

TESTING THE INTERACTION OF ALCOHOL OUTLET DENSITY AND
PERSONALITY TRAITS IN THE PREDICTION OF DRINKING AND DRIVING

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PERSONALITY TRAITS IN THE PREDICTION OF DRINKING AND DRIVING

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ABSTRACT

National and state policy efforts have had a dramatic impact on the reduction of drinking and driving fatalities over the past three decades; however, these effects reached a plateau in recent years. Personality characteristics have repeatedly shown to be related to a variety of risky behaviors including substance use and drinking and driving. The current project utilized data from Wave III and Wave IV from the National Longitudinal Study of Adolescent Health to test the interaction of personality traits and alcohol outlet density (AOD), which is one aspect of alcohol policy shown to be related to drinking and driving. SAS PROC GLIMMIX was used to fit nested (within states) logit models for self-reported drinking and driving and DUI. Results indicated that disinhibition and extraversion were associated with increased odds of drinking and driving and DUI, while agreeableness, conscientiousness, and anxiety were associated with decreased odds. Additionally, there was a significant interaction between disinhibition and alcohol outlet density, such that there was a stronger association between personality and drinking and driving as alcohol outlet density increased. There was no main effect for alcohol outlet density on drinking and driving. Results from this study provide initial evidence that while personality characteristics are important predictors of drinking and driving, for some traits, the availability of alcohol may impact that association.

INTRODUCTION

The National Highway Transportation Safety Administration (NHTSA) estimates that in 2010, 32% of all traffic fatalities involved an alcohol-impaired driver (i.e., a driver with a blood alcohol concentration of .08% g/dL or higher at the time of the accident (NHTSA, 2013)). Policy changes enacted in the 1980s have had a dramatic impact in reducing drinking and driving (Bernat, Danusmuir, & Wagenaar, 2004; Shults, Elder, Hungerford, Strife, & Ryan, 2009), but these effects reached a plateau in recent years (Yi, Chen, & Williams, 2006). This plateau suggests that current national and state policies regarding drinking and driving might not be a sufficient deterrent for some individuals. There is considerable evidence for several personality characteristics as predictors of risky behaviors (Gilbert & Gilbert, 1995; Hong & Paunonen, 2009; Hoyle, Fejfar, & Miller, 2000), and more specifically, drinking and driving (Donovan & Marlatt, 1982; Jonah, 1997). Alcohol outlet density (i.e., the number of locations in a given area where alcohol may be legally sold) is one type of alcohol policy that has been found to be associated with drinking and driving and other alcohol-related behaviors. The proposed project examined the interaction between alcohol outlet density and personality traits in the prediction of drinking and driving.

Alcohol Policy

Problems related to drinking and driving became apparent soon following the introduction of motor vehicles in American society, but it was not until the 1980s that policy efforts to reduce drinking and driving became a top priority for both national and

state legislators (Williams, 2006). Several laws enacted during this time (e.g., establishing a minimum drinking age, per se laws, zero-tolerance for underage drivers) have contributed to considerable decreases in drinking and driving rates (Babor, 2010; Bernat et al., 2004; Jonah et al., 2000; Voas, Tippetts, & Fell, 2003; Wagenaar & Toomey, 2002) as well as decreases in traffic fatalities (Yi et al., 2006; Hingson & Howland, 1990; Shults et al., 2009; Tippetts, Voas, Fell, & Nichols, 2005).

Not all policies are equally effective at reducing drinking and driving behavior (Anderson & Baumberg, 2006; Babor, 2010) or their effects are short lived (Voas, Marques, Tippetts, & Beirness, 1999; Willis, Lybrand, & Bellamy, 2004). The greatest decreases in traffic fatalities occurred in states with the strictest legislation and prevention strategies (i.e., several and/or stricter laws, sobriety check points; Tippetts et al., 2005). Although some policies, such as legislation specific to server training/liability, do not appear to reduce intoxicated driving (Lang, Stockwell, Rydon, & Beel, 1998), these policies become more effective when combined with other legislation and/or prevention efforts (Wagenaar, Murray, & Toomey, 2000). Alcohol interlocks, devices designed to require alcohol-free breath samples to start and/or continue driving, have been mandated in some states for DUI offenders. These devices have been found to reduce drinking and driving behavior and significantly decrease the rate of fatal car crashes, but these effects do not appear to last after the interlock device is removed (Voas et al., 1999; Willis et al., 2004).

Legislation related to lowering BAC levels, random breath testing, license suspension, and stricter legislation for young drivers (i.e., lower BACs, graduated licenses) are the most effective at decreasing drinking and driving behavior (Anderson &

Baumberg, 2006; Babor, 2010). Policies aimed at lowering BAC levels have been more extensively researched and their positive effects are evident across countries (Anderson & Baumberg, 2006; Mann et al., 2001, for a comparison with other countries). In the United States, lowering the BAC limit from 0.10% to 0.08% led to decreases in fatal crashes (Bernat et al., 2004; Jonah et al., 2000; Trippetts et al., 2005) as well as lower rates of self-reported drinking and driving behavior (Chou et al., 2005). Data from research conducted outside the United States suggests that legislation to further reduce the BAC limit would likely produce additional decreases in fatal car crashes (Mann et al., 2001); however, the expected reductions would not be as pronounced (Anderson & Baumberg, 2006). For example, lowering the BAC limit from 0.08% to 0.05% in Australia (Nagin, 1998) and Denmark (Bernhoff & Behrendorff, 2003) and from 0.05% to 0.02% in Sweden (Borschos, 2000) decreased the rate of car accidents due to drinking and driving, but some effects diminished with time (Nagin, 1998). Additionally, Bernhoff and Behrendorff (2003) noted that although lowering the BAC limit reduced most types of motor vehicle accidents, the rate of fatal motor vehicle accidents was not reduced. This is likely due to the fact that fatal car accidents are often associated with higher BAC levels than non-fatal car accidents (NHTSA, 2013; Royal, 2003).

Alcohol Outlet Density

Unlike legislation aimed at lowering the BAC limit, policies aimed at reducing the availability of alcohol by regulating when and where alcohol is sold often vary within states. The regulation of alcohol outlet density (AOD) is a reflection of alcohol policies aiming to decrease alcohol-related harms by reducing the availability of alcohol outlets.

The Surgeon General's Workshop on Drunk Driving in 1988 made specific recommendations for regulating alcohol outlet density in an effort to reduce fatalities and injuries related to drunk driving (U.S. Department of Health and Human Services, 1988). Despite this, there is little research evaluating the effects of reducing alcohol outlet density. Research on the effects of alcohol bans on Native American reservations, leading to a decrease in AOD, generally found reductions in alcohol-related harms (Berman, Hull & May, 2000; Chiu, Perez, & Parker 1997) and a reversal of these effects when the ban was lifted in one community (Chiu et al., 1997). It should be noted that the effect of alcohol bans appears to be dependent on the availability of alcohol in the surrounding communities, and in some cases, the availability of alcohol in an adjacent community may increase risk of death due to individuals traveling farther distances in order to consume alcohol (Campbell et al., 2009). Banning the sale of high alcohol content beer in grocery stores in Sweden, which resulted in a reduction in AOD, led to declines in hospitalizations due to alcohol intoxication as well as decreases in motor vehicle crashes (Ramstedt, 2002). In the United States, research investigating the effects of random closures of alcohol outlets following extensive damage produced by the Los Angeles riots showed that a decrease in AOD was associated with a reduction in violent crime (Yu et al., 2008). Although few, these studies indicate that policy changes aimed at reducing availability of alcohol by limiting the number of outlets may reduce harm related to alcohol consumption.

The majority of research on AOD has primarily focused on cross-sectional associations between alcohol-related harms and density of alcohol outlets. This research has found consistent evidence that greater AOD is associated with increased alcohol

consumption (Pollack, Cubbin, Ahn, & Winkleby, 2005; Weitzman, Folkman, Folkman, & Wechsler, 2003) as well as increased crime (Gyimah-Brempong, 2001), violence (Gorman, Speer, Gruenewald, & Labouvie, 2001; Norstrom, 2000; Reid, Hughey, & Peterson, 2003), campus sexual assaults (Scribner, et al., 2010), and STI rates (Cohen et al., 2006). These effects are more pronounced in low socioeconomic neighborhoods (Gorman et al., 2005; Reid et al., 2003).

The association between AOD and drinking and driving is more complex. Several studies found a positive association between AOD and drinking and driving (Treno, Grube, & Martin, 2003) as well as alcohol related vehicle accidents (Escobedo & Ortiz, 2002). However, other studies have found a negative association between AOD and drinking and driving (Colon & Cutter, 1983). Type of outlet appears to be important as well and may help explain conflicting findings in the literature. Greater restaurant density is associated with higher drinking and driving rates while a higher density of bars is associated with lower drinking and driving rates (Gruenewald, Johnson, & Treno, 2002). A higher concentration of bars is associated with greater rates of assaults while this was not found in high restaurant density neighborhoods (Lipton & Gruenewald, 2002). This suggests that type of alcohol outlet is related to specific types of alcohol related problems. Two recent reviews of the AOD literature concluded that reducing the number of alcohol outlets would be an effective method in reducing harm attributable to alcohol (Campbell et al., 2009; Popova, Giesbrecht, Bekmuradov, & Patra, 2009).

Risky Behaviors and Personality Traits

Despite the positive impact of policy changes, reductions in drinking and driving behavior and fatal accidents have reached a plateau in recent years (Yi et al., 2006) suggesting that current national and state policies on drinking and driving offenses might not be enough in deterring this behavior for some individuals. Furthermore, research on DUI recidivism suggests that current policies do not have the same effect on all individuals, and additional stricter policies will likely not deter drinking and driving for these individuals (Nochajski & Staiewicz, 2006; Schell, Chan, & Morral, 2006; Williszowski, Murphy, Jones, & Lacey, 1996). A large body of research suggests that individual differences in personality traits are important predictors of a wide range of problematic and risky behaviors (Miller, Lynam, Widiger, & Leukefeld, 2001; Miller et al., 2004; Sher & Trull, 1994) including drinking and driving (Jonah, 1997).

