictions were lifted (Fillimore & Whittman, 1982). The null result was likely due to the fact that their "pre-intervention" measurement took place four months after the intervention went into effect.

According to the National Institutes of Health (NIH) National Institute of Alcohol Abuse and Alcoholism (NIAAA) Alcohol Policy Information System (APIS), alcohol is commercially available on Sundays in 37 U.S. states (NIAAA, 2015). In 13 states, alcohol sales are completely banned on Sundays. Students in colleges and universities falling within states that allow alcohol purchases 7 days per week statewide experience increased opportunities to purchase alcohol, but it is unknown whether that translates to increased adverse outcomes related to alcohol. If Sunday sales bans are effective in influencing alcohol-related outcomes among young adults in college, then it may be possible to detect differences across states stratified by Sunday sales ban status.

Some states have Sunday sales ban legislation regarding off-premise sales of spirits, only, such that beer and wine are still available for purchase. The *Distilled Spirits Council of the United States (DISCUS)* is a national trade association representing distilled spirits interests in the United States. It advocates for legislation and regulations that will benefit the distilled spirits industry, its customers, and its partners in the U.S. and globally. According to DISCUS, spirits are commercially available on Sundays in 38 U.S. states and completely banned on Sundays in 12 states (DISCUS, 2015). Because excess alcohol consumption, binging, and law violations are among the most prevalent adverse outcomes experienced by college students (Arria, 2008; Jennison, 2004; Perkins, 2002), this study explores whether students in colleges in states with Sunday sales bans experience lower levels of these three outcomes.

3.3 Method

3.3.1 Data Sources

3.3.1.1 Alcohol Policy Information System Sunday sales Ban Data

APIS is an online resource maintained by the National Institutes of Health (NIH) National Institute of Alcohol Abuse and Alcoholism (NIAAA). The APIS website (www.alcoholpolicy.niaaa.nih.gov) details the history of alcohol policies across the United States, including Sunday sales ban status for all 50 states. According to APIS, 37 states have commercial alcohol sales available on Sundays and in 13 states alcohol is not available for commercial sales on Sundays (NIAAA, 2015). The APIS categorization discussed herein refers to the dichotomous variable based on the already dichotomized APIS Sunday sales ban categories.

3.3.1.2 Erickson, et al., Manuscript Sunday sales Ban Data

In *Measuring the Strength of State-Level Alcohol Control Policies,* a paper published by Erickson and colleges in 2014, the authors categorized states differently than those provided by APIS (described above). In many states where alcohol is available for commercial purchase on Sundays, there is a mix of commercial availability such that some areas have alcohol available seven days per week and other areas do not. In these mixed states, areas where alcohol can be purchased seven days per week is determined either by local legislation (i.e., municipalities decide whether alcohol will be available on Sundays) or by state-level legislation that defines which geographic areas will be permitted to sell alcohol every day. Erickson and colleges did a survey of Sunday sales policies, and three categories emerged: states with complete bans on Sunday sales of alcohol, mixed states, and states that allow alcohol purchase on Sundays statewide (Erickson, 2014).

As categorized by Erickson and colleagues, there are three states (Georgia, Indiana, and Connecticut) with statewide ban on alcohol sales on Sundays, thirteen states allowing mixed alcohol sales on Sundays, and 34 states that allow statewide sales of alcohol on Sundays. Because the cell size of states banning alcohol completely on Sundays is so small with the authors' categorization, for these analyses, states with complete bans and mixed states were combined. This recode created the dichotomous predictor using Erickson et al.'s categorizations, with 34 states allowing Sunday alcohol sales statewide and 16 states limiting or forbidding Sunday sales of alcohol.

3.3.1.3 Distilled Spirits Council of the United States Sunday sales Ban Data

In contrast to the APIS and Erickson bans, which both focus on bans of sales of all types of alcohol, DISCUS, the trade association representing distilled spirits interests in the United States, focuses on banning sales of distilled spirits, defined on their website as "beverage alcohol products which are first fermented and then distilled" (DISCUS, 2015). DISCUS provides data grouping spirits sales into four categories: states where spirits sales are completely banned on Sundays, states where local governments have the option to allow spirits sales on Sundays, states where only certain geographic areas are permitted to sell spirits on Sundays, and states where spirits sales are permitted off premise on Sundays (DISCUS, 2015). For these analyses, states falling into the first three categories were combined to create one "limited sales" category in the dichotomous predictor using the DISCUS categorization.

3.3.1.4 Consumption and Binge Drinking Data

The data for consumption and binge drinking among college students come from the Behavioral Risk Factor Surveillance Survey (BRFSS). The BRFSS is a state-based, random-digit dial telephone survey of people aged 18 years and older that is conducted monthly in all states. Further details about the BRFSS and its methods are available at http://www.cdc.gov/brfss (BRFSS, 2014). The BRFSS outcome variables related to alcohol problems include, among others, self-reported binge drinking and consumption. BRFSS data will be used in this research to provide key adverse outcome data, as heavy consumption and binging are known to be problematic among college students in the United States (Arria, 2008; Jennison, 2004; Wechsler, 2002).

In 2012, there were 24,894 young adults aged 18-24 interviewed in the BRFSS. Of them, 13,343 reported ever attending college or technical school, of which 3,999 had already graduated by the time they completed the survey. The 9,344 that remained were either still enrolled, or had left before graduating. When they were each asked to list their employment status (given eight choices: employed for wages, self-employed, out of work for greater than one year, out of work for less than one year, homemaker, student, retired, or unable to work), 3,978 said "student". The resulting sampled subjects were full-time students or part-time students at the time of the survey. These 3,978 respondents represent .84% of the total 2012 BRFSS sample. Although they comprise less than one percent of the BRFSS sample, students in college were the most relevant cases to analyze for this research, which focuses specifically on the effects of state laws on college students.

3.3.1.5 Alcohol Related Law Violations Data

The Campus Safety and Security Data Analysis Cutting Tool is available online, free-of-charge, to provide public access to reports related to crimes at colleges and universities in the United States (OPE, 2013). By federal mandate (the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act), these data are required to be submitted annually via a web-collection tool by all postsecondary institutions that receive federal student aid funding (OPE, 2013). The data are collected and maintained by the Office of Postsecondary Education of the U.S. Department of Education. The crime statistics represent incidents that required intervention by campus authorities and/or municipal law enforcement agencies.

3.3.2 Measures

3.3.2.1 Alcohol Use Outcomes: Consumption and Binging

Two BRFSS outcome variables were used in this research: a continuous variable noting how many instances of alcohol consumption occurred within in the past 30 days, and a continuous variable with the number of occurrences of binge drinking in the past 30 days. For each state, the consumption and binging variables were averaged across self-reported drinking students, creating a variable with average consumption among drinkers and a variable for binge drinking among drinkers.

3.3.2.2 Alcohol Related Law Violations Outcomes: Disciplinary Actions and Arrests

The data were collected using three queries with Cutting Tool "group search" postsecondary institutions' disciplinary actions requiring intervention 1) on campus 2) off campus, or 3) on public property in 2012. Outcome variables were extracted from each database for a total of six outcome variables: 1) on campus disciplinary actions, 2) off campus disciplinary actions, 3) disciplinary actions on public property, 4) arrests on campus, arrests off-campus, and arrests on public property.

3.3.3 Analyses

All analyses were performed using Stata 13.0 statistical software (StataCorp, 2013). The alcohol-related law violations outcome data were counts. The resulting distributions were truncated, right-skewed and over-dispersed. These characteristics indicated that negative binomial regression analysis was most appropriate for analysis. To estimate potential effects of Sunday sales bans on AOD-related law violations, negative binomial regression analysis was performed for each of the three ban types. A .05 alpha

level was the threshold for statistical significance, and incidence rate ratios (IRRs) were produced to determine the strength of the associations.

The consumption and binge drinking outcomes were averages of past month consumption and binging across all of the student drinkers in the BRFSS. The resulting distributions were normal, indicating linear regression was appropriate. To estimate potential effects of Sunday sales bans on consumption and binge drinking, linear regression analysis was employed. A .05 alpha level was the threshold for statistical significance and β coefficients were produced to determine the strength of the associations. As exploratory analyses, these same methods were completed using a sample of all students (drinkers and non-drinkers).

3.4 Results

3.4.1 Descriptive Statistics

The frequencies of the three ban categorization predictor variables (APIS, Erickson, and DISCUS) are described in Table 1. The descriptive statistics of consumption and binging, as well as the state aggregated counts of disciplinary actions and arrests, are described in Table 2. Across all states, the most frequent alcohol related law violation outcome was disciplinary action on campus—in New York there were 15,965 instances on college campuses. No state experienced zero disciplinary actions on campus, and Wyoming experienced 47, which was the fewest number of instances across all states. The rarest alcohol-related law violation is arrest off-campus. Seven states experienced zero arrests off-campus and one state (New Hampshire) experienced 132, the highest number of off campus arrests.

3.4.2 Linear Regression

The exploratory analyses with the entire sample (drinkers and non-drinkers) yielded no significant results. The results simple linear regression models using the sub-sample of drinking students are displayed in Table 3 with regression coefficients and *p*-values. There is evidence that the DISCUS ban categorization was modestly associated with increased consumption among drinking students (β= -.4; *p*=.028), but neither the Erickson ban categorization (β= -.2; *p*=.302) nor the APIS ban categorization (β= -.1; *p*=.419) showed any significant association. Although the results for the Erickson and APIS categorizations were statistically insignificant, it may be clinically significant that they were also negative in direction. A post-hoc test of this result showed statistical power of one predictor with n=50, r^2=.1, and α=.05 was .65 (Roper, 2015). None of the predictors showed evidence of association with binging among the student drinkers in this sample.

3.4.3 Negative Binomial Regression

The results of negative binomial regression models are displayed in Table 4 with Incidence Rate Ratios (IRR) for each of the variables, along with *p*-values. The expected log count of disciplinary actions on private property was significantly lower for states with statewide alcohol sales on Sunday as compared to states that limit Sunday sales of alcohol, using the Erickson ban categorization as the predictor (IRR= .4; *p*=.044). None of the predictors showed statistically significant associations with arrests. The APIS categorization was not a statistically significant predictor of any of the outcome variables.

