*Article*

Crime & Delinquency
1–26

DOI: 10.1177/00111287211054721
journals.sagepub.com/home/cad
SAGE

# Deterring the Drunk Driver: An Examination of Conditional Deterrence and Self-Reported Drunk Driving

**Richard J. Stringer**[1]

**Abstract**

This project uses a representative U.S. population sample and Generalized Structural Equation Modeling (GSEM) to explore the deterrence of driving under the influence (DUI) and it's moderation by the differential deterrability of problem and non-problem drinkers. As hypothesized, the results indicate that personal and vicarious experiences with punishment and punishment avoidance were significant predictors of punishment certainty and self-reported DUI. Significant heterogeneity in both the formulation of perceived certainty of punishment and the relationship between this perception and DUI also exists between problem and non-problem drinkers. Most notably, certainty of punishment was a more robust negative predictor of DUI offending for problem drinkers, and prior punishment appears to have little effect on perceptions of punishment certainty for problem drinkers.

**Keywords**

deterrence, drunk driving, structural equation modeling

Crime policy in the U.S. often focuses on punitive efforts based on the classical deterrence model (e.g., increasing objective certainty and severity of

[1]Kennesaw State University, GA, USA

**Corresponding Author:**
Richard J. Stringer, Department of Sociology & Criminal Justice, Kennesaw State University, 1000 Chastain Road, Kennesaw, GA 30144, USA.
Email: rstring7@kennesaw.edu

punishment); however, more recent theoretical developments suggest the deterrence process is much more complex than originally theorized. For example, both indirect (general deterrence) and direct (specific deterrence) experiences with punishment and punishment avoidance will influence perceptions such as certainty of punishment (Stafford & Warr, 1993). Other scholars also purport that the deterrability of offenders varies (see Jacobs, 2010; Pogarsky, 2002) and that alcohol addiction may undermine that rational decision-making process assumed by deterrence (Yu, 2000; Yu et al., 2006). As such, this project aims to examine heterogeneity in deterrence with a partial examination of the Stafford and Warr (1993) model that is conditional upon problem drinking.

Prior to the development of the Stafford and Warr (1993) model, research largely overlooked the formulation of "the very perceptions on which deterrence theory is based" such as the perception of certainty of punishment (Piquero & Pogarsky, 2002, p. 178). This is especially important because subsequent research has shown there is not a strong correlation between objective certainty and perceived certainty of punishment (Apel, 2013). Furthermore, since perceptions of deterrence can be contemporaneously shaped by experiences with both general and specific deterrence, research should not be limited to the examination of one or the other (Stafford & Warr, 1993). Perceptions are also not only formulated through experiences with punishment and non-offending, but punishment avoidance is also critical.

Although the influence of experiences on perceptions varies across person (Stafford & Warr, 1993), more recently scholars have addressed a related issue of differential deterrability (see Piquero et al., 2011). Deterrability is the ability or desire to engage in the rational process of weighing the costs and benefits of committing a crime, and this can moderate the effectiveness of deterrence on criminal propensities (Jacobs, 2010). In fact, alcohol addiction can inhibit this key assumption of rational thought (see Yu, 2000; Yu et al., 2006), which may affect the deterrability of problem drinkers. As such, since research is needed to "catalog key moderators and contingencies for deterrence" (Loughran et al., 2012a; p 734; Pratt & Cullen, 2005), this project makes a genuine contribution to the evolution of the literature on differential deterrence.

The prolific social problem of drunk driving provides a unique opportunity for the examination of Stafford and Warr's (1993) reconceptualization of deterrence theory and the potential differential deterrability of problem drinkers. Since a plethora of the population (about 20%) engages in DUI (Drew et al., 2010a), it is "a relatively common crime and persons are likely to be well stocked with experiences in violating drinking and driving laws, and experiences with punishment and punishment avoidance for those actions"

(Piquero & Paternoster, 1998, p. 5). In fact, since recent estimates indicate that there is only one arrest for every one thousand DUI trips in the U.S. (Zaloshnja et al., 2013) a survey of the public is likely to reveal substantial experience with punishment avoidance. Thus, DUI offenses are preferable to other offenses that are less common among the general public (e.g., rape, robbery, murder) for examining punishment avoidance. The analysis of DUI offenses is also a worthwhile endeavor since it is a serious social problem in the U.S. that leads to thousands of fatalities, injuries, property damage each year (Applegate et al., 1995; Lerner, 2011). Therefore, this project uses a sample of the U.S. population to partially examine diversity in the Stafford and Warr (1993) model of deterrence and self-reported DUI between problem and non-problem drinkers.

## Theory

The classical deterrence model considered specific and general deterrence to operate separately for prior offenders and the general public, respectively. However, Stafford and Warr (1993) argue that the two separate theories of specific and general deterrence are unnecessary and have significant limitations. Specifically, the theorists posit that individuals will consider a mixture of both their direct/personal (specific deterrence) and indirect/vicarious (general deterrence) experiences when formulating perceptions of certainty and severity of punishment. Therefore, scholars should evaluate the direct and indirect experiences with punishment contemporaneously (Stafford & Warr, 1993). The authors argue that individuals should be viewed as residing along a deterrence continuum with specific (personal experiences) at one end and general (vicarious experiences) at the other extreme, because some individuals may rely more on one type of experience than another. For example, non-offenders will have no choice but to rely on vicarious experiences since they lack personal experience with crime, but direct experiences may be more important for recidivists (see also Paternoster & Piquero, 1995).

Stafford and Warr (1993) also made a significant addition to the development of deterrence theory by incorporating ideas from learning theory (Akers, 2009) to explain how perceptions of certainty of punishment are formulated. The additional consideration of those that committed crimes and avoided punishment is another essential piece of the decision-making process for deterrence (Stafford & Warr, 1993). In fact, they argue that committing a crime and not being caught can have a greater influence on perceptions of punishment certainty than being caught and punished. Thus, it is crucial to measure not only if a crime was committed and punished, but if one was committed and unpunished.

Although not articulated in the Stafford and Warr (1993) model, other scholars have pointed to the importance of assessing the differential deterrability of potential offenders when examining deterrence (Jacobs, 2010; Pogarsky, 2002; Zimring & Hawkins, 1968). While deterrence assumes a rational calculation of the costs and benefits of crime, deterrability refers to the offender's "capacity and/or willingness to perform this calculation" (Jacobs, 2010, p. 417). This important distinction goes to a core assumption of deterrence is also often overlooked in early deterrence research on the Stafford and Warr (1993) model. Pogarsky (2002) posits that there are three basic categories of offender. Acute conformists will not offend regardless of their perceptions of punishment due to extralegal factors such as norms, morals, values, beliefs, etc. (Pogarsky, 2002; see also Andenaes, 1974). However, at the other end of the spectrum are the incorrigible "committed offenders who are impervious to dissuasion" that offend regardless of the threat of punishment (Pogarsky, 2002, p. 433). The deterrable offenders are those that are actually sensitive to, and influenced by, the threat of punishment (Pogarsky, 2002).

Jacobs (2010) offered further elaboration to the idea of deterrability with the argument that risk sensitivity is an important precondition to deterrability. In short, this concept refers to how individuals respond to the threat of sanctions, or in other words, how much do they care about being caught. At one extreme are those that are highly concerned about possible sanctions and at the other those that do not care at all and are "grossly insensitive to risk" (Jacobs, 2010, p. 435). Several factors such as inebriation (Shover, 2018), poor executive functioning (Nagin & Paternoster, 1993), moralism (Jacobs & Wright, 2006), desperation (Wright & Decker, 1996), and impulsivity (Nagin & Pogarsky, 2001; Piquero & Tibbetts, 1996) have been shown to reduce and/or prevent the consideration of legal sanctions. Thus, these factors have a proximate influence on risk sensitivity and deterrability (Jacobs, 2010).