While there have been several studies which examined the relationship between personality traits and drinking and driving (Donovan & Marlatt, 1982; Jonah, 1997), the vast majority of research has looked at drinking and driving as one of many risky behaviors. For example, drinking and driving has been studied as part of the broader domain of traffic violations (Dahlen & White, 2006; Smith & Kirkham, 1981), speeding (Jonah & Dawson, 1987), as well as other delinquent behaviors (Jessor, 1987). There is considerable evidence for several personality characteristics as predictors of risky behaviors (Gilbert & Gilbert, 1995; Hong & Paunonen, 2009; Hoyle et al., 2000; Martin & Boomsma, 1989; Miller et al., 2004; Trull & Sher, 1994). The Five-Factor Model (FFM) identifies five broad dimensions of personality traits: neuroticism, extraversion,

openness to experience, conscientiousness, and agreeableness (Costa & McCrae, 1992). These broad dimensions of personality are often broken down into more narrow personality traits (e.g., sensation seeking, hostility, impulsivity) which have also been shown to predict risky behaviors (Hoyle et al., 2000; Zuckerman & Kuhlman, 2000) and to differentiate among specific risky behaviors (Whiteside, Lynam, Miller, & Reynolds, 2005). This literature will be reviewed from a FFM framework.

Extraversion

Extraversion is a broad personality domain that consists of traits such as sociability, assertiveness, and high activity levels. Individuals high on extraversion engage in a variety of risky behaviors (Cooper, Agocha, & Sheldon, 2000; Hong & Paunonen, 2009) as well as antisocial behaviors (Miller et al., 2001). In regard to general health related risky behaviors, individuals high on extraversion report more sexual risk taking (Cooper et al., 2000; Hoyle et al., 2000; Miller et al., 2004), more problematic substance use (Cooper et al., 2000; Gilbert & Gilbert, 1995; Hong & Paunonen, 2009; Trull & Sher, 1994), and have a higher rate of motor vehicle accidents (Dahlen & White, 2006; Lajunen, 2001; Smith & Kirkham, 1981). High extraversion scores are also related to engagement in illegal behaviors, such as use of illegal drugs (Hundleby, 1986) and drinking and driving (Martin & Boomsma, 1989).

Several facets of extraversion, such as impulsivity and sensation seeking, have also been associated with a broad range of risky behaviors such as sexual risk-taking (Donohew et al., 2000; Hoyle et al., 2000), substance use (Arnett, 1996; Sher, Trull, Bartholow, & Vieth, 1999), and risky driving (Jonah, 1997; Jonah & Dawson, 1987;

Scott-Parker, Watson, King, & Hyde, 2011). A review of the literature on risky driving and sensation seeking (Jonah, 1997) found that the majority of the studies reported a significant relationship between high sensation seeking and engagement in drinking and driving. Additionally, impulsive individuals also report increased likelihood of engagement in drinking and driving (Jonah, 1997; Ryb, Dischinger, Kufera, & Read, 2006) and have a higher likelihood of being convicted of a drinking and driving offense (Eensoo, Paaver, Harro, & Harro, 2005).

One model of risky behaviors attributes this association to a greater sensitivity to the rewarding properties of the behavior (Larson & Ketelaar, 1991; Cooper et al., 2000); thus, extraverts are more likely to engage in risky behaviors because they are more susceptible to the anticipated rewards (Carver & White, 1994; Larson & Ketelaar, 1991; Patterson & Newman, 1993). In addition to higher susceptibility to reward, experimental studies have also linked extraversion to a lower susceptibility to punishment (Pearce-McCall & Newman, 1986; Patterson, Kosson, & Newman, 1987). Individuals high on extraversion are more likely to persevere in their responses patterns despite receiving punishment for these behaviors (Patterson et al., 1987), and appear to maintain more positive expectations for success (Pearce-McCall & Newman, 1986) and positive expectancies for substance-related behaviors (McCarthy, Kroll, & Smith, 2001).

Making the decision to drink and drive requires the evaluation of both the rewarding aspects (e.g., getting to the desired destination) as well as the potential negative consequences (e.g., receiving a DUI). Extending these research findings to drinking and driving decisions suggests a number of potential pathways by which extraversion could influence drinking and driving behavior. Individuals high in

extraversion might place greater emphasis on the immediate rewards of drinking and driving, display more confidence in their abilities to drive while intoxicated, and estimate the likelihood of negative consequences of drinking and driving as lower.

Neuroticism

Individuals high on neuroticism are characterized by a tendency to experience negative emotions including anger, anxiety, and depression as well as a heightened sensitivity to stress (Costa & McCrae, 1992). Neuroticism has consistently been associated with increased alcohol use (Cooper et al., 2000; Malouff, Thorsteinsson, Rooke, & Schutte, 2007; Martin & Sher, 1994; Trull & Sher, 1994) as well as a diagnosis of Alcohol Use Disorder (Martin & Sher, 1994). The literature on neuroticism and risk taking behaviors offers conflicting results. Several studies suggest that there is a positive relationship between neuroticism scores and risky behaviors such as sexual risk-taking (Cooper et al., 2000), substance use (Larkins & Sher, 2006; Malouff et al., 2007), and risky driving (Kirkcaldy & Furnham, 2000; Smith & Kirkham, 1981; Dahlen & White, 2006) including drinking and driving (Vollrath & Torgersen, 2002). However, other studies have found no relationship (Miller et al., 2004) or reported a negative relationship between neuroticism and risky behaviors (Bruch, Rivet, Heimberg, & Levin, 1997; Lee, Wadsworth, & Hotopf, 2006).

Researchers have proposed that this inconsistent evidence might be due to the broad measurement of neuroticism (Zuckerman & Kuhlman, 2000), specifically the inclusion of impulsivity and hostility traits along with anxiety and depression on some measures of neuroticism. Support for this view comes from studies that break the broad

domain of neuroticism into more specific personality facets. Individuals higher on specific facets of neuroticism involving negative emotionality, such as hostility and aggression, have been found to be more likely to engage in drinking and driving behavior (Turrisi, Jaccard, & McDonnell, 1997; McMillen, Pang, Wells-Parker, & Anderson, 1992). They may engage in risky behaviors as a means to cope with these negative emotions (Cooper et al., 2000; Kuntsche, Knibbe, Gmel, & Engels, 2006; Stewart, Zvolensky, Eifert, 2001).

Other facets of neuroticism can be associated with a decreased likelihood of engagement in risky behaviors. For example, neuroticism is also characterized by high anxiety, a low tolerance for aversive stimuli, and oversensitivity to punishment (Larson & Ketelaar, 1991; Carver & White, 1994). Thus, certain risky behaviors might be negatively associated with neuroticism scores due to those individuals' desire to avoid potential negative consequences. Indeed, several studies suggest that shy college students report less alcohol consumption and less alcohol related problems (Bruch et al., 1997; Stewart et al., 2001) due to a desire to avoid uncomfortable social interactions associated with typical college drinking environments. Lastly, research findings also suggest that neuroticism is associated with higher perceived susceptibility to negative life events (Darvill & Johnson, 1991) and greater expectations of negative consequences (Vollrath, Knoch, & Cassano, 1999). In one study, despite the fact that neuroticism was not correlated with several risky health behaviors, those high in neuroticism reported a greater perceived likelihood of experiencing future health problems related to those risky behaviors (Vollrath et al., 1999).

Drinking and driving can have several significant consequences for the driver, such as vehicle accidents and arrests. Individuals vary in their estimation of the likelihood of experiencing these consequences, and higher estimates of negative consequences are associated with lower levels of drinking and driving (Grube & Voas, 1996; Turrisi et al., 1997; Turrisi & Jaccard 1992). Given that individuals high on neuroticism tend to be more sensitive to punishment, it is expected that they would perceive the negative consequences of drinking and driving as more likely; in turn, they might be less likely to engage in drinking and driving behavior. Although, individuals with high neuroticism scores consume alcohol as a means to cope with negative emotions (Cooper et al., 2000; Kuntsche et al., 2006), the motivations for drinking and driving are typically related to the anticipated rewards rather than as a way to cope with these negative emotions (Greening & Stoppelbein, 2000; McCarthy, Pedersen, Thompsen, & Leuty, 2006). Lastly, research suggests that drinking in social environments is associated with greater likelihood of drinking and driving (Lee, Jones-Webb, Short, & Wagenaar, 1997), and individuals high on neuroticism are more likely to drink alone rather than with others (Mohr et al., 2001).

Agreeableness and Conscientiousness

Agreeableness is characterized by a tendency to be honest, trustworthy, and cooperative in social situations. Individuals high on conscientiousness are described as careful, self-disciplined, and act in accordance with their morals. Several studies suggest that individuals high on agreeableness and conscientiousness are less likely to engage in sexual risk-taking (Hoye et al., 2000; Miller et al., 2004) as well as alcohol and tobacco

use (Booth-Kewlet & Vickers, 1991; Hampson, Goldberg, Vogt, Dubanoski, 2006; Hong & Paunonen, 2009). A recent meta-analysis on the association between conscientiousness and health-related behaviors showed that conscientiousness-related traits were negatively correlated with several risky health-related behaviors (Bogg & Roberts, 2004).

In regard to driving behaviors, research suggests that those high in these traits have less traffic citations (Artuhur & Doverspike, 2001; Cellar, Nelson, & Yorke, 2000), report less drinking and driving behavior (Bogg & Roberts, 2004; Hong & Paunonen, 2009), as well as less driving related risk-taking and accidents (Artuhur & Doverspike, 2001; Booth-Kewlet & Vickers, 1991; Caspi et al., 1997; Hong & Paunonen, 2009). However, several studies have failed to detect a relationship between agreeableness and risk taking behavior (Miles & Johnson, 2003; Garrity & Demick, 2001). Given that these personality domains are characterized by honesty, trustworthiness, and self-discipline, it is expected that individuals high on these traits engage in lower rates of drinking and driving due to the illegal nature of the behavior.

Openness to Experience

Openness to experience is characterized by intellectual curiosity and a preference for a variety of experiences. There is considerably less support in the literature for an association between openness and risky behaviors, and the existing research findings are inconsistent. For example, studies have found associations between sexual risk taking with both and high (Vollrath et al., 1999) and low (Miller et al., 2004) openness to experience scores. Furthermore, higher openness was found to be associated with healthy eating habits (Goldberg & Stryker, 2002), while other research has found significant

associations with risky behaviors such as substance use (Booth-Kewlet & Vickers, 1991). It should be noted that this personality domain is complex and contains traits which could serve as protective factors (e.g., intellect), as well as traits which could serve as a risk factor (e.g., the desire to try new activities, which is related to sensation seeking) for risky behaviors. Thus, this association is likely to differ based on which specific trait is examined.