3.5 Discussion

3.5.1 Comment

This study explored whether students in colleges in states with Sunday sales bans experience lower levels of alcohol consumption, binge drinking, alcohol-related disciplinary actions, and alcohol-related arrests. The results showed modest evidence that Sunday sales bans are not associated with lower levels of these outcomes, and may actually be associated with increased alcohol consumption and alcohol-related disciplinary actions among college students. This result corroborates and provides additional context to prior studies. In 2009, Carpenter and Eisenberg found that that repealing Sunday sales prohibitions may simply change the within-week distribution of drinking. In 2014, Lee and Yörük found Sunday sales bans were associated with decreased alcohol problems on Sundays but there was no associated change in overall alcohol problems across the entire week. McMillan and colleagues found that counties with an older population experienced more of an increase in alcohol problems when Sunday sales bans were repealed, which indicates that Sunday sales bans may have a differential impact by age. It is possible that college students redistribute their drinking to other days in the week, and in doing so they consume more and require more disciplinary intervention from campus or municipal authorities.

3.5.2 Comparing Categorizations of Sunday Sales Ban

This research served as a quasi-comparative analysis of policy interpretation. In this research, three categorizations of the Sunday sales ban concept were tested. The first two (Erickson and APIS) focused on sales bans on all types of alcohol, and the results for those categorizations differed from one another and from the results of the third

(DISCUS) which focused more specifically on spirits sales bans. This indicates that it may be insufficient to analyze alcohol policy based on only one interpretation of the legislation in question.

The timing and dates of policy interventions are perhaps obvious critical elements of policy analysis, but previous research has failed to fully account for both of these elements. As discussed earlier, a 1982 analysis of alcohol sales restrictions around the University of California Berkeley and University of California Davis campuses were designed to test pre-post effects of legislation expanding alcohol sales availability (Fillimore & Whittman, 1982). The results from that study indicate that any measurable impact of the legislation had occurred within the first four months. In the present research, the results from the Erickson et al. manuscript were published in September 2014. The authors selected three states (Connecticut, Indiana and Georgia) to categorize as "complete prohibition" of alcohol sales on Sundays. Their discussion provides context, stating that "these states have the most restrictive policy—a ban on off-premise sales of *all* types of alcohol with no exceptions" (Erickson, 2014 page 179). This conflicts with the data provided by APIS, where Connecticut is shown as having "No Sunday sales Ban", because Connecticut repealed its Sunday sales ban in 2012. Two other states (Pennsylvania and Virginia) also differ between the APIS and Erickson categorizations, and the reason for these differences is also unclear—both Virginia and Pennsylvania had repealed their Sunday sales legislation a decade ago, with the Virginia repeal in 2004 and the Pennsylvania repeal in 2003 (NIAAA, 2015).

Ideally, alcohol policy research should consider dates of policy intervention, as well as giving consideration to the potential window of time in which the legislation may

have an impact. These results highlighted the utility of having a standardized categorization for alcohol-related legislation—in lieu of standardization, research using the existing differing categorizations may continue to yield conflicting results.

The policies surrounding Sunday sales bans in the United States are nuanced and varied depending on how alcohol sales are handled in each state. In "control states", the state controls the sale of distilled spirits (and in some states, the sale of wine as well) through government agencies that operate wholesale outlets. Even within control states, there is great variation in how alcohol sales are permitted, by outlet type. For example, in Pennsylvania, wine and spirits can only be sold in state-operated beverage outlets. However, beer can be purchased at beverage outlets, by the case or in restaurants by the six-pack. Sunday sales are not banned in Pennsylvania, but many wine and spirits shops are closed on Sunday because Sunday sales require a separate, additional permit.

3.5.3 Future Research

This study illustrates that the impact of state-level policy interventions can be measured and detected for young adults in college. This research contributes to a small but growing body of literature related to the impact of alcohol policy across all U.S. states, and more specifically related to how alcohol policy impacts young adults in college. We detected significant associations for more common outcomes of consumption and alcohol-related disciplinary action on college campuses, but found no measurable difference for binging or arrests. It is possible that maybe these more serious consequences are also impacted by Sunday sales bans, but went undetected in our study. With only 50 states in the U.S. we were restricted in terms of sample size. Many states that allow alcohol sales on Sundays only do so in certain municipalities and future

research should analyze Sunday sales ban legislation with a finer resolution, at the municipality or jurisdictional level, creating a richer dataset that better captures the nuances of this particular legislation type. In addition, the results of this research indicate that there may be differential effects depending on whether an alcohol sales ban is for all alcohol types, or solely for spirits. Future research could investigate this finding further to determine if partial bans that focus specifically on spirits have the same impact as those bans on all alcohol sales. Finally, the categorization of Sunday sales ban legislation requires standardization so that results of research can have utility for the field and be comparable across studies.

Table 3.1: Frequencies of each ban categorization across the United States (n=50)

Sunday sales ban categorization	Sunday sales Restricted	Sunday sales permitted
Erickson	16	34
APIS	13	37
DISCUS*	12	38

*refers to bans on spirits only

Table 3.2: Characteristics of Outcomes

	Average Consumption (past 30 days)		Average Binging (past 30 days)	
	Mean(sd)	(min, max)	Mean(sd)	(min, max)
	3.28 (.51)	(2.29, 5.21)	2.10 (.76)	(0.40, 4.23)
	Count of Disciplinary Actions		Count of Arrests	
	Mean(sd)	(min, max)	Mean(sd)	(min, max)
On campus	3673.00 (3526.00)	(47, 15,965)	505.06 (610.41)	(0, 3366)
Off campus	107.00 (294.20)	(0, 2006)	27.86 (33.01)	(0, 132)
Private property	44.38 (88.88)	(0, 534)	149.66 (148.38)	(0, 622)

Table 3.3: Bivariate Linear Regression Models: Sunday sales Bans and Consumption and Binge drinking among U.S. College Students (n=50)

	Consumption		Binging	
	β	*p*	β	*p*
Erickson Categorization				
Sunday sales permitted	-.2	(.302)	.1	(.641)
APIS Categorization				
Sunday sales permitted	-.1	(.419)	0.0	(.956)
DISCUS Categorization				
Sunday sales permitted	**-.4**	(.028)	2.0	(.584)

Table 3.4: Incidence Rate Ratios and p-values of Negative Binomial Regression Analyses with Sunday Sales Bans Predicting Alcohol-Related Disciplinary Actions and Alcohol Related Arrests

Sunday sales ban categorization	Disciplinary Action On-campus		Disciplinary Action Off-campus		Disciplinary Action Public Property		Arrests On-Campus		Arrests Off-campus		Arrests Public Property	
	IRR	*(p)*	IRR	*(p)*	IRR	*(p)*	IRR	*(p)*	IRR	*(p)*	IRR	*(p)*
Erickson												
Permitted	1.0	(.952)	2.1	(.173)	**.4**	(.044)	.6	(.105)	1.1	(.776)	.9	(.761)
APIS												
Permitted	1.4	(.267)	2.0	(.212)	.6	(.352)	1.0	(.962)	1.3	(.577)	1.3	(.488)
DISCUS												
Permitted	1.4	(.334)	2.4	(.135)	1.9	(.212)	.7	(.328)	1.0	(.998)	1.0	(.959)

Chapter 4: Impact of Maryland Alcohol Tax Increase on U.S. College Students' Alcohol-Related Outcomes

4.1 Abstract

Objective: This study assessed whether levels of alcohol consumption, binge drinking, and alcohol-related disciplinary actions on college campuses changed among MD college students before and after the 2011 Maryland (MD) state alcohol tax increase from 6% to 9%, and B) determined which school-level factors moderated the magnitude of any changes detected. **Method:** This study was an interrupted time series analysis of panel data containing alcohol-related disciplinary actions on 59 MD college campuses in years 2006-2013. Clustered negative binomial regression models were used to examine whether there was a statistically significant difference in counts of alcohol-related disciplinary actions comparing time before and after the tax increase. **Results:** This study illustrated that the impact of state-level alcohol tax policy interventions can be measured and detected for young adults in college, but the results are mixed. There is a general downward trend when looking at how disciplinary actions varied over time after the tax increase. However, when comparing periods pre-tax and post-tax, without controlling for time, the trend is upward. The analysis of the interaction between these two variables showed that there may have been a .91 factor decrease in count of alcohol-related disciplinary actions after the tax (p=.050). **Discussion:** Overall, the 2011 MD tax increase may be associated with a significant decrease in alcohol-related disciplinary actions on college campuses. This relationship seemed to be correlated with several school-level characteristics, including school price, school funding type, types of degrees awarded, and specialty. School price may serve as a proxy mediator or confounder of the

effect of the tax on disciplinary actions. When analyzing alcohol tax legislation, other interventions and policies related to alcohol should be taken into account.

KEYWORDS: alcohol, policy, college, alcohol tax, young adult, emerging adult

4.2 Introduction

Raising alcohol prices via alcohol tax increases is associated with decreases in excessive alcohol consumption and several related harms among the general adult population in the United States (Elder, et al., 2010; Wagenaar, et al., 2010). The existing literature on alcohol pricing and its impact suggests that the price of alcoholic beverages does affect the quantity of alcohol that consumers purchase (Babor, 2010). In 2009, Wagenaar and colleagues' meta-analysis found a consistent inverse relationship with the price of alcoholic beverages and alcohol consumption across 112 studies (Wagenaar, 2009). In 2010, another meta-analysis by Wagenaar revealed that there was also an association between alcohol prices and alcohol-related harms, including injuries, sexually transmitted diseases, drug use, and crime (Wagenaar, 2010). Price can be regulated, in part, through taxation of alcoholic beverages. The Centers for Disease Control (CDC) conducted a review to examine the effectiveness of manipulating alcohol taxes in efforts to reduce excessive alcohol consumption and related harms—the results lead the U.S. Community Preventive Services Task Force to recommend increasing alcohol taxes as a primary measure for reducing the harmful consequences related to excessive alcohol consumption (Task Force on Community Preventive Services, 2010).

In collaboration with the Task Force on Community Preventive Services, Elder and colleagues completed a meta-analysis involving studies restricted to underage populations. The results were similar to prior meta-analyses, albeit less strong—more than half of the studies found that increased taxes were significantly associated with reduced consumption and alcohol-related harms (Elder, et. al., 2010). In their summary, Elder and his colleagues noted that legislators should expect that the impact of a tax

increase will be proportional not only to its magnitude, but also to such factors as disposable income and demand for alcohol (Elder, et. al, 2010).