While many of the factors noted above are very likely to be characteristics of those with alcohol addiction problems, addiction theorists also question the extent to which addicts can make rational choices and engage in a proper deterrence calculation due to their addiction (Yu et al., 2006). For example, MacCoun (1993) shows that the decisions of addicts are often less reliant on rational choices and more often rely on unconscious or conditioned reactions. Thus, those with alcohol addiction problems may not be fully rational agents and suffer from an interrupted rational thinking process (Yu et al., 2006), which leads to lower risk sensitivity and deterrability.

## Previous Research

There is a plethora of criminological research on deterrence theory (see Pratt et al., 2006). However, despite the passage of several decades since Stafford

and Warr's (1993) reconceptualization, only some studies have empirically tested it, and none have explored how differential deterrability relates to these propositions. As such, this project aims to make a meaningful contribution to this growing area of research by exploring how deterrence is conditioned by problem drinking.

Prior research on Stafford and Warr's (1993) model has generally shown strong support for the theory. For example, there is considerable support for the proposition that punishment avoidance is related to decreased perceptions of punishment certainty (Apel, 2013; Paternoster & Piquero, 1995; Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Sitren & Applegate, 2007; Stringer, 2020). Although the prior research also generally shows that personal experiences are more important, it also indicates that vicarious experiences are important predictors of perceptions of punishment certainty as well (Paternoster & Piquero, 1995; Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Sitren & Applegate, 2007; Stringer, 2020). As such, empirical support exists for much of the Stafford and Warr (1993) reconceptualization; however, one anomaly exists between prior punishment and future crime.

Much of the prior research related to the Stafford and Warr (1993) model has discovered what has become known as a "positive punishment effect" (Pogarsky & Piquero, 2003, p. 96). Specifically, those that experienced previous punishment are predicted to have an increase in future offending compared to those without previous punishment (Bouffard et al., 2017; Paternoster & Piquero, 1995; Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Pogarsky & Piquero, 2003; Wood, 2007). The consistency of this counterintuitive relationship prompted further investigation into the complexity of the deterrence process (see Bouffard et al., 2018; Piquero & Pogarsky, 2002; Pogarsky & Piquero, 2003).

Many of the efforts to elaborate on differences on deterrence processes have explored decision making theories and literatures from the areas of rational choice and behavioral economics. One area of investigation has integrated the Stafford and Warr (1993) model with the rational choice model of Bayesian updating to examine changes in perceptions over time. For example, Pogarsky and Piquero (2003) indicated that the "positive punishment effect" is a "resetting effect" that results from a false believe that they will not be unlucky enough to be punished again and can continue to commit crimes (p. 96; see also Piquero & Pogarsky, 2002). This argument builds on Stafford and Warr's (1993) proposition that avoiding punishment can do more to encourage offending than punishment does to discourage it. The study found some support for resetting among a sub-sample of low-risk offenders that are impulsive and/or lack criminal experience (Pogarsky & Piquero, 2003; see also Matsueda et al., 2006; Pogarsky et al., 2004). However, research generally indicates that offenders increase their perceived risk of apprehension as

a result of prior punishment (Anwar & Loughran, 2011; Apel, 2013; Lochner, 2007; Matsueda et al., 2006; Pogarsky et al., 2004, 2005). However, the effect of punishment on perceptions is sensitive to both pre and post punishment experiential effects (Anwar & Loughran, 2011), and updating varies across those with low impulse control (Wilson et al., 2017), early behavioral problems, and low IQ (Thomas et al., 2013).

The continuous updating of perceptions of punishment based on new information also results in less ambiguity in the actual objective risk of apprehension (see Loughran et al., 2014). Since offenders rarely (if ever) know the actual objective certainty of being caught, this often results in an overestimation of initial perceptions of certainty (Apel, 2013; Loughran et al., 2011). However, as new information is obtained about the actual risks (either directly or indirectly) those that greatly overestimate the true risk of being caught due to a lack of experience with crime will update (likely lower) their perceptions (Apel, 2013). As a result, more experienced offenders may have less ambiguity and a lower perception of punishment certainty.

Although less ambiguity exists among frequent and visible offenses such as DUI than more serious index crimes (Apel, 2013; Sampson & Cohen, 1988), there is still a great deal of ambiguity. Specifically, the actual risk of arrest for DUI is less than 1%, but the general population estimate it to be about 35% (Piquero et al., 2012) and college student estimates range from 28% to 35% (Loughran et al., 2014; Piquero & Pogarsky, 2002; Pogarsky & Piquero, 2003). Interestingly, Midgette et al. (2021) indicate that according to the 24/7 sobriety data, ambiguity has influence over the decision to drink, but it does not impact the decision to drink and drive. Like the other concepts noted above, the relationship between ambiguity and offending varies in some respects. For example, those with a lower initial perception of risk may be ambiguity adverse because it raises their estimated risk of apprehension, but those higher on the risk continuum may actually seek ambiguity because it allows them to lower their risk (Loughran et al., 2011). Loughran et al. (2011) also extend the idea of loss aversion to explore ambiguity, but the findings for ambiguity adversity were contradictory.

Loss aversion posits that people are risk averse when the decision involves a gain but risk seeking when the decision results in a loss (e.g., criminal punishment) (Loughran, 2019; Pogarsky et al., 2018). There has been limited empirical research on loss aversion and crime, but some support exists for its application to deviance (Thomas & Nguyen, 2020), although others have found null results when applied to crime (Pickett et al., 2020). Pickett et al. (2020) suggest their findings may result from crime decisions not being only a loss or gain but a mixed gamble or simultaneous choice of both. Additionally, while individuals should be risk seeking for losses such as criminal punishment, prior

offenders may shift their reference point so that not engaging in a crime is a considered a loss and they become risk seeking (Loughran, Pogarsky et al., 2012). For example, those with alcohol addiction problems may not see drinking and driving as a loss and become risk seeking.

Overall, research into differential deterrability has confirmed that individuals do not always respond to punishment and the threat of punishment similarly (Piquero et al., 2011). In fact, Pogarsky (2002) illustrated that some will not commit crimes regardless of the perception of punishment certainty, others will do so regardless of the punishment, and only a portion is actually deterrable (see also Maxson et al., 2011; Urban, 2009; Worrall et al., 2014). Bouffard et al. (2018) also demonstrated that deterrability varies within individuals across offense types and that belief in the law, prior experiential effects (Loughran, Piquero et al., 2012), and moral values (Herman & Pogarsky, 2020) are important predictors of deterrability. Scholars have also found that emotional fear of arrest and punishment operates independent of the likelihood of being caught to influence offending decisions (Pickett, 2018; Pickett et al., 2018). Thus, those with low fear of arrest (e.g., not caring/low sensitivity to risk) may feel "as if he or she can act with impunity" and are therefore undeterrable (see Jacobs, 2010, p. 717).

Bouffard et al. (2017) indicate the alcohol disorders could explain some of the paradoxical prior results such as the positive punishment effect, and the prior literature suggests it may be related to DUI deterrability as well. Since drinking behavior is likely to influence the decision to drink and drive, alcohol use is often included as an important control measure (Bouffard et al., 2017; Piquero & Pogarsky, 2002; Stringer, 2020; Yu, 2000) and these studies have shown the importance of it when examining DUI. For example, after controlling for alcohol problems, all measures for punitive sanctions were rendered insignificant in one study (Yu, 2000), which suggests a possibility for mediation or a spurious effect. Stringer (2020) found that problem drinking was a more robust predictor of DUI than punishment certainty or severity.

While the prior research has not specifically examined differential deterrability among problem drinkers, Yu et al. (2006) presents an adjacent study by arguing that problem drinking resulted in violations of the assumption of rational thought and exploring the moderation of some deterrence measures by problem drinking. However, this project yielded insignificant results (possibly due to the small sample size of 433) for moderation, and it did not examine the reconceptualized Stafford and Warr (1993) model. As such, this project fills these voids in the existing research by testing the following hypotheses:

H1: Increased certainty of punishment will be negatively related to self-reported DUI.
H2: Personal experience with punishment will be related to an increase in certainty of punishment.
H3: Personal experience with punishment avoidance will be negatively related to certainty of punishment.
H4: Vicarious experiences will be related to punishment certainty.
H5: The relationship between deterrence-based measures will significantly vary between non-problem drinkers and problem drinkers.