Combinations of Personality Traits

Due to the broad scope of these five personality domains, their relationship to risky behaviors might be better understood in conjunction with the other domains. Several studies have examined the relationship between personality profiles (i.e., taking into consideration all five domains) and engagement in risky behaviors (Herzberg, 2009; Nicholson, Soane, Fenton-O’Creevy, & Willman, 2005; Patterson & Newman, 1993). One study specific to driving behaviors (Herzberg, 2009) conducted a cluster analysis of these five domains and identified three separate clusters. Individuals classified as under-controllers (high in neuroticism and openness and low in conscientiousness and agreeableness) were the most problematic drivers and were most likely to drive after drinking. Conversely, over-controllers (those high in neuroticism and conscientiousness and low on extraversion and openness) were the most likely to consistently follow traffic regulations.

The Current Study

The current project used data from a nationally representative study to examine the effects of alcohol outlet density and personality variables on drinking and driving behavior. Given the variability between states in alcohol related policies and likely correlation of data within states, analyses utilized a multilevel modeling approach which allows for the analysis of data from individuals nested within groups (i.e., states). The current study tested a broad set of personality traits as predictors of drinking and driving behavior, and also whether AOD moderates the influence of these personality traits. Specifically, it was hypothesized that:

- 1) There would be a main effect of alcohol outlet density on drinking and driving behavior such that individual residing in areas with more alcohol outlets per km² would be more likely to report drinking and driving as well as DUI charges and convictions.
- 2) There would also be main effects of personality on drinking and driving such that:
 - a) Individuals high on disinhibition and extraversion would report more drinking and driving behavior.
 - b) Individuals high on neuroticism, agreeableness, and conscientiousness would report less drinking and driving behavior.
 - c) No main effects were expected for openness to experience.
- 3) AOD would moderate the relationship between personality traits and drinking and driving behavior, such that there would be a greater effect of personality on drinking and driving behavior for individuals in areas of high alcohol density:

- a) For individuals high on extraversion and disinhibition the association between drinking and driving and DUI would increase as AOD increases.
- b) For individuals high on neuroticism, agreeableness, and conscientiousness, the association between drinking and driving and DUI would weaken as AOD increases.
- c) No significant interactions were hypothesized for individuals high on the openness to experience domain.

METHOD

Participants

The current project utilized data from the National Longitudinal Study of Adolescent Health (Add Health), which is a nationally representative sample of youths in the United States (Harris et al., 2009). Data collection began in 1994 and 1995 with the initial sample (Wave I). Participants were recruited from 132 middle and high schools and consisted of 90,118 students in grades 7 to 12. These students completed an in-school questionnaire which included various topics related to health behaviors and friendships. A subsample (n=20,745) of youths also completed in-home interviews at Wave I. A total of 14,738 youths completed Wave II in-home interviews approximately one year later; this sample did not include those participants who were in 12th grade at Wave I. The Wave III in-home interviews consisted of 15,170 young adult participants from the original subsample at Wave I. The data collection for Wave III was conducted in 2001 and 2002. Finally, Wave IV in-home interviews were conducted in 2007 and 2008 and included 15,701 adult participants. Please see Harris et al. (2009) for a comprehensive description of the study design. The current project utilized data from the in-home interviews collected at Wave III and Wave IV.

Measures

Demographic Information. Information regarding age, gender, ethnicity, and state of residence was collected. State of residence was later converted to pseudo state data allowing for grouping of individuals by state; however, for confidentiality purposes state of residence was not available for analyses.

Alcohol Use. Participants reported the typical quantity and frequency of alcohol consumption over the past year. Data was also collected regarding binge drinking behavior as well as specific symptoms of Alcohol Use Disorders.

Drinking and Driving Behavior. At the Wave III interview, participants reported whether they have ever driven drunk (dichotomous variable) since 1995 (Wave I interview). Additionally, participants reported whether they had ever been charged or convicted with a major traffic offense such as driving while impaired or driving without a license. The Wave III interview did not distinguish between traffic offenses involving alcohol and those which did not. The Wave IV interview asked participants to report the charges and convictions associated with their first and last arrest. In regard to arrests specific to alcohol offenses, the interview differentiated between those due to driving under the influence (DUI) and other alcohol-related offenses. Participants can have zero, one, or two arrests for DUI in addition to zero, one, or two DUI convictions. Not every DUI charge resulted in a conviction for the same, or any, offense. For the purposes of these analyses, the variables were dichotomized (0= no DUI charges; 1= one or more DUI charges).

Wave III Disinhibition. Wave III personality was assessed using seven slightly modified items from the Disinhibition factor of the Sensation Seeking Scale – V (SSS; Zuckerman, Eysenck, & Eysenck, 1978). The SSS is a 40-item measure which yields four factors (i.e., Disinhibition, Thrill and Adventure Seeking, Experience Seeking, and Boredom Susceptibility). The Disinhibition factor consists of sensation seeking behaviors such as drinking, partying, and sex. Each of the seven items used asked participants to pick between two statements. One of the statements reflects a preference for disinhibited

behavior and participants received one point for this selection. Scores were averaged and ranged between 0 -1 with higher scores indicated higher disinhibition. For ease of interpretation of odds ratios, scores were converted to a 0-10 scale, by multiplying the score by 10.

Wave IV Five Factor Model (FFM) of Personality. Wave IV personality was assessed using items which map on to the five broad domains of the FFM of personality: neuroticism (12 items), extraversion (5 items), openness to experience (5 items), conscientiousness (4 items), and agreeableness (2 items). The neuroticism construct was comprised of items related to more specific personality traits: anxiety (5 items), anger (5 items), and depression (2 items). Participants were asked to rate on a scale of 1 (strongly agree) to 5 (strongly disagree) how much they agreed with each personality statement. These items were averaged by personality domain. Domain questions are presented in Table 1.

Alcohol Outlet Density (AOD). This variable utilized the geocodes corresponding to participants' Wave III addresses and data on the number of alcohol outlet licenses at the census tract level to compute on premise and off-premise alcohol licenses per km². Alcohol outlet licensing data was collected 5-6 years after Wave III participant interviews. The number of on premise outlets (per km²) ranged between 0 – 434.36 (mean = 2.53; S.D. = 12.74).

Analytic Strategy

SAS Systems version 9.4 was used for all analyses. PROC GLIMMIX was used to fit the multilevel logit models with dichotomous response variables (i.e., self-reported

driving after too much to drink, DUI charges, and DUI convictions). PROC GLIMMIX allows for the analysis of data from individuals nested within groups (i.e., states).

Analyses were conducted in a stepwise fashion beginning with Model 1 (the baseline model) which included only two variables (i.e., personality variable and AOD). Model 2 (the covariate model) included individual level covariates (i.e., age, sex) in addition to the variables in Model 1. Model 3 (the interaction model) and Model 4 (the full model) tested the interaction of the personality variable and AOD, with and without the individual-level covariates.

RESULTS

Descriptive Statistics

At Wave III (N = 8,090), the respondents were between the ages of 18-27 (M = 21.99, SD= 1.74), 47% male, 69% Caucasian, 17% African American, 4% Native American, 7% Asian, and 9% other race. Additionally, 17% identified as Hispanic or Latino. Participants who endorsed driving after too much to drink at Wave III ($n = 2632$, 33%) were more likely to be male ($\chi^2 = 325.46, p < .001$), older ($t = 4.32, p < .001$), and Caucasian (76% vs. 65% of those who denied drinking and driving). In regard to drinking behavior, those who endorsed drinking and driving had more drinking days in the last year (62% vs. 26% endorsed weekly drinking), consumed more alcohol per drinking occasion ($t = 19.60, p = < .001$), and endorsed more frequent binge drinking (35% vs. 9% endorsed weekly binge drinking). Table 2 contains the descriptive statistics by drinking and driving status.

At Wave IV (N = 7,551), the respondents were between the ages of 25-34 (M = 29.04, SD= 1.75), 45% male, 67% Caucasian, 19% African American, 4% Native American, 7% Asian, and 9% other race. Additionally, 16% identified as Hispanic or Latino. Participants who endorsed a past DUI charge at Wave IV ($n = 421$, 6%) were more likely to be male ($\chi^2 = 274.52, p < .001$), older ($t = 2.03, p = .04$), and Caucasian (73% vs. 67% of those without DUIs). In regard to drinking behavior, those who endorsed past DUIs had more drinking days in the last year (65% vs. 34% endorsed weekly drinking), consumed more alcohol per drinking occasion ($t = 17.10, p = < .001$), and endorsed more frequent binge drinking (44% vs. 12% endorsed weekly binge drinking). Table 3 contains the descriptive statistics by DUI status.

Self-Reported Drinking and Driving

In Model 1, higher disinhibition was associated with increased odds of drinking and driving (OR = 1.311, 95% CI: 1.279-1.347); however, there was no significant main effect of AOD. The main effect of disinhibition remained significant with the addition of other individual-level covariates in Model 2. Table 4 contains the fixed-effects estimates and odds ratios (OR) for Model 1 and Model 2.

Model 3 and Model 4 tested the interaction (disinhibition x AOD) with and without the individual-level covariates. As shown in Table 5, the interaction was significant (Model 3: $\beta = 0.004$, $p = 0.039$; Model 4: $\beta = 0.004$, $p = 0.046$) indicating that the effect of personality on drinking and driving varies by level of AOD. Table 6 contains the OR and 95% CI for the effect of disinhibition on drinking and driving at different levels of AOD. Results from Model 4 indicate that when AOD is 0 per km², a one unit increase in disinhibition score was associated with a 28% increase in the likelihood of self-reported drinking and driving. When AOD is 2.3 per km² (80th percentile), there was a 29% increase the likelihood of self-reported drinking and driving for every one unit increase in disinhibition score. It should be noted that the AOD variable was highly skewed (M = 2.65, SD = 15.58) and the analysis was also conducted with AOD value of 18.23 per km² (+1 SD above the mean) in order to examine ORs at very high outlet densities. This yielded a 37% (OR = 1.370, 95% CI: 1.284-1.462) increase in the likelihood of self-reported drinking and driving for every one unit increase in disinhibition score.