Elder's study did not address the impact on college students in particular, but the three elements of Elder's summary point merit consideration in the context of college students as a target population for increased alcohol taxes. First, while magnitude of a tax increase is absolute, once it is determined, the magnitude's ultimate impact on behavior change is largely a matter of perception—whether the magnitude of increase is or is not "large" lies in the eye of the beholder. College students may not notice an increase that amounts to three percentage points. Second, disposable income, for college students, is largely based on the disposable income of their parents. If parents have already demonstrated the wherewithal to offer a college education to their children, it follows that young adults attending college do have larger disposable incomes than their non-college attending counterparts. Third, there is prior research indicating that there is no shortage of demand for alcohol among college students (Weitzman, et al., 2003; Wechsler, et al., 2010).

With the apparent purpose of decreasing alcohol consumption, on July 1, 2011 Maryland's state legislators increased the Maryland state alcohol sales tax by 50%, from 6% to 9%. In anticipation of the tax increase; the Abell Foundation conducted a projection analysis. The results indicated that a 50% alcohol tax increase in MD would save 33 lives, prevent 370 violent acts, and prevent 13,301 cases of alcohol dependence or abuse in the state every year (Jernigan and Waters, 2009).

The present study sought to determine if the 2011 policy change to increase alcohol taxes in Maryland achieved the intended effect for Maryland's college students.

Because college students are a critical sub-population of young adults developing drinking trajectories—effectiveness in reducing heavy alcohol consumption and alcohol-related harms in this group is key. If the legislation was effective, we would expect a reduction in alcohol-related disciplinary actions following the tax increase. This study evaluated whether levels of alcohol-related disciplinary actions on college campuses were related to the 2011 Maryland (MD) state alcohol tax increase from 6% to 9%, and explored which school-level factors were correlated with that relationship.

4.3 Method

4.3.1 Data Sources

4.3.1.1 College Characteristics Data

Schools were selected using the United States Department of Education's National Center for Education Statistics maintains "College Navigator", a free, public search engine designed to provide relevant information about postsecondary education options to prospective students (NCES, 2014). Querying College Navigator for two- or four-year institutions offering Associates or Bachelor's degrees in Maryland yielded 62 institutions fitting the inclusion criteria.. Data from College Navigator were merged with Clery data. Three schools (U.S. Naval Academy, Bais HaMedrash, and ITT Hanover) were dropped from the analysis because of unacceptable levels of missing data, leaving 59 schools for analysis. Panel data were constructed, clustered by school for eight years: 2006 through 2013. Twenty-six of the 59 colleges reported zero alcohol-related disciplinary actions for all eight years and could not be included in a time-series analysis. Thirty-three schools were left for the analytical sample for a total of 264 (33 × 8) observations.

4.3.1.2 Alcohol Related Disciplinary Action Data

The Campus Safety and Security Data Analysis Cutting Tool is available online, free-of-charge, to provide public access to reports related to crimes at colleges and universities in the United States (OPE, 2013). By federal mandate (the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act), these data are required to be submitted annually via a web-collection tool by all postsecondary institutions that receive federal student aid funding (OPE, 2013). The data are collected and maintained by the Office of Postsecondary Education of the U.S. Department of Education. The crime statistics represent incidents that required intervention by campus authorities and/or municipal law enforcement agencies. The data were collected using queries with Cutting Tool "group search" for the counts of alcohol-related disciplinary actions requiring intervention on campus in MD postsecondary institutions.

4.3.1.3 Tax Increase Predictor Data

APIS is an online resource maintained by the National Institutes of Health (NIH) National Institute of Alcohol Abuse and Alcoholism (NIAAA). The APIS website (www.alcoholpolicy.niaaa.nih.gov) details the history of alcohol policies across the United States, including alcohol tax policies for all 50 states. According to APIS, on July 1, 2011, Maryland adjusted its retail alcohol tax rate from 0% to 9% (NIAAA, 2015). This is the retail on-premises ad valorem excise tax levied on an alcoholic beverage. In addition, the sales tax rate in Maryland that had previously applied to alcoholic beverages was unapplied, such that consumers no longer pay sales tax for alcohol. As a result, the sales tax adjusted retail ad valorem excise tax rate on alcohol in Maryland is 3%, which simply represents the difference between the previous sales tax and the new retail on-

premises ad valorem excise tax. A consumer who made an alcohol purchase on June 30, 2011 paid 6% tax, and then on July 1, 2011 paid 9%, an increase of 50%.

4.3.2 Measures

4.2.3.1 Predictor Variables: Tax Status and Time

To model time, a variable "time" was created to represent years, with a value of 0 assigned to 2006, 1 assigned to 2007, and so forth. To model the effect of the tax on alcohol-related disciplinary actions on college campuses, the binary variable "tax" was created with a value of 0 for each of the years 2006-2010 and a value of 1 the years 2011-2012.

4.3.2.2 Moderator Variables

The data obtained included the institution type (private for profit, private non-profit, or public), degree (the highest degree offered: associate's, bachelor's, master's, etc.), setting (e.g., rural, suburb, urban), housing (a binary variable indicating whether on-campus housing is available), population (the total student population), percent undergraduate (the percentage of undergrads out of the total student population), graduation rate (the reported annual graduation rate), price (the net price for full time students for the 2010-2011 academic year), and specialty (a summary variable calculated using the sum of single sex, historically black colleges and universities and religious affiliation). Altogether, ten characteristics of Maryland colleges and universities were explored for correlation with AOD-related law violations

4.3.2.3 Outcome Variable: Alcohol Related Disciplinary Actions

Eight queries from the OPE Security Cutting Tool yielded data for all MD schools for each of the years spanning 2006 through 2013. The resulting data are panel in nature,

with the same schools having counts of alcohol-related disciplinary actions on campus in all eight years. The outcome variable was a count; its distribution was truncated, right-skewed and over-dispersed.

4.3.3 Analyses

These characteristics indicated that fixed effects negative binomial regression analysis was most appropriate for analysis. A .05 alpha level was the threshold for statistical significance, and incidence rate ratios (IRRs) were produced to determine the strength of the associations.

Independent effects of the predictors were explored in three steps. First, univariate models were used to determine the effects over time in years ("time") and over time before and after the 2011 tax increase ("tax"). Second, a complex fixed effects model was used to see whether the level differs pre- versus post-alcohol tax increase. This model allowed the time trend to differ pre- vs. post- (β tax*time) as well as the level itself to change (β tax). Third, each of the school characteristics variables were tested a series of bivariate models.

1)

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ time}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ tax}}$$

2)

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ time} + \beta \text{ tax} + \beta \text{ tax*time}}$$

3)

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ type}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ degree}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ setting}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ housing}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \text{population}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ percent undergraduate}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ graduation rate}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ specialty}}$$

$$\lambda_{\text{alcohol-related disciplinary actions}} = e^{\beta o + \beta \text{ price}}$$

Next, a preliminary multivariate model was run with statistically and theoretically significant school characteristic predictors from the bivariate models in step 3. The multivariate model was tested for collinearity and three collinear patterns emerged: between 1) campus housing and highest degree offered; 2) percent undergraduates and funding type; and 3) graduation rate and price. The collinearity test yielded the highest value for campus housing, indicating that it was possibly collinear with more than one variable, thus the decision was made to drop campus housing from the model. Percent undergraduate was insignificant and showed a weak effect size, so it was dropped in favor of funding type, which showed a relatively strong effect and statistical significance. Similarly, graduation rate was insignificant and weak, and was dropped in favor of the stronger, significant price variable.

Because the tax intervention became effective mid-year, the remaining variables (five school characteristics, time, tax, and interaction) were included in additional modeling to determine treatment of the year 2011. First, data from the year 2011 were excluded altogether, and the effect sizes and significance remained stable. Second, data from 2011 were assigned the pre-tax intervention value (zero). Again, effect sizes and significance remained stable. This confirmed that the results did not depend on the value assigned to 2011 for the tax variable. Ultimately, 2011 was treated as a post-tax intervention year. The final, maximally adjusted model included five remaining school

characteristics (type, degree, population, specialty and price), time, tax, and the time*tax interaction.

One at a time, the five school characteristics were removed from the final model to determine whether any of the variables mediated or moderated the relationship between the tax and disciplinary actions.

4.4 Results

4.4.1 Descriptive Statistics

The descriptive statistics of the counts of alcohol related disciplinary actions across the years under study, and pre- and post-tax increase implementation, are described in Table 1 for the total sample and the analytic sample. In 2006, the mean number of alcohol-related disciplinary actions was 73, and in 2013, the mean was 61. Two schools emerged as outliers warranting further investigation. The alcohol-related disciplinary actions at University of Maryland College Park (UMCP), alone, represented 26% of the total number of such actions at all campuses in 2011. Second highest was Loyola University, where disciplinary actions represented 9%.

The characteristics of the postsecondary institutions in the analytic sample are shown in Table 2. The institutions are mostly public schools (60.6%), in the suburbs (51.5%). Most of the schools offer on campus housing (75.8%). The populations of the schools have a wide range (mean=8,100, s.d.=8,956). 81% of the students are undergraduates and 42% of the schools offer doctoral degrees as the highest available degree. On average, 47% of the students successfully graduated within 1.5 times the expected number of years to graduation. 66.7% of the schools are priced more than $20,000 per year. Less than 25% of the schools target a specialty interest.

4.4.4 Fully-adjusted Final Negative Binomial Regression Model

The results of the final fully-adjusted negative binomial regression model are displayed in Table 3 with incidence rate ratios (IRRs) and *p*-values. On average, with each year that passed over the time under study, alcohol-related disciplinary actions on college campuses decreased by a factor of .95 (p=.023). When comparing the time pre-tax increase to the time post-tax, there was a change in the direction of effect-- in the period post-tax increase, colleges in Maryland experienced a 1.94 times greater count of alcohol related disciplinary actions than they had in the pre-tax period (p=.011). The interaction between these two values showed that there may have been a .91 factor decrease in count of alcohol-related disciplinary actions after the tax (p=.050).