## Method

### *Data*

This project used data from the National Survey of Drinking and Driving Attitudes and Behaviors (NSDDAB) (National Highway Traffic Safety Administration [NHTSA], 2008). These data represent the civilian driving age (16 and older) population in non-institutionalized households with a working telephone in all 50 states and the District of Columbia ($n = 6{,}999$). The survey was administered via both landline ($n = 5{,}392$) and wireless telephone ($n = 1{,}607$) in Spanish and English. Stratification occurred across four census regions (Northeast, Midwest, South, and West) and individuals were randomly sampled within each regional stratum (see Drew et al., 2010b). The overall response rate was 24.1%, and the overall refusal rate was 18.8%.[1]

Upon inspection of the original raw dataset, it was discovered that several measures had significant missing values[2] because they were contingent upon the responses to two filter questions (see Drew et al., 2010b, pp. 44, 48). The first filter question asked how often the respondent consumed alcoholic beverages in the past 12 months (see Drew et al., 2010b, p. 44). As such, respondents that did not drink alcoholic beverages in the last 12 months (40% of the sample) were not asked the follow up questions about alcohol consumption. The second filter question was about driving within 2 hours of drinking in the past 12 months, and it only applied to the question regarding the frequency of DUI in the last 30 days (see Drew et al., 2010b, p. 48).

Several options are available for dealing with missing data such as multiple imputation, but these options assume that the data is missing at random (MAR) or completely missing at random (MCAR) (see Allison, 2001). Since the missing values for these measures were the systematic result of the aforementioned filter questions, they were not missing at random,[3] and imputation would not be appropriate and would produce biased results. As such, this project addressed missing data in two ways. First, zeros were directly imputed

for these contingent dichotomous variables[2] when the respondent indicated he/she did not drink alcohol in the past 12 months. Zeros were also directly imputed for the frequency of driving within 2 hours of consuming alcohol in the past 30 days for respondents that indicated they had not driven within 2 hours of consuming alcohol in the past 12 months. Second, since Full Information Maximum Likelihood (FIML) is not available in GSEM, the remaining 438 cases were listwise deleted.

## Measures

Descriptive statistics are presented in Table 1. Driving within 2 hours of drinking alcohol in the prior month 30 days and perceptions of the certainty of punishment are both endogenous measures. To obtain the measure of self-reported drinking and driving in the past 30 days respondents were asked "In the past 30 days, how many times have you driven a motor vehicle within two hours after drinking alcoholic beverages?" (Drew et al., 2010b, p. 48). Since 85% of respondents had not driven after drinking in the prior month the distribution was positively skewed (10.38) and leptokurtic (138.04).

Perceptions of the certainty of punishment for DUI was an endogenous and exogenous latent variable comprised of three observed measures. These measures were obtained by asking respondents "How likely is it that drivers who have had too much to drink and drive safely will get stopped by the police/be convicted for drunk driving/be arrested for drunk driving?" (Drew et al., 2010b, p. 60). The ordered responses for each measure include very unlikely (1), somewhat unlikely (2), somewhat likely (3), very likely (4), and almost certain (5). These 5-point scales were identical to the scales of measure of certainty of punishment from prior studies (see Paternoster & Piquero,1995; Stringer, 2020).

Table 2 presents the results from the Confirmatory Factor Analysis (CFA) for the latent measure of certainty of punishment. The likelihood of arrest was utilized as the scale variable to define the metric of the latent variable and therefore the parameter estimate is fixed equal to one. The significant results confirm that these measures are highly correlated and "indicative of a latent theoretical measure of certainty of punishment" (Stringer, 2020, p. 327). The use of three observed measures also assures that the model is identified because it produces estimates for the same number of covariances and parameters within the matrix (3 of each) (see Paxton et al., 2011). This CFA model was utilized for all subsequent structural models.

Prior DUI arrests were measured with the survey question "Have you ever been arrested for a drinking and driving violation anytime in the past two years?" (Drew et al., 2010b, p. 61). Prior research has shown that dichotomous

**Table 1.** Descriptive Statistics ($N = 6{,}561$).

| | Mean | *SD* | Min. | Max. |
|---|---|---|---|---|
| DUI frequency in past 30 days | 0.39 | 1.81 | 0 | 30 |
| Problem drinker | 0.04 | 0.20 | 0 | 1 |
| Prior DUI arrest | 0.01 | 0.09 | 0 | 1 |
| DUI checkpoint experience | 0.16 | 0.37 | 0 | 1 |
| Punishment avoidance | 0.18 | 0.38 | 0 | 1 |
| Perceived DUI stop likelihood | 3* | 1.08 | 1 | 5 |
| Perceived DUI arrest likelihood | 3* | 1.15 | 1 | 5 |
| Perceived DUI conviction likelihood | 4* | 1.18 | 1 | 5 |
| Been with a planned DUI driver | 0.42 | 0.49 | 0 | 1 |
| Rode with DUI driver | 0.08 | 0.27 | 0 | 1 |
| Perceived likelihood of crash/accident | 4* | 0.89 | 1 | 5 |
| DUI checkpoint use approval | 5* | 1.17 | 1 | 5 |
| Number of drinks to BAC limit | 1.28 | 0.38 | 0 | 3.26 |
| Automotive driving frequency | 5* | 1.17 | 1 | 5 |
| Male | 0.45 | 0.50 | 0 | 1 |
| Age | 48.26 | 19.01 | 16 | 86 |

*Ordinal measure reported as the mode instead of mean for central tendency.

measures of DUI arrest are preferred over frequency of DUI arrest due to issues with the normality of these distributions (see Piquero & Paternoster, 1998; Stringer, 2020). Therefore, prior punishment via DUI arrest is a binary measure of prior DUI arrest (1) compared to no prior DUI arrest (0) as the reference category.

Following prior research on deterrence, experience with DUI checkpoints was also included as a measure of punishment[4] (see Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Stringer, 2020). The survey instrument measured this as "In the past twelve months, have you seen a sobriety checkpoint, where drivers are stopped briefly by police to check for alcohol-impaired driving?" (Drew et al., 2010b, p. 62). This binary measure compared those that experienced a DUI checkpoint (1) to those that did not (0) as the reference category.

Punishment avoidance was measured similar to other prior research on punishment avoidance (Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Stringer, 2020). This measure was calculated as the frequency of driving after drinking minus the frequency of going through a sobriety checkpoint during the last year with the formula below[5]:

$$PA = \left(f_{D12} - f_{D30}\right) - f_{C12}$$

**Table 2.** Measurement Model for Certainty of Punishment.

| | Estimates | | *SE* |
|---|---|---|---|
| Likelihood of conviction | 0.55*** | | 0.03 |
| Likelihood of stop | 0.74*** | | 0.04 |
| Likelihood of arrest | 1 | | — |
| AIC | | 53918.63 | |
| BIC | | 54021.39 | |

***$p < .001$.

Where *PA* is the frequency of punishment avoidance, $f_{D12}$ is the frequency of driving after drinking in the past 12 months, $f_{D30}$ is the frequency of driving after drinking in the past 30 days, and $f_{C12}$ is the frequency of going through a checkpoint in the past 12 months. This calculation produced a non-normal distribution (skew = 46.98, kurtosis = 2521.98) because about 82% of the sample had not experienced punishment avoidance. Piquero and Paternoster (1998) encountered the same issue with their measure of punishment avoidance and chose to recode it as a binary measure, so this scale was also dichotomized as well.

This project included two dichotomous measures of vicarious experiences[6] (Stafford & Warr, 1993). The first measure was developed by asking respondents "In the past twelve months, did you ever ride in a motor vehicle with a driver you thought might have consumed too much alcohol to drive safely?" (Drew et al., 2010b, p. 53), and that had done so (1) were compared to those that had not (0). The second query asked if respondents had ever been in "a situation when you were with a friend, family member, or acquaintance who had too much to drink to drive safely, yet was planning to drive?" (Drew et al., 2010b, p. 58).