FFM Personality Variables

As shown in Table 7, there were significant main effects of the anxiety (OR = 0.915, 95% CI: 0.855-0.979) and depression (OR = 0.921, 95% CI: 0.871-0.973) factors of neuroticism, extraversion (OR = 1.205, 95% CI: 1.113-1.306), conscientiousness (OR = 0.902, 95% CI: 0.842-0.967), and agreeableness (OR = 0.765, 95% CI: 0.713-0.820) on self-reported drinking and driving. With the exception of extraversion, all the significant personality variables were associated with a decrease in self-reported drinking and driving. For example, the main effect for agreeableness indicates that for every one unit decrease in agreeableness score, the odds of drinking and driving was 1.269 (increases by 27%). There was no main effect of AOD. When covariates were added to the models presented above, only anxiety, extraversion, and agreeableness remained significant. Individuals high on agreeableness were less likely to report drinking and driving (OR= 0.927, 95% CI= 0.862-0.997). Anxiety and extraversion were both associated with increased odds of reporting drinking and driving (anxiety: OR = 1.116, 95% CI=1.038-1.199); extraversion: OR = 1.308, 95% CI=1.216-1.407). When analyzed separately by sex, anxiety was associated with increased odds of drinking and driving for men (OR=1.115, 95% CI= 1.012-1.230) but not for women (OR=1.110, 95% CI= 0.998-1.235). The covariates (i.e., age and sex) were also related to drinking and driving. There was a significant main effect of age on drinking and driving for females (OR=1.065, 95% CI= 1.022-1.110) but not for males (OR=1.033, 95% CI= 0.995-1.072). Lastly, males were more likely than females to drive after drinking (OR=2.414, 95% CI= 2.192-2.657). The interaction between personality variables and AOD (FFM personality variables x

AOD) with and without the individual-level covariates was also tested, but none of the interaction terms were significant.

Self-Reported DUIs

Analyses were also conducted using self-reported DUI charges and DUI convictions as the outcome variables. As shown in Table 8, there were significant main effects of disinhibition (OR = 1.358, 95% CI: 1.293-1.426), neuroticism (OR = 0.809, 95% CI: 0.693-0.943), anxiety factor of neuroticism (OR = 0.653, 95% CI: 0.570-0.748), extraversion (OR = 1.261, 95% CI: 1.096-1.449), and agreeableness (OR = 0.637, 95% CI: 0.563-0.721) on self-reported DUI charges. Disinhibition and extraversion were both associated with increased odds of being charged with a DUI. Neuroticism, anxiety, and agreeableness were associated with decreased odds of being charged with a DUI. AOD was not significant. When covariates were added to the models presented above, only disinhibition, extraversion, and agreeableness remained significant. Individuals high on agreeableness were less likely to report DUI charges (OR= 0.845, 95% CI= 0.740-0.965). Disinhibition and extraversion were both associated with increased odds of reporting DUI charges (disinhibition: OR = 1.284, 95% CI=1.220-1.351; extraversion: OR = 1.374, 95% CI=1.190-1.586). The interaction between personality variables and AOD with and without the individual-level covariates was also tested, but none of the interaction terms were significant. A similar pattern of results was found when DUI conviction was used as the outcome variable.

DISCUSSION

The purpose of this project was to test the main effects and interactions between personality variables and alcohol outlet density in the prediction of drinking and driving. Consistent with prior research, the results indicate that certain personality variables are associated with engagement in drinking and driving (Donovan & Marlatt, 1982; Jonah, 1997) and legal consequences for drinking and driving (Eensoo et al., 2005). In addition, our results suggest that there is a stronger association between disinhibition and drinking and driving as alcohol outlet density increases; however, it is only when AOD is very high that there is a meaningful increase in the likelihood of drinking and driving. Contrary to our hypothesis, we did not find a main effect of alcohol outlet density on drinking and driving behavior or DUI.

Regarding the interaction effects tested in this study, only disinhibition was found to interact with AOD, such that, for individuals living in areas with higher exposure to alcohol outlets there was a stronger association between disinhibition and drinking and driving. Due to the high level of skew in the distribution of AOD, for the vast majority of AOD values the effect is statistically significant but the increase is not meaningful. Only when AOD values are very high there is a meaningful increase. Although related, extraversion was not found to interact with AOD. Extraversion is a broad personality domain and despite being related to disinhibition, it contains many personality traits which may not be related to drinking and driving. This may explain why the interaction between extraversion and AOD was not significant in our analyses. It is likely that certain facets of extraversion (e.g., impulsivity, disinhibition) drive the association between

extraversion and drinking and driving; however, the items included in this study were focused on the sociability aspect of extraversion.

There are several explanations for the significant interaction effect of disinhibition and AOD on drinking and driving. First, greater availability of alcohol due to higher outlet density increases the overall frequency of drinking (Pollack et al., 2005; Weitzman et al., 2003). Disinhibited individuals may be more likely to take advantage of the increased availability of alcohol in their community. Disinhibited individuals also consume higher quantities of alcohol when drinking and engage in binge drinking more frequently (Cooper et al., 2000; Gilbert & Gilbert, 1995; Hong & Paunonen, 2009; Trull & Sher, 1994). Consequently, higher AOD may differentially affect drinking and driving risk in disinhibited individuals due to increasing the frequency of which they engage in problematic drinking (i.e., larger quantities) before driving. Prior studies found a similar interaction between personality traits and environmental factors (e.g., Greek membership, poorly managed family environments) in predicting symptoms of alcohol abuse or dependence (Grekin & Sher, 2006; Hill et al., 2010). Similarly, in high school youths, increased sensation seeking was associated with a greater frequency of drinking and driving for youths who reported high access to alcohol (Pedersen & McCarthy, 2008).

Alternatively, disinhibited individuals might place a greater emphasis on the immediate rewards of drinking and driving, and living in higher alcohol density environments provides more opportunities to engage in this behavior. Making the decision to drink and drive requires the evaluation of the rewards as well as the potential negative consequences. Individuals likely engage in drinking and driving on many occasions before experiencing any negative consequences. Over time, this pattern of high

likelihood of reward vs. low likelihood of punishment for drinking and driving may be especially reinforcing of this behavior in disinhibited individuals. That is, making the decision to *not* drink and drive becomes more difficult as the individual has had many opportunities to drive after drinking without experiencing negative consequences.

Regarding the main effects of personality on drinking and driving, the results largely supported our hypotheses. Individuals with higher extraversion and disinhibition scores were more likely to report drinking and driving as well as DUI related consequences. These results remained significant with the addition of sex and age to the model. This is consistent with prior research on the association between drinking and driving and these personality traits (Martin & Boomsma, 1989; Jonah, 1997).

Given that alcohol consumption is necessary for drinking and driving to occur, a large part of the association between disinhibition and drinking and driving is likely due to the correlation between these traits and drinking. Alcohol consumption and drinking and driving are highly associated and share many of the same predictors (Bingham et al., 2007). The influence of extraversion and disinhibition on drinking and driving may be, at least partly, explained by the association between these traits and drinking behavior. It is difficult to disentangle alcohol use from drinking and driving in these analyses.

Controlling for alcohol use can lead to erroneous and, likely, non-interpretable results, due to the removal of an important component of the drinking and driving construct (i.e., alcohol consumption). Future research should continue to tease apart predictors of drinking and driving from predictors of alcohol consumption in order to identify individual characteristics that uniquely predict drinking and driving behavior.

The hypothesized effect of neuroticism on drinking and driving was not supported in these analyses. The hypothesized effect was based on research showing that individuals higher on neuroticism were more likely to report a greater likelihood of experiencing negative life events (Darvill & Johnson, 1991) and negative consequences, (Vollrath et al., 1999). Similarly, we hypothesized that they would be less likely to drink and drive because they would have higher expectations for negative consequences related to drinking and driving. Research regarding the effect of neuroticism on risky behaviors has been mixed, which may be due to the broad measurement of neuroticism (Zuckerman & Kuhlman, 2000). In this dataset, the neuroticism construct was comprised of items related to more specific personality traits: anxiety, anger, and depression. When these traits were analyzed separately, anxiety was associated with a decreased likelihood of drinking and driving and DUIs. When sex and age were added into our model, anxiety was associated with an increase in likelihood of drinking and driving. It is likely that this is due to differences in the prediction of drinking and driving by anxiety for (i.e., positive association for males, but not for females) combined with the fact that males are more likely to drink and drive.

Conceptually, one plausible explanation for an association between anxiety and decreased likelihood of drinking and driving is the context in which drinking occurs. Research suggests that drinking in social environments is associated with a greater likelihood of drinking and driving (Lee et al., 1997), and individuals high on neuroticism are more likely to drink alone rather than with others (Mohr et al., 2001). It is likely that those high in anxiety may be more likely to drink alone (and at home) and, as a result, are less likely to drive after drinking. Additionally, high anxiety can also be a protective

factor by increasing the individual's perceived likelihood of experiencing negative consequences (Larson & Ketelaar, 1991; Carver & White, 1994); thus, anxious individuals may be less likely to drink and drive because they anticipate more negative consequences such as an accident or DUI.

The hypothesized effects of agreeableness and conscientiousness on drinking and driving were supported in our analyses. These personality domains are characterized by trustworthiness, honesty, and self-discipline; therefore, the negative associations with drinking and driving and DUIs is not surprising. When sex and age were added into the model, only agreeableness remained a significant predictor of drinking and driving and DUIs. These individuals are less likely to use alcohol (Hampson et al., 2006; Hong & Paunonen, 2009) and, as a result, less likely to drive after drinking. It is possible that in drinking situations these individuals may be more likely to be designated drivers.

This area of research can be especially useful for the development of interventions aimed at reducing drinking and driving as well as informing future policies. These results suggest that disinhibited individuals may be at an even greater risk of drinking in driving in areas with a higher concentration of alcohol outlets, and efforts to prevent driving while intoxicated (e.g., sobriety check points, availability of alternate means of transportation) may have a greater impact in high AOD areas. AOD is only one aspect of alcohol policy and further research is needed to evaluate whether similar results are found with other policies. This research suggests that policies may have a limited effect in reducing drinking and driving behavior in certain high risk individuals and it is likely that further policy changes may do little to reduce drinking and driving rates in this group.

A major limitation of this project is the limited drinking and driving variables in the dataset. The Wave IV drinking and driving measure consists of self-reported DUI arrests and convictions. Additionally, information about arrests and convictions is only collected on the individual's first and last arrest. Given that the majority of individuals who drive after drinking do not get arrested, the drinking and driving measure used in the analysis might be indicative of a subset of the sample with more problematic alcohol use patterns and might not be generalizable to other individuals with less problematic drinking patterns, who also drive while intoxicated. Although, drinking and driving is better measured by the Wave III self-reported drinking and driving question, this variable is not ideal either. This question asks participants to report whether they have ever driven drunk in the last 6-7 years, which encompasses a greater percentage of individuals who drive after drinking. It should be noted that although this variable is broader than drunk-driving arrest information at Wave IV, it may not include those who drive after drinking but do not feel drunk. Individuals vary in their perceptions of intoxication (Beirness, 1987; Nygaard, Waiters, Grube, & Keefe, 2003), and certain drinkers might judge themselves safe to drive when they are legally intoxicated (Beirness, 1987). Additionally, even those who drive with BACs below the legal limit of intoxication are at an increased risk for motor vehicle accidents (Zador, 1991). Nonetheless, a similar pattern of results was obtained using the Wave III and the Wave IV variables.