The population of the schools had no association with alcohol related disciplinary actions (IRR=1.0; p=.004). As compared to schools awarding only Associate's degrees, those schools offering Master's degrees experienced 6.65 times more count of disciplinary actions (p=.010)). Public schools experience 9.86 times the count of alcohol related disciplinary actions than private nonprofit institutions (p<.001). More expensive schools charging ≥ $20,000 annual tuition were 20.2 times more likely to have alcohol – related disciplinary actions occur on campus (p<.001). Specialty schools experienced fewer alcohol-related law violations by a factor of .69 (p=.006). Because these University of Maryland College Park and Loyola University of Maryland were potentially high-leverage, the final model was rerun twice to consider whether they should be dropped from the analysis. First, with UMCP removed, and then again with UMCP and Loyola removed. Neither of these alternative analysis scenarios yielded notable changes in effect size, effect direction, or statistical significance.

All variables were tested for mediation or moderating the relationship between the tax and disciplinary actions. When school price was removed from the model, the magnitude and significance of the IRR for tax changed substantially, from IRR=1.94, p=.011 to IRR=2.72 p<.001.

4.5 Discussion

4.5.1 Comment

This study explored whether students in Maryland colleges experienced lower levels of alcohol-related disciplinary actions after the 50% alcohol tax increase implemented in July, 2011. This research contributes to a small but growing body literature, but more post-tax panel data would be helpful to clarify whether the tax had an effect. The results showed that there is a general downward trend when looking at how disciplinary actions varied over time after the tax increase. However, when comparing periods pre-tax and post-tax, without controlling for time, the trend is upward. These results seem conflicting until the unique context of college drinking in Maryland is considered.

4.5.2 General downward trend

Key faculty at two large Maryland universities began working on several multi-level initiatives to reduce college alcohol problems. These efforts included 1) successful advocacy for a ban on grain alcohol, 2) initiation of the Maryland College Alcohol Survey (MD-CAS), a survey of students at nine MD colleges and universities focused on identifying risk factors for excessive drinking, 3) statewide advocacy to reduce underage drinking in the form of sponsored “alcohol enforcement specialist training”, 4) convening regular meetings focused on campus-level strategies for preventing alcohol

problems across at least 10 schools for two years, 5) offering a statewide educational conference to engage colleges, universities and their community partners to address the problem of excessive drinking, and 6) development of a 11 school collaborative. Dubbed the Maryland Collaborative to Reduce College Drinking and Related Problems (MD Collaborative), the group uses high-level buy-in from university presidents and chancellors to leverage change on member campuses and to address the problem of college drinking statewide. It is difficult, with this analysis, to determine just how much of the observed decrease was due to the tax versus the work of the MD collaborative.

It is most likely that the observed decrease is the result of both the tax increase plus the Maryland collaborative work. A post-hoc bivariate model exploring whether membership in the collaborative was associated with disciplinary actions indicated that members schools may have experienced fewer by a factor of .46 (p=.028). A multivariate model exploring the interaction between membership and tax (whether levels of alcohol-related disciplinary actions before versus after the tax increase for MD collaborative member schools as compared to schools that were not members) showed no indication of a significant relationship (IRR=1.14, p=.237).

4.5.3 Upward trend post-tax

Much of the advocacy and attention regarding college drinking from the MD Collaborative has been about detection and reporting (MD Collaborative, 2015). It is likely that the upward trend detected in the pre- versus post-tax implementation measure is also related to their work. They encouraged attendees of their workshops and conference to practice more diligent reporting of alcohol-related problems. Even a small change on a college campus that stemmed from their advocacy (e.g. training for

university staff; a staff hire that focuses on Clery reporting) could potentially cause a large increase in detection or reporting, causing estimates to be artificially inflated.

4.5.4 School Price

The IRR for tax impact on disciplinary actions on college campuses increased and became stronger when school price was removed from the model, which indicates that the price of the school changes the impact of tax on the alcohol-related disciplinary actions at the school. Because higher priced schools logically have more financial resources, the monitoring, detection, and reporting may be consequentially better at those schools. This would cause a confounding effect. While it appears that tax is not working to reduced alcohol related disciplinary actions, it may be the case that monitoring and reporting at high resourced schools are confounding the effect.

Alternatively, price might be a mediator serving as a proxy for average student financial resources. Given that financial resources are a part of the equation for tax impact on alcohol-related outcomes (Elder, et al., 2012), this raises questions about whether the effect of raising taxes on alcohol problems is more impactful for students with less financial resources. In this scenario, while it appears that tax is not working to reduce alcohol-related disciplinary actions among college students, it may be the case that students' financial resources are moderating the effect.

4.5.5 Future Research

This study illustrated that the impact of state-level alcohol tax policy interventions can be measured and detected for young adults in college, but the results are mixed. Analyzing the impact of the tax in a vacuum, without additional information about other statewide interventions, could lead to erroneous conclusions. These results also indicate

that legislative policies designed to prevent alcohol problems are best done in tandem with multi-level prevention efforts, including community education, alcohol pricing strategies, limitations on hours of purchase, and evidence-based school- and individual-level interventions.

Large flagship institutions may play a large role in creating the culture of drinking in a state. The average flagship institution is resource-rich and will often draw students from other schools into its culture, for social events, sporting events, or as an alternative source of academic credit. Focusing on flagship institutions, in addition to other broad-sweeping interventions (e.g. alcohol tax increases) would likely be effective at reducing alcohol problems in those institutions and other smaller institutions, as well.

Table 4.1: Descriptive Statistics for Alcohol-related Disciplinary Actions on MD College Campuses

	Total sample (n=59)			Analytic sample (n=33)		
	mean	(sd)	(min, max)	mean	(sd)	(min, max)
2006	73	(165)	(0, 849)	124	(201)	(0, 849)
2007	75	(170)	(0, 987)	123	(204)	(0, 987)
2008	72	(166)	(0, 958)	118	(200)	(0, 958)
2009	67	(170)	(0, 943)	111	(210)	(0, 943)
2010	65	(170)	(0, 1062)	112	(212)	(0, 1062)
2011	69	(165)	(0, 1057)	121	(205)	(0, 1057)
2012	58	(128)	(0, 742)	101	(156)	(0, 742)
2013	61	(141)	(0, 647)	102	(170)	(0, 647)

Table 4.2: Descriptive Statistics of Higher Education Institutions Characteristics Used as Predictor Variables

	Total sample (n=59)	Analytic sample (n=33)
	No. (%)	No. (%)
Funding Type		
Private for profit	10 (17.0%)	0 (0.0%)
Private nonprofit	20 (33.9%)	13 (39.4%)
Public	29 (49.1%)	20 (60.6%)
Degrees Awarded		
Associate's	21 (35.6%)	9 (27.3%)
Bachelor's	4 (6.8%)	0 (0.0%)
Master's	15 (25.4%)	10 (30.3%)
Doctor's	19 (32.2%)	14 (42.4%)
Geographic Setting		
City	19 (32.2%)	11 (33.3%)
Suburb	32 (54.2%)	17 (51.5%)
Rural	8 (13.6%)	5 (15.2%)
Campus Housing		
No	28 (47.5%)	8 (21.2%)
Yes	31 (52.5%)	25 (75.8%)
Price		
<$20,000	35 (59.3%)	22 (66.7%)
≥$20,000	24 (40.7%)	11 (33.3%)
Specialty		
No	56 (94.9%)	25 (75.8%)
Yes	3 (5.1%)	8 (24.2%)
	mean (sd)	mean (sd)
Population	6432 (8994)	8100 (8956)
% Undergraduates	.83 (.23)	.81 (.19)
Graduation Rate	.42 (.27)	.47 (.26)

Table 4.3: Negative Binomial Regression Analysis of Tax, Time and College Characteristics on Alcohol-Related Disciplinary Actions

	Final Fully adjusted		Semi-adjusted		Unadjusted	
Variable	IRR	*p*	IRR	*p*	IRR	*p*
Time, measured annually 2006-2013	.95	.023	.96	.033	.99	.475
Tax, pre- versus post-	1.94	.011	2.10	.003	.99	.906
Interaction between time and tax	.91	.050	.89	.018	1.00	.654
Population	1.00	.004	1.00	.011	1.00	<.001
Highest Degree						
Associate	Ref.	--	--	--	--	--
Master	6.65	.010	3.39	.105	11.82	<.001
Doctor	1.85	.008	2.77	.411	6.79	<.001
Funding Type						
Private nonprofit	Ref.	--	--	--	--	--
Public	9.86	<.001	11.96	<.001	.93	.847
Annual Tuition Price						
<$20,000	Ref.	--	--	--	--	--
≥$20,000	20.20	<.001	11.33	.011	5.81	<.001
Specialty	.69	.006	.477	.046	.16	<.001
Graduation Rate	n.a.	n.a.	3.69	.393	154.18	<.001
Percent Undergraduate	n.a.	n.a.	.32	.408	.16	.114
Campus Housing						
Present	n.a.	n.a.	32.78	<.001	41.7	<.001
Not present						
Setting						
Urban	n.a.	n.a.	n.a.	n.a.	Ref.	--
Suburb					.88	.745
Rural					.53	.200

Chapter 5: Discussion

5.1 Summary

Current levels of alcohol abuse among college students and the problems that result, including law violations and binge drinking are distressing. Ultimately, this research is the first effort to reveal the nuances of how these state-level alcohol legislation measures (alcohol tax increase legislation and commercial alcohol sales restrictions) impact three important alcohol related outcomes in college students—consumption, law violations and binge drinking. This research provides new information on the current state of alcohol problems among college students in the environmental contexts of state-level policies and college-level characteristics. The findings have elucidated that there are specific college characteristics that are indicative of schools serving students who are most in need of targeted interventions. It is now clearer that there are specific college characteristics that moderate the impact of environmental strategies for preventing alcohol problems on college students.

This analysis found that college housing is predictive of AOD problems on college campuses. This analysis also found that alcohol availability and price did seem to have some impact on alcohol-related outcomes in college students. Specifically, Sunday sales bans were associated with reduced consumption and alcohol-related disciplinary actions on public property among college students in states with bans in place. In addition, increased alcohol taxes were associated with reduced disciplinary actions on college campuses over time in Maryland. This finding is in line with a prior study that found that some college students respond significantly to alcohol price changes (Chaloupka & Wechsler, 1996). The response to change in price was moderated by gender, with male

students insensitive to alcohol price changes, but female students significantly responsive. Future research and targeted interventions could focus on AOD prevention among males in college housing.