The CAGE index of problem drinking (Bush et al., 1987) has been used in prior research on drunk driving (see Bertelli & Richardson, 2008; Goodfellow & Kilgore, 2014; Stringer, 2020), and it was used to measure problem drinking herein. The scale is comprised of four questions that include: during the last 12 months "has there been a time when you felt you should cut down on your drinking?", "has there been a time when people criticized your drinking?", "has there been a time when you felt bad or guilty about your drinking?", and "has there been a time when you had a drink first thing in the morning?" (Drew et al., 2010b, p. 47). Those that indicate affirmatively on two or more of the questions are considered problem drinkers (1) and those with less than two affirmative responses are not (0).

Several other control variables were included in the models presented based on prior research in this area. Since attitudes toward DUI checkpoints

are related to DUI (Drew et al., 2010a; Greenberg et al., 2005; Stringer, 2020), it is measured with the question "About how often do you think sobriety checkpoints should be conducted?" (Drew et al., 2010b, p. 63). Responses ranged from not at all (1) to weekly (5). Prior research has also determined that concerns about being involved in an automobile crash are related to DUI (see Bouffard & Exum, 2013; Drew et al., 2010a; Stringer, 2020). Therefore, the question "How likely is it that drivers who have had too much to drink to drive safely will have an accident?" (Drew et al., 2010b, p. 60) measured this issue. Response options were the same as those for the certainty of punishment measures and ranged from very unlikely (1) to almost certain (5).

Prior research has also illustrated that those who believe it takes more drinks to reach the limit are more likely to engage in DUI (Stringer, 2020; see also Sykes & Matza, 1957). Thus, this project controlled this with the question: "The legal limit in your state is point-zero-eight (.08). In your opinion, how many 12-ounce beers would a person about your height and weight have to drink in a two-hour period to just reach the legal limit of point-zero-eight?" (Drew et al., 2010b, p. 63). The original measure did not conform to the assumption of normality (skew = 3.87, kurtosis = 33.97) and was normalized with the natural log prior to analysis. This transformation resolved the skew (0.08), but it did not completely alleviate the kurtosis (1.98).

Because those that never drive a car (e.g., those that live in a large city such as New York) are far less likely to drink and drive, driving propensities were also controlled. The reported frequency of driving was measured as "How often do you usually drive a car or other motor vehicle?" (Drew et al., 2010b, p. 83) and options included never (1), only certain times a year (2), once a week or less (3), several days a week (4), and every day (5). Since males (Hoyle et al., 2018) and young people (Drew et al., 2010b) drink and drive more often than others, age is a continuous scale and gender was a binary measure that compares males (1) to females (0).

## *Data Analysis*

Generalized Structural Equation Modeling (GSEM) was used to evaluate the aforementioned hypotheses since the endogenous variables did not conform to a normal distribution. This method also allowed for the inclusion of the latent measure of certainty of punishment presented in Table 2 as the measurement model in the full structural model (see Bollen & Lennox, 1991) and the estimation of direct and indirect paths among covariates (see Kline, 2015). Accordingly, the ordinal logit function was used for the certainty of punishment and the negative binomial model was used to estimate

parameters for DUI in the past 30 days. The negative binomial model was chosen due to the high rate of zeros in the distribution, which can produce artifactually significant results by under-estimating zero values and deflating standard errors when using the Poisson method (DeMichele et al., 2014; Osgood, 2000).

The moderation of deterrence by problem drinking was tested by conducting a multigroup analysis. This analysis utilized the "problem drinker" measure as the grouping variable and none of the parameter estimates were constrained to be equal across groups. Subsequently, hypothesis five (H5) was tested with *Z*-tests that compared the coefficients between groups. These calculations were performed using the Paternoster et al. (1998) formula:

$$Z = \frac{\beta_1 - \beta_2}{\sqrt{SE\beta_1^{\,2} + SE\beta_2^{\,2}}}$$

Where $\beta_1$ is the coefficient for non-problem drinkers, $\beta_2$ is the coefficient for non-problem drinkers, and $SE\beta_1$ and $SE\beta_2$ represent the standard errors of these estimates, respectively. These calculations utilize the $\beta$ coefficients not the odds ratios $\exp(\beta)$ presented in the tables because the $\beta$ estimates follow the normal *Z* distribution. The significance tests were two tailed with critical values of 1.96 ($p < .05$), 2.58 ($p < .01$), and 95% confidence intervals.

## Findings

Results from the GSEM model for the entire sample are presented in Table 3. The event rate ratios are incorporated along with the standard errors in parentheses. Since these estimates are the exponentiated form of the maximum likelihood estimates (similar to the odds ratio in logic regression), they can be interpreted as the percent change in the dependent variable (see DeMichele et al., 2014; Stringer, 2020). For example, the certainty of punishment estimate (0.64) indicates that each unit increase in certainty of punishment is related to a decreased odds of DUI in the past 30 days of 36%, while controlling for other factors. As such, hypothesis one (H1) is supported. Interestingly, problem drinkers were predicted to have a higher certainty of punishment, yet they were also more likely to engage in DUI than non-problem drinkers.[6] Tables 4 and 5 elaborate on the differences between problem and non-problem drinkers by comparing estimates for each group.

The predictors of certainty of punishment also produced meaningful results, as hypothesized. Specifically, respondents with prior DUI arrest

**Table 3.** Generalized Structural Equation Model ($N = 6,591$).

| | Endogenous variables | | | |
|---|---|---|---|---|
| | Certainty of punishment | | Self-reported drinking and driving | |
| Exogenous variables | *OR* | *SE* | *OR* | *SE* |
| Certainty of punishment | — | — | 0.64*** | 0.01 |
| Problem drinker | 1.63** | 0.29 | 2.77*** | 0.25 |
| Prior DUI arrest | 3.95** | 1.48 | 1.05 | 0.24 |
| DUI checkpoint experience | 1.06 | 0.10 | b | b |
| Punishment avoidance | 0.68*** | 0.06 | 10.95*** | 0.71 |
| Been with planned DUI Driver | 0.63*** | 0.04 | 1.24*** | 0.07 |
| Rode with a DUI driver | 1.08 | 0.14 | 1.06 | 0.09 |
| Perceived likelihood of crash | 5.07*** | 0.27 | 1.47*** | 0.06 |
| DUI checkpoint use approval | 0.92** | 0.03 | 0.85*** | 0.02 |
| Number of drinks to BAC limit | b | b | 1.72*** | 0.13 |
| Auto driving frequency | 0.88*** | 0.03 | 1.95*** | 0.12 |
| Male | 1.16* | 0.08 | 2.21*** | 0.14 |
| Age | 0.98*** | 0.01 | 1.00 | 0.01 |
| AIC | 57093.18 | | | |
| BIC | 57358.12 | | | |

*Note.* b = presumed noncausal relationship.
*$p < .05$, **$p < .01$. ***$p < .001$.

experiences had a significant increase in perceptions of certainty of punishment compared to those that had not been arrested previously. However, the parameter estimates for punishment via DUI checkpoint did not achieve statistical significance. Therefore, hypothesis two (H2) is partially supported. Punishment avoidance was also related to a significant decrease in perceptions of certainty of punishment. Thus, hypothesis three (H3) is supported by these data as well. Hypothesis four (H4) is also partially supported since being with someone who planned to driver drunk was related to a significant decrease in certainty of punishment but riding with a DUI driver was not.