At Wave IV, personality was measured using a FFM framework. As mentioned in the review of the personality literature above, these factors are multi-faceted and certain facets may have different associations with drinking and driving (e.g., see above for the relationship between neuroticism and drinking and driving). Additionally, only a few

items comprised each of these domains. The disinhibition factor of the Sensation Seeking Scale (Wave III) is a more narrow personality construct related to extraversion. It is likely that an alternate measure of personality, which focuses on more narrow personality traits, rather than the broad domains measured by the FFM, would better measure the relationship between personality and drinking and driving. The other factors of the Sensation Seeking Scale (i.e., thrill and adventure seeking, boredom susceptibility, and experience seeking) were not included in the Wave III measures.

The alcohol outlet density measure did not differentiate between types of on premise alcohol outlets (i.e., bars vs. restaurants). There is a limited amount of research which differentiates the effect of a high density of bars compared to a high density of restaurant; however, this research does suggest different effects. While restaurant density is associated with increased drinking and driving, high bar density is associated with decreased drinking and driving (Gruenewald et al., 2002). This suggests that individuals drinking at bars may be more likely to anticipate needing to make other arrangements for transportation. Additionally, alcohol consumption in restaurants may be indicative of unplanned drinking, and certain individual characteristics (e.g., disinhibition) may be more likely to drink in situations where they did not anticipate doing so. The AOD variable in this dataset did not distinguish between type of alcohol outlet which may explain the non-significant effects of AOD on drinking and driving. Future research in this area may help identify the extent to which specific types of outlets may increase the likelihood of drinking and driving and whether certain individuals are more likely to be affected by specific outlets.

These findings build upon already existing research and provide initial evidence that while personality characteristics are associated with drinking and driving, the availability of alcohol may moderate the magnitude of this effect. Further research is needed to assess whether type of alcohol outlet explains this effect. Similarly, this research indicates that personality characteristics may moderate the relationship between availability of alcohol and drinking and driving. These results provide an initial explanation for the recent plateau in the reduction of drinking and driving and related fatalities (Yi et al., 2006) suggesting that these policies might not be enough in deterring this behavior for some individuals (e.g., those high in disinhibition). An important area of future research should focus on identifying the mechanisms by which personality characteristics and alcohol availability interact in predicting drinking and driving. Additionally, future research should continue to incorporate personality characteristics when evaluating the effect of alcohol policies on drinking and driving behavior.

TABLES

Table 1. FFM Personality Questions at Wave IV and reverse coded items (R).

Extraversion

1. I am the life of the party.
2. I don't talk a lot. (R)
3. I talk to a lot of different people at parties.
4. I keep in the background. (R)
5. I am not really interested in others. (R)

Neuroticism (Anxiety)

1. I worry about things.
2. I am relaxed most of the time. (R)
3. I am not easily bothered by things. (R)
4. I get stressed out easily.
5. I don't worry about things that have already happened. (R)

Neuroticism (Anger)

1. I rarely get irritated. (R)
2. I get easily angry.
3. I get upset easily.
4. I lose my temper.
5. I keep my cool. (R)

Neuroticism (Depression)

1. I have frequent mood swings.
2. I seldom feel blue. (R)

Conscientiousness

1. I get chores done right away.
2. I often forget to put things back in their proper place. (R)
3. I like order.
4. I make a mess of things. (R)

Agreeableness

1. I am not interested in other people's problems. (R)
2. I sympathize with other's feelings.

Openness to Experience

1. I am not interested in abstract ideas. (R)
 2. I have difficulty understanding abstract ideas. (R)
 3. I have a vivid imagination.
 4. I do not have a good imagination. (R)
 5. I feel others' emotions.
-

Table 2. Descriptive statistics by self-reported drinking and driving status at Wave III (N = 8090)

<i>Selected Variables</i>	<i>Self-reported Drinking and Driving</i>	
	<i>No</i> <i>n = 5458</i>	<i>Yes</i> <i>n = 2632</i>
Male**	2193 (40.18%)	1620 (61.55%)
Age**	<i>M = 21.93 (SD = 1.75)</i>	<i>M = 22.11 (SD = 1.70)</i>
Race/Ethnicity ^a		
<i>Caucasian</i>	3556 (65.26%)	1995 (75.88%)
<i>African American</i>	1081 (19.84%)	324 (12.32%)
<i>Native American</i>	201 (3.69%)	104 (3.96%)
<i>Asian</i>	419 (7.69%)	140 (5.33%)
<i>Hispanic</i>	1000 (18.36%)	340 (12.94%)
<i>Other Race</i>	505 (9.27%)	212 (8.06%)
Past Year Alcohol Use		
<i>1-2 times in the last year</i>	1184 (21.69%)	143 (5.43%)
<i>1 time per month or less</i>	1570 (28.77%)	324 (12.31%)
<i>2-3 days per month</i>	1300 (23.82%)	536 (20.36%)
<i>1-2 days per week</i>	1059 (19.40%)	959 (36.44%)
<i>3-5 days per week</i>	283 (5.19%)	497 (18.88%)
<i>daily or almost daily</i>	62 (1.14%)	173 (6.57%)
Alcohol Quantity**	<i>M = 3.92 (SD = 3.33)</i>	<i>M = 5.52 (SD = 3.64)</i>
Alcohol Binge ^b		
<i>none</i>	2499 (46.01%)	335 (12.76%)
<i>1-2 times in the last year</i>	1293 (23.81%)	499 (19.01%)
<i>1 time per month or less</i>	710 (13.07%)	417 (15.89%)
<i>2-3 days per month</i>	444 (8.18%)	468 (17.83%)
<i>1-2 days per week</i>	368 (6.78%)	590 (22.48%)
<i>3-5 days per week</i>	92 (1.69%)	256 (9.75%)
<i>daily or almost daily</i>	25 (0.46%)	60 (2.29%)

** = $p < .001$;

^a=Participants were allowed to select more than one race

^b=Alcohol Binge was defined as 4 or more drinks for women (5 or more for men)

Table 3. Descriptive statistics by self-reported DUI charges at Wave IV (N=7551)

Selected Variables	Self-reported DUI Charge	
	No n = 7130	Yes n = 421
Male**	3063 (42.96%)	355 (84.32%)
Age#	M = 29.03 (SD = 1.75)	M = 29.20 (SD = 1.71)
Race/Ethnicity ^a		
Caucasian	4784 (67.17%)	307 (72.92%)
African American	1354 (19.01%)	57 (13.54%)
Native American	244 (3.43%)	35 (8.31%)
Asian	514 (7.22%)	12 (2.85%)
Hispanic	1142 (16.06%)	61 (14.52%)
Other Race	631 (8.86%)	39 (9.26%)
Past Year Alcohol Use		
none	649 (9.11%)	26 (6.18%)
1-2 times in the last year	1023 (14.36%)	29 (6.89%)
1 time per month or less	1508 (21.16%)	34 (8.08%)
2-3 days per month	1512 (21.22%)	57 (13.54%)
1-2 days per week	1604 (22.51%)	142 (33.73%)
3-5 days per week	634 (8.90%)	87 (20.67%)
daily or almost daily	196 (2.75%)	46 (10.93%)
Alcohol Quantity**	M = 3.44 (SD = 2.77)	M = 5.96 (SD = 3.70)
Alcohol Binge ^b		
none	2439 (37.76%)	41 (10.41%)
1-2 times in the last year	1560 (24.15%)	55 (13.96%)
1 time per month or less	973 (15.06%)	70 (17.77%)
2-3 days per month	713 (11.04%)	53 (13.45%)
1-2 days per week	543 (8.41%)	95 (24.11%)
3-5 days per week	175 (2.71%)	48 (12.18%)
daily or almost daily	57 (0.88%)	32 (8.12%)

** = $p < .001$; * $p < .01$; # = $p < .05$

^a = Participants were allowed to select more than one race

^b = Alcohol Binge was defined as 4 or more drinks for women (5 or more for men)

Table 4. Multilevel binomial logit models for self-reported drinking and driving.

	β	SE	OR	95% CI		P
				LL	UL	
<i>Model 1^a</i>						
Disinhibition	0.272	0.013	1.313	1.279	1.347	<.001
AOD	-0.004	0.003	0.996	0.991	1.002	0.174
<i>Model 2^b</i>						
Disinhibition	0.255	0.014	1.291	1.257	1.326	<.001
AOD	-0.004	0.003	0.996	0.990	1.001	0.134
Age	0.089	0.021	1.093	1.049	1.138	<.001
Male (vs. Female)	0.622	0.072	1.862	1.618	2.142	<.001

^a = Model 1 includes only the Disinhibition variable and Alcohol Outlet Density (AOD)

^b = Model 2 includes individual level covariates (i.e., age, sex) in addition to the variables in Model 1

Table 5. Multilevel binomial logit models with interaction terms for self-reported drinking and driving.

	<i>Model 3^a</i>			<i>Model 4^b</i>		
	β	SE	p	β	SE	p
Disinhibition	0.266	0.013	<.001	0.249	0.014	<.001
AOD	-0.034	0.015	0.026	-0.034	0.015	0.029
Age				0.088	0.021	<.001
Male (vs. Female)				0.621	0.072	<.001
Disinhibition X AOD	0.004	0.002	0.04	0.004	0.002	0.05

^a = Model 3 includes only the Disinhibition variable, Alcohol Outlet Density (AOD), and the interaction term (Disinhibition X AOD)

^b = Model 4 includes individual level covariates (i.e., age, sex) in addition to the variables in Model 3

Table 6. Odds ratios (OR) for self-reported drinking and driving for a 1 unit increase in disinhibition score at different levels of AOD (i.e., zero, 20th, 40th, 60th, and 80th percentile)

<i>Alcohol Outlet Density</i> ^a (per km ²)	<i>Model 3</i> ^b		<i>Model 4</i> ^c	
	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>
0	1.305	1.271 – 1.340	1.283	1.249 – 1.318
0.001	1.305	1.271 – 1.340	1.283	1.249 – 1.318
0.164	1.306	1.272 – 1.340	1.284	1.250 – 1.319
0.693	1.308	1.275 – 1.341	1.291	1.257 – 1.326
2.305	1.316	1.282 – 1.351	1.294	1.260 – 1.329

^a = In addition to zero, AOD levels were chosen at the 20th, 40th, 60th, and 80th percentile

^b = Model 3 includes only the Disinhibition variable, Alcohol Outlet Density (AOD), and the interaction term (Disinhibition X AOD)

^c = Model 4 includes individual level covariates (i.e., age, sex) in addition to the variables in Model 3

Table 7. Multilevel binomial logit models for self-reported drinking and driving.