5.2 Limitations

The primary critique against the utility of Clery data is that it is incomplete (Maryland Collaborative to Reduce College Drinking and Related Problems, 2013). For instance, if an incident of underage drinking is reported to a resident advisor staffing the dormitory of a school, or even to dean of a school, critics would deem it unlikely that incident will be captured in Clery data. A decision on whether this is or is not the case could only be speculative.

There are also several limitations to consider regarding BRFSS data. First, data for households without telephones are not captured in the BRFSS dataset. Second, although BRFSS subjects are repeatedly telephoned, interviewers are not always successful in reaching the randomly selected adult for the survey. Moreover, when the randomly selected adult is contacted, he/she may not consent to participation. Third, in 2011 and 2012, cellular phones were added to the BRFSS sample—there are issues with comparability in samples due to the revision in sampling technique. Lastly, any self-report data is subject to error—a participant may not remember events to report, may under- or over-report behaviors due to perceived sigma or desirability of those behaviors.

In the model specification stage of this research, theoretical relationships regarding three primary variables (college characteristics, tax increases, and commercial availability) were considered to be related to three specific adverse alcohol-related outcomes (law violations, binge drinking, and consumption). Although potential

moderating relationships were explored in this research, there are other unmeasured or unseen confounding, mediating or moderating variables not considered in these analyses. In addition, this research design assumes relative homogeneity of the college campuses that are included in the analyses—that the "culture" of drinking or not drinking is consistent from school to school, across groups within each school, and that each individual student within a school experiences similar exposure to alcohol. With this study design, there is no attempt to measure how or if alcohol is encountered. The frequency of exposure to alcohol may vary across schools, across sub-populations of students within a school, and across students within a sub-population.

Analysis for the state of Maryland may not be generalizable to other states. The BRFSS data are subject to information bias that comes with self-report data, while, theoretically, selection bias doesn't exist in Clery data—these are surveillance data with mandatory reporting. However, if the alcohol data are incomplete because of underreporting, resulting estimates would likely err on the side of deflating detected associations. If any schools have administrative staff that are hyper-vigilant about reporting alcohol-related incidents (potentially reporting incidents that are not law violations), resulting estimates would be inflated. In completing the analysis, school price moderated the relationship between the MD tax and alcohol related disciplinary actions on campus. This may be indicative of a differential relationship to reporting by school resources.

5.3 Strengths

This research capitalized on the new inclusion of cellular phones to the BRFSS random digit dialing sampling frames. Including cell numbers in the frames caused

tremendous improvements in numbers of responses from the previously elusive young adult population, which was critical to this proposal.

The recent efforts across U.S. colleges and universities to collect and report Clery data, along with the subsequent publication of those data has been an enormous and expensive undertaking. The criticisms that Clery data are incomplete and thus lack utility seem to be false considering this analysis, where both Clery data and BRFSS data results indicated similar conclusions—that states with Sunday sales bans see decreased alcohol-related law violations among college students. This comparison of results from analysis of Clery data to analysis of BRFSS data is an important contribution to the field of higher education surveillance.

This research met several important standards of research quality. First, the conceptual framing of this study was grounded in the ecological model, a long-accepted framework for behavior theories, including those related to alcohol consumption. Second, this study design was deliberately transparent. Upon the completion of this work, other researchers should be able to access the same publically available data, run the analyses described herein, and replicate these results. In the future, these methods can be repeated to include additional years of data as those data become available, and if any future national college related drinking data are collected, these methods are easily modified and transferrable for other outcomes. Third, the data and analyses selected are appropriate for the question—there is no need to re-establish accepted causal linkages between alcohol legislation and alcohol problems in the general population. This research attempts to answer questions about the utility of the most heralded alcohol legislation for preventing alcohol problems in college students, who make up a sub-population

experiencing an alarming epidemic of alcohol problems. Lastly, this study uses several years of data and evaluates pre-and post-intervention periods to maximize internal validity.

References

Abbey, A. 2002, "Alcohol-related sexual assault: A common problem among college students", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 118.

Arria, A.M., Caldeira, K.M., O'Grady, K.E., Vincent, K.B., Fitzelle, D.B., Johnson, E.P. & Wish, E.D. 2008, "Drug exposure opportunities and use patterns among college students: results of a longitudinal prospective cohort study", *Substance abuse : official publication of the Association for Medical Education and Research in Substance Abuse,* vol. 29, no. 4, pp. 19-38.

Blanco, C., Okuda, M., Wright, C., Hasin, D., Grant, B., Liu, S. & Olfson, M. 2008, "Mental health of college students and their non-college-attending peers: Results from the national epidemiologic study on alcohol and related conditions", *Archives of General Psychiatry,* vol. 65, no. 12, pp. 1429-1437.

Bouchery, E.E., Harwood, H.J., Sacks, J.J., Simon, C.J. & Brewer, R.D. 2011, "Economic costs of excessive alcohol consumption in the U.S., 2006", *American Journal of Preventive Medicine,* vol. 41, no. 5, pp. 516-524.

Brewer, D.J., Eide, E.R. & Ehrenberg, R.G. 1999, "Does it pay to attend an elite private college? Cross-cohort evidence on the effects of college type on earnings", *Journal of Human Resources,* , pp. 104-123.

Bronfenbrenner, U. 1986, "Ecology of the family as a context for human development: Research perspectives.", *Developmental psychology,* vol. 22, no. 6, pp. 723.

Bronfenbrenner, U. 1977, "Toward an experimental ecology of human development.", *American psychologist,* vol. 32, no. 7, pp. 513.

Caldeira, K.M., Arria, A.M., O'Grady, K.E., Zarate, E.M., Vincent, K.B. & Wish, E.D. 2009, "Prospective associations between alcohol and drug consumption and risky sex among female college students", *Journal of Alcohol and Drug Education,* vol. 53, no. 2, pp. nihpa115858.

Carter, A.C., Brandon, K.O. & Goldman, M.S. 2010, "The college and noncollege experience: a review of the factors that influence drinking behavior in young adulthood", *Journal of studies on alcohol and drugs,* vol. 71, no. 5, pp. 742-750.

Centers for Disease Control and Prevention (CDC) 2012, "Vital signs: binge drinking prevalence, frequency, and intensity among adults - United States, 2010", *MMWR.Morbidity and mortality weekly report,* vol. 61, no. 1, pp. 14-19.

Centers for Disease Control and Prevention (CDC) 2010-2012, "Behavioral Risk Factor Surveillance System Survey Data (BRFSS)", *Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention,* .

Centers for Disease Control and Prevention (CDC) 2004, "Alcohol-attributable deaths and years of potential life lost--United States, 2001", *MMWR.Morbidity and mortality weekly report,* vol. 53, no. 37, pp. 866-870.

Chaloupka, F.J. & Wechsler, H. 1996, "Binge drinking in college: The impact of price, availability, and alcohol control policies", *Contemporary Economic Policy,* vol. 14, no. 4, pp. 112-124.

Chen, P. & Jacobson, K.C. 2013, "Longitudinal Relationships Between College Education and Patterns of Heavy Drinking: A Comparison Between Caucasians and African-Americans", *Journal of Adolescent Health,* vol. 53, no. 3, pp. 356-362.

Chisholm, D., Rehm, J., Van Ommeren, M. & Monteiro, M. 2004, "Reducing the global burden of hazardous alcohol use: a comparative cost-effectiveness analysis", *Journal of Studies on Alcohol and Drugs,* vol. 65, no. 6, pp. 782.

Clements, R. 1999, "Prevalence of alcohol-use disorders and alcohol-related problems in a college student sample", *Journal of American College Health,* vol. 48, no. 3, pp. 111-118.

Cooper, M.L. 2002, "Alcohol use and risky sexual behavior among college students and youth: Evaluating the evidence", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 101.

Crawford Sorey, K. & Harris Duggan, M. 2008, "Differential predictors of persistence between community college adult and traditional-aged students", *Community College Journal of Research and Practice,* vol. 32, no. 2, pp. 75-100.

Crews, F.T. & Boettiger, C.A. 2009, "Impulsivity, frontal lobes and risk for addiction", *Pharmacology, biochemistry, and behavior,* vol. 93, no. 3, pp. 237-247.

Davis, J. & Bauman, K. 2013, "School enrollment in the United States: 2011", *United States Census Bureau,* .

Devos-Comby, L. & Lange, J.E. 2008, "Standardized measures of alcohol-related problems: a review of their use among college students.", *Psychology of addictive behaviors,* vol. 22, no. 3, pp. 349.

Distilled Spirits Council of the United States (DISCUS) 2015, *, Sunday Alcohol Sales*. Available: http://www.discus.org/policy/sunday/ [2015, February 8].

Elder, R.W., Lawrence, B., Ferguson, A., Naimi, T.S., Brewer, R.D., Chattopadhyay, S.K., Toomey, T.L. & Fielding, J.E. 2010, "The effectiveness of tax policy interventions for reducing excessive alcohol consumption and related harms", *American Journal of Preventive Medicine,* vol. 38, no. 2, pp. 217-229.

Erickson, D.J., Lenk, K.M., Toomey, T.L., Nelson, T.F., Jones-Webb, R. & Mosher, J.F. 2014, "Measuring the Strength of State-Level Alcohol Control Policies", *World Medical & Health Policy,* vol. 6, no. 3, pp. 171-186.

Fillmore, K.M. & Wittman, F.D. 1982, "Effects of Availability of Alcohol on College Student Drinking: A Trend Study, The", *Contemp.Drug Probs.,* vol. 11, pp. 455.

Garnier, L.M., Arria, A.M., Caldeira, K.M., Vincent, K.B., O'Grady, K.E. & Wish, E.D. 2009, "Nonmedical prescription analgesic use and concurrent alcohol consumption among college students", *The American Journal of Drug and Alcohol Abuse,* vol. 35, no. 5, pp. 334-338.

Giancola, P.R. 2002, "Alcohol-related aggression during the college years: theories, risk factors and policy implications", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 129.

Grover, P.L. 1999, "Preventing Problems Related to Alcohol Availability: Environmental Approaches (Reference Guide)", .

Gruenewald, P.J. 2011, "Regulating availability: how access to alcohol affects drinking and problems in youth and adults", *Alcohol research and health,* vol. 34, no. 2, pp. 248.