Table 4 introduces the multi-group analysis that compares predictors of certainty of punishment between non-problem and problem drinkers. This analysis illustrated several noteworthy differences in the way that perceptions of certainty of punishment are formulated. Specifically, while prior DUI arrests led to a significant increase in certainty of punishment for non-problem drinkers (5.11), the estimate for problem drinkers was much lower (2.08)

**Table 4.** Generalized Structural Equation Model Results for Certainty of Punishment ($N = 6{,}591$).

| | Non-problem drinkers | | Problem drinkers | | *Z*-score |
|---|---|---|---|---|---|
| Exogenous variables | *OR* | *SE* | *OR* | *SE* | *Z* |
| Prior DUI arrest | 5.11*** | 2.60 | 2.08 | 0.99 | 1.29 |
| DUI checkpoint experience | 1.16 | 0.12 | 0.50* | 0.16 | 2.57* |
| Punishment avoidance | 0.69*** | 0.07 | 0.52* | 0.16 | 0.83 |
| Been with planned DUI driver | 0.60*** | 0.05 | 1.07 | 0.27 | −2.23* |
| Rode with a DUI driver | 1.07 | 0.15 | 1.01 | 0.26 | 0.24 |
| Perceived likelihood of crash | 5.21*** | 0.30 | 3.74*** | 0.67 | 1.74 |
| DUI checkpoint use approval | 0.91** | 0.03 | 0.96 | 0.08 | −0.53 |
| Auto driving frequency | 0.87*** | 0.03 | 1.02 | 0.09 | −1.69 |
| Male | 1.16* | 0.08 | 1.14 | 0.28 | 0.08 |
| Age | 0.99*** | 0.00 | 0.99 | 0.01 | 0.00 |
| AIC | 56999.34 | | | | |
| BIC | 57502.05 | | | | |

*Note*. Based on two-tailed *Z*-scores.
*$p < .05$. **$p < .01$. ***$p < .001$.

and insignificant. Interestingly, there is also a significant difference ($Z = 2.57$) in the impact of going through a DUI checkpoint and certainty of punishment between these subgroups. The estimate for having been with someone that planned to drive drunk shows also significantly changes between the groups and is insignificant for problem drinkers. Although the variance did not achieve statistical significance, the coefficients for the likelihood of an accident also fluctuates.

Table 5 describes results for the predictors of DUI in the last 30 days. Most importantly, these results show that the relationship between perceptions of certainty of punishment and DUI is conditioned by problem drinking. Specifically, the decreased odds of offending per increase in perception of punishment certainty is greater (80%) for problem drinkers than for non-problem drinkers (33%). In addition, relationship between punishment avoidance and DUI offending significantly differs between problem and non-problem drinkers ($Z = 7.40$). Concerns about traffic accidents and the criterion is also moderated by problem drinking. Perceptions of the number of drinks it takes to reach the legal limit also varies between groups as well. Overall, significant heterogeneity exists between the two groups, and hypothesis five (H5) is supported.

**Table 5.** Generalized Structural Equation Model Results for Self-Reported DUI ($N = 6{,}591$).

| | Non-problem drinkers | | Problem drinkers | | *Z*-score |
|---|---|---|---|---|---|
| Exogenous variables | *OR* | *SE* | *OR* | *SE* | *Z* |
| Certainty of punishment | 0.67*** | 0.01 | 0.40*** | 0.08 | 2.83** |
| Prior DUI arrest | 0.84 | 0.25 | 0.90 | 0.46 | −0.10 |
| Punishment avoidance | 13.55*** | 0.94 | 2.29*** | 0.53 | 7.40** |
| Been with planned DUI | 1.23*** | 0.07 | 1.15 | 0.30 | 0.26 |
| Rode with a drunk driver | 1.07 | 0.09 | 1.38 | 0.34 | −0.98 |
| Likelihood of crash | 1.40*** | 0.05 | 2.50*** | 0.50 | −2.19* |
| DUI checkpoint use approval | 0.86*** | 0.02 | 0.82* | 0.06 | 0.49 |
| Number of drinks to BAC limit | 1.51*** | 0.12 | 3.03*** | 0.79 | −2.54* |
| Auto driving frequency | 1.82*** | 0.12 | 2.79*** | 0.51 | −1.85 |
| Male | 2.17*** | 0.14 | 2.89*** | 0.85 | −0.84 |
| Age | 1.01* | 0.00 | 0.99 | 0.01 | 0.85 |
| AIC | 56999.34 | | | | |
| BIC | 57502.05 | | | | |

*Note.* Based on two-tailed *Z*-scores.
*$p < .05$. **$p < .01$. ***$p < .001$.

## Discussion

This project is the first to apply the idea of differential deterrability (see Jacobs, 2010; Piquero et al., 2011; Pogarsky, 2002) to the concepts of Stafford and Warr's (1993) reconceptualization of deterrence theory by comparing problem and non-problem drinkers. Overall, the results suggest the Stafford and Warr (1993) concepts remain important to the study of deterrence and the more recent advances on differential deterrability. The results illustrating variability in the certainty of punishment and DUI relationship as well as the formulation of perceptions between these groups provide a particularly meaningful contribution to the literature.

This project contributes a partial examination of the Stafford and Warr (1993) model using a representative sample of the U.S. population, which few have accomplished (see Piquero & Paternoster, 1998; Stringer, 2020). The continued importance of perceived certainty of punishment in criminal decision-making is also sustained herein (see Nagin & Pogarsky, 2001; Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Pratt et al., 2006; Stafford & Warr, 1993; Stringer, 2020). These results also persisted after controlling for problem drinking similar to Stringer (2020), but contrary to the

Yu (2000) study. The main contributions of Stafford and Warr (1993) on punishment avoidance and the contemporaneous role that personal and vicarious experiences have in the formulation of perceptions of certainty of punishment is also supported (see Piquero & Paternoster, 1998; Piquero & Pogarsky, 2002; Stringer, 2020).

Although problem drinkers only comprised a small fraction (4%) of the overall sample, problem drinking was also one of the strongest predictors of DUI (see also Stringer, 2020). In fact, the relationship between problem drinking and DUI is even stronger than certainty of punishment and DUI offending. The results showing an increased certainty of punishment and an increase in self-reported DUI for problem drinkers[6] in Table 3 is not new (see Stringer, 2020). Initially, this may appear to support a lack of rational thinking by problem drinkers (see Goodfellow & Kilgore, 2014; MacCoun, 1993; Yu et al., 2006) since problem drinkers have an increased certainty of punishment but continue to offend at a higher rate. However, the conditional models (see Tables 4 and 5) suggests that there is some rational (yet different) calculation among this subpopulation, and this relationship is multiplicative rather than additive. Thus, it is plausible that this somewhat paradoxical relationship for problem drinking may be related to differences in deterrability and/or risk sensitivity (Jacobs, 2010).

Drawing on the prior literature on loss aversion, it is possible that problem drinking can cause a shift in one's reference point that is conducive to risk seeking behavior regarding drinking and driving (Loughran, Pogarsky et al., 2012). For example, while a non-problem drinker may see drinking alcohol and possibly even driving home as a gain (risk adverse), a problem drinker who drinks alcohol and perhaps even drives every day will view this as their reference point and not doing so will be viewed as a loss (risk seeking) (see Loughran, Pogarsky et al., 2012). Since fear of arrest also works independently of perceived certainty (Pickett, 2018; Pickett et al., 2018), it is also possible that problem drinkers have less to lose by being caught which produces less sensitivity to the risk of apprehension (see Jacobs, 2010).

While the results from Table 3 suggest that problem drinkers may be less sensitive to risk, the conditional models indicate that they are not completely undeterrable or irrational. In fact, one of the more noteworthy results from this project (see Table 5) shows that certainty of punishment is negatively related to DUI for problem and non-problem drinkers; however, this relationship significantly varies between the two groups. This not only illustrates that deterrability varies between the groups, but as noted above, it also suggests that problem drinking does not undermine the ability to make rational choices (see Yu et al., 2006). As such, the evidence suggests that problem drinkers are

not what Pogarsky (2002) would call incorrigible. In fact, the stronger relationship for problem drinkers suggests they may be influenced significantly more by perceptions of certainty than non-problem drinkers.[6]

The stronger relationship between punishment certainty and DUI for problem drinkers may be, at least partially, explained by a greater influence of deterrence on problem drinkers' decision-making process. Thus, to some extent, they may be seen as more deterrable than some non-problem drinkers (e.g., acute conformists). For example, many respondents did not drink alcohol (40%), so they are not really motivated offenders (see Cohen & Felson, 1979; Stringer et al., 2019) and are not going to drink and drive regardless of the certainty of punishment (e.g., acute conformity) (Pogarsky, 2002). In addition, moral values and internal controls are also related to deterrability (Bouffard et al., 2018; Herman & Pogarsky, 2020; Pogarsky, 2002) and DUI offending regardless of the perception of punishment (Greenberg et al., 2004, 2005; Lanza-Kaduce, 1988; Piquero & Paternoster, 1998; Stringer, 2020). As such, problem drinkers may also have less internal controls or moral values that inhibit their DUI behavior which leads to a more robust relationship between the threat of apprehension and DUI.