	β	SE	OR	95% CI		<i>p</i>
				LL	UL	
<i>Model 1^a</i>						
Neuroticism	-0.047	0.039	0.954	0.884	1.030	0.225
AOD	0.000	0.002	1.000	0.997	1.004	0.875
Anxiety	-0.089	0.034	0.915	0.855	0.979	0.010
AOD	0.000	0.002	1.000	0.997	1.004	0.842
Depression	-0.083	0.028	0.921	0.871	0.973	0.004
AOD	0.000	0.002	1.000	0.997	1.004	0.920
Anger	0.045	0.033	1.046	0.981	1.116	0.172
AOD	0.000	0.002	1.000	0.997	1.004	0.858
Extraversion	0.187	0.041	1.205	1.113	1.306	<.001
AOD	0.000	0.002	1.000	0.997	1.004	0.905
Conscientiousness	-0.103	0.035	0.902	0.842	0.967	0.004
AOD	0.000	0.002	1.000	0.997	1.004	0.789
Agreeableness	-0.269	0.036	0.765	0.713	0.820	<.001
AOD	0.000	0.002	1.001	0.997	1.004	0.671
Openness	0.034	0.047	1.034	0.943	1.134	0.472
AOD	0.000	0.002	1.000	0.997	1.004	0.836

^a = Model 1 includes only the FFM Personality Variables and Alcohol Outlet Density (AOD)

Table 8. Multilevel binomial logit models for self-reported DUI.

	β	SE	OR	95% CI		p
				LL	UL	
<i>Model 1^a</i>						
Disinhibition	0.306	0.024	1.358	1.293	1.426	<.001
AOD	-0.012	0.013	0.988	0.963	1.015	0.448
Neuroticism	-0.212	0.079	0.809	0.693	0.943	0.007
AOD	-0.014	0.011	0.986	0.966	1.007	0.182
Anxiety	-0.426	0.069	0.653	0.570	0.748	<.001
AOD	-0.013	0.011	0.987	0.967	1.007	0.207
Depression	-0.008	0.056	0.992	0.889	1.107	0.891
AOD	-0.014	0.011	0.986	0.966	1.007	0.186
Anger	0.033	0.065	1.033	0.909	1.175	0.616
AOD	-0.014	0.011	0.986	0.966	1.007	0.189
Extraversion	0.232	0.071	1.261	1.096	1.449	0.001
AOD	-0.015	0.011	0.986	0.965	1.006	0.174
Conscientiousness	-0.079	0.069	0.924	0.807	1.058	0.254
AOD	-0.014	0.011	0.986	0.966	1.007	0.188
Agreeableness	-0.451	0.063	0.637	0.563	0.721	<.001
AOD	-0.013	0.011	0.987	0.967	1.008	0.233
Openness	-0.014	0.086	0.986	0.833	1.167	0.871
AOD	-0.014	0.011	0.986	0.966	1.007	0.188

^a = Model 1 includes only the personality variables and Alcohol Outlet Density (AOD)

REFERENCES

- Anderson, P., & Baumberg, B. (2006). The effectiveness of alcohol policy. In *Alcohol in Europe: A Public Health Perspective. A Report for the European Commission*. Retrieved from: http://ec.europa.eu/health-eu/news_alcoholineurope_en.htm
- Arnett, J. (1996). Sensation seeking, aggressiveness, and adolescent reckless behavior. *Personality and Individual Differences*, 20(6), 693-702. doi:10.1016/0191-8869(96)00027-X
- Arthur, W. R., & Doverspike, D. (2001). Predicting motor vehicle crash involvement from a personality measure and a driving knowledge test. *Journal of Prevention & Intervention in the Community*, 22(1), 35-42. doi:10.1300/J005v22n01_04
- Babor, T. F. (2010). *Alcohol: No Ordinary Commodity: Research and Public Policy*. (2nd ed.). Oxford University Press, USA.
- Beirness, D.J. (1987). Self-estimates of blood alcohol concentration in drinking-driving context. *Drug and Alcohol Dependence*, 19, 79-90.
- Berman, M., Hull, T., & May, P. (2000). Alcohol control and injury death in Alaska native communities: wet, damp and dry under Alaska's local option law. *Journal of Studies on Alcohol and Drugs*, 61(2), 311-319.
- Bernat, D. H., Dunsmuir, W. M., & Wagenaar, A. C. (2004). Effects of lowering the legal BAC to 0.08 on single-vehicle-nighttime fatal traffic crashes in 19 jurisdictions. *Accident Analysis and Prevention*, 36(6), 1089-1097. doi:10.1016/j.aap.2004.04.001

- Bernhoft, I. M., & Behrendorff, I. I. (2003). Effect of lowering the alcohol limit in Denmark. *Accident Analysis and Prevention*, 35(4), 515-525. doi:10.1016/S0001-4575(02)00029-5
- Bingham, C. R., Elliott, M. R., & Shope, J. T. (2007). Social and behavioral characteristics of young adult drink/drivers adjusted for level of alcohol use. *Alcoholism: Clinical and Experimental Research*, 31(4), 655-664.
- Bogg, T., & Roberts, B. W. (2004). Conscientiousness and Health-Related Behaviors: A Meta-Analysis of the Leading Behavioral Contributors to Mortality. *Psychological Bulletin*, 130(6), 887-919. doi:10.1037/0033-2909.130.6.887
- Booth-Kewley, S., & Vickers Jr., R. R. (1991). Associations between major domains of personality and health behavior. (Naval Health Research Center Report No. 91-34). Naval Medical Research and Development Command. Bethesda, MD.
- Borschos, B. (2000) *Evaluation of the Swedish drunken driving legislation implemented on February 1, 1994*. [On-line] Presented at the 15th International Conference on Alcohol, Drugs and Traffic Safety, Stockholm, Sweden: 22-26 September. Retrieved from: <http://trid.trb.org/view.aspx?id=674158>
- Bruch, M. A., Rivet, K. M., Heimberg, R. G., & Levin, M. A. (1997). Shyness, alcohol expectancies, and drinking behavior: Replication and extension of a suppressor effect. *Personality and Individual Differences*, 22(2), 193-200. doi:10.1016/S0191-8869(96)00190-0
- Campbell, C. A., Hahn, R. A., Elder, R., Brewer, R., Chattopadhyay, S., Fielding, J., ... & Middleton, J. C. (2009). The effectiveness of limiting alcohol outlet density as a

means of reducing excessive alcohol consumption and alcohol-related harms. *American Journal of Preventive Medicine*, 37(6), 556-569.

doi: <http://dx.doi.org/10.1016/j.amepre.2009.09.028>

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality and Social Psychology*, 67(2), 319-333.

doi:10.1037/0022-3514.67.2.319

Caspi, A., Begg, D., Dickson, N., Harrington, H., Langley, J., Moffitt, T. E., & Silva, P. A. (1997). Personality differences predict health-risk behaviors in young adulthood: Evidence from a longitudinal study. *Journal of Personality and Social Psychology*, 73(5), 1052-1063. doi:10.1037/0022-3514.73.5.1052

Cellar, D. F., Nelson, Z. C., & Yorke, C. M. (2000). The five-factor model and driving behavior: Personality and involvement in vehicular accidents. *Psychological Reports*, 86(2), 454-456. doi:10.2466/PR0.86.2.454-456

Chiu, A. Y., Perez, P. E., & Parker, R. N. (1997). Impact of banning alcohol on outpatient visits in Barrow, Alaska. *The Journal of the American Medical Association*, 278(21), 1775-1777. doi:10.1001/jama.1997.03550210073042.

Chou, S., Grant, B. F., Dawson, D. A., Stinson, F. S., Saha, T., & Pickering, R. P. (2005). Twelve-month prevalence and changes in driving after drinking: United States, 1991-1992 and 2001-2002. *Drug and Alcohol Dependence*, 80(2), 223-230.

doi:10.1016/j.drugalcdep.2005.03.013

- Cohen, D. A., Ghosh-Dastidar, B., Scribner, R., Miu, A., Scott, M., Robinson, P., ... & Brown-Taylor, D. (2006). Alcohol outlets, gonorrhea, and the Los Angeles civil unrest: a longitudinal analysis. *Social Science & Medicine*, *62*(12), 3062-3071.
- Colon, I., & Cutter, H. S. (1983). The relationship of beer consumption and state alcohol and motor vehicle policies to fatal accidents. *Journal of Safety Research*, *14*(2), 83-89.
- Cooper, M., Agocha, V., & Sheldon, M. S. (2000). A motivational perspective on risky behaviors: The role of personality and affect regulatory processes. *Journal of Personality*, *68*(6), 1059-1088. doi:10.1111/1467-6494.00126
- Costa, P. T., & McCrae, R. R. (1992). Normal personality assessment in clinical practice: The NEO Personality Inventory. *Psychological Assessment*, *4*(1), 5-13.
doi:10.1037/1040-3590.4.1.5
- Dahlen, E. R., & White, R. P. (2006). The Big Five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Personality and Individual Differences*, *41*, 903-915. doi: 10.1016/j.paid.2006.03.016
- Darvill, T. J., & Johnson, R. C. (1991). Optimism and perceived control of life events as related to personality. *Personality and Individual Differences* *12*, 951-954.
- Donohew, L., Zimmerman, R., Cupp, P. S., Novak, S., Colon, S., & Abell, R. (2000). Sensation seeking, impulsive decision-making, and risky sex: implications for risk-taking and design of interventions. *Personality and Individual Differences*, *28*, 1079-1091. doi: doi:10.1016/S0191-8869(99)00158-0

- Donovan, D. M., & Marlatt, G. A. (1982). Personality subtypes among driving-while-intoxicated offenders: relationship to drinking behavior and driving risk. *Journal of Consulting and Clinical Psychology, 50*, 241-249.
- Eensoo, D., Paaver, M, Harro, M., Harro, J. (2005). Predicting drunk driving: contribution of alcohol use and related problems, traffic behavior, personality and platelet monoamine oxidase (MAO) activity. *Alcohol and Alcoholism, 40*, 140-146. doi: 10.1093/alcalc/agh135
- Escobedo, L. G., & Ortiz, M. (2002). The relationship between liquor outlet density and injury and violence in New Mexico. *Accident analysis & prevention, 34(5)*, 689-694.
- Garrity, R. D., & Demick, J. (2001). Relations among personality traits, mood states, and driving behaviors. *Journal of Adult Development, 8(2)*, 109-118.
doi:10.1023/A:1026446002317
- Gilbert, D. G., & Gilbert, B. O. (1995). Personality, psychopathology, and nicotine response as mediators of the genetics of smoking. *Behavior Genetics, 25(2)*, 133-147. doi:10.1007/BF02196923
- Goldberg, L. R., & Stycker, L. A. (2002). Personality traits and eating habits: The assessment of food preferences in a large community sample. *Personality And Individual Differences, 32(1)*, 49-65. doi:10.1016/S0191-8869(01)00005-8
- Gorman, D. M., Gorman, D. M., Zhu, L., Gorman, D. M., Zhu, L., Horel, S., ... & Horel, S. (2005). Drug 'hot-spots', alcohol availability and violence. *Drug and Alcohol Review, 24(6)*, 507-513.