Harrell, Z.A., Huang, J.L. & Kepler, D.M. 2013, "Brief report: Affluence and college alcohol problems: The relevance of parent-and child-reported indicators of socioeconomic status", *Journal of adolescence,* vol. 36, no. 5, pp. 893-897.

Heaton, P. 2012, "Sunday liquor laws and crime", *Journal of public economics,* vol. 96, no. 1, pp. 42-52.

Hill, K.G., White, H.R., Chung, I., Hawkins, J.D. & Catalano, R.F. 2000, "Early adult outcomes of adolescent binge drinking: person-and variable-centered analyses of binge drinking trajectories", *Alcoholism: Clinical and Experimental Research,* vol. 24, no. 6, pp. 892-901.

Hingson, R.W., Zha, W. & Weitzman, E.R. 2009, "Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students ages 18-24, 1998-2005", *Journal of Studies on Alcohol and Drugs,* , no. 16, pp. 12.

Hingson, R., Heeren, T., Winter, M. & Wechsler, H. 2005, "Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18–24: Changes from 1998 to 2001", *Public health,* vol. 26.

Hurlbut, S.C. & Sher, K.J. 1992, "Assessing alcohol problems in college students", *Journal of American College Health,* vol. 41, no. 2, pp. 49-58.

Jennison, K.M. 2004, "The short-term effects and unintended long-term consequences of binge drinking in college: a 10-year follow-up study", *The American Journal of Drug and Alcohol Abuse,* vol. 30, no. 3, pp. 659-684.

Jernigan, D.H. & Waters, H. 2009, *The potential benefits of alcohol excise tax increases in Maryland,* Johns Hopkins Bloomberg School of Public Health.

Johnston, L.D., O'Malley, P.M., Bachman, J.G. & Schulenberg, J.E. 2011, "Monitoring the Future National Survey Results on Drug Use, 1975-2010. Volume I, Secondary School Students.", *Institute for Social Research,* .

Johnston, L.D., O'Malley, P.M., Bachman, J.G. & Schulenberg, J.E. 2005, "Monitoring the Future: National Survey Results on Drug Use, 1975-2004. Volume I: Secondary School Students, 2004.", *National Institutes of Health,* .

Kessler, R.C., McGonagle, K.A., Zhao, S., Nelson, C.B., Hughes, M., Eshleman, S., Wittchen, H.U. & Kendler, K.S. 1994, "Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey", *Archives of General Psychiatry,* vol. 51, no. 1, pp. 8-19.

Knight, J.R., Wechsler, H., Kuo, M., Seibring, M., Weitzman, E.R. & Schuckit, M.A. 2002, "Alcohol abuse and dependence among U.S. college students", *Journal of studies on alcohol and drugs,* vol. 63, no. 3, pp. 263.

Lee, J. & Yoruk, B. 2014, "Does Legalization of Sunday Alcohol Sales Increase Crime?"Available: http://www.cesifo-group.de/portal/page/portal/DocBase_Content/WP/WP-CESifo_Working_Papers/wp-cesifo-2014/wp-cesifo-2014-11/cesifo1_wp5065.pdf [2015, February 8].

Lovenheim, M.F. & Steefel, D.P. 2011, "Do blue laws save lives? The effect of Sunday alcohol sales bans on fatal vehicle accidents", *Journal of Policy Analysis and Management,* vol. 30, no. 4, pp. 798-820.

Maddock, J.E., Laforge, R.G., Rossi, J.S. & O'Hare, T. 2001, "The college alcohol problems scale", *Addictive Behaviors,* vol. 26, no. 3, pp. 385-398.

Maryland Collaborative to Reduce College Drinking and Related Problems 2013, "College Drinking in Maryland: A Status Report", *Center on Young Adult Health*

and Development, University of Maryland School of Public Health, College Park, MD; and the Center on Alcohol Marketing and Youth, Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD, .

McKinney, L. & Novak, H. 2013, "The relationship between FAFSA filing and persistence among first-year community college students", *Community College Review,* vol. 41, no. 1, pp. 63-85.

McMillan, G.P., Hanson, T.E. & Lapham, S.C. 2007, "Geographic variability in alcohol-related crashes in response to legalized Sunday packaged alcohol sales in New Mexico", *Accident Analysis & Prevention,* vol. 39, no. 2, pp. 252-257.

McMillan, G.P. & Lapham, S. 2006, "Effectiveness of bans and laws in reducing traffic deaths", *Journal Information,* vol. 96, no. 11.

National Center for Education Statistics 2014, . Available: http://nces.ed.gov/collegenavigator/ [2014, March/17].

National Highway and Traffic Safety Administration (NHTSA) 2009, " *Traffic Safety Facts Research Notes, December 2009* http://www-nrd.nhtsa.dot.gov/Pubs/811250.pdf *Accessed April 28, 2012.*", .

National Institute on Alcohol Abuse and Alcoholism 2002, *A call to action: Changing the culture of drinking at U.S. colleges,* NIAAA Bethesda, MD.

National Institute on Alcohol Abuse and Alcoholism *, Retail Sales: Bans on Off-Premises Sunday sales* . Available: http://alcoholpolicy.niaaa.nih.gov/bans_on_off-premises_sunday_sales.html [2015, February 8].

Nelson, T.F., Naimi, T.S., Brewer, R.D. & Wechsler, H. 2005, "The state sets the rate: the relationship among state-specific college binge drinking, state binge drinking rates, and selected state alcohol control policies", *American Journal of Public Health,* vol. 95, no. 3, pp. 441-446.

Office of Postsecondary Education of the U.S. Department of Education 2014, *, The Campus Safety and Security Data Analysis Cutting Tool*. Available: http://www.ope.ed.gov/security/ [2014, March/17].

O'Neill, S.E., Parra, G.R. & Sher, K.J. 2001, "Clinical relevance of heavy drinking during the college years: cross-sectional and prospective perspectives.", *Psychology of Addictive Behaviors,* vol. 15, no. 4, pp. 350.

Perkins, H. 2002, "Social norms and the prevention of alcohol misuse in collegiate contexts", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 164.

Perkins, H. 2002, "Surveying the damage: A review of research on consequences of alcohol misuse in college populations", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 91.

Perkins, H.W. & Berkowitz, A.D. 1986, "Perceiving the community norms of alcohol use among students: some research implications for campus alcohol education programming*", *Substance use & misuse,* vol. 21, no. 9-10, pp. 961-976.

Popova, S., Giesbrecht, N., Bekmuradov, D. & Patra, J. 2009, "Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review", *Alcohol and Alcoholism (Oxford, Oxfordshire),* vol. 44, no. 5, pp. 500-516.

Presley, C.A., Meilman, P.W. & Leichliter, J.S. 2002, "College factors that influence drinking", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 82.

Rehm, J., Mathers, C., Popova, S., Thavorncharoensap, M., Teerawattananon, Y. & Patra, J. 2009, "Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders", *The Lancet,* vol. 373, no. 9682, pp. 2223-2233.

Room, R., Babor, T. & Rehm, J. 2005, "Alcohol and public health", *The lancet,* vol. 365, no. 9458, pp. 519-530.

Roper, D. 2015, *, Post-hoc Statistical Power Calculator for Multiple Regression*. Available: http://www.danielsoper.com/statcalc3/calc.aspx?id=9 [2015, February 9].

Schulenberg, J., Patrick, M., White, H. & Rabiner, D. 2012, "Historical and developmental patterns of alcohol and drug use among college students: framing the problem.", *College student drinking and drug use: multiple perspectives on a complex problem, Durham, North Carolina, USA, 18-19 May, 2010.*The Guilford Press, , pp. 13.

Schulenberg, J.E. & Maggs, J.L. 2002, "A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 54.

Scribner, R., Theall, K.P., Simonsen, N. & Robinson, W. 2010, "HIV Risk and the Alcohol Environment", *Alcohol Research & Health : The Journal of the National Institute on Alcohol Abuse and Alcoholism,* vol. 33, no. 3, pp. 179-183.

StataCorp *Stata Statistical Software: Release 13*, StataCorp LP, College Station, TX.

Stehr, M.F. 2010, "The effect of Sunday sales of alcohol on highway crash fatalities", *The BE Journal of Economic Analysis & Policy,* vol. 10, no. 1.

Swendsen, J., Burstein, M., Case, B., Conway, K.P., Dierker, L., He, J. & Merikangas, K.R. 2012, "Use and abuse of alcohol and illicit drugs in U.S. adolescents: Results of the National Comorbidity Survey–Adolescent Supplement", *Archives of General Psychiatry,* vol. 69, no. 4, pp. 390-398.

Task Force on Community Preventive Services 2010, "Increasing alcoholic beverage taxes is recommended to reduce excessive alcohol consumption and related harms", *Am J Prev Med,* vol. 38, no. 2, pp. 230-232.

Thomas Babor 2010, *Alcohol: no ordinary commodity: research and public policy,* Oxford University Press.

Toomey, T.L. & Wagenaar, A.C. 2002, "Environmental policies to reduce college drinking: Options and research findings", *Journal of Studies on Alcohol and Drugs,* , no. 14, pp. 193.

Tosevski, D.L., Milovancevic, M.P. & Gajic, S.D. 2010, "Personality and psychopathology of university students", *Current Opinion in Psychiatry,* vol. 23, no. 1, pp. 48-52.

Vernig, P.M. & Orsillo, S.M. 2014, "Drinking motives and college alcohol problems: a prospective study", *Journal of Substance Use,* , no. 0, pp. 1-7.

Wagenaar, A.C., Salois, M.J. & Komro, K.A. 2009, "Effects of beverage alcohol price and tax levels on drinking: a meta-analysis of 1003 estimates from 112 studies", *Addiction,* vol. 104, no. 2, pp. 179-190.

Wagenaar, A.C., Tobler, A.L. & Komro, K.A. 2010, "Effects of alcohol tax and price policies on morbidity and mortality: a systematic review.", *American Journal of Public Health,* vol. 100, no. 11.

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B. & Castillo, S. 1994, "Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses", *Jama,* vol. 272, no. 21, pp. 1672-1677.

Wechsler, H., Lee, J.E., Kuo, M., Seibring, M., Nelson, T.F. & Lee, H. 2002, "Trends in college binge drinking during a period of increased prevention efforts: Findings from 4 Harvard School of Public Health College Alcohol Study surveys: 1993–2001", *Journal of American College Health,* vol. 50, no. 5, pp. 203-217.