Another substantial contribution to the literature is the diverse way that perceptions of certainty were formulated. For example, many of the deterrence-based measures were not significant predictors of certainty of arrest among problem drinkers, which was not the case for non-problem drinkers. It is common for experienced offenders to put less weight on new arrests (Anwar & Loughran, 2011) when updating their perceptions, but sanctioned offending is often related to increased risk of apprehension for the general population (see Apel, 2013). Although little research has specifically examined problem drinkers, Goodfellow and Kilgore (2014) did find similar null results. Moreover, vicarious experiences appear to have little effect on perceptions of certainty for problem drinkers, which likely results from recidivist's perceptions being primarily impacted by personal experiences (Freeman & Watson, 2006; Paternoster & Piquero, 1995; Pogarsky et al., 2004; Stafford & Warr, 1993). Thus, prior punishment and vicarious experiences appear to have little impact on the perception formulation/updating process for problem drinkers.

Concerns about involvement in a traffic accident were also very meaningful to the current effort since it was the strongest predictor of punishment certainty in all of the models. Because media attention often focuses on the dangers of DUI related traffic accidents, and it is a form of vicarious experience (Stafford & Warr, 1993) that can impact DUI perceptions (Pickett, 2018) this is not unexpected. Some prior research has also explored the relationship of traffic accident concerns with DUI behavior (Bouffard & Exum, 2013;

Drew, 2010; Greenberg et al., 2004). In fact, Bouffard and Exum (2013) found that concerns about accident involvement (77%) approach the same level as concerns about legal consequences (81%) for DUI. As the current results depict, it is also related to perceived punishment certainty and symbolizes a concern that the accident may trigger a police response making the risk of arrest very likely (see Stringer, 2020).

The varying concerns about traffic accidents advances the argument that problem drinkers may be more risk seeking due to a shift in their reference point (see Loughran, Pogarsky et al., 2012) and/or less risk sensitive (Jacobs, 2010), which makes them willing to risk having a traffic accident. However, it is worth noting that ambiguity also has a potential role in two ways here. For example, most are probably aware that if they are involved an accident and the police arrive to find them intoxicated, they are almost certain to be arrested. Thus, accident involvement would considerably reduce the ambiguity in the perception of apprehension. The second way that ambiguity could relate to this relationship is through ambiguity in the risk of having an accident, and this would likely vary between experienced problem drinkers and others. Specifically, the more experienced problem drinkers are likely to calculate this risk (similar to the risk of apprehension) as low and less ambiguous (see Apel, 2013; Loughran et al., 2011).

The impact of ambiguity is beyond the scope of this analysis, and it would depend on whether an offender was ambiguity seeking or adverse. However, it is possible that an experienced problem drinker may calculate the perceived risk of detection as very low (1%) unless they are in an accident which then makes it nearly certain (99%). Thus, the ambiguity adverse offender could reduce the ambiguity in the risk of apprehension considerably and offend more (see Apel, 2013; Loughran et al., 2011). In fact, an offender could nearly dichotomize this perception by thinking they will not be arrested unless they crash.

Problem drinkers are also significantly more likely to exploit the considerable ambiguity in the true level of intoxication prior to receiving a blood alcohol content (BAC) test (see Midgette et al., 2021). Since drivers have little knowledge about the number of drinks it will take to exceed the BAC limit, drunk driving is one of few offenses where even the offender has significant ambiguity around whether it has been committed or not. Thus, merely encountering the police while driving after drinking may not be sufficient to warrant arrest because the driver could be below the limit. Prior research illustrates that BAC ambiguity is related to more offending in 24/7 sobriety programs (Midgette et al., 2021), and drunk driving within the population (Stringer, 2020), but this project shows it is also conditioned by problem drinking.

The secondary data used here is not without limitations and the results should be interpreted within this context. For example, these cross-sectional

data prevented the analysis of changes and the formulation of perceptions. Although this project was also not able to distinguish between vicarious punishment and punishment avoidance, Stringer (2020) points out these experiences most likely involve punishment avoidance. Recent advances in deterrence scholarship regarding ambiguity or fear of arrest were also not directly measured. In addition, these data also relied on accurate self-reporting of past experiences and was unable to measure the recency of prior experiences (see Anwar & Loughran, 2011). The measure of checkpoint experience[4] was consistent with Piquero and Paternoster (1998), but it does not measure checkpoint experience after drinking (see Piquero & Pogarsky, 2002), which may explain its insignificance here.

Future research may also wish to explore the differences in decision-making states when responding to a survey (presumably sober) versus making the decision to drive drunk (intoxicated). Most know that they shouldn't drink and drive while sober, but perhaps not so much after drinking. This may also vary since some (e.g., problem drinkers) may drive to a bar and drink with every intention of driving home, while others may plan on calling an Uber or having a designated driver but have a change of plan. Although, Midgette et al. (2021), refer to the bifurcated processes between the decision to drink and then the decision to drive, research on this is issue is very scarce. Despite these limitations, this article makes a noteworthy addition to the differential deterrability literature by illustrating crucial heterogeneity in the Stafford and Warr (1993) model that is conditioned by problem drinking.

## Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author received no financial support for the research, authorship, and/or publication of this article.

## ORCID iD

Richard J. Stringer https://orcid.org/0000-0002-1111-560X

## Notes

1. A non-response bias analysis was conducted with 200 interviews of non-respondents (non-contacts and refusals) using *t*-tests to compare the means of respondents to non-respondents on 45 measures. Results showed only four variables (light beer drinker, arrested for drinking/driving, employed full-time, and Hispanic/Latino descent) were significantly different ($p < .05$) between the groups (Drew et al.,

2010b). The difference in the mean reported for prior DUI arrests between respondents ($X = .01$) and non-respondents ($X = .00$) was very small (.01), but it suggests arrests may be slightly higher among respondents than non-respondents.

2. Specifically, detailed measures for social pressure to drink more (40.3%), drinking because everyone else was (40.3%), drinking first thing in the morning (40.3%), being told that one should cut down on drinking (40.3%), feeling bad or guilty about drinking (40.3%), receiving criticism about drinking (40.3%), drinking and driving in the last 30 days (79.6%) had several missing values. The second filter question was also contingent on the first.
3. Several binary measures were created that compared missing values (coded as 1) to valid cases (0) for each of the measures in question. A Pearson's correlation analysis was performed that compared these measures to another dichotomous measure for the filter questions. This analysis indicated that all of these measures, with the exception of DUI in the past 30 days (Correlation Coefficient = 0.413, $p < .001$) were perfectly correlated (Pearson Correlation Coefficient = 1.00, $p < .001$) with never drinking in the past 12 months. A comparison of the missing values for DUI in the past 30 days was also highly correlated (Coefficient 0.996, $p < .001$) with those that indicated they did not drive within 2 hours of drinking in the past 12 months as hypothesized.
4. This measure of punishment was introduced by Piquero and Paternoster (1998) and has also been utilized by subsequent research (see e.g., Piquero & Pogarsky, 2002; Stringer, 2020). A detailed explanation of the use of the measure is articulated by Piquero and Paternoster (1998) that readers may be interested in. Briefly, Piquero and Paternoster (1998) argue that while checkpoints are an unpleasant minor sanction that that produces discomfort and anxiety that drivers would like to avoid (see also Zimring & Hawkins, 1973). Piquero and Pogarsky (2002) also add that since few (2%) have been arrested, it is practical to use checkpoints too since there is more variation.
5. Since the dependent variable is DUI in the past 30 days, any self-reported drinking and driving in the past 30 days was also subtracted from DUI in the past 12 months prior to subtracting encountering a DUI checkpoint as noted in the formula. This calculation made the measures of punishment avoidance and DUI past 30 days mutually exclusive. This also established temporal order between the predictor and criterion. Thus, self-reported avoidance of DUI punishment in the 11 months preceding the last 30 days was used to predict DUI in the last 30 days.
6. This does not mean problem drinkers are not committing a high rate of DUI offenses. It is important to remember that the model coefficients represent the slope (change) but do not indicate the intercept. In fact, these data show the average problem drinker engaged in four times the number of DUI trips in the preceding 30 days (mean DUI Frequency = 1.47) compared to non-problem drinkers (mean DUI Frequency = 0.35). Thus, even though the coefficients suggest they are being deterred, they are still DUI much more than non-problem drinkers (e.g., the problem drinkers with higher certainty are involved in DUI less than those with low certainty).