- Gorman, D. M., Speer, P. W., Gruenewald, P. J., & Labouvie, E. W. (2001). Spatial dynamics of alcohol availability, neighborhood structure and violent crime. *Journal of Studies on Alcohol and Drugs*, 62(5), 628.
- Greening, L., & Stoppelbein, L. (2000). Young drivers' health attitudes and intentions to drink and drive. *Journal Of Adolescent Health*, 27(2), 94-101.
doi:10.1016/S1054-139X(99)00114-7
- Grekin, E. R., & Sher, K. J. (2006). Alcohol dependence symptoms among college freshmen: prevalence, stability, and person-environment interactions. *Experimental and Clinical Psychopharmacology*, 14(3), 329. doi: 10.1037/1064-1297.14.3.329
- Grube, J. W., & Voas, R. B. (1996). Predicting underage drinking and driving behaviors. *Addiction*, 9, 1843-1857.
- Gruenewald, P. J., Johnson, F. W., & Treno, A. J. (2002). Outlets, drinking and driving: a multilevel analysis of availability. *Journal of Studies on Alcohol and Drugs*, 63(4), 460.
- Gyimah-Brempong, K. (2001). Alcohol availability and crime: Evidence from census tract data. *Southern Economic Journal*, 2-21.
- Hampson, S. E., Goldberg, L. R., Vogt, T. M., & Dubanoski, J. P. (2006). Forty years on: Teachers' assessments of children's personality traits predict self-reported health behaviors and outcomes at midlife. *Health Psychology*, 25(1), 57-64.
doi:10.1037/0278-6133.25.1.57

- Harris, K.M., C.T. Halpern, E. Whitsel, J. Hussey, J. Tabor, P. Entzel, & Udry, J.R. (2009). The National Longitudinal Study of Adolescent Health: Research Design. Retrieved from: <http://www.cpc.unc.edu/projects/addhealth/design>.
- Herzberg, P. Y. (2009). Beyond “accident-proneness”: Using Five-Factor Model prototypes to predict driving behavior. *Journal of Research in Personality*, 43, 1096-1100. doi: 10.1016/j.jrp.2009.08.008
- Hingson, R., & Howland, J. (1990). Use of laws to deter drinking and driving. *Alcohol Health & Research World*, 14(1), 36-43.
- Hong, R. Y., & Paunonen, S. V. (2009). Personality traits and health-risk behaviours in university students. *European Journal of Personality*, 23(8), 675-696. doi:10.1002/per.736
- Hoyle, R. H., Fejfar, M. C., & Miller, J. D. (2000). Personality and sexual risk taking: A quantitative review. *Journal of Personality*, 68(6), 1203-1231. doi:10.1111/1467-6494.00132
- Hundleby, J. D. (1986). Personality and the Prediction of Delinquency and Drug Use - A Follow-up Study of Training School Boys. *British Journal of Criminology*, 26, 129-146.
- Jaccard, J., Turrisi, R. (1987). Cognitive processes and individual differences in judgments relevant to drunk driving. *Journal of Personality and Social Psychology*, 53, 135-145.
- Jessor, R. (1987). Risky driving and adolescent problem behavior: theoretical and empirical linkage. In: Benjamin, T., ed. *Young Drivers Impaired by Alcohol and Drugs*. London: Royal Society of Medicine Services, Ltd.

- Jonah, B. A. (1997). Sensation seeking and risky driving: A review and synthesis of the literature. *Accident Analysis and Prevention*, 29(5), 651-665. doi:10.1016/S0001-4575(97)00017-1
- Jonah, B. A., & Dawson, N. E. (1987). Youth and risk: Age differences in risky driving, risk perception, and risk utility. *Alcohol, Drugs & Driving*, 3, 13-29.
- Jonah, B. A., Mann, R. E., Macdonald, S., Stoduto, G., Bondy, S., & Shaikh, A. (2000). The effects of lowering legal blood alcohol limits: A review. In *Proceedings International Council on Alcohol, Drugs and Traffic Safety Conference* (Vol. 2000). International Council on Alcohol, Drugs and Traffic Safety. Retrieved from: <http://dionysus.psych.wisc.edu/lit/Topics/OWI/JonahB2000a.pdf>
- Kirkcaldy, B., & Furnham, A. (2000). Positive affectivity, psychological well-being, accident- and traffic-deaths and suicide: An international comparison. *Studia Psychologica*, 42(1-2), 97-104.
- Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2006). Who drinks and why? A review of socio-demographic, personality, and contextual issues behind the drinking motives in young people. *Addictive Behaviors*, 31(10), 1844-1857. doi:10.1016/j.addbeh.2005.12.028
- Lajunen, T. (2001). Personality and accident liability: Are extraversion, neuroticism and psychoticism related to traffic and occupational fatalities? *Personality and Individual Differences*, 31(8), 1365-1373. doi:10.1016/S0191-8869(00)00230-0
- Lang, E., Stockwell, T., Rydon, P., & Beel, A. (1998). Can training bar staff in responsible serving practices reduce alcohol-related harm? *Drug and Alcohol Review*, 17(1), 39-50. doi:10.1080/09595239800187581

- Larkins, J. M., & Sher, K. J. (2006). Family history of alcoholism and the stability of personality in young adulthood. *Psychology of Addictive Behaviors*, 20(4), 471-477. doi:10.1037/0893-164X.20.4.471
- Larson, R. J. & Ketelaar, T. (1991). Personality and susceptibility to positive and negative emotional states. *Journal of Personality and Social Psychology*, 61, 132-140.
- Lee, J. A., Jones-Webb, R. J., Short, B. J., & Wagenaar, A. C. (1997). Drinking location and risk of alcohol-impaired driving among high school seniors. *Addictive Behaviors*, 22(3), 387-393. doi:10.1016/S0306-4603(96)00045-7
- Lee, W.E., Wadsworth, M.E.J., & Hotopf, M. (2006). The protective role of trait anxiety: S longitudinal cohort study. *Psychological Medicine*, 36, 345–351.
doi: 10.1017/S0033291705006847
- Lipton, R., & Gruenewald, P. (2002). The spatial dynamics of violence and alcohol outlets. *Journal of Studies on Alcohol and Drugs*, 63(2), 187.
- Malouff, J. M., Thorsteinsson, E. B., Rooke, S. E., & Schutte, N. S. (2007). Alcohol involvement and the Five-Factor Model of personality: A meta-analysis. *Journal of Drug Education*, 37(3), 277-294. doi:10.2190/DE.37.3.d
- Mann R. E., Stoduto G., Macdonald S., Shaikh A., Bondy S., Jonah B. (2001). The effects of introducing or lowering legal *per se* blood alcohol limits for driving: an international review. *Accident Analysis and Prevention*, 33, 61–75.
- Martin, E. D., & Sher, K. J. (1994). Family history of alcoholism, alcohol use disorders and the five-factor model of personality. *Journal of Studies on Alcohol*, 55(1), 81-90.

- Martin, N. G., & Boomsma, D. I. (1989). Willingness to drive when drunk and personality: A twin Study. *Behavior Genetics*, 19, 97–111.
- McCarthy, D. M., Kroll, L. S., & Smith, G. T. (2001). Integrating disinhibition and learning risk for alcohol use. *Experimental and Clinical Psychopharmacology*, 9, 389-398. doi: 10.1037/1064-1297.9.4.389
- McCarthy, D.M., Pedersen, S.L., Thompsen, D.M., & Leuty, M.E. (2006). Development of a measure of drinking and driving expectancies for youth. *Psychological Assessment*, 18, 155-164.
- McMillen, D. L., Pang, M. G., Wells-Parker, E., & Anderson, B. J. (1992). Alcohol, personality traits, and high risk driving: A comparison of young, drinking driver groups. *Addictive Behaviors*, 17(6), 525-532. doi:10.1016/0306-4603(92)90062-Z
- Miles, D. E., & Johnson, G. L. (2003). Aggressive driving behaviors: are there psychological and attitudinal predictors? *Transportation Research Part F: Traffic Psychology And Behaviour*, 6(2), 147-161. doi:10.1016/S1369-8478(03)00022-6
- Miller, J. D., Lynam, D. R., Widiger, T. A., & Leukefeld, C. (2001). Personality disorders as extreme variants of common personality dimensions: Can the Five-Factor Model adequately represent psychopathy? *Journal of Personality*, 69(2), 253-276. doi:10.1111/1467-6494.00144
- Miller, J. D., Lynam, D., Zimmerman, R. S., Logan, T. K., Leukefeld, C., & Clayton, R. (2004). The utility of the Five Factor Model in understanding risky sexual behavior. *Personality and Individual Differences*, 36(7), 1611-1626. doi:10.1016/j.paid.2003.06.009

- Mohr, C. D., Armeli, S., Tennen, H., Carney, M., Affleck, G., & Hromi, A. (2001). Daily interpersonal experiences, context, and alcohol consumption: Crying in your beer and toasting good times. *Journal of Personality And Social Psychology*, 80(3), 489-500. doi:10.1037/0022-3514.80.3.489
- Nagin, D. (1998). Criminal deterrence research at the outset of the twenty-first century. In M. Tonry (Ed.), *Crime and justice: A review of research* (Vol. 23, pp.1-42). Chicago: University of Chicago Press.
- National Highway Traffic Safety Administration. (2013). *Traffic Safety Facts 2012: Alcohol-Impaired Driving* (Publication No. DOT HS 811 870). National Center for Statistics and Analysis. US Department of Transportation, Washington, DC. Retrieved from: <http://www-nrd.nhtsa.dot.gov/Pubs/811870.pdf>
- Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research*, 8(2), 157-176. doi:10.1080/1366987032000123856
- Nochajski, T. H., & Stasiewicz, P. R. (2006). Relapse to driving under the influence (DUI): A review. *Clinical Psychology Review*, 26(2), 179-195. doi:10.1016/j.cpr.2005.11.006
- Norström, T. (2000). Outlet density and criminal violence in Norway, 1960-1995. *Journal of Studies on Alcohol and Drugs*, 61(6), 907.
- Nygaard, P., Waiters, E. D., Grube, J. W., & Keefe, D. (2003). Why do they do it? A qualitative study of adolescent drinking and driving. *Substance Use & Misuse*, 38(7), 835-863. doi:10.1081/JA-120017613