Wechsler, H., Moeykens, B., Davenport, A., Castillo, S. & Hansen, J. 1995, "The adverse impact of heavy episodic drinkers on other college students", *Journal of Studies on Alcohol and Drugs,* vol. 56, no. 6, pp. 628.

Wechsler, H., Seibring, M., Liu, I. & Ahl, M. 2004, "Colleges respond to student binge drinking: Reducing student demand or limiting access", *Journal of American College Health,* vol. 52, no. 4, pp. 159-168.

Wechsler, H., Dowdall, G.W., Davenport, A. & Castillo, S. 1995, "Correlates of college student binge drinking", *American Journal of Public Health,* vol. 85, no. 7, pp. 921-926.

Weitzman, E.R., Folkman, A., Kerry Lemieux Folkman, M. & Wechsler, H. 2003, "The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities", *Health & place,* vol. 9, no. 1, pp. 1-6.

White, H.R., Labouvie, E.W. & Papadaratsakis, V. 2005, "Changes in substance use during the transition to adulthood: A comparison of college students and their noncollege age peers", *Journal of Drug Issues,* vol. 35, no. 2, pp. 281-306.

White, H.R., McMorris, B.J., Catalano, R.F., Fleming, C.B., Haggerty, K.P. & Abbott, R.D. 2006, "Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors", *Journal of studies on alcohol,* vol. 67, no. 6, pp. 810-822.

Whiteman, S.D., Barry, A.E., Mroczek, D.K. & MacDermid Wadsworth, S. 2013, "The development and implications of peer emotional support for student service members/veterans and civilian college students.", *Journal of counseling psychology,* vol. 60, no. 2, pp. 265.

Yörük, B.K. 2014, "Legalization of Sunday alcohol sales and alcohol consumption in the United States", *Addiction,* vol. 109, no. 1, pp. 55-61.

Zeigler, D.W., Wang, C.C., Yoast, R.A., Dickinson, B.D., McCaffree, M.A., Robinowitz, C.B. & Sterling, M.L. 2005, "The neurocognitive effects of alcohol on adolescents and college students", *Preventive medicine,* vol. 40, no. 1, pp. 23-32.

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EDUCATION AND TRAINING

Degree	Year	*Institution*	*Department*	
BA	2001	Johns Hopkins Krieger School of Arts and Sciences	Public Health	Concentration: Social Sciences
MHS	2008	Johns Hopkins Bloomberg School of Public Health	Mental Health	Thesis: "Geographic Barriers to Drug Treatment on Demand in Baltimore City"
DrPH	expected 2015	Johns Hopkins Bloomberg School of Public Health	Mental Health	Dissertation: "Evaluation of State-Level Environmental Strategies for Preventing Alcohol Problems on U.S. College Campuses"

CURRENT PROFESSIONAL EXPERIENCE

Academic Advisor and Lecturer; Public Health Studies
January 2010 – Present
Johns Hopkins University Krieger School of Arts and Sciences

Primary Responsibilities:

- Serve as primary resource and coach for academic and long-term goal planning for Public Health Studies majors (currently advising 192 students).
- Teach several courses per year (currently teaching 10 credits, including PH in Film and Media; Uganda: Childhood, Health and Society; and Public Health in Cape Town, South Africa).
- Student Group Faculty advising: serve as advisor for international student groups doing volunteer work abroad in Honduras and Peru, and a student group focusing on substance use harm reduction in Baltimore.
- Facilitate program advisory board and academic committee efforts.
- Contribute to all levels of Council on Education for Public Health (CEPH) standalone baccalaureate program accreditation and to program-related portions of Middle States Accreditation.

Major Contributions:

- Developed three of the key courses offered in PHS—Uganda: Childhood, Health and Society (in intersession); Applied Geographic Information Systems in Public Health (in summer), and Public Health in Film and Media (in fall).
- Generated funding and personnel resources and designed processes for two large-scale experiential-learning academic programs.
    - Applied Experience in Public Health (2 credit requirement for all Public Health majors)
    - JHU Intersession in Uganda (3 credit course in Kampala, Uganda)
- Launched the "Urban Environments and Public Health" International Student program in Summer 2014.
- Recruited the three faculty that taught Public Health Studies courses at Homewood in Summer 2014 and prior years.

Other University Service:

- Advisory Board Member: B'more Freshman Experience. Currently manage annual evaluation processes for B'more, the optional school-wide experiential-learning introduction to Baltimore City for freshmen.
- Advisory Board Member: Community-Based Learning, Center for Social Concern
- Committee Member: Blue Ribbon Committee on Fraternity and Sorority Life
- Interviewer: Office of Pre-Professional Programs and Advising, Health Professions Committee interviews

TEACHING—AS PRIMARY FACULTY

Intersession 2013, 2014, and 2015	*Childhood Health and Society in Uganda (21 students)*

JHU students join students from Uganda's Makerere University for a unique experiential peer-to-peer learning experience. Students learn about the strengths and challenges faced by urban and rural child health and education initiatives in Uganda. Students first examine health and education issues in a rural setting and at the Rakai Health Sciences Program, a world-class public health research facility. Students then spend time in an urban setting in Kampala, the country's capital, for hospital and school tours, guest lectures, student-driven site visits and volunteer opportunities.

Fall 2011, Fall 2012
Fall 2013, Fall 2014

Public Health in Film and Media (65 students)

This course uses film to explore and question the cultural landscape of public health in United States and internationally.

Summer 2011
Summer 2010
Fall 2010

Urban Health and Advocacy (10 students)

Presents psychosocial problems impacting health that face urban residents; offers perspectives on the history and utility of advocacy in addressing urban health issues.

Summer 2012

Applied GIS in Public Health (8 students)

Provides an introduction to basic Cartography and Geographic Information Systems terminology and tools. Requires students to apply course material to public health problems, and to create and present complex maps of professional quality.

OTHER TEACHING

Fall 2010

Guest Lecturer: Place-Based Public Health: Historical and Current Examples

This lecture was presented within the larger History course entitled "The Power of Place"

Summer 2010

Facilitator: Public Health Studies Internship (Johns Hopkins University)

A 10-week experience designed to provide insight into the social determinants of health in Baltimore City for students who volunteer with Project HEALTH.

Summer 2009 and 2010

Instructor: Public Health Research Methods (DIVE Scholars Internship: Johns Hopkins School of Public Health)

An 8-week lecture series that provided students with the basics of health research methodology: Research Methods Basics, Lit Review, Scientific Writing, Data Analysis, and Data Visualization

PUBLICATIONS (In Print)

1. Brown, Q.L., Milam, A.J., **Smart, M.J.,** Johnson, R.M., Linton, S.L., Furr-Holden, C.D.M., Ialongo, N.S. (2014) Association of objective and perceived neighborhood characteristics with tobacco use among young adults. *Drug and Alcohol Dependence*, 1(134):370-5.
2. Milam, A., Furr-Holden, C.D.M., Whitaker, D., **Smart, M.J.**, Leaf, P., Cooley, M., (2012). Neighborhood Environment and Internalizing Problems in African American Children. *Community Mental Health Journal,* 48(1):39-44.
3. Gibbons, L., Pollack, K., Curriero, F., Shields, T., **Smart, M.,** Furr-Holden, C.D.M., and Cooley, M. (2011). Neighborhood Incivilities, Perceived Neighborhood Safety and Walking Behavior among Urban-Dwelling Children. *Journal of Physical Activity and Health,* 8(2):262-71.
4. Furr-Holden, C.D.M., Campbell, K.D., Milam, A.J., **Smart, M.J.**, Ialongo, N.A., Leaf, P.J. (2010). Metric Properties of the Neighborhood Inventory for Environmental Typology (NIfETy): an environmental assessment tool for measuring indicators of violence, alcohol, tobacco and other drug exposures. *Evaluation Review*, 34(3), 159-84.
5. Furr-Holden, C.D.M., Voas, R.B., Lacey, J., Kelley-Baker, T., Romano, E., **Smart, M.J.** (2009). Toward National Estimates of Alcohol Use Disorders Among Drivers: Results from the National Roadside Survey Pilot Program. *Traffic Injury Prevention*, 10(5), 403-9.
6. Furr-Holden, C.D.M.; **Smart, M.J**.; Pokorni J.P.; Ialongo, N.S; Holder, H.; Anthony, J.C. (2008) The NIfETy Method for Environmental Assessment of Neighborhood-level Indicators. *Prev Sci*. 9(4), 245-55.
7. Lee, K.T.; Gillette, A.; Badian, H.; and **Smart, M.J**. (2003) Using information technology to effect desired behavior in the point-of-care testing environment.

Point of Care: The Journal of Near patient testing and technology. Point of Care. 2(3):183–187.

PUBLICATIONS (Under Review)

1. Esser, M., Walters, H., **Smart, M.J**., Jernigan, D. Impact of Maryland's 2011 Alcohol Sales Tax Increase on Alcoholic Beverage Sales. *American Journal of Preventive Medicine*.
2. **Smart, M.J.,** Thorpe Jr., R.J., Furr-Holden, C.D.M. Alcohol and Other Drug Related Law Violations in Maryland Colleges and Universities. *Journal of American College Health*.

PUBLICATIONS (In Progress)

1. Garoon, J., **Smart, M.J.**, Milam, A.J., Duncan, A., Warren, G., Furr-Holden, C.D.M., Triangulating Syndemic Services: Using Spatial Analysis of Injection Drug Use and HIV Incidence to Improve Drug Treatment Portal Locations in Baltimore City. *Substance Abuse and Rehabilitation.*
2. **Smart, M.J.**, Furr-Holden, C.D.M. Impact of Sunday Alcohol Sales Bans on U.S. College Students' Alcohol-Related Outcomes. *Health and Place*.
3. **Smart, M**.J., Furr-Holden, C.D.M. Impact of Maryland Alcohol Tax Increase on U.S. College Students' Alcohol-Related Outcomes. *Journal of Studies on Alcohol and Drugs*.
4. **Smart, M.J.**, Garoon, J., Milam, A.J., Duncan, A., Alexandre, P., Furr-Holden, C.D.M. Triangulating HIV/IDU Syndemic Service Placement using Spatial Analysis. *Substance Use and Misuse*.
5. **Smart, M.J.**, Kaldeira, K., Arria, A., Ethnic Variation in Patterns and Mental Health Correlates of Discontinuous Enrollment During College. *Journal of American College Health*.
6. **Smart, M.J.**, Karuhanga, G. Policy Interventions for Preventing Alcohol Problems in Uganda: Difficulties and Opportunities. *The African Journal of Drug and Alcohol Studies*.