## References


Akers, R. L. (2009). *Social learning and social structure: A general theory of crime and deviance*. Transaction Books.

Allison, P. D. (2001). *Missing data* (Vol. 136). SAGE Publications.

Andenaes, J. (1974). *Punishment and detterence*. University of Michigan Press.

Anwar, S., & Loughran, T. A. (2011). Testing a Bayesian learning theory of deterrence among serious juvenile offenders. *Criminology*, *49*(3), 667–698.

Apel, R. (2013). Sanctions, perceptions, and crime: Implications for criminal deterrence. *Journal of Quantitative Criminology*, *29*(1), 67–101.

Applegate, B. K., Cullen, F. T., Barton, S. M., Richards, P. J., Lanza-Kaduce, L., & Link, B. G. (1995). Public support for drunk-driving countermeasures: Social policy for saving lives. *Crime and Delinquency*, *41*(2), 171–190.

Bertelli, A. M., & Richardson Jr, L. E. (2008). The behavioral impact of drinking and driving laws. *Policy Studies Journal*, *36*(4), 545–569.

Bollen, K., & Lennox, R. (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin*, *110*(2), 305–314.

Bouffard, J. A., & Exum, M. L. (2013). Rational choice beyond the classroom: Decision making in offenders versus college students. *Criminal Justice Journal*, *41*(6), 438–447.

Bouffard, J. A., Exum, M. L., & Niebuhr, N. (2018). Examining the stability and predictors of deterrability across multiple offense types within a sample of convicted felons. *Criminal Justice Journal*, *57*, 76–88.

Bouffard, J. A., Niebuhr, N., & Exum, M. L. (2017). Examining specific deterrence effects on DWI among serious offenders. *Crime and Delinquency*, *63*(14), 1923–1945.

Bush, B., Shaw, S., Cleary, P., Delbanco, T. L., & Aronson, M. D. (1987). Screening for alcohol abuse using the CAGE questionnaire. *The American Journal of Medicine*, *82*(2), 231–235.

Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American Sociological Review*, *44*, 588–608.

DeMichele, M., Lowe, N. C., & Payne, B. K. (2014). A criminological approach to explain chronic drunk driving. *American Journal of Criminal Justice*, *39*(2), 292–314.

Drew, L., Royal, D., Moulton, B., Peterson, A., & Haddix, D. (2010a). *Volume I: Summary report: National survey of drinking and driving attitudes and behaviors: 2008* (DOT HS 811 342). https://one.nhtsa.gov/Driving-Safety/Impaired-Driving/National-Survey-of-Drinking-and-Driving-Attitudes-and-Behaviors:-2008#

Drew, L., Royal, D., Moulton, B., Peterson, A., & Haddix, D. (2010b). *Volume III: Methodology report: National survey of drinking and driving attitudes and behaviors: 2008* (DOT HS 811 344). https://one.nhtsa.gov/Driving-Safety/Impaired-Driving/National-Survey-of-Drinking-and-Driving-Attitudes-and-Behaviors:-2008#

Freeman, J., & Watson, B. (2006). An application of Stafford and Warr's reconceptualisation of deterrence to a group of recidivist drink drivers. *Accident Analysis and Prevention*, *38*(3), 462–471.

Goodfellow, M., & Kilgore, C. (2014). DUI offenders' beliefs about DUI statutes and DUI law enforcement. *Journal of Drug Issues*, *44*(3), 269–280.

Greenberg, M. D., Morral, A. R., & Jain, A. K. (2004). How Can repeat drunk drivers be influenced to change? Analysis of the association between drunk driving and DUI recidivists' attitudes and beliefs. *Journal of Studies on Alcohol*, *65*(4), 460–463.

Greenberg, M. D., Morral, A. R., & Jain, A. K. (2005). Drink-driving and DUI recidivists' attitudes and beliefs: A longitudinal analysis. *Journal of Studies on Alcohol*, *66*(5), 640–647.

Herman, S., & Pogarsky, G. (2020). Morality, deterrability, and offender decision making. *Justice Quarterly*. Advance online publication. https://doi.org/10.1080/07418825.2019.1709884

Hoyle, J., Miller, B. L., Stogner, J. M., Posick, C., & Blackwell, B. S. (2018). Analyzing predictors of drinking and driving among gender cohorts within a college sample. *American Journal of Criminal Justice*, *43*(4), 754–767.

Jacobs, B. A. (2010). Deterrence and deterrability. *Criminology*, *48*(2), 417–441.

Jacobs, B. A., & Wright, R. (2006). *Street justice: Retaliation in the criminal underworld*. Cambridge University Press.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford Publications.

Lanza-Kaduce, L. (1988). Perceptual deterrence and drinking and driving among college students. *Criminology*, *26*(2), 321–341.

Lerner, B. H. (2011). *One for the road: Drunk driving since 1900*. Johns Hopkins University Press.

Lochner, L. (2007). Individual perceptions of the criminal justice system. *American Economic Review*, *97*(1), 444–460.

Loughran, T. A., Pogarsky, G., Piquero, A. R., & Paternoster, R. (2012a). Re-examining the functional form of the certainty effect in deterrence theory. *Justice Quarterly*, *29*(5), 712–741.

Loughran, T. A., Piquero, A. R., Fagan, J., & Mulvey, E. P. (2012b). Differential deterrence: Studying heterogeneity and changes in perceptual deterrence among serious youthful offenders. *Crime and Delinquency*, *58*(1), 3–27.

Loughran, T. A. (2019). Behavioral criminology and public policy. *Criminology & Public Policy*, *18*(4), 737–758.

Loughran, T. A., Paternoster, R., Piquero, A. R., & Pogarsky, G. (2011). On ambiguity In perceptions of risk: Implications for criminal decision making and deterrence. *Criminology*, *49*(4), 1029–1061.

Loughran, T. A., Paternoster, R., & Thomas, K. J. (2014). Incentivizing responses to self-report questions in perceptual deterrence studies: An investigation of the validity of deterrence theory using Bayesian truth serum. *Journal of Quantitative Criminology*, *30*(4), 677–707.

MacCoun, R. J. (1993). Drugs and the law: a psychological analysis of drug prohibition. *Psychological Bulletin*, *113*(3), 497–512.

Matsueda, R. L., Kreager, D. A., & Huizinga, D. (2006). Deterring delinquents: A rational choice model of theft and violence. *American Sociological Review*, *71*(1), 95–122.

Maxson, C. L., Matsuda, K. N., & Hennigan, K. (2011). "Deterrability" among gang and nongang juvenile offenders: Are gang members more (or less) deterrable than other juvenile offenders? *Crime and Delinquency*, *57*(4), 516–543.

Midgette, G., Loughran, T. A., & Tahamont, S. (2021). The impact of ambiguity-induced error in offender decision-making: Evidence from the field. *Journal of Research in Crime and Delinquency*. Advance online publication. https://doi.org/10.1177/00224278211000088

Nagin, D. S., & Paternoster, R. (1993). Enduring individual differences and rational choice theories of crime. *Law & Society Review*, *27*(3), 467.

Nagin, D. S., & Pogarsky, G. (2001). Integrating celerity, impulsivity, and extralegal sanction threats into a model of general deterrence: Theory and evidence. *Criminology*, *39*(4), 865–892.