- Patterson, C. M., & Newman, J. P. (1993). Reflectivity and learning from aversive events: Towards a psychological mechanism for the syndromes of disinhibition. *Psychological Review*, *100*, 716-736.
- Patterson, C. M., Kosson, D. S., & Newman, J. P. (1987). Reaction to punishment, reflectivity, and passive avoidance learning in extraverts. *Journal of Personality and Social Psychology*, *52*(3), 565-575. doi:10.1037/0022-3514.52.3.565
- Pearce-McCall, D., & Newman, J. P. (1986). Expectation of success following noncontingent punishment in introverts and extraverts. *Journal of Personality and Social Psychology*, *50*(2), 439-446. doi:10.1037/0022-3514.50.2.439
- Pedersen, S. L., & McCarthy, D. M. (2008). Person-environment transactions in youth drinking and driving. *Psychology of addictive behaviors*, *22*(3), 340. doi: 10.1037/0893-164X.22.3.340
- Pollack, C. E., Cubbin, C., Ahn, D., & Winkleby, M. (2005). Neighbourhood deprivation and alcohol consumption: does the availability of alcohol play a role?. *International journal of epidemiology*, *34*(4), 772-780.
- 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*, *44*(5), 500-516.
- Ramstedt M. (2002). The repeal of medium-strength beer sales in grocery stores in Sweden — the impact on alcohol-related hospitalizations in different age groups. In Room R (Eds.), *The effects of Nordic alcohol policies: what happens to drinking and harm when alcohol controls change?* Helsinki (FI): Nordic Council

for Alcohol and Drug Research. Retrieved from:

<http://www.dldocs.stir.ac.uk/documents/nad42.pdf>

- Reid, R. J., Hughey, J., & Peterson, N. A. (2003). Generalizing the alcohol outlet-assaultive violence link: evidence from a US midwestern city. *Substance use & misuse*, 38(14), 1971-1982.
- Royal, D. (2003). National Surveys of Drinking and Driving. Attitudes and Behavior: 2001. Volume II: Findings Report. Washington, DC: U.S. Department of Traffic Safety, National Highway Traffic Safety Administration.
- Ryb, G.E., Dischinger, P.C., Kufera, J.A., & Read, K.M. (2006). Risk perception and impulsivity: Association with risky behaviors and substance abuse disorders. *Accident Analysis & Prevention*, 38, 567-573.
- Schell, T. L., Chan, K. S., & Morral, A. R. (2006). Predicting DUI recidivism: Personality, attitudinal, and behavioral risk factors. *Drug and Alcohol Dependence*, 82, 33-40. doi: 10.1016/j.drugalcdep.2005.08.006
- Scott-Parker, B., Watson, B., King, M. J., & Hyde, M. K. (2011). The psychological distress of the young driver: A brief report. *Injury Prevention*, 17(4), 275-277. doi:10.1136/ip.2010.031328
- Scribner, R. A., Mason, K. E., Simonsen, N. R., Theall, K., Chotalia, J., Johnson, S., ... & DeJong, W. (2010). An ecological analysis of alcohol-outlet density and campus-reported violence at 32 US colleges. *Journal of studies on alcohol and drugs*, 71(2), 184.

- Sher, K. J., & Trull, T. J. (1994). Personality and disinhibitory psychopathology: Alcoholism and antisocial personality disorder. *Journal of Abnormal Psychology, 103*, 92-102. doi:10.1037/0021-843X.103.1.92
- Sher, K. J., Trull, T.J., Bartholow, B., & Vieth, A. (1999). Personality and alcoholism: Issues, methods, and etiological processes. In H. Blane and K. Leonard (Eds.), *Psychological theories of drinking and alcoholism* (2nd ed.), pp. 55-105. New York: Plenum.
- Shults, R. A., Elder, R. W., Hungerford, D. W., Strife, B. J., & Ryan, G. W. (2009). Emergency department visits for alcohol-related unintentional traumatic injuries, United States, 2001. *Journal of Safety Research, 40*(4), 329-331. doi:10.1016/j.jsr.2009.06.001
- Smith, D. I., & Kirkham, R. W. (1981). Relationship between some personality characteristics and driving record. *British Journal of Social Psychology, 20*: 229–231. doi: 10.1111/j.2044-8309.1981.tb00491.x
- Stewart, S. H., Zvolensky, M. J., & Eifert, G. H. (2001). Negative-reinforcement drinking motives mediate the relation between anxiety sensitivity and increased drinking behavior. *Personality and Individual Differences, 31*(2), 157-171. doi:10.1016/S0191-8869(00)00213-0
- Tippetts, A., Voas, R. B., Fell, J. C., & Nichols, J. L. (2005). A meta-analysis of .08 BAC laws in 19 jurisdictions in the United States. *Accident Analysis and Prevention, 37*(1), 149-161. doi:10.1016/j.aap.2004.02.006

- Treno, A. J., Grube, J. W., & Martin, S. E. (2003). Alcohol availability as a predictor of youth drinking and driving: a hierarchical analysis of survey and archival data. *Alcoholism: Clinical and Experimental Research*, 27(5), 835-840.
- Trull, T. J., & Sher, K. J. (1994). Relationship between the five-factor model of personality and Axis I disorders in a nonclinical sample. *Journal of Abnormal Psychology*, 103(2), 350-360. doi:10.1037/0021-843X.103.2.350
- Turrisi, R., & Jaccard, J. (1992). Cognitive and attitudinal factors in the analysis of alternatives to drunk driving. *Journal of Studies On Alcohol*, 53(5), 405-414.
- Turrisi, R., Jaccard, J., & McDonnell, D. (1997). An examination of the relationships between personality, attitudes, and cognitions relevant to alcohol-impaired driving tendencies. *Journal of Applied Social Psychology*, 27(15), 1367-1394.
doi:10.1111/j.1559-1816.1997.tb01811.x
- U.S. Department of Health and Human Services. (1988). *Surgeon General's Workshop on Drunk Driving: Proceedings*. Rockville, MD: U.S. Dept. of Health and Human Services, Office of the Surgeon General.
- Voas, R. B., Marques, P. R., Tippetts, A. S. and Beirness, D. J. (1999), The Alberta Interlock Program: the evaluation of a province-wide program on DUI recidivism. *Addiction*, 94: 1849–1859. doi: 10.1046/j.1360-0443.1999.9412184910.x
- Voas, R. B., Tippetts, A., & Fell, J. C. (2003). Assessing the effectiveness of minimum legal drinking age and zero tolerance laws in the United States. *Accident Analysis and Prevention*, 35(4), 579-587. doi:10.1016/S0001-4575(02)00038-6
- Vollrath, M., & Torgersen, S. (2002). Who takes health risks? A probe into eight personality types. *Personality and Individual Differences*, 32, 1185–1197.

- Vollrath, M., Knoch, D., & Cassano, L. (1999), Personality, risky health behaviour, and perceived susceptibility to health risks. *European Journal of Personality*, 13, 39–50. doi: 10.1002/(SICI)1099-0984(199901/02)13:1
- Wagenaar, A. C., & Toomey, T. L. (2002). Effects of minimum drinking age laws: Review and analyses of the literature from 1960 to 2000. *Journal of Studies on Alcohol*, s4, 206-225.
- Wagenaar, A.C., Murray, D.M., & Toomey, T.L. (2000): Communities Mobilizing for Change on Alcohol (CMCA): effects of a randomized trial on arrests and traffic crashes. *Addiction*, 95, 209–217.
- Weitzman, E. R., Folkman, A., Folkman, K. L., & 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*, 9(1), 1-6.
- Whiteside, S. P., Lynam, D. R., Miller, J. D., & Reynolds, S. K. (2005). Validation of the UPPS impulsive behavior scale: A four-factor model of impulsivity. *European Journal of Personality*, 19, 559-574. doi: 10.1002/per.556
- Wiliszowski, C.; Murphy, P.; Jones, R.; Lacey, J. (1996). *Determine reasons for repeat drinking and driving* (NHTSA Report No. DOTIHS 808 401). Washington, DC: National Highway Traffic Safety Administration.
- Williams, A. F. (2006). Alcohol-impaired driving and its consequences in the United States: The past 25 years. *Journal of Safety Research*, 37, 123-138. doi: 10.1016/j.jsr.2006.01.001

- Willis, C., Lybrand, S., & Bellamy, N. (2004). Alcohol ignition interlock programmes for reducing drink driving recidivism. *The Cochrane Database of Systematic Reviews* 2004, 3. doi:10.1002/14651858.CD004168.pub2
- Yi, H. Y., Chen, C. M., & Williams, G. D. (2006). *Surveillance report# 76: Trends in alcohol-related fatal traffic crashes, United States, 1982–2004*. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism. Retrieved from: <http://pubs.niaaa.nih.gov/publications/surveillance76/FARS04.pdf>
- Yu, Q., Scribner, R., Carlin, B., Theall, K., Simonsen, N., Ghosh-Dastidar, B., ... & Mason, K. (2008). Multilevel spatio-temporal dual changepoint models for relating alcohol outlet destruction and changes in neighbourhood rates of assaultive violence. *Geospatial health*, 2(2), 161-172.
- Zador, P. L. (1991). Alcohol-related relative risk of fatal driver injuries in relation to driver age and sex. *Journal of Studies on Alcohol and Drugs*, 52, 302-310
- Zuckerman, M., & Kuhlman, D. (2000). Personality and risk-taking: Common biosocial factors. *Journal of Personality*, 68, 999-1029. doi:10.1111/1467-6494.00124
- Zuckerman, M., Eysenck, S. B., & Eysenck, H. J. (1978). Sensation seeking in England and America: Cross-cultural, age, and sex comparisons. *Journal of Consulting and Clinical Psychology*, 46(1), 139-149. doi:10.1037/0022-006X.46.1.139

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