HONORS AND AWARDS

NIDA Drug Dependence Epidemiology Fellowship 2011-2013

The NIDA-funded Drug Dependence Epidemiology Training (DDET) Program is designed to increase the number and quality of expert drug dependence epidemiologists, with special focus on HIV and advanced statistical methods to the design and analysis of epidemiologic study. Trainees achieve this through a rigorous program of coursework, research apprenticeships, and integrative activities that provide a solid foundation in the area of drug dependence epidemiology.

JHU Faculty Technology Fellowship 2011-2012

The Technology Fellowship Program is a competitive mini-grant initiative that encourages Hopkins faculty to develop digital course resources by combining their instructional expertise

and project design capabilities with the technology skills of students who are interested in enhancing their digital portfolios. The focus of this program is to create instructional resources that support undergraduate education.

PAST PROFESSIONAL EXPERIENCE

Senior Research Program Coordinator II
January 2009 – January 2010
Johns Hopkins University Bloomberg School of Public Health

Managed the Drug Investigations, Violence and Environmental (DIVE) Studies Laboratory operations including:

- Grant proposal crafting and submission, IRB compliance, and subcontract management. Managed procurement and budget tracking. Supervised the maintenance of ACCESS, Excel, ArcGIS and SPSS databases. Supervised maintenance of a confidential Pendragon database on secured network server that remotely integrates data from field staff.
- Responsible for the overall management of all DIVE research projects, including all follow-up components for a longitudinal study of approximately 1000 subjects from several samples. Simultaneously planned and organized implementation of several smaller research studies. Served as a primary point of contact for several of our group's research collaborators and consultants. Established, communicated, and maintained working relationship with project partners regarding data access and attainment.
- Supervised all Research Assistants and Research Program Assistants, including review, hire, discipline and termination. Directly supervised three Research Program Assistants, two Research Assistants, and one Graduate Assistant and 20+ Field Data Collectors.
- Represented DIVE Studies Laboratory at national meetings and teleconferences. Supervised establishment and maintenance of study protocol manuals. Supervised adherence to study protocols. Met regularly with senior RPAs for review of data accuracy and overall progress. Collaborated with faculty on presentations, written manuscripts, and grant proposals. Ensured security and confidentiality of all data.

Senior Research Program Supervisor
October 2007 – December 2008
Johns Hopkins University Bloomberg School of Public Health

- Designed and created protocol-specific reports and manuscripts. Supervised maintenance of ACCESS, Excel, ArcGIS, Pendragon and SPSS databases. Managed a confidential Pendragon database on secured network server that remotely integrates

data from field staff. Generated and maintained spreadsheets from this database for tracking participant activity. Maintained working relationship with project partners regarding data access and attainment. Supervised 20-25 RPAs; to include the ability to hire, discipline and terminate. Represented NIfETy Project at national study meetings and teleconference calls. Established and maintained study protocol manuals. Responsible for reporting to IRB. Met regularly with team for review of data accuracy and progress. Trained project staff regarding data protocols. Collaborated with project team on presentations, written manuscripts, and grants relating to project data.

Research Associate
November 2005 – September 2007
Pacific Institute for Research and Evaluation (PIRE)

- Assisted PI with conducting research in areas relevant to: 1) drug and alcohol dependence epidemiology, prevention, and measurement; 2) violence exposure and prevention in children, adolescents and young adults; and 3) environmental approaches to ATOD and violence prevention. Collaborated with investigative teams within the Prevention Services Research Institute branch of PIRE and participated in methodology workgroup meetings across sites and institutes within PIRE. Trained, coordinated, and supervised a team of up to twenty research assistants to conduct environmental surveys using personal digital assistants.

Research Assistant
May 2005 – November 2005
Pacific Institute for Research and Evaluation (PIRE)

- Assisted in the study questionnaire programming, subject interviewing, data collection, library research, training and supervision of field interviewers for various projects, correspondence.

Community Relations Coordinator
February 2004 – November 2005

Johns Hopkins Bayview Medical Center

- Designed and implemented Public Health promotion materials and programming for the population within the hospital catchment area.

Research Assistant
Department of Sociology
June 2000 – June 2001

Johns Hopkins University Krieger School of Arts and Sciences

- Worked on a sub-project of the Beginning School Study. Interviewed young men and women to gather data regarding the sociological pathways to independence (Pathways to Adulthood). Coordinated services for participants and the project as a whole. Set-up and maintained database. Constructed mini-profiles that are still utilized by Pathways to Adulthood researchers to-date.

RESEARCH GRANT PARTICIPATION (WITHIN THE PAST 5 YEARS)

"Pilot: Measuring the Impact of Municipal Alcohol Outlet Intervention on Violence Exposure in Youth" **4/1/08 - 8/31/2009**

Centers for Disease Control and Prevention Johns Hopkins Center for the Prevention of Youth Violence

Principal Investigator: Furr-Holden

This project aims to determine the feasibility of measuring the impact of alcohol outlets on violence exposure in youth residing in Baltimore City, Maryland.

"Data Driven Health Initiatives" **1/1/09 - 12/31/09**

Johns Hopkins Urban Health Institute

Principal Investigator: Furr-Holden

This project bridges resources, agencies, and data to further local health promotion initiatives, specifically in the area of children's exposure to violence and create a database that can be used in future urban health promotion initiatives across a broader range of topics.

"Understanding Neighborhood and Environmental Risks for HIV and AIDS" **1/1/09 - 12/31/09**

Hopkins Center for Health Disparities Solutions

Principal Investigator: Furr-Holden

This investigation provides data to advance the evidence base for environmental strategies and ultimately enhance the comprehensiveness and effectiveness of existing HIV intervention programs in Baltimore and provide a model for use in other urban locations.

"Environmental Strategies for Violence and AOD Prevention" **4/1/05 – 3/31/11**
R01 AA 015196

National Institute on Alcoholism and Alcohol Abuse

Principal Investigator: Furr-Holden

The investigation seeks to classify both individual- and community-level distributions and determinants of violence and alcohol and other drug (AOD) exposure by identifying environmental factors associated with increased neighborhood violence and AOD exposure among youth.

SELECTED PRESENTATIONS

Nov, 2014 Law, A., **Smart, M**. (Invited Panelist), Lucas, E., Torp, M. *Weaving a Web: Linking Education Abroad with Career Exploration*. Panel Presentation at the Council on International Educational Exchange annual meeting. Baltimore, MD.

Nov, 2014 Citti, L., **Smart, M**. (Invited Panelist), Rinker, C. *Crisis Management and Emergency Response: Case Studies for Israel and Uganda*. Panel Presentation at the International Resident Director annual workshop. Baltimore, MD.

May, 2013 **Smart, M**. *Monitoring the Impact of Legislative Alcohol Abuse Prevention*. Paper Presentation at the Kettil Bruun Society for Social and Epidemiological Research on Alcohol Annual Conference. Munyonyo, Uganda.

May, 2013 **Smart, M**. *Policy Interventions for Preventing Alcohol Problems in Uganda: Difficulties and Opportunities.* Presenter and Chair of panel-style paper presentation at the Kettil Bruun Society for Social and Epidemiological Research on Alcohol Annual Conference. Munyonyo, Uganda.

Oct., 2012 **Smart, M**. (Invited Panelist) *Science Students Studying Abroad: Benefits and Challenges*. Paper Presentation at the Danish Institute for Study Abroad International Educators' Workshop. Copenhagen, Denmark.

Oct., 2011 **Smart, M**.; Folda, L. *Applied Experience in Public Health from Baltimore, MD to Cape Town, South Africa*. Paper Presentation at the Annual Stevenson University Faculty Development Conference. Baltimore, Maryland.

July, 2010 **Smart, M.** *Tools of the Advocacy Trade*. Oral Presentation at Baltimore City Data Day. Baltimore, Maryland.

April 2009 Biggs, J.; **Smart, M.**; Furr-Holden, CDM. *The Effects of Government Surveillance on Drug Activity and Perception of Risk in Baltimore City Neighborhoods*. Poster presentation at the Annual Society for Research on Child Development. Denver, Colorado.

March 2009 **Smart, M.**; Whitaker, D., Furr-Holden, CDM. Neighborhood Environmental Variables as Predictors of Juvenile Drug Arrest. Oral Presentation at the Annual American Association of Geographers meeting. Las Vegas, Nevada.

Jan 2009 **Smart, M.** *Research to Practice Collaborations*. Presentation of methods and tips for successful translation from research findings to policy impact. Presented as a member of the NIH Grantee Panel on Research Collaborations at the U.S. Department of State. Washington, District of Columbia.

TESTIMONY

July 2009 *Baltimore City Council*

Reported to the City Council on the geographical analysis of adherence to local alcohol legislation regarding commercial alcohol sales establishments within 300 feet of churches and schools in Maryland.

SERVICE

Mutete HIV/AIDS Foundation, Advisory Board Member	2013-present
College Success Foundation; Application Reader	2011-present
The Public Squared, Advisor	2011-present

ADDITIONAL INFORMATION

Keywords: alcohol abuse, prevention, college, emerging adulthood, epidemiology, law, legislation, evaluation, monitoring, East Africa.

Brief Biography: Mieka Smart is a drug and alcohol epidemiologist by training through the National Institute on Drug Abuse (NIDA) at Johns Hopkins University Bloomberg School of Public Health in the Department of Mental Health. She currently teaches and advises students in the Johns Hopkins University Undergraduate Public Health Studies Program. Her research interests are in 1) prevention and early detection of adverse stress-response outcomes in college students, particularly alcohol use disorders, and 2) evaluation of public health law through epidemiologic research in domestic and international settings.

Technology/Computing: ArcMap, SPSS, Stata, LISREL, HTML, PenDragon, EpiCollect, Site Executive, Adobe Connect, Blackboard, Baseline CampusLabs, Wordpress, Google Blogger.