National Highway Traffic Safety Administration (NHTSA). (2008). National Survey of drinking and driving attitudes and behaviors. https://one.nhtsa.gov/Driving-Safety/Occupant-Protection/2008-National-Survey-of-Drinking-and-Driving-Attitudes-and-Behaviors

Osgood, D. W. (2000). Poisson-based regression analysis of aggregate crime rates. *Journal of Quantitative Criminology*, *16*(1), 21–43.

Paternoster, R., Brame, R., Mazerolle, P., & Piquero, A. (1998). Using the correct statistical test for the equality of regression coefficients. *Criminology*, *36*(4), 859–866.

Paternoster, R., & Piquero, A. (1995). Reconceptualizing deterrence: An empirical test of personal and vicarious experiences. *Journal of Research in Crime and Delinquency*, *32*(3), 251–286.

Paxton, P., Hipp, J. R., Marquart-Pyatt, S., & Marquart-Pyatt, S. T. (2011). *Nonrecursive models: Endogeneity, reciprocal relationships, and feedback loops* (Vol. 168). SAGE Publications.

Pickett, J. T. (2018). Using behavioral economics to advance deterrence research and improve crime policy: Some illustrative experiments. *Crime and Delinquency*, *64*(12), 1636–1659.

Pickett, J. T., Barnes, J. C., Wilson, T., & Patrick Roche, S. (2020). Prospect theory and criminal choice: Experiments testing framing, reference dependence, and decision weights. *Justice Quarterly*, *37*(6), 1140–1168.

Pickett, J. T., Roche, S. P., & Pogarsky, G. (2018). Toward a bifurcated theory of emotional deterrence. *Criminology*, *56*(1), 27–58.

Piquero, A., & Paternoster, R. (1998). An application of Stafford and Warr's reconceptualization of deterrence to drinking and driving. *Journal of Research in Crime and Delinquency*, *35*(1), 3–39.

Piquero, A. R., Paternoster, R., Pogarsky, G., & Loughran, T. (2011). Elaborating the individual difference component in deterrence theory. *Annual Review of Law and Social Science*, *7*, 335–360.

Piquero, A. R., Piquero, N. L., Gertz, M., Bratton, J., & Loughran, T. A. (2012). Sometimes ignorance is bliss: Investigating citizen perceptions of the certainty and severity of punishment. *American Journal of Criminal Justice*, *37*(4), 630–646.

Piquero, A. R., & Pogarsky, G. (2002). Beyond Stafford and Warr's reconceptualization of deterrence: Personal and vicarious experiences, impulsivity, and offending behavior. *Journal of Research in Crime and Delinquency*, *39*(2), 153–186.

Piquero, A., & Tibbetts, S. (1996). Specifying the direct and indirect effects of low self-control and situational factors in offenders' decision making: Toward a more complete model of rational offending. *Justice Quarterly*, *13*(3), 481–510.

Pogarsky, G. (2002). Identifying "deterrable" offenders: Implications for research on deterrence. *Justice Quarterly*, *19*(3), 431–452.

Pogarsky, G., Kim, K., & Paternoster, R. (2005). Perceptual change in the national youth survey: Lessons for deterrence theory and offender decision-making. *Justice Quarterly*, *22*(1), 1–29.

Pogarsky, G., & Piquero, A. R. (2003). Can punishment encourage offending? Investigating the "resetting" effect. *Journal of Research in Crime and Delinquency*, *40*(1), 95–120.

Pogarsky, G., Piquero, A. R., & Paternoster, R. (2004). Modeling change in perceptions about sanction threats: The neglected linkage in deterrence theory. *Journal of Quantitative Criminology*, *20*(4), 343–369.

Pogarsky, G., Roche, S. P., & Pickett, J. T. (2018). Offender decision-making in criminology: Contributions from behavioral economics. *Annual Review of Criminology*, *1*(1), 379–400.

Pratt, T. C., & Cullen, F. T. (2005). Assessing macro-level predictors and theories of crime: A meta-analysis. *Crime and Justice*, *32*, 373–450.

Pratt, T. C., Cullen, F. T., Blevins, K. R., Daigle, L. E., & Madensen, T. D. (2006). The empirical status of deterrence theory: A meta-analysis. *Taking Stock: The Status of Criminological Theory*, *15*, 367–396.

Sampson, R. J., & Cohen, J. (1988). Deterrent effects of the police on crime: A replication and theoretical extension. *Law & Society Review*, *22*, 163–189.

Shover, N. (2018). *Great pretenders: Pursuits and careers of persistent thieves*. Routledge.

Sitren, A. H., & Applegate, B. K. (2007). Testing the deterrent effects of personal and vicarious experience with punishment and punishment avoidance. *Deviant Behavior*, *28*(1), 29–55.

Stafford, M. C., & Warr, M. (1993). A reconceptualization of general and specific deterrence. *Journal of Research in Crime and Delinquency*, *30*(2), 123–135.

Stringer, R., White, G., Gainey, R., & Triplett, R. (2019). It Is more than just alcohol: A criminological perspective on routine drinking activities, opportunity, and alcohol-related crashes. *Journal of Drug Issues*, *49*(4), 718–738.

Stringer, R. J. (2020). Drunk driving and deterrence: Exploring the reconceptualized deterrence hypothesis and self-reported drunk driving. *Journal of Crime and Justice*, *44*(3), 1–16.

Sykes, G. M., & Matza, D. (1957). Techniques of neutralization: A theory of delinquency. *American Sociological Review*, *22*, 664–670.

Thomas, K. J., & Nguyen, H. (2020). Status gains versus status losses: Loss aversion and deviance. *Justice Quarterly*. Advance online publication. https://doi.org/10.1080/07418825.2020.1856400

Thomas, K. J., Loughran, T. A., & Piquero, A. R. (2013). Do individual characteristics explain variation in sanction risk updating among serious juvenile offenders? Advancing the logic of differential deterrence. *Law and Human Behavior*, *37*(1), 10–21.

Urban, L. S. (2009). Identifying "Deterrable" offenders in a sample of active juvenile offenders. *Southwest Journal of Criminal Justice*, *6*(1), 79–99.

Wilson, T., Paternoster, R., & Loughran, T. (2017). Direct and indirect experiential effects in an updating model of deterrence: A research note. *Journal of Research in Crime and Delinquency*, *54*(1), 63–77.

Wood, P. B. (2007). Exploring the positive punishment effect among incarcerated adult offenders. *American Journal of Criminal Justice*, *31*(2), 8–22.

Worrall, J. L., Els, N., Piquero, A. R., & TenEyck, M. (2014). The moderating effects of informal social control in the sanctions-compliance nexus. *American Journal of Criminal Justice*, *39*(2), 341–357.

Wright, R. T., & Decker, S. H. (1996). *Burglars on the job: Streetlife and residential break-ins*. Northeastern University Press.

Yu, J. (2000). Punishment and alcohol problems: Recidivism among drinking-driving offenders. *Criminal Justice Journal*, *28*(4), 261–270.

Yu, J., Evans, P. C., & Clark, L. P. (2006). Alcohol addiction and perceived sanction risks: Deterring drinking drivers. *Criminal Justice Journal*, *34*(2), 165–174.

Zaloshnja, E., Miller, T. R., & Blincoe, L. J. (2013). Costs of alcohol-involved crashes, United States, 2010. *Annals of Advances in Automotive Medicine*, *57*, 3–12.

Zimring, F., & Hawkins, G. (1968). Deterrence and marginal groups. *Journal of Research in Crime and Delinquency*, *5*(2), 100–114.

Zimring, F., & Hawkins, G. (1973). *Deterrence: The legal threat in crime control*. University of Chicago Press.

## Author Biography

**Richard J. Stringer**, Ph.D. is an Assistant Professor in the Department of Sociology and Criminal Justice at Kennesaw State University. He received his Ph.D. in Criminology and Criminal Justice from Old Dominion University in 2018. His research interests include drug and alcohol policy, courts and sentencing, policing, and advanced quantitative methods. His prior research has been funded by the U.S. Department of Justice and has appeared in outlets such as *Deviant Behavior*, *Journal of Drug Issues*, *American Journal of Criminal Justice*, and the *Journal of Crime and Justice*. He also serves as Associate Editor for the *Journal of Criminal Justice & Law*.